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Productivity Commission



# Financial Flows and Infrastructure Financing

# Financial Flows and Infrastructure Financing



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# Introduction

Alexandra Heath

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The topic of this year's conference, 'Financial Flows and Infrastructure Financing', was chosen to support the G20 agenda during Australia's presidency in 2014. More specifically, the G20 is seeking to boost global growth, including through focusing on ways to improve the climate for investment, particularly in infrastructure. Reflecting the broad range of issues covered by this topic, the conference was jointly hosted with the Productivity Commission and the Lowy Institute for International Policy. The Productivity Commission has had considerable experience with a wide range of infrastructure issues, most recently with its report on *Public Infrastructure* (PC 2014a, 2014b). The involvement of the Lowy Institute for International Policy was a natural extension of their role in supporting the G20 agenda throughout Australia's presidency. All RBA annual conferences are designed to encourage debate among policymakers, academics and practitioners on important policy questions. To this end, and reflecting the relationship with the G20 agenda, the participants included academics from local and international universities, representatives from international financial institutions, members of the G20's Investment and Infrastructure Working Group, Australian policymakers, and institutional investors.

The conference benefited greatly from the participants' broad range of experience and a number of themes emerged from the presentations and the subsequent discussions. The first was that capital markets are likely to become increasingly important as sources of infrastructure financing. This suggests that there will be a need for further financial market development and continued access to cross-border financial flows in many emerging market and small open advanced economies. A second theme was that selecting infrastructure projects that deliver the greatest net social benefits and planning how they will be built and operated most efficiently should come before questions of financing. To this end, it is necessary to ensure that project selection and planning processes are transparent, based on rigorous analysis of the costs and benefits, and independent of political interference. Finally, it was clear that if there are suitable infrastructure projects on offer, there is private capital that is willing to invest.

## Financial Flows

The conference started from a macroeconomic perspective. Infrastructure investment, as with all investment, is a source of productive capital in the economy, and it is an important policy challenge to understand what factors might be preventing savings from finding their way to the most productive investment opportunities. The first two papers consider the role played by cross-border capital flows in mobilising savings, particularly for small open economies and emerging markets. The third paper addresses this question through the lens of financial market development, emphasising the potential role of capital markets to intermediate efficiently between savers and those looking to invest in the Asian region, whether they are based locally or offshore.

Marcel Fratzscher (DIW Berlin) considers the drivers of capital flows and the extent to which policy can affect these flows. The range of policy options includes: macroeconomic policy tools, such as monetary and fiscal policy; prudential tools; policies that affect the quality of institutions and the investment environment; and capital controls and foreign exchange intervention. His analytical work, which uses high-frequency data on portfolio bond and equity flows, separates the effects of push factors that originate from external sources, such as changes in US monetary policy (for economies other than the United States), and pull factors that originate domestically, such as an economy's economic fundamentals and institutional environment. This distinction matters because the nature of the capital flows has a direct bearing on the effectiveness of the tools domestic policymakers have at their disposal. Professor Fratzscher's results suggest that push factors are, overall, about as important as pull factors in driving net capital flows. Additionally, using the example of changes to capital controls in Brazil, he finds that while these capital controls had some effect on portfolio capital flows into and out of Brazil, there were also spillover effects on other emerging market economies. This suggests that there is a role for policy coordination at the international level.

Philip Lane (Trinity College Dublin) also considers the drivers of capital flows, but at a lower frequency, over a longer time period, and only for emerging market economies. The paper starts by noting that infrastructure investment has a number of features that make it attractive for small open economies, particularly in emerging markets, to look to international investors for financing. In particular, he notes that infrastructure investment requires large amounts of capital, which may be difficult to raise domestically without crowding out other forms of investment. He also highlights the fact that, given their expertise, international investors have more capacity to mitigate and manage the risks involved in infrastructure. However, there is a trade-off between these benefits and the risks that come with potentially volatile capital flows. In light of this, and the analytical results discussed in the paper based on long-run data on capital flows, Professor Lane proposes a number of factors that are likely to improve the trade-off between the returns from allowing capital inflows and the risks associated with capital flow volatility. These include a strong macrofinancial policy framework, resilient government balance sheets and sustainable net international investment positions.

The theme that sound fundamentals are a precondition for managing the risks associated with deregulating financial markets was also present in the paper by Torsten Ehlers, Frank Packer and Eli Remolona (Bank for International Settlements). They consider the potential for capital markets to provide financing for infrastructure projects in the Asian region, noting that bank financing is well suited to the initial stages of an infrastructure project because of the high levels of uncertainty, the ease of renegotiating the terms of loans (relative to bonds) as uncertainties are resolved, and banks' comparative advantage with monitoring projects. However, they also note that regulatory changes, such as the introduction of the Liquidity Coverage Ratio under Basel III, are likely to affect bank funding to longer-term higher-risk projects relative to the period prior to the global financial crisis. They provide statistics on the development of project bond markets in Asia, noting that once infrastructure projects enter the operational phase the probability of default is relatively low and cash flows are relatively stable, making bond financing more suitable. They also provide evidence highlighting the importance of having sound legal and regulatory structures as well as efficient bureaucracies to support the development of these markets, consistent with the literature on the development of local currency bond markets.

## Facing the Challenges for Infrastructure Financing

The next session of the conference turned more specifically to the question of how infrastructure investment differs from other forms of long-term investment and what the implications of these differences might be for financing. The paper presented by Emily Poole (RBA), Carl Toohey and Peter Harris (both from the Productivity Commission) highlights the inherent role that governments play in the provision and regulation of infrastructure. They argue that project planning and selection are critical first steps before the question of the best financing model should be considered. In particular, projects should be independently examined using cost-benefit analyses where the assumptions are transparent and made available to public analysis to avoid the possibility that conclusions could be manipulated through unrealistic assumptions. The value of well-governed decision-making and advisory institutions as a part of the selection and bidding processes was emphasised both in the paper and in the subsequent discussion. Participants also generally agreed that increasing transparency gives decision-making processes around infrastructure the best chance of being independent of political pressures, which should improve project selection.

Another theme of this paper, which was touched on throughout the conference, was that once a project has been chosen, the financing arrangements need to be designed to ensure that the incentives of all the parties are aligned to build and operate productive infrastructure in the most efficient way. This means that risks are either borne by participants who are in a position to manage them or have the best capacity to bear the risk. These considerations are fundamental for deciding on the roles and responsibilities of the public and private sectors in infrastructure provision. The paper by Jordan Schwartz, Fernanda Ruiz-Nuñez and Jeff Chelsky (World Bank) explores ways in which the different risks experienced over an infrastructure project's life cycle might be mitigated. They note that there is a case for government involvement when private sector participants cannot reasonably manage some of the risks involved or are not in the best position to bear those risks. Indeed, some risks, such as political and regulatory risk, are directly related to the government's decisions. This theme was echoed by a number of participants throughout the conference.

The paper by Clifford Winston (Brookings Institution) argues that, before proceeding with new infrastructure investment, the question should be asked whether existing infrastructure can be operated more efficiently. Using case studies from the United States, he suggests that using technology to improve price signals (e.g. through user charging) and to cater more effectively for the heterogeneity in consumers' preferences is often a cost-effective way to get more out of existing infrastructure. In discussions following the presentation of the paper, it was acknowledged that there is often community resistance to user charging and privatisation, and many politicians are wary of implementing efficiency-enhancing changes of this kind as a result.

## Public-Private Partnerships

The paper by Eduardo Engel (Yale University), Ronald Fischer (Universidad de Chile) and Alexander Galetovic (Universidad de los Andes) looks at the potential for public-private partnerships (PPPs) to deliver infrastructure efficiently. They emphasise the importance of separating the economics of an infrastructure project and its financing – a point that was also made earlier in the conference. They illustrate this in a stylised framework where, in the absence of efficiency gains,



the cost to the government of providing infrastructure through a well-designed PPP contract or public procurement is the same if appropriate accounting standards are used over the life cycle of the project. Despite this equivalence, they give examples of how the budgeting of PPPs is often used by governments to avoid increasing government debt and/or on-balance sheet expenditure in the near term to circumvent political economy constraints. Several participants pointed out that the record of PPPs suggested efficiency gains were often not sufficient to justify this method of procurement and management. It was also agreed that obtaining efficiency gains relies heavily on ensuring incentive compatibility by using well-designed contracts that have measurable quality standards and only shift risks to private parties that these parties can actually control.

These themes were also apparent in the first panel discussion on the lessons from practical experiences with PPPs. In general, the panellists regarded PPPs as a useful tool, but recognised that there have been negative experiences in their use. These were often attributable to poor contract design, inappropriate risk transfer and, in some cases, weaknesses in the broader operational environment, such as lack of independence from the political process and lack of competition among providers of construction and operation services. Some participants suggested that PPPs can help to overcome political economy constraints that can prevent infrastructure delivery.

The first part of the panel discussion focused on the experience with PPPs in emerging Asia. David Hawes (Australian Department of Foreign Affairs and Trade), who has had direct experience with implementing PPPs in Indonesia and the Philippines, indicated that there has been too great an emphasis on providing 'big-ticket' infrastructure (such as roads and power stations) rather than crucial social infrastructure (such as schools and hospitals). Additionally, there has been too much focus on financing the investment rather than on funding the operation once it has been built. More recently, institutional and regulatory reforms have been put in place to respond to some of these problems. The second speaker on the panel, Maria Monica Wihardja (World Bank), also referred to the case of Indonesia and provided details on the evolution of Indonesian PPPs and the associated changes in regulation that have facilitated this progress. Mr Hawes commented that these reforms have led to a much more positive environment for infrastructure financing, and have delivered a broader range of benefits. In particular, he noted that there has been more focus on introducing competition into sectors that have traditionally been dominated by state-owned enterprises and, when that has not been possible, there has been more emphasis on designing competitive and transparent bidding processes. Dr Wihardja also noted that the ability to pursue PPPs going forward will rely on a maturing of financial institutions and financial markets. Both Mr Hawes and Dr Wihardja discussed the invaluable role played by international cooperation through the Association of Southeast Asian Nations, the Asia-Pacific Economic Cooperation and the G20, as well as through international financial institutions, particularly with respect to capacity building and supporting the reform agenda. However, both speakers noted that there is scope for greater coordination across agencies.

The second part of the panel discussion focused on the lessons from implementing PPPs in the Australian state of New South Wales (Peter Regan, NSW Treasury) and Europe (Gerassimos Thomas, European Commission). Both panellists indicated that PPPs are an important part of the strategy for developing infrastructure in their jurisdictions and that, although there had been mistakes made in the past, lessons have been learned. Mr Regan discussed how achieving an appropriate risk transfer between the public and the private sectors could be challenging and emphasised the

importance of tailoring the details of PPP contracts to the specific circumstances of the project. Mr Thomas also highlighted the fact that delivering infrastructure through a PPP improved the final outcome because it forced consideration of how best to build, operate and maintain infrastructure. Both panellists commented on the benefits of developing technical expertise within the public sector.

The need to develop capital markets as a way of tapping private sector financing as the capacity of banks and governments to provide financing diminishes was raised by both panellists. Mr Regan pointed out that the capacity of the private sector to construct and deliver infrastructure was also a potentially limiting factor that might be eased if there is a sufficient flow of projects to attract new participants. However, this needs to be weighed against the capacity of the public sector to manage a large flow of infrastructure projects. Mr Regan also spent some time discussing the benefits of the 'capital recycling' program being undertaken in New South Wales. He suggested that ring-fencing the proceeds of privatisations in a fund that can only be used for further infrastructure investment allowed decisions around infrastructure provision to proceed with more independence from the political process. He also noted that capital recycling had further benefits in terms of making privatisation more acceptable to the general public.

## The Role of Institutional Investors

The second panel looked at the prospects for long-term institutional investors, such as pension funds, to participate in financing infrastructure projects. André Laboul (Organisation for Economic Co-operation and Development) moderated the discussion with the panellists Frédéric Blanc-Brude (EDHEC Risk Institute-Asia), Leo de Bever (Alberta Investment Management Corporation), Jan Dehn (Ashmore Investment Management), Michael Hanna (IFM Investors) and Shemara Wikramanayake (Macquarie Funds Group).

The discussion was wideranging and touched on many of the issues raised at various stages throughout the conference. In particular, the panellists made it clear that there is appetite from institutional investors to invest more in infrastructure assets, but that there is a shortage of projects with suitable characteristics. In particular, regulatory risk is seen as a major impediment. One way forward is to increase the transparency and independence of decision-making processes. However, it was noted that the ability of governments to deliver a pipeline of projects in a transparent way with efficient bidding processes has been constrained by the skills available in the public sector and weaknesses in the institutional framework governing the process. Several participants suggested that risk aversion among politicians and public servants has been an impediment to reforming these processes. It was generally agreed that multilateral development banks, such as the World Bank and the Asian Development Bank, can play an important role in mitigating risk in emerging markets through their project preparation work and ability to assist in dealing with political or regulatory challenges. In this respect, it was noted that institutional investors find it costly and difficult to build a sufficient degree of expertise in smaller emerging markets.

There was a lively debate on other ways to attract institutional investors into infrastructure financing in addition to improving the flow of suitable projects. One suggestion was that more could be done to define benchmarks that would allow institutional investors to treat infrastructure as a distinct asset class. However, some panellists suggested that the risk and return on individual

infrastructure projects should be evaluated separately, and that some of the most profitable opportunities come from projects that do not neatly fall into standard benchmark categories.

The merits of the different investment models used by institutional investors were also discussed at some length. Some large funds have moved to a 'disintermediated model', where expertise in infrastructure project management is developed internally and funds are invested directly in unlisted projects. In contrast, other pension funds use external fund managers or invest in listed vehicles. It was argued by some participants that the key benefits of the disintermediated model were a better alignment of incentives between investors and procurement authorities, and much lower costs in terms of fees for asset management.

## References

**PC (Productivity Commission) (2014a)**, *Public Infrastructure: Volume 1*, Inquiry Report No 71, Productivity Commission, Canberra.

**PC (2014b)**, *Public Infrastructure: Volume 2*, Inquiry Report No 71, Productivity Commission, Canberra.

# Capital Flow Policies, Monetary Policy and Coordination

Marcel Fratzscher\*

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## 1. Introduction

The past six years have seen a controversial debate between advanced and emerging markets about the role and determinants of global capital flows, including in the G20 agenda under several presidencies. After the collapse of Lehman Brothers in September 2008, capital left many emerging markets on a massive scale, fleeing to so-called 'safe-haven' markets, in particular the United States. This was surprising to many, since the global financial crisis was not triggered by emerging markets, but had its origin in the United States. Furthermore, many emerging market economies (EMEs) had little direct exposure to the US subprime market. They were nevertheless strongly affected and experienced deep recessions, in many cases even deeper than those in the United States and in Europe.

The concerns about capital flight from EMEs in the initial aftermath of the collapse of Lehman Brothers were rather short-lived. The central banks in the United States and in most of Europe responded with an extraordinarily expansionary monetary policy stance, injecting massive liquidity into capital markets and into banks. From the second quarter of 2009, capital started coming back to EMEs on a massive scale. At the same time, the real economies of most EMEs started recovering, much more quickly than the economies in North America and Western Europe.

But policymakers in many EMEs started worrying as early as 2010 that these capital inflows could become excessive. This induced Brazilian President Rousseff to famously say: 'This crisis started in the developed world ... it will not be overcome through quantitative easing policies that have triggered ... a monetary tsunami, have led to a currency war and have introduced new and perverse forms of protectionism in the world.'

This quote illustrates the different dimensions of the concerns of policymakers in EMEs. The first concern is that monetary policy in the United States and other advanced economies (AEs), including the euro area, Japan and the United Kingdom, have negative externalities, or spillovers, to the rest of the world. In other words, the expansionary monetary policy stance by the Federal Reserve not only injected liquidity into US markets, pushed down interest rates and improved risk-taking by financial participants, but it may have had similar effects on other economies.

What may be optimal for the United States may thus not be optimal for other economies. One important development since 2009 was the strong divergence in the business cycle of EMEs on the one hand and AEs on the other. The United States and most of Europe had very low growth, high unemployment and low domestic demand, and most AE central banks lowered policy rates

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\* I would like to thank the conference participants and, in particular, the discussant, James Morley.

to virtually zero and used non-standard policy instruments to improve financing conditions. By contrast, the recovery of EMEs since 2009 had been quite strong. As a result, the discussion in international policy forums, including the G20, focused on this phenomenon of 'decoupling'. With strong growth, many EMEs were concerned about importing an excessive monetary stimulus from the United States and Europe.

This controversy illustrates that global capital markets have become highly integrated over the past few decades. The concerns of some policymakers about the expansionary monetary policy in the United States essentially reflect the fact that they no longer have full policy autonomy when it comes to macroeconomic policies, particularly monetary policy.

But the concerns of many EME policymakers have also had several additional dimensions. In particular, EME policymakers have been worried about the impact of capital flows on their exchange rates. Many EMEs tend to be open to trade and capital flows, yet still have relatively shallow capital markets. Capital inflows thus induced an appreciation of EME currencies from 2009 to 2013, with some interruptions. Also, the high degree of openness and importance of exports makes many EMEs highly sensitive to currency fluctuations.

A second concern is about financial stability. Capital inflows for some EMEs have led to a significant increase in the prices of domestic assets, such as equities and real estate, and have pushed down long-term interest rates. This, in turn, has been associated with a sharp increase in credit to the private sector. Over the past few years, therefore, we have also seen the share of non-performing loans rise in the balance sheets of many banks in EMEs.

Moreover, an appreciation of the domestic currency coupled with strong capital inflows and bank lending have contributed to a sharp deterioration of the current account positions and a build-up of private sector debt in several EMEs. For instance, in 2014 the term 'fragile five' was coined for Brazil, India, Indonesia, South Africa and Turkey, highlighting this substantial vulnerability to capital flow reversals.

What are the policy options to deal with such capital flow surges and volatility? And how have policymakers in EMEs actually responded? It is useful to think of the policy options along four different dimensions. The first is the macroeconomic policy stance. One option is to use domestic monetary policy and reduce policy interest rates to deter capital inflows. However, with diverging business cycles after 2009, lowering policy rates was not a very sensible policy option for many EME policymakers as this would have provided an even stronger domestic stimulus, thus exacerbating the bubble in financial markets and the risk of overheating.

Consequently, a much more effective macroeconomic policy option in this situation would be a tightening of fiscal policy. However, many EMEs found it very difficult to use this instrument flexibly. Brazil, for instance, ran sizeable fiscal deficits in the years after the global financial crisis, despite having high rates of economic growth, a strong domestic currency and large capital inflows. Hence, in many cases fiscal policy actually contributed to an overheating of the domestic economy and institutional factors made it difficult for many EMEs to use fiscal policy in a sufficiently countercyclical manner.

A second dimension is micro and macroprudential policies. These policies were used by a number of economies, emerging and advanced alike, and included raising reserve requirements for banks

and limiting foreign currency borrowing by financial institutions. However, in many cases such prudential tools were too limited in scope or supervisors lacked the experience to use them effectively. What complicates the task of many supervisors, particularly in EMEs, is the relatively small size and low depth and sophistication of domestic capital markets. This means that the capital flow surge since 2009 has had a much larger impact on asset prices in EMEs than in AEs that have experienced similar capital inflow surges but have deeper capital markets.

A third dimension relates to the quality of policy institutions and the investment environment. It was striking during the global financial crisis, and also during the subsequent European crisis, to observe the strength of the so-called 'flight-to-safety' phenomenon. Although many EMEs had little direct exposure to US markets in 2008 and 2009, they nevertheless were hit hard and experienced capital outflows because they were considered relatively risky. More generally, economies that were perceived to be relatively risky have had strong procyclical capital flows. This means that these economies generally experience capital inflows in periods when global risk appetite is high, and capital outflows when global risk appetite is low. Hence, the experience of the global financial crisis suggests that improving the institutional environment may be a relevant dimension for policymakers in dealing with capital flows.

The fourth policy dimension is that of capital controls and foreign exchange interventions. Many EME policymakers decided to impose capital controls on inflows or reduce capital controls on outflows to reduce net capital inflows. In fact, not since the 1980s has there been a period with so many economies imposing or raising existing controls as during the past few years. Moreover, EME central banks have further increased their holdings of foreign exchange, by intervening massively in FX markets, to at least partially absorb some of the capital coming into the economy and to reduce the upward pressure on the exchange rate.

In the policy discussion, there is still a strong controversy surrounding the question about the preferred pecking order of policies to deal with capital flow surges. Is it preferable to use macroeconomic policies to smooth capital flows? How important are institutions and prudential policies? For a long time, capital controls were widely considered detrimental, because they introduce a distortion into capital markets. But this view has changed rapidly over the last five years, with even the International Monetary Fund (IMF) now stating that capital controls might actually be a first-best option in some instances.

The quote above from Brazilian President Rousseff also underlines two further concerns by policymakers in EMEs. One is the worry about a 'currency war'. In essence, this stresses that policymakers are concerned about what policymakers in competing economies are doing. A currency appreciation in response to capital inflows is much more worrisome if other economies do not share this experience, thus implying a significant effective appreciation, a loss of competitiveness and lower growth.

Another concern expressed by President Rousseff is about protectionism. Policymakers in AEs like to think of capital controls and foreign exchange interventions as two forms of protectionism. Yet the criticism that their own monetary policy could be seen as a form of protectionism comes as a surprise to many of these policymakers. At several G20 meetings, then Federal Reserve Chairman Bernanke underlined that the motivation for US monetary policy is exclusively domestic.

Yet the same can be said of the motivations to implement capital controls or conduct foreign exchange interventions by many EMEs.

What the discussion over the past five years in international policy forums about capital flows therefore underlines is that there are important policy spillovers of domestic policy decisions, including monetary policy. This makes a strong case for policy coordination at the global level. As the example of the currency war illustrates, a lack of coordination can lead to an outcome where everyone is worse off. While the G20 and IMF appear to be the right institutions to tackle the issue of policy coordination on capital flows, little progress has been made on this front. Efforts were indeed made, including by the French G20 presidency in 2011, to arrive at a common understanding about capital flows and desirable policy responses – what was called ‘coherent conclusions’ on capital flow management. But little has happened since and it is fair to say that there is close to no coordination on the issue today. This remains a major shortcoming and may prove highly detrimental in the years to come.

The remainder of this paper addresses two central questions. First, Section 2 addresses the question about the drivers of global capital flows since 2009. In particular, it makes a distinction between push factors and pull factors. Push factors are those that are specific to the economies where capital flows originate. Pull factors, by contrast, are those that lie within the recipient economies. The question of the relative roles of push and pull factors is important, because the policy conclusions very much depend on the answer about which factors dominate. If the impetus for capital flows to a particular EME lies in the source economy, for instance monetary policy in the United States, then imposing controls in the recipient economy might be a sensible policy response. However, if the reasons are domestic, for example strong growth performance and high yields in the recipient economy, then capital controls imply a distortion, and one that cannot permanently deal with these capital inflows successfully. The paper will address this issue, presenting and discussing empirical findings for the period from 2005 to 2010.

Section 3 specifically turns to the role of US monetary policy since 2008 in inducing capital flows to EMEs and other AEs. Using a micro approach based on data on mutual funds and high-frequency data on policy announcements and operations by the Federal Reserve, the paper will discuss to what extent and through which channels US monetary policy has influenced capital flows to EMEs.

The second question the paper focuses on is how capital controls by EMEs have functioned. Brazil is an intriguing case to analyse, as it is one of the largest EMEs, has deep capital markets, and has implemented controls on equity portfolio and debt portfolio inflows during different episodes since 2008. This intriguing case study, outlined in Section 4, not only allows an analysis of whether these capital controls have been effective in reducing capital inflows into Brazil, but also of whether these controls had externalities on other EMEs. In other words, the analysis presented in this paper deals with the question of whether the implementation of capital controls in Brazil has increased or reduced capital flows to other EMEs. It also analyses whether we can identify the channels through which such potential externalities have occurred.

The overarching objective of the paper is to understand the drivers of global capital flows over the past decade, and to analyse the extent to which policy responses to these capital flow surges have been successful. Section 5 concludes by drawing out policy implications, underlining the importance of strengthening coordination of capital flow policies by the G20 and the IMF.

## 2. Push Versus Pull Factors as Drivers of Capital Flows

I first turn to the question of the drivers of capital flows to EMEs. The objective of the empirical analysis, building on the work by Fratzscher (2012), is to explain the global dynamics of capital flows during and around the global financial crisis, and in particular the heterogeneity in capital flows across economies.

All of the empirical analysis in this paper uses data on portfolio equity and bond investment flows compiled by EPFR Global (EPFR). This dataset contains daily, weekly and monthly flows for more than 16 000 equity funds and 8 000 bond funds. The EPFR data capture about 5 to 20 per cent of the market capitalisation in equity and bonds for most economies. Importantly, it is a fairly representative sample as shown by Jotikasthira, Lundblad and Ramadorai (2010), Miao and Pant (2012) and Fratzscher (2012); EPFR portfolio flows and portfolio flows obtained from total balance of payments data mostly match quite closely.

At the fund level, EPFR data provide information on the total assets under management (AUM) at the end of each period, which is used to calculate each period's change in AUM. The data allow for a distinction between net capital injections and valuation changes (due to asset returns and exchange rate changes). Importantly, all of the analyses focus on total net injections into the funds (abstracting from valuation changes), aggregated at the economy level, because these flows reflect the active decisions of investors about whether or not to add to or reduce investments in a particular fund class. Therefore, the focus is not on analysing the portfolio allocation strategy of individual fund managers, but rather that of individual firms or other institutional investors.

The empirical methodology uses a factor model with two factors: a set of global/common factors and a set of domestic/idiosyncratic factors,  $S_{i,t} = [S_t^G, S_{i,t}^D]$ . To test whether portfolio capital flows during and around the global financial crisis reflected global/common factors or domestic/idiosyncratic factors, and whether there were any characteristics that affected the sensitivity of capital flows to these factors at the economy level, the following equations are used:

$$f_{i,t} = E_{t-1}[f_{i,t}] + \beta_{i,t-1}' S_{i,t} + e_{i,t} \quad (1)$$

$$\beta_{i,t-1} = \beta_{i,0} + \beta_1' Z_{i,t-1} + \gamma_{i,t-1} D_t \quad (2)$$

$$\gamma_{i,t-1} = \gamma_{i,0} + \gamma_1' Z_{i,t-1} \quad (3)$$

In Equation (1),  $f_{i,t}$  is the net capital flow to economy  $i$  during week  $t$ ;  $E_{t-1}[f_{i,t}]$  is the level of these net flows expected at time  $t - 1$ , measured as a function of lagged values of net flows and changes in US and domestic interest rates;  $S_{i,t}$  is the vector of the observable global and domestic factors. Equation (2) allows the sensitivity of net flows to global and domestic factors to be affected by:  $Z_{i,t-1}$ , which is a vector of determinants that vary across economies and time; and  $D_t$ , which is a financial crisis dummy that takes the value 1 from 7 August 2007 to 15 March 2009. The specification of the coefficient of the crisis dummy in Equation (2) allows for a change in the transmission during the crisis to be either due to an unconditional increase in the factor loadings ( $\gamma_{i,0}$ ) or a change in the factor loadings conditional on the determinants ( $\gamma_1$ ) (see Equation (3)).

The sample period from 12 October 2005 to 22 November 2010 has about 266 weekly observations for equity and bond flows to 50 economies. As most of the common factors are US variables, the United States is excluded from all model estimations as an economy receiving capital flows. The



factor model in Equations (1)–(3) is in the spirit of standard asset pricing models and is related to the work by Bekaert *et al* (2011), who focus on equity market contagion and equity returns at the firm level during the global financial crisis.

The first set of hypotheses to be tested relates to time invariant coefficients on the factors ( $\beta_{i,0}$ ), the coefficients that describe how the sensitivity of net flows to global and domestic factors varies with economy-specific characteristics ( $\beta_i$ ), and whether and how these coefficients have changed during the financial crisis ( $\gamma_{i,0}$ ,  $\gamma_i$ ). This allows us to understand the overall drivers of capital flows and the transmission channels of the crisis.

The second main hypothesis involves gauging the extent to which drivers associated with push factors (common to all economies) or pull factors (specific to individual economies and their own characteristics) account for the dynamics of capital flows during the crisis and non-crisis times.

Specifically, the contributions of push and pull factors to net capital flows are derived from the factor model in Equations (1)–(3) in the following way:

$$\hat{f}_{i,t}^G = (\beta_{i,0} + \gamma_{i,0}D_t)' S_t^G \tag{4}$$

$$\hat{f}_{i,t}^D = E_{t-1}[f_{i,t}] + (\beta_i' Z_{i,t-1} + \gamma_i Z_{i,t-1} D_t)' S_{i,t} + (\beta_{i,0} + \gamma_{i,0}D_t)' S_{i,t}^D, \tag{5}$$

where  $\hat{f}_{i,t}^G$  is the contribution of push factors (i.e. factors common to each economy  $i$ ), and  $\hat{f}_{i,t}^D$  is the contribution of pull factors, which is the sum of the expectations term and the components of net flows due to economy-specific determinants ( $Z_{i,t-1}$ ) and economy-specific/idiosyncratic factors ( $S_{i,t}^D$ ).

The first step is to estimate the model in Equations (1)–(3) including  $S_{i,t}$  but excluding  $Z_{i,t-1}$ . Table 1 shows the estimated effect of shocks on capital flows in the non-crisis period ( $\beta_{i,0}$ ) and of the additional effect during the crisis ( $\gamma_{i,0}$ ) for each of the five common factors and two idiosyncratic factors. Recall that in Equations (1)–(3),  $\gamma_{i,0}$  gives the difference in the effect of a particular factor during the crisis, while  $(\beta_{i,0} + \gamma_{i,0})$  provides the overall effect during the crisis. The reported coefficients are averages across economy-specific coefficients as specified in Equations (1)–(3).

The key crisis events had a significant negative effect on net capital flows, yet only for EMEs and not for AEs. In terms of global or common factors, a worsening of liquidity conditions, captured by a rise in the difference between the 3-month overnight indexed swap rate and the 3-month US Treasury bill yield, or TED spread, induces net portfolio outflows. Still, the effect was smaller during the crisis than in the non-crisis period. However, it should not be interpreted that liquidity shocks have become less important as drivers of net capital flows during the crisis as the magnitude of such shocks increased enormously in the crisis.

**Table 1: Total Net Portfolio Capital Flows**

	Full sample		AEs		EMEs	
	Non-crisis	Crisis	Non-crisis	Crisis	Non-crisis	Crisis
<b>Global shocks (<math>S_t^G</math>)</b>						
Crisis events		-0.807*** (0.128)		0.134* (0.077)		-1.333*** (0.120)
Liquidity – TED spread	-0.340*** (0.044)	0.179*** (0.032)	-0.212*** (0.023)	0.189*** (0.027)	-0.404*** (0.069)	0.168*** (0.052)
Risk – VIX	0.010 (0.012)	-0.106*** (0.025)	-0.052*** (0.011)	0.077*** (0.017)	0.044*** (0.016)	-0.214*** (0.022)
US macro shocks	-0.703*** (0.089)	0.873*** (0.158)	-0.719*** (0.124)	0.800*** (0.122)	-0.670*** (0.129)	0.894*** (0.258)
US equity shocks	0.096*** (0.006)	-0.009 (0.005)	0.051*** (0.003)	-0.004 (0.005)	0.125*** (0.005)	-0.011 (0.008)
<b>Domestic shocks (<math>S_{i,t}^D</math>)</b>						
Domestic macro shocks	0.213 (0.568)	1.231 (1.373)	-0.259 (0.399)	-1.190** (0.591)	0.526 (0.936)	2.846*** (1.218)
Domestic equity shocks	0.042*** (0.006)	-0.001 (0.005)	0.022*** (0.006)	0.002 (0.008)	0.057*** (0.008)	-0.003 (0.008)
<b>Controls (<math>E_{t-1}[f_{it}^1]</math>)</b>						
Lagged flows	0.394*** (0.019)	-0.023 (0.029)	0.306*** (0.039)	0.059 (0.049)	0.453*** (0.013)	-0.072** (0.034)
US interest rate change	0.756*** (0.046)	-0.446*** (0.050)	0.634*** (0.050)	-0.644*** (0.075)	0.838*** (0.069)	-0.303*** (0.053)
Domestic interest rate change	-0.005 (0.114)	0.087 (0.179)	0.247* (0.129)	0.187 (0.293)	-0.166 (0.171)	0.030 (0.244)
Constant	0.150*** (0.017)	-0.304*** (0.020)	0.067*** (0.013)	-0.282*** (0.015)	0.192*** (0.022)	-0.316*** (0.031)
$R^2$	0.583					
No of obs	13 515					

Notes: Coefficients are averages across estimates for individual economies; \*\*\*, \*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses

Source: Fraztscher (2012)

The response of portfolio capital flows to changes in risk, as proxied by the option implied volatility on the S&P 500 index (VIX), during the crisis is striking. While higher risk during the crisis is associated with some net portfolio outflows, there is a remarkable heterogeneity in the effect across economy groups. While a rise in the VIX led to net outflows from AEs and net inflows into EMEs before the crisis, this effect reversed during the crisis, when the sharp increase in global risk induced net inflows into AEs and net outflows out of EMEs. This suggests that the pricing of risk changed fundamentally during the crisis. The finding is consistent with the flight-to-safety phenomenon commonly stressed as a key driver of global capital flows in the crisis.

In the non-crisis period, a positive US macro shock – that is, macroeconomic announcement surprises, cumulated for each respective time period – induces capital outflows, presumably as capital is repatriated into the United States, while a positive domestic macroeconomic shock leads to net capital inflows into the domestic economy. Yet the absolute magnitude of the effect of domestic macroeconomic shocks increases in the crisis for AEs, suggesting that negative domestic shocks during the crisis triggered capital outflows from EMEs and net inflows into AEs (e.g. a repatriation of capital from abroad by investors based in AEs). If one considers AEs as relatively safe, this finding is again consistent with the flight-to-safety hypothesis. This is further corroborated by the change in sign for US macroeconomic news, similarly indicating a repatriation of capital into the United States in response to negative US macroeconomic shocks during the crisis.

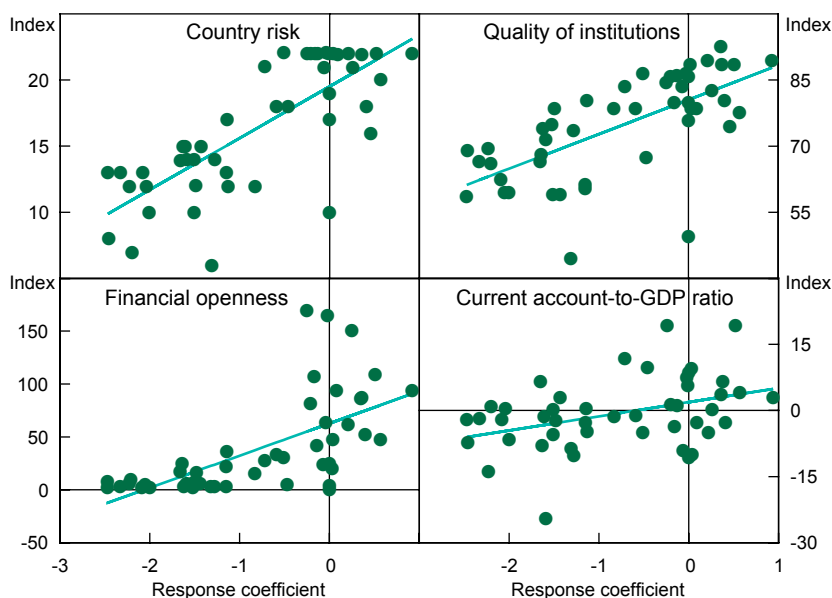
Finally, an increase in both US and domestic equity returns leads to an increase in net capital inflows into all economies. The coefficients do not change markedly during the crisis, suggesting that the transmission mechanism of asset price changes to capital flows did not change materially.

What explains the high degree of heterogeneity in capital flows across economies? And in particular, what accounts for the change in the sign and size of the sensitivity of economies' net capital flows to common and idiosyncratic shocks during the global financial crisis? These questions are approached by estimating the factor model in Equations (1)–(3) including the vector of country-specific determinants  $Z_{i,t-1}$ . These variables relate to an economy's economic fundamentals (size of reserves, current account position, fiscal position, growth, etc), its institutional environment (sovereign risk, institutional quality), its financial policies during the crisis and its external exposure (through trade and financial linkages).<sup>1</sup>

The main question is whether any of these determinants have been important during the crisis as a facilitator or insulator of capital flows in response to common and idiosyncratic shocks. A first look at the data is quite informative. For each of the economies in the sample, Figure 1 plots the estimates of the impact of the crisis on capital flows ( $\gamma_{i,0}$ ) based on the analysis of the previous subsection against the country-specific determinants  $Z_{i,t-1}$ . The panels show a strikingly strong correlation pattern. Specifically, economies with a high sovereign rating and with a good quality of policy institutions have net capital flows that are less sensitive to adverse crisis events.

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1 Note that all determinants are defined so that a higher value means better fundamentals, better institutions, the implementation of better financial policies, and more trade and financial integration. This is helpful so that the coefficients can be interpreted more easily across variables.

**Figure 1: Determinants of the Effect of Crisis Events on Capital Flows**

Notes: The horizontal axis shows the response coefficients of portfolio capital flows to key crisis events for each of the economies in the sample; the vertical axis shows the values of the four respective determinants for each of the economies

Source: Fratzscher (2012)

The purpose of the final step of the analysis is to gauge the economic relevance of the identified effects and to compare the overall importance of different drivers associated with push factors versus pull factors in explaining global capital flows.

Looking at the fitted values of the model is one way to gauge what share of net capital flows can be accounted for by drivers associated with push factors and what share by drivers related to pull factors. Using the definitions in Equations (4) and (5), Table 2 shows actual net capital flows during each of three sub-periods (pre-crisis, crisis and post-crisis) and the fitted cumulated flows estimated from the factor model described by Equations (1)–(3). Table 2 also shows the shares of fitted net capital flows accounted for by global factors and by domestic factors calculated, respectively, as  $X_{i,t}^G = \hat{f}_{i,t}^G / \hat{f}_{i,t}$  and  $X_{i,t}^D = \hat{f}_{i,t}^D / \hat{f}_{i,t}$ .

The main finding of Table 2 is that global factors are, overall, about as important as domestic factors as drivers of net capital flows over the period 2005–2010. However, there are some interesting differences across regions and over time. Importantly, while global factors appear to have been more important during the crisis – accounting for about 73 per cent of fitted net capital flows on average – domestic factors have come to dominate net capital flows since 2009. Looking at different regions, domestic factors have become particularly important for EMEs in Latin America and Asia in the 2009–2010 surge in net capital flows to EMEs, accounting for most of the cumulated net capital flows during that period.

**Table 2: Actual Versus Fitted Net Capital Flows – Global Factors Versus Domestic Factors**

	Net capital flows % of AUM						
	Actual			Fitted			
	Pre-crisis	Crisis	Post-crisis	Global factors		Post-crisis	
			% of AUM	% of fitted	% of AUM	% of fitted	
<b>Total sample</b>	<b>12.7</b>	<b>-15.7</b>	<b>26.4</b>	<b>9.2</b>	<b>65.4</b>	<b>10.3</b>	<b>45.0</b>
EM Asia	18.3	-9.6	39.7	9.1	48.3	6.3	18.1
EM Europe	9.2	-29.5	35.7	9.0	86.6	23.9	80.3
Latin America	27.4	-14.0	53.6	15.8	48.8	17.3	36.9
Africa/Middle East	1.5	-5.1	28.1	4.8	109.3	13.0	54.8
Advanced Europe	8.7	-18.5	5.0	8.1	90.8	3.7	84.2
Other advanced	14.3	-14.2	13.3	12.2	76.1	7.0	58.8
	<b>Fitted</b>						
	Pre-crisis	Crisis	Post-crisis	Domestic factors		Post-crisis	
				% of AUM	% of fitted	% of AUM	% of fitted
<b>Total sample</b>	<b>14.1</b>	<b>-16.0</b>	<b>22.8</b>	<b>4.9</b>	<b>34.6</b>	<b>12.6</b>	<b>55.0</b>
EM Asia	18.8	-9.2	34.6	9.7	51.7	28.3	81.9
EM Europe	10.4	-30.4	29.7	1.4	13.4	5.9	19.7
Latin America	32.4	-14.1	47.0	16.6	51.2	29.6	63.1
Africa/Middle East	4.4	-5.5	23.8	-0.4	-9.3	10.8	45.2
Advanced Europe	8.9	-18.8	4.4	0.8	9.2	0.7	15.8
Other advanced	16.1	-14.9	11.9	3.8	23.9	4.9	41.2

Notes: Actual cumulated flows during each of the three sub-periods and fitted cumulated flows from the factor model described in Equations (1)–(3); fitted net capital flows are split up into a part explained by global factors and a part accounted for by domestic factors, as outlined in Equations (4)–(5); numbers are averages across economies in each region

Source: Fratzscher (2012)

### 3. The Role of US Monetary Policy for Explaining Capital Flows to EMEs

How important has US monetary policy been in explaining the capital outflows from EMEs during the financial crisis in 2008 and in early 2009? And how has it contributed to the subsequent surge in net capital inflows? This section tries to answer these questions by building on the work by Fratzscher, Lo Duca and Straub (2012).

The empirical approach for evaluating the impact of quantitative easing (QE) is to analyse the response of portfolio decisions, asset prices and exchange rates to specific unconventional policy actions and events. Importantly, there is a differentiation between US and foreign variables (further distinguishing between EMEs and other AEs). This allows for testing whether foreign markets were affected differently from the United States, as well as whether different types of investment were influenced differently. The impact of QE is evaluated using the following model:

$$y_{i,t} = E_{t-1}[y_{i,t}] + (\beta + \gamma^{EME} D_i^{EME} + \gamma^{AE} D_i^{AE}) MP_t + \varepsilon_{i,t} \quad (6)$$

with  $MP_t = [AN1_t, AN2_t, LQ_t, TR_t, MBS_t]'$ .

The dependent variable,  $y_{i,t}$ , for economy  $i$  and day  $t$  is alternatively: the net inflows (into bonds or into equities), expressed as a percentage of all AUM; equity price returns; the first difference of long-term bond yields; or exchange rate returns.  $D_i^{EME}$  is a dummy variable equal to 1 if economy  $i$  is an EME, and  $D_i^{AE}$  is a dummy variable equal to 1 if economy  $i$  is an AE (other than the United States). Hence, the impact of a particular policy measure,  $MP_t$ , on the United States is given by the coefficient  $\beta$ , while the additional impact on EMEs and other AEs is denoted by the respective coefficients  $\gamma^{EME}$  and  $\gamma^{AE}$ .

There is a distinction drawn between two sets of unconventional monetary policy measures in the analysis. The first set, announcements (denoted  $AN1$  and  $AN2$ ), are impulse dummy variables equal to 1 for a number of announcements related to QE1 and QE2 policies, respectively. Such announcements mostly occur in the weeks or even months before actual operations are implemented. As is common in the literature (Gagnon *et al* 2011; Wright 2011), Fratzscher *et al* (2012) analyse 12 key announcements by the Federal Reserve, which are primarily related to Federal Reserve purchases (or their reversals) of US Treasuries and span from 2008 to 2010.

The second set of policy measures relates to actual market interventions by the Federal Reserve and is measured as the weekly changes of outstanding amounts of the following operations in the Federal Reserve balance sheet:<sup>2</sup> (i) liquidity support measures for the financial sector ( $LQ$ ); (ii) purchases of long-term Treasury bonds ( $TR$ ); and (iii) purchases of long-term mortgage-backed securities and government-sponsored enterprise debt ( $MBS$ ).<sup>3</sup> Note that all of these measures can take positive or negative values, for example in the latter case when such operations are reversed.

Importantly, a set of control variables are included to capture the expected component,  $E_{t-1}[y_{i,t}]$ , of changes in portfolio allocations and asset prices for economy  $i$  at time  $t$ . In the basic setting, the following factors are accounted for: (i) economy fixed effects to capture economy-specific, time-invariant elements; (ii) lagged variables reflecting financial shocks, risk and global market

2 This classification is based on a lecture by Federal Reserve Chairman Ben Bernanke given on 13 January 2009 at the London School of Economics (Bernanke 2009); see also Carlson *et al* (2009).

3 I separate purchases of long-term mortgage-backed securities (MBS) and purchases of long-term Treasury bonds, since the latter only became prominent following the QE2 announcement in August 2010.

conditions, such as the VIX, the 10-year US Treasury bond yield and the TED spread; and (iii) lagged returns of the domestic market.<sup>4</sup> In practice, it turns out that the inclusion of different sets of controls only modestly influences the magnitude of the estimated coefficients, but does not alter their sign or statistical significance.

An important methodological caveat is that Federal Reserve operations and market interventions may, to some extent, be endogenous to market developments. For instance, a decision by the Federal Reserve to provide more liquidity support to banks is likely to have been influenced by market conditions and banks' needs for liquidity, and thus may have been higher during weeks when spreads were high, equity markets fell and investors withdrew capital from markets.

It is very hard to deal with this issue, and Fratzscher *et al* (2012) try to do so in several different ways. In particular, their analysis controls for market developments and previous trends in the empirical model, as outlined above, and also uses interventions with lags in the robustness exercise. Moreover, in robustness tests, a more sophisticated two-stage approach is adopted where the first calculation estimates the unexpected component of Federal Reserve operations and this is then used as an explanatory variable in the benchmark model. Most importantly, Fratzscher *et al* (2012) note that if there is an endogeneity bias, removing it should strengthen the estimates of the empirical findings because Federal Reserve operations in most cases were of a 'leaning-against-the-wind' type where the Federal Reserve responded to market distortions and attempted to mitigate them.

The estimated coefficients of the benchmark regression are reported in Table 3 for portfolio flows, in Table 4 for asset returns/yields and in Table 5 for exchange rate returns. The tables show the estimated coefficients of Equation (6) for the five variables capturing the US unconventional monetary policy measures. The discussion of the findings distinguishes between policy measures that fall under the QE1 period – primarily QE1 announcements, liquidity operations and MBS purchases – and QE2 measures, which are mainly QE2 announcements and Treasury purchases.

For the QE1 period of 2008–2009, recall that the main objective of Federal Reserve policy was one of market repair and the provision of liquidity to financial institutions, as an extension of the Federal Reserve's role as a lender of last resort, to avoid a credit crunch in the US economy. Table 3 indicates that the Federal Reserve was fairly successful in pursuing this objective as its policy measures primarily caused a portfolio rebalancing across economies, with capital flowing mainly out of EMEs and into US equity and bond funds. Starting with QE1 announcements, these mainly triggered inflows into both US equities and, to a lesser extent, into US bonds. Hence, unlike what has been discussed in the previous literature, the portfolio rebalancing that appears to have been most pronounced in response to QE1 announcements has been one across economies, rather than across asset classes. This portfolio rebalancing pattern is also clearly visible in the reaction of asset prices as each of the QE1 announcements reduced US 10-year Treasury yields on average by 16 basis points (Table 4), which is consistent with the findings of the literature (for example, see Neely (2010) for the impact of QE1 on AEs' yields).

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4 There are some differences in the precise specification of the models for flows and for asset prices. For example, the model for the former includes levels of the VIX, the TED spread and the 10-year US Treasury bond yield, while the model for prices includes changes of these variables.

**Table 3: Impact of Federal Reserve Unconventional Monetary Policy Measures – Portfolio Allocations and Capital Flows**  
Per cent of AUM in the economy of destination

	$\beta$	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	$\gamma^{EME}$	$\gamma^{AE}$	$\gamma^{EME} - \gamma^{AE}$
<b>Dependent variable: inflows into equity funds</b>						
AN1	0.44802*** (0.01839)	0.04111* (0.022)	0.08289*** (0.02097)	***	***	
AN2	0.00831 (0.0101)	0.14094*** (0.0192)	-0.00445 (0.0167)	***		***
LQ	0.00247*** (0.00015)	-0.00077*** (0.00027)	0.00068** (0.00029)	***	***	***
MBS	-0.00209*** (0.00016)	0.00045 (0.0006)	0.00042 (0.00037)	***	***	
TR	-0.00128* (0.00077)	0.00621*** (0.00108)	0.00003 (0.00133)	***		***
Controls	Yes					
Fixed effects	Yes					
R <sup>2</sup>	0.03					
No of obs	56 084					
<b>Dependent variable: inflows into bond funds</b>						
AN1	0.23752*** (0.01872)	-0.08502*** (0.01879)	0.08410** (0.03823)	***	***	***
AN2	-0.20395*** (0.00944)	0.02930** (0.01406)	-0.06269** (0.0239)	***	***	***
LQ	0.00173*** (0.00014)	-0.00232*** (0.00017)	0.00033 (0.00024)	***	***	***
MBS	0.00419*** (0.00012)	0.00434*** (0.0004)	0.00478*** (0.00046)			
TR	-0.01851*** (0.00057)	-0.01988*** (0.00121)	-0.00392** (0.00176)		***	***
Controls	Yes					
Fixed effects	Yes					
R <sup>2</sup>	0.25					
No of obs	54 429					

Notes: Estimated impact of the different non-standard monetary policy instruments on portfolio flows according to Equation (6); control variables are included but not shown; sample includes daily observations from January 2007 to December 2010;  $\beta$  is the estimated impact of monetary policy instruments on US flows;  $\beta + \gamma^{EME}$  ( $\beta + \gamma^{AE}$ ) is the estimated impact of monetary policy instruments on flows into EMEs (other AEs);  $\gamma^{EME}$  ( $\gamma^{AE}$ ) indicates whether the effect is statistically different from the impact on the United States;  $\gamma^{EME} - \gamma^{AE}$  indicates whether the coefficients  $\gamma^{EME}$  and  $\gamma^{AE}$  are statistically different; \*\*\*, \*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors of the coefficients in parentheses

Source: Fratzscher *et al* (2012)



**Table 4: Impact of Federal Reserve Unconventional Monetary Policy Measures – Equity Returns and Government Bond Yields**

	$\beta$	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	$\gamma^{EME}$	$\gamma^{AE}$	$\gamma^{EME} - \gamma^{AE}$
<b>Dependent variable: equity returns – per cent</b>						
AN1	1.08812*** (0.09322)	-0.08615 (0.20506)	-0.42340** (0.16762)	***	***	
AN2	0.96743*** (0.01607)	0.37365*** (0.12271)	0.44304*** (0.07349)	***	***	
LQ	-0.01411*** (0.0002)	-0.01434*** (0.00143)	-0.01363*** (0.00157)			
MBS	-0.00528*** (0.00018)	-0.00081 (0.00153)	-0.00203 (0.00169)	***	*	
TR	0.02542*** (0.00103)	0.03043*** (0.00622)	0.03203*** (0.00417)			
Controls	Yes					
Fixed effects	Yes					
R <sup>2</sup>	0.08					
No of obs	56 062					
<b>Dependent variable: change in 10-year bond yields – percentage points</b>						
AN1	-0.16317*** (0.01141)	-0.12211* (0.07099)	-0.05923* (0.0346)			**
AN2	-0.02050*** (0.00192)	-0.00386 (0.00837)	-0.01777 (0.01807)	*		
LQ	-0.00037*** (0.00002)	0.00126 (0.00125)	-0.00027*** (0.00004)			***
MBS	0.00007* (0.00004)	-0.00041 (0.00065)	-0.00029 (0.00022)			
TR	0.00234*** (0.00009)	-0.00158 (0.0018)	0.00007 (0.00076)	**	***	
Controls	Yes					
Fixed effects	Yes					
R <sup>2</sup>	0.01					
No of obs	48 825					

Note: See notes to Table 3

Source: Fratzscher *et al* (2012)

**Table 5: Impact of Federal Reserve Unconventional Monetary Policy Measures – Exchange Rates**

Per cent, positive values mean appreciation of the US dollar

	$\beta$	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	$\gamma^{EME}$	$\gamma^{AE}$	$\gamma^{EME} - \gamma^{AE}$
<b>Dependent variable: exchange rate returns</b>						
AN1	-0.84485*** (0.05801)	-0.21177 (0.12946)	-1.45310*** (0.07388)	***	***	***
AN2	-0.06209*** (0.00426)	-0.08910*** (0.03308)	-0.28847*** (0.05537)		***	***
LQ	0.00378*** (0.00008)	0.00523*** (0.00096)	0.00435*** (0.00067)			
MBS	0.00427*** (0.0001)	0.00274** (0.00115)	-0.00055 (0.00047)		***	***
TR	-0.00899*** (0.00037)	-0.00492** (0.00229)	-0.00892*** (0.00147)	*		
Controls	Yes					
Fixed effects	Yes					
R <sup>2</sup>	0.04					
No of obs	59 205					

Note: See notes to Table 3

Source: Fratzscher *et al* (2012)

A second, crucial element of the Federal Reserve's strategy during the QE1 period was its liquidity operations. These also induced a cross-economy rebalancing from EME assets into US equities and bonds (Table 3) and a drop in US bond yields (Table 4), while putting upward pressure on the US dollar as a result (Table 5). This finding again seems sensible against the background of the underlying objective of the Federal Reserve's liquidity operations. There may also have been a moral suasion component, that is, market participants that receive funding from the Federal Reserve might be inclined not to reduce their exposures to the domestic economy, but rather achieve their desired deleveraging by selling off foreign asset holdings in EMEs. In addition, by expanding the pool of collateral eligible to obtain central bank liquidity, the Federal Reserve might have increased the willingness of investors to hold US assets at times of global liquidity shortages.

The third main element of QE1 policies, MBS purchases by the Federal Reserve, induced net inflows into bond funds of all regions and groups, and net outflows from US equity funds (Table 3), while asset prices only reacted weakly (Table 4). This finding is consistent with the argument that MBS purchases helped improve the functioning of particular US bond market segments, making them more attractive to investors and hence attracting private capital into funds investing in bond markets. Indeed, the Federal Reserve stated that its goal for the MBS purchases was to 'reduce the cost and increase the availability of credit for the purchase of houses' (Federal Reserve 2008). As discussed in Hancock and Passmore (2011), the Federal Reserve's MBS purchase program re-established a robust secondary mortgage market, which meant that loans to the marginal mortgage borrower could be funded via capital markets. This is consistent with the finding of net inflows into US bond markets.

In contrast, for the QE2 period in 2010, Federal Reserve policy measures functioned in a fundamentally different way from those of the QE1 period. In particular, QE2 policies induced a portfolio rebalancing out of US equities and bonds, and partly into EME equities. This holds for both QE2 announcements as well as for the Federal Reserve's Treasury purchases (Table 3). Moreover, Treasury purchases by the Federal Reserve also induced a portfolio rebalancing across asset classes, as bond funds in all regions experienced net outflows and EME equity funds experienced net inflows. When the Federal Reserve buys long-term government bonds, it crowds out other investors and reduces yields in this market segment. This raises the demand for more risky assets. Relative to the size of AUM, the effects of US Treasury purchases by the Federal Reserve were even larger for many EMEs than for the United States itself, suggesting that these operations had a particularly strong impact on capital flows to EMEs. In fact, the estimates indicate some, albeit small, net outflows even from US equities compared with sizeable net inflows into EME equities. Moreover, opposite to the effects of liquidity operations, US Treasury purchases triggered stronger risk-taking by fund managers, particularly with regard to equity investment in EMEs.

The responses of asset prices are in line with the results for portfolio allocations. Table 4 suggests that QE2 announcements had a substantially smaller effect on US yields than QE1 announcements, reducing them on average by about 2 basis points, which is consistent with the findings by Wright (2011). Moreover, US Treasury purchases even raised their yields slightly (Table 4). Most importantly, both QE2 announcements and Treasury purchases by the Federal Reserve worked to weaken the US dollar significantly (Table 5).

How important are the effects of US monetary policy measures for changes in portfolio allocations, asset prices and exchange rates? Given the discussion of statistical significance and the underlying mechanisms and channels through which US unconventional monetary policy measures have functioned, to what extent can the large shifts in portfolio allocations of global capital flows observed during the crisis in 2007–2008 and also since 2009 be explained by such policy measures? Moreover, has Federal Reserve policy functioned in a procyclical or a countercyclical manner, thereby exacerbating or reducing capital flows and asset price movements?

Two different analyses are conducted to get at these questions. First, we calculate the cumulative effects of the different policy measures on total investment in the United States, and on other AE and EME bond and equity funds. Table 6 shows the cumulated effects of each US policy measure at the peak of the Federal Reserve's balance sheet exposure, while Table 7 shows the impact of the total change over the 2007 to 2011 sample period. The distinction between the two is important primarily for the liquidity operations, which reached a cumulated peak of US\$2 000 billion in early 2009, but then were unwound to a large extent by the end of 2010. The same analysis is conducted for asset prices (equity returns, bond yields and exchange rates) in the B panels of Tables 6 and 7.

The second analysis is to cumulate across all five Federal Reserve policy measures; however, not at one particular point in time (as in Tables 6 and 7), but rather presenting the evolution of the total cumulated effect of US monetary policy measures over time. This is shown in Figure 2 for equity and bond flows into the United States, EMEs and other AEs.

**Table 6: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – ‘Peak’ Impact**

	Panel A: Portfolio allocations and capital flows								
	Equity funds			Bond funds					
	US	EME	Other AE	US	EME	Other AE			
Total impact of:									
<i>AN1</i>									
Per cent of AUM	1.80	0.16	0.33	0.95	-0.35	0.34			
US\$m – EPFR	18 630	383	1 417	4 249	-123	231			
US\$m – IMF CPIS		1 474	8 780		-592	4 575			
<i>AN2</i>									
Per cent of AUM	0.02	0.42	-0.01	-0.61	0.09	-0.19			
US\$m – EPFR	333	2 914	-107	-6 008	96	-348			
US\$m – IMF CPIS		3 844	-355		145	-2 534			
<i>LQ</i>									
Per cent of AUM	4.88	-1.46	1.29	3.33	-4.37	0.62			
US\$m – EPFR	62 451	-5 067	7 396	14 354	-2 256	481			
US\$m – IMF CPIS					-7 338	8 457			
<i>MBS</i>									
Per cent of AUM	-2.67	0.61	0.54	5.54	5.80	6.31			
US\$m – EPFR	-33 105	2 464	3 030	32 816	2 793	5 675			
US\$m – IMF CPIS					9 740	86 069			
<i>TR</i>									
Per cent of AUM	-0.80	3.45	0.01	-9.73	-10.52	-2.04			
US\$m – EPFR	-11 136	17 725	38	-75 417	-8 210	-2 666			
US\$m – IMF CPIS		31 365	158		-17 666	-27 888			
	Panel B: Asset prices and exchange rates								
	Equity prices			Bond yields			Exchange rates		
	Per cent			Percentage points			Per cent		
	US	EME	Other AE	US	EME	Other AE	US	EME	Other AE
Total impact of:									
<i>AN1</i>	4.30	-0.34	-1.68	-0.66	-0.48	-0.25	-3.24	-0.62	-5.61
<i>AN2</i>	2.93	1.12	1.33	-0.07	-0.01	-0.06	-0.19	-0.30	-0.94
<i>LQ</i>	-23.56	-23.90	-22.87	-0.69	2.45	-0.69	7.45	11.44	8.39
<i>MBS</i>	-6.61	-1.03	-2.58	0.11	-0.57	-0.41	5.71	3.88	-0.11
<i>TR</i>	15.08	18.31	18.25	1.31	-0.87	0.11	-4.83	-2.89	-5.78

Notes: Total impact of each monetary policy instrument is calculated by multiplying the estimated coefficient for the operation (see Tables 3–5) by the size of the operation at each period  $t$  and by cumulating the effect from the beginning of the program to the day of the maximum expansion of the program; maximum expansion of the liquidity support measures was reached at the end of December 2008, while the maximum expansion of MBS purchases was reached at the end of June 2010; the maximum expansion of other monetary policy instruments was reached in December 2010; flows based on IMF Coordinated Portfolio Investment Survey (CPIS) data are computed on the basis of the stock of portfolio investment held by US residents in the target group of economies (i.e. EMEs and AEs) at the end of 2009

Source: Fratzscher *et al* (2012)

**Table 7: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – Total Impact (Over Entire Sample Period)**  
(continued next page)

	Panel A: Portfolio allocations and capital flows					
	Equity funds			Bond funds		
	US	EME	Other AE	US	EME	Other AE
Total impact of:						
<i>AN1</i>						
Per cent of AUM	1.80	0.16	0.33	0.95	-0.35	0.34
US\$m – EPFR	18 630	383	1 417	4 249	-123	231
US\$m – IMF CPIS		1 474	8 780		-592	4 575
<i>AN2</i>						
Per cent of AUM	0.02	0.42	-0.01	-0.61	0.09	-0.19
US\$m – EPFR	333	2 914	-107	-6 008	96	-348
US\$m – IMF CPIS		3 844	-355		145	-2 534
<i>LQ</i>						
Per cent of AUM	0.44	-0.13	0.12	-0.29	-0.40	0.06
US\$m – EPFR	12 305	-345	1 491	-2 193	-476	20
US\$m – IMF CPIS		-1 226	3 112		-668	753
<i>MBS</i>						
Per cent of AUM	-2.38	0.54	0.49	4.92	5.13	5.59
US\$m – EPFR	-28.197	1 995	2 536	26 977	2 100	4 379
US\$m – IMF CPIS		4 917	12 927		8 616	76 297
<i>TR</i>						
Per cent of AUM	-0.80	3.45	0.01	-9.73	-10.52	-2.04
US\$m – EPFR	-11 136	17 725	38	-75 417	-8 210	-2 666
US\$m – IMF CPIS		31 365	158		-17 666	-27 888
All operations						
Per cent of AUM	-0.91	4.45	0.93	-4.76	-6.05	3.75
US\$m – EPFR	-8 065	22 672	5 376	-52 391	-6 614	1 617
US\$m – IMF CPIS		40 374	24 622		-10 165	51 203
Total flows						
Per cent of AUM	-4.64	25.43	-17.08	27.33	33.78	-3.94
US\$m – EPFR	-41 222	130 015	-133 251	177 783	31 541	16 422
US\$m – IMF CPIS		230 923	-452 651		56 726	-53 742

**Table 7: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – Total Impact (Over Entire Sample Period)**  
(continued)

	Panel B: Asset prices and exchange rates								
	Equity prices			Bond yields			Exchange rates		
	Per cent			Percentage points			Per cent		
	US	EME	Other AE	US	EME	Other AE	US	EME	Other AE
Total impact of:									
AN1	4.30	-0.34	-1.68	-0.66	-0.48	-0.25	-3.24	-0.62	-5.61
AN2	2.93	1.12	1.33	-0.07	-0.01	-0.06	-0.19	-0.30	-0.94
LQ	-2.11	-2.15	-2.00	-0.06	0.19	-0.05	0.54	0.81	0.61
MBS	-5.90	-0.92	-2.31	0.09	-0.52	-0.37	5.07	3.45	-0.69
TR	15.08	18.31	18.25	1.31	-0.87	0.11	-4.83	-2.89	-5.78
All operations	14.30	16.02	13.59	0.63	-1.70	-0.62	-2.65	0.45	-12.41
Total cumulated change over period	-20.31	-0.41	-35.08	-1.40	-0.23	0.25	-8.79	4.24	-7.31

Notes: Total impact of each monetary policy instrument is calculated by multiplying the estimated coefficient for the operation (see Tables 3–5) by the size of the operation at each period  $t$  and by cumulating the effect from the beginning of the program to the end of the sample in December 2010; see notes to Table 6

Source: Fratzscher *et al* (2012)

Three main findings emerge. First, the absolute effect of US monetary policy measures on portfolio allocations, capital flows and asset prices is substantial. For instance, in cumulative terms, US policy measures together explain EME net equity inflows of around 4½ per cent and EME net bond outflows of around 6 per cent as a share of the funds' AUM between mid 2007 and early 2011 (Table 7). As the size of EME equity assets held by foreigners is substantially larger than that for EME bond assets, these figures imply net inflows of US\$23 billion into EME equities and net outflows of US\$7 billion from EME bonds using the mutual fund database. Similarly for US funds and other AE funds, Federal Reserve non-standard policy measures induced significant effects on allocations. For example, cumulative inflows into AE bonds of a little under 4 per cent of AUM and net outflows from US bond funds of a little under 5 per cent of AUM.

Importantly, these cumulative figures mask the fact that some of the Federal Reserve measures exerted opposing effects on portfolio allocations. Looking at the breakdown by individual Federal Reserve measures in Table 6, for instance, shows that Federal Reserve purchases of US Treasuries caused large net outflows out of US bond funds of 9.7 per cent of AUM and out of EME bond funds of 10.5 per cent, while MBS purchases had the opposite effect, inducing net inflows into US and EME bond funds of between 5 and 6 per cent of AUM.

The responses of asset prices and exchange rates reveal a similar picture; Federal Reserve policies have exerted economically meaningful effects on equity returns and bond yields in all three geographical areas – the United States, EMEs and other AEs. Panels B of Tables 6 and 7 show that, for instance, the QE1 announcement raised US equity prices by 4.3 per cent and lowered 10-year US Treasury yields by 66 basis points (Table 7), which is in line with the stylised facts presented above.

Similarly, Federal Reserve operations – specifically Treasury purchases – exerted an even larger effect on asset prices in all financial market segments globally. Federal Reserve Treasury purchases raised US equity prices by 15 per cent (and EME and other AE equity prices by 18 per cent), and led to an effective depreciation of the US dollar of 4.8 per cent.

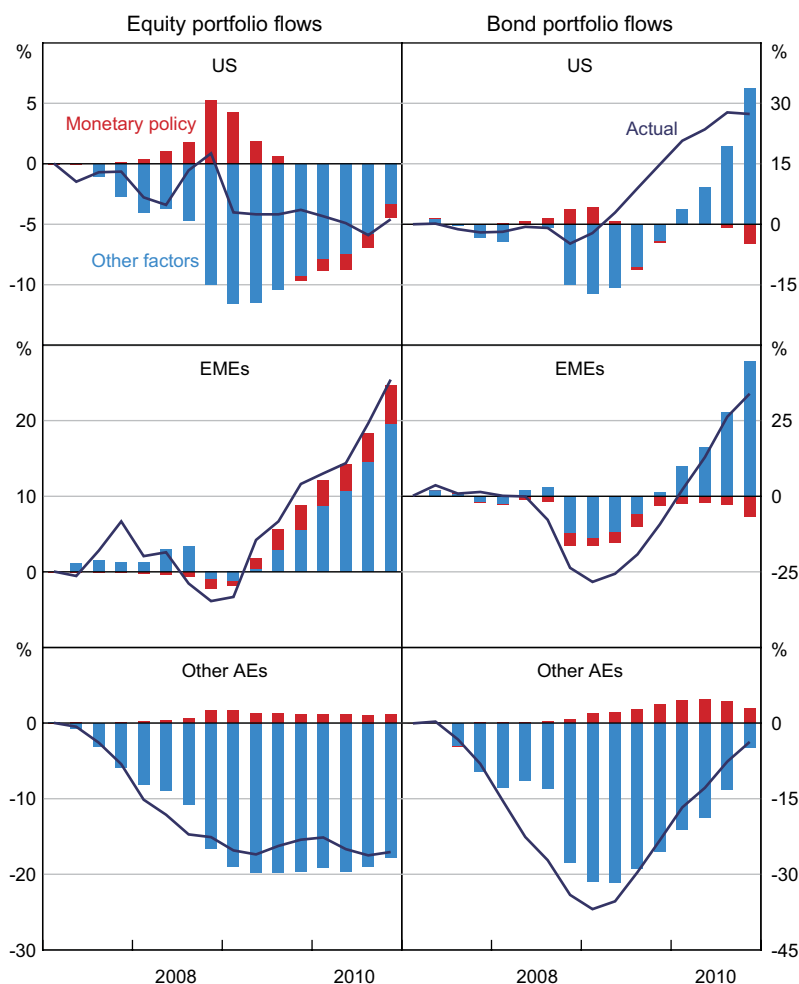
The second main result is that although these effects of Federal Reserve policies obviously constitute sizeable magnitudes in absolute terms, they are moderate compared with the total cumulative changes in portfolio allocations, capital flows and asset prices when taking a longer-term perspective over the entire sample period. For instance, the total increase in net equity inflows to EMEs over the period 2007–2011 was more than 25 per cent, while the total increase in net bond inflows to EMEs was 34 per cent. These growth rates are far larger than what can be accounted for by the estimated effects of Federal Reserve announcements and operations. In fact, Figure 2 shows that the control variables (common risk, liquidity and yield factors, and local asset returns) have been substantially more important as drivers of capital flows to EMEs than US monetary policy measures. The same holds for allocations to US funds and to other AE funds. Hence, overall, a key finding is that Federal Reserve non-standard measures account for only a small share of changes in portfolio allocations and capital flows.

Another important aspect of the results is that capital flows to EMEs have in most cases been substantially more sensitive to Federal Reserve policy measures than flows into US funds or other AE funds, when measured relative to fund AUM. This again confirms that Federal Reserve measures have indeed exerted a substantial and economically meaningful effect, particularly on capital flows to EMEs.

Another point is that the effects of Federal Reserve announcements have, overall, been substantially smaller than the effects of actual Federal Reserve operations on portfolio flows and asset prices. For instance, QE1 announcements caused net inflows of about 1.0 per cent of AUM into US bond funds and 1.8 per cent into US equity funds. In contrast, Federal Reserve purchases of US Treasuries lowered the private mutual fund holdings of US bonds by close to 10 per cent and of US equities by 0.8 per cent. A similar finding holds for asset prices, although QE announcements did exert very substantial effects on equity returns and in particular on US Treasury yields.

This finding is important because it challenges the approach in the literature that focuses exclusively on the effects of QE announcements, rather than the operations themselves. It also underlines and confirms the role of the market repair and liquidity provision functions of Federal Reserve policies, which means that the mere announcement or anticipation of such measures alone do not meet these objectives, but that it takes the operations to truly accomplish the goals. What the findings also suggest is that while QE announcements indeed triggered substantial changes in US asset prices, most of the effects on capital flows as well as on asset prices for EMEs and other AEs were caused by operations. Hence, analysing operations is key for understanding how the Federal Reserve's unconventional monetary policy measures have functioned and, in particular, gauging their global repercussions.

**Figure 2: Cumulated Impact of Federal Reserve Quantitative Easing and Other Control Variables**  
Per cent of AUM in economy of destination



Source: Fratzscher *et al* (2012)

The third main finding is that the evidence suggests US unconventional monetary policy measures since 2007 have significantly exacerbated the procyclicality of capital flows to EMEs. By contrast, these Federal Reserve measures have worked in a countercyclical manner for investments in US equity and bond markets, as well as those of other AEs. Figure 2 shows how during the height of the 2007–2008 crisis, Federal Reserve liquidity operations pulled capital out of EMEs and into US equity and bond funds. In contrast, during the recovery period of 2009, when overall capital inflows into EMEs surged, the combination of a partial reversal of Federal Reserve liquidity operations with Treasury and MBS purchases contributed to the capital flow surge into EME equities.



#### 4. Externalities of Capital Controls – The Case of Brazil

Some policymakers have recently become more supportive of controls on capital inflows, particularly if they are aimed at limiting the appreciation of overvalued currencies and reducing financial fragilities resulting from large and volatile capital flows. This support has been bolstered by theoretical work showing that taxes on capital inflows can improve an economy's welfare by reducing negative feedback effects due to capital flow volatility (Jeanne and Korinek 2010; Korinek 2010) or by adjusting the terms of trade to shift consumption across periods (Costinot, Lorenzoni and Werning 2011). This theoretical work has been supported by empirical work showing that even if capital controls cannot significantly affect the total volume of capital inflows, they can improve the economy's liability structure and increase its resilience to crises (Ostry *et al* 2010).<sup>5</sup> Even the IMF, formerly an avid promoter of capital market liberalisation, has recently started to support the use of controls on capital inflows in certain circumstances (see IMF (2011) and Ostry *et al* (2011)).

The evidence used in support of capital controls, however, has largely focused on the direct benefits to the economy implementing the controls and ignored any externalities on other economies. If controls reduce certain capital inflows for the host economy, do they simply shift these flows and the corresponding challenges to another economy in a 'bubble-thy-neighbour' effect? These externalities could be particularly important in the current environment in which macroeconomic policies in some economies are already distorting capital flows in ways that foster fragilities and create future challenges (see, for example, Rajan (2010)).<sup>6</sup> Only two recent theoretical papers consider these multilateral effects of capital controls and model how controls in one economy can affect welfare in other economies (see Costinot *et al* (2011) and Korinek (2011)). They show that these externalities could be positive or negative, depending on the model's assumptions. Due to concerns about the possibility of negative externalities, Jeanne (2012) proposes a framework for multilateral oversight of capital controls. Despite this recent theoretical and policy-related work, however, there has not yet been any empirical analysis of whether the use of controls on capital inflows generates meaningful externalities on other economies.

This lack of empirical assessment is surprising given the related evidence in other areas, such as trade diversion and financial market contagion. An important focus of the trade literature has been on how trade restrictions can create 'trade diversion' as well as trade creation. Similarly, the literature on financial contagion has documented that portfolio investors respond to wealth, valuation, liquidity and information shocks in one economy by adjusting portfolio allocations in the economy where the shock occurs as well as in other economies. There have not been many analogous attempts so far to document if capital account restrictions create 'capital flow diversion' or related portfolio adjustments.

This section builds on the work by Forbes *et al* (2011), which attempts to fill this void by testing for any portfolio effects of capital controls on the economy instituting the controls, as well as for

5 In contrast, Forbes and Warnock (2012) find that capital controls do not significantly reduce the probability of an economy experiencing surges or stops in foreign capital flows. For surveys on the effects of capital controls, see Prasad *et al* (2003), Forbes (2004), Henry (2007), Cardarelli, Elekdag and Kose (2009), Cline (2010), Ostry *et al* (2010) and Magud, Reinhart and Rogoff (2011).

6 Jeanne (2012) discusses how capital controls in China have supported an undervalued exchange rate, suppressing domestic demand and acting as an impediment to a global recovery and reduction in global imbalances.

any externalities on other economies. Previous empirical analyses of capital controls focused on effects on macroeconomic variables – such as the exchange rate, total volume of inflows, interest rates or liability structures. The approach presented in this section analyses how capital controls affect equity and bond fund allocations in response to changes in capital controls, using the EPFR database.

The empirical analysis focuses on changes in Brazil's capital controls from 2006 to 2011. Brazil had a fairly open capital account during this period, but on several occasions added, removed or raised a tax on certain types of foreign portfolio inflows. Focusing on one economy has the disadvantage that the analysis may not generalise to other economies' experiences with controls – or even to different types of controls within the same economy. I focus on this specific example, however, for two important reasons. First, one challenge with the cross-economy analysis of controls is that different economies have adopted very different types of controls, with different levels of enforcement, different goals and at different levels of financial development. Imposing the assumption in a cross-economy study that these very different experiences have the same effect would bias estimates toward finding no effect (which is a common result in the empirical literature). Second, the introduction of capital controls in economies with small equity and debt markets is less likely to have measurable externalities on portfolio investors. Since Brazil is the largest equity and debt market in Latin America, and is a large component of most emerging market indices against which portfolio investors are benchmarked, it is a logical place to start.<sup>7</sup> If there is no evidence of externalities in this setting, it is unlikely (although not impossible) that there would be economically significant externalities from smaller economies implementing capital controls.

In order to analyse the effects of Brazil's capital controls, I focus on an empirical framework in which investors adjust the portfolio shares allocated to each economy based on the economy's weight in the relevant benchmark. I find that changes in Brazil's capital controls have a significant effect on the share of funds' portfolios allocated to Brazil. More specifically, the estimates imply that if Brazil had *not* instituted a 6 per cent tax on foreign purchases of fixed income (i.e. if Brazil had kept the tax at 0 per cent), global emerging equity and bond funds would have increased their portfolio allocations to Brazil by about 3 to 5 per cent relative to their existing levels. Global equity funds (that invest primarily in developed markets and have smaller portfolio allocations to Brazil) would have increased their allocations to Brazil by about 17 to 20 per cent.<sup>8</sup> Back-of-the-envelope calculations suggest that this effect is not only significant, but that the magnitude of the impact on portfolio flows could be large. Although these calculations involve a number of assumptions and should be interpreted cautiously, they suggest that foreign portfolio investors would have held roughly US\$28 to US\$32 billion more in equity and debt investments in Brazil if Brazil had not implemented these capital controls. This is large relative to annual portfolio flows (US\$71 billion in 2010), but moderate relative to total foreign portfolio investment in Brazil (US\$554 billion at the end of 2009).

7 Brazil's share of J.P. Morgan's Emerging Markets Bond Index Global benchmark ranged from 7 per cent to 11 per cent over the sample period from 2006 to mid 2011.

8 To put this in context, average portfolio allocations to Brazil at the end of the sample in July 2011 were 11.6 per cent for global emerging market bond funds, 15.9 per cent for global emerging market equity funds and 1.8 per cent for global equity funds.

The analysis considers four episodes when Brazil's Tax on Financial Operations (IOF) – a tax on capital inflows – changed during the sample period (January 2006 to July 2011). The IOF was originally established in 1993 and has been used intermittently since then. The four episodes are:

03/2008	Increased IOF from 0 to 1.5 per cent on fixed income.
10/2008	Reduced IOF on fixed income to 0 per cent.
10/2009	Increased IOF from 0 to 2 per cent on fixed income and equities.
10/2010	Increased IOF to 4 per cent on fixed income; then increased IOF to 6 per cent on fixed income and adopted a number of restrictions to close loopholes that were used to avoid the tax over next two months; Finance Minister Mantega also announced that other measures were under consideration.

Basic theoretical models of portfolio allocation (e.g. Stulz 1981) show that an increase in the cost of holding foreign assets will cause investors to reduce the share of their portfolios allocated to those assets (holding everything else constant). Gelos (2011) provides an excellent survey of the series of papers building on this basic framework to analyse portfolio allocation across economies. Although none of these papers directly tests for the effect of capital controls on portfolio allocation, several papers show that foreign investors tend to invest less in economies with more restrictions on foreign ownership, weaker investor protection, less transparency, weaker shareholder rights, greater corruption and a weaker legal framework. These results suggest that new capital controls – which are generally viewed as increasing policy uncertainty, reducing government transparency, weakening investor protection and providing greater opportunities for corruption – could reduce foreign investors' portfolio allocations to the economy.

More specifically, the analysis below builds on Gelos and Wei (2005), which uses a model in which a fund's portfolio allocation across economies is based on the economy's weight in the benchmark, a fund fixed effect and an error term. This framework can be derived directly from the International Capital Asset Pricing Model. I also include variables to capture the effect of Brazil's capital controls on portfolio allocations to Brazil (the direct portfolio effect) and allocations to economies other than Brazil (the externality), as well as a set of control variables:

$$\omega_{i,j,t} = \alpha_{i,j} + \gamma_D \text{Control}_t^{\text{Brazil}} + \gamma_E \text{Control}_t^{\text{Ex-Brazil}} + \beta \omega_{i,t}^{\text{benchmark},j} + \delta \chi_{i,j,t} + \varepsilon_{i,j,t}, \quad (7)$$

where  $\omega_{i,j,t}$  is the share of the portfolio allocated to economy  $i$  for fund group  $j$  at time  $t$ ;  $\alpha_{i,j}$  is the economy-fund-group fixed effect;  $\text{Control}_t^{\text{Brazil}}$  is the level of Brazil's IOF if economy  $i$  is Brazil;  $\text{Control}_t^{\text{Ex-Brazil}}$  is the level of Brazil's IOF if economy  $i$  is any economy other than Brazil;  $\omega_{i,t}^{\text{benchmark},j}$  is the weight of economy  $i$  in the relevant benchmark for fund group  $j$  at time  $t$ ;  $\chi_{i,j,t}$  is the set of control variables; and  $\varepsilon_{i,j,t}$  is the error term.

In order to focus on how changes in Brazil's capital controls affect changes in portfolio allocations to other economies, I take the first difference of Equation (7):

$$\Delta \omega_{i,j,t} = \gamma_D \Delta \text{Control}_t^{\text{Brazil}} + \gamma_E \Delta \text{Control}_t^{\text{Ex-Brazil}} + \beta \Delta \omega_{i,t}^{\text{benchmark},j} + \delta \Delta \chi_{i,j,t} + \mu_{i,j,t}. \quad (8)$$

Equation (8) is the base case for the analysis. It estimates how changes in capital controls in Brazil are related to changes in funds' portfolio weights allocated to each economy. I also estimate the model with the portfolio shares and portfolio weights expressed in logarithmic form, so that the

effect of changes in Brazil's capital controls on the percentage changes in funds' portfolio weights allocated to each economy can be estimated. I assume that the magnitude of a change in capital controls affects the magnitude of any portfolio reallocation rather than use a dummy variable that takes the value one when there is any change in capital controls; this assumes that any such change would have an equal-sized effect on reallocations. I focus on testing two hypotheses from Equation (8):

- the direct portfolio effect:  $\gamma_D < 0$ , an increase in the IOF decreases the share of funds' portfolios allocated to Brazil
- the externality effect:  $\gamma_E > 0$ , an increase in the IOF increases the share of funds' portfolios allocated to economies other than Brazil.

Table 8 reports the base-case estimates of Equation (8) predicting changes (and percentage changes) in economy-portfolio weights as a function of changes in Brazil's IOF and changes (or percentage changes) in economy benchmark weights for the sample of EME equity and bond funds. Columns (1) and (2) report results without any additional control variables and columns (3) and (4) report results with the full set of control variables. All estimates include robust standard errors clustered by fund group and economy. Columns labelled 'First difference' report results when portfolio weights are measured as changes and columns labelled 'Log difference' report results when portfolio weights are measured as percentage changes. The results are presented for both specifications as each estimates a different relationship, both of which are useful in understanding the portfolio effects of capital controls. The log-differenced specification is more straightforward to interpret as it focuses on percentage changes in portfolio weights and gives equal weighting to each economy in the sample. The first-differenced specification puts more weight on larger adjustments in portfolio allocations, and therefore greater weight on larger markets. This has the benefit of capturing the major shifts in portfolio allocations of most interest to investors, but results may not be as applicable for smaller markets.

Before focusing on the central results, it is useful to mention several of the significant coefficient estimates for the control variables, which all follow *a priori* expectations.<sup>9</sup> The coefficient on  $\omega^{benchmark}$  is positive, sizeable in magnitude, and consistently significant at the 1 per cent level, supporting the claims made in investor interviews that mutual fund investors closely track changes in their benchmark indices. The negative and significant coefficient on *Overweight* indicates that funds tend to increase (decrease) their economy allocations after they are underweight (overweight), thereby supporting a rebalancing effect when funds deviate from their benchmarks. The negative coefficient on *Outperformance* has fluctuating significance and suggests that funds may engage in portfolio rebalancing rather than return chasing. The significant negative coefficient on *Off-benchmark share* indicates that when funds increase allocations to economies that are not in the benchmark, they simultaneously decrease allocations to economies in the benchmark.

9 The two variables that are not significant in this base specification are also not surprising. The coefficient on *Global risk* is not significant, undoubtedly reflecting that although changes in global risk may affect total flows into emerging markets, this may not have differentiated effects on individual economy weights within a fund. The coefficient on *Interest spread* is also not significant. This may reflect the various ways in which economy interest rates could interact with portfolio allocations. Higher interest rate spreads would be expected to increase capital inflows and fund allocations if they simply reflect higher returns, but if the higher interest rates reflect greater economy risk, this could decrease fund allocations.

I have also estimated the full set of regressions with a range of other control variables that have been used in the literature on portfolio flows. These additional control variables are rarely significant, even at the 10 per cent level, and including different combinations of them has no significant effect on the main results for the capital control variables as reported below. In fact, although many of the control variables used in the main analysis are individually significant and including them improves the explanatory power of the regression, they rarely change the key results.

**Table 8: Regression Results – Effects of Capital Controls**

	Without additional control variables		Full set of control variables	
	First difference (1)	Log difference (2)	First difference (3)	Log difference (4)
$Control^{Brazil}$	-0.037** (0.017)	-0.129*** (0.021)	-0.036* (0.018)	-0.062** (0.030)
$Control^{Ex-Brazil}$	0.005 (0.006)	0.082 (0.210)	0.003 (0.006)	0.076 (0.213)
$\omega^{benchmark}$	0.723*** (0.042)	0.656*** (0.087)	0.729*** (0.041)	0.664*** (0.084)
<i>Other control events</i>			-0.041* (0.022)	-0.997** (0.476)
<i>Global risk</i>			-0.000 (0.000)	0.015 (0.009)
<i>Overweight</i>			-0.012*** (0.004)	-0.015*** (0.003)
<i>Outperformance</i>			-0.002*** (0.000)	-0.023 (0.017)
<i>Interest spread</i>			-0.002 (0.002)	0.027 (0.038)
<i>Off-benchmark share</i>			-0.068*** (0.025)	-0.060** (0.022)
$R^2$	0.468	0.140	0.479	0.151
No of obs	2 545	2 545	2 545	2 545

Notes: \*\*\*, \*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses, clustered by country and fund group; regressions of Equation (8) predicting the change (labelled 'First difference') or percentage change (labelled 'Log difference') in the economy share in the fund group's portfolio;  $Control$  captures any effect of changes in the IOF on fixed income in Brazil over a three-month window on either Brazil or other economies in the sample (*Ex-Brazil*); fund groups included in the regressions are: global EME equity and bond funds and Latin America regional equity funds

Source: Forbes, Fratzscher and Straub (2013)

Moving to the central results, the negative and significant coefficient on  $Control^{Brazil}$  indicates that an increase in the IOF corresponds to lower portfolio allocations to Brazil. Using the estimate for the first-differenced equation with the full set of controls in column (3), the -0.036 coefficient

indicates that removing the 6 per cent tax corresponds to funds increasing their portfolio weights allocated to Brazil by 0.22 percentage points over each of the three months starting with the change in the tax. The corresponding  $-0.062$  coefficient in the log-differenced specification in column (4) indicates that a 6 per cent reduction in the IOF corresponds to funds increasing their portfolio weights allocated to Brazil by 0.37 per cent over each of the three months. Combining these estimates, if the tax was removed at the end of the sample in July 2011, the average portfolio share allocated to Brazil (across all funds in this sample) would increase from 18.0 per cent to 18.2–18.7 per cent after three months. Although this appears to be small in magnitude, it can imply substantial effects on capital flows, especially when considering more precise estimates for different types of funds.

The coefficient estimates on the other variables related to capital controls also yield noteworthy results. The negative coefficient on *Other control events* provides additional evidence of the direct, negative effect of capital controls; when other economies in the sample increase their capital controls, investors reduce the share of their portfolios allocated to these economies.<sup>10</sup> In contrast, the coefficient estimates on  $Control_t^{Ex-Brazil}$  are positive but not significant. This indicates that there are no significant externalities from changes in the IOF on average portfolio allocations to all other economies in the sample.

To test if different determinants had a significant effect on how investors reallocated their portfolios in response to changes in the IOF, the base model in Equation (8) is estimated isolating the externalities due to these four strategies from any general externalities. More specifically, I estimate:

$$\Delta\omega_{i,j,t} = \gamma_D \Delta Control_t^{Brazil} + \gamma_{EG} \Delta Control_t^{ExternalityGroup} + \gamma_{EO} \Delta Control_t^{Other} + \beta \cdot \Delta\omega_{i,t}^{benchmark,j} + \delta \Delta\chi_{i,j,t} + \mu_{i,j,t}, \quad (9)$$

where  $\Delta Control_t^{ExternalityGroup}$  is the change in the IOF if economy  $i$  is in one of the four externality groups discussed below;  $\Delta Control_t^{Other}$  is the change in the IOF if economy  $i$  is other than Brazil and not in the externality group; and all other variables are defined as above. I can then test not only for a direct effect of changes in the IOF on portfolio allocations to Brazil ( $\gamma_D < 0$ ) but also any positive or negative externalities on economies in a specific group ( $\gamma_{EG} \neq 0$ ) as well as to the other economies in the portfolio ( $\gamma_{EO} \neq 0$ ). The externalities in global emerging market equity funds are the initial focus for several reasons: (i) interviews with investors indicated that these are the funds most likely to reallocate portfolios in response to changes in the IOF; (ii) sample coverage for the equity funds is significantly better than for bond funds; and (iii) the simple regression framework and model is more successful in predicting equity than debt allocations. Also, dedicated Latin America regional funds or global funds are not included in the initial analysis as many of the spillovers would be difficult to capture in these funds; results including these broader fund groups are reported in the sensitivity tests below and largely agree with those in the smaller sample.

The definition of externality groups relies on investor interviews, but then data are used to ensure that all relevant economies are included in each group. *Region* includes all economies in Latin America. *Market size* includes economies that constitute at least 4 per cent of the relevant

<sup>10</sup> This coefficient is only significant at the 10 per cent level for the first-differenced equation. This may reflect that *Other control events* includes a number of very different capital controls which had different effects in different economies – an argument used in this paper to justify focusing on the capital controls in one economy.

benchmark for equities. *Dragon play* includes economies that are major commodity exporters or Asian export-oriented emerging markets, both of which could benefit substantially from rapid growth in China. *Control risk* is a group of economies that are believed to have a greater risk of implementing controls on capital inflows in the future. This includes economies that are traditionally fairly open to foreign investment but implemented new controls on portfolio inflows from 2006 to 2010 as well as economies that have traditionally maintained widespread capital account restrictions as measured in Chinn and Ito (2008).

Table 9 uses these definitions to estimate Equation (9) and test for externalities from changes in the IOF on each of these specific groups of economies individually. The results suggest that there are significant externalities to some groups. Specifically, columns (1)–(2) and columns (5)–(6) indicate that an increase in Brazil's IOF causes investors to significantly increase the share of their portfolios allocated to other economies in Latin America and to other dragon play economies. Columns (3) and (4) do not, however, find any significant externalities on large markets. Columns (7) and (8) suggest that an increase in the IOF causes investors to significantly decrease the share of their portfolios allocated to other economies believed to be a greater control risk.

The results in Table 9 suggest that changes in the IOF not only caused investors to adjust their portfolio allocations to Brazil, but also created significant positive and negative externalities for other economies. When Brazil increased the IOF, investors increased the share of their portfolios allocated to dragon play economies and decreased the share allocated to economies viewed as more likely to implement capital controls in the future. This further supports the hypothesis that changes in capital controls can act as a signal to investors, by causing them to reassess the risks in other economies that are also sympathetic to the use of capital controls.

But even if capital controls generate significant externalities by changing portfolio allocations to other economies, are these externalities economically meaningful? In order to get a rough sense of the magnitude of these externalities, I begin by considering each externality group as an aggregate share in a portfolio. Then I compute the spillover effects for each group in US dollars. The counterfactual for comparison is again that Brazil removes the IOF of 6 per cent on fixed income and everything else remains constant. Then the coefficient estimates for both the first-differenced and log-differenced estimates in Table 9 (which estimate the effect on each externality group separately and then simultaneously) suggest that reducing the IOF to zero would correspond to global emerging market equity funds reducing the share of their portfolios allocated to other dragon play economies by 7.8 to 10.2 per cent. The same reduction in the IOF would also correspond to global emerging market equity funds increasing the share of their portfolios allocated to other control risk economies by 3.3 to 9.1 per cent. Holding AUM constant and assuming no changes in benchmark weights, this corresponds to decreased investment of about US\$13 to US\$17 billion into the group of dragon play economies and increased investment of US\$6 to US\$16 billion into the group of control risk economies.

Table 9: Externalities of Capital Controls

	Region		Market size		Dragon play		Control risk	
	First difference (1)	Log difference (2)	First difference (3)	Log difference (4)	First difference (5)	Log difference (6)	First difference (7)	Log difference (8)
$Control^{Brazil}$	-0.028*** (0.003)	-0.275*** (0.061)	-0.028*** (0.003)	-0.276*** (0.062)	-0.027*** (0.003)	-0.271*** (0.061)	-0.028*** (0.003)	-0.276*** (0.062)
$Control^{ExternalityGroup}$	0.002 (0.009)	0.017 (0.187)	-0.002 (0.008)	-0.017 (0.308)	-0.018* (0.008)	-0.343** (0.139)	0.016 (0.010)	0.175 (0.232)
$\omega_{benchmark}$	0.847*** (0.021)	0.975*** (0.043)	0.847*** (0.021)	0.975*** (0.043)	0.845*** (0.022)	0.975*** (0.044)	0.845*** (0.022)	0.974*** (0.043)
$Other\ control\ events$	-0.042* (0.023)	-2.076*** (0.670)	-0.034** (0.014)	-2.007** (0.749)	-0.085* (0.049)	-2.860** (1.322)	-0.001 (0.034)	-1.687*** (0.403)
$Region$	0.012** (0.005)	0.207*** (0.052)						
$Market\ size$			0.009 (0.014)	0.098 (0.137)				
$Dragon\ play$					0.025** (0.009)	0.416** (0.194)		
$Control\ risk$							-0.018** (0.008)	-0.184** (0.070)
Macro controls	Y	Y	Y	Y	Y	Y	Y	Y
$R^2$	0.702	0.555	0.702	0.555	0.704	0.558	0.703	0.556
No of obs	1 086	1 086	1 086	1 086	1 086	1 086	1 086	1 086

Notes: See notes for Table 8; sample restricted to global emerging market equity funds;  $Control^{ExternalityGroup}$  represents all allocations apart from Brazil and the respective externality group  
Source: Forbes et al (2013)



## 5. Conclusions

This paper has provided an overview of research about the determinants of capital flows since the global financial crisis in 2008. The empirical results presented in Section 2 indicate that push factors in the form of shocks to liquidity and risk as well as to macroeconomic conditions and policies in advanced economies, in particular the United States, have indeed exerted a significant effect on capital flows to EMEs as well as other AEs. Although these effects were larger during the 2007–2008 crisis, they have continued to exert a sizeable effect on global capital flows during the subsequent recovery. However, the findings also underline that the drivers of capital flows are strongly related to pull factors and, in particular, the recipient economy's macroeconomic fundamentals, institutions and policies, which in fact have been the dominant drivers of capital flows in the 2009–2010 recovery.

Monetary policy has been blamed as a main driver of global capital flows since the global financial crisis, in particular to EMEs. The results of Section 3 suggest that there is indeed an important global dimension to and externalities from monetary policy decisions in AEs. However, the paper is mute on whether such externalities are overall positive or negative for other economies – as the potentially undesirable effects of these measures on the procyclicality of EME capital flows need to be weighed against potential benefits, such as higher economic activity and a better financial market functioning in the global economy. In any case, US monetary policy is found to explain only about 20 per cent of capital flows to EMEs on average since 2009.

Finally, the results of Section 4 suggest that although new controls on capital inflows can affect portfolio flows to the economy imposing the controls, thereby potentially helping to manage the risks from inflow surges, these policies should not be considered in isolation. There will be multilateral consequences as investors reallocate their portfolios in response to capital controls. The results are consistent with arguments that the capital controls may have slightly reduced the risk of bubbles and overheating in Brazil, but at the same time it may have aggravated these challenges in other economies, and especially other 'dragon play' economies linked to China's economy.

The key insight is that any model or discussion of capital controls should consider not only the impact on the economy implementing the controls, but also the externalities to other economies. If a large economy or a number of economies implement controls simultaneously, these could create substantial distortions in other economies and global capital flows, triggering a 'bubble-thy-neighbour' effect that may lead to retaliation and reduce global welfare. This makes a strong case for policy coordination of capital flow policies, with the IMF and the G20 carrying an important responsibility to do so.

## References

- Bekaert G, M Ehrmann, M Fratzscher and AJ Mehl (2011)**, 'Global Crises and Equity Market Contagion', NBER Working Paper No 17121.
- Bernanke BS (2009)**, 'The Crisis and the Policy Response', The Stamp Memorial Lecture, London School of Economics, London, 13 January.
- Cardarelli R, S Elekdag and MA Kose (2009)**, 'Capital Inflows: Macroeconomic Implications and Policy Responses', IMF Working Paper No WP/09/40.
- Carlson JB, JG Haubrich, K Cherny and S Wakefield (2009)**, 'Credit Easing: A Policy for a Time of Financial Crisis', Federal Reserve Bank of Cleveland *Economic Trends*, February, pp 7–13.
- Chinn MD and H Ito (2008)**, 'A New Measure of Financial Openness', *Journal of Comparative Policy Analysis: Research and Practice*, 10(3), pp 309–322.
- Cline WR (2010)**, *Financial Globalization, Economic Growth, and the Crisis of 2007–09*, Peterson Institute of International Economics, Washington DC.
- Costinot A, G Lorenzoni and I Werning (2011)**, 'A Theory of Capital Controls as Dynamic Terms-of-Trade Manipulation', NBER Working Paper No 17680.
- Federal Reserve (Board of Governors of the Federal Reserve System) (2008)**, 'Federal Reserve Announces it will Initiate a Program to Purchase the Direct Obligations of Housing-Related Government-Sponsored Enterprises and Mortgage-Backed Securities Backed by Fannie Mae, Freddie Mac, and Ginnie Mae', Press Release, 25 November.
- Forbes KJ (2004)**, 'The Asian Flu and Russian Virus: The International Transmission of Crises in Firm-Level Data', *Journal of International Economics*, 63(1), pp 59–92.
- Forbes KJ, M Fratzscher, T Kostka and R Straub (2011)**, 'Bubble Thy Neighbor: Direct and Spillover Effects of Capital Controls', Paper presented at the 12th Jacques Polak Annual Research Conference, Washington DC, 10–11 November.
- Forbes KJ, M Fratzscher and R Straub (2013)**, 'Capital Controls and Macroprudential Measures: What Are They Good For?', DIW Berlin Discussion Papers No 1343.
- Forbes KJ and FE Warnock (2012)**, 'Capital Flow Waves: Surges, Stops, Flight, and Retrenchment', *Journal of International Economics*, 88(2), pp 235–251.
- Fratzscher M (2012)**, 'Capital Flows, Push Versus Pull Factors and the Global Financial Crisis', *Journal of International Economics*, 88(2), pp 341–356.
- Fratzscher M, M Lo Duca and R Straub (2012)**, 'A Global Monetary Tsunami? On the Spillovers of US Quantitative Easing', Centre for Economic Policy Research Discussion Paper No 9195.
- Gagnon J, M Raskin, J Remache and B Sack (2011)**, 'Large-Scale Asset Purchases by the Federal Reserve: Did They Work?', Federal Reserve Bank of New York Staff Report No 441.
- Gelos RG (2011)**, 'International Mutual Funds, Capital Flow Volatility, and Contagion – A Survey', IMF Working Paper No WP/11/92.
- Gelos RG and S-J Wei (2005)**, 'Transparency and International Portfolio Holdings', *The Journal of Finance*, 60(6), pp 2987–3020.
- Hancock D and W Passmore (2011)**, 'Did the Federal Reserve's MBS Purchase Program Lower Mortgage Rates?', *Journal of Monetary Economics*, 58(5), pp 498–514.

**Henry PB (2007)**, 'Capital Account Liberalization: Theory, Evidence, and Speculation', *Journal of Economic Literature*, 45(4), pp 887–935.

**IMF (International Monetary Fund) (2011)**, 'Recent Experiences in Managing Capital Inflows—Cross-Cutting Themes and Possible Policy Framework', Policy Paper, 14 February.

**Jeanne O (2012)**, 'Who Needs to Open the Capital Account?', unpublished manuscript, Peterson Institute of International Economics.

**Jeanne O and A Korinek (2010)**, 'Managing Credit Booms and Busts: A Pigouvian Taxation Approach', NBER Working Paper No 16377.

**Jotikasthira C, CT Lundblad and T Ramadorai (2010)**, 'Asset Fire Sales and Purchases and the International Transmission of Financial Shocks', Centre for Economic Policy Research Discussion Paper No 7595.

**Korinek A (2010)**, 'Regulating Capital Flows to Emerging Markets: An Externality View', unpublished manuscript, University of Maryland.

**Korinek A (2011)**, 'Capital Controls and Currency Wars', unpublished manuscript, University of Maryland.

**Magud NE, CM Reinhart and KS Rogoff (2011)**, 'Capital Controls: Myth and Reality—A Portfolio Balance Approach', Peterson Institute of International Economics Working Paper WP 11-7.

**Miao Y and M Pant (2012)**, 'Coincident Indicators of Capital Flows', IMF Working Paper No WP/12/55.

**Neely CJ (2010)**, 'The Large-Scale Asset Purchases had Large International Effects', Federal Reserve Bank of St. Louis Working Paper 2010-018C.

**Ostry JD, AR Ghosh, K Habermeier, M Chamon, MS Qureshi and DBS Reinhardt (2010)**, 'Capital Inflows: The Role of Controls', IMF Staff Position Note SPN/10/04.

**Ostry JD, AR Ghosh, K Habermeier, L Laeven, M Chamon, MS Qureshi and A Kokenyne (2011)**, 'Managing Capital Inflows: What Tools to Use?', IMF Staff Discussion Note SDN/11/06.

**Prasad ES, KS Rogoff, S-J Wei and MA Kose (2003)**, *Effects of Financial Globalization on Developing Countries: Some Empirical Evidence*, Occasional Paper No 220, International Monetary Fund, Washington DC.

**Rajan R (2010)**, 'Beggaring the World Economy', Project Syndicate, 7 October, online. Available at <<http://www.project-syndicate.org/commentary/beggaring-the-world-economy>>.

**Stulz R (1981)**, 'On the Effects of Barriers to International Investment', *The Journal of Finance*, 36(4), pp 923–934.

**Wright JH (2011)**, 'What Does Monetary Policy Do to Long-Term Interest Rates at the Zero Lower Bound?', NBER Working Paper No 17154.

# Discussion

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## 1. James Morley

The paper by Marcel Fratzscher investigates capital flows to emerging market economies (EMEs) prior to, during and after the global financial crisis (GFC). It considers the relative importance of 'push' versus 'pull' factors in driving capital flows, where 'push' factors are external variables such as US macroeconomic news and 'pull' factors are internal variables such as a country's institutions and policies. The paper also considers the impact of changes in Brazil's capital controls on portfolio allocations.

To investigate the relative importance of push versus pull factors, a factor model of weekly net capital flows is estimated. A key feature of the model is that the factor loadings (i.e. the parameters governing the impact of various factors on net capital flows) are allowed to be different during the GFC between 2007 and 2009. A notable finding is that negative US macroeconomic news increases capital flows to emerging market economies during normal times, but it decreased these flows during the GFC due to 'flight to safety'. Also, push and pull factors are equally important for capital flows during normal times, but push factors became more important during the GFC. However, despite the importance of push factors in the GFC, US monetary policy appears to have played only a relatively minor role in driving capital flows.

To investigate the impact of changes in Brazil's capital controls, a regression model of portfolio shares for EMEs is estimated. The main empirical finding for this model is that the capital controls have a statistically and economically significant impact on portfolio allocations to Brazil, with an increase in controls reducing the weight on Brazil in portfolios. The capital controls are also estimated to create a positive externality in the sense of an increase in the weight on other Latin American and 'dragon play' economies, which are economies that are major commodity exporters or Asian export-oriented emerging markets.

The main policy conclusions from this analysis are that (i) US monetary policy was not the primary driver of capital inflows during the GFC and its immediate aftermath and (ii) the positive externality suggests cross-country coordination may be necessary to avoid a 'bubble-thy-neighbour' effect of capital controls, whereby dampening of flows for one economy such as Brazil only serves to increase flows to other similar economies.

This is a very useful paper in that it conducts careful empirical analysis to verify or challenge conventional wisdoms about the drivers of capital flows in the GFC and the effects of Brazil's capital controls on portfolio allocations.

In terms of the importance of push and pull factors during the GFC, I wondered how sensitive the results are to different timing assumptions? In particular, are the different estimates largely driven by an outlier effect of 2008:Q4 or do the different estimates during the GFC require inclusion of the

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whole 2007 to 2009 period in the sub-sample? I also wondered if the role of US monetary policy might be understated due to measurement error. Specifically, it is difficult to measure the stance of unconventional US monetary policy during the GFC just using announcements and interventions, but the structure of the factor model seems to be that it would attribute anything unobservable, including other aspects of monetary policy (e.g. communications other than announcements), to the idiosyncratic factor that is supposed to reflect pull factors.

In terms of the portfolio allocation results, I wonder to what extent the finding of a positive externality is a 'mechanical' result in the sense that any reduction in the weight on Brazilian assets will lead to an increase in weight on some other assets by construction? The fact that it turns out to be an increase in weights for closely related economies is notable. But the mere existence of an increase in weights for other countries does not necessarily mean that policy coordination would be useful. If the capital controls decrease the level of capital flows, then they could be employed unilaterally by all economies worried about excessive capital inflows. This is in contrast to currency adjustments, which cannot be employed by all economies in the same direction.

It would be interesting to know how the capital controls affect the nature of capital flows to Brazil and related economies. Do they reduce 'hot flows' that involve investment in highly liquid assets and can be reversed quickly? The desired effect of the capital controls may not be to reduce capital flows, but to alter the type of flows.

Also, there are other policies that can influence capital flows, including trade tariffs and subsidies (Jeanne 2013) and sterilised intervention (Prasad 2013). It would be interesting to see what effects these policies have had on portfolio allocations for EMEs and whether they are similar to those for capital controls. As Prasad (2013) argues, sterilised intervention has the benefit of flexibility in that it can be done quickly, while tariffs or capital controls often require major legislative changes, making them harder to reverse if the circumstances that motivated their use change. In terms of the analysis of Brazilian capital controls, I wondered whether some of the results could be confounded by concomitant changes in trade policies or sterilised interventions in Brazil and the other economies considered in the analysis.

One final note is that the paper focuses primarily on the effects of policy on capital flows as opposed to the exchange rate. However, some of the analysis in the paper suggests that unconventional US monetary policy since the crisis has worked to depreciate the US dollar, raising the possibility that monetary policy contributed to a 'currency war'. While the effects of US monetary policy on the US dollar exchange rate appears to be statistically significant, it is less clear from the results how economically important US monetary policy was for overall currency fluctuations.

Overall, the analysis in this paper is extremely helpful in shedding new empirical light on the sources of capital flows and effects of actual policies trying to restrict them. It seems likely that this line of research will continue as EMEs continue to worry about the effects of large, sudden capital flows and try different practical policies to mitigate their effects. This study and related work by its author will provide useful benchmarks for future research on the topic.

## References

**Jeanne O (2013)**, 'Capital Account Policies and the Real Exchange Rate', *NBER International Seminar on Macroeconomics 2012*, University of Chicago Press, Chicago, pp 7–42.

**Prasad N (2013)**, 'Sterilized Interventions and Capital Controls', unpublished manuscript, University of Wisconsin-Madison.

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## 2. General Discussion

The discussion began with participants asking about policy coordination across economies, including questions about the actual objective of coordination and the mechanism through which policy coordination can affect capital flows. One participant suggested that policy coordination is simply the clear explanation of policy. Marcel Fratzscher echoed this sentiment, asserting that policy coordination essentially reduces to clearly communicating about the policy tools that will be used in given situations. As an example, he referred to the Organisation for Economic Co-operation and Development's Code of Liberalisation of Capital Movements, which provides guidelines on the appropriate use of capital controls and promotes a transparent framework for the implementation of these controls. He went on to suggest that it would be useful for the International Monetary Fund or G20 to adopt a similar code. As an example of coordination, he also referred to the European Bank Coordination 'Vienna' Initiative, which played a role in discouraging western European banks from withdrawing capital from eastern Europe during the financial crisis.

Several participants commented on aspects of the EPFR Global (EPFR) portfolio flow data used in the paper. One participant questioned the relevance of portfolio flows to overall capital flows given the relative importance of bank-related flows for many countries. Related to this, another participant suggested that the representativeness of the portfolio flow data (with respect to overall capital flows) varies both over time, depending on what sort of shock is occurring, and across countries at any given point in time. Yet another participant noted that the portfolio flows data do not necessarily line up with balance of payments data over short periods. Professor Fratzscher admitted that capital flows related to portfolio flows and bank flows are different, but pointed out that they are generally positively correlated and that, at least for EMEs, there is a good match between the dynamics and magnitudes of the flows as measured in the EPFR and balance of payments data. There was also discussion around the usefulness of weekly flow data, with one participant asserting that it may be more useful to assess the effectiveness of policy interventions over longer time horizons. In response, Professor Fratzscher explained that most of the impact of changes in capital controls on asset prices and capital allocations tends to occur within 6–8 weeks. He also noted that the effects are quite large even at this relatively short horizon. Professor Fratzscher acknowledged that it may be interesting to look at longer-term effects, but that it is econometrically difficult to identify these effects at longer horizons.

Picking up on the question about the effect of capital controls on the composition of capital flows, one participant noted that Brazil's implementation of capital controls was associated with an increase in foreign direct investment (FDI), which only partially offset the decrease in portfolio flows. In response, Professor Fratzscher noted that investors will always attempt to circumvent

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capital controls, but that he was unable to assess the effects of capital controls on FDI or bilateral bank lending using his dataset. The same participant also noted that most of the post-crisis capital flows into EMEs have been from countries other than the United States, Japan and Germany, and that US capital outflows have fallen since the crisis (with the exception of flows from the United States to Canada and Mexico). Following on from this, the participant suggested that it may be interesting to analyse the source of portfolio flows into EMEs.

Another participant noted that countries face a challenge in achieving an appropriate policy mix, with various combinations of fiscal, monetary, exchange rate and macroprudential policies available, and that it is difficult to disentangle the appropriateness of a policy mix empirically. The same participant also referred to the fact that the IMF has recently been more open to considering capital controls as an appropriate policy tool. Professor Fratzscher agreed in principle with the IMF's stance, but went on to argue that capital controls cannot constitute a permanent solution to capital flow volatility in cases where 'pull' (i.e. country-specific) factors are driving capital flows. However, capital controls can 'buy time' for policymakers to implement other more appropriate domestic policies. Related to this, one participant highlighted the importance of strong fundamentals for being able to manage changes in capital flows. The participant drew on the example of Canada, which was highly exposed to capital outflows to the United States during the financial crisis. The participant argued that Canada's strong fundamentals allowed stimulatory monetary and fiscal policies to offset the effects of these capital outflows.

One participant questioned the policy relevance of capital flows, arguing that changes in the relative prices of existing positions are more important than capital flows themselves when it comes to external imbalances. In response, Professor Fratzscher emphasised that his analysis abstracts from price changes and thus represents the active portfolio rebalancing of investors, and that including price changes would result in much larger overall portfolio changes.

# External Funding and Long-term Investment

Philip R Lane\*

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## 1. Introduction

In principle, international financial integration should assist emerging and developing economies by fostering consumption smoothing, international risk sharing and efficient capital allocation. Since these economies have lower capital stocks and more volatile output growth than the set of advanced economies, there should be welfare gains from international capital mobility.<sup>1</sup> However, in the other direction, various types of distortions and market frictions mean that external capital flows (especially short-term debt flows) can also introduce new risk factors, such that a fully open financial account may not be optimal.<sup>2</sup>

In relation to the financing of infrastructure projects, allowing a role for international investors is especially attractive for several reasons. First, large-scale infrastructure projects are lumpy in nature, requiring a temporary period of extraordinarily high investment. Were such projects exclusively financed from domestic resources this would require some combination of crowding out of other investment opportunities and the suppression of consumption levels. By contrast, the aggregate resource constraint can be temporarily relaxed in an open economy, so that consumption can be smoothed and other investment opportunities can be pursued simultaneously with large-scale infrastructure investment (Clarida 1993).

Second, the return on infrastructure investment is especially risky for several reasons. The long-term pay-back period for many infrastructure projects means that investors must operate under a greater degree of uncertainty compared with shorter-term and smaller projects. In addition to direct project risks of various types (including political risks), infrastructure returns will typically be highly correlated with domestic macroeconomic performance. Consequently, infrastructure projects have poor hedging properties for domestic investors. These characteristics mean that it is desirable for a surge in infrastructure investment to be accompanied by foreign equity inflows, which can take the form of foreign investors taking direct equity stakes in infrastructure projects and/or through a more general matching of increased domestic capital risk with increased macro-level international risk sharing.

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1 See Coeurdacier, Rey and Winant (2013) for a benchmark model that jointly examines the contributions of international capital mobility to capital accumulation and risk sharing.

2 See, among many others, Eichengreen (1990), Ostry *et al* (2011) and Brunnermeier and Sannikov (2014).



Third, the superior growth potential of emerging and developing economies and the projected infrastructure shortages in these regions mean that the globally efficient allocation of capital necessarily involves long-term investment funding from the advanced economies (see also Dobbs *et al* (2010)).<sup>3</sup>

Fourth, the specialised nature of many infrastructure projects means that national investors can face a knowledge gap in the design, building and operation of infrastructure projects (Dobbs *et al* 2013). It follows that it can be more efficient to allow a role for foreign firms in the production of infrastructure, since the embedded expertise gained elsewhere can allow the development of higher-quality infrastructure at lower cost. While the expertise brought by foreign firms could be isolated from the issue of cross-border funding, the fact that these firms have easier access to global funding sources means that there is a natural degree of complementarity between foreign expertise and foreign funding.

Finally, it should be recognised that there are multiple types of interactions between infrastructure investment and international capital flows. While the reasons outlined above explain why international capital flows can be helpful in funding long-term infrastructure projects, the overall state of the external balance sheet (in conjunction with other macrofinancial fundamentals) can be an important factor in determining capital costs for individual infrastructure projects (Dailami and Leipziger 1997). There is also an intertemporal dimension to the extent that improving the infrastructure capital stock improves future productivity levels and thereby makes the economy more attractive for foreign investors (Hoffmann 2003).

Given these considerations, a major goal for national and international policymakers is to identify ways these potential gains from international financial flows can be achieved, while minimising the risks from capital flow volatility. Since the 1997–1998 Asian crisis, many emerging and developing economies have sought to reduce risk exposures by running net external surpluses, accumulating large pools of liquid foreign assets and deterring foreign debt inflows. However, this configuration is costly in terms of the lost opportunities for consumption smoothing, risk sharing and efficient capital allocation. It is possible that a superior risk-return profile could be achieved by the introduction of a set of national and international policy reforms.

In this paper, I explore these themes along a number of fronts. Section 2 reviews some of the relevant research literature. Section 3 describes the current international financial profile of emerging and developing economies, while Section 4 relates cross-country variation in capital flows to a set of macrofinancial fundamentals. The policy reform agenda is discussed in Section 5. Finally, Section 6 concludes.

## 2. International Financial Flows: Empirical Patterns

Some insights about long-term trends can be obtained by examining the behaviour of average capital flows and/or accumulated stocks of foreign assets and liabilities over sustained periods. In relation to gross positions, Lane and Milesi-Ferretti (2008) find that economies with higher levels of output per capita and more developed domestic financial systems exhibit larger foreign liability

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<sup>3</sup> As pointed out by Bougheas, Demetriades and Morgenroth (2003), an additional motivation for international backing of infrastructure is that individual economies do not factor in the positive international spillovers from infrastructure improvements (e.g. improvements in energy, transportation and communications networks).

and asset positions (scaled by GDP).<sup>4</sup> Consistent with that evidence, Lane (2001, 2004) finds that the level of long-term external debt liabilities is strongly correlated with the level of output per capita and trade openness. Among other mechanisms, higher levels of these variables positively affect repayment capability and the degree of pledgeable collateral, thereby relaxing external debt constraints.

Of course, it is difficult to establish lines of causality, since cross-border financial integration may also contribute to higher income levels and a deeper domestic financial system (Kose *et al* 2009; Obstfeld 2009). It is also difficult to disentangle the influence of underlying common factors that may simultaneously affect cross-border financial flows, domestic output per capita and domestic financial development. For instance, Alfaro, Kalemli-Ozcan and Volosovych (2008) highlight the role of institutional quality in driving cross-border equity flows, while institutional quality is also a factor that is surely important in determining domestic income levels and domestic financial development. In related fashion, Hoffmann (2003) shows that capital inflows are positively correlated with various indices of the stock of domestic infrastructure but that these covariation patterns tend to lose significance once the level of output per capita is included as a control variable.

The equity-debt mix in the composition of foreign liabilities can also be related to country characteristics. In the cross-section, Faria *et al* (2007) find that larger economies with a better institutional quality score and a higher endowment of natural resources have a greater share of equity (foreign direct investment (FDI) and portfolio) in external liabilities. In addition, these authors find that shifts in the equity share over time can be linked to the degree of financial reform undertaken.

Hale (2007) shows that the funding composition of debt is also affected by macrofinancial fundamentals. In particular, a riskier aggregate external profile (low sovereign credit rating, high ratio of debt servicing to exports, higher real exchange rate or history of debt restructuring) tilts the composition of external debt issuance away from bank loans and investment-grade bond issuance towards speculative-grade bonds.<sup>5</sup>

In relation to patterns in net capital flows, which are especially relevant for the consumption smoothing role of international financial integration, the empirical literature has studied the determinants of net international investment positions and average current account balances. In relation to the former, Lane and Milesi-Ferretti (2002) highlight that the long-term component in the net international investment positions of emerging and developing economies is negatively related to public debt levels (a twin debts pattern) and to the level of output per capita. The negative association with the level of output per capita can be attributed to several possible mechanisms. From an investor perspective, richer emerging economies may have more developed domestic financial systems and may be better credit risks, which provides scope for shorter-term debt instruments to be used. From the perspective of an individual emerging economy, a higher level of income per capita may make it more relaxed about taking on the risks associated with a larger net stock of short-term external liabilities.

4 In addition, these authors find that the level of international financial integration is inversely related to economy size. This is not surprising, since the scope of internal diversification is more limited in smaller economies.

5 Of course, as recently highlighted by Shin (2013), the split between bank loans and bonds will vary over time in line with the cyclical conditions prevailing in the global banking system and international bond markets.

In relation to the behaviour of average current account balances, Lane and Milesi-Ferretti (2012) examine four-year averages over the 1969–2008 period. For the group of emerging and developing economies, the average current account deficit is larger for faster-growing economies and for those economies running larger fiscal deficits (see also Abbas *et al* (2011)). In addition, demographic factors and energy resource endowments affect the current account balance with the expected signs (faster population growth and a higher dependency ratio are associated with more negative current account balances, while higher earnings from oil exports are associated with more positive current account balances).

Moreover, although the linkages between net capital inflows and domestic investment are quite indirect at the aggregate level, Bosworth and Collins (1999), Mody and Murshid (2005) and Pels (2010) find some evidence that net capital inflows can boost the rate of domestic investment, especially for economies with more developed domestic financial systems. To the extent that domestic credit is allocated to fund investment projects, this is also consistent with the positive covariation pattern between net debt inflows and domestic credit that is reported by Lane and McQuade (2014).

Of course, in evaluating the role played by international financial flows, it is necessary to examine volatility as well as time-averaged patterns. In particular, the stock of external debt liabilities is a robust indicator of vulnerability to a financial crisis (Catão and Milesi-Ferretti 2013).<sup>6</sup> In addition to the direct risks associated with the rolling over of external debt, debt inflows can also indirectly amplify risk exposures through real exchange rate appreciation and domestic credit growth (Jordà, Schularick and Taylor 2011; Gourinchas and Obstfeld 2012; Lane and McQuade 2014). Finally, since shifts in global financial conditions are often the source of a reversal in capital flows, capital flow volatility cannot be avoided just through domestic macrofinancial stabilisation policies (see Forbes and Warnock (2012a, 2012b), Lane and Milesi-Ferretti (2012) and Rey (2013)).

In recognition of these risks, many emerging and developing economies have sought to reduce external vulnerability by reducing net external liabilities, promoting equity-type liabilities over debt-type liabilities, accumulating large stocks of official reserve assets and improving net foreign currency positions (Lane and Milesi-Ferretti 2007; Lane and Shambaugh 2010). In addition, in terms of regulatory policies, economies have adopted a more cautious approach to financial account liberalisation, while also being more ready to adopt tactical-type controls in response to surges of capital inflows (Ostry *et al* 2011; Klein 2012; Forbes, Fratzscher and Straub 2013).

These strategies have reduced international risk exposures and helped these economies to weather the global financial crisis in 2008–2009. That said, it is possible that risk reduction has gone too far relative to the potential gains from a more open approach to international financial integration (see also Dollar and Kraay (2006)). In Sections 3 and 4, I look further at this trade-off.

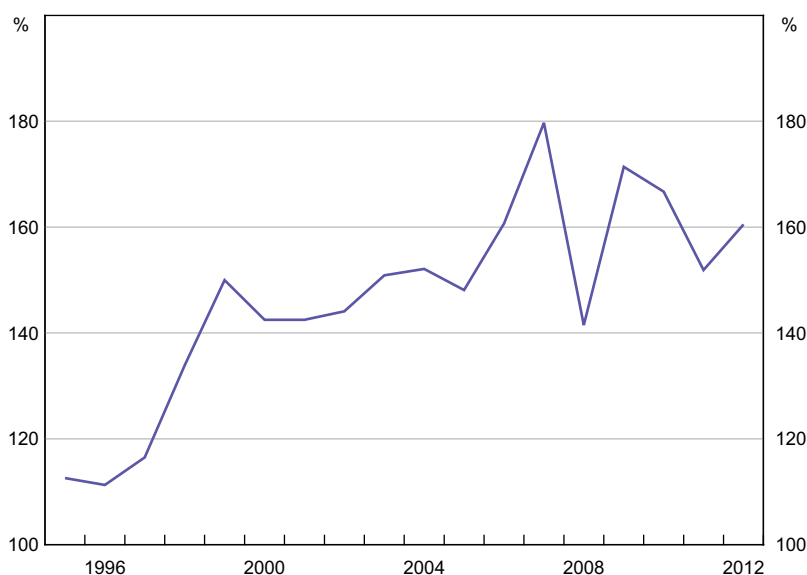
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6 Of course, in conducting a risk assessment, it is also important to take into account the maturity of the external debt and whether the debt was used to fund extra consumption or extra investment (especially in productive types of capital). See also Blanchard, Das and Faruqee (2010), Du, Wei and Xie (2013) and Klemm (2013).

### 3. The International Balance Sheets of Emerging and Developing Economies

This section outlines the current configuration of the international balance sheet for emerging and developing economies. Figure 1 plots the sum of foreign assets and liabilities as a ratio to GDP for an aggregate of 100 emerging and developing economies (as listed in Table A1). This 'IFI ratio' is widely used as an index of the scale of *de facto* international financial integration (Lane and Milesi-Ferretti 2007). While the IFI ratio for this aggregate is far below the values observed for advanced economies, it is important to appreciate that it has trended upwards since the mid 1990s so that the overall level of international financial integration is substantially higher than before the Asian crisis (Lane and Milesi-Ferretti 2008; Lane 2013b).

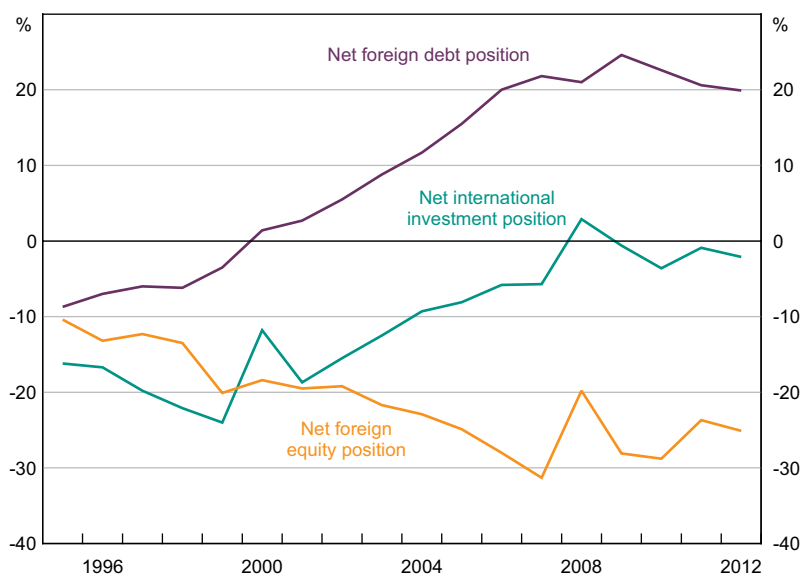
**Figure 1: Emerging and Developing Economies' Aggregate International Financial Integration Ratio**  
Per cent of GDP



Source: updated version of dataset described in Lane and Milesi-Ferretti (2007)

Figure 2 shows that the nature of this group's interaction with the global financial system has shifted over the years. In particular, the net international investment position has sharply increased, which can be attributed to much smaller current account deficits (plus surpluses in many economies) and rapid growth in output. Moreover, these economies now have a positive net foreign debt position, with official reserve assets growing faster than the stock of external debt liabilities. In contrast, the net foreign equity position has become increasingly negative, as equity-type liabilities have shifted domestic macrofinancial risks to foreign investors.

**Figure 2: Emerging and Developing Economies' Aggregate Financial Position**  
Per cent of GDP



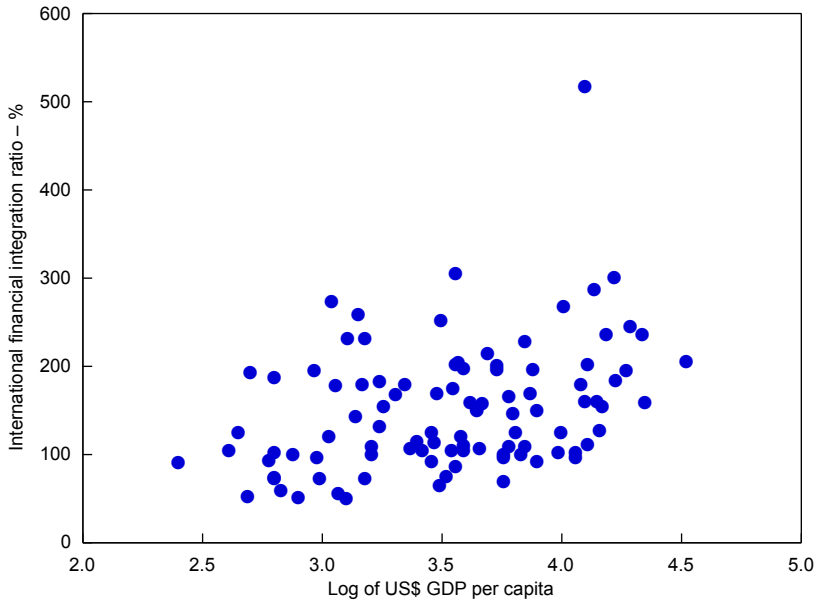
Source: updated version of dataset described in Lane and Milesi-Ferretti (2007)

As documented by Lane and Shambaugh (2010), the net result of these shifts in the international balance sheet is that many emerging and developing economies now have positive net foreign currency positions. This means that a depreciation of the domestic currency should be associated with international valuation gains. This is in sharp contrast to the traditional exposure pattern where high stocks of foreign currency debt liabilities meant that currency depreciations would generate destabilising adverse valuation movements in the international balance sheet.

Of course, there is significant cross-country variation within the aggregate group. Figure 3 plots the 2012 IFI ratio against (log) GDP per capita for the individual economies in the sample. The relation with output per capita is clearly positive: richer economies tend to exhibit higher stocks of cross-border assets and liabilities. The net international investment position also covaries positively with GDP per capita in this sample (Figure 4). One reason for this is that very low-income economies have greater access to concessional types of funding. Finally, while net foreign equity positions are positively correlated with net foreign debt positions, there is considerable heterogeneity in funding patterns within this group (Figure 5).<sup>7</sup>

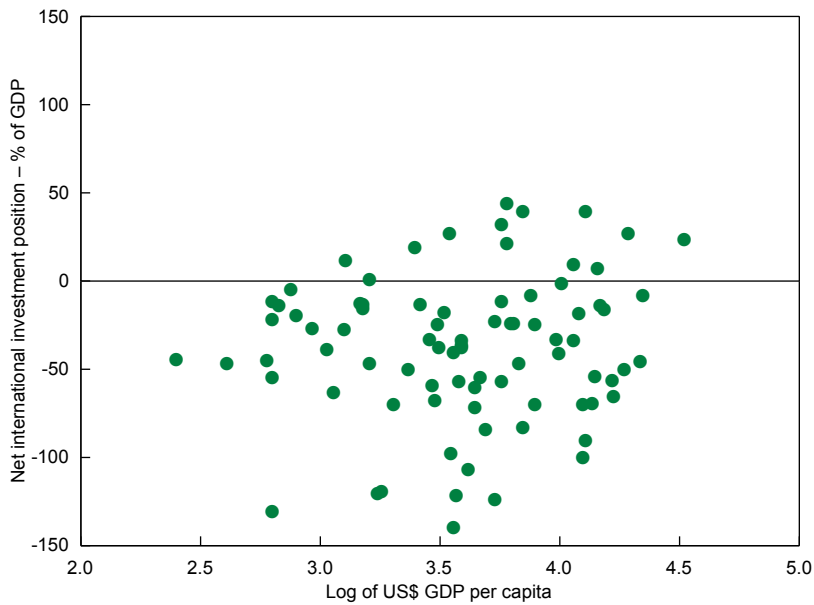
<sup>7</sup> Both net foreign debt and net foreign equity positions are positively correlated with output per capita (the correlation is stronger for the former than for the latter).

**Figure 3: International Financial Integration Ratio against Output per Capita**  
2012



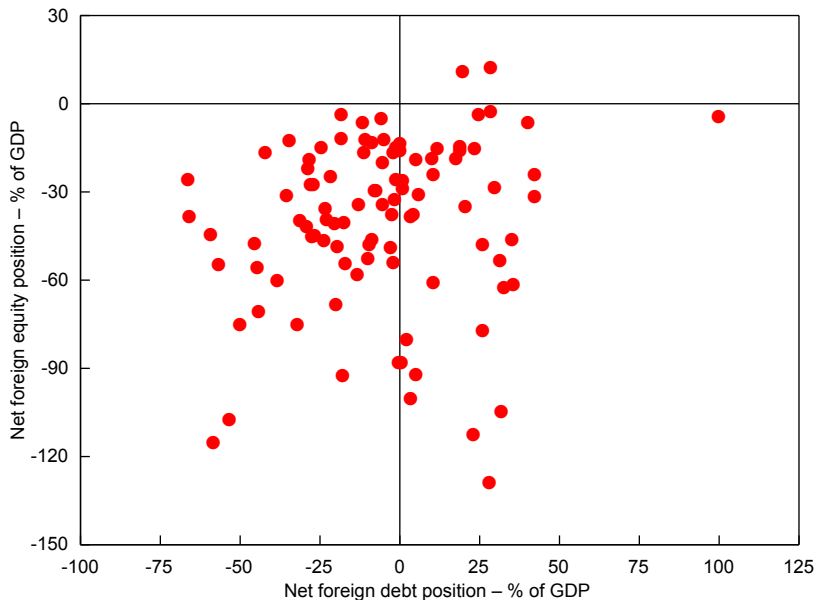
Source: updated version of dataset described in Lane and Milesi-Ferretti (2007)

**Figure 4: Net International Investment Position against Output per Capita**  
2012



Source: updated version of dataset described in Lane and Milesi-Ferretti (2007)

**Figure 5: Net Foreign Equity Position against Net Foreign Debt Position**  
2012



Source: updated version of dataset described in Lane and Milesi-Ferretti (2007)

Taken together, Figures 1–5 show that the international financial integration of the group of emerging and developing economies has climbed since the mid 1990s but that the underlying composition is quite skewed, with a contraction in the scale of aggregate net capital flows to these economies and a marked relative aversion to net debt inflows. While the current configuration can be rationalised as a risk mitigation strategy, it may be quite expensive in terms of lost opportunities to exploit international financial flows in the funding of infrastructure projects more fully.

Finally, Figures 3–5 also highlight the diversity in international financial patterns within the group of emerging and developing economies. In the next section, I examine more closely the cross-country variation in international financial flows among this group.

#### 4. International Financial Flows: 2003–2012

This section presents new evidence on the behaviour of average capital flows over 2003–2012. I ask a series of questions about the behaviour of capital flows to a group of 99 emerging and developing economies. Since our primary focus is on medium-term behaviour, I examine the cross-sectional variation in average capital flows over the 2003–2012 period. The general specification for the econometric analysis is given by:

$$FINFLOW_i = \alpha + \beta X_i + \sigma Z_i + \theta NIIP_i + \varepsilon_i. \quad (1)$$

The variable  $FINFLOW_i$  denotes one of three categories of international financial flows, expressed as a ratio to GDP, that are explained below.<sup>8</sup> The predetermined variables,  $X_i$ , are measured in 2002 and  $Z_i$  denotes a set of contemporaneous variables. The variable  $NIIP_i$  is the initial net international investment position measured in 2002 as a ratio to GDP, which allows for stock-flow interactions in some specifications. While stock-flow interactions can be important, a downside of including this variable is that it is likely to be affected by the predetermined variables, giving rise to possible interpretation problems.

The selection of predetermined variables is in line with the prior literature on international financial integration and international capital flows (see, among many others, Lane and Milesi-Ferretti (2008, 2012)). I include the level of GDP per capita as a general development indicator.<sup>9</sup> I also include country size (as measured by population), since scale effects may be an important correlate of capital flows relative to GDP. In addition, I include a measure of the importance of the natural resource sector (the ratio of natural resource rents to GDP), since a large endowment of natural resources provides a motivation for intertemporal smoothing and may be especially attractive as a sectoral destination for international investors. I also include an indicator of domestic financial development (the ratio of domestic credit to GDP), since there are complementarities between domestic financial trade and international financial trade.

Since the inclusion of contemporaneous variables raises obvious endogeneity issues, I only examine three variables: the population growth rate, the GDP growth rate and the fiscal balance.<sup>10</sup> The rate of population growth serves as a proxy for the role of demographic factors in determining capital flows (see, among many others, Higgins (1998)). The output growth rate is included to control for the effect of general macroeconomic performance on capital flows, while the fiscal balance is included as a control for the relation between fiscal imbalances and external imbalances (see also Abbas *et al* 2011).<sup>11</sup>

In terms of international financial flows, I examine a range of variables. First I focus on aggregate net financial flows, as reflected in the current account balance,  $CAB$ . Following Alfaro, Kalemli-Ozcan and Volosovych (2013), I also examine an adjusted current account balance,  $PCAB$ , that strips away the component of the current account balance that is financed by official development finance, which is relevant for the low-income economies in my sample. The results of these regressions are presented in Table 1.

8 In some benchmark models, it is not obvious that capital flows should be scaled by GDP. However, in the presence of adjustment costs and/or where the level of output is a proxy for the level of available collateral, expressing capital flows as a ratio to GDP is sensible (Lane 2001, 2004).

9 Many indicators are correlated with GDP per capita in the country cross-section. These include measures of institutional quality and also indices of financial account liberalisation. In view of the collinearity across many such variables, I opt to include GDP per capita as a general indicator of the level of development.

10 While it is plausible that the population growth rate is exogenous to capital flows, this is less likely for the output growth rate and the fiscal balance. Since it is not obvious that strong and valid instruments exist for these variables, I focus on OLS estimates. The inclusion of these variables is intended to control for omitted variable bias.

11 I also explored two other contemporaneous variables: the level of remittances and the rate of real exchange rate appreciation. Remittances are potentially relevant, in view of their importance as a cross-border resource transfer for low-income economies. While there is a strong correlation between remittances and the level of the overall current account balance, the current account net of remittances and the overall current account are also highly correlated and show a similar sensitivity to the list of regressors that I examine. While the rate of real exchange rate appreciation can affect the behaviour of both domestic and foreign investors, it turns out that the cross-sectional correlation between capital flows and the rate of real exchange rate appreciation is typically close to zero across the different specifications. This is not too surprising, given that real exchange rate appreciation can increase capital inflows in some models but decrease capital inflows in other models.



**Table 1: Current Account Balance**  
OLS estimates, 2003–2012

Explanatory variable	Dependent variable					
	CAB			PCAB		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-53.2*** (7.0)	-54.2*** (7.8)	-39.4*** (8.6)	-15.3** (6.8)	-16.9** (7.3)	-8.2 (8.4)
$GDP-PC_{02}$	0.05*** (0.008)	0.05*** (0.008)	0.037*** (0.009)	0.013* (0.008)	0.014* (0.008)	0.005 (0.009)
$SIZE_{02}$	0.02*** (0.003)	0.02*** (0.004)	0.015*** (0.003)	0.004 (0.003)	0.005 (0.003)	0.004 (0.003)
$NATRES_{02}$	0.23*** (0.05)	0.17*** (0.06)	0.22*** (0.06)	0.16*** (0.05)	0.08 (0.06)	0.10* (0.58)
$FINDEV_{02}$	-0.001 (0.007)	0.001 (0.007)	0.001 (0.006)	0.001 (0.006)	0.001 (0.005)	0.001 (0.006)
$POPGROW_{03-12}$	1.84** (0.71)	1.72*** (0.71)	1.4** (0.68)	2.7*** (0.69)	2.5*** (0.66)	2.3*** (0.66)
$GROWTH_{03-12}$		0.38 (0.34)	0.26 (0.32)		0.49 (0.31)	0.42 (0.31)
$FBAL_{03-12}$		0.29 (0.21)	0.34* (0.2)		0.52*** (0.19)	0.55*** (0.19)
$NIIP_{02}$			0.032*** (0.01)			0.019** (0.009)
$R^2$	0.52	0.54	0.59	0.29	0.36	0.39
No of obs	99	99	99	99	99	99

Notes: \*\*\*, \*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses; Mauritania excluded from estimation sample due to missing data;  $GDP-PC_{02}$  is (log) GDP per capita in 2002,  $SIZE_{02}$  is (log) population in 2002,  $NATRES_{02}$  is ratio of natural resource rents to GDP in 2002,  $FINDEV_{02}$  is ratio of domestic credit to GDP in 2002,  $POPGROW_{03-12}$  is rate of population growth over 2003–2012,  $GROWTH_{03-12}$  is growth rate of real GDP per capita over 2003–2012,  $FBAL_{03-12}$  is average fiscal balance over 2003–2012,  $NIIP_{02}$  is net international investment position in 2002

Sources: Feenstra, Inklaar and Timmer (2013); IMF; World Bank

Second, I turn to international debt flows. I initially study gross debt inflows,  $DEBT$ , and an alternative measure,  $PDEBT$ , that strips out the impact of debt forgiveness. I then look at net debt flows by first subtracting non-reserve international debt flows from  $PDEBT$  to obtain  $NPDEBT$ , and secondly also subtracting official reserve outflows to obtain  $NPDEBTALL$ . Finally, I also examine the stock of foreign portfolio debt liabilities as the dependent variable, which is derived from the positions reported to the International Monetary Fund (IMF) for the Coordinated Portfolio Investment Survey (CPIS), and is denoted  $CPISDEBT$ . There are pros and cons to each of these individual debt measures, so it is useful to examine them jointly.<sup>12</sup> The results from these regressions are presented in Table 2.

<sup>12</sup> In a future draft, I also plan to look at external liabilities to Bank for International Settlements reporting banks.

Finally, I examine international equity flows in Table 3. I look at FDI inflows (*FDI*), portfolio equity inflows (*PEQ*) and the stock of foreign portfolio equity liabilities (*CPISPEQ*), which are again derived from the positions of CPIS reporting economies.<sup>13</sup>

The results when the total current account balance is the dependent variable are reported in Table 1 in columns (1)–(3). Some clear patterns are evident: the current account balance tends to be more positive in those economies that have higher levels of output per capita, are larger in size, have larger natural resource endowments or faster rates of population growth. The latter result is contrary to expectations, given that faster population growth should be associated with higher public and private investment needs (Higgins 1998).

When the adjusted current account balance, *PCAB*, is the dependent variable (columns (4)–(6)), output per capita and country size lose statistical significance. This can be attributed to the fact that poorer and smaller economies have greater access to official development assistance. In contrast, the fiscal balance gains in significance, with a twin deficits pattern applying to the aid-adjusted current account balance.

Finally, columns (3) and (6) show a statistically significant positive relation between the average current account balance and the initial net international investment position. A positive covariation pattern indicates strong persistence in the pattern of net capital flows: economies that accumulated larger net international investment positions up to 2002 also tended to run more positive current account balances over 2003–2012. Since this result applies despite the inclusion of a number of standard controls in the  $X_i$  set, it suggests that there are omitted variables or unobserved factors that contribute to the persistent differences in net international financial flows across this sample of economies.

The results for international debt flows are presented in Table 2. The evidence in columns (1) and (3) is that gross debt inflows are positively related to the level of GDP per capita; this also holds for the stock of portfolio debt liabilities in columns (9)–(10). However, this is not evident for the measures of net debt inflows in columns (5)–(8). In contrast, the results indicate that net debt inflows can be related to the fiscal balance: those economies running larger fiscal deficits tend to have higher net debt inflows. As in Table 1, the results for population growth are surprising, with faster population growth associated with lower debt inflows.

Finally, Table 2 shows a significantly positive relation between the initial net international investment position and gross or net debt inflows. This suggests that economies with strong macrofinancial fundamentals (as proxied by *NIIPI*) are more attractive as a destination for debt inflows and/or that these economies are more willing to absorb debt inflows.

13 I do not focus on FDI outflows or portfolio equity outflows, given that flows in these categories are quite small for many economies in our sample.

**Table 2: International Debt Flows**  
OLS estimates, 2003–2012

Explanatory variable	Dependent variable									
	DEBT	PDEBT	NPDEBT	NPDEBTALL	CPISDEBT	DEBT	PDEBT	NPDEBT	NPDEBTALL	CPISDEBT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	-12.2* (6.2)	3.5 (6.5)	-24.0*** (7.3)	-0.15 (7.0)	-2.9 (6.0)	10.1 (6.6)	-0.43 (6.7)	11.2 (7.5)	-24.8*** (6.4)	-22.4*** (7.5)
GDP-PC <sub>02</sub>	0.018*** (0.006)	0.002 (0.007)	0.03*** (0.008)	0.007 (0.007)	0.005 (0.006)	-0.008 (0.007)	-0.002 (0.007)	-0.01 (0.008)	0.04*** (0.007)	0.04*** (0.008)
SIZE <sub>02</sub>	-0.001 (0.0028)	-0.004 (0.0026)	0.001 (0.003)	-0.003 (0.003)	0.001 (0.003)	-0.002 (0.003)	0.003 (0.003)	0.001 (0.003)	0.003 (0.003)	0.003 (0.003)
NATRES <sub>02</sub>	-0.09* (0.05)	-0.04 (0.04)	-0.05 (0.06)	0.03 (0.05)	-0.02 (0.05)	0.02 (0.05)	0.01 (0.05)	0.04 (0.05)	-0.02 (0.05)	-0.01 (0.05)
FINDEV <sub>02</sub>	0.002 (0.005)	0.002 (0.005)	0.002 (0.006)	0.002 (0.005)	0.004 (0.04)	-0.004 (0.04)	0.004 (0.005)	0.004 (0.005)	0.006 (0.005)	0.006 (0.005)
POPGR <sub>03-12</sub>	-0.8 (0.56)	-1.1** (0.51)	-1.3* (0.67)	-1.8*** (0.56)	-1.7*** (0.55)	-2.0*** (0.52)	-1.6*** (0.61)	-1.9*** (0.59)	0.36 (0.58)	0.31 (0.59)
GROWTH <sub>03-12</sub>	0.54** (0.27)	0.41* (0.24)	0.62* (0.32)	0.42 (0.26)	-0.17 (0.26)	-0.28 (0.24)	-0.38 (0.29)	-0.48* (0.28)	-0.45 (0.28)	-0.47* (0.28)
FBAL <sub>03-12</sub>	-0.03 (0.17)	0.01 (0.15)	-0.23 (0.2)	-0.16 (0.16)	-0.61*** (0.16)	-0.58*** (0.15)	-0.96*** (0.18)	-0.92*** (0.17)	-0.11 (0.17)	-0.11 (0.17)
NIP <sub>02</sub>		0.034*** (0.007)		0.051*** (0.008)		0.028*** (0.008)		0.025*** (0.008)		0.005 (0.01)
R <sup>2</sup>	0.23	0.38	0.35	0.56	0.36	0.45	0.4	0.45	0.46	0.47
No of obs	99	99	99	99	99	99	99	99	99	99

Notes: \*\*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses; Mauritania excluded from estimation sample due to missing data; explanatory variables are defined in Table 1

Sources: Feenstra *et al* (2013); IMF; World Bank

This pattern also applies in relation to portfolio equity inflows (but not for FDI inflows) in Table 3. In addition, both FDI and portfolio equity inflows are positively related to the level of GDP per capita, output growth and the fiscal balance, and negatively related to country size and the natural resource endowment.

**Table 3: International Equity Flows**  
OLS estimates, 2003–2012

Explanatory variable	Dependent variable					
	FDI		PEQ		CPISPEQ	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-2.8 (4.7)	-3.1 (5.5)	-3.5*** (1.1)	-1.4 (1.2)	-68.7*** (14.8)	-33.9** (15.9)
$GDP-PC_{02}$	0.009* (0.005)	0.009 (0.006)	0.004*** (0.001)	0.002 (0.001)	0.08*** (0.002)	0.05*** (0.016)
$SIZE_{02}$	-0.008*** (0.002)	-0.008*** (0.002)	-0.001* (0.0005)	0.0006 (0.00005)	0.002** (0.007)	0.006 (0.006)
$NATRES_{02}$	-0.08** (0.04)	-0.08** (0.04)	-0.02** (0.01)	-0.01 (0.01)	-0.24** (0.12)	-0.13 (0.11)
$FINDEV_{02}$	-0.005 (0.004)	-0.005 (0.004)	-0.001 (0.001)	-0.001 (0.008)	-0.001 (0.001)	-0.001 (0.001)
$POPGROW_{03-12}$	-0.04 (0.43)	-0.04 (0.44)	-0.15 (0.1)	0.11 (0.09)	3.9*** (1.3)	3.2** (1.3)
$GROWTH_{03-12}$	0.68*** (0.2)	0.68*** (0.2)	0.08* (0.05)	0.06 (0.04)	0.47 (0.64)	0.18 (0.59)
$FBAL_{03-12}$	0.34*** (0.13)	0.34*** (0.13)	0.06** (0.03)	0.06** (0.03)	0.85** (0.39)	0.95** (0.36)
$NIIP_{02}$		-0.001 (0.01)		0.004*** (0.001)		0.073*** (0.017)
$R^2$	0.3	0.3	0.2	0.29	0.3	0.41
No of obs	99	99	99	99	99	99

Notes: \*\*\*, \*\* and \* denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses; Mauritania excluded from estimation sample due to missing data; explanatory variables are defined in Table 1

Sources: Feentsra *et al* (2013); IMF; World Bank

Finally, the stock of portfolio equity liabilities is positively associated with the level of output per capita in columns (5)–(6) of Table 3. The regression evidence suggests that the stock of portfolio equity liabilities is also higher for large economies (in contrast with the pattern for FDI inflows) and economies with smaller natural resource endowments, faster population growth and stronger macrofinancial fundamentals (i.e. more positive fiscal balance and more positive net international investment position).

Taken together, the evidence in Tables 1–3 show some systematic patterns in the behaviour of average international financial flows across the set of emerging and developing economies. These patterns provide some clues about the likely evolution of flows for individual economies in response to shifts in the predetermined variables and contemporaneous variables. At the same time, it is important to emphasise that Tables 1–3 capture ‘local’ variation within the emerging and developing group; the broader question about the appropriate scale and composition of flows between the advanced economies and this group of economies is not addressed within this framework.

Keeping in mind the empirical patterns described in Sections 3 and 4, I next turn to a discussion of the policy agenda in relation to international financial flows.

## 5. Policy Issues

The improvement of the long-term funding environment for infrastructure projects involves policy reforms along many fronts (World Bank 2013; World Bank Group 2014). In general terms, policies that increase the availability of cross-border finance should also support infrastructure investment (both directly in relation to the funding of infrastructure projects and indirectly in relation to the broader dynamics of capital flows). This will be particularly relevant if the policy framework does not discriminate against foreign investors (Stulz 2005).

In terms of the specific contribution that can be obtained by improving the policy framework in relation to international capital flows, the policy objective is to attain the potential benefits from international financial integration without endangering domestic macrofinancial stability (Canuto and Ghosh 2013; G30 Working Group 2013). While a risk-minimising strategy is to deter capital inflows until the domestic financial system (i.e. banking systems, securities markets and investment institutions) is sufficiently mature, an excessively closed domestic system may not develop as quickly in the absence of the competition that can be provided by the entry of foreign institutions. In related fashion, an overly gradualist approach runs the risk of regulatory capture by domestic financial interests (Kose *et al* 2009).

For these reasons, it may be preferable to embrace a more open approach to international financial integration, in combination with a proactive approach to managing the risks associated with volatile capital flows. The preservation of macrofinancial stability in the face of capital flow volatility is a multi-dimensional policy challenge. The appropriate combination of monetary, exchange rate, fiscal and macroprudential policies, capital flow management and structural reforms will vary across economies and regions and across time (Lane 2003, 2013a).

While there has been considerable attention paid to the interaction of monetary and financial stability policies and to capital flow management policies, the role of prudent fiscal policy has been relatively less studied. Two core principles apply. First, maintaining a sufficiently robust public balance sheet (comprising a safe level of public debt and sufficient liquid assets that can be made available during rainy-day episodes) is required if fiscal policy is to respond countercyclically in the event of an adverse shock. Second, the impact of external imbalances and domestic credit expansion on government revenues means that the cyclical assessment of the fiscal stance should incorporate the financial cycle as well as the fiscal cycle (Borio, Disyatat and Juselius 2013; Benetrix and Lane 2014). Since the maintenance of fiscal discipline during good times has proven

problematic for many political systems, institutional reforms such as numerical fiscal rules and formal input from an independent fiscal council may prove helpful (Lane 2003, 2013a).

In addition to the primary role of the domestic macrofinancial policy framework, international financial institutions, such as the IMF, can provide an additional backstop in relation to foreign currency funding.<sup>14</sup> While various types of precautionary credit lines are currently offered, the take-up of such international insurance schemes remains quite limited, as is the availability of international currency swap lines to the central banks of emerging and developing economies. Further progress in developing international safety nets is an important component in ensuring that cross-border financial flows can make a positive contribution to funding long-term investment in emerging and developing economies (see also Farhi, Gourinchas and Rey (2011)). In addition, international financial institutions can also help to mitigate the riskiness of debt flows by promoting the expansion of local currency debt markets and the issuance of state-contingent types of debt (Rogoff 1999).

## 6. Conclusions

This paper has provided an overview of the current configuration of international financial flows to emerging and developing economies. It has argued that international funding can (in principle) play a beneficial role in facilitating a higher rate of long-term investment in this group of economies, both directly and indirectly, by relaxing the aggregate resource constraint facing these economies. These benefits take the form of consumption smoothing, efficient capital allocation and risk diversification.

The risks associated with capital flow volatility constitute the main barrier to reaping these benefits. This paper has outlined the steps taken by emerging and developing economies to mitigate these risks over the last 15 years, including running more positive current account balances, switching the composition of foreign liabilities from debt to equity and accumulating liquid official reserve assets. However, it is possible that this strategy has gone too far and that these economies should consider allowing a greater role for international debt inflows.

The main policy challenge is that a more open approach to international debt inflows should be accompanied by a proactive and resilient macrofinancial policy framework at domestic and international levels. The rate of success in designing and implementing the policy infrastructure determines the optimal speed of ramping up international debt inflows.

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<sup>14</sup> Of course, international financial institutions are also important as direct providers of infrastructure finance and as a catalyst for private sector funding (Chelsky, Morel and Kabir 2013). I do not dwell on this wider set of issues in this paper.

## Appendix A: Sample Composition

**Table A1: Economy Sample**

AL	EE	LS	RO
AM	EG	LT	RU
AO	ET	LV	RW
AR	FJ	MA	SD
AZ	GE	MD	SG
BA	GH	MG	SI
BD	GM	MK	SK
BF	GT	ML	SN
BG	GY	MN	ST
BJ	HK	MR	SV
BO	HN	MV	SZ
BR	HR	MW	TH
BT	HU	MX	TJ
BW	ID	MY	TN
BY	IL	MZ	TO
CL	IN	NA	TT
CM	JM	NE	TZ
CN	JO	NG	UA
CO	KE	NI	UG
CR	KG	PE	UY
CV	KH	PG	VE
CZ	KR	PH	VN
DJ	KZ	PK	VU
DO	LA	PL	ZA
EC	LK	PY	ZM

Note: See Glossary for a listing of country codes

## References

- Abbas S, M Ali, J Bouhga-Hagbe, A Fatás, P Mauro and RC Velloso (2011)**, 'Fiscal Policy and the Current Account', *IMF Economic Review*, 59(4), pp 603–629.
- Alfaro L, S Kalemli-Ozcan and V Volosovych (2008)**, 'Why Doesn't Capital Flow from Rich to Poor Countries? An Empirical Investigation', *The Review of Economics and Statistics*, 90(2), pp 347–368.
- Alfaro L, S Kalemli-Ozcan and V Volosovych (2013)**, 'Sovereigns, Upstream Capital Flows and Global Imbalances', unpublished manuscript, Harvard University, October.
- Benetrix A and PR Lane (2014)**, 'The Financial Cycle and the Fiscal Cycle', unpublished manuscript, Trinity College Dublin.
- Blanchard OJ, M Das and H Faruquee (2010)**, 'The Initial Impact of the Crisis on Emerging Market Economies', *Brookings Papers on Economic Activity*, Spring, pp 263–307.
- Borio C, P Disyatat and M Juselius (2013)**, 'Rethinking Potential Output: Embedding Information about the Financial Cycle', BIS Working Papers No 404.
- Bosworth BP and SM Collins (1999)**, 'Capital Flows to Developing Economies: Implications for Saving and Investment', *Brookings Papers on Economic Activity*, 1999(1), pp 143–180.
- Bougheas S, PO Demetriades and ELW Morgenroth (2003)**, 'International Aspects of Public Infrastructure Investment', *Canadian Journal of Economics*, 36(4), pp 884–910.
- Brunnermeier MK and Y Sannikov (2014)**, 'International Credit Flows, Pecuniary Externalities, and Capital Controls', unpublished manuscript, Princeton University.
- Canuto O and SR Ghosh (2013)**, *Dealing with the Challenges of Macro Financial Linkages in Emerging Markets*, World Bank Study, World Bank, Washington DC.
- Catão LAV and GM Milesi-Ferretti (2013)**, 'External Liabilities and Crises', IMF Working Paper No WP/13/113.
- Chelsky J, C Morel and M Kabir (2013)**, 'Investment Financing in the Wake of the Crisis: The Role of Multilateral Development Banks', World Bank *Economic Premise*, No 121.
- Clarida RH (1993)**, 'International Capital Mobility, Public Investment and Economic Growth', NBER Working Paper No 4506.
- Coeurdacier N, H Rey and P Winant (2013)**, 'Financial Integration and Growth in a Risky World', unpublished manuscript, London Business School, October.
- Dailami M and D Leipziger (1997)**, 'Infrastructure Project Finance and Capital Flows: A New Perspective', World Bank Policy Research Working Paper No 861.
- Dobbs R, S Lund, C Roxburgh, J Manyika, A Kim, A Schreiner, R Boin, R Chopra, S Jauch, HM Kim, M McDonald and J Piotrowski (2010)**, *Farewell to Cheap Capital? The Implications of Long-Term Shifts in Global Investment and Saving*, McKinsey Global Institute, London.
- Dobbs R, H Pohl, D-Y Lin, J Mischke, N Garemo, J Hexter, S Matzinger, R Palter and R Nanavatty (2013)**, 'Infrastructure Productivity: How to Save \$1 Trillion a Year', McKinsey Global Institute and McKinsey Infrastructure Practice Report, January.
- Dollar D and A Kraay (2006)**, 'Neither a Borrower Nor a Lender: Does China's Zero Net Foreign Asset Position Make Economic Sense?', *Journal of Monetary Economics*, 53(5), pp 943–971.
- Du Q, S-J Wei and P Xie (2013)**, 'Roads and the Real Exchange Rate', NBER Working Paper No 19291.
- Eichengreen B (1990)**, 'Trends and Cycles in Foreign Lending', NBER Working Paper No 3411.



**Farhi E, P-O Gourinchas and H Rey (2011)**, *Reforming the International Monetary System*, Centre for Economic Policy Research, London.

**Faria A, PR Lane, P Mauro and GM Milesi-Ferretti (2007)**, 'The Shifting Composition of External Liabilities', *Journal of the European Economic Association*, 5(2/3), pp 480–490.

**Feenstra RC, R Inklaar and MP Timmer (2013)**, 'The Next Generation of the Penn World Table'. Available for download at <<http://www.ggd.net/pwt>>.

**Forbes KJ, M Fratzscher and R Straub (2013)**, 'Capital Controls and Macroprudential Measures: What Are They Good For?', MIT-Sloan School Working Paper No 5061-13.

**Forbes KJ and FE Warnock (2012a)**, 'Capital Flow Waves: Surges, Stops, Flight, and Retrenchment', *Journal of International Economics*, 88(2), pp 235–251.

**Forbes KJ and FE Warnock (2012b)**, 'Debt- and Equity-Led Capital Flow Episodes', NBER Working Paper No 18329.

**Gourinchas P-O and M Obstfeld (2012)**, 'Stories of the Twentieth Century for the Twenty-First', *American Economic Journal: Macroeconomics*, 4(1), pp 226–265.

**G30 Working Group (Group of Thirty Working Group on Long-Term Finance) (2013)**, *Long-Term Finance and Economic Growth*, Special Report, The Group of Thirty, Washington DC.

**Hale G (2007)**, 'Bonds or Loans? The Effect of Macroeconomic Fundamentals', *The Economic Journal*, 117(516), pp 196–215.

**Higgins M (1998)**, 'Demography, National Savings, and International Capital Flows', *International Economic Review*, 39(2), pp 343–369.

**Hoffmann M (2003)**, 'Cross-Country Evidence on the Link between the Level of Infrastructure and Capital Inflows', *Applied Economics*, 35(5), pp 515–526.

**Jordà O, M Schularick and AM Taylor (2011)**, 'Financial Crises, Credit Booms, and External Imbalances: 140 Years of Lessons', *IMF Economic Review*, 59(2), pp 340–378.

**Klein MW (2012)**, 'Capital Controls: Gates Versus Walls', *Brookings Papers on Economic Activity*, Fall, pp 317–355.

**Klemm A (2013)**, 'Growth Following Investment and Consumption-Driven Current Account Crises', IMF Working Paper No WP/13/217.

**Kose MA, E Prasad, K Rogoff and S-J Wei (2009)**, 'Financial Globalization: A Reappraisal', *IMF Staff Papers*, 56(1), pp 8–62.

**Lane PR (2001)**, 'International Trade and Economic Convergence: The Credit Channel', *Oxford Economic Papers*, 53(2), pp 221–240.

**Lane PR (2003)**, 'Business Cycles and Macroeconomic Policy in Emerging Market Economies', *International Finance*, 6(1), pp 89–108.

**Lane PR (2004)**, 'Empirical Perspectives on Long-Term External Debt', *Topics in Macroeconomics*, 4(1), Article 1.

**Lane PR (2013a)**, 'External Imbalances and Macroeconomic Policy', *New Zealand Economic Papers*, 47(1), pp 53–70.

**Lane PR (2013b)**, 'Financial Globalisation and the Crisis', *Open Economies Review*, 24(3), pp 555–580.

**Lane PR and P McQuade (2014)**, 'Domestic Credit Growth and International Capital Flows', *The Scandinavian Journal of Economics*, 116(1), pp 218–252.

**Lane PR and GM Milesi-Ferretti (2002)**, 'Long-Term Capital Movements', *NBER Macroeconomics Annual*, 16, pp 73–116.

**Lane PR and GM Milesi-Ferretti (2007)**, 'The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004', *Journal of International Economics*, 73(2), pp 223–250.

**Lane PR and GM Milesi-Ferretti (2008)**, 'The Drivers of Financial Globalization', *The American Economic Review*, 98(2), pp 327–332.

**Lane PR and GM Milesi-Ferretti (2012)**, 'External Adjustment and the Global Crisis', *Journal of International Economics*, 88(2), pp 252–265.

**Lane PR and JC Shambaugh (2010)**, 'Financial Exchange Rates and International Currency Exposures', *The American Economic Review*, 100(1), pp 518–540.

**Mody A and AP Murshid (2005)**, 'Growing Up with Capital Flows', *Journal of International Economics*, 65(1), pp 249–266.

**Obstfeld M (2009)**, 'International Finance and Growth in Developing Countries: What Have We Learned?', *IMF Staff Papers*, 56(1), pp 63–111.

**Ostry J, AR Ghosh, M Chamon and MS Qureshi (2011)**, 'Capital Controls: When and Why?', *IMF Economic Review*, 59(3), pp 562–580.

**Pels B (2010)**, 'Capital Inflows and Investment', Institute for International Integration Studies, IIS Discussion Paper No 330.

**Rey H (2013)**, 'Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence', Paper presented at the Federal Reserve Bank of Kansas City Economic Policy Symposium on 'Global Dimensions of Unconventional Monetary Policy', Jackson Hole, 22–24 August.

**Rogoff K (1999)**, 'International Institutions for Reducing Global Financial Instability', *The Journal of Economic Perspectives*, 13(4), pp 21–42.

**Shin HS (2013)**, 'The Second Phase of Global Liquidity and Its Impact on Emerging Economies', Keynote Address at the Federal Reserve Bank of San Francisco 2013 Asia Economic Policy Conference 'Prospects for Asia and the Global Economy', San Francisco, 3–5 November.

**Stulz RM (2005)**, 'The Limits of Financial Globalization', *The Journal of Finance*, 60(4), pp 1595–1638.

**World Bank (2013)**, 'Long-Term Investment Financing for Growth and Development: Umbrella Paper', Presented to the Meeting of the G20 Ministers of Finance and Central Bank Governors, Moscow, February.

**World Bank Group (2014)**, 'Success Stories and Lessons Learned: Country, Sector and Project Examples of Overcoming Constraints to the Financing of Infrastructure', Background paper for the G20 Investment and Infrastructure Working Group, February.

# Discussion

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## 1. Guy Debelle

The paper by Philip Lane looks at the role of external funding in the funding of infrastructure.

He starts with a review of literature which is, in large part, a review of Philip's own work. This is appropriate given that the body of work he has put together, particularly with Gian Maria Milesi-Ferretti, is the standard-setter when looking at the issue of cross-border financial stocks and flows. The difference between Lane's paper and the previous paper in this session by Marcel Fratzscher is primarily one of frequency. Fratzscher's paper examines weekly data while Lane's paper utilises decadal data.

Lane uses this analysis of the data on external positions to examine the role of foreign capital flows in funding infrastructure. He notes that accessing this larger pool of capital available offshore for infrastructure reduces the likelihood of crowding out that could occur if only domestic funding were sought. I am not sure I would completely agree with this argument. Capital is essentially fungible, so there is no particular reason (on this grounds) why offshore funding is more desirable for funding infrastructure rather than any other part of the economy where desired investment or spending exceeds savings. For example, infrastructure could be entirely domestically funded, but other areas of corporate activity could be funded from abroad.

The fungibility of capital raises a fundamental question of whether a country can choose the composition of its capital flows. I will come at this issue in a few different ways.

Lane states that 'external capital flows (especially short-term debt flows) can also introduce new risk factors, such that a fully open financial account may not be optimal' (p 43). I would generally agree with this statement, but it suggests to me the proposition that it might be optimal to apply capital controls directed at addressing the volatility of short-term flows, while at the same time allowing inflows to fund infrastructure.

If a country can choose the composition of its capital flows, then potentially it could impose capital controls on the volatile short-term flows while allowing free flow of capital for long-term investment, including infrastructure. Recent developments in Brazil can be interpreted along these lines. The imposition of many forms of capital controls should not be a big factor in an infrastructure funding decision. The bigger concern for funding infrastructure is more likely to be the risk of capital appropriation rather than capital controls.

At the same time as noting the volatility of capital flows, Lane seems to be more sceptical of the social worth of sovereigns accumulating large capital pools of foreign assets (i.e. foreign exchange reserves). But such an accumulation may again be socially optimal in a world of volatile short-term flows. It is conceivable the government may be doing the intermediation that the private sector would otherwise be doing with a fully open capital account. One can question whether it is appropriate that the public sector is doing this rather than the private sector, but it is not clear

that the stocks accumulated by the private sector would be all that different in either magnitude or composition than those accumulated by the public sector.

There are a number of points to consider when thinking about the appropriate composition of infrastructure funding. The desirable nature of infrastructure funding is likely to vary with the phase of the infrastructure project. The composition of funding for the construction phase may well be quite different than that in the operation phase. The construction phase is more likely to be conducive to debt rather than equity.

The different forms of funding bring with them differing risks and have different risk-sharing attributes. Some forms of funding are likely to be more resilient in different situations. Syndicated lending, which generally entails some involvement from global investment banks, brings with it the possibility of contagion in the event of a global financial shock, as was very evident in 2008 and 2009. Shorter-term debt flows are likely to be vulnerable to a sudden stop in a way that direct equity is unlikely to be. Government borrowing in foreign currency is also likely to be vulnerable to a sudden stop whereas borrowing in domestic currency is likely to be more resilient.

Related to this, it is important that the funding does indeed involve risk-sharing between the provider of funding and the relevant government, and does not lead to the government underwriting all the potential losses. There is also the issue of bundling together expertise and funding. How separable are these? In practice, I think they are likely to be more separable than not.

Before closing, a few points on the estimation in Lane's paper. The paper summarises a number of regressions to explain the size of current accounts and net foreign asset positions. Back in an earlier life, I did a bit of work in this area with Hamid Faruqee at the International Monetary Fund (IMF) (DeBelle and Faruqee 1996). This work formed one of the building blocks of the IMF's Consultative Group on Exchange Rates (CGER) process. In doing that work, we discovered that a lot of the relationships between current accounts or net foreign asset positions and their various explanators might be 'U-shaped' rather than linear. For example, consider a measure of the stage of development. A country starts off with an underdeveloped financial system, there is little capital inflow at first as a result, but then as the financial sector deepens, the country attracts capital flows and runs a current account deficit. Then the country and its financial system mature and the country becomes a capital provider and runs a current account surplus. Or take demographics and the example of Japan. Japan has been accumulating capital and a large foreign asset position for many years to deal with the problem of an ageing population by running current account surpluses. But at some point, when the population has aged, it will start to run down the accumulated stocks and run current account deficits. There is a reasonable debate to be had as to whether that point has now been reached.

So in conclusion let me highlight three points that Lane's paper makes:

- When it comes to cross-border stocks and flows, the gross matters much more than the net. This is a point I very much agree with and is of paramount importance in examining the structure of the global financial system.
- The composition of the gross flows matters. This then raises the question of whether a country can choose the composition of its capital flows. Can capital controls be placed on volatile short-term flows without affecting the ability of the country to attract infrastructure funding?

- The various forms of infrastructure funding bring with them different risks and different risk mitigants. Some run the risk of contagion, sudden stop or capital flight. Others don't but may be more costly.

## Reference

**Debelle G and H Faruqee (1996)**, 'What Determines the Current Account? A Cross-Sectional and Panel Approach', IMF Working Paper No WP/96/58.

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## 2. General Discussion

The discussion began with one participant suggesting that emerging market economies' aversion to debt inflows largely reflects the fact that these debt inflows can quickly reverse. They also noted that changes in the direction of flows are often driven by factors that are external to the economy in question (such as monetary policy actions by advanced-economy central banks). The participant then questioned why these economies were so concerned about changes in the direction of capital flows, and whether there was anything that could be done to address the problem at a fundamental level. Another participant noted that there had been a sharp decline in debt inflows to emerging markets, and asked whether this was due to supply factors or a reluctance by emerging market economies to take on debt.

One participant welcomed the conclusion that long-term capital should be flowing from the northern to the southern hemisphere to fund essential infrastructure projects in emerging market economies. The participant went on to ask what a prudent level of the current account deficit would be for these economies, while also noting that it is possible to run a current account deficit for long periods of time as long as the money is used well, citing Australia as an example. Another participant contended that one of the important distinctions between the northern and southern hemispheres is that very few global banks are domiciled in the south – an issue, they speculated, that is unlikely to change even with economic growth. This could have implications for capital flows to emerging markets, particularly as the interests of the home economies tend to be placed ahead of the interests of other economies in which global banks conduct their business. Picking up on the topic of global banks, and the earlier question on the decline in debt inflows to emerging markets, Philip Lane noted that the world economy is currently in an 'interesting' transitional phase, with the global banks withdrawing from some of their global activities due, in part, to new bank regulations. He went on to question whether bond markets or emerging market banks (particularly the already large Chinese banks) would fill the financing gap left by the withdrawal of the existing global banks.

Another participant asserted that the fungibility of capital is likely to affect statistics on the composition of capital flows and, relatedly, questioned the efficacy of capital controls. As an example, the participant described how Mexican entrepreneurs were able to circumvent restrictions on short-term offshore borrowing implemented in Mexico during its 1994 financial crisis. A Mexican entrepreneur would sell shares in their company to foreign banks under the promise that the shares would be bought back at a higher price in the near future. While this is essentially short-term (collateralised) borrowing, the two legs of this transaction would be recorded

as equity flows. Professor Lane agreed that one of the big issues with capital flow management is the effectiveness of tactical controls – that is, targeted controls that are implemented in reaction to cyclical developments, such as those used in the 1994 Mexican crisis. He suggested that tactical controls often leave alternative channels for capital flows open, allowing financial engineering to bypass the controls. In contrast, more long-term and broad-based controls, such as those used in China, are much less likely to be circumvented. Professor Lane, partly in response to the discussant's comments on the fungibility of capital, remarked that fungibility was a key motivation for his paper's focus on overall capital flows as opposed to the financing of individual infrastructure projects. He argued that the source of infrastructure financing – whether domestic or foreign – is irrelevant provided that overall investment needs are being met.

On the accuracy of balance of payments statistics, one participant noted that corporations in emerging market economies have increased their offshore debt issuance since 2010, resulting in balance of payments statistics underestimating these economies' external debt liabilities. The participant remarked that the magnitude of this understatement can be relatively large, at around 6 per cent of GDP for some of the larger emerging market economies, implying that policymakers may be overlooking a relatively important source of risk.

Another participant commented on the fact that the aggregate net international investment position of emerging market economies had shifted over time because many of these economies were no longer running deficits. The participant questioned how much of this change was driven by China building up large foreign exchange reserves. The participant also noted an interesting change in the composition of foreign claims. In emerging markets, the public sector has largely been responsible for the increase in foreign claims, both through holding larger foreign exchange reserves and through foreign investment by sovereign wealth funds. In contrast, in advanced economies, public debt has been increasing strongly while the private sector has become more of a net creditor. After questioning the extent to which the private sector in emerging economies had been building up foreign claims, the participant went on to propose that, in terms of foreign investment, the private sector does not seem to be particularly well diversified in emerging markets relative to the private sector in advanced economies. In response, Professor Lane stated that the shift in the net international investment position of emerging market economies had largely been driven by build-ups of official foreign exchange reserves.



# Infrastructure and Corporate Bond Markets in Asia

Torsten Ehlers, Frank Packer and Eli Remolona\*

## 1. Introduction

Emerging market economies in Asia find themselves caught in a puzzling situation. How can a region with such abundant savings be facing a shortage of infrastructure financing? Channelling enough savings to badly needed infrastructure investment has been extraordinarily difficult. What accounts for this failure of financial intermediation?

A clue to this failure is to be found in the way large infrastructure projects are actually financed. In emerging Asia, more so than in other regions, the large projects that do get privately financed rely heavily on bank loans. Certainly, there are projects that are financed with bonds but they are relatively few. This is telling, because infrastructure projects tend to need large sums at long maturities – requirements that would seem to favour bond financing over bank financing.

Infrastructure projects do not appear to be inherently more risky than loans to normal corporate borrowers. The risks are just different. Infrastructure projects often produce public goods or are natural monopolies. This means that the government must play a significant role in ensuring their provision and in regulating the quality and pricing of outputs. At the same time, there are efficiency gains to be realised by including the private sector. Private sector participation can help to select cost-efficient solutions, but also to ensure satisfactory operation during the project's life. This means that contracts need to be designed so as to minimise the moral hazard risks associated with private sector participation. The predictability of the regulatory and legal framework under which a project operates is therefore crucial.

Financial markets have found ways to manage the risks of large infrastructure projects. Building on project finance techniques, large projects in many jurisdictions are now typically public-private partnerships (PPPs) that raise funds through a special purpose vehicle (SPV). The SPV allows contractual structures that facilitate the credible distribution of responsibilities and cash flows, and manages the risks of moral hazard and government regulation. However, what makes the formation of these vehicles hard in practice is that the contractual structures are so complex that highly specialised expertise is invariably required to put them together.

In this paper, we first describe the nature of infrastructure finance, paying special attention to the relative strengths and weaknesses of bank and bond finance at different phases of an infrastructure project. Default and restructuring risks tend to be higher in the early stages of large infrastructure

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projects, though recoveries tend to be greater than in other sectors. We argue that an important step for most governments in emerging Asia is to build up the necessary expertise for structuring viable projects as well as a supportive legal framework. In Section 3, we analyse bond ratings for a sample of infrastructure bonds and show that while overall country risk influences the risk assessment of infrastructure bonds, political risk factors such as contract viability and bureaucratic efficiency may be even more important.

Section 4 provides a comprehensive overview of the infrastructure bond market. Infrastructure bond markets have grown larger over time, and they now tend to move in a cyclical fashion mirroring the overall bond market. The markets in emerging Asia are still relatively small and most issuance is made onshore in local currency. The further development of local bond markets is hence of great importance for infrastructure bond markets. The final section concludes.

## 2. The Nature of Infrastructure Finance

Attracting private funding for infrastructure projects hinges on new techniques of project finance (Brealey, Cooper and Habib 1996). These techniques entail two sets of contractual arrangements: (i) the creation of a legally and economically self-contained entity (SPV) against which all legal contracts are written; and (ii) a set of contracts dictating the distribution of risks and returns. Debt investors are serviced by the cash flows of the particular project. This structure can also help to limit agency problems, as owners and operators cannot simply divert revenues away from the project to other entities. Owners of projects are typically governments, large corporations or construction companies.<sup>1</sup> Debt financing is in almost all cases non-recourse, or may allow very limited recourse in some cases. Assessing the probability of repayment of a debt security hence depends to a very large extent on the viability of the project itself. Project bonds, and more specifically infrastructure bonds, are therefore different from corporate bonds, where the creditworthiness of the corporation, and not the viability of the projects, is the determining factor.

A typical infrastructure project has three distinct phases – the planning phase, the construction phase and the operational phase. Each phase exhibits different risk and return characteristics and each poses different incentive problems. Hence, each phase requires a different mix of financial instruments to cover different risk and return profiles, and so targets different types of investors (Table 1). Bonds are usually used for refinancing more seasoned infrastructure projects in the operational phase and are relatively rare in the initial planning and construction phases.

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1 For a discussion of the economics of PPPs, see Engel, Fischer and Galetovic (2010).

**Table 1: Phases of Infrastructure Projects and their Characteristics**

Phase	Economic and contractual issues	Financial characteristics	Potential investors
Planning	Contracts are written in the planning phase and are crucial to the success of projects. The planning phase can take a long time (10 to 30 months) and the involved parties may attempt to renegotiate contract commitments. Ratings from rating agencies are important to secure interest from debt investors, as are credit insurance or government guarantees.	The procuring authority needs to find equity investors. The equity sponsor needs to secure commitments by debt investors (mostly banks). Given the long planning period, early commitments by debt investors come at a high cost. Leverage can be high (10:1 or more).	Equity sponsors need a high level of expertise. They are often construction companies or governments. In rare cases, infrastructure funds (Australia, Asia) or direct investments by pension funds (Canada) may be involved. Debt investors are mostly banks through (syndicated) loans. Bond financing is rare, as projects carry high risks in the initial phases.
Construction	Monitoring incentives are essential. Private involvement (as opposed to purely public investment) can ensure this.	This is a high-risk phase. Due to the complexity of infrastructure projects, unexpected events are likely. Default rates are relatively high. Initial commitments by debtholders must extend far beyond this stage, as a project does not generate positive cash flows in this phase.	Refinancing or additional financing is very difficult and costly at this stage. Equity sponsors may have an incentive to provide additional finance if risks materialise.
Operational	Ownership and volatility of cash flows due to demand risks are key. Models such as flexible-term present value contracts and availability-based fees reduce volatility, risk and financing costs, but have adverse incentive effects.	Positive cash flows. The risk of default diminishes considerably.	Refinancing of debt (bank loans) from the initial phase. Bonds are a natural choice, but they are not very common. Refinancing with bank loans or government funds is common.

## 2.1 Bond versus bank finance

Bond financing is very rare in the planning and construction phases. Several factors put bond financing at a disadvantage compared with bank loans for 'greenfield' projects. First, infrastructure bonds are mainly of interest to long-term investors such as pension funds or insurance companies, which are typically less willing or able to invest in high-risk debt securities. Second, debt restructurings are common in the initial phase of projects. Usually, restructurings would trigger selective bond defaults, whereas banks are more flexible in restructuring existing loans.

Bank loans have some key advantages over bonds in the planning and construction phases: (i) debtholders serve an important monitoring role and banks tend to have the necessary expertise in infrastructure projects; (ii) infrastructure projects need a gradual disbursement of funds and bank loans are sufficiently flexible; and (iii) infrastructure projects are more likely to require debt restructurings during the construction phase – in the event of unforeseen outcomes, banks can quickly negotiate restructurings among themselves, whereas the restructuring of bonds is complex and time intensive.

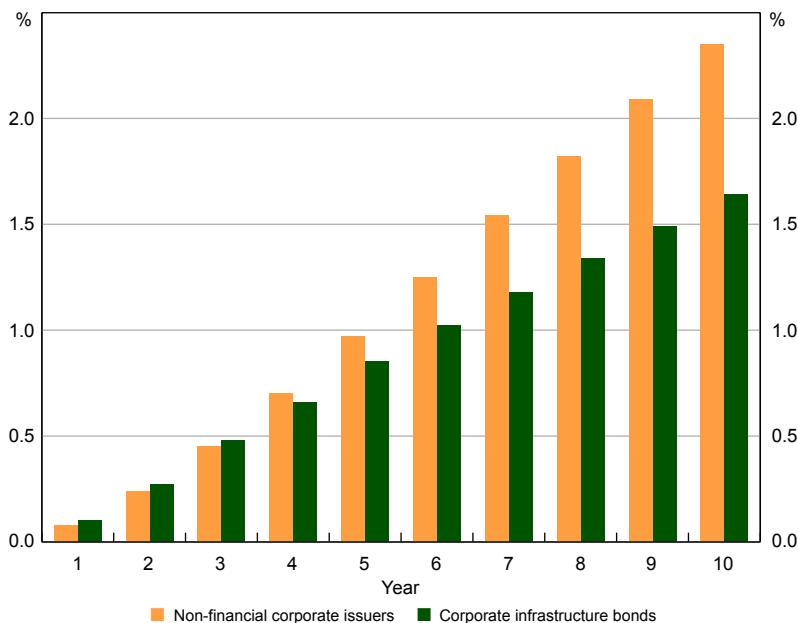
In the operational phase, however, with its stable underlying cash flows, infrastructure projects are akin to fixed-income securities and therefore bond financing is a natural and economically appropriate financing instrument. The documented default and recovery performance for infrastructure bonds is illustrative of the sector's investment properties.<sup>2</sup> The cumulative default rate of investment-grade infrastructure bonds tends to be higher than that of non-financial corporate issuers at the initial stages, but is lower from year 4 (Figure 1). This result is congruent with the fact that credit ratings are designed to be consistent measures of absolute and relative credit risk at the 3–4 year time horizon across asset classes. The greater stability over longer time horizons reflects the tendency of infrastructure bonds to become less risky at longer horizons once hurdles at the early and intermediate stages are cleared.

In the event of default, the recovery rate on infrastructure bonds is also higher than that measured for the broader universe of defaulted corporate debt (Table 2). One reason for these high recovery rates may be that when infrastructure bonds do default, they tend to default earlier, before the value of the project has had too much chance to depreciate. Another possible reason is the potential government support for high-profile projects; policymakers may decide to provide financial support to a troubled project if it is deemed to be politically advantageous.

Another feature of infrastructure bonds is that the credit ratings tend to be significantly more stable than those of non-financial corporate issuers (Moody's Investors Service 2012). In particular, ratings are more likely to remain unchanged at each letter-grade level over both the 1-year and 5-year horizon for infrastructure bonds than for non-financial corporate issuers. Lower migration rates show up as a rather narrow differential at the 1-year time horizon, but the differences are quite marked at the 5-year horizon. For instance, 56 per cent of A-rated infrastructure bond issuers were still at the A-rated level after five years, versus less than 50 per cent of non-financial corporate issuers. Of Baa-rated infrastructure issues, 53.9 per cent remained in this category relative to 48.6 per cent of non-financial corporate issuers.

<sup>2</sup> We refer here to Moody's Investors Service (Moody's Investors Service 2012), although Moody's is not the only major global rating agency to publish default and recovery statistics for infrastructure bonds. At the latest count, Moody's publishes ratings on more than 1 000 corporate infrastructure and project finance entities.

**Figure 1: Investment-grade Bonds**  
Cumulative default rates



Source: Moody's Investors Service (2012)

**Table 2: Recovery Rates for Defaulted Corporate Bonds**  
Average trading prices of US\$100 of issuers' bonds 30 days after its initial missed payment or bankruptcy filing

Sector	Senior secured	Senior unsecured
Regulated utilities	85.52	59.16
Unregulated utilities	60.96	41.45
Others	65.93	60.05
Corporate infrastructure bonds	68.72	53.01
Non-financial corporate issuers	49.30	36.50

Note: In cases of distressed exchange, average price one day before closing of the distressed exchange

Source: Moody's Investors Service (2012)

These characteristics would suggest infrastructure bonds are an attractive investment alternative. At the same time, institutional investors, such as pension funds, insurance companies and sovereign wealth funds, have a growing need for a diversified portfolio of long-term assets. One recent study puts this investor base at about US\$90 trillion (HSBC 2013). According to figures from the Organisation for Economic Co-operation and Development (OECD), the demand for assets from this long-term investor base has also been increasing rapidly over the last decade (OECD 2013). Nevertheless, in 2012 infrastructure debt securities amounted to only 0.4 per cent of total assets within the OECD sample of pension and pension reserve funds.

## 2.2 Bottlenecks

Why do potential investors in many countries hold so few infrastructure bonds? We argue that there is a lack of a pipeline of properly structured projects, which often reflects an inadequate legal and regulatory framework. Infrastructure investments entail complex legal and financial arrangements, requiring a lot of expertise. Building up the necessary expertise is costly, and investors will only be willing to incur these fixed costs if there is a sufficient and predictable pipeline of infrastructure investment opportunities. Otherwise, the costs can easily outweigh the potential benefits of investing in infrastructure over other asset classes such as corporate bonds.

Creating a pipeline of suitable projects requires a coherent and trusted legal framework for infrastructure projects. The economic viability of infrastructure projects is often dependent on government decisions, such as pricing, environmental regulation, or transportation and energy policy. In some countries, reliable frameworks do not exist. Cases of political interference – for example arbitrary cuts in the prices private infrastructure operators are allowed to charge – greatly increase the perception of political risks, which are among the greatest concerns of private investors. But even if solid legal frameworks exist, best practices or experience with large infrastructure projects can be lacking on the side of the government. In some countries, such as the United Kingdom, central government agencies have been set up as a central point for the development of large infrastructure projects, which enables a continuous build-up of expertise. Also, in countries where infrastructure projects are undertaken by provincial authorities, such as Australia, an effective dissemination of best practice and expertise can be successfully implemented. Establishing such practices and institutions takes time, but their development can help to realise enormous efficiency gains and enables governments to successfully undertake a much larger number of projects.

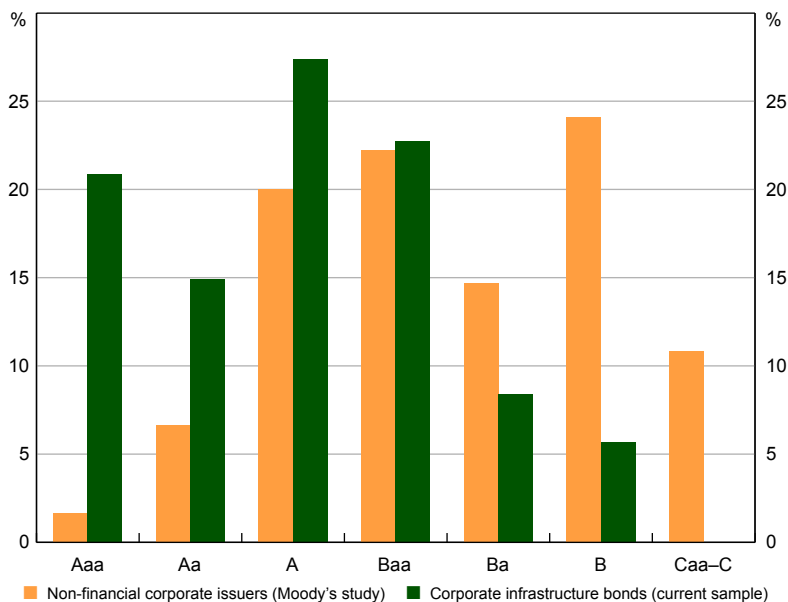
## 3. Country and System Risks to Infrastructure Bonds

To assess the importance of country and system risks, we examine a sample of 369 infrastructure bonds with credit ratings from the major global rating agencies (Moody's, Standard & Poor's (S&P) and Fitch Ratings).<sup>3</sup> When we chart the distribution of issues by average rating, the highest rating (Aaa) accounts for a significant portion of issuance, though it peaks at A, while the speculative-grade categories (Ba and lower) account for 14 per cent (Figure 2). This sample is much more highly rated than other more general samples of non-financial corporate issuers, and supports the view that those infrastructure bonds that receive ratings from the major agencies tend to have relatively low credit risk.

The sample's geographic distribution has a relatively high proportion of North American and European infrastructure bonds. North America and Europe (including central and eastern Europe and the United Kingdom) account for 41 per cent and 21 per cent, respectively, while 20 per cent of the issues are from the Asia-Pacific region. The geographic dispersion of investment-grade and speculative-grade ratings is also of interest. The bonds of emerging Europe and Latin America – which constitute just 4 per cent and 15 per cent of the overall rated issues, respectively – make up 17 per cent and 52 per cent of the speculative-grade sub-sample. By contrast, there are only three issues (6 per cent) from the Asia-Pacific region in the sample that are rated speculative grade.

<sup>3</sup> How the infrastructure bond sample is constructed, both rated and unrated, is described in more detail in Section 4 and Appendix A.

**Figure 2: Distribution of Ratings – Corporate Versus Infrastructure Bonds**



Notes: Sample of infrastructure bonds comprises 369 issues from 2000–2013 with global ratings; average of ratings from Fitch, Moody's and S&P taken to place sample bonds in ratings bucket  
 Sources: Bloomberg; Dealogic; Moody's Investors Service (2012)

### 3.1 Split ratings

In our sample of rated infrastructure bonds, we find that a large proportion (two-thirds) have a rating at issue from more than one of the three agencies (Table 3). In more than one-half of those cases, there is a different rating from at least two of the agencies. To be sure, some differences of opinion are inevitable to the extent they reflect additional information and different perspectives. The frequency of disagreement for infrastructure bonds is quite similar to the frequency of split ratings that has been observed for US corporate bonds.<sup>4</sup> At the same time, the frequency of ratings disagreement is much lower than that observed for financial institution ratings, where fully 92 per cent of all banks rated by more than one of the major agencies have been found to have different ratings across agencies (Packer and Tarashev 2011).

<sup>4</sup> See Cantor, Packer and Cole (1997). In that paper, only Moody's and S&P ratings were used. Had the count of split-rated issues included Fitch ratings, an even larger proportion of split-rated issues would have resulted.

**Table 3: Infrastructure Bond Rating**

Based on Fitch, Moody's and S&amp;P ratings

	(1) Number of rated issues	(2) Percentage of rated issues (1) with multiple ratings  Per cent	(3) Percentage of multiple ratings (2) with split ratings  Per cent	(4) Percentage of split rating pairs (3) that are split in the same direction as sovereign rating <sup>(a)</sup>  Per cent
Investment grade	317	64	52	26
AAA	77	84	17	100
AA	55	64	77	53
A	101	42	69	9
BBB	84	71	63	10
Speculative grade	52	77	83	40
BB	31	87	89	23
B	21	62	69	83
Total	369	66	57	29

Note: (a) Calculated as a percentage of all possible rating pairs, which exceeds the number of issues

Sources: Bloomberg; Dealogic; authors' calculations

Consistent with the results of other studies, split ratings are least likely at the upper bound. In cases with multiple ratings where one rating was AAA, the other rating was lower than AAA only 17 per cent of the time. Split ratings were much more likely among speculative-grade credits, as 83 per cent of speculative-grade issues with multiple ratings had split ratings.

Disagreements over the creditworthiness of infrastructure bonds appear to be just as likely to reflect differences of opinion concerning the sovereign risk of the parent's home country as much as the structure of the infrastructure bond *per se*. This is particularly the case with speculative-grade bonds. Among the cases where a pair of rating agencies offered different ratings, 40 per cent had ratings of the relevant sovereign that were split in the same direction; only 2 per cent had a split in the opposite direction. Namely, the rating agency with higher (lower) ratings for the infrastructure bond often had the sovereign rated higher (lower). In nearly 90 per cent of those cases, the split was exactly the same number of notches.

That said, there appears to be plenty of room for disagreement beyond the assessment of country risk. In fully 58 per cent of the cases of split ratings on all infrastructure bonds, the corresponding sovereign ratings of the agencies were identical. And the same bond ratings did not necessarily indicate the same view on the bond net of country risk, for in 37 per cent of cases credit rating agencies had given the same rating to an infrastructure bond even though the country risk rating was different.

Despite the possibility that the ratings agencies may differ in terms of their view of the overall risk of infrastructure bonds, and the fact that the use of ratings in regulation may make issuers search

for the easier ratings, the ratings dataset does not indicate that ratings shopping of this sort is going on. Of the 127 single-rated bonds, in only 13 cases was the rating agency chosen that had the single highest sovereign rating for the country of the parent. In fact, there were 15 cases in which the related sovereign rating was lower than that of the major rating agency.

### 3.2 The importance of the regulatory framework

In addition to country risk, rating agencies clearly recognise the importance of regulatory factors when assigning risk assessments to infrastructure bonds. As evidence of this, one can turn to the methodology used by Moody's for calculating ratings on regulated electricity and gas utilities (Moody's Investors Service 2013). The 'legislative and judicial framework' and the 'consistency and predictability of regulation' each occupy 12.5 per cent of Moody's 'broad factor ratings'.

Moody's defines a high rating on the legislative and judicial framework as the case where '[u]tility regulation occurs under a fully developed framework that is national in scope based on legislation that provides the utility a nearly absolute monopoly ... within its service territory, an unquestioned assurance that rates will be set in a manner that will permit the utility ... [to] recover all necessary investments, an extremely high degree of clarity as to the manner ... regulated ... There is an independent judiciary that can arbitrate disagreements between the regulator and the utility ...' (Moody's Investors Service 2013, p 33).

By contrast, the lowest investment-grade rating (Baa) is only consistent with a 'strong monopoly ... *that may have some exceptions* ... a general assurance that, *subject to prudence requirements that are mostly reasonable*, rates will be set in a manner that will permit the utility to recover investments, *reasonable clarity* as to the manner [of regulation and rate setting] ... an independent judiciary ... *regulation has been applied* ... *such that redress to an independent arbiter has not been required* [italics added]' (Moody's Investors Service 2013, p 33).

The second sub-factor, consistency and predictability of regulation, is also illustrative in its differences between the highest and lowest investment-grade rating description. The Aaa category indicates that '[t]he issuer's interaction with the regulator has led to a strong, lengthy track record of predictable, consistent and favorable decisions. The regulator is highly credit supportive of the issuer and utilities in general' (Moody's Investors Service 2013, p 34). The Baa category instead reads: '[t]he issuer's interaction with the regulator has led to an *adequate* track record. The regulator is *generally* consistent and predictable, *but there may be some evidence of inconsistency or unpredictability from time to time* ... [italics added]' (p 34).

### 3.3 Metrics of system risk

The above discussion suggests that there is an array of factors beyond financial ratios and other credit fundamentals that affect the creditworthiness of infrastructure bonds. At the same time, the country risk rating of the parent of the project alone may be an inexact proxy for the risks that might particularly influence the performance and creditworthiness of infrastructure bonds.

To confirm whether more finely defined qualitative measures might help to explain the creditworthiness of infrastructure bonds more generally, for each domicile of the issuer, we take



the following country risk measures from the International Country Risk Guide (ICRG) at the time of issuance (The PRS Group 2013):

- (i) *Political risk*. Together with the economic and financial risk ratings, the political risk rating is one of the major components of the ICRG composite country risk rating. The overall political risk rating aggregates 12 component factors, including government stability, socioeconomic conditions and the three factors mentioned below – corruption, bureaucracy quality and contract viability/expropriation.
- (ii) *Corruption*. As described by the ICRG, corruption within the political system ‘... distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and ... [it] introduces an inherent instability into the political process’ (p 4).
- (iii) *Bureaucracy quality*. The ICRG explains its importance as follows: ‘The institutional strength and quality of the bureaucracy is a shock absorber that tends to minimize revisions of policy when governments change ... In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure ...’ (p 7).
- (iv) *Contract viability/expropriation risk*. This variable is also one of the components of the overall political risk rating. It reflects the risk of unilateral contract modification, cancellation or outright expropriation.

For each measure, a higher value reflects lower risk.

In Table 4, we examine the rank-order correlations of the various country risk measures with the corresponding sovereign rating, as well as with the average credit rating of the three major credit rating agencies for each of the 369 infrastructure bonds in our sample. If the bond is a local currency bond, the local currency sovereign rating is used in the calculations; otherwise the foreign currency rating is used. We report rank-order correlations for the total sample, as well as the subset of issues rated investment grade and speculative grade.

All of the measures of country risk are highly correlated with the sovereign rating, both for the total sample and the investment-grade and speculative-grade sub-samples (Table 4). It would appear that among the selected four attributes, it is the quality of bureaucracy that is the most consistently highly correlated with the sovereign rating, with correlations of 0.77 for the investment-grade sub-sample, 0.88 for the speculative-grade sub-sample, and 0.82 overall. However, political risk is more highly correlated for the speculative-grade sub-sample (0.95). In any event, correlation for all of the variables with the country sovereign rating is high and significantly so.

Interestingly, the sovereign credit rating generally shows lower correlation with the infrastructure issue rating than the other measures of country risk: it scores the lowest pair-wise correlation in the case of investment-grade issues (0.06), and almost the lowest correlation coefficient for the whole sample (0.30). The highest correlations with issuer ratings are exhibited by the metric of contract viability/expropriation risk, scoring 0.47 for the whole sample, followed by political risk (0.41) and quality of bureaucracy (0.33). (Contract viability/expropriation risk also has the highest correlations with the issue rating for the investment-grade and speculative-grade sub-samples.) This suggests that contract viability/expropriation risk, political risk and quality of the bureaucracy may be country characteristics that are highly likely to influence the infrastructure bond rating.

**Table 4: Infrastructure Bond Ratings and Measures of Country Risk**  
Rank-order correlation

	Sovereign rating			Issue rating <sup>(a)</sup>		
	Investment grade	Speculative grade	All	Investment grade	Speculative grade	All
Sovereign rating	na	na	na	0.06	0.21	0.30
Political risk	0.64	0.95	0.74	0.27	0.09	0.41
Corruption risk	0.76	0.85	0.79	0.07	0.23	0.23
Quality of bureaucracy	0.77	0.88	0.82	0.12	0.00	0.33
Contract viability/ expropriation risk	0.48	0.82	0.61	0.31	0.37	0.47

Notes: A higher value for any country risk metric is indicative of lower risk and higher quality

(a) Issues with ratings below B- are not included

Sources: Bloomberg; The PRS Group (2013)

To be sure, an exact assessment of the relative contribution of any particular risk factor to the issuer bond rating should be estimated simultaneously in a multivariate framework, ideally one that controls for other observable country characteristics such as per capita income or growth. Nonetheless, these rank-order correlations are strongly suggestive that the sovereign credit rating is unlikely to be a sufficient statistic when evaluating the effect of country risks on infrastructure bonds, and that more granular country risk characteristics are likely to be useful as well.

## 4. The Markets for Infrastructure Bonds

To analyse infrastructure bond markets, we construct a database of corporate issues that includes 1 625 infrastructure-related deals in different parts of the world. We ask three questions regarding the role of bonds in infrastructure finance. First, how have the global and regional bond markets for infrastructure evolved in recent years? Second, how important have the bond markets been relative to syndicated loans for infrastructure financing? Third, in raising infrastructure funds, how do economies in emerging Asia differ in their reliance on bond markets, including how they choose between onshore and offshore bond markets?

### 4.1 Assembling a database of infrastructure bonds

We take a relatively broad definition of infrastructure when assembling the dataset. In general, infrastructure can be divided into two types: (i) economic infrastructure, such as roads or electricity grids; and (ii) social infrastructure, such as schools or health care. We include both types in our definition. We exclude, however, the oil, gas and mining industry, which in most cases is dominated by large international corporations with easy access to capital markets. As our focus is on infrastructure bonds as a means to finance the large future demand for economic and social infrastructure, we do include project bonds issued by national government agencies and multilateral development banks. While not all projects undertaken by these institutions are necessarily infrastructure related, they are, however, important players in the infrastructure market in general.

With respect to the type of security, we also take a broad definition. Hence, our sample includes debt securities with different degrees of seniority, fixed-maturity and callable bonds, perpetual bonds and medium-term notes. All of these securities have in common the fact that they are tradeable securities, which can be held by any investor, not only by banks.

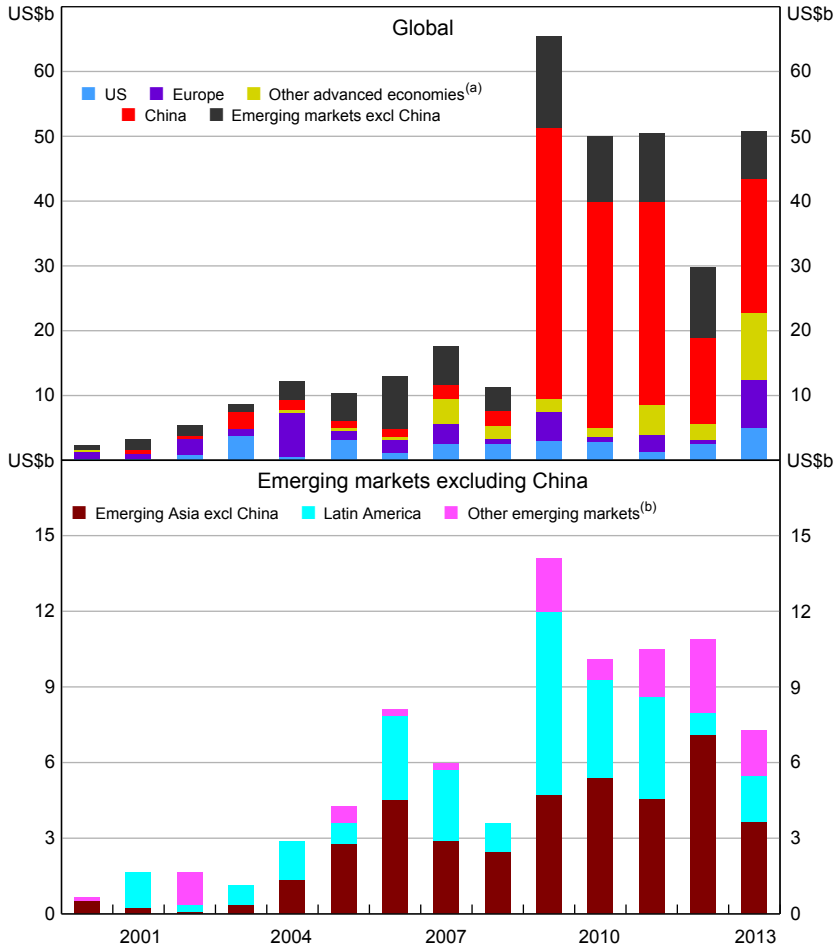
Our dataset merges two sources of data. The first source is Dealogic BondWare, which covers 1 008 deals over the period from 1 January 2000 to 31 December 2013. The second source is Bloomberg, which covers a considerably larger sample of 8 140 deals, also between 2000 and 2013. Merging the two sources together provides us with a total of 8 973 observations, including 174 observations that are common to the two sources. We define the country as the location of incorporation of the issuer in the case of Dealogic and as the domicile of the issuer in the case of Bloomberg. Then, to identify the infrastructure-related part of project debt securities, we rely on the issuer industry classification. The classifications differ between Dealogic and Bloomberg, and are generally more granular for Dealogic. Restricting our sample to infrastructure-related industries leaves us with 1 625 infrastructure-related debt security deals, which define our 'market for infrastructure bonds'. Appendix A provides a full list of the industries we classify as infrastructure related, as well as additional information on the construction of the dataset.

## 4.2 Global and regional market developments

First, we examine global and regional developments in infrastructure bond markets. As shown in Figure 3 (top panel), the global market for infrastructure bonds has grown rapidly since 2008. Since the global financial crisis, the issuance of global infrastructure bonds has risen to be roughly three times its pre-crisis levels. In 2009, annual global issuance topped US\$60 billion, although it has since fallen back modestly to around US\$50 billion. These developments have evidently been strongly influenced both by the financial cycle and a structural shift towards greater issuance in China by state-owned entities.

In terms of volumes of issuance, China has been in a class by itself. In 2010, it alone accounted for 70 per cent of the global issuance and since then has maintained a global market share of more than 40 per cent. Largely because of China, the share of infrastructure bond issuance by emerging markets rose from 30–60 per cent prior to 2009 to 80 per cent since the financial crisis. Without China the share of emerging markets would have remained at around 20 per cent after 2008. Nonetheless, in 2013 advanced economies posted record issuance, driving down emerging markets' share of overall issuance.

**Figure 3: Developments in the Market for Infrastructure Bonds**  
Aggregate issuance



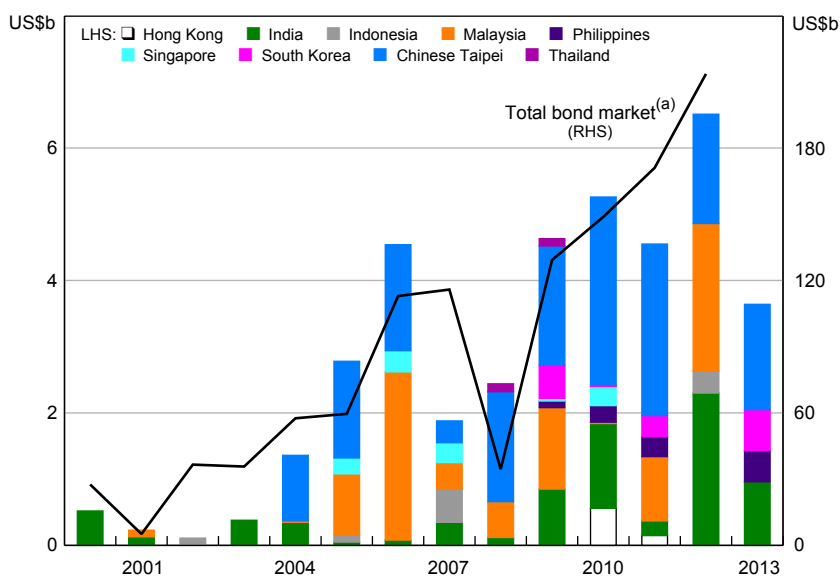
Notes: Definitions of the geographical regions are given in Appendix A  
 (a) Excluding the US and Europe  
 (b) Africa, central and eastern Europe, and the Middle East  
 Sources: Bloomberg; Dealogic; authors' calculations

Two developments stand out for emerging markets excluding China. Issuers from both emerging Asia and Latin America issued increasing amounts of infrastructure bonds over the sample period (Figure 3, bottom panel). At the same time, the volume of such issuance has been subject to the global financial cycle, hence mirroring capital flows in and out of emerging markets. This cycle has recently been analysed by Bruno and Shin (2013) and Rey (2013), who find that it is related to investor risk appetites, as proxied for by the VIX index. Prior to the global financial crisis, emerging bond markets attracted strong capital inflows, which correspond to the rise in infrastructure bond issuance from 2004 to 2007. As capital flows to emerging market economies in general reversed sharply in 2008, so did issuance volumes of infrastructure bonds. As capital inflows into

emerging Asia and Latin America surged again between 2009 and 2013, infrastructure bond issuance reached record highs.

The growth and cyclical nature of emerging economies' infrastructure bond markets in general also applies to emerging Asia more specifically (Figure 4). From 2008 to 2009, issuance almost doubled from around US\$2.5 billion to US\$4.7 billion. In 2012, major emerging Asian economies excluding China posted record aggregate issuance of US\$6.5 billion, but this fell to US\$3.6 billion in 2013. These periods of rapid change reflect similar movements in total bond markets and the infrastructure bond markets. This co-movement is especially remarkable given the fact that issuing infrastructure bonds tends to entail longer lead times than issuing other emerging market bonds. When it comes to hot and cold markets in bond issuance, infrastructure bonds appear no different from emerging market bonds in general.

**Figure 4: Infrastructure Bond Market and Total Bond Market Developments in Major Emerging Asian Economies**  
Aggregate issuance



Notes: (a) Aggregate net issuances based on the BIS' debt security statistics for issuers residing in the respective regions; data for India are not available, hence the aggregate volume is under-represented

Sources: BIS; Bloomberg; Dealogic; authors' calculations

### 4.3 Bonds versus syndicated loans

How important have the bond markets been in the overall financing raised for infrastructure? An important fact to keep in mind is the changing roles of bond markets and banks over the life cycle of a project, as discussed earlier. Bonds tend to provide financing for 'brownfield' projects, namely those that are largely in place and for which the cash flows are already reasonably predictable. Bank loans tend to play a larger role for 'greenfield' projects, namely those that are still in the construction stage. As explained above, banks tend to have special expertise in monitoring the progress of projects at this stage and allow more flexibility if restructuring of the financing becomes necessary. Nonetheless, there seems to be some scope for substitution between bonds and bank loans in the financing of infrastructure projects.

In what follows, we assess the importance of bond markets in a limited way, specifically by asking how much infrastructure financing tends to be in the form of bonds versus syndicated loans from banks. Note that syndicated project loans would typically only be a subset of all bank loans for infrastructure projects. That said, syndicated project loans are likely to represent a major share of bank loan financing in terms of the overall volume, given that they are more likely to be used for very large loans. We rely on Dealogic for the syndicated loan data and apply the same industry groups as we have for the project bonds to identify infrastructure-related deals.<sup>5</sup>

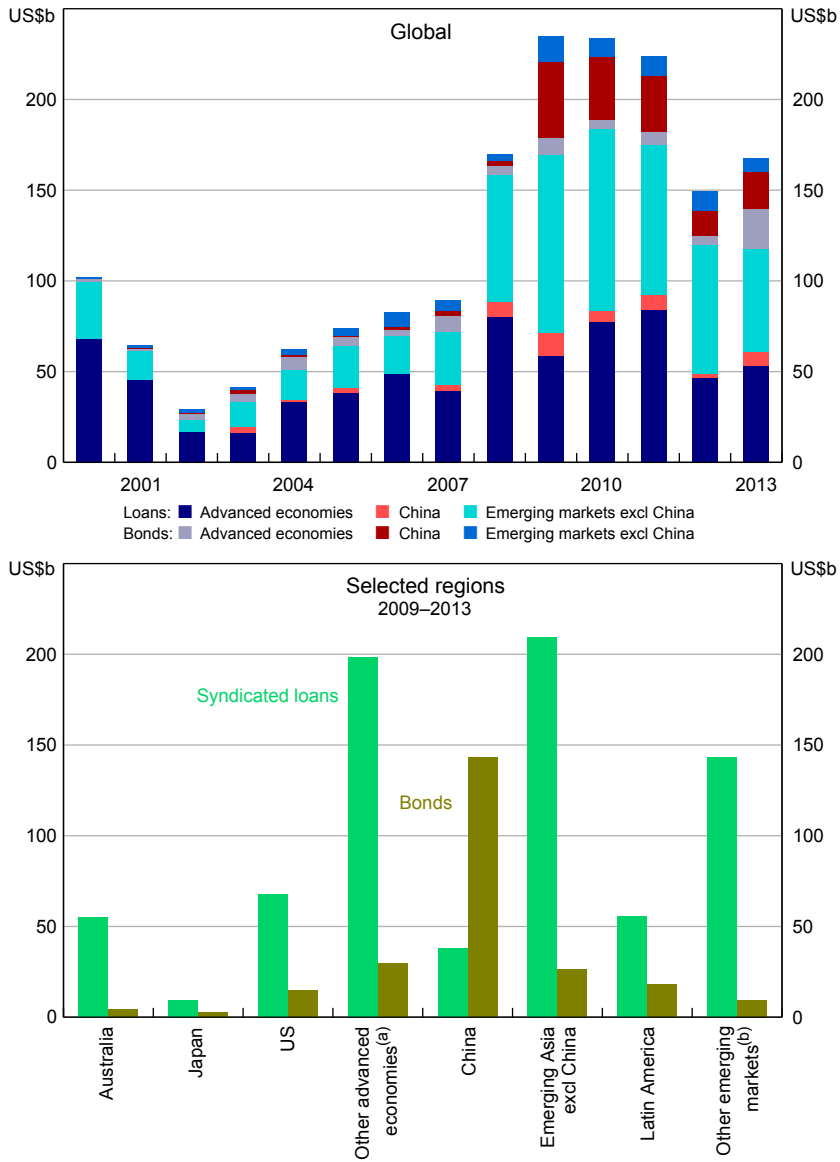
Since 2000, syndicated loans have dominated private sector infrastructure finance in both emerging and advanced economies; however, bonds have become increasingly important over time (Figure 5, top panel). The ratio of bonds to loans over the past five years has hovered between 30 per cent and 40 per cent, a range that well exceeds the average of the whole period. As market conditions have improved and investor interest in emerging bond markets has increased since 2009, so has the ratio of bond finance to syndicated loan finance. This general trend holds true both with and without the observations from China. In the case of advanced economies, an increased reliance on bonds relative to syndicated loans is evident in Europe, Canada and Australia, all of which posted record infrastructure bond issuance in 2013.

We observe significant differences in the importance of bonds relative to syndicated loans when comparing regions. Bonds play a prominent role in US projects and those in other advanced economies. The ratio of bond to syndicated loan finance between 2009 and 2013 was around 1:5 in the United States and 1:6 in other advanced economies (excluding Australia, Japan and the United States) (Figure 5, bottom panel). In emerging Asia excluding China, where bank financing has traditionally been dominant, this ratio is about 1:8. Interestingly, in Latin America the ratio is 1:3, the highest among the emerging market regions.<sup>6</sup> This difference may be due to Latin America's relatively good access to international bond markets, as discussed below.

<sup>5</sup> A more detailed description is given in Appendix A.

<sup>6</sup> In general, issuers from the Middle East and Africa have placed some large project bonds in this period, but they were mainly related to oil and gas exploration and the mining industry, which we do not count as infrastructure-related and are usually done by very large international corporations or quasi-government SPVs.

**Figure 5: A Comparison of Infrastructure-related Project Bond and Syndicated Loan Finance**  
Aggregate issuance



Notes: Definitions of the geographical regions are given in Appendix A  
 (a) Excluding Australia, Japan and the US  
 (b) Africa, central and eastern Europe, and the Middle East  
 Sources: Bloomberg; Dealogic; authors' calculations

## 4.4 Infrastructure bond financing in emerging Asia

Across individual economies in emerging Asia, the reliance on bond markets for infrastructure finance varies considerably. Table 5 summarises some of the differences. Among the nine jurisdictions we look at, the three most successful ones in terms of the number and volume of bond issues have been China, Chinese Taipei and Malaysia. One feature these three jurisdictions have in common is that they tend to issue in their onshore bond markets. This is indicated in part by the share of infrastructure bond issuance in local currencies, which is virtually 100 per cent for each of the three jurisdictions. Other economies also tend to issue in local currency, although they have done so only in relatively small amounts. In our data, only two jurisdictions tend to issue in foreign currencies, namely Hong Kong and the Philippines. In doing so, however, they have been able to issue only a few infrastructure bonds. In examining what determines the choice between onshore and offshore markets for corporate bonds more generally, Mizen *et al* (2012) find the depth and liquidity of the onshore market to be of overriding importance.

When the onshore market lacks depth and liquidity, going offshore can make sense given the amounts needed for infrastructure project bonds and the desirability of long maturities. However, there are in fact two distinct offshore markets, and one is more accessible than the other. There is the US market, which can accommodate the largest issues and the longest maturities. It is also the market with the investor base that is most willing to consider special sectors, including the infrastructure sectors. The other offshore market is the Eurobond market, which is also deep and liquid, but not to the same degree as the US market.

Going to the US market, however, means adhering to the more demanding 144A disclosure standard. The 144A standard is much more demanding because of the broad anti-fraud provisions of US securities law. In practice, these anti-fraud provisions lead to enhanced underwriter due diligence, including a request for '10b disclosure letters' from the company's US lawyers, which are negative assurance letters attesting to the absence of any misstatement or omission. The 144A standard also requires the management's description of the business, the drafting of which consumes large amounts of management time.

The Eurobond alternative to the US market follows the Regulation S disclosure standard. This standard is less demanding than 144A. Issuing in this market means giving up access to the broad US investor base. Nonetheless, the size threshold for the Regulation S standard seems to have grown in recent years, allowing issues as large as US\$3 billion. Compared with 144A issuance, the issuance value of Regulation S has been significant for the Philippines and Singapore. But compared with Latin America or advanced economies, the share is still miniscule for the region as a whole.



**Table 5: Overview of the Characteristics of Infrastructure Bonds in Emerging Asia**

Value-weighted, per cent unless stated otherwise, 2009–2013

	CN	HK	ID	IN	MY	PH	SG	TH	TW	Emerging Asia	Latin America	Advanced economies
Number of deals	340	3	28	1	76	6	2	4	64	551	71	190
Value – US\$b	142.1	0.7	5.6	0.3	4.5	1.1	0.3	0.1	10.5	167.5	17.9	51.4
Share of total project bond market	21.3	10.7	79.1	16.6	64.2	62.5	90.1	41.3	95.4	23.6	37.4	39.6
Average maturity – years	9.1	8.9	12.1	15.0	11.5	9.3	5.0	7.7	7.5	9.1	14.2	18.3
Average coupon	5.2	4.0	8.9	6.0	4.8	6.5	1.9	3.6	1.5	5.1	7.6	4.5
Share in local currency	99.9	0.0	94.7	100.0	100.0	24.5	100.0	100.0	100.0	98.2	26.6	91.9
Share in US\$	0.1	0.0	5.3	0.0	0.0	75.5	0.0	0.0	0.0	1.2	71.7	31.6
Share in Regulation S	0.1	21.5	5.3	0.0	0.0	75.5	88.1	0.0	0.0	1.4	50.3	25.2
Share in 144A	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	18.5	24.2

Note: See Glossary for a listing of country codes

Sources: Bloomberg; Dealogic; authors' calculations

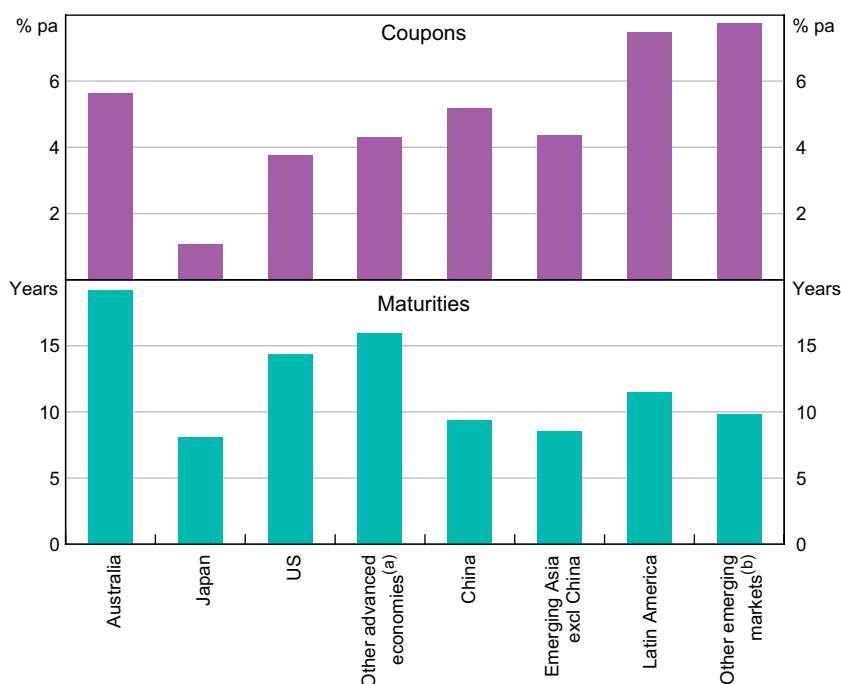
The demanding standards of the US market are reflected in the very low share of 144A compliant issues. Even in Latin America or advanced economies, 144A compliant bonds make up a relatively small share. The amount of 144A issuance by emerging Asian borrowers has also been miniscule. Issuers that go offshore generally prefer to issue under the Regulation S standard.

As revenues from infrastructure projects mostly come in local currency, the potential for infrastructure bonds is greatly increased by deep and liquid local bond markets. Hence, factors related to local bond market development are likely to be of particular importance to emerging markets. Gochoco-Bautista and Remolona (2012) and Packer and Remolona (2012) have identified such factors.

### 4.5 Maturities and pricing

In spite of the fact that most infrastructure bonds from emerging Asia are issued in the onshore market, the cyclicity of such issuance is related to the global financial cycle. This cyclicity is also reflected in the maturities and coupons of infrastructure bonds. In terms of the coupons that issuers need to pay, conditions in emerging markets, and emerging Asia in particular, are comparable to those in advanced economies (Figure 6, top panel).

**Figure 6: Average Coupons and Maturities of Infrastructure Bonds**  
Value-weighted averages, 2009–2013



Notes: Definitions of the geographical regions are given in Appendix A

(a) Excluding Australia, Japan and the US

(b) Africa, central and eastern Europe, and the Middle East

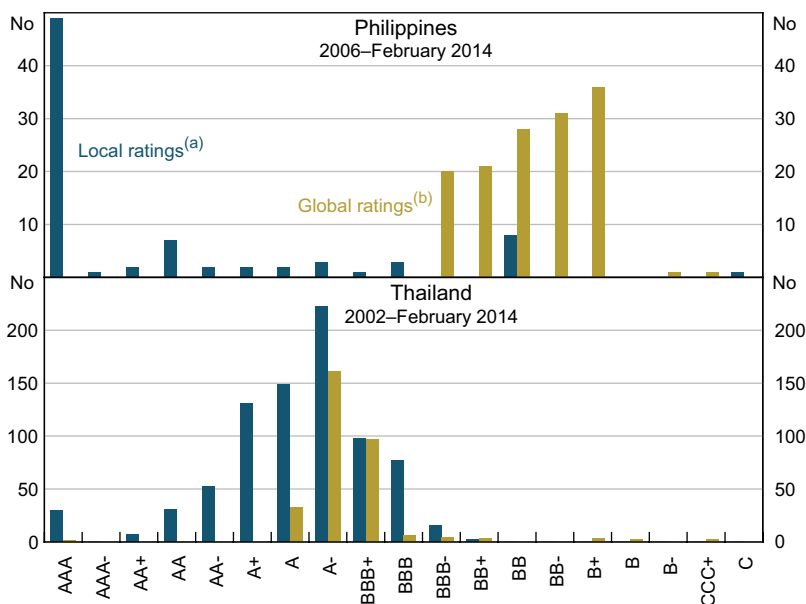
Sources: Bloomberg; Dealogic; authors' calculations

Major differences are apparent in the maturities of these bonds (Figure 6, bottom panel). Whereas in advanced economies the average maturity of issued infrastructure bonds is around 15 years, in emerging Asia it is only around 8 years. Central and eastern European and Latin American issuers have been able to secure slightly higher maturities (10–11 years), whereas average maturities in Africa are only 7.5 years. Overall, this suggests that the conditions of issuance are not as good as in advanced economies. Issuers with access to bond markets seem to be able to secure relatively good conditions. However, the total volume of issuance in emerging market economies is still quite low. It thus seems likely that some issuers may have been deterred by unfavourable conditions, or the lack of depth in bond markets, in particular at longer maturities.

### 4.6 The evidence from local ratings

Local rating agencies provide ratings for issuers who only want to access local bond markets and are therefore important for developing onshore bond markets and also potentially for attracting foreign investors to the market. For the jurisdictions of the Philippines and Thailand, we examine 81 and 815 issues with local ratings, respectively. In Figure 7, we illustrate the number of infrastructure bonds with local ratings and the number with global ratings.

**Figure 7: Distribution of Local and Global Ratings**  
Number of issues rated



Notes: (a) For the Philippines, ratings from PhilRatings; for Thailand, ratings from TRIS Rating  
(b) Average of ratings from Fitch, Moody's and S&P  
Sources: Bloomberg; PhilRatings; TRIS Ratings; authors' calculations

In general, the ratings of the local agencies and the global agencies cover different issuers. For example, in the Philippine sample, only one issuer had both global ratings (BB) and local ratings (AAA). In this case, the issue ratings did not overlap, however, as the ratings proffered by the global ratings agency were only on US dollar issues.

In addition, the local ratings tend to be higher than the global ratings. This is partly because the sovereign rating generally caps how high any individual corporation will be rated by global rating agencies. In the Philippines, most local ratings are bunched at the higher end of the rating scale – 50 out of the 81 issues are rated at AAA, while a further 11 are rated at AA- and there are no speculative-grade ratings, other than for securitised tranches. In contrast, most ratings from global rating agencies are speculative grade.

In Thailand, the local ratings agencies' ratings cover a wider range. Only 30 of the 815 issues, or less than 4 per cent, are rated AAA and another 90, or 12 per cent, are rated AA (either AA+, AA or AA-). The peak of the distribution is in the A category (A+, A or A-) with 502 issues, or 61 per cent of all issues. A further 191 issues are rated BBB (23 per cent), while only 2 are rated below investment grade. Although there is greater overlap in Thailand than in the Philippines, the distribution of global ratings again lies clearly to the lower end of the local rating agencies' ratings, as ratings are capped by sovereign ceilings in the A range.

Rating distributions that differ widely across agencies are potentially relevant to the development of local bond markets. In particular for infrastructure bonds, which are subject to project-specific risks and have a long maturity, the availability of transparent metrics of credit risk are often essential to convince investors to take exposure. As the local rating scales are often significantly higher than those of the international agencies, international investors may discount the information content of local ratings given the increased difficulty of comparing them with international benchmarks. On the other hand, the targeted investor group might only be interested in a single country's corporate bonds, and find the increased granularity that comes from the absence of a sovereign ceiling quite helpful. In any case, the publication of studies by local agencies that document the association of particular ratings with default and subsequent ratings migration is highly recommended to facilitate a mapping from one scale to another so as to attract global investors to domestic markets.

## 5. Conclusion

What makes bond financing of large infrastructure projects so hard? We argue that there are four possible reasons. The first reason is that infrastructure projects are complex and require highly specialised expertise both on the side of governments and investors. Promoting and enhancing the development of this expertise will contribute to a pipeline of bankable projects. Once investors see such a pipeline, they will in turn have the incentive to hire the specialists that can assess the risks of those projects.

Second, infrastructure projects have special risks, some of which are beyond a sponsor's control. The fact that infrastructure projects often produce public goods or are natural monopolies means that the government inevitably plays a critical role and therefore can be an important source of risk. In this paper, we report correlations between infrastructure bond credit ratings and qualitative

indicators of governance at the national level, which point to contract viability and bureaucratic inefficiency as two important risks for infrastructure financing.

A third potential reason for the lack of bond financing is the cyclical nature of bond markets. As finance for infrastructure projects is time sensitive and involves large amounts and long maturities, a change in market conditions can greatly affect the conditions or even the success of infrastructure bond issuance. In this respect, bond financing is more feasible for mature projects, where the refinancing of existing debt can be timed more flexibly.

The fourth reason for the lack of infrastructure bond financing in Asia is the lack of depth and liquidity of onshore local currency bond markets – in particular at long maturities. As revenues from most infrastructure projects are denominated in local currencies, infrastructure bonds are in most cases denominated in local currency. Some infrastructure projects have been financed in offshore corporate bond markets, which have had the depth and liquidity to provide large sums at long maturities for special sectors. Such financing is most feasible when the country has a high sovereign rating, especially when this reflects a credible legal framework, political stability and a reasonably efficient bureaucracy. It also helps to have well-functioning markets for hedging currency risks.

Overall, it would be better if large infrastructure projects could be financed in a deep and liquid onshore corporate bond market. In this case, the sovereign ceiling would be less of a constraint and currency risk would not be an issue. But this requires solid legal frameworks in the host countries. Indeed, the last few years have seen a surge in such onshore financing in Asia. This trend is expected to continue, as countries in the region foster the development of their onshore bond markets.

## Appendix A: Dataset Methodology

### A.1 Country abbreviations and regions

All two-digit country codes used are based on the ISO 3166-1 alpha-2 standard. The definitions for the regions underlying the figures and tables in this paper are given in Table A1.

**Table A1: Definition of Geographic Regions**

Region	Included economies
Advanced economies	AD, AT, AU, BE, CA, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IS, IT, JE, JP, LU, MC, MT, NL, NO, NZ, PT, SE, US
Africa	AO, BF, BI, BJ, BW, CD, CG, CI, CM, CV, DJ, DZ, EG, ER, ET, GA, GH, GM, KE, LR, LS, MA, MG, ML, MR, MU, MW, MZ, NA, NE, NG, RW, SC, SD, SL, SN, SS, TD, TG, TN, TZ, UG, ZA, ZM, ZW
Central and eastern Europe	AL, AM, AZ, BA, BG, BY, CZ, EE, GE, GL, HR, HU, LT, LV, MD, ME, MK, PL, RO, RS, RU, SI, SK, TR, UA
Emerging Asia	BD, BN, BT, CN, HK, ID, IN, KG, KH, KR, KZ, LA, LK, MH, MM, MN, MO, MV, MY, NP, PG, PH, PK, SG, TH, TJ, TM, TW, UZ, VN
Europe	AD, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
Latin America	AG, AN, AR, AW, BB, BM, BO, BR, BS, BZ, CL, CO, CR, CU, DO, EC, GD, GN, GQ, GT, GU, GW, GY, HN, HT, JM, KN, KY, LC, MF, MX, NI, PA, PE, PR, SV, TC, TT, UY, VE, VG, VI
Middle East	AE, AF, BH, IL, IQ, IR, JO, KW, LB, LY, OM, PS, QA, SA, SY, YE

Note: See Glossary for a listing of country codes

Source: authors' selections

### A.2 Dataset details

Merging the datasets on project debt security data from Dealogic BondWare and Bloomberg requires the identification of duplicate values. We identified 174 duplicates by exact matching of issue date, maturity date, issue amount, issue currency and country of issuer. For 116 observations this method of identification is not distinct. In those cases we also look at the name of the issuer and define duplicates as securities where the issuer appears to be identical.

Both datasets provide data on the initial amount, the issue date and maturity date, indicators for Regulation S and 144A compliance, as well as the initial and issuer ratings from the three major rating agencies. Only Bloomberg, however, provides consistent data on coupon rates of debt securities. Bloomberg provides data on the issuance amount only in the currency of denomination of the debt security. The US dollar value is calculated on the basis of the BIS long time series on daily exchange rates, matched with the issue date of the debt security. Where daily exchange rates were not available from the BIS database, we used daily exchange rate data from national central banks or from Datastream.

The list of infrastructure-related industries is presented in Table A2. For Dealogic, the list also represents the definitions for industries for infrastructure-related syndicated project loans from

Dealogic LoanWare. The sample of syndicated project loans comprises 15 845 total project finance deals from 1 January 2000 to 31 December 2013. Based on the industry classification in Table A2, we obtain a total of 8 778 observations for infrastructure-related syndicated project loans, compared with 1 624 infrastructure bond deals in our sample.

**Table A2: Classification of Infrastructure-related Industries**

<b>Dealogic</b>	<b>Bloomberg</b>
Construction/building products – infrastructure	Aerospace and defence
Finance – development banks/multilateral agencies	Cable and satellite
Finance – export credit agencies	Communications equipment
Finance – government-sponsored entities/ credit agencies	Educational services
Government – central authorities	Government agencies
Government – local authorities	Government development banks
Government – provincial authorities	Governments regional/local
Healthcare – hospitals/clinics	Healthcare facilities/services
Healthcare – miscellaneous services	Managed care
Healthcare – nursing homes	Railroad
Healthcare – outpatient care/home care	Renewable energy
Professional services – schools/universities	Sovereigns
Telecommunications – cable television	Supranationals
Telecommunications – equipment	Utilities
Telecommunications – radio/TV broadcasting	Waste and environment service equipment & facilities
Telecommunications – satellite	Wireless telecom services
Telecommunications – services	Wireline telecom services
Telecommunications – telephone	
Telecommunications – wireless/cellular	
Transportation – airports	
Transportation – rail	
Transportation – road	
Transportation – ship	
Utility and energy – diversified	
Utility and energy – electric power	
Utility and energy – gas	
Utility and energy – hydroelectric power	
Utility and energy – nuclear power	
Utility and energy – waste management	
Utility and energy – water supply	

Sources: Bloomberg; Dealogic; authors' selection

## References

- Brealey RA, IA Cooper and MA Habib (1996)**, 'Using Project Finance to Fund Infrastructure Investments', *Journal of Applied Corporate Finance*, 9(3), pp 25–39.
- Bruno V and HS Shin (2013)**, 'Capital Flows and the Risk-Taking Channel of Monetary Policy', NBER Working Paper No 18942.
- Cantor R, F Packer and K Cole (1997)**, 'Split Ratings and the Pricing of Credit Risk', *The Journal of Fixed Income*, 7(3), pp 72–82.
- Engel E, R Fischer and A Galetovic (2010)**, 'The Economics of Infrastructure Finance: Public-Private Partnerships versus Public Provision', *EIB Papers*, 15(1), pp 40–69.
- Gochoco-Bautista MS and E Remolona (2012)**, 'Going Regional: How to Deepen ASEAN's Financial Markets', ADB (Asian Development Bank) Economics Working Paper No 300.
- HSBC (2013)**, 'Infrastructure and PPP Bonds: Capital Markets and How to Access Institutional Capital', Presentation to European Bank for Reconstruction and Development workshop, March.
- Mizen P, F Packer, E Remolona and S Tsoukas (2012)**, 'Why Do Firms Issue Abroad? Lessons from Onshore and Offshore Corporate Bond Finance in Asian Emerging Markets', BIS Working Paper No 401.
- Moody's Investors Service (2012)**, 'Infrastructure Default and Recovery Rates, 1983–2012H1', Special Comment, 18 December.
- Moody's Investors Service (2013)**, 'Regulated Electric and Gas Utilities', Ratings Methodology, 23 December.
- OECD (Organisation for Economic Co-operation and Development) (2013)**, 'Annual Survey of Large Pension Funds and Public Pension Reserve Funds', Report on Pension Funds' Long-Term Investments, October.
- Packer F and E Remolona (2012)**, 'Attracting Foreign Participation in Asian Local Currency Bond Markets: The Case of the Asian Bond Fund 2 Initiative', *Pacific Economic Review*, 17(3), pp 415–433.
- Packer F and N Tarashev (2011)**, 'Rating Methodologies for Banks', *BIS Quarterly Review*, June, pp 39–52.
- The PRS Group (2013)**, 'International Country Risk Guide Methodology'. Available at <<https://www.prsgroup.com/about-us/our-two-methodologies/icrg>>.
- Rey H (2013)**, 'Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence', Paper presented at the Federal Reserve Bank of Kansas City Economic Policy Symposium on 'Global Dimensions of Unconventional Monetary Policy', Jackson Hole, 22–24 August.



# Discussion

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## 1. Jim Turnbull

Almost every paper I have ever read on infrastructure finance focuses on the achievement of what market practitioners believe is the Holy Grail of infrastructure finance. As PwC (2013) has stated in a recent publication, '[a] logical infrastructure project debt market would use short-term bank debt markets e.g. construction finance, with refinancing into the long-term institutional markets as seen increasingly in the regulated infrastructure utilities and leveraged infrastructure acquisition markets' (p 5). The reality is that the conversion rate from the high-risk construction phase to the capital market funding phase is relatively low – it is important to try to find out the reasons why and to attempt to rectify them.

This lack of conversion of infrastructure finance from syndicated bank loans to viable capital market instruments is now of much greater concern because of changes to the regulatory system that threaten to restrict the availability of longer-tenor bank loans. Market commentators have raised the issue that many banks are resistant to lending on a syndicated basis out past the 5–7 year maturity, particularly in local currency. A watershed moment is approaching, as many of the traditional elements of this financing model are undergoing extensive structural change. Major regulatory reforms such as Basel III and Solvency II are forcing banks and, to a lesser extent, insurers into reviewing the capital charges related to the provision of long-term finance through loans to end users of a lesser credit quality. Several banks are exiting this type of business because new regulatory capital charges make it uneconomic. This hits the traditional model of project finance and acts as a powerful incentive to review the business process of infrastructure finance to see if the capital market offers a truly viable funding alternative for the post-construction phase of an infrastructure project.

It is in this context that the paper by Ehlers, Packer and Remolona seeks to chart the progress of the capacity of local capital markets to provide a partial infrastructure finance solution within emerging market economies (EMEs). It also attempts to answer a question raised earlier about why emerging market investment flows into the infrastructure sector are not finding their way into projects in home markets, with the limited pool of domestic infrastructure investors preferring to invest in 'safe assets' denominated in hard currencies from developed economies.

What becomes clear from the paper is that promoting the issuance of infrastructure instruments in the capital markets confronts many of the same issues that are discussed with respect to developing domestic local currency bond markets. Indeed, infrastructure bonds are effectively a subset of the wider capital market development agenda and must be considered in this context. At the basic level this agenda includes:

- Formulating a government bond issuance strategy that creates a viable risk-free benchmark but does not crowd out alternative issuance.

- Encouraging a domestic investor base with the 'right' long-term bias. This presupposes that there is capital available outside of the banking system. In many EMEs – particularly economies where the European Bank for Reconstruction and Development operates – this does not exist. Additionally, while governments may recognise the importance of finding investors for infrastructure projects, they may be undertaking short-term and cynical reforms to the private pension sectors that actually undermine the growth of this essential source of funds.
- Promoting the development of local currency hedging products as a prerequisite for international real money investors to participate; many regulators and central banks of EMEs have a historical aversion to derivative products. But the absence of these instruments can lead to limited market penetration or a proliferation of the 'wrong' sort of international investor.
- Supporting a policy of long-term regulatory commitment including balanced tax and commercial policies while minimising direct intervention in project selection.
- Ensuring sufficient confidence in the governance and transparency of financial reporting.
- Developing gradations of project-specific credit support with the potentially conflicting goal of creating a supply of both high-quality credits for conservative investors and more risky instruments for other investor groups. And here the role of the international financial institutions (IFIs) comes under the microscope.

The paper covers all of these elements in some detail and the progress looks broadly optimistic. Infrastructure bonds have lower default rates and better recovery characteristics than corporate bonds at the same rating level – so on its face, they represent a viable capital market asset class. However, some caution needs to be exercised before saying that there is a solid foundation from which the capital markets can provide some of the finance shortfall that may result from the reduced activities of banks in the project finance sector. The long quantitative easing cycle has kept sovereign yields low and has encouraged investment in 'riskier' long-term assets, which is essentially a hunt for yield. So while the current growth potential looks positive, any upward shifts in interest rates in the sovereign space are likely to lead to growing risk aversion to longer-dated assets that are less liquid, particularly local currency assets where there are embedded currency risks to international investors. This may act as a brake on the progress we have seen in the utilisation of local bond markets over the last five years.

I am less convinced about the conclusion that the existence of a systematic difference between local and international rating scales means that 'international investors may discount the information content of local ratings given the increased difficulty of comparing them with international benchmarks' (p 87). As an ex-foreign investor, I personally find local rating scales quite helpful because of the increased granularity that results from the absence of the sovereign ceiling. Focusing on the difficulty of aligning local rating scales to global scales rather misses the point. Local ratings address a target investor group that might be captive and have different dynamics to the international investor, such as restrictions on external investment or currency of investment. Nevertheless, the information is valuable to any investor if they wish to do their analysis. Additionally, my experience suggests that issues of currency denomination and hedging capability are far more material to a foreign investor's investment process.

## DISCUSSION

Ultimately, the issue of lower cumulative default rates and higher recovery rates at each rating level after year 4 of a project cycle relative to corporate bonds seems to me to be less material to long-term investors than the fact that early infrastructure investments often undergo debt restructuring and reorganisations, which diminish the cash flow certainty of the instrument. And it has often been observed that where other market participants see a bond, a long-term investor sees a cash flow stream. Many real money investors lack the capacity to be a part of the restructuring process, which is why they have tended to leave the 0–4 year area to the banks that traditionally have this expertise. Once again, this does not explain why we see limited conversion to capital market instruments after year 4 of the project cycle.

Discussions of the capacity of local markets to provide infrastructure finance need to consider the role played by the public finance strategy of the government. While I realise the paper focuses on local corporate bond markets, this certainly underestimates the role domestic capital markets play in providing infrastructure funding outside of the 'project bond' space. As an example, issuance of government bonds by the Turkish Government across longer maturities has been said to 'crowd out' other issuers. But Turkey also uses many of the funds raised in its local markets for infrastructure projects. It is just that they are not labelled as infrastructure bonds – they are government bonds. As part of any infrastructure funding discussion it is perfectly legitimate for government issuers to assess whether savings in lower funding costs through their own-name generic issuance can outweigh the benefit of utilising the traditional public-private partnership (PPP) model. In fact, as taxpayers and users we should hope that this is done!

At the same time, while I hesitate to introduce the phrase 'regulatory arbitrage' into the infrastructure bond discussion, we need to be aware that governments have their own hurdles due to self-imposed debt limits or the like that may or may not incentivise infrastructure bond issuance. This is a huge determinant of the way that an infrastructure finance market develops and has to be recognised. Nevertheless, this appears to be a greater issue in emerging Europe than in the Asian capital markets.

The new paradigm suggests that existing ring-fence styled models using special purpose vehicles (SPVs) have their purposes but that they may need to be adapted over time. In many ways, the SPV is a legacy structure based on project finance principles and complex interrelationships between contracting parties that supports early stage investments. It has not yet fully evolved to a viable instrument that is then acceptable to the capital markets. Some form of structuring or financial engineering is needed before acceptable capital market style products develop from infrastructure financing needs. The present solutions seem to take one of three forms:

- slicing various infrastructure projects into parcels and allocating them to infrastructure investment trusts and funds – somewhat erroneously called the Macquarie Model in some circles
- encouraging investors such as pension funds and specialist boutiques into taking and managing project risk as a business
- a hybrid approach of the two where a whole infrastructure project is positioned into a trust and run as a standalone investment vehicle.

While each of these solutions has some benefits and negatives, they are clearly not the whole answer and are somewhat evolutionary. None of the above appear particularly conducive to promoting local currency bond issuance.

Recognising the importance of this issue, the G20/B20 Infrastructure Working Group has also proposed an internationally standardised structure for the PPP asset class, which would employ a trust structure that implements and manages PPP projects at the national level. However, this work is in its early stages and will require extensive consultation.

Nevertheless, future capital market structuring is likely to focus on developing solutions that make the cash flow more predictable for long-term investors. Discussion of 'insuring away' some of the early project risk inevitably morphs into an examination of the role of IFIs as risk insurers in EMEs, but it is worth remembering that IFI balance sheets are relatively small so their capacity is limited.

Some optimism has also been expressed about the future of instruments such as securitisation or even the covered bond structure. In these cases, the lack of homogeneity of the pool creates difficulties as does the issue of collateral substitution in covered bond pools.

## References

**PwC (PricewaterhouseCoopers LLP) (2013)**, 'Capital Markets: The Rise of Non-Bank Infrastructure Project Finance', Report prepared by the Capital Projects and Infrastructure Group, October.

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## 2. General Discussion

The discussion began with one participant commenting that demand-side factors could be behind the higher average credit quality of infrastructure bonds relative to that of other non-financial corporate issuance. The participant suggested that the difference in credit quality may reflect the tendency for bond investors to hold diversified portfolios of highly rated bonds as a way of avoiding the need to expend time and resources on assessing risk independently – that is, they invest passively. The participant noted, however, that supply factors also play a role (i.e. bond investors can only buy what has been issued). Frank Packer suggested that the preference for highly rated issues could also reflect a perception that ratings – particularly by local ratings agencies – are less informative at the lower end of the ratings spectrum.

Another participant questioned the importance of country-level risk characteristics (such as political risk and bureaucracy quality) in explaining infrastructure bond ratings. The participant noted that the rank-order correlations between measures of country risk and infrastructure bond ratings do not imply causation, and suggested analysing the relationship in a multivariate setting as a better way of identifying a causal relationship. The participant went on to hypothesise that the inclusion of controls – particularly GDP per capita or other broad measures of economic development – in such a multivariate model could result in the country risk measures losing their explanatory power.

## DISCUSSION

There was robust discussion around the relative merits of bond versus bank financing of infrastructure projects. One participant noted that recovery rates for infrastructure-related project loans are close to 100 per cent because of continual project monitoring by banks; in contrast, corporate infrastructure bonds only have recovery rates of around 70 per cent. The participant explained that the restructuring of project loans by banks during the initial phases of a project – particularly the construction phase – allows them to capture value, but, in contrast, restructuring bonds is impractical (as noted in the paper). The participant went on to argue that, because of these shortcomings, project bonds do not have a future, but that bonds backed by pools of infrastructure-related project loans could potentially be a useful financial innovation. Another participant pondered whether any viable infrastructure projects are not being built due to the nature of the available finance, and questioned whether the issue of financing using bond issuance or bank loans was of first-order importance.

The discussion then turned to aspects of the data used in the paper. One participant queried whether the infrastructure bond sample included petrochemical companies in Latin America. In response, Torsten Ehlers indicated that these types of companies were not included in the sample. Another participant suggested that the infrastructure bond market in China may not be as large, relative to total project finance supplied by banks, as the data on syndicated loan finance suggest, because syndicated loans represent only a subset of total bank lending. Dr Packer acknowledged that the sample excludes bilateral bank lending, which is likely to account for a significant share of total bank lending for infrastructure projects.

One participant highlighted the very high share of infrastructure bond issuance accounted for by EMEs since 2009 and described this as ‘striking’. The participant also noted that new syndicated loan finance has fallen significantly since 2010, but that this decrease has not been offset by an increase in infrastructure bond issuance. Another participant emphasised a theme that the paper had in common with other papers presented at the conference: if governments ‘get their houses in order’ by developing high-quality institutional frameworks and ensuring stable political and regulatory environments, then markets will provide the necessary financing for infrastructure investment.

# Public Infrastructure: A Framework for Decision-making

Emily Poole, Carl Toohey and Peter Harris\*

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## 1. Introduction

The issue of how best to deliver investment in public infrastructure has been receiving significant policy attention around the world of late. Population growth, demographic change, greater urbanisation and rising expectations are putting pressure on existing infrastructure networks and facilities in both advanced and developing countries. The need for infrastructure investment is being identified across a range of sectors including transport, utilities, communications, education and health.

The characteristics of some types of infrastructure mean governments have an important role to play in ensuring important services are provided in the interests of the broader community. However, tight fiscal conditions prevailing in many countries, combined with a more challenging climate for sourcing private capital for long-term infrastructure projects in the wake of the global financial crisis, have renewed interest in infrastructure financing models. This includes questions about whether the design and use of public-private partnership (PPP) models can be improved, and how projects can be structured to encourage greater private investment from a wider range of debt and equity investors, including superannuation/pension funds. As well as interest at the country level there has also been growing discussion on infrastructure financing in multilateral forums such as the G20 and the Asia-Pacific Economic Cooperation (APEC). Historically low interest rates for government borrowing in some countries have also renewed discussion about the relative merits of public versus private financing models more generally.

The question of how to finance a project presumes that a decision has been made that the investment is the best use of limited resources in the first place. However, policymakers need first to identify public infrastructure service needs, the appropriate role for government in addressing these over time, and priorities for public investment. Once a decision is made to build the infrastructure, the central economic question becomes how the project can be delivered most efficiently.

This paper sets out thinking about these issues from a policy perspective. It does not assess infrastructure issues in any specific country. Rather, it sets out a high-level framework that could be applied to guide the role of government as a facilitator of, and as an investor in, infrastructure. Section 2 outlines the characteristics of public infrastructure and a framework for decision-making; Section 3 discusses issues around risk allocation in public infrastructure projects; Section 4 considers different financing options and relevant issues; and Section 5 concludes.

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## 2. Investment in Public Infrastructure

### 2.1 Characteristics of public infrastructure

Infrastructure refers to the long-lived physical structures, facilities and supporting operating systems that provide essential services to consumers and facilitate the flow of goods, information and factors of production between buyers and sellers. Ultimately, the underlying assets are important for the services they deliver. Economic infrastructure (such as utilities, transport and communications networks) provides essential services to individuals, households and businesses, and influences the efficiency of an economy. Social infrastructure (such as education, health and community facilities) provides important services for the day-to-day activities of individuals and supports economic and social objectives.

Infrastructure has several characteristics that distinguish it from most other forms of investment (Grimsey and Lewis 2002; Inderst 2010). Major economic and social infrastructure projects typically involve:

- significant upfront capital expenditure
- long-term revenue and/or benefit streams linked to the services provided by the infrastructure asset
- costs and revenues subject to a range of uncertainties and project-specific risks
- irreversible and illiquid investments that can lock in technology and future upgrade options
- assets and services that exhibit public good and/or monopoly characteristics.

In the context of this paper, 'public' infrastructure is an investment where the government has the primary role in, and responsibility for, deciding on whether and how the infrastructure is provided in the interests of the broader community and on the source of the revenue streams to pay for the infrastructure over its life. Thus, public infrastructure extends beyond infrastructure that is owned or directly funded by the public sector. For example, this definition would capture infrastructure assets and services owned and operated by the private sector, but where the government has created the overarching policy and regulatory framework, or possibly retains a contingent liability for the infrastructure assets and continued service provision.

The traditional economic rationale for government intervention is that socially beneficial infrastructure assets and/or services would be underprovided by the private sector. Potential underprovision arises where services exhibit public good characteristics (notably non-excludability for infrastructure such as most road networks), network effects and positive externalities, or where a facility has natural monopoly characteristics such that a private provider would have the ability and incentive to raise prices and/or restrict output below socially desirable levels. Governments may also become involved to address certain social or equity objectives, such as equivalent service pricing or universal coverage (though from an economic perspective, such interventions should still pass a social net benefit test). The case for government intervention based on market failure should also be balanced against risks of government failure. A number of studies have explored the scope for government intervention to create inefficiencies, not least because of an absence of market signals and commercial disciplines. Indeed, this has become a prime reason for increasing the involvement of the private sector in public infrastructure provision (Krueger 1990; Winston 2006, 2013; PC 2008b).

Even where governments assume primary responsibility for deciding that certain infrastructure assets and services should be provided, there are numerous ways to bring about their delivery. These range from the direct provision of services by the government using government-owned assets, to full divestiture to, and provision by, the private sector, albeit subject to regulation. Between these two extremes are various mixes of public and private involvement in delivering projects and services, ranging from government as a purchaser of services from the private sector (contracting out) to the private sector building, operating, owning and financing infrastructure with and without taxpayer funding (see Box A).

All approaches involve efficiency trade-offs, the balance of which will vary, and consequently need to be assessed on a case-by-case basis. For example, though government provision may be more likely to ensure that socially beneficial infrastructure services are provided to the community, designing an incentive-compatible framework to ensure they are provided cost-effectively can be challenging. On the other hand, notwithstanding the scope for partnership approaches to draw to a greater extent on the productive efficiencies of the private sector, factors such as asymmetric information and incomplete contracts, along with the transaction costs of contracting and monitoring, can undermine potential gains (Brealey, Cooper and Habib 1997).

### **Box A: Roles for Government and the Private Sector in Delivering Public Infrastructure Services**

There are a number of separable tasks and roles involved in delivering public infrastructure services, ranging from planning and regulation to funding, design, construction, operation and maintenance. The different delivery models involve assigning more or less of these tasks to the private sector.

While many of these roles can be performed by the government or private sector, some can only be performed by government. For example, only governments can regulate and provide public (taxpayer) funding. Thus, even if responsibility for providing public infrastructure is divested fully to the private sector, governments will normally maintain a regulatory role, potentially affecting the private provider's pricing, service delivery and investment decisions. Governments also generally retain overarching planning responsibility for public infrastructure, even though private owners may have responsibility for making decisions about particular investments.

Ultimately, governments must fund public infrastructure from taxes and/or allow users (or indirect beneficiaries) to be charged. Government as funder does not preclude private provision. Governments as owners and providers can purchase services from private providers directly, or make payments to private sector infrastructure owners and providers, effectively buying services on behalf of the community. Traditionally, in many countries, government has owned and provided public infrastructure. Models for government ownership of infrastructure include statutory monopolies and corporatised entities such as government trading enterprises.

Private sector involvement typically centres around design, construction, operation, maintenance and, in some cases, ownership of a particular piece of infrastructure. Revenues must come from



user charges or taxpayers via government. The private sector may simply provide specific services on a short-term contract basis. Such models do not involve private project financing. A range of models fall within the spectrum of 'partnership' models, including different types of PPPs, concessions and lease arrangements that involve private project financing.<sup>1</sup> Distinct features of PPPs are long-term contracts (20+ years), the bundling of construction and operation to a single private partner (though that partner may comprise a consortium of firms), scope for greater degrees of risk sharing and private project financing. Fully privatised infrastructure gives private owners greater operational and investment autonomy, as well as residual risk.

1 The term 'PPP' is often applied broadly to many and various contractual arrangements involving the government and private firms. In many developing countries, the term is used to describe any contract with a private firm including medium-term service contracts and outsourcing arrangements, as well as privately financed long-term contracts with the government for the provision of assets and/or services by private firms (including build, own, operate and transfer arrangements).

The rationale for, and nature of, government involvement may change over time (see Box B). For example, improvements in technology may overcome non-excludability issues (therefore allowing infrastructure services to be provided privately), such as electronic tolling on roads (though the costs of such technologies must be weighed against their efficiency benefits). Growth in the size of the market and new technology can introduce competition into market segments previously characterised by monopoly provision, such as in electricity generation. A well-designed access regime targeted at natural monopoly infrastructure may be more efficient at managing some of the private incentives associated with the provision of services (unless there is a non-trivial probability of a costly regulatory error). And more sophisticated instruments may be developed to regulate, tax or subsidise externalities directly, leaving service provision and investment decisions largely to the private sector within an overarching policy or regulatory framework.

Thus, although governments in many countries have historically played a dominant role in the construction, ownership and operation of key economic and social infrastructure, more recent decades have seen a shift towards greater involvement of the private sector, not just as builders, but also as operators, financiers and owners of what would otherwise be considered 'public infrastructure' assets and services.<sup>1</sup> This has occurred through a wide range of privatisation and contracting models (PC 2008b; World Economic Forum 2010; Jett and Verink 2013).<sup>2</sup>

1 There are exceptions. Winston (2013) notes that in the case of the US transportation sector, all modes of transport were initially developed and operated by the private sector in the 19th century. It is only in later decades that the public sector began to assume a more dominant role in the ownership, provision and regulation of these assets and the related services.

2 In Australia, a number of key economic infrastructure assets (electricity, gas, telecommunications and airports) were corporatised then restructured and privatised over the past two decades. Infrastructure reforms have also included the introduction of competition and industry-specific regulatory frameworks in key economic sectors. Recent decades have also seen the increased use of long-term contractual 'partnership' models between the public and private sectors for economic and social infrastructure projects.

## Box B: Government and Private Sector Involvement in Key Economic Infrastructure Services in Australia

**Roads:** The full private ownership and provision of roads has not been implemented in any jurisdiction on a network-wide basis. The Productivity Commission has previously attributed this to a range of factors including public good characteristics, concerns about monopoly power, the need to deal effectively with community access and public interest issues. However, there has been increasing use of tolls on major new road links (in New South Wales, Queensland and Victoria) planned by government, and delivered and operated by the private sector (PC 2006). Technological developments, for example improved vehicle identification systems, may expand future road pricing options.

**Urban water:** Most urban water assets (distribution and retailing networks, bulk-water supply and treatment assets) remain owned by state governments, although there is private ownership of some assets. The Productivity Commission identified likely areas of market failure in this sector to include the natural monopoly elements of the supply chain, health and environmental externalities, and public goods. In its view, while governments should continue to play a substantial role, this role needs to be carefully designed and there may be scope for markets to have a greater role within the framework established by governments (PC 2011a).

**Electricity:** While particular elements of the supply chain are generally considered to exhibit natural monopoly characteristics, the structure of the electricity supply industry has shifted over time, with some vertical separation of generation and retailing from the natural monopoly elements of the industry (which includes transmission and distribution), and horizontal integration of network businesses. The National Electricity Market was established in 1998 as a wholesale market for the supply of electricity to retailers and end-users in the eastern states of Australia. Mixtures of public and private firms operate within this market and are subject to an industry-specific regulatory regime. Again, new technologies appear likely to offer scope for improving links between pricing and consumer willingness to pay (PC 2013).

**Airports:** Historically, most major airports were owned and operated by the Australian Government. There was considerable cross-subsidisation across and within airports. This made it difficult to fund investment to cater for growth in passenger traffic and to improve service quality. In 1997, the Australian Government commenced the process of privatising its airport holdings through the sale of long-term leases. In recognition of the market power of some larger airports, privatisation was accompanied by the introduction of price regulation, which has subsequently been restricted to a more light-handed price monitoring regime (PC 2008b, 2011b).

## 2.2 Public infrastructure decisions – a framework

Exploring the merits of different financing options for public infrastructure is an important area of inquiry for policymakers. However, a focus on project financing options presumes that the decision has already been made that the investment is the best use of limited resources. Given that the source of financing itself cannot fundamentally alter the economics of a project, a necessary first step is ensuring that good projects – that is, ones that generate net social benefits – are

chosen. Questions for the government to consider at this early stage include: how to identify infrastructure ‘needs’ (or gaps); is there a facilitation role for government in addressing identified needs; is addressing the public infrastructure need a priority; and how can a public infrastructure project be delivered in the most efficient manner (Rajaram *et al* 2010; Klein 2012).

### 2.2.1 The importance of getting the planning and institutional framework right

Estimates of infrastructure ‘gaps’ or ‘deficits’ might indicate a need for new and continued investments in infrastructure (both private and public).<sup>3</sup> However, they should not substitute for effective processes that ensure service needs are properly identified, the highest value projects are selected and services are delivered as efficiently as possible. Building the wrong projects will impose net costs on the economy. Yet, identifying the right projects is especially challenging for those public infrastructure services where there is no market mechanism, such as price or profitability, to signal future needs, consumer willingness to pay or the need for capacity adjustments. Instead, in these circumstances, governments must rely on other tools to identify needs, such as setting clear overarching policy objectives, developing long-term plans for infrastructure and service delivery, and applying social cost-benefit frameworks to help guide priorities and decisions on how services can be best delivered.

Effective infrastructure planning is particularly important given the network nature of many public infrastructure assets (particularly economic infrastructure), where investments in one element of an integrated system of assets and services have system-wide impacts. Network externalities need to be considered in the planning process, as do other interdependencies, such as disruptions during construction phases and the competition for scarce construction resources.<sup>4</sup> For larger projects in particular, the effective sequencing of investments may offer economies of scope or avoid higher per unit costs due to capacity constraints (e.g. if construction capabilities and skilled labour inputs are limited in supply).

The governance arrangements and the institutional environment within which infrastructure decisions are made are also crucial factors. Sound governance arrangements that promote evidence-based analysis, transparent decision-making and independent review can improve the quality of, and confidence in, public infrastructure decision-making. Some countries have established specialist institutions with the aim of improving infrastructure planning and project selection across multiple infrastructure sectors, and the public sector’s capability to engage with the private sector. These specialist institutions include Canada’s Infrastructure Ontario, Singapore’s Land Transport Authority, Infrastructure Australia and Infrastructure UK.

3 Various estimates of global infrastructure investment ‘needs’ exist, although these types of estimates can be subject to qualification and criticism, and are highly dependent on a range of other factors, including forecasting methodology (top-down or bottom-up), the type of investments considered (new, maintenance, etc) and data availability, among others (Inderst 2013). The Organisation for Economic Co-operation and Development (OECD) estimates that US\$53 trillion in infrastructure investment will be needed between 2010 and 2030 in telecommunications, electricity, surface transport and water sectors (OECD 2011). Dobbs *et al* (2013) estimate that US\$57 trillion of global investment will be needed in road, rail, ports, airports, power, water and telecommunications between 2013 and 2030 to keep pace with projected global GDP growth.

4 As noted in an Australian context by Lowe (2013), in recent times, private business investment has been at a record high level as a share of GDP because of the resource boom. At times, this has created pressures in parts of the labour market, including for workers with engineering and specialist building skills. However, he notes that over the next few years, resource investment is expected to decline significantly as the Australian economy moves from the investment to the export phase of the boom, which creates an opportunity for infrastructure investment to rise as a share of GDP without putting undue pressure on domestic capacity.

### 2.2.2 Government as investment facilitator

Even once an infrastructure need has been identified, before considering the case for public investment (with government as either a ‘provider’ or ‘partner’), it is relevant to consider whether governments have other (lower-cost) policy options and tools available to address the identified need in the short or long term (Banks 2008). Possible options will depend on the nature of the infrastructure and the regulatory and institutional settings that already apply.

For instance, policy or regulatory barriers may be preventing profitable private investment in socially beneficial infrastructure and services from taking place. The commercial viability of some infrastructure projects may depend on the government (in its ‘policy setter’ role) providing a clear policy environment, appropriate regulatory approvals or access rights. In these circumstances, the government can play a facilitation role to allow investment to proceed on a commercial basis by resolving uncertainties, including those arising from its own policies. Conversely, inconsistent or unpredictable government actions could create uncertainties and discourage investment.<sup>5</sup>

Where public infrastructure assets and services are highly regulated, there may be opportunities to make adjustments to the overarching policy and regulatory frameworks to promote more efficient investment and service outcomes. In a range of reports into various infrastructure sectors in Australia, the Productivity Commission has observed that poorly designed pricing or regulatory requirements can create incentives for underinvestment or overinvestment. For example, existing service standards in the electricity sector, which do not necessarily reflect consumer preferences, have led to overinvestment in electricity transmission infrastructure (PC 2013). In the urban water sector, price was not used to reflect water scarcity in times of shortage (water restrictions were used as the rationing mechanism). This was a factor that later contributed to inefficient supply augmentation in new large-scale desalination plants (PC 2011a).

Infrastructure services may be assessed as warranted on net social benefit grounds where private revenues necessarily fall short of private costs. In these cases, public funding will be needed but public funding may not require public investment: it may be feasible for the government simply to ‘buy’ otherwise uncommercial services from the infrastructure provider on behalf of the community (e.g. to service a regional area). These contracts can be structured as an ongoing payment for services, through community service obligations (CSOs),<sup>6</sup> as a one-off upfront contribution in cash or in kind, or as another arrangement.

When barriers to private investment cannot be efficiently removed by efforts to resolve policy uncertainty, or private funding shortfalls cannot be addressed through purchasing arrangements, public investment is an option. As discussed further in Sections 3 and 4, the decision by government to provide the infrastructure itself or in partnership with the private sector will be informed by a range of factors, including the nature and magnitude of the risks associated with the project, and how well placed the government and/or private partners are to manage them.

5 Risk of the expropriation of assets or equity of a private provider can be a concern for private investors in some countries. While the risk of direct expropriation may have dissipated in many countries, other forms of political risk (such as breach of contract, civil disturbances or regulatory restrictions) remain a key concern for private investors (Henisz and Zelner 2010; MIGA 2013). Araya, Schwartz and Andrés (2013) find that a difference of one standard deviation in a country's sovereign risk score is associated with a 27 per cent increase in the probability of having an infrastructure commitment with private participation.

6 CSOs are non-commercial activities undertaken by government trading enterprises at the direction of government to achieve social policy objectives. They can range from transport concessions for pensioners, below-cost electricity charges, or the provision of non-commercial ferry services (PC 2008a).

### 2.2.3 Prioritise public investment and funding

While there are different empirical assessments of the aggregate economic impacts of infrastructure investment, inevitably such investments are made in the presence of real resource and funding constraints. In other words, they involve opportunity costs – not only the costs of resources used up in building and operating the infrastructure, but also the opportunity costs of raising taxes or diverting public funds from other uses.

Without appropriate frameworks in place, poorly chosen projects run the risk of diverting resources from more socially productive activities.<sup>7</sup> Cost-benefit analysis is used in many countries as an *ex ante* assessment tool to help guide and improve public sector appraisal of public infrastructure projects, although the quality of and weight given to these assessments vary widely (Ergas and Robson 2010; Mackie 2010; Pickford 2013).

A well-constructed social cost-benefit analysis of viable options for addressing a recognised need is an essential tool for identifying the option that meets the need at the lowest cost/highest net benefit. Ensuring that the public gets the best value may not necessarily mean prioritising the largest or the most ‘iconic’ projects, as those delivering the largest economic and social pay-offs may not involve immediate or large investments. For example, smaller investments that address bottlenecks in existing networks (such as rail access to some major ports, or the use of intelligent traffic systems instead of adding to new road capacity) may deliver large net benefits and substitute for, or defer the need for, larger network augmentation.<sup>8</sup> Where investments involve considerable uncertainties it can be beneficial to include the ‘option value’ from delaying a large and substantially irreversible commitment of capital, or make smaller-scale investments to retain flexibility where these risks are known and acceptable (Dixit and Pindyck 1994).

That said, a social cost-benefit analysis of infrastructure investment options is rarely a straightforward exercise in practice. Major public infrastructure investments typically involve both positive and negative spillovers that can be difficult to predict and quantify. There is often debate on key inputs to the analysis, such as the costs and benefits that should be included, the baseline assumptions and the appropriate discount rate to apply.<sup>9</sup> Decision-makers are also often confronted with

7 The link between investment in public infrastructure and broader growth and productivity outcomes has been extensively considered and debated in the literature, particular since Aschauer’s (1989b) empirical finding of a strongly positive link in the United States. Reviews of the relevant literature by Romp and de Haan (2005) and Straub (2008) show that while some studies conclude a high impact of infrastructure on growth, others find negative or zero returns, and significant empirical challenges remain. A more recent International Monetary Fund (IMF) working paper shows a generally positive link between the public capital stock (rather than investment) and economic growth across OECD member and non-member countries, with the quality of infrastructure expected to influence the estimated strength of the link (Arslanalp *et al* 2010). Adjusting infrastructure spending for the quality and efficiency of the public investment management process is another area being explored in recent IMF work (Dabla-Norris *et al* 2011).

8 For example, Dobbs *et al* (2013) cite estimates that the average benefit-cost ratio (BCR) for ‘traditional’ road capacity is 2.7, while that for the use of intelligent traffic management is 14 and that for optimised traffic signals is 17. Infrastructure Australia’s latest National Infrastructure Priority List indicates that ‘smaller’ projects (by estimated capital value) often have higher forecast BCRs (Infrastructure Australia 2013).

9 There is often debate on how to choose appropriate discount rates for the appraisal of public infrastructure investments (and public policy evaluation more generally) (see Baumol (1968); Arrow and Lind (1970); and Brealey *et al* (1997)). Where an infrastructure investment directly or indirectly draws resources away from an alternative investment, and the timing of benefits differs from the funding flow, the choice of discount rate should reflect the opportunity cost of the capital (Baker *et al* 2008; Harrison 2010).

'optimism bias' in estimates from project proponents (Flyvbjerg 2009).<sup>10</sup> Notwithstanding these challenges, entrenching the transparent use of cost-benefit analysis in the project appraisal process should improve the rigour of, and impose discipline on, public sector investment decisions (Ergas and Robson 2010). When applied in a systematic and transparent manner, there is scope for independent audit or testing of the analysis and review (including *ex post* review), and thus potential for significantly improving the quality of public investment decision-making (Freebairn and Corden 2013).<sup>11</sup>

Another issue relevant to the cost-benefit analysis is the size of the 'gap' between user charges and costs, which will have a direct bearing on the government's funding task. In some cases, it may not be technically possible to levy user charges (although technological advancements can change the options over time, such as in the case of electronic tolling systems for road use). In other instances, structuring user charges based on the full recovery of financial costs may conflict with the broader economic and social policy objectives of providing the infrastructure (potentially reducing use to below socially optimal levels, which is the primary rationale for government intervention). For example, a rationale for subsidising public transport networks is often to reduce congestion on roads where congestion charging is infeasible (Parry and Small 2009; Button 2010). Decision-makers must also consider other relevant trade-offs, such as the transaction costs of implementing and administering pricing systems, or any other relevant policy, regulatory or legal impediments.

Nonetheless, where there are clear linkages between user benefits and costs, it is generally desirable from an efficiency perspective to link consumer 'willingness to pay' with charges for use of the infrastructure. In principle, well-calibrated user charges (such as two-part pricing) can provide signals for efficient use of infrastructure once it is deployed, signal the need for future adjustments to capacity (based on users' willingness to pay) and minimise or even eliminate the need for government funding. Additionally, user charges, and the scope providers have to vary prices, can provide incentives for service innovation.

Where user charges are not applied, or fall short of the revenue required to service debt, governments may adopt a variety of funding mechanisms (whether financed through general revenue, borrowing or selling existing assets), such as annual lump sum CSO payments, 'pay as you go' arrangements and 'block funding' at any or all of the various phases of the infrastructure development. The funding method adopted can affect the incentives of the infrastructure operators to maximise efficiency if funding is not linked in a clear way to performance.

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<sup>10</sup> Flyvbjerg (2009) notes that *ex ante* estimates of infrastructure costs and benefits are often very different from actual *ex post* costs and benefits. In the context of transport infrastructure projects (based on a sample of 258 projects in 20 countries), he found that the average cost overrun was 44.7 per cent for rail projects, 33.8 per cent for bridges and tunnels, and 20.4 per cent for roads. In terms of forecasts of patronage, the results of Flyvbjerg's study indicate that actual patronage was, on average, 51.4 per cent lower than forecast for rail projects and 9.5 per cent higher than forecast for road projects.

<sup>11</sup> Many texts and studies provide important insights for the application of social cost-benefit analysis assessments to public decision-making (Layard and Glaister 1994; Mishan and Quah 2007; Boardman *et al* 2010). Some agencies within government also establish guidelines and frameworks for the use of such assessments. For example, in Australia, the Department of Finance and Administration provides a *Handbook of Cost-Benefit Analysis* (DOFA 2006).

### 2.2.4 Deliver the project efficiently: funding versus financing

Once a decision is made by government to prioritise a public infrastructure investment, the next question is how to deliver it in the most efficient way. In selecting the delivery model, it is critical to distinguish between ‘funding’ and ‘financing’. Funding is how investment costs are repaid over time, compensating those who provide the debt or equity capital for the project. Ultimately, public infrastructure is funded by users of the infrastructure (e.g. through direct user charges), other beneficiaries<sup>12</sup> or taxpayers (IFWG 2012; Maddock 2013).

Financing is about raising money upfront to pay for the design, construction and early operational phases of an infrastructure asset, whether through debt or equity instruments of a public or private nature. The role of financing is to bridge the intertemporal gap between the large upfront costs of an infrastructure investment and the revenue stream accruing over its life. Finance providers will never knowingly *fund* an infrastructure project – they will only provide finance in the expectation that they will be repaid, including a rate of return commensurate with the risks they bear.

For large public infrastructure projects, the choice essentially comes down to either some form of partnership model (such as a PPP) supported by private financing, or a range of government procurement approaches involving public financing. The extensive literature on the use of PPPs indicates that while they can bring efficiency benefits, these are by no means certain and there are risks – for example, if governments are motivated to use them purely to ‘escape’ budget discipline (and fiscal limits). Indeed, as pointed out by many academics, this latter motivation rests on an illusion because in the absence of efficiency gains, PPPs and publicly financed projects have similar long-term effects on public finances (Engel, Fischer and Galetovic 2010; Funcke, Irwin and Rial 2013).<sup>13</sup>

## 3. The Role of the Private Sector – Risk Management and Allocation

From an economic perspective, the central case for the use of private financing models rests on whether they can lead to efficiency benefits by harnessing the skills and know-how of private partners combined with commercial incentives. An important consideration is whether the private sector is better placed to manage project-specific risks. Better risk management encompasses actions to reduce costs as well as increase benefits, thus enhancing the net social value of the project. Experience with PPPs has shown that there are a number of challenges that need to be considered with respect to risk allocation. First, risks change over the life cycle of a project. Second, there is an ongoing debate as to which party is best placed to manage demand risk. Third, the capability of and incentives for the public sector to design, negotiate and enforce well-designed contracts will be critical for ensuring net benefits are realised. Finally, the transaction costs (e.g. negotiating and monitoring costs) associated with using different models can be non-trivial.

<sup>12</sup> For example, ‘other beneficiaries’ in this context could include the use of value capture mechanisms, such as tax increment financing (IFWG 2012).

<sup>13</sup> That is, in some types of PPPs the government defers payments but ultimately must still pay the full costs of the project. In others, government concedes the right to collect user fees, and thus loses revenue it would have collected if the project had been financed traditionally.

### 3.1 Why is risk allocation important?

All infrastructure projects face risk and uncertainty that affect realised benefits and costs. Many risks associated with the delivery of public infrastructure are similar in nature, if not magnitude and scale, to those confronting private commercial ventures. They include risks surrounding:

- *Construction and operating costs* such as project design, approval processes, delays, maintenance costs, factor costs, regulation impacts and monitoring and enforcement of contracts.
- *Revenue (funding) streams* such as prices and volumes, which in turn are affected by service quality, the availability and price of close substitutes, price regulation (which affects user charges), other regulation, operational risks that can disrupt services and general economic conditions.
- *Financing costs* such as interest rates, exchange rates, and liquidity and refinancing risks, all of which are affected by the broader regulatory and policy environment in which firms operate, as well as general economic conditions and the structure of domestic financial markets.

Risks associated with public infrastructure projects are ultimately borne by government (taxpayers), users and/or private sector investors. The allocation of risks between private parties and governments will be largely determined by the chosen model of private sector involvement (OECD 2007). Where government acts solely as a 'policy setter' and infrastructure is delivered, operated and owned by a private firm subject to regulation, many of the risks (including financing risks) are transferred permanently to the private sector (although governments may still retain some residual risk for continued essential service delivery). Where government acts as a 'provider' many project risks are retained by taxpayers (either directly or through a government trading enterprise (GTE)), although there is scope to transfer specific risks under different contracting models.<sup>14</sup> In principle, partnership models (such as PPPs) offer scope for greater degrees of risk to be assigned to the private partner, although in practice risk assignment may not differ much from simpler contracting models.

A commonly accepted principle is that risks should be allocated to the party best able to manage them. However, putting this broad principle into practice is not straightforward. The World Bank and the OECD provide more specific guidance (see Irwin (2007) and OECD (2007)), arguing that risk should be allocated to:

- *the party best able to control the likelihood of the risk occurring* – for example, the private party might be better placed to minimise construction cost overruns or delays or unnecessarily costly project design because they are in control and have more expertise;
- *the party best able to control the impact of the risk on project outcomes, by assessing and anticipating a risk and responding to it* – for example, while no party can control the risk of an earthquake, a private firm might be more effective in using design techniques to reduce damage should one occur; or

<sup>14</sup> For example, governments may engage the private sector to design and construct an infrastructure asset under a fixed-priced contract where the intention is to transfer construction risk to the private sector and provide the firm with incentives to ensure cost-efficient construction.



- *the party best able to absorb the risk at lowest cost, where the risk cannot be controlled by either party* – the cost of absorbing a risk depends on several factors, including: the extent to which the risk is correlated with the value of the party's other assets and liabilities; the ability to pass the risk on (e.g. to users or third-party insurers); and the nature and risk preferences of the ultimate risk bearers.

Transferring risk to the private sector is not 'free'. Private operators require compensation for assuming risk. An asset's price incorporates the risks associated with the asset's expected net revenue stream. For example, under a PPP with private financing, risks transferred to the private sector will be reflected in a higher price or required rate of return (OECD 2007). A criticism of PPPs has been the magnitude of the 'premium' that public authorities pay relative to the typically lower government borrowing rate to finance public infrastructure projects. Estimates of this differential vary by country and over time, although some sources indicate that the cost of capital can be in the order of 200–300 basis points higher than the government's explicit cost of funds (Yescombe 2007).<sup>15</sup>

The concept of a 'PPP premium' has been refuted by some on the grounds that the government's apparent financing advantage reflects its ability to tax. Taxpayers bear the residual or contingent risks if a project fails to deliver as planned, yet they are not compensated for this risk like private investors would expect to be (Brealey *et al* 1997).<sup>16</sup> Others focus on the scope for the higher cost of capital in a well-designed PPP contract to reflect the 'flip side' of the efficiency or 'value for money' advantage of using a PPP from better private sector management (Engel *et al* 2010). At issue is the size of the additional value, and what share of the improvement accrues to the private partner. This is a crucial issue for consideration in PPP design as naturally each partner has an incentive to seek additional returns without assuming commensurate additional risk. Drawing on empirical evidence, a recent UK Government review of their PPP program (the Private Finance Initiative, or PFI) expressed a general concern that private sector investors had made an unreasonable level of profit relative to the risks they had borne (HM Treasury 2012b; Vecchi, Hellowell and Gatti 2013).

Relevant factors to consider in any 'value for money' assessment of financing options (notably public debt versus private finance) include the return paid to investors, the cost of contingent liabilities to government arising from the exposure to project risk, the transaction costs of the financing arrangement, and the efficiency gains that can be expected from aligning private sector accountabilities with financial exposure to project risks (Chan *et al* 2009). Conducting such an assessment at the project level is not straightforward (Burger and Hawkesworth 2011). Many countries use some form of 'public sector comparator' (PSC) as a quantitative policy tool to assess the expected value for money of a PPP compared with public debt financing (OECD 2008). The PSC analysis includes, among other things, the identification and valuation of the risks retained by government and those transferred to the private partner under the PPP. While PSC analysis is considered a useful tool in many jurisdictions, particularly because of the systematic discipline it can bring to considering different procurement options, its value has been subject to debate (WBI-PPIAF 2012). Identified limitations include: a shortage of relevant data; results being highly

<sup>15</sup> Yescombe (2007) also estimates that the spread between the cost of capital for a PPP and the lender's cost of funds lies in the range of 75–150 basis points.

<sup>16</sup> Further to this, Brealey *et al* (1997) state that taxpayers may arguably bear more risk than shareholders because the latter are protected by limited liability in a way that taxpayers are not.

sensitive to assumptions about the discount rate used and the methodologies used to value risk transfer to the private sector (and, therefore, results potentially being open to manipulation); and that it focuses on financial costs to government rather than comparing the net social benefit of different procurement approaches (Leigland and Shugart 2006; Chan *et al* 2009).

Some studies have measured cost savings arising from PPPs from a broader, multi-project perspective. For a selection of PPP projects in Victoria (Australia), the estimated cost savings ranged from 28 per cent for a wastewater facility at Echuca–Rochester, to 5 per cent for the Spencer Street Station Redevelopment (Fitzgerald 2004). More recent studies based on a broader selection of projects find evidence that PPPs lead to fewer cost overruns and more on-time delivery compared with traditional government procurement.<sup>17</sup>

Others are less convinced about the robustness of whole-of-life cost savings from using PPPs. Drawing on a survey of international evidence, Hodge and Greve (2007) consider that the economic and financial benefits of PPPs are still subject to debate and considerable uncertainty; an OECD study considers the evidence ‘inconclusive’ (Araújo and Sutherland 2010). Other studies point out that a lack of credible data (for reasons including that many projects are still ongoing) has hindered a more systematic and broad-based evaluation of actual whole-of-life cost savings from the use of PPPs (Posner, Ryu and Tkachenko 2009; Hodge 2010; Istrate and Puentes 2011; UK NAO 2011; Willoughby 2013).<sup>18</sup> Whatever view is taken on the evidence of the efficiency benefits thus far, it is clear that the issue of risk management and allocation is central to establishing whether the use of partnership models, such as PPPs, can be expected to deliver net social benefits. Hence, rigorous and transparent assessment of risks and who bears them is vital.

### 3.2 Practical issues to consider with risk management and allocation

Contracting is the central risk allocation tool used in public infrastructure projects. Yet risks are not always easy to identify, measure or contract in a timely fashion (Leruth 2012). Indeed, the challenge of designing contracts may be one factor that explains the relatively low use of PPPs despite the widespread interest in them, and some recent trends in their use (Box C). Recognising that risk assessment is highly sector and project specific, it is nonetheless useful to explore some of the issues and challenges confronting policymakers, particularly in the context of ‘partnership’ models.

<sup>17</sup> An analysis of 54 projects across Australia showed that the average cost overrun from contractual commitment to completion was 1 per cent for PPPs, compared with 15 per cent for traditional procurement. The average completion time, weighted by project value, was 3 per cent ahead of schedule for PPPs, compared with 24 per cent behind schedule for traditional procurement (Allen Consulting Group, Duffield and Raisbeck 2007). A separate analysis of 67 projects across Australia found that PPPs had an average cost escalation of 4 per cent post contract execution, compared with 18 per cent for traditional procurement (Duffield, Raisbeck and Xu 2008). The UK National Audit Office surveyed 114 projects across different economic and social infrastructure sectors between 2003 and 2008. The results indicated that 65 per cent of PFI projects were completed on budget to the contracted price, compared with 54 per cent of non-PFI projects, while 69 per cent of PFI projects were delivered to timetable, compared with 63 per cent of non-PFI projects (UK NAO 2009).

<sup>18</sup> In its 2011 review of the PFI, the UK National Audit Office noted that: ‘There is no clear data to conclude whether the use of PFI has led to demonstrably better or worse value for money than other forms of procurement’ (UK NAO 2011, p 6).

### 3.2.1 Risks change over the life of an infrastructure asset

Risks change as an infrastructure asset passes through the planning, construction, operation and decommissioning phases. This evolution of risks provides important context for thinking about risk allocation and trade-offs between different procurement approaches.

In the planning phase of a project, the risks over the construction, operation and decommissioning phases need to be assessed and allocated. Risks in the construction phase may be generally best managed by the construction firm (Quiggin 2004). The numerous risks associated with sourcing inputs, price fluctuations, quality assurance, occupational health and safety, unforeseen site costs and, to a degree, changes in design are generally part of normal business for construction firms. Under a private financing model, the exposure of the private financier and government partner to construction cost overruns and delays depends largely on the nature and detail of the contract with the construction firms. This trade-off between the contract price and who bears construction cost overruns is relatively straightforward.

A less straightforward, but potentially important, trade-off is between construction costs (how well the facility is designed and built) and operational costs (the cost of operation including maintenance). Internalising this trade-off can provide net savings over the life of the asset. This could be done ‘hands off’ through contracting if the sources of construction and operational risk are observable (and able to be contracted), or more ‘hands on’ if the sources of risk are less easy to observe, there are information asymmetry issues between the procuring parties, and/or external monitoring is more difficult. The ‘bundling’ of the design, construction and operation phases is one of the main efficiency arguments for using a PPP, on the basis that it can encourage the private partner to internalise cost reductions at the operational stage arising from investment at the design/construction stages, leading to lower whole-of-life project costs (Dewatripont and Legros 2005; Yescombe 2007; Maskin and Tirole 2008). In principle, PPPs are expected to work better as a mechanism to internalise this trade-off where the quality of the service can be well specified in a contract by government, whereas the quality of the construction cannot (Hart 2003).

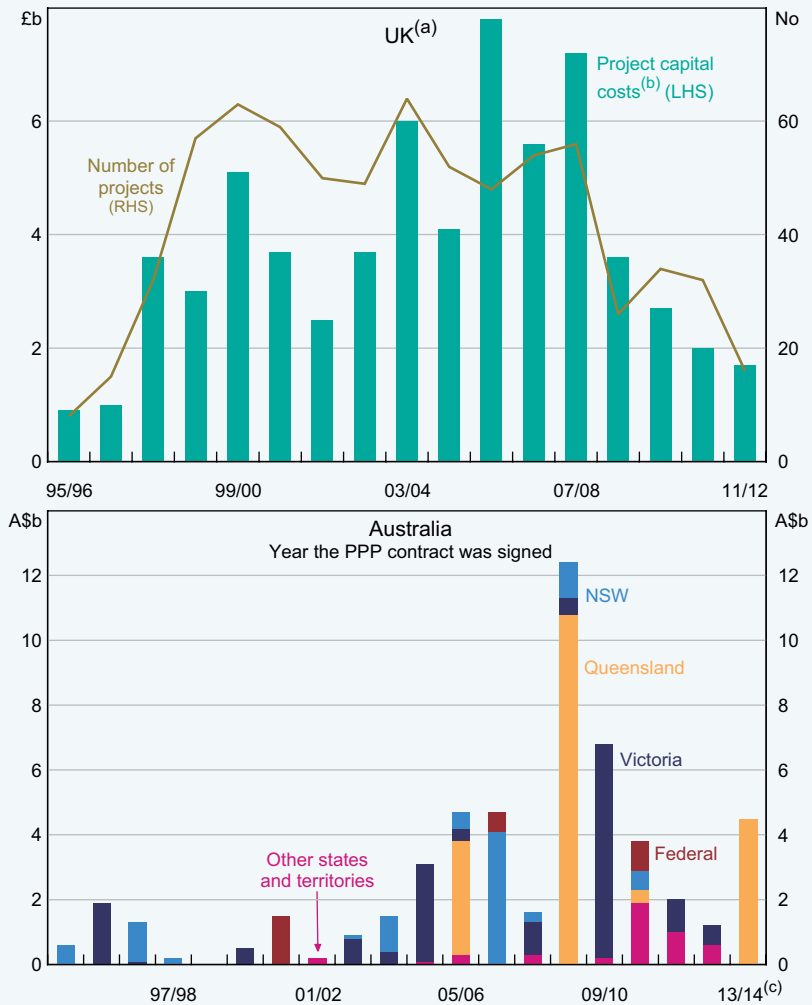
#### Box C: Use of PPPs in the United Kingdom and Australia

Despite their relatively high profile, PPPs have accounted for a relatively modest share of overall investment in infrastructure, even in countries that are considered leading PPP users, such as the United Kingdom and Australia. In the United Kingdom, they have been a ‘small but important’ part of overall government investment in public infrastructure and services (HM Treasury 2012b). In Australia, contract closures for PPP projects have amounted to around 5 per cent of the value of total infrastructure investment since 1995 (Chong and Poole 2013), although the proportion has been as high as 10 per cent in states such as Victoria over the past decade (Partnerships Victoria 2013). Della Croce (2011) estimates that PPPs were used to finance less than 10 per cent of total public infrastructure investment in a sample of OECD countries.

There is also some evidence that PPP transaction volumes and values have declined in some regions in recent years (PwC 2013). This includes countries such as the United Kingdom and

Australia (Figure C1) (Chong and Poole 2013). These trends are likely to have been influenced by a wide range of factors, including more challenging conditions for obtaining long-term debt financing for major infrastructure projects in the aftermath of the global financial crisis, as well as the often lumpy nature of these projects, which means that deal flow is not always consistent.

**Figure C1: The Number and Value of PPPs in the United Kingdom and Australia**



Notes: (a) Projects closed using the UK Government's PFI  
 (b) 2011/12 prices  
 (c) As at February 2014

Sources: HM Treasury; Infrastructure Australia

In the operation phase the trade-off between demand volume and operations cost is usually internalised. That is, the firm operating the facility will trade off the quality of the service and the effect this has on demand with the cost of providing that quality. However, there may be other sources of demand risk that the operating entity cannot manage. For example, it has been suggested that PPPs involving the transfer of demand risk to the private sector are better suited to infrastructure where demand is more stable and predictable (such as port services), and less suited where there is more need to retain service and policy flexibility and responsiveness to service delivery in the future (such as with hospitals) or where technology changes at a faster rate (such as with information and communications technology services) (Araújo and Sutherland 2010).

Regulatory requirements are likely to affect the risks and costs in the decommissioning phase. Clarity about these requirements is ideally sought at the planning phase, but as experiences with nuclear power plants and a range of 'super clean-up' sites has shown, insufficient attention has often been paid in the past to this phase. Whether by design or by default, governments have often ended up bearing these costs, which, had they been internalised, might have changed the way in which an asset was planned, constructed and/or operated. Not all infrastructure assets will have a decommissioning phase, but those that do not are still likely to require major overhauls or upgrades over time. These can be regarded as new investments and the cycle will start over again.

### 3.2.2 Nature and source of risks to the revenue (funding) stream

The risk that forecast revenues do not materialise is a crucial factor in determining the commercial viability of any public infrastructure project (Grimsey and Lewis 2002). Risks to the future revenue stream for an infrastructure project can arise whether it is funded from user charges or government payments. The given mix of funding, along with the degree of volatility over time, will affect the types of financing arrangements that can be applied and the potential efficiency pay-offs.

To date, and perhaps unsurprisingly, economic infrastructure PPPs have been more likely to involve a 'user-pays' structure than social infrastructure PPPs. The levying of tolls, fares or user charges on infrastructure such as roads, bridges, tunnels, ports and airports can provide much of the revenue needed to compensate private investors. In this situation, demand risk is tied to decisions made by a multitude of users, which in turn will be influenced by service quality (largely within the operator's control) and service alternatives available to users. For social infrastructure PPPs related to facilities like schools, hospitals and prisons, revenue flows are largely government determined, and this infrastructure is more likely to have 'availability-based' or other direct payments from government in addition to any use-based payments.

Where user charges are applied, the central question is whether the government or private sector is better placed to manage the associated demand/patronage risk. This requires consideration of the main sources of demand risk. As noted above, demand risk arises from users' choices about using the infrastructure, which are dependent on factors such as price, quality and substitution possibilities. All major infrastructure investments can be subject to policy and regulatory risk, but by their nature public infrastructure projects (even where assets are owned and operated by the private sector) are more likely to be subject to demand risk arising from government decisions. Many assets will be subject to price regulation or regulatory review that may not be fully specified in a PPP contract. Further, as much infrastructure forms part of a network (such as

roads or electricity transmission), or competes with other infrastructure (such as ports or electricity generation), government policy, and regulatory and investment decisions in other areas of the network, or in competing markets, may also affect demand risk.

Consequently, in some circumstances the judgement might be that it would be more efficient for governments to assume patronage/demand risk (Engel *et al* 2010; Maddock 2013). Various funding mechanisms have been used for toll road PPPs where the government has retained demand risk (see Box D).

### Box D: Mechanisms to Reduce Demand/Revenue Risk for Private Partner in Toll Road Projects

**Availability payments:** Government payments are provided if the private partner meets certain quality and availability standards rather than payments being based on utilisation. In Australia, availability payments are being used to deliver the Peninsula Link Freeway PPP project, where the private partner will receive quarterly payments from the Victorian Government in the operating phase based on meeting certain key performance indicators (IFWG 2012). This type of payment mechanism has also been used for toll road projects in Canada, India and the United States (Storr 2009).

**Government guarantees:** Governments might issue traffic forecasts, and provide payments one way or another if traffic growth is different from forecasts (effectively providing a minimum revenue guarantee) (IFWG 2012). This approach has been used for toll roads in Canada, Ireland and Korea (BITRE 2011a). There may be scope to design contracts such that the public and private partners share in the upside if demand/patronage is above that forecast.

**Present-value-of-revenue contracts:** The private partner operates the infrastructure for as long as it takes to earn an amount of revenue agreed upfront in net present value terms. The contract is awarded in a competitive auction process. This model has been used in Chile and Portugal (Engel, Fischer and Galotevic 2011).

**Build-Own-Operate-Privatise:** The government initially uses its own capital by financing and operating a new infrastructure project (such as through borrowing or using the proceeds from privatising brownfield assets), and accepts all demand/patronage risk, but with the intention of introducing private investment and finance once the revenue streams are more certain. Broadly, this appears to be the model being used for Sydney's planned WestConnex toll road (NSW Government 2013a).

However, government assumption of demand risk can create other issues. Where the main funding source of the project is government payments over time (such as through CSOs, promises of availability payments or buyback after a specified period), a private partner may demand compensation for the risk of a change in government policy, especially if it anticipates political and regulatory instability. These types of mechanism may weaken the risk management

intent, and consequently reduce the potential efficiency benefits, of a partnership arrangement where the private operator would otherwise be better able to manage those risks (such as by using more innovative mechanisms to link pricing with consumer preferences and willingness to pay) (EPEC 2011). They can also weaken private sector incentives to encourage utilisation. In circumstances where the use of private financing models can bring greater market discipline or other scrutiny to bear on the initial investment decision, the retention of demand risk by government arguably weakens the private sector's incentives to act as an additional filter for projects with questionable net social benefits and/or patronage forecasts (Chan *et al* 2009).

### 3.2.3 Are risks effectively transferred to the private sector?

The extent of actual risk transfer in a partnership arrangement may not be clear. This might be deliberate where governments seek to conceal the extent of their residual funding obligations. It may reflect information and capability asymmetries or simply the prohibitive costs of contracting for every possible contingency. Whatever the reason, incomplete contracts may mean that governments retain a residual obligation to step in to ensure a project does not fail, contracts may need to be renegotiated, or clauses in the original contract may limit actual risk transfer and/or create other risks for taxpayers (Quiggin 2005; Connolly and Wall 2013).

There are examples where, despite the apparent transfer of risk in a contract, the government has subsequently intervened to provide extra financial support or guarantees in PPP projects. For example, in the United Kingdom, the three London underground PPPs signed in 2003 ran into financial difficulties that led to the government providing additional unanticipated financial support (Shaoul, Stafford and Stapleton 2012). In Australia, the NSW Government provided conditional deferred equity of A\$175 million to the Waratah Train PPP project to overcome concerns regarding the private partner's ability to refinance its debt in 2018 (Hayford 2013).

The renegotiation of PPP contracts may sometimes undermine the original risk allocation model. Contract renegotiations are not unusual; Iossa and Martimort (2012) report that renegotiations occurred in 33 per cent of PFI projects signed by central UK government departments between 2004 and 2006, equivalent to 17 per cent of the value of the project on average. This can be particularly problematic for a government in a weak negotiating position, because it has a strong interest in maintaining service continuity and avoiding breaking the contract. Based on a sample of 50 PPP concessions awarded in Chile between 1993 and 2006, total investment increased by nearly one-third as a result of renegotiations, 84 per cent of which were payments for 'additional works' not specified in the original contract (Engel *et al* 2010). In the United States, 6 out of 20 projects surveyed by Engel *et al* (2011) underwent major change in the initial contractual agreements favouring the concessionaire.

There are other examples where contracts contained clauses that mitigated the actual extent of risk transfer to the private partner, and created contingent risks for taxpayers. For example, in the case of the Fergatus suburban passenger rail in Portugal, despite the initial contract formally transferring demand risk to the concessionaire, the government was required to assume the debt if traffic remained below the lower traffic-band level for several years (Araújo and Sutherland 2010).<sup>19</sup>

<sup>19</sup> The Portuguese Court of Auditors now recommends against transferring demand risk to the private sector (Araújo and Sutherland 2010).

Early PPP toll road projects in Australia (such as Citylink, M2 and the Eastern Distributor) contained 'materially adverse effect' clauses, which allowed the private partner to delay the payment of concession fees if certain returns were not made (Brown 2005; Chan *et al* 2009).

Contract clauses may also inappropriately constrain future policy choices. Engel *et al* (2011) provide the cautionary example of a PPP contract for tolled express lanes in the United States that were added to an existing highway (Orange County SR91), which included a 'no compete' clause preventing the upgrade of the other existing lanes. Once it became apparent that expansion of the road was necessary to deal with increasing congestion on the non-tolled elements of the road system, the government was forced to purchase back the infrastructure at a very high price.

Risks have been more successfully transferred in other contracts, in some cases resulting in significant losses for private investors. For example, the very large Channel Tunnel project saw full transfer of risks to the private sector, which subsequently made substantial losses following a financial restructure (Eurotunnel Group 2008). (Of course, transfer of risks to the private sector does not of itself ensure that the project is socially beneficial and may simply redistribute losses.) As another example, while overly optimistic patronage forecasts have been a common feature of many toll road PPPs in a range of countries, recent experience in Australia (such as the Cross City and Lane Cove Tunnels in Sydney, and the Clem 7 and Brisbane Airport link in Brisbane) has been that patronage risks were effectively transferred to private investors that incurred significant losses from miscalculating traffic forecasts (Hayford 2013).<sup>20</sup> The poor financial performance of recent Australian toll road projects has reduced the appetite of some private sector investors to take demand risk in future PPP-type projects for greenfield infrastructure in Australia (Hayford 2013; DIRD 2013).

### 3.2.4 Transaction costs

The long-term nature of partnership contracts with the private sector and the use of private finance means they are often more complex to negotiate, have longer lead times than more traditional procurement contracts and involve higher transaction costs for both government and private parties (Araújo and Sutherland 2010; RICS 2013). This includes transaction costs associated with searching for and negotiating with bidders and managing the contracts into the future (Vecchi *et al* 2013). Higher transaction costs are eventually either borne by taxpayers or reflected in higher user charges.

Some studies estimate that the transaction costs associated with PPPs are in the range of 7–10 per cent of a project's capital value (Araújo and Sutherland 2010; Engel *et al* 2010; Willoughby 2013). Dudkin and Väilä (2005) find, based on a sample of 55 PFI projects in the United Kingdom, that the combined pre-contractual transaction costs for the public sector and winning bidder were on average 7 per cent of the total capital value of the project (split approximately equally between these parties). There is also the issue that all those participating in the bidding process face bidding costs that will not necessarily be recouped. Evidence provided to a recent inquiry in Australia

<sup>20</sup> In a review of global traffic forecasts for toll roads, BITRE (2011b) finds that there was an asymmetric pattern of forecasting errors between toll and non-toll roads, with consistent overestimation of demand for toll roads. Based on a sample of 14 Australian toll road projects, Li and Hensher (2010) estimate that actual traffic volumes were 45 per cent below forecast levels. Bain and Polakovic (2005) find evidence of an average optimism bias of 20–30 per cent in year one traffic forecasts from 104 international toll road studies.



into infrastructure financing found that PPP 'bid costs' were in the order of A\$2–3 million for a A\$250 million project and A\$5–6 million for a A\$1 billion project (KPMG 2010; IFWG 2012).<sup>21</sup> PPPs can also take time to negotiate. On average, negotiations have taken 14–18 months in Canada, 17 months in Australia and up to 35 months in the United Kingdom (HM Treasury 2012b; Iossa and Martimort 2012; RICS 2013).

High transaction or bidding costs for the establishment of a PPP may act as a barrier to entry and diminish competition in the bidding process. Dunleavy and Carrera (2013) note that the PFI in the United Kingdom increased procurement costs substantially and produced an oligopolistic market for most major projects, with very few bids per contract even in the supposedly competitive construction sector. The UK National Audit Office (UK NAO 2007) find that for PFI projects between 2004 and 2006, 30 per cent of the projects received only two bids, 50 per cent three bids and 20 per cent four bids. Hellowell and Vecchi (2013) find a consistent pattern of excess profitability for primary equity investors in the UK PFI market and attribute this to a lack of competition, which is particularly an issue in the exclusive bidder phase.

The public sector's capability to negotiate, contract, monitor and enforce PPP contracts also affects costs. As noted by Reeves (2013), PPPs require an active commitment by government to monitoring, supervision, performance measurement and relationship management for the life of the contract. Consequently, effective contract management requires an adequate stock of public sector skills. Again, the need for appropriate institutions, transparent and open processes, and public sector capability and incentive alignment arises. Over one half of OECD countries report the existence of a dedicated PPP unit of some kind (OECD 2010). A capability gap has also been recognised as an important issue for emerging countries (APEC 2013).<sup>22</sup> However, concerns remain that a lack of commercial skills in the public sector to match those of the private sector puts governments at a disadvantage in the negotiation and management of contracts (UK NAO 2011).

#### 4. Infrastructure Financing: Options and Policy Issues

There are a number of factors specifically related to financing decisions that can affect the relative costs of private participation and public procurement. Public financing for upfront construction costs of a project can be provided through several channels. These include government debt issuance, higher taxes, a reallocation of government spending from other areas of the budget, the proceeds of privatisations and/or through the off-balance sheet activities of GTEs. These options have different trade-offs in terms of transparency, accountability, cost and incentives for efficiency in the underlying project. For partnership arrangements, the cost of private capital will depend on the cost and availability of equity investment, bank lending and bond issuance. As different types of private investors are willing to take on different types of risks, risk allocation is a crucial factor in determining the pool of willing investors. Finally, in the case that a market failure is deemed to exist in the provision of private infrastructure financing, then a final option is for the government to invest alongside private parties through vehicles such as national development banks or pooled investment funds.

<sup>21</sup> A caveat for this figure is that bid costs in Australia were found to be between 25 and 45 per cent higher than in a comparable overseas market such as Canada, though lower than in the United Kingdom (KPMG 2010; IFWG 2012).

<sup>22</sup> A key outcome of the September 2013 APEC Finance Ministers meeting was a commitment to establish an APEC PPP Experts Advisory Panel to enhance infrastructure development in this region, and ongoing support for a pilot PPP centre within the Indonesian Ministry of Finance.

## 4.1 Public financing options

General budget appropriations are the most common form of government financing, which in turn can be financed through the issuance of general-purpose or specific-purpose government debt, higher taxes or a reallocation of government spending from other areas of the budget. Alternatives to generate capital include 'capital recycling', where existing government infrastructure assets are privatised and the funds raised are used to finance new infrastructure projects, and off-budget financing by GTEs.

The most efficient choice will be determined by myriad factors, including the characteristics of the project in question, the level of government (federal, state or local) responsible for the project, prevailing fiscal constraints (including the level of government debt) and the potential pool of assets available for privatisation. It is important that public financing is transparent so that the government is held accountable for their financing decision. Box E examines trends in the public financing of infrastructure in Australia over the past two decades.

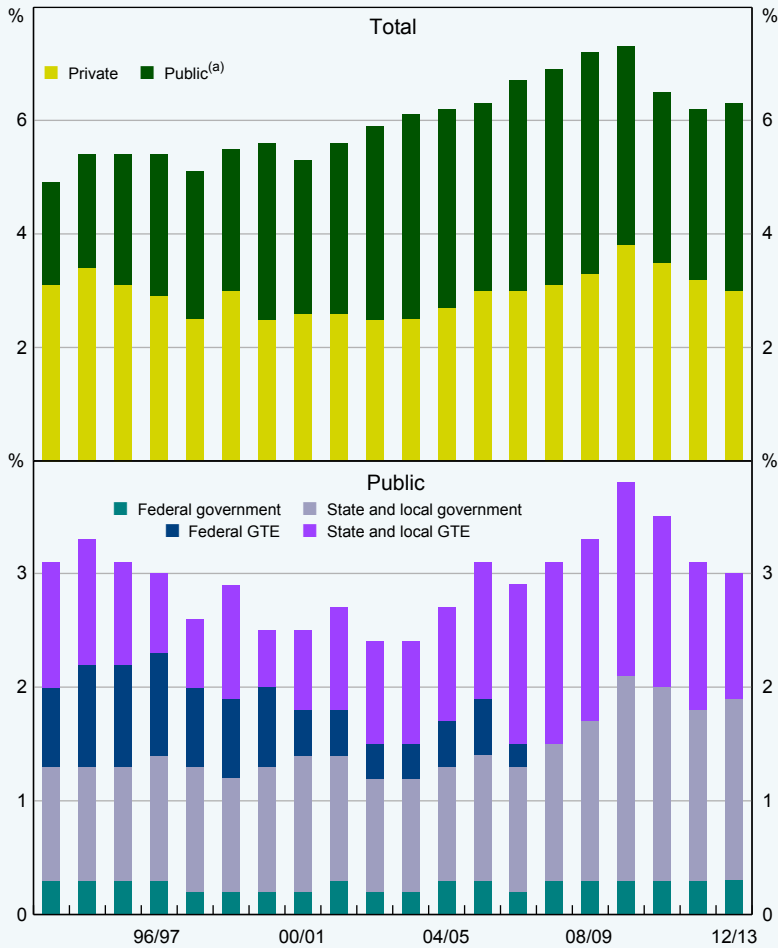
### Box E: Trends in Infrastructure Financing in Australia over the Past Two Decades

The most striking change in public infrastructure investment in Australia over the past two decades has been the large-scale privatisation of state and federal GTEs, such as Telstra and Qantas, from the mid 1990s. These privatisations often followed a period of 'corporatisation', where GTEs were required to achieve certain commercial benchmarks and operate under competitive neutrality (RBA 1997).

In Australia, total private and public infrastructure investment has averaged around 6 per cent of GDP over the past two decades, with the share of fully public financing declining to around 50 per cent from more than 60 per cent in the early 1990s (Figure E1) (Chong and Poole 2013).<sup>1</sup> State and local governments, either directly or through GTEs, now account for almost all direct public infrastructure investment in Australia. The relatively low amount of direct federal government infrastructure investment is concentrated in the education and healthcare sectors. However, it should be noted that a large portion of state government funding for infrastructure projects comes from federal transfer payments, including payments to assist in financing specific infrastructure investments through programs such as the Roads to Recovery program. For example, federal grants provided almost 13 per cent of financing for public infrastructure projects in New South Wales in 2012/13 (NSW Government 2013b).

<sup>1</sup> This is likely to overstate the amount spent on infrastructure relative to GDP. The fixed asset investment data from which this measure of infrastructure investment is derived include some items that are excluded from national accounts aggregates, such as transfers of existing structures.

**Figure E1: Infrastructure Investment in Australia**  
Per cent of GDP



Notes: Includes gross fixed capital formation in: transport; communications; education; health care; electricity, gas, water & waste services; and postal & warehousing services

(a) Includes GTEs

Source: ABS Cat No 5206.0

### 4.1.1 Budget appropriations – taxes now or government debt issuance now (and taxes later)

An important advantage of using general budget appropriations over other types of public financing is greater transparency and accountability, which should improve the quality of decision-making (Chan *et al* 2009). Regardless of whether tax revenue or debt is used to finance general budget appropriations for infrastructure projects, the legislative process helps ensure that capital spending is scrutinised and open to public view.

The debate over whether to finance infrastructure investments using government debt or taxes is a long-running one, reflecting the broader debate on debt and deficits in the public finance literature. The government faces an intertemporal budget constraint, meaning that an increase in government spending in the current period must be financed either by increasing taxes by an equivalent amount in the current period, or by issuing debt, which must be repaid by higher taxes in the future. Most economists agree that the decision of whether to use tax or debt will have different effects on private consumption and investment (Elmendorf and Mankiw 1999).<sup>23</sup> Whether debt or tax financing for public infrastructure is optimal depends on a number of factors, including the expected economic impact of the infrastructure project, intergenerational considerations, political-institutional factors, the existing capital stock and capital market imperfections (Feldstein 1985; Aschauer 1989a). Consequently, this decision will differ across infrastructure projects, countries and time.

At the project level, a common argument in favour of debt financing over tax financing for infrastructure projects is one of intergenerational equity. Infrastructure is a capital rather than a consumption good, meaning that well-selected economic (and some social) infrastructure projects should result in higher incomes in the future. Debt financing shifts the burden of paying for the infrastructure from current taxpayers, who (at the extreme) receive no current benefit from the project, to those future taxpayers who will. The 'golden rule' of public sector borrowing used in the United Kingdom between 1998 and 2009, that over the economic cycle the government should only borrow to invest and not to fund current spending, is based on this 'user pays' principle.<sup>24</sup> Of course, intergenerational equity issues will be less problematic where the infrastructure project leads to relatively immediate benefits to taxpayers, for example intelligent traffic systems.

At the country level, political-institutional factors can have a significant influence on whether debt or tax financing for infrastructure is preferred by voters and politicians. Political economy theory suggests that countries with more fragmented coalitions, polarised political parties and politicians with geographically dispersed interests have greater difficulty in achieving balanced budgets (Alesina and Perotti 1994). Therefore, countries with these political features would presumably be better served from the point of view of the voters through tax financing in order to prevent running up large government debts. However, from the point of view of politicians interested in being re-elected, 'fiscal illusion' can provide strong motivations for debt financing. Fiscal illusion argues that voters are systematically biased towards overestimating the benefits of current expenditure and underestimating the impact on the future tax burden, meaning that politicians do not get sufficiently punished by voters for increasing fiscal deficits (and debt) (Buchanan and Wagner 1977). The use of budgetary frameworks such as balanced budget rules are often promoted as tools to overcome the political barriers and better align the interests of politicians and voters; however, their success in practice has been mixed (IMF 2009).

Finally, across time, the current level of government debt can be a practical constraint on a government's ability to increase debt further for infrastructure financing. This is the situation

23 In contrast, proponents of Ricardian equivalence combine the government budget constraint and the permanent income hypothesis to argue that the private sector rationally perceives a budget deficit (higher debt) today as leading to higher taxes in the future and as a result they will not change their consumption decisions in the current period in the face of a change in the fiscal mix (Barro 1974). However, Ricardian equivalence has not been supported empirically (Elmendorf and Mankiw 1999).

24 Two significant problems in implementing these types of rules in practice are defining what period constitutes an economic cycle and what can be counted as capital spending (Emmerson, Frayne and Love 2001).

that many governments, particularly in advanced countries, consider themselves to be in at the moment. A government's ability to issue debt at the prevailing market interest rate is constrained by investors' perceptions of the impact of additional lending on the sustainability of the stock of government debt. While a well-selected debt-financed infrastructure project should boost productive capacity in the future, investors may be concerned about higher levels of debt constraining the government's ability to respond to adverse macroeconomic shocks in the near term. Factors such as the current level of government debt, a country's credit rating, the strength of the country's infrastructure selection and macroeconomic policy frameworks, and prevailing global conditions will be important factors (among others) in determining the impact of additional government borrowing on investors' risk perceptions and, therefore, the pricing of government debt.

#### 4.1.2 Off-balance sheet financing by GTEs

GTEs are legally independent entities, at least partially owned and overseen by the government, that charge fees for the goods and services they provide. GTEs are commonly used to provide services in sectors with monopolistic or public good characteristics where user charges can provide the bulk of revenue, such as utilities and public transport networks. Infrastructure projects undertaken by GTEs may or may not be subject to the scrutiny of the budget appropriations process depending on how they are being financed.

GTEs can finance their infrastructure investments through retained earnings, government capital injections, bond issuance or borrowing from banks (although these latter two are often constrained by governments). The capacity of a GTE to finance investments using retained earnings is also dependent on government policies regarding dividend payments and pricing. A capital contribution will be subject to budget appropriation and so is potentially subject to more scrutiny. Depending on the jurisdiction, debt issuance can be tied to financing a particular project (specific-purpose borrowing), issued directly by the GTE, or issued indirectly as part of general government borrowing.<sup>25</sup>

Two related concerns with GTEs in practice are that they may be inefficient and a source of contingent liabilities for governments. In the absence of the profit-maximisation incentives provided by the market, principal-agent problems between the government and the managers of the GTE can result in inefficient capital management (Shapiro and Willig 1990; PC 2008a). Conflicting policy objectives, regulatory error and an inability for the government to distinguish between policy-induced losses and operational losses can also contribute to inefficiencies. These concerns can be mitigated to some extent with transparent external evaluation, strong governance processes and independent regulators, or even privatisation in the presence of strong policy and regulatory frameworks (Kikeri and Nellis 2004; Bortolotti and Perotti 2007). For example, in Australia, GTEs in principle are required to operate on a commercial basis, with funding for non-commercial activities explicitly identified and accounted for by governments, and are subject to the same tax rates on profits as private businesses.

<sup>25</sup> Specific-purpose bonds are repaid using the income generated by the infrastructure project (either user charges or government payments). They are commonly used in Canada and the United States where they are referred to as revenue bonds, but they have been phased out in Australia. Proponents of specific-purpose bonds argue that they impose market discipline on a project; opponents argue that they encourage rent-seeking behaviour (as they often give special tax treatment) and are a more costly way of raising finance than general government debt (Chan *et al* 2009).

### 4.1.3 Privatisations and ‘capital recycling’

‘Capital recycling’, where the proceeds from the sale of a commercially viable infrastructure asset are used to fully or partially finance a new investment project, provides governments with an alternative to financing infrastructure through taxation revenue or debt issuance. Of course, government revenue and debt is fungible so this is technically equivalent to the privatisation proceeds being used to reduce government debt. However, explicitly linking the two projects is considered by some as a useful political tool for reducing community resistance to privatisation of the infrastructure asset. A recent example of capital recycling in Australia is the tying of the proceeds from the long-term leases of Port Botany and Port Kembla to financing for several infrastructure projects in New South Wales, including the WestConnex motorway (O’Farrell 2013). The WestConnex project is also planned to involve a second form of capital recycling, whereby the government will provide equity financing for the first phase of the project, but private sector capital will be raised against toll revenue once the first phase becomes operational to finance the construction of subsequent phases (NSW Government 2013a).

From a risk allocation perspective, both these forms of capital recycling have the government taking on the bulk of the risks in the greenfield phase of the infrastructure asset, with the private sector providing finance in the brownfield phase. Conservative investors, such as pension funds, are often more willing to invest in brownfield assets than greenfield projects, as they are not exposed to construction risk and demand risk is lower once the asset has been in operation for a period of time. Investor reticence may be more of an issue in ‘thin’ markets for infrastructure, in particular where the scope for diversification of greenfield investment is limited, and where greenfield investments are a relatively large share of the available portfolio.

The amount of funds that can be raised through privatisation is restricted by the value of publicly owned infrastructure assets that are presently ‘suitable’ for privatisation. There may be a wide variety of motivations for governments to pursue privatisation, including that private ownership can raise the internal efficiency of government-owned businesses through aligning the incentives of managers towards profit maximisation.<sup>26</sup> On the other hand, a private provider brings the risk of inefficiency arising from abuse of market power and thus the scope for and costs of regulating market power must also be considered. Privatisation changes the nature of the principal-agent problem as it introduces an information barrier between the government, regulators and the privatised entity, meaning that the regulatory framework must be carefully designed to take this into account and incentivise the optimal behaviour (Shapiro and Willig 1990; Vickers and Yarrow 1991). Regulatory incentives will also have implications for the ownership structure, including leverage and the type of owners (Helm and Tindall 2009). Welfare studies of privatisations in a range of countries have found that the gains from privatisations are greatest and distributed more evenly across stakeholders when combined with effective competition and regulatory frameworks (Kikeri and Nellis 2004).

Moreover, the proceeds of privatisations ideally should be allocated to maximise their social value, which may or may not involve reinvestment in a public infrastructure project. Linking

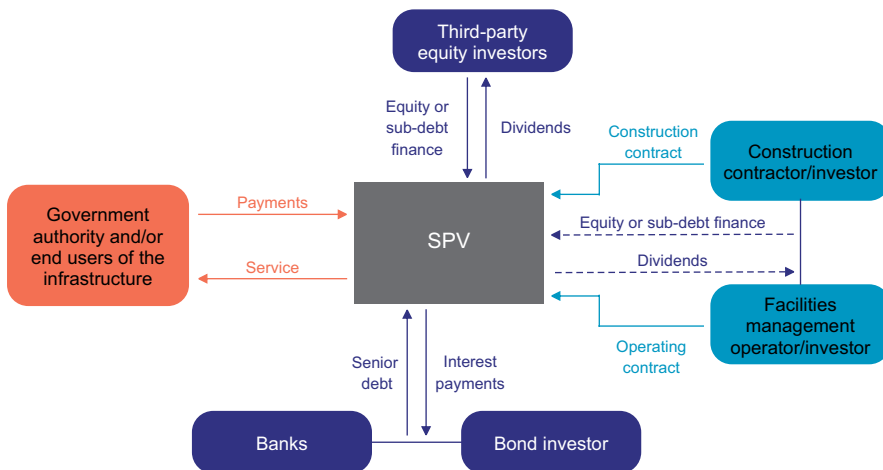
<sup>26</sup> Based on a sample of Mexican non-financial firms privatised between 1983 and 1991, La Porta and López-de-Silanes (1999) find a 24 percentage point increase in the operating income-to-sales ratio after privatisation, of which 5 per cent is explained by higher prices, 31 per cent is explained by transfers from laid-off workers and the remainder is the result of productivity improvements.

proceeds to new infrastructure is essentially a form of hypothecation that limits the options for using funds, though the practical implications of this may be negligible where there are many socially worthwhile infrastructure projects. Nevertheless, the need for infrastructure proposals to be subject to a robust and independent cost-benefit analysis remains.

## 4.2 Private financing of public infrastructure

Private financing of public infrastructure is most commonly associated with PPPs.<sup>27</sup> The financing cost of a PPP will depend on the mix and relative cost of the debt and equity financing, which (as discussed in Section 3) will in turn depend on the risk characteristics of the PPP project and the composition and risk appetite of investors. The core financing structure at the greenfield stage is very similar across a variety of PPP models (Figure 1). Typically, a non-recourse special purpose vehicle (SPV) is created that protects investors against losses greater than the amount they invested in the project. Senior debt financing is sourced from banks and the capital market in exchange for fixed interest payments. Equity financing is typically at least partially provided by the construction company (which may also hold subordinated debt), but may also come from third-party investors such as large pension or superannuation funds. Equity investors are rewarded through dividend payments and any capital gains made upon the sale of their equity stake. Projects with government-contracted service payments, such as schools and hospitals, generally have higher leverage (ratio of debt to equity) than projects that are funded through user charges, as the more certain revenue streams suit the regular servicing of debt.

**Figure 1: Typical Project Company Financing Structure**



Source: Adapted from UK NAO (2012, p 13)

The ability to sell both debt and equity stakes in the secondary market means that the leverage and composition of investors may change in response to the changing risks over the life of the PPP project. For example, once the construction phase is complete and construction risk is removed

<sup>27</sup> Another form of private financing is investment in the listed equity and debt of privatised public infrastructure companies.

from the project, the construction contractor may wish to sell their equity stake to realise any profits and enable them to finance construction in another project. Further, debt financing from banks may be refinanced through long-term bond issuance to investors. A little-explored question in the literature is whether the ability for private parties involved in the construction or early operation phases of the asset to sell their stakes to secondary investors creates perverse incentives at the bidding stage or undermines the 'bundling' efficiency advantages of PPPs over public procurement. In the presence of imperfect information, the incentives for parties responsible for construction and maintenance to minimise costs over the lifetime of the project are likely to be weaker when they can pass on their financial exposure to another investor at an early stage of the project's life.

#### 4.2.1 Debt financing – bank lending and bond issuance

Bank financing is the dominant source of debt financing for PPPs in most countries (EPEC 2010; Inderst 2013). However, deleveraging by banks following the financial crisis and greater investment in infrastructure by pension funds has seen bond financing increasingly being discussed as an alternative debt financing source (PwC 2013). The key advantage of bond over bank financing is lower refinancing risk, as bond issuances typically have longer tenors than bank loans. However, there are a number of drawbacks with bond financing relative to borrowing from banks, particularly in the greenfield phase of a PPP, that need to be considered when comparing the relative cost of bank and bond financing, including (Yescombe 2007; EPEC 2010, 2012):

- Uncertainty of tenor and pricing prior to the completion of the bond underwriting process.
- Greater difficulty in coordinating bondholders relative to banks to monitor the project and make any required decisions.
- Higher prepayment penalties and fixed preparatory costs of issuance, such as attaining a credit rating.
- Higher interest costs as, during the construction phase, bank interest is only charged on funds that have been drawn to date (plus a commitment fee), while bond funds are drawn all at once and can generally only be reinvested at a lower interest rate until needed. This 'negative arbitrage' means that more debt needs to be issued under a bond issue than a bank loan for a project with the same construction costs.
- Attracting sufficient demand from institutional investors, for which the bond is likely to require a credit rating of at least A- (EPEC 2012). Because 'typical' project finance structures deliver lower credit ratings than this, the senior debt may need to be 'enhanced' through either a credit guarantee or debt tranching. The difficulties experienced by monoline insurers during the financial crisis mean that, in some jurisdictions, a government partner or a supranational body, such as a development bank, may provide credit guarantees or enhancements on debt in exchange for a fee.

These drawbacks mean that bond financing is likely to be a more attractive financing option during the brownfield phase of an infrastructure project, particularly for projects seeking to attract risk-averse institutional investors. In this sense, bank and bond financing may increasingly play a complementary role in infrastructure financing. Banks, which typically prefer to lend for shorter tenors, can finance the construction phase of the project where the monitoring needs and risks



are higher, with these loans subsequently being refinanced through long-dated bond issuance to institutional investors once the project becomes operational.

A final consideration is that the domestic capital market may not be developed enough in terms of depth or liquidity to make domestic project bond issuance an attractive alternative to bank financing. Prerequisites for bond financing to be a viable alternative include an available pool of investment capital outside the banking system, sufficiently strong governance and legal framework for project bonds, and balanced tax treatment for bank debt and bonds (PwC 2013).<sup>28</sup> In the case that conditions in the domestic capital market are not attractive, the project company may need to turn to offshore bond markets, such as the private placement market in the United States.

#### 4.2.2 Equity financing by institutional investors

If they have any asset allocation to infrastructure at all, institutional investors, such as pension funds, have historically favoured indirect equity investments in brownfield infrastructure through infrastructure funds (Prequin 2012; Inderst 2013; OECD 2013a). These types of investments allow institutional investors to overcome scale issues, outsource decisions such as which specific infrastructure projects to invest in, and avoid involvement in day-to-day management issues that they are unlikely to have the in-house capacity to make, while maintaining the key attractions of infrastructure investments. These include the long life of infrastructure assets being a better duration match for pension fund liabilities and the potential for assets with payments linked to inflation to act as an inflation hedge (Della Croce 2011). However, the fees charged by external fund managers erode returns.

A more recent development has been the direct involvement of several large (predominantly Australian and Canadian) pension funds in the equity financing of brownfield, and occasionally even greenfield, infrastructure projects (Inderst and Della Croce 2013). These funds have made the decision that devoting resources towards building up in-house teams capable of analysing and bidding on complex infrastructure deals provides better value for money than paying fees to external managers. There are also cases of pension funds pooling their resources to establish investment platforms or funds capable of directly investing in infrastructure. An example of this in Australia is IFM Investors (formerly Industry Funds Management), which is wholly owned by 30 Australian industry superannuation funds and has two open-ended infrastructure funds that invest primarily in brownfield infrastructure assets in advanced countries. However, direct investment currently remains out of reach of most pension funds – of the 1 650 active infrastructure investors monitored by Prequin (2012), only 29 per cent were expecting to make new direct infrastructure investments over the next year, compared with 91 per cent looking to make new investments in unlisted funds.

While pension funds are often held up as a large potential source of private infrastructure financing, in many countries a range of factors may inhibit a rapid increase in infrastructure investment by pension funds. These include structural factors, such as a lack of appropriate financing vehicles, liquidity requirements of prudential regulators, limited expertise, regulatory disincentives and a lack of information on risk and returns, as well as more cautious investment strategies favouring

<sup>28</sup> PricewaterhouseCoopers has identified Australia, Benelux, Canada, France, Germany, Latin America, Mexico, the United Kingdom, and the United States as being regions and countries where the market conditions are largely in place for an infrastructure bond market to be operational.

fixed income following the financial crisis (World Bank 2013). These impediments could help explain the OECD finding that infrastructure investments only accounted for 0.9 per cent of total assets under management on average across large pension funds in 2012 (US\$72.1 billion in total), as well as the significant differences observed in levels of investment across countries (OECD 2013a).

Where some have argued that this is a 'policy problem', various options have been raised to address some of these impediments. These include improving information availability and transparency (for examples, see OECD (2013c)), and establishing a clear pipeline for future infrastructure projects to encourage pension funds to devote the internal resources required to build up capacity in analysing investment projects in a particular country or sector (IFWG 2012). However, in some circumstances pension funds may be fundamentally unsuited to taking on a number of the risks associated with greenfield infrastructure projects – construction, demand and regulatory risks in particular – and, therefore, such reforms may have little impact in the absence of financing arrangements or instruments that can shift these risks onto other parties.

### 4.3 Government financial assistance

A final way that the government has acted as a partner in infrastructure investment is through providing financing assistance in the form of loans, guarantees and/or equity injections. A common channel for this assistance, particularly in developing countries, is through the creation of sub-national or national development banks (NDBs) that target financial support to infrastructure projects. A more recent innovation is for the government or NDB to contribute capital towards a pooled infrastructure investment fund, with the aim of encouraging private investors, such as pension funds, that would not have been willing to invest without the government having 'skin in the game'. As with other models, government co-financing brings its own set of risks.

#### 4.3.1 National development (or infrastructure) banks

Many countries have NDBs that aim to provide credit to sectors of the economy that the government has judged to have been underserved by private financial institutions (ideally from a net social benefit perspective). NDBs can provide credit directly to the borrower (tier 1) or indirectly through private financial intermediaries (tier 2), using a variety of products, including loans (at market or concessional rates), guarantees and equity investments. Conditions are generally attached to the provision of funds to financial institutions from tier 2 NDBs. For example, these funds must be on-lent to a certain sector (such as infrastructure or small and medium enterprises) or for a specific purpose (such as trade financing).

There are two rationales for why NDBs might be relevant for infrastructure financing (Smallridge and de Ollolqui 2011). First, and most commonly, NDBs are sometimes justified by governments or others on the grounds of filling a market 'gap' that has arisen because the private sector is unwilling or unable to accept certain risks or faces prohibitively high transaction costs. However, it should also be noted that the presence of a market gap is a necessary, but not sufficient, justification for NDB involvement – total (indirect and direct) benefits still need to exceed the cost to the government. Moreover, from an economic perspective, the case for government involvement is more appropriately based on the existence of a market failure, and even this needs to be weighed

against any costs of government intervention. Second, through the use of risk-sharing instruments, NDBs are often seen to be justified on the grounds of being able to ‘catalyse’ private financing in a particular sector or play a countercyclical financing role during times of heightened risk aversion. Like GTEs, NDBs have a funding advantage over private financial institutions in that, aside from the initial government capital injection, they are also supported by an implicit or explicit government guarantee and so are able to issue debt at a lower cost than commercial banks.

Regardless of the justification used, the performance of NDBs as measured against outreach to their target sector(s) and financial sustainability has generally been judged as disappointing (Yaron 2004; Rudolph 2010; Smallridge and de Olloqui 2011). A common weakness identified with poorly performing NDBs is the lack of a clear mandate and governance framework, with the resulting problems of political interference in lending decisions, poor transparency, a lack of managerial skills and incentives, conflicting and/or multiple policy objectives, and crowding out of private financing. To combat these problems, an NDB should, at the very least, have defined target sectors that address identified market failures, play a complementary role to private financial institutions and have a specified minimum rate of return on capital to ensure financial sustainability (Rudolph 2010). While NDBs are generally not profit maximisers due to their public policy mandates, ensuring that they are financially sustainable is essential to avoid the NDB being a continual drain on the government’s budgetary resources. Further, they are not necessarily a solution to other structural problems in the financial markets that may be better addressed by promoting a healthy and competitive financial system.

### 4.3.2 Official involvement in pooled infrastructure funds

Official involvement in pooled infrastructure funds is becoming an increasingly popular form of support for private financing in infrastructure. Recent examples of initiatives launched by multilateral development banks (MDBs) include the ASEAN Infrastructure Fund (AIF) and the US\$1.2 billion IFC Global Infrastructure Fund. National initiatives include Macquarie’s Mexican Infrastructure Fund and the UK’s Pensions Infrastructure Platform.<sup>29</sup> Given that these funds are only in their infancy, it is not possible to evaluate their impact on private infrastructure financing, but a significant question surrounds the degree to which they could be crowding out other sources of private financing.

Pooled infrastructure funds seek to tap into private sources of infrastructure financing through governments, NDBs and/or MDBs co-investing alongside private investors in an infrastructure fund targeted towards a particular sector, country or region. The purported attractions for private investors, and particularly institutional investors, of these types of pooled funds include gaining access to the project selection and management expertise of the fund manager/sponsor, as well as a perceived reduction in the political risks associated with the infrastructure investments (OECD 2013b). The involvement of MDBs in pooled funds targeting infrastructure investment, particularly in developing countries, is viewed as reducing the likelihood of the government making changes to regulations that threaten the financial viability of the investments.

The key barrier to these types of funds being successful in increasing private financing for infrastructure has been a mismatch between the type of infrastructure projects that these pooled infrastructure funds are targeting and the type demanded by investors. As previously

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<sup>29</sup> For further information on these initiatives, see Macquarie Group (2010), ADB (2011), HM Treasury (2012a) and IFC (2013).

discussed, institutional investors are risk averse and tend to prefer brownfield assets in developed countries, not the greenfield projects in emerging market countries that these pooled funds are often targeting. Therefore, in order to attract institutional investors into pooled funds targeting investments in developing countries, the official sponsor may have to take on a significant amount of risk themselves, or choose only highly creditworthy projects that would have received private financing regardless. As such, the pooled fund may merely crowd out private financing rather than increasing it. Fund structures created by the official sector can also contain unattractive features for private investors, including high fees and a complicated legal structure.

## 5. Concluding Remarks

This paper sets out threshold issues for governments making decisions about public infrastructure investment. A crucial point is that financing decisions must follow the investment decision, acknowledging that at times risk assignment resulting from the financing arrangements may influence the net benefit of the project.

Rigorous and transparent project selection and planning processes are essential to ensuring the efficient use of scarce public and private resources. Once it has been determined that a project warrants prioritisation, attention can turn to how it should be delivered and the optimal role for government (policy setter, purchaser of services, provider or partner). A key decision with significant implications for the subsequent delivery model, and hence financing decision, will be whether the project is to be funded through user (or other beneficiary) charges or government payments (taxation).

The choice of financing options must be guided by the benefits that private sector participation can bring, not as a source of finance *per se*, but in terms of expertise to manage risks and reduce the costs associated with infrastructure investment. Indeed, unless PPPs deliver real efficiency benefits, or somehow affect the ability of the project to generate revenues efficiently from user charges and thus reduce the need for public funds, they can only change the timing of government funding of the infrastructure (and revenue raising) and the composition of financing. Allocating risks to the party best able to manage them is crucial for realising efficiency benefits, and should be done transparently to avoid becoming just a slogan. Optimal allocation is more obvious for some types of risk than others, and may change over the project's life. In particular, the party best able to manage demand risk is currently a contentious issue in many countries, including Australia, following experiences with overoptimistic private traffic forecasts on toll road PPPs.

Decisions on financing should aim to minimise costs, including contingent liabilities and transaction costs, as well as ensuring that incentives are aligned for appropriate decision-making through the (long) life of the project. The financing decisions facing the private partner are related to how the project is structured. This will depend on the features of the project itself, particularly the allocation of risk between the government and private partners, as well as the investment climate of the country. Therefore, even in the absence of explicit government support mechanisms such as NDBs or co-investment funds, government decisions will have important implications for the cost of private financing, and therefore the value for money of the project itself. The composition of investors may also change over the life of the project, in line with the changing nature of risks. For example, the shorter and riskier construction phase of the project may better suit the risk and

maturity profiles of banks and private equity investors, while the operational phase may be more aligned with long-term investors seeking stable incomes, such as pension funds.

As a provider, the government faces the choice between higher debt and/or taxes, shifting the composition of government spending or selling public assets. Factors to consider include intergenerational equity, relative costs and benefits, and prevailing fiscal constraints. The relative weights of these factors will differ over time and between countries and types of project. Importantly, even for projects involving private financing, to the extent that there is a gap between efficient user charges and costs, the shortfall must be met by government over the life of the project and these payments must be financed through a combination of taxes, debt or privatisations. In other words, governments inevitably must raise funds to pay for those aspects of public infrastructure services that cannot be directly charged for if such services are to be provided, whether by the private or public sector.

## References

- ADB (Asian Development Bank) (2011)**, 'Proposed Equity Contribution and Administration of ASEAN Infrastructure Fund', Report and Recommendations of the President to the Board of Directors, August.
- Alesina A and R Perotti (1994)**, 'The Political Economy of Budget Deficits', NBER Working Paper No 4637.
- Allen Consulting Group, C Duffield and P Raisbeck (2007)**, 'Performance of PPPs and Traditional Procurement in Australia', Major Report for Infrastructure Partnerships Australia, November.
- APEC (Asia-Pacific Economic Cooperation) (2013)**, '2013 APEC Finance Ministers' Meeting: Joint Ministerial Statement', Bali, 20 September.
- Araújo S and D Sutherland (2010)**, 'Public-Private Partnerships and Investment in Infrastructure', OECD Economics Department Working Papers No 803.
- Araya G, JZ Schwartz and LA Andrés (2013)**, 'The Effects of Country Risk and Conflict on Infrastructure PPPs', World Bank Policy Research Working Paper No 6569.
- Arrow KJ and RC Lind (1970)**, 'Uncertainty and the Evaluation of Public Investment Decisions', *The American Economic Review*, 60(3), pp 364–378.
- Arslanalp S, F Bornhorst, S Gupta and E Sze (2010)**, 'Public Capital and Growth', IMF Working Paper No WP/10/175.
- Aschauer DA (1989a)**, 'Does Public Capital Crowd Out Private Capital?', *Journal of Monetary Economics*, 24(2), pp 171–188.
- Aschauer DA (1989b)**, 'Is Public Expenditure Productive?', *Journal of Monetary Economics*, 23(2), pp 177–200.
- Bain R and L Polakovic (2005)**, 'Traffic Forecasting Risk Study Update 2005: Through Ramp-Up and Beyond', Report for Standard & Poor's RatingsDirect Global Credit Portal, 25 August.
- Baker R, A Barker, A Johnston and M Kohlhaas (2008)**, *The Stern Review: An Assessment of its Methodology*, Productivity Commission Staff Working Paper, Productivity Commission, Melbourne, January.
- Banks G (2008)**, 'Riding the Third Wave: Some Challenges in National Reform', Paper presented at the Melbourne Institute and *The Australian Economic and Social Outlook Conference 2008 'New Agenda for Prosperity'*, Melbourne, 27–28 March.
- Barro RJ (1974)**, 'Are Government Bonds Net Wealth?', *Journal of Political Economy*, 82(6), pp 1095–1117.
- Baumol WJ (1968)**, 'On the Social Rate of Discount', *The American Economic Review*, 58(4), pp 788–802.
- BITRE (Bureau of Infrastructure, Transport and Regional Economics) (2011a)**, 'Patronage Forecasting Symposium: Summary of Outcomes', Document from Patronage Forecasting Symposium, Canberra, 21 June.
- BITRE (2011b)**, 'Review of Traffic Forecasting Performance of Toll Roads', Document from Patronage Forecasting Symposium, Canberra, 21 June.
- Boardman AE, DH Greenberg, AR Vining and DL Weimer (2010)**, *Cost-Benefit Analysis: Concepts and Practice*, 4th edn, Pearson Series in Economics, Prentice Hall, Upper Saddle River, NJ.
- Bortolotti B and E Perotti (2007)**, 'From Government to Regulatory Governance: Privatization and the Residual Role of the State', *The World Bank Research Observer*, 22(1), pp 53–66.
- Brealey RA, IA Cooper and MA Habib (1997)**, 'Investment Appraisal in the Public Sector', *Oxford Review of Economic Policy*, 13(4), pp 12–28.
- Brown C (2005)**, 'Financing Transport Infrastructure: For Whom the Road Tolls', *The Australian Economic Review*, 38(4), pp 431–438.

**Buchanan JM and RE Wagner (1977)**, *Democracy in Deficit: The Political Economy of Lord Keynes*, Academic Press, New York.

**Burger P and I Hawkesworth (2011)**, 'How To Attain Value for Money: Comparing PPP and Traditional Infrastructure Public Procurement', *OECD Journal on Budgeting*, 11(1), pp 91–146.

**Button K (2010)**, *Transport Economics*, 3rd edn, Edward Elgar Publishing, Cheltenham.

**Chan C, D Forwood, H Roper and C Sayers (2009)**, *Public Infrastructure Financing: An International Perspective*, Productivity Commission Staff Working Paper, Productivity Commission, Melbourne, March.

**Chong S and E Poole (2013)**, 'Financing Infrastructure: A Spectrum of Country Approaches', *RBA Bulletin*, September, pp 65–76.

**Connoly C and T Wall (2013)**, 'The Impact of the Global Financial Crisis on Public–Private Partnerships: A UK Perspective', in C Greve and GA Hodge (eds), *Rethinking Public–Private Partnerships: Strategies for Turbulent Times*, Routledge Critical Studies in Public Management, Routledge, Abingdon, Oxon, pp 33–56.

**Dabla-Norris E, J Brumby, A Kyobe, Z Mills and C Papageorgiou (2011)**, 'Investing in Public Investment: An Index of Public Investment Efficiency', IMF Working Paper No WP/11/37.

**Della Croce R (2011)**, 'Pension Funds Investment in Infrastructure: A Survey', Report for the International Futures Programme: Project on Strategic Transport Infrastructure to 2030, September.

**Dewatripont M and P Legros (2005)**, 'Public-Private Partnerships: Contract Design and Risk Transfer', *EIB Papers*, 10(1), pp 120–145.

**DIRD (Department of Infrastructure and Regional Development) (2013)**, 'Productivity Commission Inquiry into Public Infrastructure', Submission to the Productivity Commission Inquiry into Public Infrastructure, December.

**Dixit A and RS Pindyck (1994)**, *Investment under Uncertainty*, Princeton University Press, Princeton.

**Dobbs R, H Pohl, D-Y Lin, J Mischke, N Garemo, J Hexter, S Matzinger, R Palter and R Nanavatty (2013)**, 'Infrastructure Productivity: How to Save \$1 Trillion a Year', McKinsey Global Institute and McKinsey Infrastructure Practice Report, January.

**DOFA (Department of Finance and Administration) (2006)**, *Handbook of Cost-Benefit Analysis*, rev, Financial Management Reference Material No 6, Department of Finance and Administration, Canberra.

**Dudkin G and T Vällilä (2005)**, 'Transactions Costs in Public-Private Partnerships: A First Look at the Evidence', European Investment Bank Economic and Financial Report 2005/03.

**Duffield C, P Raisbeck and M Xu (2008)**, 'National PPP Forum – Benchmarking Study, Phase II: Report on the Performance of PPP Projects in Australia when Compared with a Representative Sample of Traditionally Procured Infrastructure Projects', Conducted by the Melbourne Engineering Research Institute, University of Melbourne, December.

**Dunleavy P and L Carrera (2013)**, *Growing the Productivity of Government Services*, Edward Elgar, Cheltenham.

**Elmendorf DW and NG Mankiw (1999)**, 'Government Debt', in JB Taylor and M Woodford (eds), *Handbook of Macroeconomics, Volume 1C*, Handbook in Economics 15, Elsevier Science, Amsterdam, pp 1615–1669.

**Emmerson C, C Frayne and S Love (2001)**, 'The Government's Fiscal Rules', Institute for Fiscal Studies Briefing Note 16, rev November 2006.

**Engel E, R Fischer and A Galetovic (2010)**, 'The Economics of Infrastructure Finance: Public-Private Partnerships versus Public Provision', *EIB Papers*, 15(1), pp 40–69.

**Engel E, R Fischer and A Galetovic (2011)**, 'Public-Private Partnerships to Revamp U.S. Infrastructure', Brookings Institution, The Hamilton Project Discussion Paper 2011-02.

**EPEC (European PPP Expertise Centre) (2010)**, 'Capital Markets in PPP Financing: Where We Were and Where are We Going?', Report, March.

**EPEC (2011)**, 'State Guarantees in PPPs: A Guide to Better Evaluation, Design, Implementation and Management', Report, May.

**EPEC (2012)**, 'Financing PPPs with Project Bonds: Issues for Public Procuring Authorities', Report, October.

**Ergas H and A Robson (2010)**, 'Evaluating Major Infrastructure Projects: How Robust are our Processes?', in *Strengthening Evidence-Based Policy in the Australian Federation, Volume 1: Proceedings*, Roundtable Proceedings, Productivity Commission, Canberra, pp 127–167.

**Eurotunnel Group (2008)**, 'Annual Review 2007'.

**Feldstein M (1985)**, 'Debt and Taxes in the Theory of Public Finance', *Journal of Public Economics*, 28(2), pp 233–245.

**Fitzgerald P (2004)**, 'Review of Partnerships Victoria Provided Infrastructure: Final Report to the Treasurer', Report commissioned by the Victorian Treasurer, January.

**Flyvbjerg B (2009)**, 'Survival of the Unfittest: Why the Worst Infrastructure Gets Built – and What We Can Do about It', *Oxford Review of Economic Policy*, 25(3), pp 344–367.

**Freebairn J and M Cordon (2013)**, 'Vision Versus Prudence: Government Debt Financing of Investment', Melbourne Institute Working Paper No 30/13.

**Funcke K, T Irwin and I Rial (2013)**, 'Budgeting and Reporting for Public-Private Partnerships', International Transport Forum Discussion Paper No 2013-7.

**Grimsey D and MK Lewis (2002)**, 'Evaluating the Risks of Public Private Partnerships for Infrastructure Projects', *International Journal of Project Management*, 20(2), pp 107–118.

**Harrison M (2010)**, *Valuing the Future: The Social Discount Rate in Cost-Benefit Analysis*, Visiting Researcher Paper, Productivity Commission, Canberra.

**Hart O (2003)**, 'Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships', *The Economic Journal*, 113(486), pp C69–C76.

**Hayford O (2013)**, 'Improving the Outcomes of Public Private Partnerships', Clayton Utz Report, August. Available at <[http://www.claytonutz.com.au/docs/improving\\_%20outcomes\\_ppp\\_2013.pdf](http://www.claytonutz.com.au/docs/improving_%20outcomes_ppp_2013.pdf)>.

**Hellowell M and V Vecchi (2013)**, 'What Return for Risk? The Price of Equity Capital in Public–Private Partnerships', in C Greve and GA Hodge (eds), *Rethinking Public–Private Partnerships: Strategies for Turbulent Times*, Routledge Critical Studies in Public Management, Routledge, Abingdon, Oxon, pp 57–77.

**Helm D and T Tindall (2009)**, 'The Evolution of Infrastructure and Utility Ownership and its Implications', *Oxford Review of Economic Policy*, 25(3), pp 411–434.

**Henisz WJ and BA Zelner (2010)**, 'The Hidden Risks in Emerging Markets', *Harvard Business Review*, April, pp 88–95.

**HM Treasury (2012a)**, 'Government Welcomes First Injection into Pensions Infrastructure Platform', Press Release, 18 October.

**HM Treasury (2012b)**, *A New Approach to Public Private Partnerships*, Report, HM Treasury, London. Available at <[http://webarchive.nationalarchives.gov.uk/20130319161430/http://hm-treasury.gov.uk/d/infrastructure\\_new\\_approach\\_to\\_public\\_private\\_partnerships\\_051212.pdf](http://webarchive.nationalarchives.gov.uk/20130319161430/http://hm-treasury.gov.uk/d/infrastructure_new_approach_to_public_private_partnerships_051212.pdf)>.



**Hodge GA (2010)**, 'Reviewing Public-Private Partnerships: Some Thoughts on Evaluation', in GA Hodge, C Greve and AE Boardman (eds), *International Handbook on Public-Private Partnerships*, Edward Elgar Publishing, Cheltenham, pp 81–112.

**Hodge GA and C Greve (2007)**, 'Public-Private Partnerships: An International Performance Review', *Public Administration Review*, 67(3), pp 545–558.

**IFC (International Finance Corporation) (2013)**, 'IFC Global Infrastructure Fund Completes \$1.2 Billion Fundraising', Press Release, 8 October.

**IFWG (Infrastructure Finance Working Group) (2012)**, 'Infrastructure Finance and Funding Reform', Report to Infrastructure Australia, April.

**IMF (International Monetary Fund) (2009)**, 'Fiscal Rules—Anchoring Expectations for Sustainable Public Finances', IMF Policy Paper.

**Inderst G (2010)**, 'Infrastructure as an Asset Class', *EIB Papers*, 15(1), pp 70–104.

**Inderst G (2013)**, 'Private Infrastructure Finance and Investment in Europe', European Investment Bank Working Papers No 2013/02.

**Inderst G and R Della Croce (2013)**, 'Pension Fund Investment in Infrastructure: A Comparison between Australia and Canada', OECD Working Papers on Finance, Insurance and Private Pensions No 32.

**Infrastructure Australia (2013)**, 'Infrastructure Priority List Update – December 2013'.

**Iossa E and D Martimort (2012)**, 'Risk Allocation and the Costs and Benefits of Public-Private Partnerships', *RAND Journal of Economics*, 43(3), pp 442–474.

**Irwin TC (2007)**, *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects*, The World Bank, Washington DC.

**Istrate E and R Puentes (2011)**, 'Moving Forward on Public Private Partnerships: U.S. and International Experience with PPP Units', Brookings-Rockefeller Project on State and Metropolitan Innovation Policy Paper.

**Jett AN and BJ Verink (2013)**, 'Infrastructure Policy Unit: 2012 Global PPI Data Update', Private Participation in Infrastructure Research Group Note 85.

**Kikeri S and J Nellis (2004)**, 'An Assessment of Privatisation', *World Bank Research Observer*, 19(1), pp 87–118.

**Klein M (2012)**, 'Infrastructure Policy: Basic Design Options', World Bank Policy Research Working Paper No 6274.

**KPMG (2010)**, 'PPP Procurement: Review of Barriers to Competition and Efficiency in the Procurement of PPP Projects', Commissioned by Infrastructure Australia, May. Available at <<http://www.kpmg.com/NZ/en/IssuesAndInsights/ArticlesPublications/SmarterProcurement/Documents/Review-of-barriers-to-competition.pdf>>.

**Krueger AO (1990)**, 'Government Failures in Development', *The Journal of Economic Perspectives*, 4(3), pp 9–23.

**La Porta R and F López-de-Silanes (1999)**, 'The Benefits of Privatization: Evidence from Mexico', *The Quarterly Journal of Economics*, 114(4), pp 1193–1242.

**Layard R and S Glaister (1994)**, *Cost-Benefit Analysis*, Cambridge University Press, Cambridge.

**Leigland J and C Shugart (2006)**, 'Is the Public Sector Comparator Right for Developing Countries?', Public-Private Infrastructure Advisory Facility *Gridlines*, Note 4.

**Leruth LE (2012)**, 'Public-Private Cooperation in Infrastructure Development: A Principal-Agent Story of Contingent Liabilities, Fiscal Risks, and Other (Un)pleasant Surprises', *Networks and Spatial Economics*, 12(2), pp 223–237.

**Li Z and DA Hensher (2010)**, 'Toll Roads in Australia: An Overview of Characteristics and Accuracy of Demand Forecasts', *Transport Reviews: A Transnational Transdisciplinary Journal*, 30(5), pp 541–569.

**Lowe P (2013)**, 'Productivity and Infrastructure', Opening Address to the IARIW-UNSW Conference on Productivity: Measurement, Drivers and Trends, Sydney, 26–27 November.

**Mackie P (2010)**, 'Cost-Benefit Analysis in Transport – A UK Perspective', Joint Transport Research Centre Discussion Paper No 2010-16.

**Macquarie Group (2010)**, 'Macquarie Group Launches Mexican Infrastructure Fund', Media Release, 14 January.

**Maddock R (2013)**, 'Principles for Australian Infrastructure Finance', Monash University Department of Economics Discussion Paper No 55/13.

**Maskin E and J Tirole (2008)**, 'Public-Private Partnerships and Government Spending Limits', *International Journal of Industrial Organization*, 26(2), pp 412–420.

**MIGA (Multilateral Investment Guarantee Agency) (2013)**, *World Investment and Political Risk 2013*, Conducted by the *Economist* Intelligence Unit on behalf of MIGA, World Bank Group, Washington DC.

**Mishan EJ and E Quah (2007)**, *Cost-Benefit Analysis*, 5th edn, Routledge, New York.

**NSW (New South Wales) Government (2013a)**, *2013-14 NSW Budget – Budget Paper No 2: Budget Statement*, NSW Treasury, Sydney.

**NSW Government (2013b)**, *2013–14 NSW Budget – Budget Paper No 4: Infrastructure Statement*, NSW Treasury, Sydney.

**OECD (Organisation for Economic Co-operation and Development) (2007)**, 'OECD Principles for Private Sector Participation in Infrastructure'.

**OECD (2008)**, *Public-Private Partnerships: In Pursuit of Risk Sharing and Value for Money*, OECD Publishing, Paris.

**OECD (2010)**, *Dedicated Public-Private Partnership Units: A Survey of Institutional and Governance Structures*, OECD Publishing, Paris.

**OECD (2011)**, 'Strategic Transport Infrastructure Needs to 2030: Main Findings', OECD Futures Project on Transcontinental Infrastructure Needs to 2030/50.

**OECD (2013a)**, 'Annual Survey of Large Pension Funds and Public Pension Reserve Funds', Report on Pension Funds' Long-Term Investments, October.

**OECD (2013b)**, 'Draft Report on Insurers and Pension Funds as Long-Term Investors: An Approach to Infrastructure Investment', Prepared for the 5th Meeting of the G20/OECD Task Force on Institutional Investors and Long-Term Financing, Paris, 26 November.

**OECD (2013c)**, 'G20/OECD High-Level Principles of Long-Term Investment Financing by Institutional Investors', Developed by the OECD Task Force on Institutional Investors and Long-Term Financing, September.

**O'Farrell B (Premier of NSW, Minister for Western Sydney) (2013)**, 'Billions Allocated to Restart NSW', Media Release, 8 May.

**Parry I and K Small (2009)**, 'Should Urban Transit Subsidies be Reduced?', *The American Economic Review*, 99(3), pp 700–724.

**Partnerships Victoria (2013)**, 'About Partnerships Victoria: Overview', accessed on 4 July 2014. Available at <<http://www.dtf.vic.gov.au/Infrastructure-Delivery/Public-private-partnerships/About-Partnerships-Victoria>>.

**PC (Productivity Commission) (2006)**, *Road and Rail Freight Infrastructure Pricing*, Productivity Commission Inquiry Report No 41, Productivity Commission, Canberra.

**PC (2008a)**, *Financial Performance of Government Trading Enterprises 2004–05 to 2006–07*, Commission Research Paper, Productivity Commission, Canberra.

**PC (2008b)**, 'Submission to Infrastructure Australia's National Infrastructure Audit', Productivity Commission Submission, September.

**PC (2011a)**, *Australia's Urban Water Sector: Volume 1*, Productivity Commission Inquiry Report No 55, Productivity Commission, Canberra.

**PC (2011b)**, *Economic Regulation of Airport Services*, Productivity Commission Inquiry Report No 57, Productivity Commission, Canberra.

**PC (2013)**, *Electricity Network Regulatory Frameworks: Volume 1*, Productivity Commission Inquiry Report No 62, Productivity Commission, Canberra.

**Pickford M (2013)**, 'State Highway Investment in New Zealand: The Decline and Fall of Economic Efficiency', *Policy Quarterly*, 9(3), pp 28–35.

**Posner PL, SK Ryu and A Tkachenko (2009)**, 'Public-Private Partnerships: The Relevance of Budgeting', *OECD Journal on Budgeting*, 9(1), Article 3.

**Preqin (2012)**, 'Preqin Infrastructure Special Report: Future Searches and Mandates', October.

**PwC (PricewaterhouseCoopers LLP) (2013)**, 'Capital Markets: The Rise of Non-Bank Infrastructure Project Finance', Report prepared by the Capital Projects and Infrastructure Group, October.

**Quiggin J (2004)**, 'Risks, PPPs and the Public Sector Comparator', *Australian Accounting Review*, 14(33), pp 51–61.

**Quiggin J (2005)**, 'Public–Private Partnerships: Options for Improved Risk Allocation', *The Australian Economic Review*, 38(4), pp 445–450.

**Rajaram A, TM Le, N Biletska and J Brumby (2010)**, 'A Diagnostic Framework for Assessing Public Investment Management', World Bank Policy Research Working Paper No 5397.

**RBA (Reserve Bank of Australia) (1997)**, 'Privatisation in Australia', *RBA Bulletin*, December, pp 7–16.

**Reeves E (2013)**, 'Mind the Gap: Accountability and Value for Money in Public–Private Partnerships in Ireland', in C Greve and GA Hodge (eds), *Rethinking Public-Private Partnerships: Strategies for Turbulent Times*, Routledge Critical Studies in Public Management, Routledge, Abingdon, Oxon, pp 78–97.

**RICS (Royal Institution of Chartered Surveyors) (2013)**, 'The Future of Private Finance Initiative and Public Private Partnership', Research Report, June.

**Romp W and J de Haan (2005)**, 'Public Capital and Economic Growth: A Critical Survey', *EIB Papers*, 10(1), pp 40–70.

**Rudolph HP (2010)**, 'State Financial Institutions: Can They Be Relied on to Kick-Start Lending?', *Crisis Response: Public Policy for the Private Sector*, Note Number 12.

**Shaoul J, A Stafford and P Stapleton (2012)**, 'The Fantasy World of Private Finance for Transport via Public Private Partnerships', International Transport Forum Discussion Paper No 2012-6.

**Shapiro C and RD Willig (1990)**, 'Economic Rationales for the Scope of Privatization', Princeton University, John M. Olin Program for the Study of Economic Organization and Public Policy Discussion Paper No 41.

**Smallridge D and F de Olloqui (2011)**, 'A Health Diagnostic Tool for Public Development Banks', Inter-American Development Bank Technical Note No IBD-TN-225.

**Storr D (2009)**, 'New Era for Toll Roads in Australia', Construction Update – Winter 2009, King and Wood Mallesons, accessed on 8 July 2014. Available at <<http://www.mallesons.com/publications/marketAlerts/2009/Construction-Update-Winter2009/Pages/New-Era-for-Toll-Roads-in-Australia.aspx>>.

**Straub S (2008)**, 'Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges', World Bank Policy Research Working Paper No 4460.

**UK NAO (National Audit Office) (2007)**, *Improving the PFI Tendering Process*, Report by the Comptroller and Auditor General, HC 149 Session 2006–2007, 8 March, The Stationery Office, London.

**UK NAO (2009)**, 'Performance of PFI Construction', Review by the Private Finance Practice, October.

**UK NAO (2011)**, *Lessons from PFI and Other Projects*, Report by the Comptroller and Auditor General, HC 920 Session 2010–2011, 28 April, The Stationery Office, London.

**UK NAO (2012)**, *Equity Investment in Privately Financed Projects: HM Treasury*, Report by the Comptroller and Auditor General, HC 1792 Session 2010–2012, 10 February, The Stationery Office, London.

**Vecchi V, M Hellowell and S Gatti (2013)**, 'Does the Private Sector Receive an Excessive Return from Investments in Health Care Infrastructure Projects? Evidence from the UK', *Health Policy*, 110(2–3), pp 243–270.

**Vickers J and G Yarrow (1991)**, 'Economic Perspectives on Privatization', *The Journal of Economic Perspectives*, 5(2), pp 111–132.

**WBI-PPIAF (World Bank Institute and Public-Private Infrastructure Advisory Facility) (2012)**, *Public-Private Partnerships: Reference Guide Version 1.0*, World Bank, Washington DC.

**Willoughby C (2013)**, 'How Much Can Public Private Partnership Really do for Urban Transport in Developing Countries?', *Research in Transportation Economics*, 40(1), pp 34–55.

**Winston C (2006)**, *Government Failure Versus Market Failure: Microeconomics Policy Research and Government Performance*, AEI-Brookings Joint Center for Regulatory Studies, Washington DC.

**Winston C (2013)**, 'On the Performance of the US Transportation System: Caution Ahead', *Journal of Economic Literature*, 51(3), pp 773–824.

**World Bank (2013)**, 'Long-Term Investment Financing for Growth and Development: Umbrella Paper', Presented to the Meeting of the G20 Ministers of Finance and Central Bank Governors, Moscow, February.

**World Economic Forum (2010)**, *Paving the Way: Maximising the Value of Private Finance in Infrastructure*, Prepared in collaboration with PricewaterhouseCoopers, World Economic Forum USA, New York.

**Yaron J (2004)**, 'State-Owned Development Finance Institutions (SDFI): Background, Political Economy and Performance Assessment', Discussion Paper, Inter-American Development Bank.

**Yescombe ER (2007)**, *Public–Private Partnerships: Principles of Policy and Finance*, Butterworth-Heinemann, Oxford.

# Discussion

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## 1. Era Dabla-Norris

Long-term investment in productive assets is needed to support growth prospects and job creation in advanced and emerging economies alike. The global financial crisis, and the ensuing deleveraging and retrenchment of long-term credit, has led to a significant contraction in investment in many advanced and emerging economies, which has yet to recover to pre-crisis levels. Going beyond the crisis, investment needs remain pressing for many countries. Creating sufficient fiscal space to support productive public investment is an additional challenge for some countries.

Against this background, this paper provides an extremely useful policy primer on the preconditions and trade-offs associated with public infrastructure provision. Clearly, governments have a central role to play in putting in place policies and institutional frameworks conducive to infrastructure investment. However, decisions associated with project selection, infrastructure priorities and the modalities of efficient delivery continue to loom large in policy debates. This paper makes an important contribution in providing a conceptual framework for addressing these issues.

These remarks focus on two aspects of the paper: (i) grounding the discussion on public infrastructure within a macroeconomic perspective; and (ii) elaborating on the guiding principles for infrastructure provision, taking into account risks and returns at various stages of the infrastructure process.

### Bringing a macroeconomic perspective to bear

From a macroeconomic perspective, arguments for boosting public investment in physical and social infrastructure to boost growth rest on the high returns to such investments, and existing pressing deficiencies in these areas. Improvements in infrastructure raise the productivity of human and physical capital not only directly, but also indirectly through lower transportation and transaction costs, which increase economies of scale, productivity and thus growth.

The link between public infrastructure or capital spending and capital stock accumulation, and hence long-run growth, however, is often undermined by the low efficiency of public investment. The notion that public investment spending is equal to capital accumulation rests on the assumption that public investment is inherently productive. This assumption is particularly problematic, as poor project selection and a high degree of inefficiency and waste can distort the impact of public spending on capital accumulation, leaving a trail of poorly executed and ineffective projects (Pritchett 2000).

A growing body of theoretical and empirical evidence recognises the importance of the quality and efficiency of investment spending in determining the marginal productivity of investment and its growth impact. Following Barro (1990), a large number of endogenous growth models show

that productive government investment can raise the long-run rate of growth by permanently increasing the returns to other factors of production. More recent theoretical studies show that inefficiencies in the provision of public infrastructure services can reduce the quality and effectiveness of public capital, firms' incentives to invest, and hence growth (Chakraborty and Dabla-Norris 2011).

In summary, the theoretical literature suggests that the link with productivity and growth outcomes depends critically on the quality and efficiency of public infrastructure. Recent work at the International Monetary Fund has focused on developing indices that capture the institutional environment underpinning public investment management across four different stages: project appraisal, selection, implementation and evaluation (Dabla-Norris *et al* 2012). Building on this, research has found that the quality of public investment, as measured by variables capturing the adequacy of project selection and implementation, is statistically significant in explaining variations in economic growth across countries (Gupta *et al* 2011). These studies highlight the importance of going beyond discussions of spending levels and addressing issues of the broad institutional framework underpinning the provision of investment. Indeed, as the paper by Poole, Toohey and Harris points out, 'financing decisions must follow the investment decision'.

Country efforts to 'invest in the investment process' can thus play a critical role in raising the returns on public and private investment, and in ensuring that public infrastructure investment reaps the required growth dividends, while maintaining fiscal sustainability. In this spirit, the paper by Poole *et al* rightfully notes that this effort encompasses several aspects: country capacity to carry out technically sound and non-politicised project appraisal and selection; appropriate mechanisms for implementation, oversight and monitoring of investment projects; and adopting the most efficient modes of infrastructure delivery. The transparency and accountability of these functions and processes contributes to ensuring that productive public investment is supported. Indeed, as the paper discusses, a necessary first step in ensuring that good projects – ones that generate the highest net social benefits – are chosen is to get the planning and institutional framework right.

## Guiding principles

Drawing on the extant literature, the paper discusses how infrastructure could be financed in different ways: privately (ranging from management contracts to temporary or full private ownership), through public-private partnerships (PPPs), or directly through public procurement. Further, different financial instruments could be used. Some may be tied directly to the proceeds of the infrastructure, others may be partly or wholly guaranteed by the public sector, while yet others can be funded out of general public resources. All these approaches involve opportunity costs and efficiency trade-offs. Asymmetric information and incomplete contracts, and transaction costs associated with monitoring and contracting, in turn, have a bearing on the appropriate modalities.

The traditional question 'Are governments, banks or capital markets best placed to finance infrastructure?'; however, is too simplistic. A typical infrastructure project has several distinct phases – planning and design, construction and operation. Each phase exhibits different risk and return characteristics and entails different incentive problems, requiring a different role for governments, banks and other private investors.

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The paper could benefit from providing a more structured framework for thinking about the appropriate role of different agents and aligning appropriate incentives in these distinct infrastructure phases. For instance, the provision of credit or cash flow guarantees by governments, which fully insure the private sector against any potential losses, could eliminate incentives for cost minimisation and quality maintenance and lead to cost overruns. In this case, pure government procurement could be more effective, as funding costs can be lower while incentive structures conceivably remain the same. But transferring too much risk to the private sector could also lead to poor incentives and inefficiencies. While the paper addresses the question of why risk allocation is important and the associated practical considerations, it could delve into these issues in greater detail.

To this end, a number of distinct questions are of import from a policy perspective:

- What are the key risks for the involved parties at various stages of the infrastructure process? What is the appropriate distribution of risks and returns at the various stages and how should this be determined?
- What are some best practices in structuring risk transfers in infrastructure projects (e.g. to minimise cost overruns or failures)? How can projects be structured to ensure incentive compatibility to promote efficiency gains (e.g. from private sector contracting)?
- What is the role for policy in promoting greater intermediation of the savings pool and matching the demand for and supply of financing?

Answers to these questions would serve to strengthen the wealth of practical information and guidance for government decision-making about public infrastructure investment contained in this paper.

## References

**Barro RJ (1990)**, 'Government Spending in a Simple Model of Endogenous Growth', *Journal of Political Economy*, 98(5, Part 2: The Problem of Development: A Conference of the Institute for the Study of Free Enterprise Systems), pp S103–S125.

**Chakraborty S and E Dabla-Norris (2011)**, 'The Quality of Public Investment', *The B.E. Journal of Macroeconomics*, 11(1), Contributions, Article 27.

**Dabla-Norris E, J Brumby, A Kyobe, Z Mills and C Papageorgiou (2012)**, 'Investing in Public Investment: An Index of Public Investment Efficiency', *Journal of Economic Growth*, 17(3), pp 235–266.

**Gupta S, A Kangur, C Papageorgiou and A Wane (2011)**, 'Efficiency-Adjusted Public Capital and Growth', IMF Working Paper No WP/11/217.

**Pritchett L (2000)**, 'The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital', *Journal of Economic Growth*, 5(4), pp 361–384.

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## 2. General Discussion

Much of the discussion revolved around the nature of the analysis used in infrastructure project selection and appraisal. The discussion began with one participant picking up on a central point of the paper – the importance of rigorous analysis when selecting infrastructure projects. The participant questioned whether rigorous *ex post* project evaluation was also important to encourage better accountability and governance. Another participant accepted the paper's emphasis on cost-benefit analysis in infrastructure project selection, but noted that a number of inferior techniques, such as input-output models, are being used as substitutes for this analysis. The participant also highlighted the development of the 'wider economic benefits' literature, which argues that externalities arising from infrastructure projects, such as agglomeration benefits and effects on GDP, should be recognised in project appraisal. Although there is debate about the magnitude of these benefits, the participant proposed that wider economic benefits could provide a link between the macroeconomic literature that suggests there are substantial gains from additional infrastructure and traditional cost-benefit studies. Another participant described these wider economic benefits as general equilibrium effects, and suggested that it would be a simple extension of the paper to mention these benefits, such as improvements in land use, trade flows, competition and economies of agglomeration. Peter Harris noted that the paper's advocacy of cost-benefit analysis largely reflects the fact that it is prevalent enough for all parts of government to understand it, but that the paper in no way advises against more sophisticated forms of analysis. Mr Harris argued, however, that it is important for any type of analysis used in project selection to have sufficient market credibility. To the extent that the appraisal of potential projects incorporates improbable sources of benefits, the government's credibility will be undermined and potential investors will be driven away. Finally, Mr Harris reiterated that rigorous cost-benefit analysis will be valuable regardless of whether a given project is going to be publically or privately financed.

Another participant applauded the framework for decision-making that was put forward by the paper, but questioned why few governments adhere to such rigorous analytical frameworks when selecting infrastructure projects. The participant went on to ask whether the authors had any advice on how to encourage governments to implement this framework. In response, Mr Harris reiterated that one of the key points of the paper is that if infrastructure project selection should be done in a systematic and transparent way – rather than having a government sharing only specific investment propositions with the public – the ability for potential investors and stakeholders to assess these projects and react to them will result in a pipeline of valuable projects being developed.

The remainder of the discussion largely focused on PPPs. One participant drew attention to the noticeable decline in recent years in the volume of PPPs in Australia and the United Kingdom. The participant argued that these two jurisdictions have been the most successful in shifting demand risk to the private sector and claimed that in doing so, many of these projects, such as Sydney's Lane Cove Tunnel, had failed financially and that this appears to have reduced private sector interest in PPPs. The participant also noted that recent PPPs have involved substantially more risk being explicitly retained by the public sector than in the past, and that private investors'



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returns on these projects have been 'disappointing'. Based on these observations, the participant questioned whether there is a future for the PPP model as an alternative to public investment or privatisation. In response, Mr Harris contended that the Productivity Commission's analysis and liaison – primarily with large financiers such as pension funds – suggests that there is ample private financing available for PPPs, but that a lack of attractive investment structures is holding this back. Mr Harris suggested that PPPs could be better designed without the government simply reabsorbing demand risk. Furthermore, he argued that if the government retains demand risk, it is unclear what risks, other than construction risk, it is transferring to the private sector and therefore how potential efficiency gains are being generated.

Another participant agreed with the paper's identification of the need to improve the efficiency of government procurement, but argued that the result of this process is a more general improvement in government efficiency. The participant went on to question whether there is any need for PPPs once the government has become efficient. The participant drew on the example of Finland, describing how most of Finland's government-procured infrastructure is efficiently procured using techniques usually associated with the private sector. The participant then argued that one way to look at PPPs is as a mechanism of insurance against government failure in infrastructure provision – that is, to compensate for the fact that most countries' governments are unlikely to evolve into something like the 'super-efficient Finnish government' in the near future. In response, Mr Harris emphasised that the point of the paper is to discuss ways to improve public access to private sector financing for infrastructure investment by highlighting some key lessons from others' experiences of PPPs. He went on to identify that the pre-eminent lesson is that the fundamental features of PPPs are the transfer of risk and the efficiency improvements that follow from these transfers.

# Closing the Infrastructure Finance Gap: Addressing Risk

Jordan Z Schwartz, Fernanda Ruiz-Nuñez and Jeff Chelsky

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## 1. Introduction

The links between infrastructure and development are well established. They include the impact of infrastructure on poverty alleviation, equity, growth and specific development outcomes such as job creation, market access, health and education (Calderón and Servén 2004, 2008, 2010; Straub 2008). These relationships are complex and dynamic; even with respect to growth and job creation, infrastructure's effects are felt through multiple channels.<sup>1</sup> The demand for infrastructure is rising with the accelerating pace of globalisation and urbanisation. Every month in the developing world more than five million people migrate to urban areas. This demand trend is compounded by the growing need for low CO<sub>2</sub> and climate-resilient investments to combat the challenges of climate change (Fay and Toman 2010; Bhattacharya and Romani 2013).

Since the onset of the global financial crisis, fiscal constraints in many economies have meant that government budgets – traditionally the major source of financing for infrastructure – cannot alone be expected to finance infrastructure needs in emerging markets and developing economies (EMDEs). Yet the volume of private participation in financing infrastructure projects in EMDEs remains modest.

While private sector financial commitments to infrastructure projects have risen to about US\$ 180 billion per year in EMDEs, this is less than 20 per cent of overall current infrastructure investment in these economies. There are a number of current and emerging challenges that are expected to further undermine the attractiveness of long-term private investments, such as infrastructure. For example, internationally agreed financial regulatory reform is expected to have a negative impact on private demand for longer-term and less-liquid investments, such as infrastructure (FSB 2013). In addition, the weakness in and deleveraging of European banks is likely to persist into the medium term, which implies a growing mismatch between the time horizon of available capital and that of productive long-term investment projects (World Bank 2013).

Even under more normal credit conditions, the costs and risks faced by private investors in infrastructure are high, particularly in EMDEs where economic and financial conditions tend to be weaker and less stable. From a public policy perspective, given the positive economic, social and environmental externalities that quality infrastructure can provide, efforts to lower the overall riskiness of infrastructure investments and enhance the availability of efficient risk-sharing instruments can have important efficiency and distributional implications. At the same time, there

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<sup>1</sup> See Agénor and Moreno-Dodson (2006) for an overview and Schwartz, Andrés and Dragoiu (2009) and Ianchovichina *et al* (2013) for a treatment of infrastructure's effects on jobs and growth.

is a need to ensure that efforts to encourage private sector participation in infrastructure offer optimal benefits but do not impose an inappropriate burden on the public sector.

Against this background, this paper aims to assess the different forms of risk that constrain private financing of both public and private infrastructure. The paper then identifies the various tools and risk mitigation measures that can help reduce and better share risk, with an eye to identifying areas where additional efforts may be required if the private sector is to play a larger role in financing infrastructure development in EMDEs.

## 2. Risks in Infrastructure Investments

While there is no single, consistent definition of risk in the literature on infrastructure, it is often defined as the probability of a loss or unwanted outcome. Another definition is that a risk is a potential problem, which can be avoided or mitigated. This paper focuses on common risks faced by the private sector when they are involved in infrastructure projects. Therefore, risk is defined as a situation or condition of investment that leads to consequences or costs for external investors that require mitigation, management or offsetting returns.

Many governments have published their own guidance notes or manuals to foster greater efficiency and better management of public-private partnerships (PPPs). These documents generally set out various generic categories of risk faced by public and private sector agents as a tool for providing a structure for managing PPP-related risk. The presentation is often in the form of a 'risk allocation matrix'.

While the relative importance of particular types of risk will differ across jurisdictions and sectors, there is considerable commonality in the various types of risk that governments have identified in undertaking PPPs. This can be seen by sampling publicly available documentation. Some kinds of risk are consistently identified in country guidance. These include: design risk (i.e. the risk that design will be unable to meet the expected performance and service requirements); market demand/volume risk (i.e. the risk that projected demand for services may diverge from expectations); political risk; regulatory risk; and residual value risk (i.e. the risk that the value of the facility at the end of the project may be less than anticipated). However, even a small sample shows that risk categorisation and classification across countries can be quite heterogeneous, making comparisons across approaches difficult, and limiting the potential to compare and contrast the strengths of various frameworks. Comparisons are made more challenging by the frequent overlap between various categories of risk.

For example, the US Department of Transportation's Federal Highway Administration identifies 18 types of risk across 3 broad categories (the development, construction and operation phases) (FHWA 2012). The South African National Treasury identifies 24 separate types of risk in 10 categories (National Treasury 2004). The Indian Ministry of Finance sets out 19 generic types of risk in 5 categories (pre-operative task, construction phase, operation phase, handover and other risks) (Ministry of Finance 2010). In Australia, the Queensland Government (2008) produces a risk allocation matrix with 45 specific risks for PPPs across 10 broad risk categories. The Philippines Public-Private Partnership Center identifies 11 specific types of risk across 4 broad categories (general, pre-commissioning, post-commissioning and project lifetime risks) (PPP Center 2012).

## 2.1 Type of risks

Despite this heterogeneity of structure, some risks surface consistently as defining concerns for investors in PPPs. Based on a review of manuals and guidance notes, the framework used in this paper groups the risks in the following categories (see Table 3 for definitions of some of the listed risks):<sup>2</sup>

**External market volatility risks:** These risks relate to global or regional financial crises that may be beyond the control of individual countries and economies. The recent global financial crisis is an example. Although it did not originate in the developing world, it caused a 'flight to quality' that resulted in outflows of funds that had been involved in the private participation in infrastructure (PPI). Proportionately, these flows were more concentrated in larger and lower-risk countries (such as Brazil) and higher-return sectors (such as energy). These risks with cross-border spillover effects may include:

- banking crises
- energy crises
- abrupt changes in the stance of monetary policy in advanced economies
- regional wars or catastrophes.

**Political and macroeconomic risks:** These include country-specific factors that can reduce the profitability of doing business in a country, either by adversely affecting operating profits or the value of assets. These risks include:

- political risk
- regulatory risk
- breach of contract risk
- interest rate risk
- inflation risk
- exchange rate risk.

**Sector risks:** These include economic or other factors that affect one sector more specifically than another. For example:

- market, demand or volume risk
- technology risk.

**Project risks:** These refer to those circumstances that may have an effect on the responsibilities of each party to the PPP agreement and the benefits they may achieve from the project. These risks include:

- financing risk
- design risk
- construction risk
- completion risk

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2 Adopted and expanded from Mandri-Perrott (2009) and a review of published PPP risk matrices.

- operation and maintenance risk
- project cost overrun risk
- environmental/social safeguards risk.

**Risks specific to PPP arrangements:** These arise from situations where counterparties to the PPP agreement are not able to meet their responsibilities under the agreement. These risks include:

- residual value risk
- sponsor risk
- default and termination risk.

In choosing a framework as part of a toolkit for managing and allocating risk, it is important to be able to distinguish between risks faced purely by the public sector (e.g. insolvency risk and residual value risk), the private sector (e.g. political risk, regulatory risk and sub-contractor risk) and both sectors (e.g. *force majeure* risk, technology risk and design risk).

## 2.2 Magnitude of risk

The risks associated with a specific infrastructure project generally arise from the nature of the underlying asset itself and the environment in which it operates. The magnitude of a risk varies depending on the country (and its underlying investment climate), sector (and its institutional maturity) and project (and its complexity).

Risks also vary across the life of the project. Some risks are important early on in the bidding process and some will continue to exist until the end of the project life. These considerations obviously affect the optimum risk allocation. The three distinct periods that affect risk allocation for projects are the:

- project development phase (before bid submission and between bid submission and financial close of the deal)
- construction phase
- operational phase.

Risks are usually the highest during the project development phase and tend to decrease as projects move toward the operational phase, as more information becomes available. For example, the quality of the infrastructure build, operational efficiency and the actual demand for services start to be observed as the project becomes operational. Figure 1 shows a typical infrastructure project risk profile across different phases.

**Figure 1: Risk Profile over the Project Cycle**

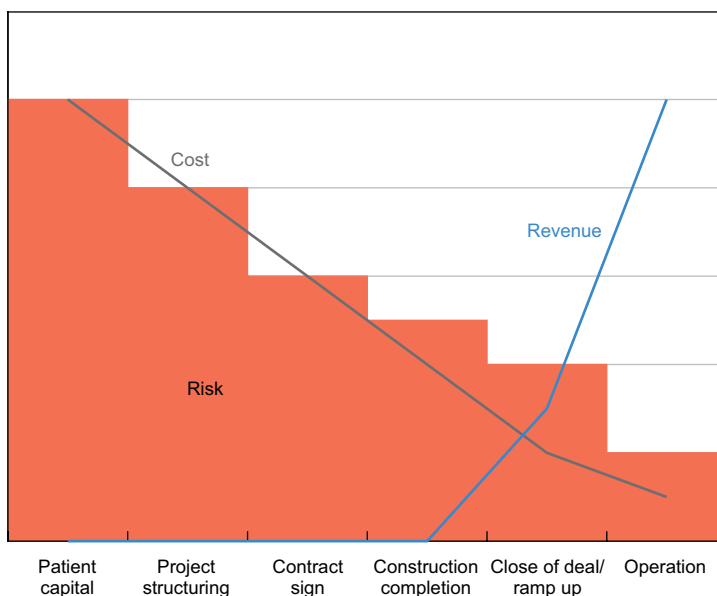


Table 1 categorises the main risks by the different stages of project development during which they are most likely to be relevant.

**Table 1: Key Risks at Each Phase of Project Development**

Development phase	Construction phase	Operational phase
Pre-construction		Including contract term
Planning and environment	Engineering	Demand
Project design	Changes in market conditions	Competing facilities
Political	Cost overrun	Operation and maintenance
Change of law	Construction delay	Appropriation
Regulatory		Financial default risk to public agency
Site		Refinancing
Permitting		Political
Procurement		Regulatory
Financing		Handback/residual value

For policymakers trying to leverage private capital and obtain operational efficiencies in infrastructure and basic service provision, understanding the underlying factors that influence the level of PPI is of central importance.

There is a considerable literature in economics and finance that attempts to explain the determinants of investment and the relationship between investment and risk. However, the literature on infrastructure investment and risk is thinner, and is mainly focused on political and macroeconomic risks. In the case of PPI transactions, Hammami, Ruhashyankiko and Yehoue (2006) utilise the World Bank PPI database to analyse the considerations for using PPPs: government constraints; political environment; market conditions; macroeconomic stability; institutional quality; the legal system; and past experience with PPPs. The paper concludes that lower levels of corruption and a more effective rule of law are the variables associated with more success in getting private sector involvement through PPPs. Both of these risks are particularly associated with the development and operation phases.

Araya, Schwartz and Andrés (2013) find that country risk ratings are a reliable predictor of infrastructure investment levels in EMDEs. The results suggest that a one standard deviation difference in a country's sovereign risk score is associated with a 27 per cent higher probability of having a commitment of PPI, and a 41 per cent higher level of investment in dollar terms, as weighted by GDP. On average, private participation in energy-related infrastructure investments exhibits a higher correlation with country risk than private participation in other infrastructure projects, such as transport, telecommunications and water investments. This analysis also finds that concessions are more sensitive than greenfield investments to country risk, although country risk is a good predictor of investment levels for both contractual forms.<sup>3</sup>

An analysis of PPI patterns for those countries emerging from conflict reveals that they typically require six to seven years to pass from the day that the conflict is officially resolved before they attract significant levels of private investment in infrastructure. Private investment in sectors where assets are more difficult to secure – such as water, power distribution or roads – is slower to appear or simply never materialises. The levels of investment overall in conflict-affected countries are lower than in other EMDEs in both absolute terms and as a ratio to per capita income. This is despite the low per capita income levels associated with this subset of EMDEs.

Foreign direct investment – in finance, services, manufacturing and extractive industries – is not nearly as sensitive to country risk as infrastructure investment. This points to the unique features of infrastructure investment, including the long return periods, the social and political sensitivity of basic services, and the exposure to local currency through tariffs and user fees. In Nigeria, for example, recent press suggested that over 100 000 barrels of oil are stolen per day from the supply chain of this important export commodity. And yet direct investment into that sector continues unabated. In contrast, in Niger's power sector, recent attempts to reduce financially unsustainable subsidies by raising tariffs resulted in riots, which had a negative impact on the likelihood of electricity sector investments in retail distribution and, for any investments in electricity generation, this is likely to have increased the cost of capital and need for government guarantees. This analysis suggests that perceptions of sovereign risk and stability are a key driver of infrastructure investment levels and this is usually supported by perception surveys.

There are various sources that attempt to measure the perception of risk through investor surveys. For example, the 2013 Multilateral Investment Guarantee Agency-*Economist* Intelligence Unit (MIGA-EIU) Political Risk Survey finds that investors classify macroeconomic instability and political

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3 A concession is a legal arrangement in which a firm obtains from the government the right to provide a particular service.

risk as the main constraints for investing in EMDEs. Among political risk components, the survey finds that regulatory issues (58 per cent) and breach of contract (45 per cent) remain the most important concerns for investors over the next three years (MIGA 2013).

To examine factors that trigger breach of foreign-investment contracts, Nose (2014) constructs a large contract-level dataset. He finds that after controlling for regional and sector fixed effects, less-democratic and resource-dependent governments are more likely to breach contracts, especially after large global shocks, notably natural disasters. These factors are similar to those found to affect outright expropriation. Furthermore, although investors' bargaining power becomes obsolete as contracts mature, contracts can be designed to mitigate the risk of a breach by involving multilateral organisations and creating buffers to absorb commodity price shocks.

As previously discussed, private sector participation is crucial to reduce the infrastructure financing gap, not only by providing direct financing to the infrastructure sector but also by improving efficiency. Andrés, Schwartz and Guasch (2013) find that independent regulation and private sector participation help improve elements of performance in infrastructure service provision, particularly in terms of quality of services, which, over time, might reduce some social risks. However, PPI does tend to lead to a rise in household consumer prices (with commercial prices coming down slightly), probably due to reductions in cross-subsidies among consumer classes.

The nature and the quantum of risk affect the cost of capital. The expected return of an investment in infrastructure should equal the rate on a risk-free security plus a risk premium that compensates for the risks faced (as reflected in a capital asset pricing model). The higher the risk premium, the higher the expected return for the investment to be undertaken.

Risk, and therefore the cost of capital, can be reduced in a number of ways. First, risk can be reduced through diversification. As highlighted by Sawant (2010) and Rothballer and Kaserer (2012), infrastructure is characterised by significant exposure to idiosyncratic risks despite the lower competition in infrastructure industries. This peculiar risk profile can be partly explained by construction risks, operating leverage, the exposure to regulatory changes and the lack of product diversification.

The risk and return characteristics of infrastructure assets vary widely as the underlying assets often have very different cash flow profiles, risk profiles and capital structures. A government-mandated utility with extremely stable long-term cash flows will have very different risk and return characteristics to a toll road asset, where cash flows will be affected by fluctuations in traffic volume. These differences highlight the potential benefits of diversified infrastructure portfolios, advanced risk management capabilities and efficient mechanisms for sharing risk between the private and public sectors.

Another way of lowering and allocating risk optimally is to reduce the risk premium and, therefore, the cost of capital. In regulated sectors, this can be done by using tariffs that can be charged to users of the service and are periodically determined by the regulator (these are often linked to inflation). However, dividends from utilities are likely to be affected by other risks, such as political, economic and regulatory risk, and investors will therefore require a higher return profile. In order to price that risk premium, investors will consider both the likelihood of a risk occurring and the monetary impact of the risk, should it occur. A higher risk premium will need to be funded through higher user fees or taxes.



Another aspect of managing risk effectively is to measure costs, benefits and the impact of risk factors as accurately as possible. Often risks are underestimated and allocated to parties without the knowledge, resources and capabilities to manage them effectively. Risks that private firms are more capable of managing should be transferred to the private sector. It is appropriate for the private sector to bear some level of risk to ensure that incentives remain supportive of efficiency and project quality. This is unlikely to be the case if the public sector is expected to carry most of the risks associated with project development.

### 3. Risk Mitigation Measures

There are a number of measures and mechanisms that could be taken to reduce and/or share risk optimally.

Upstream measures to improve sectoral planning, prioritisation and project preparation are crucial to lower overall sectoral risk and project risks. Risks associated with the particular characteristics of a project or a PPP arrangement can also be lowered by reducing the severity of the loss or the likelihood of the loss occurring. To do this requires improving project preparation and strengthening PPP frameworks. For example, construction risk can be reduced by better project preparation involving comprehensive feasibility studies that provide more accurate technical, social, environmental and economic information on the particular project. However, it is important to note that risks cannot be fully eliminated as unforeseen events may happen. Risks that cannot be mitigated should be allocated optimally (i.e. government retains it, transfers it to the private sector or shares it with the private sector).

Macroeconomic and political risks can be reduced by improving the overall investment climate. The investment climate is, in turn, affected by many factors, including political stability and regime certainty, rule of law and judicial access, property rights, government regulations, taxes, and government transparency and accountability. A more stable and predictable environment in which both domestic and foreign investors can operate efficiently will reduce the macroeconomic and political risks. Again, however, these types of risks cannot be completely removed and any remaining risks should be allocated efficiently.

There are risks that the private sector is not willing to accept because they are perceived as excessive or beyond their control. In those circumstances, certain defined risks can be transferred from project financiers (lenders and equity investors) to creditworthy third parties (guarantors and insurers) that have a better capacity to accept such risks. The financial instruments used to transfer those risks are called 'risk mitigation' instruments. When they are effectively used, it becomes possible to undertake commercially viable projects which would not get financing otherwise.

Risk mitigation instruments can be categorised by: (i) type of beneficiary (debt providers or equity investors); (ii) type of risk that they cover; and (iii) by coverage (full or partial). The applicability of different types of risk mitigation instruments depends on the nature of infrastructure financing selected for a particular project. Table 2 matches risk mitigation instruments to the underlying risk.

**Table 2: Risk Mitigation – Matching Instruments to the Underlying Risk**

	Multilateral development banks		Export credit agencies	Bilateral donors	Private guarantors and insurers
	Public	Private arms			
Sovereign debt	Partial credit guarantee	Political risk insurance (non-honouring of sovereign financial obligations)	Political risk or comprehensive insurance/guarantee		Credit guarantee (wrap)
Corporate debt	Partial credit guarantee	Partial credit guarantee	Political risk or comprehensive insurance/guarantee	Partial credit guarantee	Credit guarantee (wrap)
Project finance					
Debt	Partial risk guarantee (or partial credit guarantee)	Political risk insurance (or partial credit guarantee)	Political risk or comprehensive insurance/guarantee		Credit guarantee (wrap) or political risk insurance
Equity	Partial risk guarantee (through deemed loan)	Political risk insurance	Political risk insurance		Political risk insurance
Debt and equity	Partial risk guarantee (through letter of credit to benefit all financiers)				
Eligibility	Sovereign indemnity	Partial credit guarantee: acceptable credit Political risk insurance: sovereign link	Sovereign indemnity or link (tied to nationality)	Acceptable credit (untied but specific targets)	Investment-grade political risk insurance (acceptable sovereign track record)
Pricing	Uniform cooperative base (backed by sovereign indemnity)	Market base	Market base	Market base	Market base

Source: Matsukawa (2014)

Table 3 presents the definitions of the main risks previously discussed, and information on what risk mitigation instruments and mechanisms are available to mitigate the different categories of risk in infrastructure investment summarised in Table 1. While there are a variety of risk mitigation instruments offered by both private and public providers, many infrastructure projects, particularly in EMDEs, do not have full access to all these options. As a result, they face limits on the extent to which they can manage the risks inherent in a given project. The main constraint is related to the accessibility of the existing risk mitigation instruments for certain borrowers or projects, and the magnitude of the risk that could be covered.

**Table 3: Risks and Risk Mitigation**  
(continued next page)

<b>Risk category</b>	<b>Description</b>	<b>Mitigation measures/mechanisms</b>
<b>External market volatility risk</b>		
Financial market crises	Possibility of spillover from external financial crises: demand, currency, inflation	<i>Transferred to taxpayers:</i> exchange rate shocks and capital flow volatility may require extraordinary support measures from government or central bank <i>Reduction of risk:</i> International Monetary Fund, World Bank and other multilateral development banks can provide assistance with structural reform to enhance resilience as well as precautionary and <i>ex post</i> balance of payments support; bilateral swap arrangements
<b>Political risks</b>		
Expropriation and repatriation of capital	Nationalisation of assets or service rights; imposition of restrictions on capital repatriation	<i>Priced in – private sector and ratepayers:</i> political risk insurance
Regulatory	Changes in regulations and laws, including extraordinary interference in tariff levels	<i>Priced in – private sector and ratepayers:</i> Contractual public obligations for tariff adjustment, and change in laws <i>Priced in and transferred to taxpayers:</i> Non-contractual regulation obligations
Breach of contract	Government does not comply with contractual obligations (e.g. availability payments, termination payment, capital grants, right of way, construction of supporting facilities, setting up of agencies)	Breach of contract cover offered by most international financial institutions (IFIs) and in-country guarantee agencies <i>Taxpayers:</i> guaranteed with government indemnity (e.g. partial risk guarantee) <i>Priced in – private sector and ratepayers:</i> guarantee instrument (non-honouring of sovereign obligations) – MIGA
<b>Macroeconomic risks</b>		
Interest rate	Interest rates move adversely, affecting availability and cost of funds	<i>Priced in – private sector and ratepayers:</i> hedging and rate lock-ins for commercial risks

**Table 3: Risks and Risk Mitigation**  
(continued next page)

<b>Risk category</b>	<b>Description</b>	<b>Mitigation measures/mechanisms</b>
Inflation	Actual inflation exceeds projected inflation, eroding value of government transfers (more apparent during operations phase)	<i>Ratepayers:</i> inflation indexing of tariffs <i>Private sector:</i> inflation impact on operational expenditure covered by contractor's private insurance <i>Government or priced in:</i> tariff and availability payment adjustments cover through breach of contract guarantees
Exchange rate	Exchange rate fluctuations could affect cost of imported inputs to construction or operations Exchange rate between the currency of revenue and the currency of debt diverge resulting in an increase in the cost of debt	<i>Ratepayers:</i> inflation indexing to cover pass-through of exchange rate movement to inflation <i>Government or priced in:</i> exchange rate affecting the financing, capped risk exposure can be provided by either IFIs, such as the World Bank, and commercial banks; swaps, hedging and rate lock-in can be offered to project company by government or purchased on the market
<b>Sector risks</b>		
Market, demand or volume	Demand for services may be lower than projected	<i>Government or priced in:</i> minimum revenue guarantees, minimum traffic guarantees, off-take agreements and power purchase agreements
Technology	Non-performance: technology inputs may fail to deliver required output specifications Uncompetitive: technological improvements may render sunk assets uncompetitive	<i>Investor/operator:</i> outputs and performance risks would be covered under private insurance and performance bonds <i>Ratepayers:</i> in case of energy generation, 'stranded asset' compensation may be embedded in contract or regulation
<b>Project risks</b>		
Financing	Debt and/or equity required by private party for a project is not available in amounts and on terms anticipated	<i>Ratepayers/private sector:</i> bridge financing or higher equity until demand is proven <i>Taxpayers:</i> subsidised funding from government, including concessional funding, and capital grants
Design	Design may not achieve required output specifications/services at anticipated cost	<i>Private sector:</i> outputs and performance risks would be covered under private insurance and performance bond
Construction	Events prevent facility from being delivered on time and on budget (e.g. geological, land acquisition, equipment supply or resettlement)	<i>Private sector:</i> performance bonds <i>Government:</i> oversight and supervision <i>Reduced:</i> greater investment in project preparation, design and feasibility

**Table 3: Risks and Risk Mitigation**  
(continued)

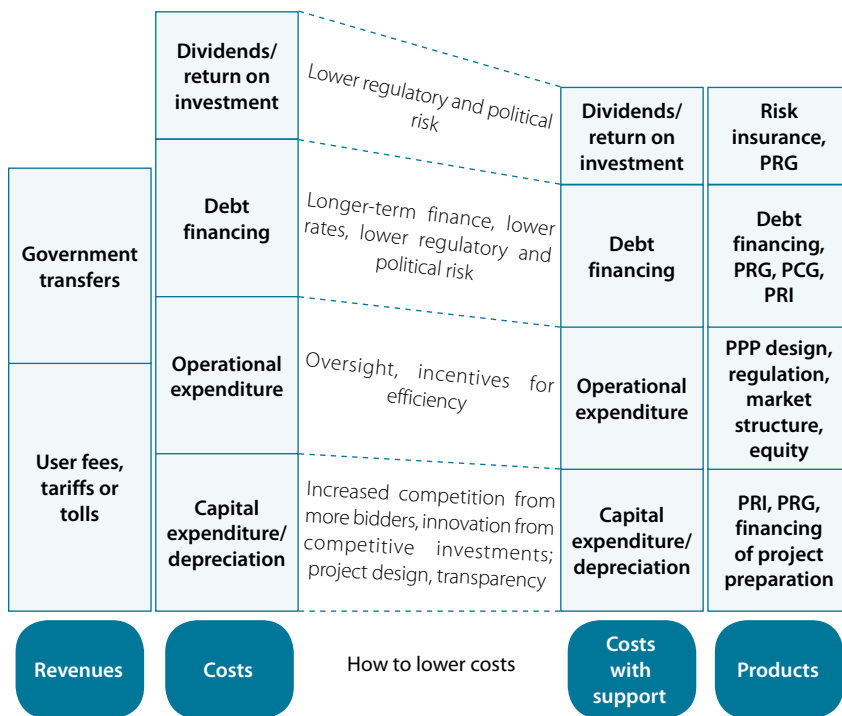
<b>Risk category</b>	<b>Description</b>	<b>Mitigation measures/mechanisms</b>
Completion	Project may not be completed or cannot be delivered according to agreed schedule	<i>Private sector:</i> performance bonds <i>Government:</i> oversight and supervision <i>Reduced:</i> greater investment in project preparation, design and feasibility
Operation	Any factors (other than <i>force majeure</i> ) impacting on operating requirements of project (e.g. operating expenditure, technology failure or environmental incidents)	<i>Investor/operator and, eventually, ratepayers:</i> for factors related to regulation and policy, use guarantees <i>Private sector:</i> for factors relating to performance, should be covered in the operation and management contract and performance bond
Maintenance	Costs of maintaining assets in required condition higher than projected Maintenance not carried out	<i>Investor/operator and, eventually, ratepayers:</i> for factors related to regulation and policy, use guarantees <i>Private sector:</i> for factors relating to performance, should be covered in the operation and management contract and performance bond
Environmental/ social	Liability for environmental and socially caused losses/damages arising from construction, operation or pre-transfer activities	<i>Investor/operator and, eventually, ratepayers:</i> for factors related to regulation and policy, use guarantees <i>Reduced:</i> safeguard policies for projects funded by IFIs; international commercial banks apply Equator principles
<b>Risks specific to PPP arrangements</b>		
Residual value	Project assets at termination or expiry of PPP agreement not having going concern value or being in the condition prescribed for hand back	<i>Private operator:</i> explicit clauses on valuation of undepreciated assets <i>Reduced:</i> ability to uphold contract clauses on handover value and conditions (e.g. independent regulator)
Sponsor (insolvency)	Private party unable to provide required services, becomes insolvent, or later found improper	<i>Financier:</i> step-in rights, replacement and termination <i>Reduced:</i> strengthening of credit rights and enforcement; regulatory framework to maintain financial-economic equilibrium
Default and termination	Loss of asset upon premature termination of lease, or breach of other contracts, and without adequate compensation	<i>Private operator:</i> government transfers staggered, or held in escrow <i>Reduced:</i> thorough due diligence on project company

Source: various country guidance notes and manuals

Official development agencies, bilateral agencies (such as an export credit agency), guarantors and insurers are all exploring new applications of existing instruments or new instruments. The aim of this is to help countries raise finance, not only from traditional project sponsors and bank lenders, but also from new sources such as domestic capital markets, infrastructure funds and sovereign wealth funds.

The measures, mechanisms and instruments listed in this section could be useful in reducing, sharing and managing risk. Figure 2 illustrates how some of those measures could reduce the viability gap sufficiently to make it feasible for the private sector to participate. The reduction may also allow less dependence on taxes and/or user fees.

**Figure 2: Risk Measures to Close the Project Viability Gap**



Notes: PRG denotes partial risk guarantee; PCG denotes partial credit guarantee; PRI denotes partial risk insurance

#### 4. Conclusions

In an environment characterised by constrained fiscal space, the challenge for governments pursuing economic and environmental goals through infrastructure development is to attract external sources of financing. While there may be plenty of liquid capital in the system, infrastructure investment requires longer-term, more patient financing than is frequently available, particularly for EMDEs. And while there may be considerable longer-term capital in the hands of institutional investors, the level of risk – both actual and perceived – associated with investing in infrastructure

in EMDEs has tended to make these investments unattractive. The challenge is, therefore, to find ways both to reduce the overall riskiness associated with infrastructure investment in EMDEs and then develop the tools necessary to foster an appropriate sharing of risk between the public and private sectors. This is the spirit behind the World Bank Group's approach to mobilising additional financing for infrastructure development.

Improving the underlying domestic investment climate – including by fostering greater transparency, confronting corruption (particularly at the sectoral level) and improving investor and creditor rights and protections – could significantly reduce economic and political risks that would otherwise imply extremely high risk premiums. Upstream measures to improve sectoral planning, prioritisation and project preparation are also crucial to lower overall sectoral and project risks. Risks associated with the particular characteristics of a project or a PPP arrangement can also be lowered by improving project preparation, applying transparent and internationally recognised safeguards and standards, and strengthening PPP frameworks.

In addition, there are a number of risk-mitigating and viability-enhancing instruments being implemented around the world to correct project-specific weaknesses, each designed to meet different ends. However, some of them are not available for certain borrowers or projects. Moreover, the lack of understanding of the nature of the instruments and the project-specific deficiencies they correct often results in their improper and sub-optimal use, and loss of government credibility vis-à-vis private markets.

The challenge is a political, technical and financial one. There is a need to improve the underlying infrastructure investment climate, planning, project prioritisation and preparation to reduce risks. At the national level, this takes political commitment, technical and institutional capacity building, backed by adequate and predictable resources. At the same time, the international community can help by improving the availability and accessibility of existing risk mitigation instruments, as well as by expanding the use of guarantees, risk insurance and innovative finance to crowd-in new investors and develop local capital markets.

As traditional sources of financing for infrastructure come under pressure, other sources of financing, such as institutional investors (including pension funds, insurance companies and sovereign wealth funds), will need market instruments and regulatory support to bring the risk profile of investment in infrastructure into better alignment with their own risk tolerance. Credit enhancements can help to attract this long-term capital. These enhancements would build local capital markets, and mitigate currency risk and specific regulatory risks that are both exogenous and endogenous to projects. Furthermore, pension funds in EMDEs have a larger role to play than they do in advanced economies, as their financial systems are mostly bank based and their financial markets are still small relative to their economies.

## References

**Agénor P-R and B Moreno-Dodson (2006)**, 'Public Infrastructure and Growth: New Channels and Policy Implications', World Bank Policy Research Working Paper No 4064.

**Andrés LA, JZ Schwartz and JL Guasch (2013)**, *Uncovering the Drivers of Utility Performance: Lessons from Latin America and the Caribbean on the Role of the Private Sector, Regulation, and Governance in the Power, Water, and Telecommunication Sectors*, The World Bank, Washington DC.

**Araya G, JZ Schwartz and LA Andrés (2013)**, 'The Effects of Country Risk and Conflict on Infrastructure PPPs', World Bank Policy Research Working Paper No 6569.

**Bhattacharya A and M Romani (2013)**, 'Meeting the Financing Challenge for Sustainable Infrastructure', Paper prepared for the Global Green Growth Summit 2013 'The Future of Green Growth: Finance, Innovation and Policy', Incheon City, 10–11 June.

**Calderón C and L Servén (2004)**, 'The Effects of Infrastructure Development on Growth and Income Distribution', World Bank Policy Research Working Paper No 3400.

**Calderón C and L Servén (2008)**, 'Infrastructure and Economic Development in Sub-Saharan Africa', World Bank Policy Research Working Paper No 4712.

**Calderón C and L Servén (2010)**, 'Infrastructure in Latin America', World Bank Policy Research Working Paper No 5317.

**Fay M and M Toman (2010)**, 'Infrastructure and Sustainable Development', Paper submitted to the Korea–World Bank High Level Conference on Post-Crisis Growth and Development, hosted jointly by the G20 Summit Coordinating Committee and the World Bank and organised by the Korea Institute for International Economic Policy, Busan, 4 June.

**FHWA (Federal Highway Administration) (2012)**, 'Risk Assessment for Public-Private Partnerships: A Primer', P3 Toolkit Primer.

**FSB (Financial Stability Board) (2013)**, 'Financial Regulatory Factors Affecting the Availability of Long-Term Investment Finance', Report to G20 Finance Ministers and Central Bank Governors, 8 February.

**Hammami M, J-F Ruhashyankiko and E Yehoue (2006)**, 'Determinants of Public-Private Partnerships in Infrastructure', IMF Working Paper No WP/06/99.

**Ianchovichina E, A Estache, R Foucart, G Garsous and T Yepes (2013)**, 'Job Creation through Infrastructure Investment in the Middle East and North Africa', *World Development*, 45, pp 209–222.

**Mandri-Perrott C (2009)**, *Public and Private Participation in the Water and Wastewater Sector: Developing Sustainable Legal Mechanisms*, Water Law & Policy Series, IWA Publishing, London.

**Matsukawa T (2014)**, 'Risk Mitigation Instruments for Infrastructure Financing', World Bank Background Paper.

**MIGA (Multilateral Investment Guarantee Agency) (2013)**, *World Investment and Political Risk 2013*, Conducted by the *Economist* Intelligence Unit on behalf of MIGA, World Bank Group, Washington DC.

**Ministry of Finance (Ministry of Finance, Government of India) (2010)**, 'PPP Toolkit for Improving PPP Decision-Making Processes, Sector: Urban Transport | Module 1: PPP Background | Risk – A Critical Focus of PPP Design', accessed on 3 February 2014. Available at <<http://toolkit.pppinindia.com/urban-transport/module1-racfpd.php?links=risk1>>.

**National Treasury (National Treasury, Republic of South Africa) (2004)**, 'PPP Manual – Module 4: PPP Feasibility Study', National Treasury PPP Practice Note Number 05 of 2004. Available at <[http://www.dwaf.gov.za/dir\\_ws/wsnis/vdfileload/file.asp?ID=1023](http://www.dwaf.gov.za/dir_ws/wsnis/vdfileload/file.asp?ID=1023)>.



**Nose M (2014)**, 'Triggers of Contract Breach: Contract Design, Shocks, or Institutions?', World Bank Policy Research Working Paper No 6738.

**PPP Center (Public-Private Partnership Center) (2012)**, *A PPP Manual for LGUs – Volume 2: Developing PPP Projects for Local Government Units*, Developing Public-Private Partnerships in Local Infrastructure and Development Projects, PPP Center, Quezon City.

**Queensland Government (Department of Infrastructure and Planning, Queensland Government) (2008)**, 'Public Private Partnerships Guidance Material – Supporting Document: Risk Management'. Available at <<http://www.treasury.qld.gov.au/projects-queensland/policy-framework/public-private-partnerships/risk-management.pdf>>.

**Rothballer C and C Kaserer (2012)**, 'The Risk Profile of Infrastructure Investments: Challenging Conventional Wisdom', *The Journal of Structured Finance*, 18(2), pp 95–109.

**Sawant RJ (2010)**, *Infrastructure Investing: Managing Risks and Rewards for Pensions, Insurance Companies & Endowments*, John Wiley & Sons, Inc., Hoboken.

**Schwartz JZ, LA Andrés and G Dragoiu (2009)**, 'Crisis in Latin America: Infrastructure Investment, Employment, and the Expectations of Stimulus', World Bank Policy Research Working Paper No 5009.

**Straub S (2008)**, 'Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges', World Bank Policy Research Working Paper No 4460.

**World Bank (2013)**, 'Long-Term Investment Financing for Growth and Development: Umbrella Paper', Presented to the Meeting of the G20 Ministers of Finance and Central Bank Governors, Moscow, February.

# Discussion

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## 1. Anne Krueger

Private-public partnerships (PPPs) are certainly in vogue. Schwartz, Ruiz-Nuñez and Chelsky base their paper on the twin propositions that there is a 'need' for infrastructure, and that public finances will not be adequate to finance that 'need'. On that basis, they then address the question of what types of risk are faced by PPP-financed infrastructure. There is much in the paper that is informative. However, it is not a discussant's role to praise, but rather to raise questions and provide critical comments.

I will start by questioning, or at least qualifying, their two basic propositions. I will then ask what is different about the risks and returns associated with PPP investments and those associated with other forms of investment. A concluding comment then raises questions about the appropriate allocation of risk within a PPP.

### The 'need' for infrastructure and the financing gap

There is no question that there is a 'need' for infrastructure. But there is a 'need' for much else, too. Over-investment in infrastructure, or investment in the wrong kinds of infrastructure, can reduce growth just as under-investment can, when it creates transport or other infrastructure bottlenecks, or failed investments by the private sector, which may be induced by inappropriate government policies. A better starting point for the paper might have been to define infrastructure (which is not done) and then to sketch the criteria – such as cost-benefit analysis or rate of return estimates – that constitute the appropriate basis for choosing infrastructure projects.

In general, investment in infrastructure and in other items should take place so that the risk-adjusted return is equalised across projects. I will return to the 'risk-adjusted' part later. But, except in a few countries, there is little provision for systematic and professional evaluation of any government-sponsored projects, infrastructure or otherwise.

There are several issues. The first is whether one can speak of a 'need' for infrastructure in general without some systematic evaluation of rates of return. There are famed examples of wasted infrastructure investments. In the United States, a recent headline case was financing of a 'bridge to nowhere' in Alaska that was included in the US budget bill. There was reported to be literally nothing on the far side of the bridge from a very small remote Alaskan town. Similarly, there are currently stories of 'ghost' cities in China that have been built – apartment blocks, retail stores, hospitals, schools, etc – for tens or hundreds of thousands of people that are empty. Even if these towns are eventually occupied, there is a zero return on the investment for a considerable period. Surely, more productive investments would have yielded a positive return in the years before there was demand for housing and facilities in the new towns. If nothing else, that return could have been used to build better facilities at a later date.

But there are many other instances of infrastructure investments with low, even if positive, rates of return. Sometimes delays and cost overruns are much greater than would seem to be warranted, so that returns are significantly lowered. Sometimes projects with significantly higher rates of return are bypassed while others with lower returns are undertaken. Obviously, political pressures can play an important part in these ill-advised undertakings. Using available resources as productively as possible is self-evidently desirable. Certainly, if it is agreed that there is a 'need' for infrastructure, a first step should be to insure that those projects that are undertaken offer the promise of reasonably high returns.

Moreover, in most countries, there are low- or negative-return expenditures in the government budget. Subsidies intended to help the poor that cost percentage points of GDP and go disproportionately to the upper end of the income distribution are so common as to require little comment. Fuel and food subsidies are widespread and costly. In many instances, targeting subsidies so that the bulk reached the lower half of the income distribution could free up enough resources in the government budget for financing a large percentage increase in infrastructure investment expenditures. Indeed, it is tempting to argue that in many, if not most, middle-income countries, appropriate benefit-cost (or rate-of-return) evaluation of projects and selection of those projects with the highest ratios, combined with reduced subsidy costs through appropriate targeting, would itself solve, or at least greatly reduce the magnitude of, the infrastructure 'deficit'.

### What is different about PPP investment?

To get closer to the question addressed in the paper, I shall assume that PPPs are to be used to finance at least some infrastructure investment. Even then, a major question is what, if anything, is different about PPP-financed infrastructure investments compared with any other investments? Here, there are several issues that are difficult to disentangle. The authors raise issues such as 'foreign exchange risk'. But this also affects domestic private sector investors (who, for example, may build capacity to produce goods to be sold in the home market that rely on imported inputs) and, of course, private foreign direct investment (FDI).

The paper also suggests that there are regulatory risks for would-be PPP investors. But so too there are regulatory risks to any private investors, both domestic and foreign: environmental regulations may change; price controls may be imposed or intensified; labour market regulations may be tightened; and so on. All of these, and other, policy measures can both affect the prospective rates of return on investments and are 'risks' that confront all potential investors in varying degrees.

If one were to try to pinpoint how PPP returns and risks differ from those encountered in FDI or domestic private investment, the focus should probably be on the impact of government policies. It is certainly true that any investment, private or public, will be subject to future policies and changes in the external environment. But PPPs by their nature involve a very particular interaction between the government (and its policies) and the investors in that project.

Perhaps a characterisation of PPP infrastructure investments that focuses on their long time horizon, the fact that the government can control other entrants into the activity (although even here there are exceptions) and the fact that PPP investors are typically foreign, can enable a reasonable view of the problem. The first thing to note is that PPP investments are usually undertaken by foreigners, who in turn must negotiate with the government in the host country. While most countries

have some sort of procedure for permitting FDI in general, negotiating terms of a PPP contract surely entails more interaction with government officials. This immediately raises the issue of how policymakers can reduce or eliminate the risks of corruption in awarding PPP contracts. This risk is assumed by the government, while the functionaries in the relevant government department may be the beneficiaries. Many observers believe that there is considerably more corruption on average associated with PPPs than with FDI.

Beyond that, the issue is whether PPPs, because the government's partners are foreign, are more exposed to the vagaries of exchange rates, domestic monetary policy, regulatory changes and other policy changes than other forms of investment. While it is surely a matter of degree, and there is wide variation among projects, it is certainly plausible that foreigners can exert less influence on public officials than can domestic investors. And the fact that the time horizons over which investments and returns take place are probably longer on average than in many private investments may make these risks more important. However, it may also reduce the ability of policymakers to reduce perceived risks.

But that leads immediately to the question of how the risks associated with infrastructure investment, the subject of the paper, can be reduced. Note first that there are inevitably some risks associated with future actions, and it is certainly not appropriate policy simply to minimise risk. That could be done by failing to invest at all! The question, rather, is whether there are public policy actions that can reduce the risk and thus increase the attractiveness of given PPP ventures beyond those actions that can be taken to facilitate private investment – domestic and foreign – in general.

The problem, when it is posed in that form, is evident: it is the government that makes the policy and the government that needs to make the commitments that will reduce the risks of regulatory or other measures that would reduce returns. Worse yet, it is not necessarily the same government: the government today may well be firmly convinced that it must honour its PPP commitments; but the government may change and the government of tomorrow may not share that conviction. A pertinent example is the contracts signed by the Argentine government in the 1990s for several public utilities. There is little question that the government of the day fully intended to honour its pledges to maintain constant tariffs in US dollar terms. But the successor governments early in the last decade quickly abandoned that practice. Even if policymakers and politicians of today have every intention of honouring their commitments, it is also possible that political pressures may induce changes in policies at a later date.

A reasonable conclusion would seem to be that in countries where the rule of law is respected, contracts are honoured and the 'business climate' is generally good, the risks confronted by all investors, including those in PPP-financed infrastructure, will be lower than in countries where governance practices are weaker. Some issues pinpointed by the paper – macroeconomic stability, for example – are ones that can only be addressed at the country-wide level. Others can perhaps be addressed at the level of individual ministries. There may also be mechanisms by which independent authorities can oversee PPP investments and hence reduce the likelihood of capricious policy impositions, but I would guess that potential PPP partners would consider risk to be lower in countries where the treatment of all investors was deemed 'friendly'.

## The allocation of risk between public and private partners

There will always be risk in any investment project. Where there are partners in the project, as in a PPP, a critical question is how risk is shared between them. One can easily think of situations in which it would be more important to get the allocation of risk appropriate than to reduce the overall project risk.

Here, the prescription is fairly straightforward. Those risks arising primarily from the private partner's behaviour should be borne by that partner, whereas those risks resulting from government actions should be borne by the government. Thus, delays in issuance of construction permits should be penalised by compensation (or alteration of the subsequent timetable, or other means) from the government to the private partner. If actual construction takes longer than agreed upon in the contract, however, the penalty should fall on the private partner (unless, of course, those delays result from other government actions). The Argentine commitment to maintain utility rates in US dollar terms had the government bearing macroeconomic inflation and exchange rate risk over which it had more control. That assignment of risk was appropriate given that the exchange rate and inflation depended on government policy. But it is difficult to think of a way that a PPP contract could guarantee the private partner's immunity from breach of contract, which is what happened in that case.

I would argue that appropriate technical evaluation of the likely rates of return (or benefit-cost ratios) and improvements in the 'business friendly' environment are the two most sorely needed policy measures in most countries seeking productive PPP investments. If a competent technical evaluation bureau and a 'business friendly' environment are in place, there are doubtless actions that can further reduce risk without reducing rates of return. But the starting point should be to address the factors that affect the climate and returns for investment in general, and to provide incentives that induce investors to undertake the most desirable projects regardless of the sector of the project or the nationality of the investor. In most countries there is scope for significant improvement in governance, the commercial code, and much more. In those countries, the returns for overall improvements could be very substantial.

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## 2. General Discussion

Much of the discussion of this paper revolved around the differences between infrastructure investment and other investment – an issue that was highlighted by the discussant. The discussion began with one participant suggesting that the fundamental difference is the state's large role in infrastructure provision, specifically in project selection, pricing and contract design. Jordan Schwartz agreed that this is a defining feature for infrastructure, but also argued, in response to the discussant's comments, that infrastructure investors typically have relatively large currency mismatches, as their equipment supply, energy inputs, and debt and equity exposures are often denominated in foreign currency, while their revenues tend to be in local currency. Mr Schwartz noted that this is not commonly the case for investments in other sectors, such as the tradeable sector.

Jeff Chelsky argued that while many of the risks associated with infrastructure investment identified in the paper are risks that are faced when undertaking any type of investment, these risks still need to be managed and are often more significant for infrastructure than other types of investment. Mr Chelsky also emphasised that many of the risks associated with infrastructure investment are magnified in developing economies, owing to factors such as poor pay for civil servants, difficulty enforcing the collection of tariffs and weak creditor rights. Mr Chelsky went on to re-emphasise that the purpose of the paper was to systematically identify the risks associated with infrastructure investment and consider how they can be reduced or appropriately shared between parties so that institutional investors – who hold large pools of longer-term assets, but are typically risk averse – will consider infrastructure, particularly in developing economies, as a viable investment. Another participant asked about what the multilateral development banks could do to contribute to mitigating risk to help close the ‘infrastructure gap’ above and beyond the potential contribution of governments or other institutions.

Another participant suggested that the biggest difference between infrastructure investment financed by government and that financed by PPPs is the so-called ‘equity premium’ (i.e. the difference between the rate of return required by private investors in a PPP and the borrowing rate of the government). The participant went on to argue that there is a lack of theoretical explanation for why the equity premium is so large. Consequently, it is unclear whether there is a corresponding ‘true’ government risk or whether the premium arises from something specific to private equity. Ultimately, the participant argued, it is unclear what benefits taxpayers and/or users of the infrastructure derive from paying this premium.

Much of the remaining discussion focused on the decision-making process of government in its provision of infrastructure. One participant suggested that the challenge society faces in terms of infrastructure provision is to devise a set of governance arrangements that constrain the state to make decisions that are in society’s collective interest. The participant drew a parallel with monetary policy in some jurisdictions, whereby the state has agreed to grant central banks independence, which, coupled with accountability and transparency, has resulted in a net benefit to society. Another participant responded that, because infrastructure necessarily involves government, the judgements of politicians unavoidably apply to infrastructure provision. This makes it difficult, if not impossible, for politicians to be removed from the process of decision-making. Therefore, the participant argued, it is important to make the decision-making process transparent so that sub-optimal decisions at the political level are obvious and the decision-makers incur some cost. Referring to the example of monetary policy, the participant went on to argue that the institution – independence of the central bank – is the vehicle through which policy has improved over time. Therefore, the improvement is not inherent in the policy itself, and institutional reform is likely to be the mechanism by which problems in infrastructure provision can be solved. Finally, the participant posited that developing economies may have an advantage in establishing robust infrastructure-related policymaking institutions, as, unlike in the advanced economies, they do not have well-established institutions with existing vested interests.

Picking up on the discussant’s comments about the building of a ‘bridge to nowhere’ in Alaska, another participant noted that the Sydney Harbour Bridge was essentially a bridge to nowhere when it was first built. The participant questioned whether there are any lessons to be learned from comparing ‘bridges to nowhere’ that were ultimately productive investments against those that

## DISCUSSION

were unproductive. In response, another participant argued that whether an initially unproductive investment later becomes productive is not proof that it was a good investment, as an alternative investment with a greater return could have been made in the interim. Mr Schwartz agreed that it is difficult to justify constructing infrastructure when there isn't proven demand for it, particularly under high discount rates, but that the reverse – *not* constructing infrastructure when there *is* proven demand for it – is 'abominable'. Mr Schwartz went on to explain that the World Bank requires potential infrastructure projects to provide an immediate rate of return under fairly high discount rates, whereas some countries are willing to build infrastructure that only proves to be economically viable over time.

Another participant cautioned that care should be taken when calculating infrastructure deficits, as these can lead to policymakers overestimating the expense of implementing beneficial policies. As an example, the participant drew on a case study of Abidjan (the largest city in Côte d'Ivoire), which, by the 1990s, had similar potable water coverage to Buenos Aires despite having a substantially lower per capita income. The participant also argued against the notion that individuals in developing economies are not willing or able to pay for basic infrastructure. As evidence, the participant referred to studies that have shown that individuals who do not have access to electricity spend large amounts of money on candles. This money could instead be used to pay for an electricity grid. The participant also described the diffusion of mobile phones throughout Africa despite their expense, which implies that consumers place a high value on the ability to make phone calls. The participant suggested that the value of having access to potable water or electricity is most probably much higher still, especially for the very poor, as the impact on welfare is relatively large. Additionally, the participant argued that the subsidisation of infrastructure use is often, in fact, regressive, as lower-income households are less likely to be connected to infrastructure networks and thus do not receive the benefits of subsidisation. In response, Mr Schwartz agreed that subsidies for infrastructure use are often regressive, owing to poor regulation and planning.

# How the Private Sector Can Improve Public Transportation Infrastructure

Clifford Winston\*

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## 1. Introduction

Transportation infrastructure significantly contributes to a nation's prosperity by facilitating workers' access to employers, consumers' access to shopping and leisure activities, and firms' access to capital, labour and potential customers. The public sector has generally provided the vast amount of a nation's infrastructure – roadways, waterways, railways and airways – and expanded it to satisfy users' growing demand for transportation. But as demand has increased and ageing infrastructure facilities have required ever-greater funds for maintenance and new construction, capacity has become increasingly strained and travellers and shippers have experienced more congestion and delays. Policymakers have tried to find new sources of money to finance projects to expand capacity; but congestion and delays have persisted.

The public sector's 'strategy' of increasing spending to build its way out of congestion has been entrenched for decades and is unlikely to change for the foreseeable future into a sustainable strategy that could improve infrastructure performance.<sup>1</sup> I therefore consider in this paper three ways that private sector firms could potentially contribute to that goal.

1. They could purchase infrastructure facilities from the government and operate them more efficiently subject to general business laws (privatisation).
2. They could develop technological innovations that the public sector could implement to improve current infrastructure performance.
3. They could make technological advances that greatly improve the operations of transportation modes that use the infrastructure.<sup>2</sup>

In what follows, I explore those possibilities by drawing on evidence based primarily, but not exclusively, on highway and aviation infrastructure services in the United States, which have been the main focus of infrastructure policy discussions. I conclude that: privatisation, while worthy of carefully designed experiments, faces considerable uncertainties as to its long-run success in the United States; technological innovations developed by the private sector are available for

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\* This paper draws heavily upon and extends Winston (2013b) and Winston and Mannering (forthcoming).

1 Peterson (2013) discusses the resistance in the United States to raising the federal tax on gasoline and diesel fuels, which provides revenue for the Highway Trust Fund that finances federal highway expenditures, quoting Representative Steve Southerland (Representative for Florida) as saying, 'You can't tax your way out of this mess'. However, a few months earlier the Obama Administration proposed overhauling the corporate tax code to generate funds for infrastructure construction and many Republican lawmakers simply countered by arguing that more transportation funds should be left in the hands of individual states instead of with the federal government. Recently, some states have raised their gasoline taxes.

2 In many countries, the public sector has tried to engage the private sector through public-private infrastructure partnerships; but their primary purpose has been to substitute private for public spending and they have not generated notable efficiency gains.



the public sector to implement but policymakers have resisted doing so; and, more positively, technological advances in the transportation modes could facilitate significant improvements in infrastructure performance provided its implementation is not impeded by the government.

## 2. An Overview of Public Infrastructure Inefficiencies

I begin with a brief overview of the economic inefficiencies that have developed under public ownership and management of transportation infrastructure.<sup>3</sup> Although I draw only on the US experience, other countries' infrastructure is characterised by similar inefficiencies.

The United States has grappled with determining the optimal mix of public and private provision of transportation since its founding. Infrastructure was initially developed and operated by the private sector but the public sector soon after played a role. For example, starting with the Ohio Statehood Enabling Act in 1802, states provided limited funds for road building, and in the 1820s state governments subsidised and owned some canals and railways. But even by the 1860s, cumulative private capital investment in bridges, canals, ferries, railroads and roads amounted to roughly US\$3 billion (in 1860 dollars), a significant share of the nation's GDP (Wright and Murphy 2009).<sup>4</sup> Various financial crises subsequently resulted in the government owning and operating most of the nation's infrastructure, although it has been contested whether the government effectively responded or contributed to those crises. For example, Klein and Fielding (1992) argue that government regulations of highway tolls during the 19th century greatly contributed to the failure of private highway companies. And the government takeover of private airports during the Great Depression can be questioned because a better course of action in the long run may have been to allow private airport competition to develop by offering struggling airports financial assistance so they could stay in business and compete.

Funding for public highway and aviation infrastructure is obtained from various taxes and fees. Motorists and truckers are charged gasoline and diesel fuel taxes for their use of the roadways, aircraft are charged a weight-based landing fee for their use of airport runways, and air travellers are charged a fixed rate, currently US\$4.00 per flight segment, and a 7.5 per cent tax on their fare to pay for air traffic control services (Airlines for America 2014).

As auto, truck and plane traffic has continued to grow, those sources of funds have become inadequate to cover the costs that users impose on public infrastructure. The federal gasoline tax, which is the primary source of highway user-fee revenues, has not been raised since 1993 and Congress has recently been forced to add general funds to the Highway Trust Fund to close what would otherwise be a deficit. Airports are experiencing similar problems. Since 2000, the Airport and Airway Trust Fund has been running annual deficits of between US\$3 and US\$5 billion that have been covered by general taxpayer funds (Winston 2013b). And the Federal Aviation Administration (FAA) was forced to furlough air traffic controllers, which significantly increased flight delays, when the government sequester hit in April 2013 because its funds could not cover current operations (Winston 2013a).

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<sup>3</sup> This material is explained in greater detail in Winston (2013b).

<sup>4</sup> Starkie (2013) points out that in the United Kingdom during the 18th and 19th centuries, the role of the State was to enable transport infrastructure to be both planned and developed largely by private interests.

Funding shortfalls have contributed to longer and more frequent travel delays related to pothole-ridden roads. According to data from the Texas Transportation Institute (TTI) reported in Winston (2013b), the average annual traffic delay endured by motorists in urban areas has more than doubled during the past three decades. At the same time, despite frustratingly frequent lane closures for road repairs, highway crews cannot seem to outpace the rate of pavement deterioration. The Federal Highway Administration's (FHWA) Highway Statistics indicate that although the condition of the nation's highways and bridges varies with general economic conditions, as much as one-third of the nation's highways may be in poor or mediocre condition, and one-quarter of the nation's bridges may be functionally obsolete or structurally deficient for several years before repairs are made. Due to greater airport and airspace demand, congestion and travel times by air in the United States have steadily increased since airlines were deregulated in 1978.

Public provision of highway and aviation infrastructure is characterised by growing budget deficits, travel delays, and physical deterioration because it has not been guided by basic economic principles: prices do not reflect social marginal costs, especially a user's contribution to congestion and delays; investments are not based on cost-benefit analysis and have failed to maximise net benefits; and operating costs have been inflated by regulations. In addition, those static inefficiencies have been compounded by dynamic inefficiencies that are attributable to the slow rate of technological advance in infrastructure services.

## 2.1 Pricing

Motorists and truckers should be charged for their use of lane capacity by paying efficient (marginal cost) congestion tolls, which can be assessed using modern technology without disrupting their journeys, assuming sufficient safeguards are employed to protect their privacy.<sup>5</sup> By substantially reducing – but not eliminating – delays and residential sprawl because the out-of-pocket cost of commuting would no longer be underpriced, such tolls could generate annual gains of US\$40 billion. This includes the travel time savings for commuters, savings for taxpayers from lower costs of public services that come with greater residential density, and greater revenues to the government (Langer and Winston 2008).<sup>6</sup> In addition, truckers should be charged an axle-weight tax that accurately accounts for their trucks' damage to road pavement (for a given weight, trucks with more axles inflict less pavement damage). Small, Winston and Evans (1989) find that an axle-weight (marginal cost) charge would encourage truckers to shift to vehicles with more axles that do less damage to road pavement, thereby reducing maintenance expenditures and producing an annual welfare gain exceeding US\$10 billion.

Airport runways become congested – that is, they reach capacity – when planes that take off or land force other aircraft to wait on taxiways and tarmacs to take off or force them to wait in the air by reducing their speeds or circling the airport before they can land. In contrast to weight-based landing fees, efficient take-off and landing (marginal cost) congestion charges that vary by time

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5 Miller (2014) summarises research that indicates how a system of road charges could be structured to safeguard privacy.

6 The benefits from congestion pricing are likely to be understated because they do not include the positive effects on health and the environment and the improvements in travel time reliability. Small, Winston and Yan (2005) find that the value that motorists place on the standard deviation of travel time (or the difference between two fractiles of the distribution of travel time) was similar to the value they place on average travel time.

of day could significantly reduce air travel delays, generating a US\$6.3 billion annual welfare gain, accounting for time savings to travellers and reduced operating costs to airlines (Morrison and Winston 1989). Similarly, a marginal-cost user fee that accounts for an aircraft's contribution to congested airspace near airports and to its demand on air traffic control services could reduce delays and traffic control's workload by inducing airlines to schedule flights to use the available airspace more efficiently.

## 2.2 Investments and operations

Optimal investments in transportation infrastructure should maximise the present value of users' benefits, net of capital and maintenance costs, while efficient operations should minimise costs.

In practice, investments in highway capacity have been excessive because users' prices have been set below marginal cost. Duranton and Turner (2012) conclude from a study covering the period 1983 to 2003 that, at the margin, the benefits from additional roads have fallen short of the costs and that increasing the provision of new roads is unlikely to relieve congestion. In contrast, investments in highway durability have been insufficient. Small *et al* (1989) have argued that optimal pavement thickness should minimise the present discounted sum of initial capital and ongoing maintenance costs. They determine that building roads with thicker pavement at an annualised cost of US\$3.7 billion would generate an annualised maintenance saving of almost four times as much – US\$14.4 billion – for a net annual welfare gain of US\$10.7 billion. Improving the durability of a nation's roads is also important because it reduces the wear and tear on motorists' and truckers' vehicles. Driving on damaged roads is estimated to cost US motorists US\$67 billion in additional annual operating costs and repairs (The Road Information Program 2010) and also damages trucks and increases their operating costs.

US airport authorities appear to have underinvested in airport runway capacity at major airports. Morrison and Winston (1989) estimate that the annual gain from combining efficient runway pricing with efficient runway investments, which would reduce delays and airlines' operating costs, would have been US\$16 billion. I am not aware of a more recent study, but the growth in air traffic suggests that the gains today from combining efficient pricing with investment would be even greater.

Regulations have significantly raised the cost of infrastructure services. Federal and state transportation departments employ nearly 200 000 workers, in part just to ensure that highway projects meet all regulations. Sherk (2011) finds that the annual cost of Davis-Bacon regulations, which stipulate that 'prevailing wages' – interpreted in practice as 'union wages' – be paid on any construction project receiving federal funds increases the cost of federal construction projects by 9.9 per cent; repealing the regulations and paying market wages would have saved taxpayers US\$10.9 billion in 2010. The savings are not solely transfers from labour because the inflated wage payments are funded by taxation, which generates a cost (excess burden). Finally, the cost of constructing runways has turned into a task that is measured in billions of dollars because it takes decades to meet regulations, especially Environmental Protection Agency environmental impact standards (Winston 2010).

## 2.3 Dynamic inefficiencies

Government's stifling of innovation and technological advance in highway and aviation infrastructure has deprived travellers of significant benefits. Because innovations and technological change often become apparent only after government impediments have been eliminated by policy reforms, such as privatisation and deregulation, they may be difficult to identify and the costs from failing to implement them may be difficult to quantify before the policy change. However, the extraordinary time that the FAA has taken to implement the latest technological advances in air traffic control that could improve the safety and speed of air travel clearly illustrates the nature of the problem.

In the early 1980s, the FAA announced plans to develop an advanced automated system that was scheduled to be completed by 1991 at a cost of US\$12 billion. As of 2013, the fully upgraded system is more than two decades late, billions of dollars over budget, and still nowhere in sight. Instead, the FAA has turned its attention to transitioning the current radar-based system to a more advanced satellite-based system (Winston 2013b). I discuss the delays and cost overruns associated with implementing that technology in Section 4.2.

## 2.4 Causes of inefficient policies

Agency limitations, regulatory constraints and political forces combine to maintain inefficient highway and aviation infrastructure policies and to impede efficient reforms. For example, the FAA is at the heart of airport and air traffic control inefficiencies because it lacks organisational independence and is prevented to a significant extent by both the US Department of Transportation and Congress from using its resources – and from encouraging airports to use theirs – more efficiently. Given that it faces opposition from two powerful branches of government, it is not surprising that the FAA finds it so difficult to reform its policies.<sup>7</sup>

Constructive reforms must also overcome various regulations. For example, I noted the regulatory hurdles that delay airport runway investments. Turning to airport pricing, Levine (2007) points out that widespread adoption of runway congestion tolls would require airline tenants and their airport landlords to abrogate their existing contracts and to develop an acceptable framework for determining all airport charges.

Regulations of, and expenditures on, transportation infrastructure are likely to benefit particular stakeholders, especially those who effectively pressure members of Congress and regulatory officials to support their agenda and to oppose efficient reforms. For example, Stiglitz (1998) describes his efforts as part of the Clinton Administration to institute congestion pricing for air traffic control only to find reform blocked by owners of corporate jets and small planes who have a vested interest in inefficiently low user fees. Other examples of special interest politics that are transparent in influencing infrastructure policy include the American Automobile Association's and the American Trucking Associations' longstanding opposition to efficient congestion tolls and axle-weight charges that are likely to cause some of their members to pay more for using the

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<sup>7</sup> Robyn (2007), among others, suggests that re-mandating the FAA with a more independent mission that gives it an arm's-length relationship with Congress and the Executive Branch, especially in its management of air traffic control, would improve its performance.

road system, and labour unions' opposition to removing the Davis-Bacon regulations because thousands of construction workers would see their wages fall.

Finally, because federal transportation legislation re-authorises hundreds of billions of dollars for aviation and highway infrastructure spending that has the potential to benefit certain stakeholders at the expense of others, members of Congress must continually engage in contentious negotiations to craft the legislation. Compromises broadly allocate federal highway funds to states and federal aviation funds to airports and air traffic control facilities, instead of taking a cost-benefit approach to allocate those funds efficiently to specific locales to alleviate the country's most congested highways and air travel corridors.

In sum, although the public sector has greatly contributed to building America's invaluable highway and aviation infrastructure, its costly policies cannot and should not be ignored. Certainly it would be desirable to reform transportation policy to make it more efficient, but I have argued that this is highly unlikely. Instead, I consider various ways that the private sector could provide constructive change.

### 3. Privatisation

Privatisation – namely, a transparent, well-structured agreement in which the government sells, not leases, transportation infrastructure assets to private firms – would give the private sector an opportunity to improve infrastructure performance and social welfare compared with government ownership and provision. Whether privatisation succeeds depends, in theory, on the extent of market power that private firms possess, the extent to which incentives influence whether private firms achieve their goals, and whether consumers have any recourse for applying competitive pressure on the private firms to respond to their (heterogeneous) preferences (Vickers and Yarrow 1991; Roland 2008).

Policymakers have privatised infrastructure in many parts of the world but the preliminary evidence on privatisation's economic effects is mixed. Studies of airport privatisation subject to varying degrees of regulation have found that airport efficiency has improved in Australia (Forsyth 2008) and the United Kingdom (Graham 2008; Starkie 2008). In a worldwide comparison of airports, Oum, Yan and Yu (2008) find that airport privatisation reduced costs by promoting competition and Bilotkach *et al* (2012) find for European airports that privatisation reduced runway charges to airlines, but Bel and Fageda (2010) find that it increased charges.<sup>8</sup> Comparisons of the US Air Traffic Organization with Nav Canada, a private sector air traffic control organisation established in 1996 and financed by publicly traded debt, have found that under privatisation, modernisation of technology greatly improved, air travel became safer and users benefited from improved service quality (Oster 2006; McDougall and Roberts 2008).<sup>9</sup>

8 When the three London airports – Heathrow, Gatwick and Stansted – were privatised, BAA PLC and subsequently Ferrovial, SA were allowed to purchase them. The UK Competition Commission eventually required that Gatwick and Stansted be sold to different owners.

9 Robyn (2007) argues that the shift in the air traffic control system technology from ground-based radar to satellites and cockpit controls presents an opportunity in the future to explore the effects of competition in air traffic control services. Different regional air traffic control service providers could serve different terminal areas – and enter areas that are not receiving state-of-the-art service. Providers could negotiate directly with airspace users and airports to determine the price and the type of service and equipment to be provided.

Highway privatisation has been explored in developed and developing countries with varying results and no general consensus on its effects (Gómez-Ibáñez and Meyer 1993). Australia's Macquarie Bank Ltd and Spain's Cintra Infraestructuras SA have amassed large infrastructure funds and have been leading investors in private highways throughout the world, but I am not aware of economic assessments of these or any other investors' privatisation projects.

As summarised in Gómez-Ibáñez (2006), unbundling train operations and track infrastructure maintenance turned out to create coordination problems in the United Kingdom, where the private train operators, the private infrastructure company, Railtrack, and the government regulator often disagreed about the design of the improvements needed to expand track capacity, how much they should cost and how those costs should be shared. Congestion on the system made maintenance more difficult and contributed to accidents that helped bankrupt Railtrack in 2001. Nash (2006) and Glaister (2006) argue that the UK government deserves considerable blame for Railtrack's collapse because it implemented the unbundling policy hastily and carelessly. Indeed, vertical unbundling did not cause serious problems in the rest of Europe and Australia, but that may be because the rail infrastructure companies were in public rather than private hands or because infrastructure capacity was far less strained.

Evidence for the United States, based on simulating the effects of highway and airport privatisation, indicates there are plausible situations where privatisation could lead to efficiency gains that improve travellers' welfare, especially if private infrastructure firms respond to travellers' varied preferences for faster and more reliable travel. Winston and Yan (2011) analyse highway privatisation based on motorists' travel on State Route 91 in California. The authors model a competitive environment by assuming the highway takes the form of two routes with equal lane capacities and that both routes could be operated by a private monopolist. Alternatively, each route could be operated by a different private firm, generating duopoly competition, or one route could be operated by a private firm and the other by the government, generating public-private competition. They also address the potential problem of the private highway firm(s) having market power by assuming that motorists, represented by a third party, and private providers negotiate tolls and capacity that generate a contract equilibrium (Meyer and Tye 1988). Finally, they assume that motorists would be refunded the gasoline taxes that currently go into the Highway Trust Fund because the private provider(s) would finance the highway with tolls.

Based on this analysis, Winston and Yan (2011) find that highway privatisation could benefit road users and increase welfare by reducing the inefficiencies associated with current (public sector) road pricing and capacity allocation, even if the highway were owned and operated by a monopolist. Motorists would be able to gain in certain bargaining situations where they are given a choice of paying a high toll to use lanes with little congestion, lower travel times and greater travel time reliability, or paying a low toll to use lanes that are highly congested and offer higher travel times and lower travel time reliability.<sup>10</sup> Highway privatisation could also enhance motorists' welfare and social welfare by generating more efficient investments, improved operations that reduce production costs, and technological innovations. Motorists fail to gain when a private

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<sup>10</sup> The option to pay a toll and travel in less-congested lanes is available in some major US metropolitan areas that have high-occupancy-toll (HOT) lanes. The HOT lanes that opened in 2013 in the Virginia portion of the Washington DC Capital Beltway appear to be successful. As reported by Halsey and Craighill (2013), more than one-third of surveyed motorists indicated that they have used these lanes and that they have obtained notable travel time savings.

owner sets monopoly charges and negotiations do not lead to price and lane capacity allocations that are aligned with their preferences.

Yan and Winston (2014) develop a model of privatised airports in the San Francisco Bay Area, under which separate owners compete for airline operations by setting profit-maximising runway charges that reduce travel delays and airlines compete for passengers. Runway charges are determined through separate negotiations between airlines, which are organised as a bargaining unit, and each of the three Bay Area airports – Oakland, San Jose and San Francisco.

The authors find that it would be essential for the Bay Area airports to be sold to different owners to prevent carriers from facing monopoly charges that would be passed on to travellers. They also find that by allowing the airports to set different charges for different classifications of airport users, they would gain from privatisation. Commercial carriers would be better off when they negotiate charges that lower their operating costs because of reduced delays, including the delays caused by general aviation. Under these arrangements, the general aviation users face higher airport charges that are more in line with their contribution to delays. Although air travellers would pay higher fares because airport charges to airlines would increase, their time savings from less-congested air travel would more than offset that cost. The higher charges faced by general aviation passengers would also be softened if policymakers expanded airport privatisation to encourage (smaller) private airports to compete for (smaller) aircraft operations. This could be achieved, for example, by taking advantage of improvements in global positioning system (GPS) technology that have enabled general aviation to have easier access to smaller airports, upgrading runways and gates, and offering van and rental car services to improve travellers' access to the central city and other parts of the metropolitan area. Travellers in low-density markets could especially benefit from privatisation because they would have more flight alternatives if private airports nationwide offered commercial services.

Unfortunately, the available evidence on the effects of privatising transportation infrastructure is not sufficiently developed to rule out the possibility that privatisation could result in market failure attributable to the abuse of monopoly power or inadequate management of uncertainty that could lead to a financial collapse because, for example, demand is much lower or costs are much higher than anticipated.<sup>11</sup> In addition, many questions can be raised about how privatisation should proceed. For example, what is the most efficient way for the government to transfer public infrastructure to private firms? What should the sale prices be for those assets? What role, if any, should the public sector have in the privatised system? How much time will be needed for competition to develop in privatised markets? Should regulations be implemented during the transition to effective competition? What contingency plans should be developed in the event that privatisation results in the financial collapse of a significant part of the system or in a monopoly provider that faces no competitive discipline?

Accordingly, Winston (2010) argues that it is important for policymakers, in collaboration with scholars, practitioners and users, to carefully design and execute experiments to obtain additional

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<sup>11</sup> Dezember and Glazer (2013) describe some examples where private investors have invested in toll roads in the United States before the Great Recession and were forced to declare bankruptcy when their traffic forecasts failed to meet expectations. However, selectivity bias is present in this evidence because investors were not free to invest in any part of the US highway system they desired. The privatised toll roads entailed considerable risk because they were not major thoroughfares that generated a high and reasonably predictable level of traffic.

hard evidence of the effects of infrastructure privatisation before considering nationwide adoption. As the experiments evolve, analysts should evaluate their economic outcomes and, if necessary, propose supplemental policies that could enhance the infrastructure's performance.<sup>12</sup>

## 4. Private Sector Innovations

### 4.1 Public highway infrastructure

Even without privatisation, private sector firms could still contribute to improving public highway infrastructure performance if policymakers expeditiously implemented technologies that firms have developed. The FHWA must rely on the private sector for research and development because its budget allocates only a small amount of funds for that purpose.

Based on cost-benefit analysis, general purpose and specific technologies could be implemented to improve the efficiency of highway pricing, investment and operations that affect safety. General purpose technologies include: GPS satellite navigation services that, among other things, can collect information about motorists, such as their location, speed and alternative routings for their journeys; Bluetooth signals that can be detected to monitor the speed of cars and trucks through the road system in real time to assist drivers' route choice decisions and to adjust traffic signal timing; and mobile software applications (apps) and websites that provide motorists with real-time information on traffic speeds and volumes, conditions on alternative routes and available parking spaces. Motorists are becoming increasingly aware of the benefits of GPS services and the share of cars on the road that are equipped with those services is expected to climb from 10 per cent as of 2013 to 50 per cent by 2015.

Specific technologies include: weigh-in-motion (WIM) capabilities, which provide real-time information about truck weight and axle configurations that can be used by highway officials to set efficient pavement-wear charges and enforce safety efficiently; adjustable lane technologies, which allow variations in the number and width of lanes in response to real-time traffic flows; improved road construction and design technologies to increase pavement life and to strengthen roads and bridges; and photo-enforcement technologies to monitor vehicles' speeds to improve traffic flow, capacity and safety.

#### 4.1.1 Congestion pricing

As noted in the introduction, policymakers have been seeking additional sources of highway funding so they can increase spending to expand capacity. But as we know from Downs' Law, such spending would not reduce traffic congestion for very long because peak-hour congestion would rise to meet maximum capacity as motorists shifted from less preferred routes, modes and times of day (Downs 1962). Downs' Law would not apply, however, if policymakers set tolls

12 Successful experiments with privatising certain, albeit limited, transportation services throughout the world have shown benefits that are slowly gaining attention and possibly generating support for additional explorations. For example, the Mass Transit Railway (MTR) Corporation manages the subway and bus systems on Hong Kong and the northern part of Kowloon and, in contrast with most other transit systems, turns a profit. Its strategy is to operate as a vertically integrated entity that provides transport services and owns or accepts development fees from property within or next to its stations. Its profits from real estate ventures and transit revenues have been used to properly maintain its transit operations, which reduces operating costs and service interruptions and encourages patronage. In the United States, the Detroit Bus Company is a recent experimental private bus service, which provides transportation for school children and enables travellers to know the location of its buses with bus trackers.



that were adjusted in real time to traffic flows and congestion. Some motorists who previously avoided highly congested highways and local streets would be discouraged by the initial toll levels from using those thoroughfares even when travel speeds improved, while others would be discouraged by the increase in tolls if traffic became more congested.

The informational requirements to set an accurate optimal congestion toll  $\tau_l$  (on highway link  $l$  in a road network consisting of  $L$  links) can be seen from Equation (1). For a given volume of traffic per unit of time,  $v_l$ , and the link's vehicle-carrying capacity per unit of time,  $K_l$ , the toll that a highway authority should set is expressed as (Lindsey 2012)

$$\tau_l = \frac{\partial c_l(v_l, K_l)}{\partial v_l} v_l, \quad l \in L \quad (1)$$

where  $c_l$  is the user cost function, which includes the private costs of a trip, such as fuel consumption and other vehicle operating costs like depreciation, as well as travel time costs.

As indicated by Equation (1), the highway authority must first determine the traffic volume on a specific stretch of road during a given time interval to implement an accurate congestion toll. It can make this determination by using GPS navigation services and then draw on plausible cost estimates that are available in the literature (for example, Small and Verhoef (2007)) to set the specific charge. This charge and estimated travel times on different routes can be communicated by information technology, such as an app, to motorists before they reach the tolling area to give them sufficient time to decide whether to take the tolled route or an alternative that offered their preferred combinations of out-of-pocket costs and travel time. Those motorists who choose the toll road would have the charge deducted electronically via their vehicle transponders without their journeys being disrupted or their privacy invaded. (Of course, it would be a motorist's choice whether to use the available technology to obtain pricing and routing information.) Motorists would also have the option to vary their value of time for different trips depending on their purpose and on the activity at the destination.<sup>13</sup> Implementing available technologies would therefore improve pricing efficiency and, as noted, generate substantial welfare gains by providing the highway authority with the critical traffic information that it would need to set efficient tolls throughout the day, as well as by providing motorists with the pricing and routing information that they would need to optimise their journeys.

Information technology could be implemented to price traffic lanes while informing motorists of their options on all parts of the road, including shoulders on highways for emergency purposes. Because automakers have continued to improve vehicle reliability since the automobile was introduced, breakdowns do not occur as frequently today and the benefits to motorists from opening a shoulder to increase highway capacity and reduce congestion are likely to exceed the cost of limiting space for vehicle incidents.<sup>14</sup> The Bureau of Public Roads (BPR) formula, which determines travel time on a road accounting for delays due to congestion, can be used to get a

13 I do not want to minimise the potential practical issues with motorists using information technology to improve their trips. For example, real-time information could lead to a 'herd effect' where many users shift simultaneously to a route and make it more congested. In that case, prices would have to increase accordingly and some travellers may revise their choices. Such issues may have to be resolved by further improvements in information technology that is used for highway travel.

14 Vehicles on US roads have never been older, now averaging 11.3 years, as the quality of vehicle construction has improved. Some of the ageing is undoubtedly attributable to the slow recovery from the Great Recession, which has caused people to hold on to vehicles longer to avoid a big purchase.

feel for the potential benefits. The formula indicates that opening a shoulder to traffic (in the peak travel direction) on a four-lane freeway that was operating with a traffic flow that was 90 per cent of highway capacity would reduce motorists' travel time on the freeway by roughly one-third (Mannering and Washburn 2013).<sup>15</sup> Pricing the shoulder efficiently would further increase travel time savings and the benefits from road pricing.<sup>16</sup> As noted, motorists could use an app to get knowledge in advance of whether the shoulder was open to traffic and the price to drive on it.

#### 4.1.2 Pavement and bridge wear pricing

Because pavement damage is related to a truck's weight per axle and bridge stress is related to a truck's total weight, efficient highway prices for trucks should encourage truckers to reduce those weights whenever possible. The damage caused by an axle is defined in terms of the number of 'equivalent single-axle loads' (ESALs) causing the same damage; the standard is a single axle of 18 000 pounds. An efficient short-run marginal cost pavement-wear charge (*SRMC*) would induce truckers to reduce their ESALs by encouraging them to shift to vehicles with more axles that do less damage to road pavements, thereby reducing maintenance expenditures and producing welfare gains. The informational requirements to set this charge can be seen from Equation (2), which is given per ESAL mile as (Small and Winston 1988):

$$SRMC = \frac{\alpha C(W)}{N(D)}, \quad (2)$$

where  $\alpha$  is a parameter,  $C(W)$  is the cost of resurfacing a highway of width  $W$ , measured by the number of lanes, and  $N(D)$  is the lifetime of a road of durability  $D$ , as determined by the number of ESALs that can pass over it before it must be resurfaced.

A highway authority can estimate a truck's ESAL miles to charge it accurately for its contribution to pavement damage by using high-speed WIM technologies. WIM uses sensors that are installed in one or more traffic lanes to identify a vehicle and record its number of axles, vehicle load and journey (that is, the roads it uses) while it continues to travel in the traffic stream, thus not disrupting its operations (Jacob 2010). The total charge would then be sent to the truck's owner as the product of the truck's ESAL miles and a plausible estimate of the resurfacing costs per ESAL mile.

WIM technologies could also be used to measure the considerable stress caused by trucks crossing a bridge (Fu *et al* 2003) and to determine efficient bridge-wear charges as a function of vehicle weight and bridge age; the latter consideration is important because older bridges become more susceptible to heavy loads as a result of metal fatigue and the possibility of age-related deterioration of concrete reinforcing bars (Barker and Puckett 2007). Trucks could submit their planned routing in advance and be informed of those charges online, and could either reduce their loads or take an alternative route to avoid higher-priced bridge crossings, thereby extending the design life of the bridge and reducing the likelihood of catastrophic bridge failure, expensive repairs and loss of life.

15 The BPR formula for travel time on a highway link is given by  $t_i = t_f [1 + \alpha(v_i/K_i)^\beta]$ , where:  $t_i$  is the travel time in minutes on highway link  $i$ ;  $t_f$  is the free-flow travel time in minutes on this link;  $v_i$  is the traffic volume on the link; and  $K_i$  is the capacity of the link. The parameters  $\alpha$  and  $\beta$  take the values of 1.1491 and 6.8677 for freeways.

16 Minneapolis has begun to explore this policy by introducing 'dynamic priced shoulder lanes' on Interstate 35W.

### 4.1.3 Truck size and weight limits

Truck size and weight limits have been established in the United States to keep trucks that might cause excessive pavement/bridge damage or jeopardise safety off certain roads. At the same time, those limits raise the costs of trucking operations by requiring trucks to disrupt their journeys to stop at weigh stations for inspection, and by forcing trucking companies to use smaller trucks and make additional trips to move the nation's freight. WIM technologies could enable highway authorities to accurately monitor truck sizes and weights, thus eliminating the need for them to be inspected at weigh stations.<sup>17</sup> And information technology that facilitated more efficient highway pricing could spur vehicle design improvements, such as stronger brakes that would allow trucking companies to use larger trucks to reduce average operating costs without compromising safety.<sup>18</sup>

McKinnon (2005) provides some illustrative evidence from the United Kingdom that relaxing truck size and weight limits could significantly increase trucking productivity and reduce social costs. McKinnon estimated that increasing maximum truck weights by 6 700 pounds (a modest 7.3 per cent increase over the previous weight limits) resulted in trucking industry annual operating cost savings of nearly US\$250 million (in 2013 dollars). Significantly reducing vehicle miles travelled also reduced congestion and greenhouse gas emissions. Similarly, the US and other nations' surface freight transportation systems stand to increase their efficiency without necessarily increasing accident costs by implementing technology that permits more flexible and larger truck sizes and weight limits.

### 4.1.4 Investments in capacity and durability

Technology could be implemented to facilitate investments that expand highways' vehicle-carrying capacity and increase durability of these highways at reasonable cost. Ng and Small (2012) point out that most highways in major metropolitan areas operate in congested conditions during much of the day, yet highway design standards are based on free-flow travel speeds. Highway authorities could effectively expand capacity during peak travel periods to reduce delays by adjusting the number and width of lanes on a freeway in response to real-time traffic volumes that are measured by GPS navigation services. Thus to enable vehicles to move faster, heavy traffic volumes would call for more but narrower lanes, while lighter traffic volumes would call for fewer but wider lanes. Technology exists to install lane dividers that can be illuminated so that they are visible to motorists, and can be adjusted in response to changes in traffic volumes to increase or decrease the number of lanes that are available. As noted in the case of opening a highway shoulder to traffic, creating an additional lane during peak travel periods would result in substantial travel time savings for motorists. And although it would be easier and less costly to install variable lane widths for new roads than for existing roads, implementing this technology whenever possible would be less expensive than constructing an additional lane that meets standard width requirements, especially for freeways in dense urban areas where land is scarce and adding to road capacity is a very expensive proposition.

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<sup>17</sup> Something akin to weigh stations may be desirable to inspect trucks for other safety-related matters.

<sup>18</sup> Truckers have adopted improvements in vehicle design to reduce operating costs. For example, in response to higher fuel prices, some truckers increased their vehicles' fuel economy by using the TrailerTail, developed by ATDynamics, to reduce the aerodynamic drag generated at the rear of a trailer.

The rapid evolution of material science (including nanotechnologies) has produced advances in construction materials, construction processes and quality control that have significantly improved road pavement design. This has resulted in greater durability, longer lifetimes, lower maintenance costs and less vehicle damage caused by potholes. For example, Little *et al* (1997) estimate that the SUPERPAVE effort in the late 1980s and 1990s (TRB Superpave Committee 2005), which developed new asphaltic binder specifications for repaving, produced roughly US\$0.6 billion (in 2013 dollars) in benefits. Other investments that apply recent advances in material science technologies are also possible, but they are often delayed because state departments of transportation try to minimise their expenditures rather than the sum of these expenditures and highway users' costs. Delays in the uptake of technology also occur because state departments of transportation award contracts on the basis of the minimum bid, not on the technological sophistication of the contractor (Winston 2010).

Finally, state departments of transportation have been slow to implement advances in roadway structural monitoring technologies that would allow them to monitor the health of both pavements and bridges on a continuous basis, providing valuable information for optimal repair and rehabilitation strategies that could reduce the cost of highway services (Lajnef *et al* 2011).

#### 4.1.5 Safety

Policymakers and highway authorities have attempted to promote safety by setting speed limits, instituting traffic signals, enforcing traffic laws and responding to traffic incidents. Technology could be implemented at modest cost to improve the effectiveness of those actions.

Congressional action set a national maximum speed limit of 55 miles/hour in 1974, but subsequently abolished it in 1996 and allowed states to set their own maximum speed limits. Lave and Lave (1999) conclude that this experience shows that higher speed does not necessarily kill, and that lives could be saved by setting speed limits that people would obey because they were aligned with driving conditions. Accordingly, highway authorities could implement technology to improve safety and reduce travel times by setting variable speed limits (VSLs) that are properly aligned with real-time traffic flows and other driving conditions such as weather. Papageorgiou, Kosmatopoulos and Papamichail (2008) find that VSLs displayed on roadside variable message signs have led to substantial improvements in safety in many countries. There is also evidence that they have improved highway safety in the United States (PB Americas, Inc *et al* 2007).

The traffic control systems in most US cities were developed by inexperienced public officials when the automobile was a new mode of transportation. Todd (2004) points out that in many driving situations, all-way stops (where traffic approaching intersections from all directions are required to stop) and roundabouts would be more effective than traffic signals in reducing motorist and pedestrian fatalities, as well as reducing traffic delays. To add to the problem, poor signal timing and coordination, often caused by outdated signal control technology or reliance on obsolete data on relative traffic volumes (Atkinson *et al* 2008), contribute to some 300 million vehicle hours of annual delay on major roadways (National Transportation Operations Coalition 2007). Technology that enables traffic signals to respond to real-time traffic flows by optimising the duration of traffic signals could be more widely applied to enhance safety and reduce travel times. Such optimisation would also result in the use of a flashing red signal instead of the conventional

red, yellow and green traffic signal at intersections with very low traffic volumes. In addition, a signal could warn motorists stopped at traffic lights of an impending green light. This would reduce start-up delays, which amount to about 6 per cent of the time that a traffic signal is green at a typical intersection. Mannering and Washburn (2013) estimate that cutting start-up delays in half could reduce the delays caused by signals by nearly 20 per cent, with little effect on safety.

Finally, the costs of enforcing traffic safety laws, which include high-speed police chases that occasionally result in fatal accidents, could be substantially reduced by using photo-enforcement technology (roadside cameras) to identify and issue citations to motorists who run stop signs or traffic signals, or who exceed the speed limit by a predetermined amount, such as 15 miles per hour.<sup>19</sup> Shin, Washington and van Schalkwyk (2009) evaluate an experiment in Arizona and find that automated speed enforcement on only a 6.5 mile stretch of freeway in Scottsdale reduced enforcement costs as much as US\$17 million per year.

Vehicle incidents (accidents and disablements) account for a large share of traffic congestion and they can be very costly.<sup>20</sup> Garrison and Mannering (1990) estimate that the average per-minute cost in travel time delays of incidents on Seattle freeways was US\$3 500 (in 2013 dollars). In accordance with cost-benefit considerations, including any additional costs to taxpayers, highway authorities could make much greater use of communications technology to reduce incident costs and help accident victims receive assistance more quickly by detecting disruptions in traffic flows and speeds that indicate an incident has occurred. Incident response teams, including tow trucks to remove disabled vehicles, could then be quickly alerted and dispatched, while motorists on the road could be notified of disruptions and advised to avoid the troubled area and to make way for response teams that are addressing the problem. Wilde (2013) estimates that a one minute increase in response time could increase the mortality rate by as much as 17 per cent; hence, reducing response times could also potentially save the lives of many motorists involved in accidents.

#### 4.1.6 Impediments to adopting technology

Technological innovations have long been recognised as a major source of economic growth and improved living standards, but analysts have been hard-pressed to explain how policymakers can spur such innovations. In the case of a public sector facility like highways, policymakers are responsible for using the latest technology to provide this service in accordance with cost-benefit considerations. Accordingly, they are clearly impeding technological change by failing to implement recent innovations that could, at modest cost, significantly improve the speed, reliability and safety of motorists' trips, while reducing the cost of highway services.

Why has the public sector failed to implement those technologies in a timely manner to realise their social benefits? As discussed previously, the federal government is biased toward the status quo in managing and operating the nation's transportation system because of agency limitations, regulatory constraints and political forces. In the case of the FHWA, lack of expertise may prevent technologies that improve the highway system from being implemented effectively and efficiently. Indeed, I noted above that the FHWA's budget does not place a priority on developing

<sup>19</sup> Photo-enforcement technology has encountered legal challenges in some but not all US states.

<sup>20</sup> The FHWA puts the share as high as 25 per cent (FHWA Operations 2013), while the TTI's Urban Mobility Report puts the share closer to 50 per cent (Schrack, Eisele and Lomax 2012).

new technologies to improve highways. Like other agencies, the FHWA may also be risk-averse and want to avoid the mistakes and well-publicised delays in implementing technology that, for example, have tarnished the FAA's reputation for managing air traffic control effectively (as discussed in Section 4.2.3).

From a political perspective, implementing the latest technology may be helpful in overcoming highway users' opposition to certain policies such as congestion and pavement-wear pricing. Motorists have indicated that they value the option to pay an electronic toll to expedite their trips, as indicated by the growing adoption in several areas of the country, such as Atlanta, Los Angeles, Salt Lake City and Washington DC, of HOT lanes, where solo motorists can pay a toll to travel in a less-congested carpool lane. As more motorists use GPS services to expand their route choice options they may become more enthusiastic about comprehensive road pricing, especially if prices and travel time vary on different lanes to cater to motorists' heterogeneous preferences for travel time and reliability (Small, Winston and Yan 2006). In response to political pressures, policymakers could reduce charges on a given lane to selected users, such as carpoolers and low-income travellers.

Trucking interests have been able to dissuade policymakers from significantly reforming truck charges despite repeated protests from railroad and automobile interests that the fuel tax does not fully charge trucks for their fair share of highway costs (Winston 2010). WIM technologies would make the trucking industry's highway costs more transparent and may eventually break the stalemate among the transportation modes, while truckers' resistance to reforming truck charges might be lessened if they were given greater flexibility in their choice of trailer sizes and loads that they could carry.

I speculate that although implementing new technologies could help address political impediments to efficient pricing, transportation officials continue to maintain status quo policies because they fear certain users' objections to higher charges and because the FHWA may not stand to gain much from technology that reduces the cost of building and maintaining highways if those savings lead to reductions in its budget. In sum, the FHWA, like other public sector agencies, appears to lack sufficient incentives to summon the political will to change.

## 4.2 Public aviation infrastructure

The FAA is responsible for managing and implementing major research and development projects in the private sector to improve airport operations and modernise air traffic control. The Transportation Security Administration (TSA) is responsible for managing airport screening and security. Both agencies rely on the private sector to provide state-of-the-art equipment, and are responsible for managing projects and adopting the new technologies in a timely and cost-efficient manner.

### 4.2.1 Airport runway operations

Tens of thousands of flights are cancelled or delayed every year in the United States because of snow storms. One of the contributing factors is that ploughs and sweepers cannot clear snow off runways fast enough to allow aircraft to take off and land safely. Heated runways could potentially

solve that problem and provide billions of dollars of benefits in time savings to travellers and cost savings to airlines (see, for example, McCartney (2014)).

Private homes and businesses have been using heating systems to keep snow off their driveways and walkways for decades. In fact, since 1967 the Green Bay Packers have used an underground system of electric coils, subsequently replaced with a system of pipes filled with a solution including antifreeze, to keep their football field soft for games that are played in sub-freezing conditions. Airports, however, have not been installing heating systems on their runways. The FAA claims that heating large airport surfaces is too expensive, but with roughly 100 000 flights in the United States cancelled during the admittedly severe 2014 winter season, policymakers should take a careful look at the costs and benefits of heated runways at major airports.

#### 4.2.2 Airport security

An efficient airport security system allocates resources based on costs and benefits by directing expenditures toward detecting the greatest threats to safety and preventing them from materialising. It is, of course, difficult to assess the benefits of TSA screening because we do not know of any terrorist attacks that screening has prevented. Nonetheless, the TSA has been criticised for expending too much time and money confiscating firearms – almost all of which were probably intended for recreational use – instead of trying to keep dangerous people off airplanes (Poole 2009). To that end, greater efforts should be made to classify travellers according to their risk to airline passengers' safety. More rapid implementation of advanced screening technologies would enhance the approach. After a long delay, the TSA has introduced full-body scanners at US airports, which are more effective than metal detectors at spotting potentially dangerous objects and substances, and can do so with minimal radiation exposure. Some European airports have begun to use biometrics – computers verifying identities through physical characteristics – to detect terrorists and expedite screening so that it is more efficient. The TSA currently uses biometrics to control employees' access to secure areas and to verify the identities of passengers who enroll in its traveller program, PreCheck, but it does not have any plans to use the technology to process passengers at the airport. The TSA's slow adoption of biometrics to screen all passengers may expose it to additional criticism if European airports find that it is a valuable complement to human screeners.

#### 4.2.3 Air traffic control

The FAA has turned its attention to expediting the transition from the current radar-based air traffic control system that uses imprecise, decades-old technology to a next generation satellite-based system known, appropriately, as NextGen (Winston 2010). Radar updates aircraft positions only every 5 to 10 seconds and forces controllers to separate aircraft by several miles to provide a safety buffer and avoid collisions. In contrast, the automatic dependent surveillance broadcast (a key component of NextGen) updates positions every second. Aircraft equipped with GPS technology would enable pilots to fly directly to their destinations instead of following indirect routes to stay within the range of ground stations. By enabling pilots to be less dependent on controllers, to choose the most efficient altitude, routing and speed for their trip, and to operate in cloudy and foggy weather much as they do on clear days, a NextGen satellite-based system could reduce travel times, carrier operating costs and airplane emissions throughout the

system while improving safety. The FAA (2012) estimates that, compared with the current system, NextGen would enable the airspace to handle three times as many planes with half as many air traffic controllers. The FAA estimates the benefits from avoided delay, time savings, and reduced cancellations and carbon dioxide emissions will amount to US\$106 billion between now and 2030.

Unfortunately, government officials expect NextGen to take much longer to deliver and cost billions of dollars more than they originally expected. Calvin L Scovel III, the Inspector General of the US Department of Transportation, said in testimony before Congress that NextGen's completion could slip by at least a decade and its cost could triple (Scovel 2013).

#### 4.2.4 Impediments to adopting technology

Poole (2013) evaluates seven critical elements of NextGen to shed light on why progress toward implementing the system has been much slower than anticipated. As in the case of the FHWA, Poole identifies a status quo bias that resists innovation as well as problems in identifying promising technologies and in efficiently procuring those that it does identify. Over the years, the FAA has lost its best and brightest engineers to the private sector and lost its program management expertise, making it overly reliant on contractors that it has difficulty controlling. Given NextGen's troubles, it is possible that policymakers will aim to keep the existing system operating and postpone NextGen even further. If so, the US air traffic control system will fall behind those of other countries, including Australia, Canada, Germany, New Zealand and the United Kingdom. Air traffic control providers in those countries have embraced new technologies and procedures much faster than the FAA. The systems have been reorganised as self-supporting corporate entities, which charge aviation customers directly for their air traffic control services and issue bonds backed by their revenue streams. Serious doubts exist that US policymakers can summon the political will to reform the air traffic control system to emulate the more successful 'corporate' model that has developed abroad.

### 4.3 Transportation modes

All modes of transportation have improved their performance and safety regardless of the state of their infrastructure. For example, automakers have continued to improve vehicle engines, designs and structural strength by installing seatbelts, anti-lock brakes, air bags and the like. More recent safety innovations include electronic stability control, warning and emergency braking systems, speed alerts, and mirrors with blind spot warnings. Those innovations will also increase road capacity by enabling vehicles to drive closer together without compromising speed (Winston and Mannering forthcoming).

Airlines have improved their fleets by acquiring aircraft with more powerful and fuel-efficient jet engines and they are planning on incorporating improvements in wing design to reduce fuel consumption (Karp 2014). They have also fit aircraft with navigational aids, such as wind shear avoidance and alert systems, to improve passenger safety.

The recent revelations of 'autonomous vehicles' and aircraft that rely on advanced navigation equipment raise the possibility of an entirely new era of highway and air transportation. This provides an additional way that the private sector could improve infrastructure performance. To be sure, those improvements are further in the future than efficient policy reforms, privatisation



and the adoption of existing technologies, which are actions that could be taken now. At the same time, no doubt exists that technological innovations in vehicles and aircraft will occur; hence, a critical issue is whether highway and aviation policymakers will facilitate the introduction of those innovations in a timely manner.

### 4.3.1 Autonomous surface vehicles

Autonomous or driverless cars and trucks do a human driver's normal job and much more. Driverless cars are operated by computers that obtain information from an array of sensors on the surrounding road conditions, including the location, speed and trajectories of other cars. The onboard computers gather and process information many times faster than the human mind can process it. By gathering and reacting immediately to real-time information, and by eliminating concerns about risky human behaviour, such as distracted and impaired driving, the technology has the potential to prevent collisions and greatly reduce highway fatalities, injuries, vehicle damage and costly insurance. It can also significantly reduce delays and improve travel time reliability by creating smoother traffic flows and by routing and, when necessary, rerouting drivers who have programmed their destinations.

Driverless trucks are also in the developmental stage. For example, dozens of such trucks are being used to haul materials in an iron ore mine in Australia and at other locations away from public thoroughfares (Winston and Mannering forthcoming). In addition to contributing to improved traffic flow and motorists' safety, driverless trucks would benefit industry, and ultimately consumers, by substantially reducing labour, insurance and operating costs.

Thus far, seven US states – including California, Florida and Nevada – have legalised the testing of driverless cars, and several other states are considering doing the same. Competition among automakers and other firms to develop the best technology is already underway: Google has logged nearly 500 000 miles testing its version of a driverless car; General Motors is working on a model with researchers at Carnegie Mellon University; Audi, BMW, Toyota and Volvo have demonstrated their driverless models; and Nissan has claimed that it will offer a full line of driverless cars in the next decade (Winston and Mannering forthcoming). In short, some, admittedly optimistic, forecasts indicate that driverless cars could be a common sight on US roads by 2025.

Empirical estimates of their benefits are sparse but Fagnant and Kockelman (2013) show that they are highly dependent on the speed of adoption and extent of market penetration. Accounting for the reduction in fatalities and injuries, less vehicle damage, and savings in travel time, fuel and parking costs, these authors estimate that even a modest 10 per cent penetration of driverless cars would generate annual benefits of US\$40 billion. Annual benefits amount to an eye-popping US\$200 billion if market penetration reaches 50 per cent. An additional benefit is that residents of our cities will need far fewer cars – perhaps only one-third of the cars that they have now – for their vehicle travel (Spieser *et al* 2014).

Driverless vehicles are inevitable but the major obstacle to their adoption as soon as they are available is whether the government will take prudent and expeditious approaches to help resolve important questions about assigning liability in the event of an accident, the availability of insurance and safety regulation. The National Highway and Traffic Safety Administration (NHTSA), which is responsible for regulating automobile safety, has issued cautious recommendations

about driverless cars (Winston and Mannering forthcoming). That may be appropriate at this stage of the vehicle's development, but NHTSA should also be cautious about sharing the FHWA's legacy of not promoting timely innovation in highway travel.

### 4.3.2 Air travel using advanced navigation systems

An essential component of air travel is that it requires communication between aircraft and air traffic control to maintain safe distances between aircraft and accurate flight paths from origin to destination. As discussed by Poole (2013), the substantial improvement in communications provided by technologies such as digital communications and GPS could facilitate automating much of the routine separation of aircraft, permitting far greater use of the entire airspace than the limited airways defined by ground-based navigational aids. As noted, the benefits in time and cost savings and safety for aircraft operators and air travellers in the new environment would be significant.

High-end general aviation and commercial air carriers have taken the step of carrying advanced navigation equipment in their aircraft (Southwest Airlines is a notable example). However, they cannot use the new equipment because the FAA has been slow to put in new facilities, train controllers and approve new flight procedures. Indeed, the FAA has no economic incentive to implement the new technology rapidly. Thus, air service providers are frustrated and some are even reluctant to purchase new equipment because of their concerns with the FAA's management of NextGen (Poole 2013).

New communications technology would also allow for the introduction of unmanned aircraft (drones) into the aviation system for commercial purposes. For example, new start-ups hope to launch delivery of textbooks in Australia using drones and Amazon has indicated an interest in drone deliveries. However, the FAA has banned the commercial use of drones and the United States again appears to be falling behind other countries because its regulator and infrastructure provider are moving too slowly (Pasztor 2013).

## 5. Conclusions

The creation of new modes of transport in the United States by the private sector has resulted in new infrastructure investment (Schweikart and Folsom 2013). Cars were introduced by private entrepreneurs, who also built private roads including parts of the Lincoln Highway in 1913, the first transcontinental highway. The federal interstate highway system then followed in 1956. Airplanes became a major industry and were flying passengers domestically in the 1920s and overseas in the 1930s. During that period nearly all airports were privately funded. Public airports appeared in large numbers when military airfields were converted after World War II.

The justification for government takeover of private highway and aviation infrastructure continues to be debated today, but what cannot be debated is that inefficient and intractable public policies have significantly compromised the performance of those public facilities. I have therefore explored three ways that the private sector may be able to help. First, privatisation – returning the public infrastructure into private hands – could potentially lead to efficiency improvements; but the outcome is uncertain and such fundamental institutional change would require carefully designed experiments to generate widespread public support. Second, the private sector has

developed technological innovations, especially in information technology, that public providers could adopt to improve the performance of existing infrastructure. But public agencies have a strong status quo bias and they have been very slow to introduce such innovations.

Because the public sector constitutes a strong impediment to privatisation and the adoption of improved technologies, I am more optimistic about the long-run success of the third possibility explored in this paper, that is, direct actions taken by the private sector to improve the transportation system. In particular, the modes of transport themselves are well along in the process of adopting innovations that could significantly improve the efficiency and safety of infrastructure. Thus, history appears to be repeating as transportation modes (automobiles and airplanes) are exhibiting technological advances that will usher in a new era of highway and air transportation. As noted, innovations in modes of transport lead innovations in infrastructure, so history will hopefully also repeat with modal advances spurring infrastructure to improve. Research and experimentation should then continue to explore the synergies between the modes and their infrastructure, and determine if they would be even greater if both were in private hands.

## References

- Airlines for America (2014)**, 'Government-Imposed Taxes on Air Transportation', accessed on 25 June 2014. Available at <<http://www.airlines.org/Pages/Government-Imposed-Taxes-on-Air-Transportation.aspx>>.
- Atkinson RD, DD Castro, SM Andes, DK Correa, G Daily, JL Gifford and JA Hedlund (2008)**, 'Digital Quality of Life: Understanding the Personal & Social Benefits of the Information Technology Revolution', The Information Technology and Innovation Foundation Report.
- Barker R and J Puckett (2007)**, *Design of Highway Bridges: An LRFD Approach*, 2nd edn, John Wiley & Sons, New York.
- Bel G and X Fageda (2010)**, 'Privatization, Regulation, and Airport Pricing: An Empirical Analysis for Europe', *Journal of Regulatory Economics*, 37(2), pp 142–161.
- Bilotkach V, JA Clougherty, J Mueller and A Zhang (2012)**, 'Regulation, Privatization, and Airport Charges: Panel Data Evidence from European Airports', *Journal of Regulatory Economics*, 42(1), pp 73–94.
- Dezember R and E Glazer (2013)**, 'Drop in Traffic Takes Toll on Investors in Private Roads', *The Wall Street Journal*, 20 November, online. Available at <<http://online.wsj.com/news/articles/SB10001424052702303482504579177890461812588>>.
- Downs A (1962)**, 'The Law of Peak-Hour Expressway Congestion', *Traffic Quarterly*, 16(3), pp 393–409.
- Duranton G and MA Turner (2012)**, 'Urban Growth and Transportation', *The Review of Economic Studies*, 79(4), pp 1407–1440.
- FAA (Federal Aviation Administration) (2012)**, 'The Business Case for the Next Generation Air Transportation System', Report, August.
- Fagnant DJ and KM Kockelman (2013)**, 'Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations', Eno Center for Transportation, William P Eno Research Paper.
- FHWA Operations (Federal Highway Administration, Office of Operations) (2013)**, 'Reducing Non-Recurring Congestion', accessed on 25 June 2014. Available at <[http://ops.fhwa.dot.gov/program\\_areas/reduce-non-cong.htm](http://ops.fhwa.dot.gov/program_areas/reduce-non-cong.htm)>.
- Forsyth P (2008)**, 'Airport Policy in Australia and New Zealand: Privatization, Light-Handed Regulation, and Performance', in C Winston and G de Rus (eds), *Aviation Infrastructure Performance: A Study in Comparative Political Economy*, Brookings Institution Press, Washington DC, pp 65–99.
- Fu G, J Feng, W Dekelbab, F Moses, H Cohen, D Mertz and P Thompson (2003)**, 'Effect of Truck Weight on Bridge Network Costs', NCHRP (National Cooperative Highway Research Program) Report 495.
- Garrison D and F Mannering (1990)**, 'Assessing the Traffic Impacts of Freeway Incidents and Driver Information', *ITE Journal*, 60(8), pp 19–23.
- Glaister S (2006)**, 'Britain: Competition Undermined by Politics', in JA Gómez-Ibáñez and G de Rus (eds), *Competition in the Railway Industry: An International Comparative Analysis*, Edward Elgar Publishing Limited, Cheltenham, pp 49–80.
- Gómez-Ibáñez JA (2006)**, 'An Overview of the Options', in JA Gómez-Ibáñez and G de Rus (eds), *Competition in the Railway Industry: An International Comparative Analysis*, Edward Elgar Publishing Limited, Cheltenham, pp 1–22.
- Gómez-Ibáñez JA and JR Meyer (1993)**, *Going Private: The International Experience with Transport Privatization*, Brookings Institution Press, Washington DC.

**Graham A (2008)**, 'Airport Planning and Regulation in the United Kingdom', in C Winston and G de Rus (eds), *Aviation Infrastructure Performance: A Study in Comparative Political Economy*, Brookings Institution Press, Washington, DC, pp 100–135.

**Halsey A and PM Craighill (2013)**, 'Drivers See Less Congestion on Area Roads', *The Washington Post*, 30 June, online. Available at <[http://www.washingtonpost.com/local/trafficandcommuting/drivers-see-less-congestion-on-area-roads/2013/06/29/085b1b50-dea0-11e2-b94a-452948b95ca8\\_story.html](http://www.washingtonpost.com/local/trafficandcommuting/drivers-see-less-congestion-on-area-roads/2013/06/29/085b1b50-dea0-11e2-b94a-452948b95ca8_story.html)>.

**Jacob B (2010)**, 'Weigh-In-Motion for Road Safety, Enforcement and Infrastructures', unpublished manuscript, Laboratoire Central des Ponts et Chaussées.

**Karp G (2014)**, 'Winglets go a Long Way to Give Airlines Fuel Savings', *Chicago Tribune*, 4 March, online. Available at <[http://articles.chicagotribune.com/2014-03-04/business/ct-airline-winglets-0302-biz-20140304\\_1\\_fuel-savings-jet-fuel-southwest-airlines](http://articles.chicagotribune.com/2014-03-04/business/ct-airline-winglets-0302-biz-20140304_1_fuel-savings-jet-fuel-southwest-airlines)>.

**Klein DB and GJ Fielding (1992)**, 'Private Toll Roads: Learning from the 19th Century', *Transportation Quarterly*, 46(3), pp 321–341.

**Lajnef N, M Rhimi, K Chatti, L Mhamdi and F Faridazar (2011)**, 'Toward an Integrated Smart Sensing System and Data Interpretation Techniques for Pavement Fatigue Monitoring', *Computer-Aided Civil and Infrastructure Engineering*, 26(7), pp 513–523.

**Langer A and C Winston (2008)**, 'Toward a Comprehensive Assessment of Road Pricing Accounting for Land Use', *Brookings-Wharton Papers on Urban Affairs*, 2008, pp 127–175.

**Lave C and L Lave (1999)**, 'Fuel Economy and Auto Safety Regulation: Is the Cure Worse than the Disease?', in JA Gómez-Ibáñez, WB Tye and C Winston (eds), *Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer*, Brookings Institution Press, Washington DC, pp 257–289.

**Levine ME (2007)**, 'Congestion Pricing at New York Airports: Right Idea, But Can We Really Start Here and Now?', Reason Foundation Policy Brief No 66.

**Lindsey R (2012)**, 'Road Pricing and Investment', *Economics of Transportation*, 1(1), pp 49–63.

**Little DN, J Memmott, F McFarland, Z Goff, R Smith, CV Wootan, D Zollinger, T Tang and J Epps (1997)**, 'Economic Benefits of SHRP Research', Research Report 596-1F, Texas Transportation Institute. Available at <<http://d2dtl5nnpfr0r.cloudfront.net/tti.tamu.edu/documents/596-1F.pdf>>.

**Mannering FL and SS Washburn (2013)**, *Principles of Highway Engineering and Traffic Analysis*, 5th edn, John Wiley and Sons, New Jersey.

**McCartney S (2014)**, 'The Case for Heated Runways: Researchers Seek Ways to Warm Snowy Airport Surfaces', *The Wall Street Journal*, 19 February, online. Available at <<http://online.wsj.com/news/articles/SB10001424052702304914204579392883809689994>>.

**McDougall G and A Roberts (2008)**, 'Commercializing Air Traffic Control: Have the Reforms Worked?', *Canadian Public Administration*, 51(1), pp 45–69.

**McKinnon AC (2005)**, 'The Economic and Environmental Benefits of Increasing Maximum Truck Weight: The British Experience', *Transportation Research Record Part D: Transport and Environment*, 10(1), pp 77–95.

**Meyer JR and WB Tye (1988)**, 'Toward Achieving Workable Competition in Industries Undergoing a Transition to Deregulation: A Contractual Equilibrium Approach', *Yale Journal on Regulation*, 5(2), pp 273–297.

**Miller TC (2014)**, 'Improving the Efficiency and Equity of Highway Funding and Management: The Role of VMT Charges', Mercatus Center Working Paper No 14-04.

**Morrison SA and C Winston (1989)**, 'Enhancing the Performance of the Deregulated Air Transportation System', *Brookings Papers on Economic Activity: Microeconomics*, 1989, pp 61–112.

**Nash C (2006)**, 'Europe: Alternative Models for Restructuring', in JA Gómez-Ibáñez and G de Rus (eds), *Competition in the Railway Industry: An International Comparative Analysis*, Edward Elgar Publishing Limited, Cheltenham, pp 25–48.

**National Transportation Operations Coalition (2007)**, '2007 National Traffic Signal Report Card – Executive Summary'.

**Ng CF and KA Small (2012)**, 'Tradeoffs among Free-Flow Speed, Capacity, Cost, and Environmental Footprint in Highway Design', *Transportation*, 39(6), pp 1259–1280.

**Oster CV Jr (2006)**, 'Reforming the Federal Aviation Administration: Lessons from Canada and the United Kingdom', Report, IBM Center for the Business of Government, Washington DC.

**Oum TH, J Yan and C Yu (2008)**, 'Ownership Forms Matter for Airport Efficiency: A Stochastic Frontier Investigation of Worldwide Airports', *Journal of Urban Economics*, 64(2), pp 422–435.

**Papageorgiou M, E Kosmatopoulos and I Papamichail (2008)**, 'Effects of Variable Speed Limits on Motorway Traffic Flow', *Transportation Research Record: Journal of the Transportation Research Board*, 2047, pp 37–48.

**Pasztor A (2013)**, 'FAA Authorizes the Use of Commercial-Drone Testing: Six Operators Selected to Conduct Research, Setting Stage for Eventual Widespread Use', *The Wall Street Journal*, 30 December, online. Available at <<http://online.wsj.com/news/articles/SB10001424052702304591604579290412510481766>>.

**PB Americas, Inc, Carter + Burgess, EarthTech, Inc and Telvent Farradyne (2007)**, 'Active Traffic Management (ATM) Feasibility Study', Submission for Puget Sound Regional Council to Washington State Department of Transportation, November. Available at <<http://psrc.org/assets/524/ATMfeasibilitystudy.pdf>>.

**Peterson K (2013)**, 'Push for Transportation Funding Gains Steam', *The Wall Street Journal*, 27 October, online. Available at <<http://online.wsj.com/news/articles/SB10001424052702304682504579158143435088218>>.

**Poole RW Jr (2009)**, 'Will We Get Serious about Aviation Security?', Reason.com, 29 December.

**Poole RW Jr (2013)**, 'Organization and Innovation in Air Traffic Control', Hudson Institute Initiative on Future Innovation Report.

**The Road Information Program (2010)**, 'Key Facts about America's Surface Transportation System and Federal Funding', Fact Sheet.

**Robyn D (2007)**, 'Reforming the Air Traffic Control System to Promote Efficiency and Reduce Delays', Paper prepared for the Council of Economic Advisors by The Brattle Group, Inc in association with GRA, Incorporated, 29 October.

**Roland G (2008)**, 'Private and Public Ownership in Economic Theory', in G Roland (ed), *Privatization: Successes and Failures*, Initiative for Policy Dialogue, Columbia University Press, New York, pp 9–31.

**Schrank D, B Eisele and T Lomax (2012)**, '2012 Urban Mobility Report', Annual report from Texas A&M Transportation Institute in partnership with INRIX.

**Schweikart L Jr and BW Folsom Jr (2013)**, 'Obama's False History of Public Investment: Entrepreneurs Built Our Roads, Rails and Canals Far Better than Government Did', *The Wall Street Journal*, 5 August, online. Available at <<http://online.wsj.com/news/articles/SB10001424127887324635904578644233086643450>>.

**Scovel CL (2013)**, 'FAA's Progress and Challenges in Advancing the Next Generation Air Transportation System', Statement of the Honorable Calvin L Scovel III, Inspector General, US Department of Transportation before the Committee on Transportation and Infrastructure Subcommittee on Aviation United States House of Representatives, Washington DC, 17 July.

**Sherk J (2011)**, 'Repealing the Davis–Bacon Act Would Save Taxpayers US\$10.9 Billion', The Heritage Foundation WebMemo No 3145.

**Shin K, SP Washington and I van Schalkwyk (2009)**, 'Evaluation of the Scottsdale Loop 101 Automated Speed Enforcement Demonstration Program', *Accident Analysis & Prevention*, 41(3), pp 393–403.

**Small KA and ET Verhoef (2007)**, *The Economics of Urban Transportation*, Routledge, Abingdon.

**Small KA and C Winston (1988)**, 'Optimal Highway Durability', *The American Economic Review*, 78(3), pp 560–569.

**Small KA, C Winston and CA Evans (1989)**, *Road Work: A New Highway Pricing and Investment Policy*, Brookings Institution Press, Washington DC.

**Small KA, C Winston and J Yan (2005)**, 'Uncovering the Distribution of Motorists' Preferences for Travel Time and Reliability', *Econometrica*, 73(4), pp 1367–1382.

**Small KA, C Winston and J Yan (2006)**, 'Differentiated Road Pricing, Express Lanes, and Carpools: Exploiting Heterogeneous Preferences in Policy Design', *Brookings-Wharton Papers on Urban Affairs*, pp 53–96.

**Spieser K, K Treleaven, R Zhang, E Frazzoli, D Morton and M Pavone (2014)**, 'Toward a Systematic Approach to the Design and Evaluation of Automated Mobility-On-Demand Systems: A Case Study in Singapore', in G Meyer and S Beiker (eds), *Road Vehicle Automation*, Lecture Notes in Mobility, Springer, Cham, Switzerland, pp 229–246.

**Starkie D (2008)**, 'The Airport Industry in a Competitive Environment: A United Kingdom Perspective', Organisation for Economic Co-operation and Development and International Transport Forum Joint Transport Research Centre Discussion Paper 2008-15.

**Starkie D (2013)**, 'Transport Infrastructure: Adding Value', Institute of Economic Affairs Discussion Paper No 50.

**Stiglitz J (1998)**, 'Distinguished Lecture on Economics in Government: The Private Uses of Public Interests: Incentives and Institutions', *Journal of Economic Perspectives*, 12(2), pp 3–22.

**Todd K (2004)**, 'Traffic Control: An Exercise in Self-Defeat', *Regulation*, Fall, pp 10–12.

**TRB Superpave Committee (2005)**, 'Superior Performing Asphalt Pavement: SUPERPAVE Performance by Design', Final Report, Transportation Research Board Miscellaneous Report.

**Vickers J and G Yarrow (1991)**, 'Economic Perspectives on Privatization', *The Journal of Economic Perspectives*, 5(2), pp 111–132.

**Wilde ET (2013)**, 'Do Emergency Medical System Response Times Matter for Health Outcomes?', *Health Economics*, 22(7), pp 790–806.

**Winston C (2010)**, *Last Exit: Privatization and Deregulation of the US Transportation System*, Brookings Institution Press, Washington DC.

**Winston C (2013a)**, 'How to Avoid Another FAA Fiasco: The U.S. Should Consider Following the Lead of Canada and England by Privatizing Transportation Services', *The Wall Street Journal*, 7 May, online. Available at <<http://online.wsj.com/news/articles/SB10001424127887324266904578461000412813578>>.

**Winston C (2013b)**, 'On the Performance of the US Transportation System: Caution Ahead', *Journal of Economic Literature*, 51(3), pp 773–824.

**Winston C and F Mannering (forthcoming)**, 'Implementing Technology to Improve Public Highway Performance: A Leapfrog Technology from the Private Sector is Going to be Necessary', *Economics of Transportation*.

**Winston C and J Yan (2011)**, 'Can Privatization of US Highways Improve Motorists' Welfare?', *Journal of Public Economics*, 95(7–8), pp 993–1005.

**Wright RE and BP Murphy (2009)**, 'The Private Provision of Transportation Infrastructure in Antebellum America: Lessons and Warnings', unpublished manuscript, Augustana College.

**Yan J and C Winston (2014)**, 'Can Private Airport Competition Improve Runway Pricing? The Case of San Francisco Bay Area Airports', *Journal of Public Economics*, 115, pp 146–157.



# Discussion

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## 1. John Quiggin

I thank the organisers of this conference for inviting me to speak. Before addressing Clifford Winston's stimulating paper, I'd like to comment on the main graphic used for this conference, which shows the Sydney Harbour Bridge. The Bridge is a publicly owned project, constructed under a fixed-price contract and funded by a toll.

More interesting is the tunnel under the bridge, constructed as one of Australia's first build, own, operate and transfer projects. Although the tunnel is notionally private, the revenue flows from the tunnel are guaranteed by the NSW Government, which is therefore the residual income recipient and, in economic terms, the owner. The reason for this arrangement was to evade restrictions on public borrowing imposed at the time by the Loan Council.

The spurious idea that transferring infrastructure to the private sector gives government a 'magic pudding', from which to finance new investment, has been refuted many times, notably by several other speakers at this conference. Unfortunately, it has been repeated even more often, also notably by a number of speakers at this conference, including most of those actually involved in the policy process. The latest variant on this idea, outside the scope of my comments today, is the idea of 'capital recycling'.

Coming to Clifford Winston's paper, it may be divided into two parts: diagnosis and prescription.

The diagnostic element is a critique of US infrastructure policy and the debate surrounding it. Winston begins by disputing the standard view that investment in infrastructure is inadequate. Given the inefficiency with which public investment funds are allocated, and with which public infrastructure is used, Winston argues that it is impossible to determine whether too much or too little is being spent in aggregate.

As regards investment misallocation, Winston focuses on aspects of the US political process that lead to projects being allocated on spurious principles of equity, with the idea that each locality should get a share in every program, regardless of marginal benefit. In addition, there is the problem of influential politicians securing funds for vanity projects, such as the famous Alaskan 'bridge to nowhere'. These particular problems are less evident in the Australian system where political parties play a bigger role than influential individual politicians. However, we have our own problems, such as the largesse lavished on marginal seats.

Next, Winston considers problems with pricing. Infrastructure services are commonly underpriced or given away 'free', with the implied requirement for rationing. Where prices are charged, they are neither cost-reflective nor based on the kind of Ramsey pricing principles that would be recommended by economists.

Although Australia has probably made more progress in this respect than the United States, neither country has addressed the policy that would probably yield more benefits than any other

– that of congestion pricing for roads. It is striking that this issue is regarded as utterly untouchable by Australian politicians, even politicians who have been willing to commit political suicide in the pursuit of privatisation. For example, the Bligh Government in Queensland ruled out any consideration of congestion pricing when the topic was raised in the Henry Tax Review in 2010. Yet the same government went to a crushing defeat in 2012 on the issue of privatisation – a defeat predicted by years of devastating opinion polls.

It is true that congestion pricing is a controversial policy, and that the immediate reaction of the public is generally hostile. But this negative initial reaction does not, based on long experience, compare with the longstanding and remorseless public opposition to privatisation. In Australia, polls regularly record majorities of more than 70 per cent opposed to privatisation. It does not appear that the question has been asked in Australia, but polls taken in the United Kingdom show majority support for renationalisation of the water and railway industries, which have been privatised for decades.

The somewhat skewed views of political leaders may be explained by the company they keep. The small minority of the population who regularly drive into the CBD is heavily over-represented in the social circles surrounding politicians, as is the even smaller minority who benefit directly from privatisation as advisers, lobbyists, financiers and so on. So, perhaps it is unsurprising that political leaders delude themselves into thinking that privatisation is politically saleable and congestion pricing is not.

Winston's final concern relates to technology, and the failure of US transport authorities to embrace advances, some of which are already in use in Australia and elsewhere. Winston diagnoses ingrained risk aversion on the part of public sector employees, but this seems to be a cultural problem specific to the US Government.

Although it's possible to quibble about some of the details of Winston's diagnosis, few economists would disagree with its general tenor. Rational investment planning, cost-reflective pricing and openness to technological innovation all command fairly widespread support.

A decade or two ago, the same might have been said of the prescriptive component of the paper: privatisation. Even among sceptics, privatisation seemed to be the inevitable wave of the future.

Extensive, and largely disappointing, experience has changed the picture, to the point that Winston himself is ambivalent. As noted in the paper, '[p]olicymakers have privatised infrastructure in many parts of the world but the preliminary evidence on privatisation's economic effects is mixed' (p 168).

Whereas privatisation in one form or another seemed to be an inevitable trend in the 1990s, significant countercurrents have emerged in recent years. These include:

- renationalisation in instances of failed privatisation (Railtrack in the United Kingdom, NZ railways)
- new public enterprises undertaking responsibilities previously divested through privatisation (the National Broadband Network in Australia)
- reforms to public-private partnership (PPP) systems that reduce risk transfer to the private sector, and have coincided with a decline in the volume of PPP projects (Australia and United Kingdom).

What explains the disappointing outcomes of infrastructure privatisation, at least relative to the high hopes of the late 20th century? Winston's discussion of the problems of the existing system gives us a clue. There is a striking mismatch between the problems of the infrastructure sector and the strengths of private provision, as may be illustrated by Table 1.

**Table 1: Infrastructure Policy Needs Versus Private Sector Strengths**

<b>Policy needs</b>	<b>Private sector strengths</b>
Cost-reflective pricing	Profit-maximising prices
Efficient allocation of capital	Efficient management of labour
Process innovation	Product innovation

Table 1 may be explicated row by row. As already noted, existing infrastructure systems suffer from the absence of proper pricing, and from pricing that bears little relationship to the cost of provision.

It is certainly reasonable to anticipate that privatisation will lead to an increase in prices. However, the success of private infrastructure investment depends on the ability to find profit-maximising pricing structures, and these will rarely be cost-reflective. For example, Macquarie Bank, the leading player in this field, has succeeded largely by virtue of its success in overcoming resistance to unanticipated price increases, such as the large increase in monopoly parking charges imposed at Sydney Airport.

As regards operating efficiency, it is commonly argued that public sector infrastructure enterprises are overstaffed and suffer from restrictive work practices. Private sector operations typically display more managerial flexibility in these respects. However, labour costs usually make up a relatively small proportion of the total costs of infrastructure projects. The primary costs are associated with capital and here the case for privatisation is much less favourable. Not only is equity capital expensive but the long record of investment bubbles and busts, recently exemplified by the US dotcom bubble and the global financial crisis, suggest that private sector allocation of capital is far from optimal.

Finally, as regards innovation, the private sector is clearly superior in identifying and addressing unmet consumer demands, even demands of which consumers are themselves unaware until new products and services are offered to them. On the other hand, there is little empirical evidence to suggest that the private sector does a better job in process innovations like those needed to improve infrastructure services.

Not only is most fundamental research undertaken within the public sector (broadly defined to include universities and publicly funded research institutes) but the same is true of critical technologies. Radar, satellites, GPS, the internet and the World Wide Web, critical to the innovations discussed by Winston, were all developed in, and first deployed by, the public sector.

To sum up, while the infrastructure sector has plenty of problems, there is no reason to think that privatisation is likely to provide a solution. Indeed, the observation of Kay and Thompson (1986),

nearly 30 years ago, that privatisation is ‘a policy in search of a rationale’ remains just as true today. I close with their observation that:

the reality behind the apparent multiplicity of objectives is not that the policy [privatisation] has a rather sophisticated rationale, but rather that it is lacking any clear analysis of purpose or effects; and hence any objective which seems achievable is seized as justification. (p 19)

## Reference

**Kay JA and DJ Thompson (1986)**, ‘Privatisation: A Policy in Search of a Rationale’, *The Economic Journal*, 96(381), pp 18–32.

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## 2. General Discussion

In response to a question, the discussion began with Clifford Winston commenting on possibly useful lessons from the US experience of privatisation. Dr Winston described concerns in the lead-up to the deregulation of US railroads (which are typically monopolies or duopolies) about potentially large increases in the price of rail services. However, surprisingly, prices of rail services fell after deregulation. Dr Winston argued that the reason for this was the development of a contract equilibrium, under which logistics firms would band together and negotiate freight charges with the railroad, thereby reducing the railroad operator’s relative bargaining power. Dr Winston went on to suggest that contract negotiations could be useful in ensuring efficient pricing outcomes from future privatisation. For example, in the case of roads, third parties representing different subsets of road users (such as car drivers, truck drivers, etc) could negotiate prices with the road provider. Dr Winston claimed that a system of this kind would achieve welfare gains, as pricing would respond to the heterogeneous preferences of users. Dr Winston also commented on shortcomings in the allocation of government funds for infrastructure investment, arguing that the destination of these funds is often determined by lobbying rather than the efficient allocation of resources to projects that will have the greatest benefit. He suggested that privatisation could assist in efficient resource allocation, but went on to stress his belief that the most constructive way of improving infrastructure provision, specifically for transport, is by allowing and encouraging innovation by the modes.

Still on the topic of privatisation, one participant asked for Dr Winston’s view on ‘capital recycling’, which has recently become more popular in Australia. The participant noted that, as well as providing efficiency benefits, privatisation also provides benefits to the public sector’s balance sheet by effectively selling a fully operational piece of infrastructure and using the associated capital to finance further infrastructure investment. Dr Winston agreed that governments would be attracted to this idea. Another participant suggested that once demand risk has been resolved (which typically occurs relatively early on in a project’s life), an infrastructure asset behaves like a government bond, in that it provides a long-term stream of relatively fixed income. The participant argued that if the shadow cost of government debt is high, it may make sense to sell this income stream and use the proceeds to pay off the government’s debt obligations.

One participant commented on Dr Winston’s observation that prices for the use of infrastructure in the United States have tended to be much lower than is economically efficient. The participant

## DISCUSSION

queried the extent to which economically efficient pricing structures could contribute to a closing of the perceived infrastructure investment gap. Dr Winston opined that an important purpose of infrastructure pricing is to provide guidance for efficient investment that is based on cost-benefit analysis. He also suggested that, although the improvement of pricing would do a lot to address inefficiency problems, a major improvement in pricing structures is unlikely to occur. Another participant questioned whether the use of high-occupancy-toll (HOT) lanes in the United States was an efficient way of dealing with the inability to adopt congestion pricing, or whether it was just another inefficient pricing mechanism. In response, Dr Winston stressed that one of the key lessons from the US experience of HOT lanes was that it revealed significant preference heterogeneity among road users – something that government regulation and current operation of infrastructure does not reveal. However, he was sceptical that efficiency gains will be realised using this type of pricing. Instead, he argued that improvements in infrastructure will be realised by modal innovations, specifically through automation (such as driverless cars). Dr Winston also posited that autonomous vehicles will be invaluable in dealing with ageing population problems, as the elderly will want to continue driving but may pose a danger to themselves and other road users.

# Finance and Public-Private Partnerships

Eduardo Engel, Ronald Fischer and Alexander Galetovic\*

## 1. Introduction

The use of public-private partnerships (PPPs) to replace or complement the public provision of infrastructure has become common in recent years.<sup>1</sup> Public infrastructure projects that require large up-front investments, such as highways, light rail, bridges, seaports, airports, water, sewerage, hospitals, gaols and schools, are now often provided via PPPs.<sup>2</sup>

A PPP bundles investment and service provision of infrastructure into a single long-term contract. A group of private investors finances and manages the construction of the project, then maintains and operates the facilities for a long period of usually 20 to 30 years, and at the end of the contract transfers the assets to the government. During the operation of the project, the private partner receives a stream of payments as compensation. These payments cover both the initial investment (the so-called capital expense or capex) and operation and maintenance expenses (the so-called operation expense or opex). Depending on the project and type of infrastructure, these revenues are derived from user fees (as in a toll road), or from payments by the government's procuring authority (as in the case of gaols).

As pointed out by Yescombe (2007), the growth and spread of PPPs around the world is closely linked to the development of project finance, a financial technique based on lending against the cash flow of a project that is legally and economically self-contained – a so-called special purpose vehicle (SPV).<sup>3</sup> Project finance arrangements are highly leveraged and lenders receive no guarantees beyond the right to be paid from the cash flows of the project.<sup>4</sup> Because the assets of the project are specific, they are illiquid and have little value if the project is a failure. There is

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\* For comments we are very grateful to our discussant Frédéric Blanc-Brude and to many participants in the conference.

1 There exist three broad alternative organisational forms to provide infrastructure: traditional provision; PPPs; and privatisation, perhaps under a regulated monopoly. Each one of these forms includes a number of contractual arrangements. For example, Guasch (2004) lists the following 12 arrangements, ordered by increasing private participation: public supply and operation; outsourcing; corporatisation and performance agreement; management contracts; leasing (also known as *affermage*); franchise; concession; build-operate-transfer (BOT); build-own-operate; divestiture by license; divestiture by sale; and private supply and operation. In what follows, our definition of PPP includes the four cases grouped by Guasch as concessions, namely leasing, franchise, concession, and BOT. We also use the terms PPP and concession interchangeably.

2 Many databases and analyses classify telecommunication networks and power (generation, transmission and distribution) as 'infrastructure'. While there are PPPs in power and telecommunications, we would think that these are better provided by standard regulated utilities (power transmission and distribution) or competitive regimes (telecoms and power generation). Indeed, around the world most PPPs are transportation projects or 'social' infrastructure, for example hospitals, schools or gaols.

3 PPPs are only part of global project finance, but most PPPs are financed with project finance. According to Blanc-Brude and Ismail (2013), project finance around the world finances between US\$350 and US\$400 billion every year; about 20 per cent goes to oil and gas projects and 80 per cent to infrastructure – mainly water, telecoms, energy, transport and government services. Of these infrastructure projects, between US\$60 and US\$100 billion per year are PPPs. Around 75 per cent of PPPs are in the transport sector, and an additional 20 per cent finances government services. As a reference, consider that total world private and public infrastructure spending is estimated to be between US\$2 and US\$3 trillion.

4 According to Blanc-Brude and Ismail (2013), debt finance accounts for 77 per cent of total project finance, on average.

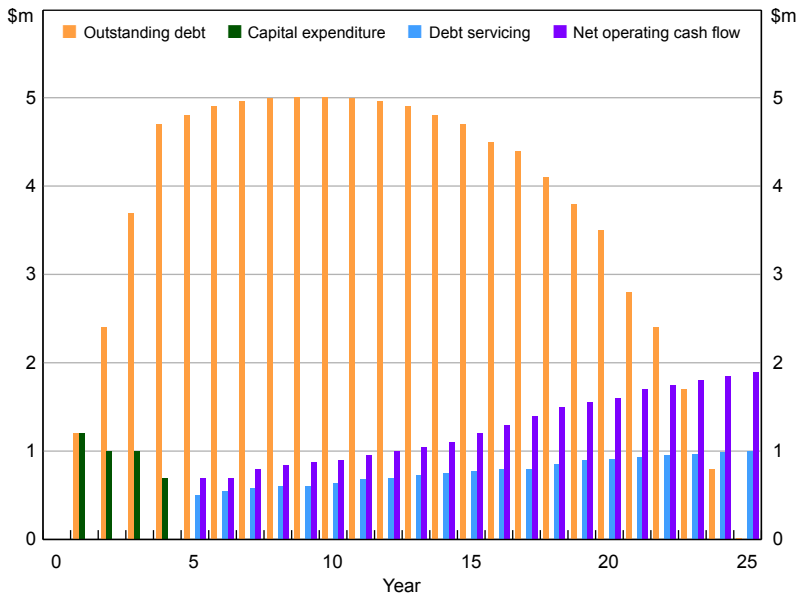
ample scope for moral hazard during the construction stage; banks tend to provide finance during this stage as they are well placed to mitigate this moral hazard by continually monitoring the project. During the operation of the project, bonds, sometimes held by pension funds and other long-term investors, substitute for bank lending. Indeed, after completion, risk is limited mostly to events that may affect the cash flows of the project, which makes PPP projects suitable for bond finance. In Section 2 we analyse the economics and contracting of PPP finance and conclude that the narrow organisational focus forced by project finance and SPVs fosters efficiency and incentive alignment. Moreover, because PPP projects are large, require independent management, and both scale and scope economies across projects are typically small, an SPV seems a particularly suitable organisational form. Thus, project finance contributes to efficiency – a case of finance fostering efficiency gains.

Section 3, by contrast, takes a sceptical view about the differences between private and public finance. We argue that whether a PPP is a better way of procuring public infrastructure depends almost exclusively on the economic characteristics of the specific project, not on the way it is funded or financed. More generally, PPPs work when objective performance standards can be written into the contract between the public authority and the private firm. Moreover, proper intertemporal accounting shows that PPPs do not liberate public funds. Consequently, from the perspective of the public budget and balance sheets, PPP projects should be registered like public projects.

Section 4 examines the relationship between risk and PPPs. The apparently higher cost of financing PPPs – the so-called PPP premium – is not an argument in favour of public provision, since it appears to be due to the combination of poor contract design plus cost-cutting incentives embedded in PPPs. Thus, in the case of a correctly designed PPP contract, the higher cost of capital may well be the price to pay for the efficiency advantages of PPPs relative to public provision. Section 5 presents some conclusions.

## 2. The Economics of PPP Finance

The typical PPP infrastructure project involves a large initial upfront investment that is sunk, and operations and maintenance (O&M) costs paid over the life of the project. These O&M costs are a comparatively small fraction of total costs, and this fact determines several characteristics of PPP finance. Figure 1 shows the typical time profile of the financial flows of a PPP project, which is assumed to be 100 per cent debt financed. It further assumes that the interest rate is 12 per cent, that revenues grow at 5 per cent each year and that debt payments grow by 3.5 per cent each year. Capital expenditures occur during the first four years. Revenues over the life of the project are used to pay off debt by year 25. After the initial capital expenditure, the main objective of the project is to collect revenues, which are used to pay outstanding debt and generate dividends for the owners.

**Figure 1: Time Profile of Financial Flows**

Four additional economic characteristics of most PPP projects are important for understanding the choice of financial arrangements. First, PPP projects are usually large enough to require independent management, especially during construction, and frequently even in the operational phase. It is also often the case that there are few synergies to be realised by building or operating two or more PPP projects together. For instance, the projects may be located far apart at the place where the service is consumed, and efficient scale is site specific. This means that project assets are illiquid and have little value if the project fails.

Third, most of the production processes, both during construction and operation, are subcontracted. Hence, any scale and scope economies are internalised by specialised service providers, for example construction companies, maintenance contractors or toll collectors.<sup>5</sup>

Last, it is efficient to bundle construction and operation. Bundling forces investors to internalise operation and maintenance costs, and generates incentives to design the project so that it minimises life-cycle costs. But perhaps even more importantly, when builders are responsible for enforceable service standards, they have an incentive to consider them when designing the project.

As we will see next, the specifics of project finance fit these basic economics of PPP projects.

## 2.1 The life cycle of PPP finance

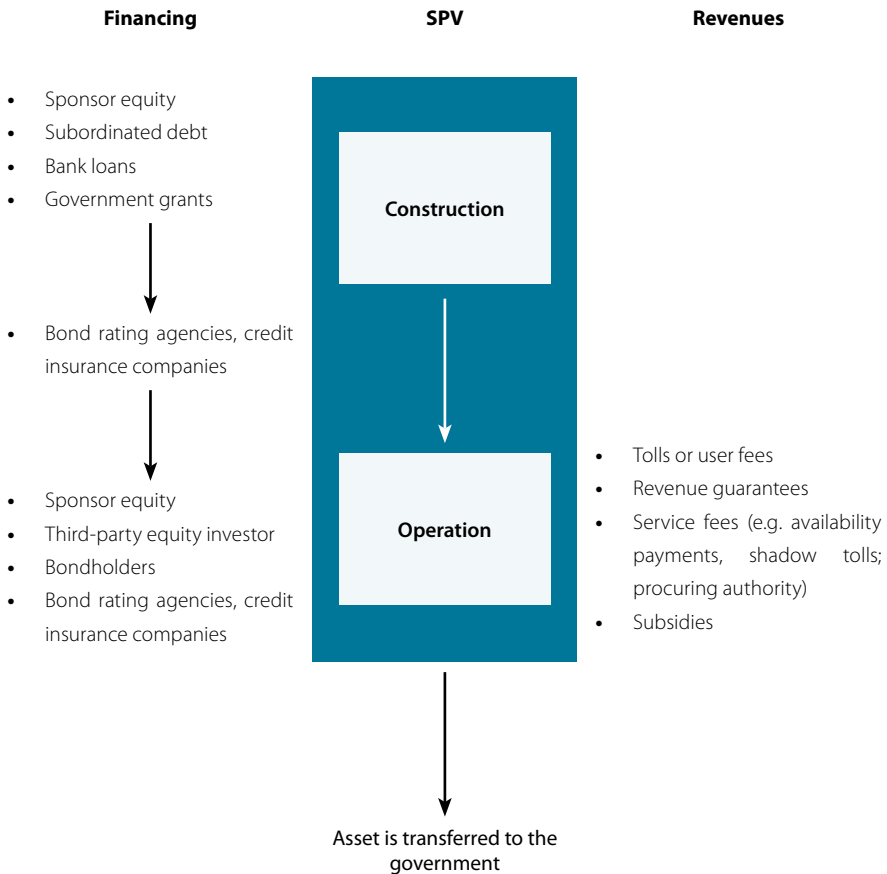
As pointed out by Yescombe (2007), the growth and spread of PPPs are closely linked to the development of project finance, a technique based on lending against the cash flow of a project

<sup>5</sup> For example, Blanc-Brude and Makovsek (2013) show evidence that large construction companies diversify exogenous construction risk across many large construction projects and provide insurance to the SPV.



that is legally and economically self-contained. As can be seen in Figure 2, this is ensured by creating an SPV, which does not undertake any business other than building and operating the project (Yescombe 2002, p 318). Before bidding for the project takes place, an SPV is set up by a *sponsor*. The sponsor is the equity investor responsible for organising the bidding process, and developing and managing the project. They are the residual claimants and are essential to the success of the project. This means that lenders will carefully examine the characteristics of the sponsor before committing resources. Sponsors can be: operational, in the sense that they belong to the industry and will secure business for themselves as subcontractors; or financial, in that they are interested in the financial arrangements for the project.<sup>6</sup>

**Figure 2: The Life Cycle of a PPP Project**



6 The Queen Elizabeth II Bridge in Dartford in the United Kingdom is an example of the first type of sponsor: the construction division of Trafalgar House Plc organised local landowners plus an investment bank and presented an initial proposal to the government. The Department of Transport approved the proposal and, after seeking other bids, awarded the project to Trafalgar House (Levy 1996). In the Dulles Greenway project in Virginia, which began operating in 1995, the main sponsor was a family-owned investment company, which owned 57.04 per cent of the property (Toll Roads Investors Partnership II; see Levy (1996)).

Initial sponsors supply the initial equity of the project, and in some cases are required to keep a fraction until the end of the PPP contract without the possibility of transferring. The objective of this is to create long-term incentives. This is expensive for the initial sponsor for two reasons: first, because the cost of capital for the sponsor is high; and second, because by tying up resources for a long time, they cannot be deployed to other uses. As the sponsor specialises in the early, building part of the project, this limits its possibilities for future business. This means that projects must be very profitable to compensate the sponsors for this cost.

Even though the SPV remains active over the whole life of the project, until the assets revert to the government, there is a clear demarcation between financing during the construction phase and financing in the operational phase (Figure 2). During construction, sponsor equity (perhaps along with bridge loans and subordinated or mezzanine debt) is combined with bank loans and, sometimes, government grants in money or kind. In the case of projects that derive their revenues from user fees, the initial contribution to investment is sometimes supplemented with subsidies from the government if the project revenues are not sufficient to pay for the project.

As completion of the construction stage approaches, bondholders enter the picture and substitute for bank lending. Bond finance is associated with two additional entities: rating agencies and credit insurance companies. When the PPP project becomes operational, but only then, the sponsor's equity may be bought out by a facilities operator, or even third-party passive investors, usually pension or mutual funds. Bondholders, of course, have priority over the cash flow of the project.

The life cycle of PPP finance and the change in financing source is determined by the different incentive problems faced in the construction and operational phases. Construction is subject to substantial uncertainty and major design changes, and costs depend crucially on the diligence of the sponsor and the building contractor. Thus, there is ample scope for moral hazard in this stage. Banks perform a monitoring role that is well suited to mitigate moral hazard, by exercising tight control over changes to the project's contract and the behaviour of the SPV and its contractors. To control behaviour, banks disburse funds only gradually as project stages are completed. After completion and ramp-up of the project, risk falls abruptly and is limited only to events that may affect the cash flows from the project. This is suitable for bond finance because bondholders only care about events that significantly affect the security of the cash flows underpinning repayment, but are not directly involved in management or control of the PPP. This is appropriate for institutional and other passive investors, who by mandate can only invest small amounts of their funds in the initial stages of a PPP because of their high risk.

## 2.2 Contracts and project finance

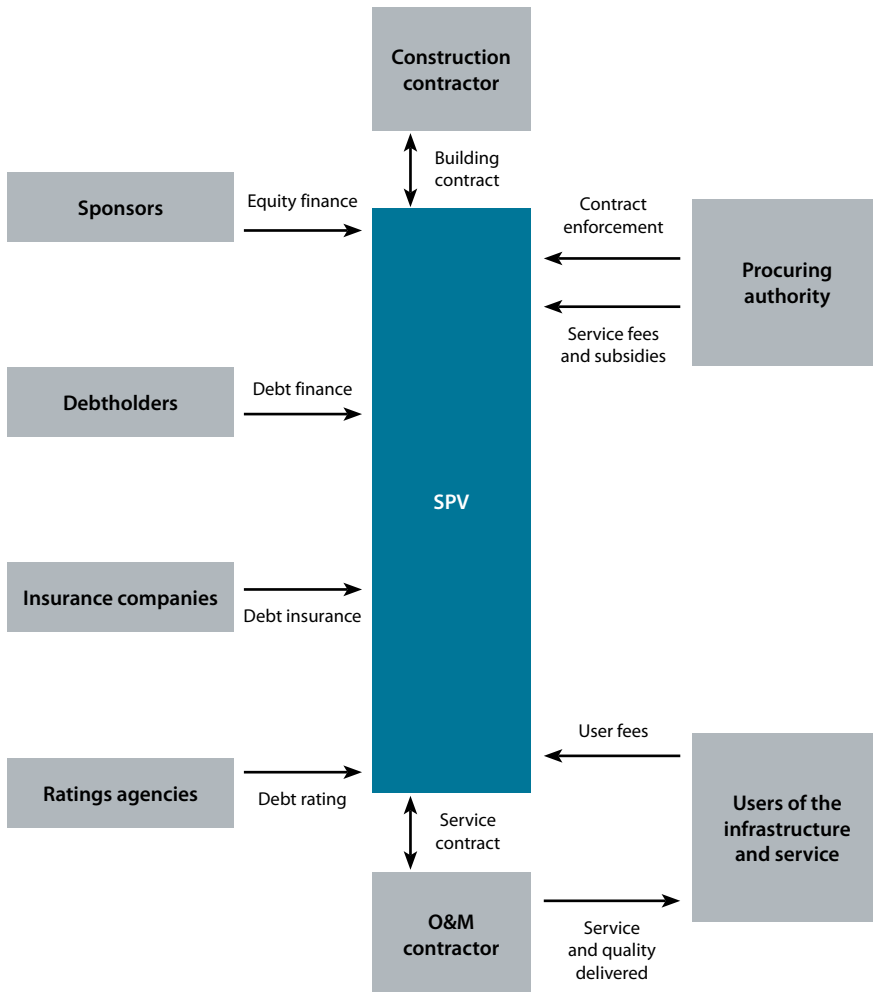
Financial contracts must deal with many incentive problems, which in the case of PPPs can be traced back to the contracts made by the SPV. In this section we examine these contracts and the roles of various agents.

### 2.2.1 The web of contracts around an SPV

As can be seen in Figure 3, the SPV lies at the centre of a web of contracts. These include contracts with: the procuring authority (usually the local or central government); users of the services provided by the PPP; building and operations contractors; and investors and financiers. Each of

these contracts is a potential source of conflict that may increase the risk borne by debtholders. The success of the SPV in dealing with these conflicts depends on two factors. The first factor is the quality of the legal institutions and laws on which the web of contracts rests. The second factor is that the particulars of each relationship and contract affect risk perceptions of debtholders.

**Figure 3: The Web of Contracts around an SPV**



The project is intended to provide a service to users, but the fundamental contracting parties are the SPV and the procuring authority, which enforces the PPP contract and represents users of the project. Because contracts give at least some discretion to the procuring authority, cash flows and even the continuation of the concession may depend on its decisions. Thus, ambiguous service standards and defective conflict resolution mechanisms increase risk. In addition, user fees will

be at risk if the political authority is tempted to buy support or votes by lowering service fees, either directly or by postponing inflation adjustments, in so-called *regulatory takings*. Similarly, if a substantial fraction of the SPV's revenues are derived from payments by the procuring authority, these payments depend on the ability (or desire) of the government to fulfill its obligations. It follows that the governance structure of the procuring authority, its degree of independence and the financial condition of the government affect the level of risk perceived by debtholders.

Consider next the relationship of the SPV with construction and O&M contractors. Many PPP projects involve complex engineering. In complex projects, unexpected events are more likely and it becomes harder to replace the building contractor. In these cases, the experience and reputation of the contractor become an issue. Moreover, the financial strength of the contractor is relevant because this determines its ability to credibly bear cost overruns without having to renegotiate the contract. Similarly, while the operational phase is less complex, revenue flows depend on whether the contracted service and quality standards are fulfilled, which depends on the O&M contractor. Again, the experience and, secondarily, the financial strength of the contractor concern debtholders. Debtholders also care about the type of risk-sharing agreements negotiated between the SPV and the contractors. Cost-plus contracts, which shift cost shocks to the SPV, are riskier than fixed-price contracts from their point of view.

Finally, debtholders care about the incentives of the sponsor, who provides around 30 per cent of the funding in the typical PPP project. This large chunk of equity has the lowest priority in the cash-flow cascade, and is theoretically committed for the length of the PPP contract to provide incentives to minimise the life-cycle costs of the project. Providers of funds worry about the financial strength and experience of sponsors, particularly during the construction and the ramp-up phase of complex transportation projects. They value previous successful experience in the industry and technical prowess, and look for evidence that the sponsor is committed to the project, both financially and in terms of time and reputation.<sup>7</sup>

### 2.2.2 Project revenues, demand risk and finance

SPV revenues depend on the project's availability, the level of user fees, demand volume and the term of the contract. The relevance of each factor varies over projects, but revenues can be classified along two dimensions: the source of payments and the extent to which the SPV is made to bear demand risk (on this issue, see Engel, Fischer and Galetovic (1997, 2001)).

Provided that the SPV meets the minimum quality and availability standards, demand for most PPP projects is exogenous to a large extent. Despite the fact that they cannot affect demand, many PPPs are made to bear demand risk. When revenues are derived primarily from user fees, SPVs assume two types of project risks associated with demand. First, the risk that the project is a failure and will never be able to repay the creditors. This risk represents a market test of the quality of the project and is correctly assigned to creditors. The second risk appears because the term of the concession contract is fixed (say, at 20 years). This means that a profitable project may be unable to repay the debt over the contract term, due to adverse initial macroeconomic conditions, for instance. Even when the primary source of revenues is the procuring authority, the contract may tie payments to use of the project over a fixed term, in so-called *shadow tolls* (or fees). In both

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<sup>7</sup> Lobbying ability with the procuring authority and its political taskmasters is also considered favourably at this stage.

these cases, bondholders bear the uncertainty that demand over the term of the contract may not generate enough revenues to meet debt payments on schedule. Sponsors face even more risk, and expect large profits as compensation.

Contracts can be designed to make project revenues independent of, or less dependent on, demand in a given time period. This reduces the second type of risk and, therefore, the expected rents to the sponsor as well as the return demanded by bondholders. When the source of revenues is the procuring authority, the contract that eliminates this risk has a fixed term, with payments contingent on the availability of the infrastructure (hence the term *availability payments*). When user fees are the main source of revenue, the appropriate contract is a present-value-of-revenue (PVR) contract, which specifies a fixed present value of revenues under a variable-length contract.<sup>8</sup> In either case, the contract eliminates demand risk to a large extent, and revenue risk is reduced to meeting (hopefully) clearly defined performance standards. For more details see Section 4.2.2.

All things considered, financiers prefer predictable cash flows. Consequently, availability contracts and flexible-term contracts tend to receive higher ratings than contracts where the concessionaire bears considerable demand risk (Fitch Ratings 2010).

### 2.2.3 Credit rating agencies and credit insurance providers

While the relationship between bondholders and the SPV is kept at arm's-length distance, management behaviour is still (somewhat loosely) monitored by credit rating agencies and credit insurance companies while there are bonds outstanding.<sup>9</sup> The role of credit rating agencies and credit insurance companies is essential to the issuance of bonds. The credit rating agency issues a so-called shadow rating of the SPV. With this rating, the SPV buys insurance that increases the rating of its bonds to investment grade or higher (for instance from BBB to A-), and the bonds are then sold to institutional and other investors. In a market that operates correctly, the insurance premium should be exactly equivalent to the difference between the risk premiums associated with the insured and shadow ratings. In the example, this corresponds to the difference in risk premium between A- and BBB bonds. This premium varies over the life of the project, as risk perceptions and circumstances change. The bond covenants require that the SPV pay the premiums required to preserve the initial risk rating of the bond. This creates the correct incentives for the SPV, as its costs increase with the perceived riskiness of the bonds.

Credit rating companies worry most about the impact of the various risks around the ability of the project to make the scheduled debt payments. This requires the analysis of the expected value and the volatility of the project's net cash flow. In addition, credit rating agencies penalise poor information, ambiguities, complexity and discretion in laws or contracts. Thus, the rating of a bond depends on: the quality and timeliness of the information revealed by the SPV; the opinions of experts (good news from independent experts increases ratings *ceteris paribus*); the quality of laws

8 Under a PVR contract, the concession lasts until the concessionaire receives a set amount in present value. Therefore, the term of the concession is shorter the more the infrastructure is used. A PVR contract can be allocated competitively with a least-present-value-of-revenue auction (Engel *et al* 2001).

9 After the financial crisis of 2008, the various deficiencies of being dependent on rating agencies and monolines (bond insurance companies) have come to light. Our analysis assumes a reformed system of credit rating agencies and credit insurance companies that are not subject to the conflicts of interest that beset the industry up to 2008.

and institutions that have a bearing on the project; and the clarity and conflict potential of the web of contracts. In terms of contract theory, credit rating companies punish contract incompleteness.

In addition to the risks we have surveyed that are inherently related to the economics of the project – construction, operation and revenue risks – exchange rate, political and country risks are also considered in evaluations.

### 2.3 Leverage and SPVs

There are two possible forms for the financial structure of a PPP infrastructure project: as a project within a company, using corporate debt for financing; or as a stand-alone project, set up as an SPV. While the second form has large transaction costs, it provides advantages that compensate for the added cost of the complex structure.

Most PPP contracts use project finance because it is useful in raising long-term financing for major projects. A characteristic of project finance is that sponsors provide no guarantees beyond the right to be paid from the project's cash flows. Nevertheless, sponsors need to attract large amounts of resources, which leave them highly leveraged, with 70 to 100 per cent of the funds provided by lenders. The level of leverage depends on the volatility of revenues; if revenues are very volatile, the project may not be *bankable*. Governments sometimes provide revenue insurance to improve the bankability of a project. Better alternatives, such as PVR and availability contracts, also allow for high levels of gearing. Conversely, technically complex projects require higher levels of sponsor equity.

There are several reasons why SPVs and project finance are to be preferred over corporate finance. Since SPVs use high levels of leverage, the expected return on equity increases, even after adjusting for the higher financing costs.<sup>10</sup> Moreover, it is more difficult to raise equity than to raise debt, especially in projects with no history, and this leads to higher leverage.

In the construction phase, by separating the project from a larger sponsoring corporation, an SPV precludes underinvestment in the project caused by competition for resources within the sponsor. Moreover, when setting up a PPP as a division within a corporation, the large free cash flows produced by a PPP in the operational phase are subject to costly agency problems, which may divert the revenues from their primary role of repaying the debt contracted to fund the project. Since an infrastructure SPV does not have growth opportunities, the possibility of diverting resources away from creditors is very limited, in contrast to the case of a division within a large corporation. Hence, the project's cash flow can be credibly pledged to pay bondholders and this allows for high leverage.

A final reason for isolating the project within an SPV is that it reduces the possibility of contaminating the healthy corporation with the problems of the independent entity. It must be recalled that even when the problems in a subsidiary of a large corporation do not threaten its financial stability, financial distress in the subsidiary affects the credit conditions facing the corporation.

Of course, these financial advantages of SPVs would be undone if stand-alone projects lose scope economies. But, as argued in Section 2, few, if any, productive efficiency gains can be realised

<sup>10</sup> Of course, this is an advantage only if the Modigliani-Miller offset does not wash out the gain; practitioners tend to argue that this is the case in practice.

by pooling multiple PPP projects whose demand is normally location based. Any gains that can be realised by being a sponsor of several PPP projects – for example, previous experience and lobbying proficiency – can be achieved by sponsoring several SPVs.<sup>11</sup>

## 2.4 Infrastructure as an asset class

The spread of PPPs has nurtured the view in financial markets that infrastructure is a new asset class with distinctive characteristics: high barriers to entry and economies of scale (i.e. many projects are natural monopolies); services with inelastic demand that does not fluctuate much with the business cycle; high operating margins; and long durations (concessions of 20 or 30 years, leases which may last up to 99 years).<sup>12</sup> It is argued that these economic characteristics have attractive financial counterparts: returns with low correlation with the economic cycle and the returns of other asset classes; long-term and stable cash flows that are often covered against inflation; and low default rates. These characteristics are especially attractive to long-term investors like pension funds and insurance companies.

The emergence of infrastructure as an asset class sparked financial innovation. Perhaps the best known innovator is the Australian investment bank Macquarie Group. In 1994 this bank led the Hills Motorway Group, the SPV that financed, built and operated the M2 Motorway in Sydney, which is a 21 kilometre long highway that forms part of the Sydney Orbital Network (Solomon 2009, ch 5). Interestingly, the stapled securities issued by Hills Motorway Group were listed on the Australian Stock Exchange in December 1994, making the M2 Motorway Australia's (and perhaps the world's) first publicly listed toll road.

In 1996 Macquarie launched the Infrastructure Trust of Australia (ITA) Group, its first infrastructure fund, in which investors bought stapled securities backed by income generated by two trusts. One of these trusts, ITA(I), would derive its income from infrastructure assets – for example toll roads, tunnels, bridges and airports – in which the fund did not have a controlling interest. ITA(II), by contrast, would have a controlling interest in each of the assets it owned. Over time, the ITA Group opened new funds, invested in foreign assets, and was renamed Macquarie Infrastructure Group (MIG). Through MIG, Macquarie invested directly in toll roads, bridges and tunnels, and indirectly by buying stakes in multinational infrastructure firms, for example Spain's Cintra. As explained by Solomon (2009, ch 5), each asset was set up as a separate SPV with MIG as a shareholder. And the holders of the debt issued by each SPV did not have recourse to MIG.

While the Macquarie model has spread, the world infrastructure fund industry is quite concentrated; according to Inderst (2013), Macquarie has a share of about 40 per cent of the total and the top five managers control two-thirds of assets. Inderst (2013) reports that between 2004 and 2012 infrastructure funds did between 250 and 300 deals and raised US\$214 billion (or about US\$20 billion per annum), even though the annual total is volatile, ranging from US\$9 billion in 2009 to US\$45 billion in 2007.

Most of the funds invest in equity; while debt funds are becoming more common, they are still infrequent and account for less than 10 per cent of total fund raising. Similarly, the direct

<sup>11</sup> Note, however, that Tirole (2006, ch 4) suggests that by linking the fates of two independent projects, higher levels of leverage can be achieved than when the projects remain independent.

<sup>12</sup> See, for example, Weisdorf (2007), Weber and Alfen (2010) or Bahçeci *et al* (2011). For sceptical reviews, see Inderst (2010a, 2010b).

involvement of pension funds and insurance companies in PPP finance is still quite limited. Thus, considering that annual PPP investment ranges between US\$60 and US\$100 billion, and that each SPV finances at most 30 per cent of the investments with equity, it seems that infrastructure funds are quantitatively important for the PPP industry.<sup>13</sup>

It seems reasonable to think that financial innovation is necessary for the PPP model to develop. Moreover, infrastructure projects have idiosyncratic characteristics that explain why specialised intermediaries and funds are necessary. Nevertheless, some have argued that fund structures are used to raise debt and disguise excessive leverage, well beyond the leverage intended by the governments who use PPPs (Das 2011, pp 158–161). Also, it is claimed that debt has been used to anticipate dividend payments to fund shareholders during the initial stages, when the infrastructure projects are still producing losses. Last, some have pointed out that fund structures tend to be unnecessarily complex to allow fund managers to charge more in fees many times over.

Be that as it may, one should not lose sight of the fact that private finance, while necessary, is only a means to reach an end – better and more efficient public infrastructure provision. Indeed, in the next section we suggest that some scepticism is warranted and caution about some pitfalls to be avoided.

### 3. The Irrelevance and Pitfalls of PPP Finance

#### 3.1 Why PPPs?

When delivering infrastructure, governments face three challenges: deciding what and when to build; building in a cost-effective way; and ensuring proper maintenance and service quality thereafter. Part of the appeal of PPPs stems from the glaring shortcomings of public provision. When PPPs began to spread around the world some 20 years ago, many believed that private participation in infrastructure would by itself improve performance. To some extent, this prejudice is warranted. Public agencies in charge of infrastructure (for example, ministries of public works, city governments and municipalities) tend to have many objectives and are accountable to multiple principals, thereby weakening incentives. Moreover, management practices in the public sector are more rigid, and public agencies are constrained by annual budgets – for good reasons. Public managers can neither use the earnings of their organisation to reward employees' performance nor freely allocate factors of production. Indeed, constraints imposed by the legislature and the administration limit hiring, purchasing, contracting and organisational structures (Wilson 1989, ch 7). These constraints also imply that the design of institutions that manage infrastructure is seldom concerned with efficient scale and scope. Thus, while many projects are large enough to assign tasks to specialised service providers such as construction companies or maintenance contractors, public agencies tend to manage all the infrastructure of a jurisdiction (sometimes the whole country), which has a size that far exceeds the efficient scale of operation.

PPPs, by contrast, are the opposite type of organisation. Because each project is managed by an SPV, their focus is narrow and incentives naturally sharp. Moreover, because SPVs are private firms, management is not constrained by public sector rigidities, and their goal is private gain. Also, it

<sup>13</sup> The figures are not directly comparable. One reason is that, as said before, not all private infrastructure is provided through PPPs. Another is that not all fund investments are direct – some funds invest in other funds.



is far easier to pitch each PPP to its efficient scale of operation. Last, a long-term contract isolates the SPV from the year-to-year vagaries of the public budget. All in all, PPPs substitute private management practices, strong incentives and focus for public sector rigidities, weak incentives and excessive scale.<sup>14</sup>

It is not surprising, therefore, that when the current trend of PPPs began, its proponents believed that private participation by itself would improve performance. Since then, PPPs have been used to provide traditional infrastructure such as roads, bridges, tunnels, airports and ports, and also complex services such as education, health, information technology and gaols. Yet results have been mixed at best and in retrospect the initial enthusiasm looks somewhat naïve: PPPs are one possible organisational form, and many years of research show that the appropriate organisational form varies with the environment and project characteristics.

Two characteristics define a PPP. First, it is a limited-term intertemporal contract with a private firm and bundles finance, construction and operation. Thus, while bundling differentiates a PPP contract from standard public provision, the limited term differentiates it from privatisation. Second, the private firm owns the assets as long as the PPP contract lasts. This implies that, from the point of view of incentives and control rights, PPPs are akin to privatisation. Given these characteristics, research by Hart (2003) and Bennett and Iossa (2006) identify the basic trade-off: other things equal, bundling stimulates investments and actions that cut life-cycle costs, but cost cutting can be at the expense of service quality and user welfare. Thus, PPPs may or may not be the best alternative depending on project characteristics.

Most transportation infrastructure – roads, tunnels, bridges, ports, airports and rail – are suitable for PPPs because objective service standards can be defined and enforced, and quality made contractible. This makes PPPs the appropriate organisational form, because once service standards are fixed, the firm can be left free to choose the optimal combination of inputs and minimise costs. This is so regardless of the funding source for the project.

The choice is not clear-cut when quality is not contractible, for then the trade-off between cost-cutting and service quality resurfaces. Sometimes it may be possible to regulate service quality indirectly, by specifying the amount and quality of inputs. But this works only if the relationship between inputs and service quality is close. If it isn't, then the public authority must retain at least some control and discretion over managerial decisions, but this weakens the private party's ownership rights and introduces rigidity in its choices. If this is sufficiently severe, public provision is the preferred alternative.

Consider schools. Important aspects of primary and secondary education, about which parents and society care (such as moral values), are not contractible, because they cannot be measured with standardised tests. A variety of inputs can be specified (for example, the number of students per teacher, teacher seniority and degrees, and equipment), but they are only partially related to the overall quality of education. Even if specifying inputs helps to attain reasonable levels of

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<sup>14</sup> These, of course, are the incentives wrought by asset ownership. It has been pointed out to us that PPPs are just financial contracts, because governments keep the ownership of the physical asset and the SPV only has a claim over the project's cash flow, akin to a total rate of return swap. Nevertheless, a PPP contract typically transfers the control and the operation of the asset to the SPV for the duration of the contract and includes penalties that punish poor performance and maintenance. Consequently, from the microeconomic point of view, the PPP contract tends to replicate the incentives wrought by private ownership of physical assets. (We thank Frédéric Blanc-Brude for making us aware of this point.)

educational quality, it may also limit innovative options that increase efficiency. For example, limiting the number of students per teacher may discourage expenditures on software that partly substitutes for in-classroom teaching or that extends the reach of gifted teachers.

Note that so far we have not mentioned finance. This is not a casual omission, because the case for PPPs in a specific project or infrastructure must stand on productive, allocative and dynamic efficiency, not on finance. Will a PPP lead to lower production costs, better maintenance or higher quality of service? Will users pay the long-run marginal or average social cost of providing the infrastructure? And will a PPP lead to faster adoption of socially valuable innovations? Our main point is that whether a PPP makes sense depends almost exclusively on the economic characteristics of the infrastructure, not on the way it is funded or financed. Indeed, as we will see next, on a first pass the presumption should be that finance is irrelevant. Worse, PPPs may help private firms or governments to use finance in ways that may destroy value.

## 3.2 The irrelevance of finance

### 3.2.1 PPPs and the economy's balance sheet

Assume, for simplicity, a project that is fully funded with public debt. With conventional provision, the project adds real capital to the asset side of the government's balance sheet and public debt to its liabilities. At the same time, public debt increases the assets of the household sector and, consequently, its net worth. Consolidation of both balance sheets shows, however, that the increase in the household sector's net worth is equal to the value of the additional real capital – public debt does not appear on the economy's balance sheet because it is a liability of the government but an asset of the household sector and both cancel out.

Now assume that the same infrastructure is built under a PPP. This time the project adds real capital to the asset side of the business sector's balance sheet, and a combination of debt and equity to its liabilities. In turn, the assets of the household sector increase by the amount of the incremental debt and equity, which equals the increase in its net worth. Again, consolidation of both balance sheets shows that the increase in the household sector's net worth is equal to the value of the additional real capital – this time neither the debt of the business sector nor its equity appear on the economy's balance sheet because they are a liability of the business sector but an asset of the household sector, and both cancel out. Hence, on first pass the impact of the project on the economy's balance sheet does not depend on the way it is financed.

The alert reader will immediately recognise that this argument simply extends the Modigliani-Miller proposition to PPPs and, consequently, shares its limitations. Nevertheless, it stresses again, this time from a macroeconomic perspective, that any claim that PPPs create a financial advantage must explain how a particular way of financing an infrastructure project increases its economic value to society. Is some productive or allocative efficiency achievable with a specific financing structure but not with another? Are some innovations more likely to be adopted with some types of financiers but not with others? Ultimately, social value is created by the efficiency with which real capital is deployed and used – the real side of the balance sheet – not by the financial composition of the liabilities side.

### 3.2.2 Public finance and PPPs

Governments often argue that PPPs free up scarce government resources for use in programs that are socially attractive but not privately profitable. Similarly, they argue that PPPs allow governments to provide the infrastructure without raising taxes.

This argument obviously does not apply to PPPs that have capital costs funded by future government payments and bind the intertemporal budget. In these cases, PPPs help governments perform a useful accounting trick, in which future obligations are kept off the balance sheet for no clear economic reason. For example, the United Kingdom, a major user of this type of PPP, has discovered that the capital charges for past investments are constraining the current budgets of local authorities.

The argument that PPPs can relieve tight government budgets is suspect even for projects where the capital costs are partially or totally covered by user fees, because user fees could have been used to pay the capital costs under public provision as well. The resources saved by the government by not paying the upfront investment under a PPP should be equal, in present value, to user-fee revenue forgone to the concessionaire. That is, from a financial viewpoint, PPPs borrow from the future with no net gain in present discounted terms.

An alternative argument for PPPs, which is also related to public finance, is that of the lower cost of public funds. According to this doctrine, the government collects distortionary taxes to finance infrastructure projects, whereas the private sector can finance projects without these distortions. It follows that PPPs (or privatisation) are to be preferred to public provision. This argument is also incorrect. To see the intuition, denote by  $f$  the cost of distortionary taxation, so that a dollar collected by the government has a cost that is more than a dollar to society, say  $1 + f$ , with  $f > 0$ . The project can be financed through either user fees or subsidies. The difference between the two financing options is that only subsidies involve distortionary taxation.

The government will save  $f$  dollars per dollar invested by the firm in the infrastructure project. However, these savings are offset by the lower revenues collected by government: under a PPP, it collects user fees only after the concession ends, while under public provision, it can start collecting user fees once the project is available to users. Thus, for every dollar of user fees given up to the concessionaire, the government forgoes the opportunity of reducing distortionary taxation elsewhere in the economy.

### 3.2.3 PPPs and the funding of infrastructure

An additional misconception about PPPs is that they substitute user fees for subsidies. Nevertheless, the decision between public provision and PPPs is not one about the source of funding. On the one hand, PPPs can work with both user fees and subsidies and, on the other hand, public provision is not incompatible with user fees. For example, a private concessionaire may build and operate a gaol, which must be funded with subsidies – obviously inmates do not pay user fees! Similarly, many toll roads are owned by governments.

### 3.3 PPPs and fiscal accounting

#### 3.3.1 PPPs: Public or private infrastructure?

One of the drivers of PPPs is that governments want to indulge in public works even when restricted by budgetary constraints. Off-balance sheet projects allow incumbents to sidestep spending caps and spend more on infrastructure than would be the case under conventional provision. Similarly, incumbents may use a brownfield PPP to 'sell' assets and spend the proceeds in projects or programs that favour the incumbent. For this reason, organisations that set accounting standards have struggled to determine when a PPP project should be included on the balance sheet of the public sector or whether it is legitimate to keep them off the public balance sheet.

The basic insight here is that as far as the risk profile of the government budget is concerned, PPPs are much closer to public provision than to privatisation (Engel, Fischer and Galetovic 2013). This may seem surprising, but it follows from the fact that when thinking about the risk allocation implied by PPPs, what matters is the volatility of the discounted budget and not the fluctuations in annual revenues. Indeed, as we show in Section 4, an important class of optimal PPP contracts, so-called PVR contracts, exactly replicate the net cash flow streams of public provision in each state of the world. Because all residual risk is transferred to the government and users under these contracts, and the concessionaire recovers the upfront investment in all states of the world, a PPP affects the intertemporal budget in exactly the same fashion as conventional public provision. More generally, it can be shown that cash flows from a PPP project replace either taxes or subsidies at the margin. The conclusion, then, is that from a public finance perspective there is a strong presumption that PPPs are analogous to public provision – in essence, they remain public projects and should be treated as such in the government balance sheet and budget.

Nevertheless, because PPPs are relatively recent, there is little agreement over how to account for them on the government's balance sheet. As pointed out by Eurostat (2010), the key accounting issue is the classification of the assets involved in the PPP contract. If they are classified as government assets they immediately influence the deficit and government debt. In contrast, if they are classified as assets of the concessionaire, the impact on the government deficit is spread over the duration of the contract and governments can keep the assets off their balance sheet, thereby avoiding spending and debt caps. Under public provision, on the other hand, caps on spending or net fiscal debt are, in principle, more effective in controlling the bias toward spending anticipation, because projects must be included in the budget.

One systematic treatment of PPPs is in Eurostat (2010). If user fees are the main revenue source of the PPP, as in a toll road, Eurostat considers the assets to be private during the life of the contract. In contrast, if most of the concessionaire's revenues are government payments (as in an availability contract or shadow toll) the classification of assets depends on who bears the construction, availability and demand risks.

Thus, if the private partner bears construction risk and either availability or demand risk, Eurostat recommends that assets built by PPPs be classified as non-governmental and thus be recorded off the balance sheet. For this reason, a basic concept in classifying PPPs as being off-balance sheet is the existence of risk transfer to the private sector, because this implies that the private sponsor 'has skin in the game' such that the project does not entail a present or future cost to

the government given the incentives facing the firm. However, these general principles allow for considerable discretion. Eurostat's approach can be gamed by governments because of its formal nature. For example, it has problems in the case of minimum revenue guarantees. Contingent guarantees are assumed to transfer risk if they are not likely to be called, and this ambiguity allows for excessive discretion.

The United Kingdom's generally accepted accounting principles (GAAP) are less formal and focus more on the substance of risk transfer. These rules consider a project to be on the balance sheet under any of the following conditions: if the public works authority (PWA) is responsible for the debt under default; if the level of risk is excessive and would only be assumed if lenders face no risks; or if the PWA decides *ex post* the conditions by which the private finance initiative (PFI) contract is fulfilled (Yescombe 2007, p 72). Moreover, the UK GAAP require that any other risks borne by the PWA be quantified and their net present value be compared with the net present value of the project. If the remaining risks represent a substantial fraction of the net present value of the project, the project should be on the government's balance sheet. This means that the 'UK GAAP only included the liabilities if the balance of risk and reward was with the public sector' (House of Lords Select Committee on Economic Affairs 2010, p 17). However, since the interpretation of 'balance' was left to public bodies and their auditors, this led to most PFI projects not being included in the public sector net debt statistics. This changed in 2009, when UK accounting practices began to abide by the International Financial Reporting Standards. Under these standards, assets that are controlled by the public sector, including most PFI projects, have to be included in the departmental balance sheets (House of Lords Select Committee on Economic Affairs 2010). Nonetheless, in practice there exist two parallel accounting standards (the more demanding IFRIC 12 and the older GAAP) and PFI investments continue to be excluded from national debt calculations.

How should PPPs be accounted for in the budget? The key point is that PPPs change the timing of government revenues and disbursements and the composition of financing, but do not alter the net present value of the discounted budget. They should therefore be treated just as standard government investments. To see why, consider a PPP project – built in one year, with no operational or maintenance costs and which is fully financed by future payments from the budget – and a similar project built under public provision. In the first case, under current fiscal accounting there is neither a deficit nor debt. However, each year until the end of the contract, the government has to pay a predetermined amount to remunerate the capital cost of the concessionaire. At the end of the contract, the government becomes the owner of the asset. In the second case, the government initially increases its debt by the amount of the loan necessary to build the project, incurs a budget deficit in the same year and obtains an asset to balance the increased debt. Each year thereafter it pays down the debt and when the debt is run down (assuming the same payments as in the previous case), it has the asset and no debt or payments. From a correct accounting point of view, a PPP just substitutes debt with the concessionaire for standard public debt. Thus, there is no reason to treat those PPPs differently from projects under public provision. It follows that on the award of such a PPP, the present value of the contract should be counted as a public capital expenditure and public debt should be increased by the same amount. Over the life of the concession, debt must be run down in the books.

This proposal runs somewhat contrary to the Eurostat rules, and it is interesting to discuss why. Even under public provision, construction risks are usually allocated to the private firm. Hence, Eurostat rules imply that the government can take the PPP off-balance sheet when either availability or demand risk is assumed by the concessionaire. The problem is that Eurostat have taken a static view of risk allocation. Once we use an intertemporal approach, it is clear that, even if the firm bears all the demand risk during the life of the contract, the discounted budget is still the residual risk claimant. Furthermore, when quality is contractible, as arguably is the case for most PPP investments in the transportation sector, demand risk will be mainly exogenous and therefore does not provide useful incentives. To the extent that taxpayers bear exogenous risk at a lower cost than the firm, the optimal contract then eliminates risk for the firm. Thus, the effect on the government budget is identical to that of public provision.

It should be noted that the adoption of this proposal would require changes in the way that government statistics are recorded.<sup>15</sup> The reason is as follows. The basic building block of accounting and macroeconomic statistics is the institutional unit – the basic unit that generates statistics or accounting data from its economic activities. In the case of PPPs, the institutional location of the SPV largely determines the accounting convention followed by governments; only if the SPV is controlled by the government are transactions related to PPPs automatically consolidated within the government accounts. Therefore, many countries push PPPs off the balance sheet by classifying SPVs as private sector entities. Even when the SPV follows adequate international standards (normally requested by stakeholders for surveillance purposes), its transactions have no impact on government accounts. In contrast, our proposal argues that infrastructure procured via a PPP should be considered public. In our view, it should be a matter of indifference whether the entity performing the function is part of the public sector or privately owned.

Some might argue that counting privately financed investment as public debt may worsen the bias against public spending in infrastructure, which is the result of political incentives, perhaps excessively stringent limits on fiscal borrowing, and faulty accounting rules that treat investment as current expenditure (Blanchard and Giavazzi 2004). According to this argument, keeping PPPs off the balance sheet is a second-best remedy that mitigates the bias and increases the output of socially worthwhile infrastructure projects.

The easy answer to this criticism is that the bias against infrastructure spending should be addressed by changing the incentives within the public sector and improving public accounting. The more realistic answer is that keeping PPPs off-balance sheet assumes a virtuous government. Nevertheless, spending limits exist precisely because governments want to overspend. It is doubtful in principle and, given the experience with PPPs so far, probably wrong in practice to believe that governments will use off-balance sheet vehicles wisely and with prudence.

### 3.3.2 Government revenue guarantees

Governments commonly grant revenue guarantees to concessionaires, especially when concessions last a fixed term. Guarantees are contingent subsidies. As such, they have an effect on the discounted budget, but their contingent nature makes it difficult to account for them.

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15 We thank Katja Funke, Isabel Rial and Shamsuddin Tareq for pointing this out to us.

Under current accounting standards, future obligations will probably remain hidden (Hemming *et al* 2006, p 40). Cash accounting makes guarantees apparent only when they are paid, in which case they appear as current expenditure. Accrual accounting, in turn, records the guarantee as a government liability only if the government considers that the probability of making a payment is higher than 50 per cent and can make a reasonable estimate of the payment. Even then, unless the government makes a provision and sets aside the funds, guarantees are only recorded when they are called. Worse, most countries have poor records of guarantees and when information exists it is locked in individual agencies and ministries (Hemming *et al* 2006, p 42). Some countries, such as Chile, Colombia and New Zealand, have attempted to quantify guarantees within an accrual framework by estimating the expected outlays and correcting for the degree of risk involved (for example, via value-at-risk type measures). Yet any rule that relies on a probabilistic assessment can be easily manipulated, as probabilities are ultimately a matter of judgement. Guarantees thus soften the budget constraint of the incumbent government, allowing it to sidestep normal budgetary procedures and parliamentary oversight. However, when the full amount invested is accounted for as a public capital expenditure, with a corresponding increase in public debt, guarantees are implicitly included and there is no need to make value judgements on the cost of a contingent guarantee.

Accounting for capital and debt payments is somewhat trickier. As in the case of the optimal contract, this 'debt' is backed by a combination of user-fee revenue, guarantees and possible renegotiations of the concession contract. These different items are combined in different proportions as events unfold. In the case of fixed-term PPPs, the private partner assumes the demand risk and may receive capital gains or losses over the life of the concession. This requires a convention for the treatment of project revenues and the gradual extinction of the guarantee as the concession unfolds. In any case, under our proposal the full cost of the project is recognised as debt, so it follows that it will be extinguished when the concession ends.

### 3.3.3 The Ryrie Rules

While there seems to be considerable confusion about how to account for PPPs in the government's budget and balance sheet, it is worth mentioning that these problems seem to have been understood during the 1980s in the United Kingdom, well before the introduction of the PFI in 1992. As Heald and McCleod (2002) explain, during the 1980s, the provision of private finance for public projects was governed by the 1981 Ryrie Rules. Under these rules, government guarantees were not allowed and private financing could not be additional to public finance – whenever a privately financed project was undertaken, public spending would be reduced, pound for pound. As Heald and McCleod (2002, para 502) point out:

The rationale for this provision was that there is little macroeconomic difference between the government borrowing on the market to finance public expenditure generally and the private sector borrowing for essentially public projects. The objective of the Ryrie Rules was to stop ministers from insulating private finance from risk so that it could be used to circumvent public expenditure constraints.

It can be easily seen that whenever there is a spending cap, this provision is equivalent to our proposal to count PPP projects as current investment.

It is telling that the Ryrie Rules were formally abandoned in 1989 and that from then on the UK Treasury promoted private financing as additional to public investment. This suggests that incentives and interests rather than ignorance are the reason for the lack of progress in improving PPP accounting rules.

### 3.4 Renegotiations and finance

One of the problems facing PPPs is the renegotiation of the PPP contract. There are various justifiable reasons for renegotiating a contract, for example a changing environment, new information or discovery of design errors. All parties, including the public, might gain in renegotiating contracts in some cases. In other cases, the only reason to modify the contract is to benefit one or both active parties: either the procuring authority (e.g. in the case of expropriation of the PPP) or the project sponsor (e.g. by helping a failing project with a length extension or lowering the technical standards); or both these parties at the expense of the public. One of the problems of renegotiation is that it is difficult to discriminate between justifiable and non-justifiable renegotiations.

During the construction stage, renegotiations also occur under traditional provision. The difference is that PPPs have a longer time horizon and have additional dimensions for renegotiation, including contract length, user fees and service quality standards, among others. Even when renegotiations are justifiable, the results may not be fair, given that renegotiations occur in the context of bilateral monopoly.

Renegotiations lower the risk of failure, which may help attract willing lenders. On the other hand, the possibility of renegotiating the contract to the benefit of the private participants/sponsor negates many benefits of PPPs. If the sponsor knows that not being efficient (in demand prediction, cost reduction, project design, service quality, etc) does not increase the risk of failure or the losses from the project, the incentive properties of PPPs are lost. Moreover, the results of renegotiation tend to favour sponsors that have strong lobbying skills at the expense of technical expertise, so these firms have an advantage in bidding for PPPs with governments that are known to renegotiate their contracts. As with guarantees, renegotiations allow incumbent governments to sidestep budgetary spending and debt limits, and thus lead to excessive current spending in infrastructure.

Under public provision, caps on spending or on net fiscal debt are reasonably effective in controlling this bias, because any additional expenditure agreed in renegotiations must be included in the budget. In contrast to public provision, renegotiations of PPP contracts can be used to evade spending caps under defective fiscal accounting standards. Essentially, PPP arrangements bundle finance and construction, so the firm can increase 'lending' to the government by renegotiating the contract in return for payments to be made by future administrations. Under the usual fiscal accounting rules, neither the additional investments that take place after renegotiations nor the future obligations originating in the renegotiated agreement are accounted for in the balance sheet. This suggests that the solution to the spending bias is no different to what we have already discussed for PPPs in general: any additions to the project should be counted as current capital expenditures and, therefore, accounted for as debt.

Is there any evidence of renegotiations being used to anticipate public spending? If spending anticipation through renegotiations is a real issue, four features should be observable. First,



firms should lowball their bids, expecting to recover normal or supranormal profits in future renegotiations. Second, additional works should be included when contracts are renegotiated, that is, the additional payments should be in exchange for additional investments by the private partner. Third, there should be major renegotiations shortly after the awarding of the contract, during the construction phase. Fourth, a substantial fraction of the costs of the renegotiation process should be borne by future administrations.

While there is little systematic data on renegotiations, Engel, Fischer and Galetovic (2009) compile information on the 50 PPP concessions awarded in Chile between 1993 and 2006. Total investment increased via renegotiation from US\$8.4 billion to US\$11.3 billion (i.e. by nearly one-third). Most of the increase (83 per cent) was the result of 78 bilateral renegotiations, while the rest were decisions of arbitration panels. For the US\$2.3 billion awarded in bilateral renegotiations, only 35 per cent of the additional cost was paid by the administration that renegotiated. Moreover, 84 per cent corresponded to payments for additional works, while the remaining 16 per cent corresponded to additional payments for works that were included in the original contract. Of the total value of bilateral renegotiations, 78 per cent was awarded during construction. Finally, even though specific provisions in the Chilean concessions law limit the amounts that can be renegotiated, these limits were routinely exceeded.

### 3.5 Credit constraints

Many financially constrained governments see PPPs as an answer to providing infrastructure services. According to this view, PPPs allow credit-rationed governments to invest in additional socially profitable projects, which may be impossible under public provision because of credit constraints. That is, the current value of the cost of public funds is much higher – infinite if the government has no access whatsoever to credit – than its expected value in the near future.

To evaluate whether PPPs help, it is convenient to distinguish between projects whose capital costs can be partially or totally covered by user fees and projects whose capital costs are funded mainly or entirely by future government payments. Examples of the latter category are availability contracts, which specify a schedule of capital charges payable in the future and which bind the discounted budget. If firms are prepared to invest in these PPP projects, they are in practice lending funds to the government, which means it is not resource-constrained.

However, even PPPs in the first category do not help relax the financial restrictions facing the government. If the government can set aside the flow of revenues generated by the project, then it can use these revenues either to pay off the debt under public provision or to pay off the concessionaire under a PPP.<sup>16</sup> And if it cannot credibly protect the flow of revenues from creditors or other uses, then neither option is available.<sup>17</sup>

16 For this mechanism to work, the legal system should be sufficiently sophisticated to ensure that the revenue flows from the PPP can be assigned by (and even mortgaged by) the concessionaire's financial providers, independently of the firm's financial condition. This means that even if the concessionaire is unable to complete the project or goes bankrupt afterward, the revenue flows cannot be captured in the mass of the concessionaire's debt (at least in countries with inefficient bankruptcy systems), but remain available to financiers if the project provides the services it was contracted to perform. In the case of unfinished projects, the financiers might be required to find another construction firm to complete the project before receiving revenue from the project.

17 Of course, if a law prevents a regional or local government from issuing debt, so that it must pay upfront for any publicly provided infrastructure project, then building a project as a PPP will free up resources.

We conclude that, quite generally, PPPs do not free up government resources *per se*, even though they may do so indirectly if they lead to efficiency gains. In many cases, one of the main advantages of PPPs from the government's perspective, if not from the social welfare point of view, is that they allow for investment while keeping future obligations off-balance sheet and outside of parliamentary control.

## 4. Risk and PPPs

### 4.1 Risk and incentives in PPPs

Risk is one of the main themes in the PPP discussion and some risk transfer to the private firm is essential for incentive compatibility. Risks in a PPP contract can be classified into seven different categories, which sometimes are related and overlap:<sup>18</sup> (i) construction risk, including design flaws, cost overruns and delays; (ii) O&M risk; (iii) performance risk, including the availability of the service or infrastructure and uncertainty about service quality more generally; (iv) residual value risk, mainly uncertainty about the value of the assets at the end of the PPP contract; (v) policy risk, ranging from macroeconomic uncertainty, which affects all sectors of the economy, to government actions that mainly affect the project (e.g. investment in alternative roads); (vi) demand risk – that is, uncertainty about the future rate of use of the infrastructure; and (vii) financial risk, including interest rate and exchange rate fluctuations and any other factor affecting financing.

How are these risks to be allocated between the government, the private firm and the users of the project? The principle has been clearly stated by Irwin (2007, p 14): the contract should allocate risks to maximise project value, taking account of moral hazard, adverse selection and risk-bearing preferences. This is quite general, but it implies that controllable risks should be borne, at least in part, by the party best equipped to control them, for a party has weaker incentives to be efficient when it does not bear a risk over which it has some control. Exogenous risk should be shifted to the party best endowed to bear or diversify it. Under public provision, in contrast, most of these risks are borne by taxpayers, with the exception, perhaps, of availability and service quality, as users typically suffer bad quality.<sup>19</sup> Because taxpayers seldom influence governments' decisions, and bureaucrats respond to users' concerns only when forced by political pressures, one may presume that the potential for efficiency gains in PPPs is large.

Consider first construction risk. Completion times and the cost of building usually exceed projections, but most of the time can only be controlled by the builder. Hence, the private firm should bear these risks (perhaps with the exception of delays caused by disputes about the application of eminent domain).<sup>20</sup> Similarly, because design and diligence during construction strongly influence facility availability, O&M costs and service quality, these risks should also be borne by the same private firm. If the transfer of these risks is effective, one should expect

<sup>18</sup> See, for example, Hall (1998), Cangiano, Hemming and Ter-Minassian (2004) and Irwin (2007).

<sup>19</sup> Construction risks are nominally borne by contractors, but in practice one of the shortcomings of public provision is endemic contract renegotiations that effectively shift risks to taxpayers.

<sup>20</sup> When construction risk is excessive due to fundamental uncertainty, as in tunnels, the usual practice is to have cost-sharing agreements that are triggered when geological conditions are much worse than expected. This creates moral hazard problems, but it may be the only option when uncertainty is large because otherwise the rate charged by the concessionaire to protect against tail risk is too expensive.

substantial efficiency gains from PPPs, because under public provision these risks are mostly borne by taxpayers and users, not by those who make the decisions.

Note that bundling, ownership and service standards are all necessary to ensure that these risks are effectively transferred to the private firm. For example, it is harder to make a firm accountable for service quality if it was not responsible for designing and building the facility (hence, the importance of bundling) or if the firm has no control rights over investment and operational decisions (hence, the importance of ownership rights). Similarly, without objective and measurable service standards, it is difficult to transfer service quality risk from the users of the facility to the firm.

Moreover, as Hall (1998) points out, the extent to which risks are transferred depends largely on the choice of payment mechanism. Thus, to ensure that incentives to complete the project on time are strong, payments received by the firm should be triggered only after the facility is in service. Similarly, payments made contingent on the availability of the facility and on meeting service quality standards give strong incentives to provide adequate maintenance and proper management. In contrast, payments that are independent of performance or, worse, that transfer higher costs to taxpayers, reproduce incentives that are similar to those in public provision.

Some of the risks in our list are controlled or even created by the government. Because the residual value of PPP assets depends on government planning decisions (not to mention that most assets are project specific), it is sensible to transfer that risk to the government. This is ensured when the private firm recovers its entire investment over the term of the contract. This also suggests that some policy risks should perhaps be borne by the government to avoid moral hazard.

Policy risks can be classified, broadly speaking, into two categories. First, the government may implement policies that directly affect the project and little else. For example, it may build or expand a road that competes with the tolled PPP. It may even change the rules with the express purpose of expropriating the concessionaire. In general, these policy risks should be borne by the government, mainly to prevent its opportunism and moral hazard.

Second, actions by the government may unintentionally affect the PPP. For example, devaluation of the exchange rate may reduce the foreign firm's return, or a change in environmental standards may require additional investments. In these cases, the government is not acting opportunistically and there is no good reason to have it bear the risk, as the private firm is in the same position as any other private firm in the economy. This principle is routinely overlooked. For example, governments often grant foreign concessionaires insurance against devaluations. Not only does this discriminate against local investors, it also discriminates against foreign firms in other sectors of the economy that must bear exchange rate risk. More generally, policy risks that have little to do with the project and affect most firms in the economy (e.g. those caused by monetary policy) should be treated as exogenous and allocated to diversify risk.

Perhaps the main exogenous risk in a PPP project is uncertainty about the volume of demand over the life of the contract. The general principle, of course, is that exogenous demand risk should be borne by the party best able to diversify it. But note that if the private firm assumes demand risk, taxpayers are in fact purchasing an insurance contract. As Hall (1998) notes, this doesn't seem to be cost-effective. Demand forecasts are notoriously imprecise. In some cases, changes in policy, which are unknown at the time of tendering, may radically affect the usage of the facility and

there is little that the firm can do about it most of the time.<sup>21</sup> In those cases, either a PVR contract or availability payments is the right compensation scheme.

The principle of transferring exogenous demand risk to the government admits one clear exception, however. When the PPP is fully sustained by user fees, the willingness of private firms to take the contract can signal whether there is enough demand for it. This introduces a market test that is usually absent in infrastructure services and helps to avoid white elephants. For example, Chile's port authorities recently put to tender a second container terminal in Valparaíso, one of Chile's main ports. Before the tender, many observers pointed out the severe technical challenges faced by a second terminal and anticipated that it was a poor business proposition. Indeed, no bidders appeared in the auction. This market response signalled to the port authority that the expansion of the port was not a good idea.

One might argue that, like demand risk, financial risk is largely outside the firm's control; hence, the government should also bear interest rate or exchange rate risk. But this overlooks that firms can choose alternative capital structures and that, more generally, it doesn't make much sense to think that governments are particularly efficient at providing and selling financial insurance.

## 4.2 Is there a PPP interest rate premium?

A recurrent criticism of PPPs is that they cost more per dollar of financing than public debt – the so-called PPP premium. For example, the trade magazine *Euromoney* gives the following argument for public financing:

The other solution [to highway finance] is to finance the project wholly in the public sector, either with government or multilateral funds. It is, after all, more expensive to raise debt on a project finance basis. When considered alongside the guarantees and commitments which have to be provided to attract commercial finance, the best approach would be to borrow on a sovereign basis.<sup>22</sup>

The numbers that have been quoted for this cost difference vary widely. According to Yescombe (2007, p 18), the cost of capital for a PPP used to be 200–300 basis points higher than the cost of public funds. This cost has doubled since the credit crisis. He also shows that the spread over the lender's cost of funds lies in the range of 75–150 basis points, with highway projects being at the upper limit (Yescombe 2007, p 150). Hence, when governments decide between public provision and PPPs, they trade-off a lower cost of funds under public provision against the supposedly higher efficiency of a PPP.

Other authors, however, argue that there is no PPP premium. One line of argument claims that bondholder risk under public provision is subsumed under general government default risk. Moreover, public debt is cheaper because the public implicitly absorbs the risk through potentially higher taxes or lower public expenditures in case of imminent default on all government debt. As noted by Kay (1993, p 63):

The view that 'private sector capital costs more' is naive, because the cost of debt both to governments and to private firms is influenced predominantly by the perceived risk of default

<sup>21</sup> This is, for example, the case for highways, where actions of the franchise holder have little effect on demand if contracted service levels are adequate and enforced.

<sup>22</sup> Cited in Klein (1997, p 29).

rather than an assessment of the quality of returns from the specific investment. We would lend to the government even if we thought it would burn the money or fire it off into space, and we do lend it for both these purposes.

In other words, while many failed projects go unaccounted for under public provision because taxpayers assume the costs of this risk, under a PPP these risks are made explicit and priced, increasing the measured financing cost of a PPP project. This merely reflects a just reward for carrying those risks.

#### 4.2.1 Diversification

Financial economists distinguish between systematic risk – risk that varies systematically with the market or the economy – and project-specific risk. Systematic risk cannot be diversified and should affect public and private financing in the same way.<sup>23</sup> Is there a *prima facie* reason to think that the public sector is better at diversifying exogenous risks than PPP financiers?

With perfect capital markets, the diversification that can be achieved by government participation in a large number of projects is also achievable through the capital market, so no PPP premium would exist in this case. As Hirshleifer (1966, pp 276–277) points out:

[T]he efficient discount rate, assuming perfect markets, is the market rate implicit in the valuation of private assets whose returns are ‘comparable’ to the public investment in question — where ‘comparable’ means having the same proportionate time-state distribution of returns.

Hence, the PPP premium and the alleged financial advantage of public provision would seem to rest on capital market imperfections that give an edge to diversification opportunities available to the government. Interestingly, this does not require that project returns be independent of the economy (the assumption of the Arrow-Lind theorem<sup>24</sup>), only that some alternatives to spread risks available to the government are unavailable to the capital market (Brainard and Dolbear 1971).

In practice there are transaction costs that preclude the existence of complete markets and limit diversification through the capital market. On the other hand, diversification opportunities available to the government must be weighed against the administrative cost of its bureaucracy.

#### 4.2.2 Contracting and exogenous risk

Given that the government has an advantage in bearing risk, it is useful to consider PPP contracts that assign all exogenous risk to the government. To begin, consider the following scenario: demand for the infrastructure is uncertain, so that the consumer surplus at time  $t$ ,  $CS_t$ , and user-fee revenues,  $R_t$ , are random variables determined by the state of demand,  $v$ , which represents one possible trajectory of demand realisations and corresponds to the present discounted value of user-fee revenues in that state. The upfront investment,  $I$ , is the same in all demand states and operating and maintenance costs are zero. Finally, the PPP firm is selected in a competitive auction that dissipates rents.

<sup>23</sup> As argued by Shugart (2010), if part of the systematic risk premium was something peculiar to the equity markets, then part of the PPP premium would be a true additional cost for PPPs that would not apply to public sector (taxpayer) financed projects. But we see little reason to think that this is the case.

<sup>24</sup> See Arrow and Lind (1970).

Table 1 shows the distribution of the present value of cash flows and surpluses in one demand state for alternative sources of funds and procurement mechanisms. Within PPPs, alternative contractual forms are possible, depending on the source of revenues: PVR contracts, fixed-term tolls, availability contracts and shadow tolls.

**Table 1: Risk Allocation, Source of Revenues and Contractual Form**

Funding	Contractual form		
	Public provision	PVR	Fixed-term toll
<b>User fees</b>			
Users	$CS_0^\infty(v) - R_0^\infty(v)$	$CS_0^\infty(v) - R_0^\infty(v)$	$CS_0^\infty(v) - R_0^\infty(v)$
Taxpayers	$R_0^\infty(v) - I$	$R_0^\infty(v) - I$	$R_0^\infty(v) - R_0^T(v)$
Firms	$I - I$	$I - I$	$R_0^T(v) - I$
		PPP	
<b>Tax subsidy</b>	Public provision	Availability payment	Fixed-term shadow toll
Users	$CS_0^\infty(v)$	$CS_0^\infty(v)$	$CS_0^\infty(v)$
Taxpayers	$-I$	$-I$	$-R_0^T(v)$
Firms	$I - I$	$I - I$	$R_0^T(v) - I$

Note that under user-fee funding, public provision and PVR are identical. Similarly, under tax-subsidy funding, public provision and availability payments are identical. This is our main claim: independent of the source of funds, there exist PPP contracts that replicate in all demand states the surplus and cash flow distribution of public provision and have the same impact on the intertemporal public budget.

To see this, let  $X_s^t$  denote the present value of  $X$  between times  $s$  and  $t$  at time zero and consider first the case in which funding comes from user fees. Under public provision, the project is built at cost  $I$ , and the firm receives  $I$  before the infrastructure becomes operational (we assume competitive tendering that dissipates all rents). Hence, taxpayers pay  $I$  upfront, collect  $R_0^\infty(v)$  in state  $v$  and receive  $R_0^\infty(v) - I$  in present value. Users, on the other hand, receive a net surplus equal to  $CS_0^\infty(v) - R_0^\infty(v)$ . Under a PVR contract, taxpayers save  $I$  upfront, but they relinquish user-fee revenue during the length of the concession, which is equal to  $I$  in present value (given that the competitive assumption means that the winning bid will ask for  $I$  in present value of revenues). Because the state collects user fees after the concession ends, taxpayers receive  $R_0^\infty(v) - I$ . Users' net surplus in state  $v$  is  $CS_0^\infty(v) - R_0^\infty(v)$ , as with public provision. This confirms that any risk diversification advantage for the government can be realised with a PPP under a PVR contract and no PPP premium should be observed.

Now consider a fixed-term PPP that lasts  $T$  years. The concessionaire collects  $R_0^T(v)$  with a surplus of  $R_0^T(v) - I$ , which is a random variable; in contrast, it faces no risk under a PVR contract. Taxpayers

receive  $R_T^\infty(v)$ , and, in general, their risk falls.<sup>25</sup> A fixed-term contract thus shifts risk from taxpayers to the concessionaire because there is uncertainty about demand for the project during the fixed term  $T$ .

Next consider projects that are fully funded by taxpayers. Again, with public provision the project is built at cost  $I$ , which the firm receives before the infrastructure becomes operational – taxpayers pay  $I$  upfront. When a PPP is financed with availability payments, the timing of disbursements differs, but the present value of payments is still  $I$ . Hence, neither taxpayers nor the concessionaire bears risk, and the impact of the project on the intertemporal public budget is the same in both cases. Thus, part of the observed PPP premium may reflect faulty contract design rather than a fundamental disadvantage of PPPs.

How large is the premium demanded under a fixed-term contract? To see the effect of contracting on the PPP premium, we consider a simple example. Assume a project that requires an upfront investment of  $I = 100$ . Annual user-fee revenue is assumed to be constant over time, equal to 7.9 and 12.8 in the low- and high-demand states, which are equally likely. Finally, we assume that firms cannot fully diversify risk (e.g. by providing incentives to owners or managers) and have concave utility, and that the risk-free discount rate is 5 per cent.

The PVR contract lasts until the firm collects 100 (that is, 10 years if demand is high and 20 years if demand is low). The firm bears no risk and therefore charges no risk premium. The implicit interest therefore equals the risk-free discount rate of 5 per cent, and there is no PPP premium.

Consider next a fixed-term contract and assume that firms bid on the shortest contract term. If firms are risk neutral, the winner will bid a contract length that ensures expected discounted revenue of 100, on average. Then the contract term is 13.2 years. If the firm cannot fully diversify risk, it will demand a risk premium. In our example the contract length in this case is 16 years.<sup>26</sup> The firm's expected revenue is larger than 100: in our example, assuming risk-averse firms, the expected revenue at 16 years is 114 and there is a PPP premium.

It follows that a PVR contract can attract investors at lower interest rates than the usual fixed-term PPP contract. The realised sample path of user-fee revenues is the same under both contractual forms, but the franchise term is demand contingent only under a PVR contract. If demand is low, the franchise holder of a fixed-term contract may default; in contrast, a PVR concession is just extended until toll revenue equals the bid, which rules out default. The downside of the PVR contract is that bondholders do not know when they will be repaid, but this risk carries a lower cost than default risk.

PPPs financed via taxes have sometimes resorted to shadow tolls. That is, the state pays a fee to the concessionaire for every user of the infrastructure for a fixed number of years,  $T$ . This type of PPP contract not only shifts risk to the concessionaire, but also creates risk. Since the concessionaire now bears risk, a PPP premium should be observed (lower right corner of Table 1). Viewed from this perspective, a shadow fee contract is equivalent to adding a lottery to an availability contract. The firm and taxpayers are forced to participate in a zero-sum lottery in which whatever is won

<sup>25</sup> For any process with independent increments, as well as any stationary non-deterministic process, it is easy to show that the standard deviation of  $R_T^\infty$  at time zero is decreasing in  $T$ . It follows that with public provision or a PVR contract, the standard deviation of taxpayers' discounted revenue will be higher than under a fixed-term PPP.

<sup>26</sup> With the approximation for the risk premium in Proposition 9 in Engel *et al* (2001), this corresponds to a utility function with coefficient of relative risk aversion equal to 2.15.

by one party is lost by the other. Again, this leads to a risk premium that is not inherent to PPPs, but results from a specific contractual form.<sup>27</sup>

### 4.2.3 Endogenous risk, efficiency and the PPP premium

There are various reasons why society may be better off under a PPP than under public provision, and these generally impose additional risk on the private party. First, firms control the infrastructure assets during the life of the contract under a PPP, so innovations that use the assets more efficiently do not require extensive negotiations with the regulator. Under public provision, introducing innovations is very cumbersome. For example, investing in cost reductions and other efficiency-enhancing activities usually implies assuming additional risk, which is likely to increase the cost of capital for the firm. The flip side is that if the innovation succeeds, life-cycle costs will be lower than under public provision. This suggests that there will be more innovation under PPPs than under public provision.

A second argument in favour of PPPs, as discussed earlier, is that project finance is structured to provide incentives to internalise life-cycle cost considerations during the construction phase. These incentives are not present under public provision.

More generally, one of the main points of a PPP is to shift endogenous risk to the concessionaire, to prevent moral hazard and strengthen incentives to cut costs and provide adequate service quality. Unless the concessionaire is risk neutral, he will charge for bearing that risk. Moreover, these risks are not diversifiable in the capital market, for if they could be diversified, there would be no incentive to improve performance in the first place. Hence, the 'right' PPP premium would compare financing costs under public provision and an incentive contract (where the agent bears endogenous risk) with financing costs under a PPP. In practice, however, the inability to make remuneration depend on performance means that traditional provision cannot transfer endogenous risks to agents.

In all these cases, the financial arrangements impose risk on the firm, and this translates into a PPP premium. The higher financing costs that result should not necessarily be held against PPPs when comparing them with public provision. In exchange for the high cost of sponsor funds, the procuring authority obtains the services of a company that is focused on reducing life-cycle costs. These endogenous risks provide incentives, and it is a mistake to consider a PPP premium while omitting the improved performance from the calculation. This compensates for the lower risk premiums required under public provision of infrastructure. There is no reason to believe *prima facie* that achieving equivalent incentives with public provision would be cheaper. As Klein (1997) pointed out, the cost of funds cannot be considered independently of the incentive system under which intermediaries collect them.

## 5. Conclusion

It is perhaps fair to say that the alleged financial advantages of PPPs have been one of the main reasons for their popularity. Newspaper articles often mention that PPPs release government funds, thus expanding the set of projects that governments can undertake. More generally,

<sup>27</sup> Of course, a lottery is non-systematic risk *a fortiori*, and should be fully diversifiable through perfect capital markets. Nevertheless, it doesn't make sense to add risk to a contract considering that in the real world there are transaction costs.



sophisticated financial engineering often gives the impression that ‘finance makes things happen’. By contrast, we conclude that there is no *prima facie* financial reason to prefer PPPs over public provision. The case for PPPs in a specific project or type of infrastructure must stand on productive, allocative and dynamic efficiency. Will a PPP lead to lower production costs, better maintenance or higher quality of service than conventional provision? Will users pay the long-run marginal or average social cost of providing the infrastructure? And will a PPP lead to faster adoption of socially valuable innovations? Our main point is that whether a PPP makes sense depends largely on the economic characteristics of the infrastructure, not on the way it is funded or financed.

This is not to say that finance is irrelevant. Compared with traditional public provision, the narrow organisational focus forced by project finance and SPVs fosters efficiency and incentive alignment. Moreover, PPP projects are large, require independent management, and both scale and scope economies across projects are typically small. Thus, an SPV seems a particularly suitable organisational form which is much closer to the efficient scale of operation than the gigantic government entities in charge of all public infrastructures of a given country or state. Thus, arguably project finance fosters productive, allocative and dynamic efficiency.

At the same time, some scepticism is warranted. One reason is that, from a macroeconomic perspective, social value is created when real capital is deployed and used efficiently – the real side of the balance sheet – not when the financial composition of liabilities changes. Similarly, it is a mirage that PPPs liberate public funds. PPPs affect the intertemporal public budget in much the same way as public provision. With a PPP the current government saves on investment outlays. But then it either relinquishes future user-fee revenue (if the PPP is financed with user fees) or future tax revenues (if the PPP is financed with payments from the public budget). Governments may be credit constrained but, even then, the increased availability of funds occurs only under very special conditions.

From a public finance point of view PPPs have disadvantages. Because fiscal accounting rules keep most PPPs off the balance sheet, governments have used them to anticipate spending and to sidestep the normal budgetary process, in much the same way that off-balance sheet vehicles helped banks to elude capital requirements and prudential regulation. We conclude that, from the point of view of the public budget, PPPs should be treated as conventional public investments. Similarly, some have argued that fund structures are used to raise debt and disguise excessive leverage, well beyond the leverage intended by the governments who use PPPs. Also, it is claimed that debt has been used to anticipate dividend payments to fund shareholders during the initial stages, when the infrastructure projects are still producing losses. Last, some have pointed out that some fund structures tend to be unnecessarily complex to allow fund managers to charge fees many times over.

We are less convinced that PPP financing is inherently more costly than public provision financed with public debt. Indeed, with adequate contracting, PPPs can replicate the intertemporal risk profile of public provision. Hence, the so-called PPP premium may reflect faulty contractual schemes, which inefficiently assign exogenous risks to the private partner. Alternatively, the PPP premium may pay the concessionaire for assuming endogenous risks that cannot be meaningfully separated from the incentive structure responsible for the efficiency gains under PPPs. For these reasons, the apparent higher cost of capital should not be necessarily interpreted as evidence against PPPs.

## References

- Arrow KJ and RC Lind (1970)**, 'Uncertainty and the Evaluation of Public Investment Decisions', *The American Economic Review*, 60(3), pp 364–378.
- Bahçeci S, D Lippera, M-A Lucas de Peslouan, M Lyonnet du Moutier, N Rebondy and L Taillandier (2011)**, 'Guide to Infrastructure Investing', Af2i working group in partnership with J.P. Morgan Asset Management.
- Bennett J and E Iossa (2006)**, 'Building and Managing Facilities for Public Services', *Journal of Public Economics*, 90(10–11), pp 2143–2160.
- Blanc-Brude F and ORH Ismail (2013)**, 'Who is Afraid of Construction Risk?', EDHEC-Risk Institute Publication, July.
- Blanc-Brude F and D Makovsek (2013)**, 'Construction Risk in Infrastructure Project Finance', EDHEC Business School Working Paper, February.
- Blanchard OJ and F Giavazzi (2004)**, 'Improving the SGP through a Proper Accounting of Public Investment', Centre for Economic Policy Research Discussion Paper No 4220.
- Brainard W and FT Dolbear (1971)**, 'Social Risk in Financial Markets', *The American Economic Review*, 61(2), pp 360–370.
- Cangiano M, R Hemming and T Ter-Minassian (2004)**, 'Public-Private Partnerships: Implications for Public Finances', in *Public Debt*, Proceedings of a Public Finance Workshop, Banca D'Italia, Rome, pp 553–574.
- Das S (2011)**, *Extreme Money: Masters of the Universe and the Cult of Risk*, FT Press, London.
- Engel E, R Fischer and A Galetovic (1997)**, 'Highway Franchising: Pitfalls and Opportunities', *The American Economic Review*, 87(2), pp 68–72.
- Engel E, R Fischer and A Galetovic (2001)**, 'Least-Present-Value-of-Revenue Auctions and Highway Franchising', *Journal of Political Economy*, 109(5), pp 993–1020.
- Engel E, R Fischer and A Galetovic (2009)**, 'Soft Budgets and Renegotiation in Public-Private Partnerships', NBER Working Paper No 15300.
- Engel E, R Fischer and A Galetovic (2013)**, 'The Basic Public Finance of Public-Private Partnerships', *Journal of the European Economic Association*, 11(1), pp 83–111.
- Eurostat (2010)**, *Manual on Government Deficit and Debt: Implementation of ESA95*, Methodologies and Working Papers, Publications Office of the European Union, Luxembourg.
- Fitch Ratings (2010)**, 'Rating Criteria for Availability-Based Infrastructure Projects', Criteria Report, 29 March.
- Guasch JL (2004)**, *Granting and Renegotiating Infrastructure Concessions: Doing it Right*, WBI Development Studies, The World Bank, Washington DC.
- Hall J (1998)**, 'Private Opportunity, Public Benefit?', *Fiscal Studies*, 19(2), pp 121–140.
- Hart O (2003)**, 'Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships', *The Economic Journal*, 113(486), C69–C76.
- Heald D and A McLeod (2002)**, 'Public Expenditure', in NR Whitty (ed), *Constitutional Law*, rev, volume of *The Laws of Scotland: Stair Memorial Encyclopaedia*, Butterworths, Edinburgh.
- Hemming R, M Alier, B Anderson, M Cangiano and M Petrie (2006)**, *Public-Private Partnerships, Government Guarantees, and Fiscal Risk*, Special Issues Paper, International Monetary Fund, Washington DC.

**Hirshleifer J (1966)**, 'Investment Decision under Uncertainty: Applications of the State-Preference Approach', *The Quarterly Journal of Economics*, 80(2), pp 252–277.

**House of Lords Select Committee on Economic Affairs (2010)**, *Private Finance Projects and Off-Balance Sheet Debt – Volume 1: Report*, 1st Report of Session 2009–10, HL Paper 63-I, The Stationery Office Limited, London.

**Inderst G (2010a)**, 'Infrastructure as an Asset Class', *EIB Papers*, 15(1), pp 70–104.

**Inderst G (2010b)**, 'Pension Fund Investment in Infrastructure: What have We Learnt?', *Pensions*, 15(2), pp 89–99.

**Inderst G (2013)**, 'Private Infrastructure Finance and Investment in Europe', European Investment Bank Working Papers No 2013/02.

**Irwin TC (2007)**, *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects*, The World Bank, Washington DC.

**Kay J (1993)**, 'Efficiency and Private Capital in the Provision of Infrastructure', in *Infrastructure Policies for the 1990s*, OECD Publications, Paris, pp 55–73.

**Klein M (1997)**, 'The Risk Premium for Evaluating Public Projects', *Oxford Review of Economic Policy*, 13(4), pp 29–42.

**Levy SM (1996)**, *Build, Operate, Transfer: Paving the Road for Tomorrow's Infrastructure*, John Wiley & Sons, New York.

**Shugart C (2010)**, 'PPPs, the Public Sector Comparator, and Discount Rates: Key Issues for Developing Countries', in DF Burgess and GP Jenkins (eds), *Discount Rates for the Evaluation of Public Private Partnerships*, McGill-Queen's University Press, Montreal, pp 19–76.

**Solomon LD (2009)**, *The Promise and Perils of Infrastructure Privatization: The Macquarie Model*, Palgrave MacMillan, New York.

**Tirole J (2006)**, *The Theory of Corporate Finance*, Princeton University Press, Princeton.

**Weber B and HW Alfen (2010)**, *Infrastructure as an Asset Class: Investment Strategies, Project Finance and PPP*, Wiley Finance Series, John Wiley & Sons Ltd, Chichester.

**Weisdorf MA (2007)**, 'Infrastructure: A Growing Real Return Asset Class', *CFA Institute Conference Proceedings Quarterly*, 24(3), pp 17–27.

**Wilson JQ (1989)**, *Bureaucracy: What Government Agencies Do and Why They Do It*, Basic Books, New York.

**Yescombe ER (2002)**, *Principles of Project Finance*, Academic Press, San Diego.

**Yescombe ER (2007)**, *Public–Private Partnerships: Principles of Policy and Finance*, Butterworth-Heinemann, Oxford.

# Discussion

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## 1. Frédéric Blanc-Brude

### Key points of the paper

This rich paper makes numerous points about public-private partnerships (PPPs). Here I focus on its most significant contribution, the argument that private infrastructure finance is welfare-neutral.

The authors write:

Our main point is that whether a PPP makes sense depends almost exclusively on the economic characteristics of the infrastructure, not on the way it is funded or financed. (p 205)

Borrowing from existing results, in particular Hart (2003), the authors argue that the benefits of PPPs to society lie only in efficiency gains in production (e.g. bundling and cost-cutting incentives) and allocation (e.g. improvements in the quality and quantity of infrastructure). They conclude that risk transfer to the private sector is most justified when the risk is endogenous (i.e. it is affected by firms' own actions). When this is the case, welfare can be improved using availability payments or variable-term present-value-of-revenue (PVR) contracts. In contrast, fixed-term, real and shadow-toll contracts will be inefficient under these circumstances. The authors also note that if market imperfections mean that there is a cost of capital 'premium' in PPPs, this is not an argument against such contracts as long as it is at least compensated by improved operational efficiency.

Thus, the authors argue, if PPPs are costly for society it is because they do not allocate risks efficiently (i.e. because public tendering is not well designed). This would be a case of government failure.

The paper makes a number of important points:

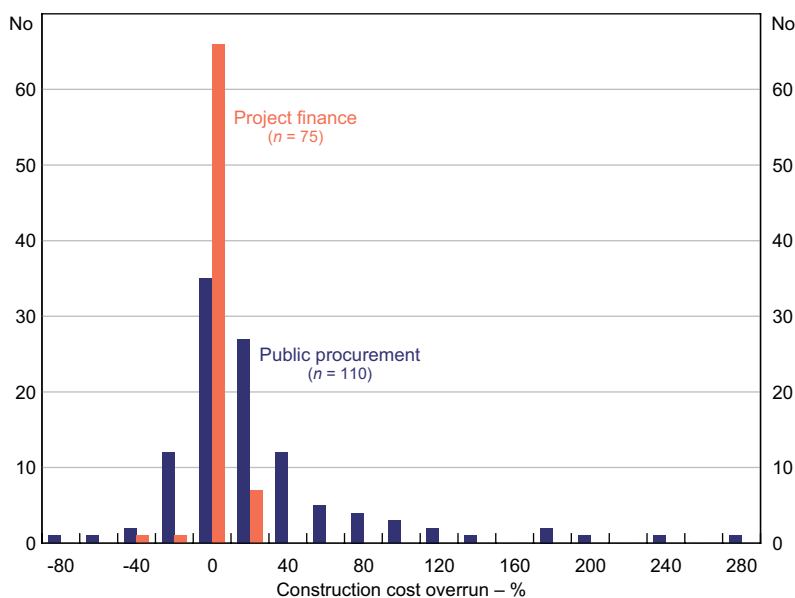
1. The benefits of PPPs should be measured at the level of total public outlays, that is, as a part of a portfolio rather than as a project-specific 'value for money' proposition.
2. The least risk-averse party should bear most of the risks, consistent with standard insights of welfare economics (see, for example, Dewatripont, Legros and Matthews (2003) and Gollier (2004)).
3. Transferring exogenous risks only increases the cost of capital without creating new benefits. Most PPP failures are a consequence of exogenous risks, such as traffic demand risk (for a review, see Blanc-Brude (2013b)).
4. The existence of endogenous risks is the only reason to transfer risks (at a premium) from a less risk-averse to a more risk-averse agent: residual claims create incentives to reduce risks through diversification, hedging or insurance.

My remaining comments focus on the value of long-term commitment mechanisms for ensuring that risk transfer is as efficient as possible and that any remaining inefficiencies are mitigated effectively. I also consider whether it is true that the source of funding is irrelevant.

## Risk transfer and long-term contracts

The evidence suggests that the risks faced in public infrastructure projects can change ‘shape’ once transferred to the private sector. The transfer of construction risk is a case in point. Construction risk in project finance, measured as the size of cost overruns, can be shown to be almost nil from the perspective of the project company if there are large construction firms that can diversify construction risk and sell insurance to the special purpose vehicle (SPV) that defines the PPP (Figure 1; Table 1; see Blanc-Brude and Makovsek (2013)). In comparison, construction risk is systematic and significant for the public equity holder in standard procurement, as documented by Flyvbjerg, Bruzelius and Rothengatter (2003). This suggests that it is very important for the success of a PPP for the contracting arrangements to be implemented carefully.

**Figure 1: Distribution of Construction Cost Overruns in Infrastructure Projects**



Sources: Blanc-Brude and Makovsek (2013); Flyvbjerg *et al* (2003)

**Table 1: Construction Cost Overruns in Infrastructure Projects – Summary Statistics**

	Public procurement	Project finance
<i>n</i>	110	74 <sup>(a)</sup>
Mean – %	26.7	3.3
Median – %	20.0	0.0
Min – %	–80.0	–23.0
Max – %	280.0	36.4
Std dev – %	55.0	9.6
Skewness	2.17	1.58
Kurtosis	6.24	3.91

Note: (a) Excludes one outlier observation

Source: Blanc-Brude and Makovsek (2013)

Indeed, PPPs are pure financial contracts. In the majority of PPPs, the private sector and the SPV do not actually own any tangible asset, just a contract with the public sector that makes the investor the residual claimant to a (risky) stream of cash flows. This may be the most overlooked fact in the literature on PPPs and infrastructure financing.

As a result, PPPs are better understood as ways to create credible commitment mechanisms to swap expected cash flows between the public and private sectors. Project finance is the evolutionary response to the long-term investment problem of enforcing time-consistency, and makes stand-alone infrastructure asset financing possible. PPPs can be described as a series of long-term promises. This is not unlike a total rate of return swap, which is a portfolio of bonds and options. For example, in a classic PPP with availability payments, the public sector receives a pre-agreed stream of infrastructure services and pays a fixed price (the fixed leg of the swap), while the firm receives a fixed income and faces stochastic costs (variable leg). Hence, in order to have PPPs we need to have counterparties for such contracts swapping long-term cash flows.

## The cost of long-term finance

Hence, there may be reasons to question the authors' conclusions about the irrelevance of the source of finance to deliver the benefits of PPPs. In particular, it is likely that delivering the benefits of PPPs is conditional on the possibility of long-term private investors being involved in the project at a future date. Long-term investors will only participate if their cost of capital is not so high that it more than offsets their rate of return, which, as the authors argue, will be related to the size of potential efficiency gains. But long-term finance can be costly for a number of reasons:

- transaction costs, which can be high because project financing is difficult to do
- liquidity premia, which can be high because repayment periods span decades

- regulatory capital charges for long-term lending (Basel III, Solvency II, etc)<sup>1</sup>
- rents are likely to be persistent even with competitive bidding (Blanc-Brude, Goldsmith and Vällilä 2009; Blanc-Brude 2013a).

If long-term private finance is costly then efficiency gains from contracting have to be substantial to create public benefits. Thus, the source of private finance may matter if some financing structures can lower capital costs by more than others. While the paper is about the difference between public and private finance, finance still matters insofar as we have to think about different sources of private finance available to PPPs.

## Who supplies long-term finance and why?

The public sector provides long-term finance for infrastructure because it has to. That is, society values the real benefits of long-term capital investment. Investors provide long-term finance because they want to. That is, they benefit from the long-term nature of these assets (e.g. for duration hedging or the illiquidity yield spread).

The authors write:

The resources saved by the government by not paying the upfront investment under a PPP should be equal, in present value, to user-fee revenue forgone to the concessionaire. That is, from a financial viewpoint, PPPs borrow from the future with no net gain in present discounted terms. (p 206)

However, the authors don't consider the possibility that some investors may value the same stream of cash flows differently than the government because they face different costs of financial distress, duration hedging benefits, etc.

## Further welfare implications of PPPs

Moreover, originating financial assets through PPPs creates other benefits. There are at least two ways by which the existence of PPP contracts may have welfare implications beyond the productivity and efficiency gains created by more efficient contracting.

First, PPPs can provide insurance against government failure. This can be achieved by tying the government's hands (achieving commitment) with PPPs. Under these contracts, governments cannot choose to undersupply society with regard to public infrastructure *ex post* without significant negative consequences. This benefit can be viewed as an insurance premium paid by taxpayers against future government failure and/or time inconsistency (e.g. to fund maintenance).

Second, PPPs can act as robust channels of intergenerational transfers. If pension funds receive the cash flows of infrastructure projects, taxpayers (the current workforce) and the users of infrastructure are transferring funds to retirees via an infrastructure project. In addition, well-designed infrastructure projects should have a positive impact on total factor productivity, which improves the ability to fund such intergenerational transfers. PPPs financed or funded by long-term institutional investors may thus lead to wealth redistribution.

<sup>1</sup> Incidentally, the cost of investing in a variable-length concession contract (PVR) is probably prohibitive for many investors. For example, within a risk-based prudential framework, a variable-length contract that may or may not extend 15 years into the future would be more expensive to invest in than a 15-year fixed-term contract. Moreover, such instruments become unusable for liability matching or hedging purposes. In the authors' framework, the only feasible efficient contract left would be annuity based. Indeed, this type of contract is becoming the norm in the most developed PPP sectors, such as in Europe.

In conclusion, insofar as PPPs are about delivering infrastructure efficiently, their source of finance is irrelevant, but (a) long-term commitment mechanisms through financial instruments are a necessary condition to have PPPs, and (b) society may value the existence of long-term private assets to manage long-term private liabilities like pensions or insurance policies.

## References

- Blanc-Brude F (2013a)**, 'Risk Transfer, Self-Selection and *Ex Post* Efficiency in Public Procurement: An Example from UK Primary and Secondary School Construction Contracts', *Revue d'Economie Industrielle*, 141(1st Quarter), pp 149–180.
- Blanc-Brude F (2013b)**, 'Towards Efficient Benchmarks for Infrastructure Equity Investments', EDHEC-Risk Institute Paper.
- Blanc-Brude F, H Goldsmith and T Väilä (2009)**, 'A Comparison of Construction Contract Prices for Traditionally Procured Roads and Public–Private Partnerships', *Review of Industrial Organization*, 35(1–2), pp 19–40.
- Blanc-Brude F and D Makovsek (2013)**, 'Construction Risk in Infrastructure Project Finance', EDHEC Business School Working Paper, February.
- Dewatripont M, P Legros and SA Matthews (2003)**, 'Moral Hazard and Capital Structure Dynamics', *Journal of the European Economic Association*, 1(4), pp 890–930.
- Flyvbjerg B, N Bruzelius and W Rothengatter (2003)**, *Megaprojects and Risk: An Anatomy of Ambition*, Cambridge University Press, Cambridge, pp 1–5.
- Gollier C (2004)**, *The Economics of Risk and Time*, MIT Press, Cambridge.
- Hart O (2003)**, 'Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships', *The Economic Journal*, 113(486), pp C69–C76.

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## 2. General Discussion

The discussion began with one participant asking whether there was any empirical evidence for the efficiency benefits of PPPs. The participant also questioned whether infrastructure projects possess agglomeration benefits, particularly in the operation phase, despite there being limited economies of scope or scale. Alexander Galetovic admitted that there is very little empirical evidence for the efficiency of PPPs, as they are a relatively new approach to infrastructure provision, having only been used in the last 20–30 years, and the life cycle of infrastructure projects tends to be long. Professor Galetovic proffered his view that, despite the lack of empirical evidence, PPPs can be a valuable method of procuring infrastructure in any situation where some level of government control is desirable but the private sector can be involved in the production process. Professor Galetovic went on to suggest that the implementation of PPPs has been poor, largely reflecting failures in contract design, which results in potential efficiency gains not being fully realised.

Another participant questioned why members of the finance sector had not called attention to the fact that PPPs do not liberate public funds once proper intertemporal accounting is used. In response, Professor Galetovic explained that PPPs, as off-balance sheet vehicles, do allow



## DISCUSSION

governments to spend more on infrastructure by bypassing fiscal spending limits. He pointed out, however, that this is likely to be inefficient and that at some point the cost of the PPP must be realised by the government. Additionally, Professor Galetovic posited that the chance that a future government administration may eventually bear the cost of the PPP may also act as an incentive for their use.

Professor Galetovic also commented further on the relevance of finance to infrastructure provision. He argued that it is unfair to characterise finance as being irrelevant to infrastructure provision, as it can be useful if it strengthens incentives in a way that the public sector cannot. Professor Galetovic opined, however, that the finance sector tends to oversell the value of its services. As a consequence, it is important to remember the Modigliani-Miller theorem – that the value of a project is independent of its capital structure – and that welfare is ultimately determined by a production function, which is a function of real quantities like capital and labour, and not the financing mix.

There was also some discussion about the extent to which PPPs transfer property rights. Picking up on the discussant's remarks about PPPs simply being financial contracts, Professor Galetovic reasoned that appropriately designed long-term contracts should result in the infrastructure manager behaving as if they owned the asset, and that one of the crucial aspects of these contracts is the transfer of the infrastructure asset at the end of the contract period. He also argued that the defining feature of property rights (in terms of their ability to generate incentives) is that they can be sold. Others contended that the defining feature of property rights is that the holder can exercise them in whatever way they wish. However, the nature of infrastructure projects – that is, the intrinsic heavy involvement of government – limits the ability to exercise these rights, so that the value of the assets is entirely determined by contractual features rather than underlying features of the asset itself.

Much of the remaining discussion broadly revolved around the objective of PPPs, particularly the desirability of using PPPs to transfer demand risk. One participant welcomed the paper's conclusion that PPPs should not be used to transfer demand risk from the public to the private sector. The participant opined that, in Australia, the transfer of demand risk to the private sector is the characteristic that differentiates PPPs from other forms of public procurement. He went on to suggest that this fact, in combination with the conclusions of the paper, implies that PPPs should not be used in Australia. The participant also argued that the idea of PPPs being a solution to inefficient government procurement of infrastructure lessens the pressure to reduce the inefficiency of government procurement more generally. The participant contended that there has already been progress in improving the efficiency of public procurement in Australia, with most public procurement making use of fixed-price contracts (so that the contractor bears the costs of cost overruns). Another participant noted that the European experience of transferring demand risk to the private sector using PPPs has also been poor, with a number of PPPs failing due to demand being overestimated. Because of the costs associated with these failed PPPs, there has been a trend toward 'availability payment' PPPs, which is closer to what is recommended in the paper under discussion. The participant speculated that PPP contracts may eventually evolve to only transfer endogenous risks and not demand (or other exogenous) risks. In response to these points, Professor Galetovic argued that the main purpose of a PPP is to procure infrastructure efficiently, and that the transfer of demand risk is subordinate to that goal. He went on to suggest

that demand risk should be transferred to the private sector only if it results in better alignment of incentives.

Further to the topic of the objective of PPPs, another participant disputed the discussant's comments on the potential role of PPPs as insurance against governmental failure or as a channel for intergenerational transfers. The participant argued that using PPPs to address problems other than the efficient procurement of infrastructure is problematic, as PPPs are opaque financial vehicles with a fairly high potential for corruption. Professor Galetovic broadly agreed with this sentiment, reiterating his argument that the objective of PPPs is to procure necessary infrastructure efficiently, and that all other objectives are subordinate to this. He went on to suggest that problems in other sectors, such as the pension fund sector, should be addressed directly.



# Panel: PPPs – Lessons Learned

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## 1. David Hawes

### Lessons from emerging south-east Asia

I've been asked to talk today about lessons from emerging south-east Asia's experiences with public-private partnerships (PPPs). Several south-east Asian nations, including Indonesia and the Philippines, committed to private provision of infrastructure some two decades before the G20 adopted its Multi-Year Action Plan on Development in 2010. On the demand side, this decision reflected their recognition that the infrastructure investments needed to sustain rapid economic growth would exceed the current financing and delivery capacities of government agencies and state-owned enterprises (SOEs). Additionally, on the supply side, there was tremendous interest on the part of international developers, particularly in the power sector, to find new markets offering higher returns.

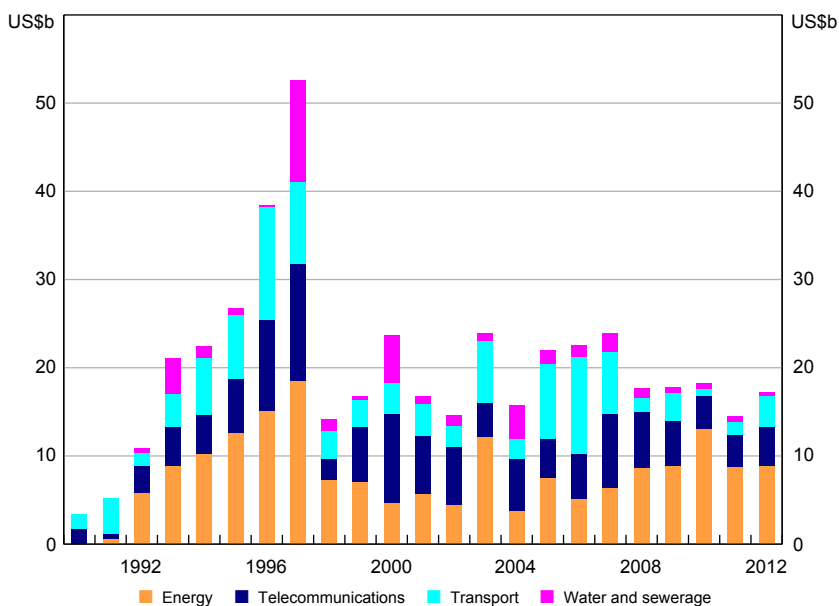
In addition to promoting PPPs, governments also sought to deregulate sectors that were closed to private participation and to corporatise, restructure and, in some instances, partially privatise SOEs. The World Bank played a key role during this period by advocating private participation in infrastructure (PPI), providing support for policy, regulatory, institutional and structural reforms, and by positioning conventional infrastructure lending as a 'sunset' business. Against the backdrop of worsening power shortages, transport congestion and inadequate urban water services, PPPs quickly came to be seen as a fast-track solution. However, governments focused on securing financing for 'big-ticket' greenfield projects, such as power generators and toll roads, and generally gave little attention to harnessing private sector efficiency or investing in social infrastructure, such as hospitals and gaols. At the same time, issues of policy and regulation were put on the backburner, and little consideration was given to user tariffs; the focus was more on how to get the project financed in the first place rather than on who was going to pay for the ongoing provision of services once it was built. In just four years from 1994, Indonesia awarded 27 independent power producer (IPP) projects and more than 40 toll road concessions, while the Philippines signed a similar number of IPP contracts between 1991 and 1998.

Capturing the benefits of private sector efficiency for the public good is best accomplished through competition in the market. The most obvious example is mobile telecoms, where technological advances coupled with light regulation have permitted head-to-head competition among several operators, which has resulted in lower tariffs and improved service quality. Multi-buyer–multi-seller bulk power markets offer another example, although experience over the past decade has highlighted the importance – and difficulty – of effective regulation. PPPs have been employed in situations where effective competition in the market is not feasible. Indeed, the current PPPs in Indonesia and the Philippines have been shaped by the 1990s experience, where the majority of projects resulted from unsolicited bids or direct negotiations and there was, therefore, no

mechanism for capturing private sector efficiency. As a result, tariffs turned out to be high. This experience reinforced the World Bank’s exhortations that, when the infrastructure is being provided in an uncompetitive sector of the economy, it is best to award PPP contracts through transparent competitive solicitation processes designed to attract the most capable investors.

The fallout from the Asian financial crisis has also served to highlight the need not only for sound project preparation and transparent transaction processes but also for credible investment-enabling environments and capable contracting institutions. While governments’ appetite for private infrastructure investment has remained strong, data from the World Bank PPI database indicate that investors and lenders have remained wary. Annual project finance commitments (in constant US dollar prices) for the east Asia-Pacific region have yet to reach 50 per cent of their 1997 peak, while 2012 commitments were equivalent to only around 0.2 per cent of regional GDP (Figure 1).

**Figure 1: East Asia-Pacific Region – PPI**  
By sector



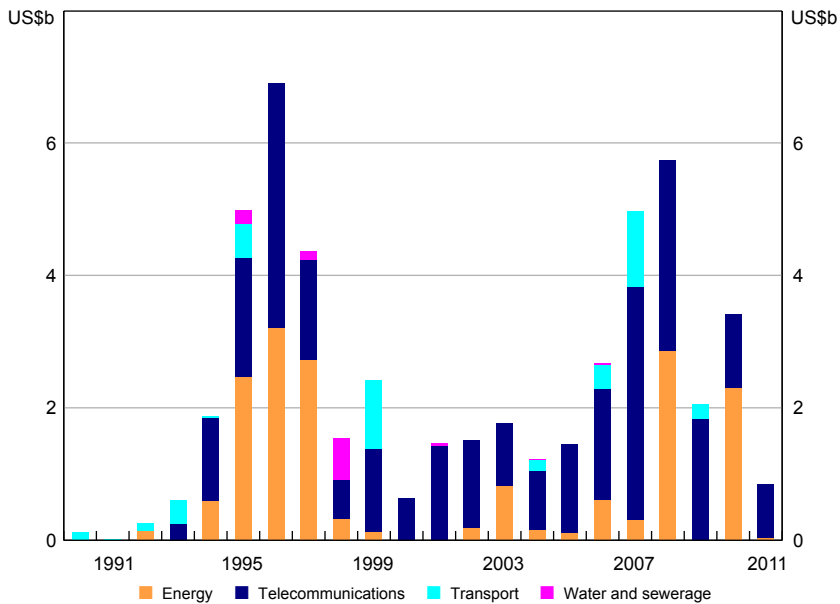
Note: 2012 prices, adjusted using the US CPI  
Sources: PPI Project Database; Public-Private Infrastructure Advisory Facility; World Bank

The need for wideranging reforms to enable a positive investment environment has been recognised. By way of example, since 2004 Indonesia has enacted new laws for key infrastructure sectors, which, among other changes, have eliminated the special status previously accorded to SOEs. It has also issued cross-sector regulations for PPPs, which define project selection, preparation and solicitation processes, and expressly permit direct and contingent government support. A guarantee institution and a viability gap-funding policy have since been established under the auspices of the Ministry of Finance, and preparations are now underway to establish a

PPP centre designed to centralise expertise, encourage capacity building and provide transaction advisory assistance.

But these initiatives have yet to translate into the anticipated substantial increase in PPP investment. While Indonesia has seen gross fixed capital investment bounce back strongly after 1998, private infrastructure investment has languished. Moreover, during the past decade, around two-thirds of total PPI flows have gone to the telecoms sector, which generally does not use PPPs, while only a relatively small proportion has gone to the transport and water sectors (Figure 2). The Philippines, with its revitalised PPP centre and recently established Project Development and Monitoring Facility, has arguably progressed more rapidly over the past three years due in part to its ability to offer relatively small projects in sectors such as health and education, which are well suited to private finance, and to engage international transaction advisors through simplified procurement processes.

**Figure 2: Indonesia – PPI**  
By sector



Sources: PPI Project Database; Public-Private Infrastructure Advisory Facility; World Bank

Although Indonesia’s reform initiatives have yet to translate into the anticipated PPP deal flow, they have, in the interim, served to stimulate significant improvements in the performance of key infrastructure SOEs. Some – such as the toll road corporation, Jasa Marga – are now partially privatised and are raising capital through bond issues. They are also empowered to pay competitive salaries and hire top-tier consultants and advisers. This is necessarily blurring the boundary between public and private provision and complicating the definition of public sector comparators.

International cooperation has played an important role in assisting governments in the region to pursue their PPI aspirations. The Asia-Pacific Economic Cooperation (APEC), the Association of Southeast Asian Nations (ASEAN) and, more recently, the G20 provide forums in which members can share their experiences, while the World Bank Group and the Asian Development Bank – along with specialised donor-funded institutions such as the Public-Private Infrastructure Advisory Facility – continue to channel technical assistance for strengthening the underlying investment environment and preparing pilot PPP projects to best-practice standards. Bilateral assistance has also been provided by many individual G20 members, including Australia, Canada, Japan and Korea.

Several valuable lessons can be distilled from south-east Asia's experiences with PPPs over the past quarter century. First, and perhaps most important, well-prepared PPP projects offered through transparent processes can – and do – secure financing. Deal volumes, however, remain well below the levels of 1995–1997, and prospective investors may still need to contend with a 'noodle dish' of regulations and permit requirements, potential delays due to land and right-of-way acquisition, and issues around legal certainty. Additionally, the issue of user tariffs and subsidies has still not been addressed. For example, in Indonesia, only around 60 per cent of the cost of power supply is paid by the user. This is constraining the provision of new infrastructure, as a large funding burden falls on the taxpayer. These concerns will need to be addressed if PPP flows to sectors in need of infrastructure investment, including transport, water and sanitation, are to increase significantly.

Second, policy, regulatory and institutional reforms aimed at enabling PPP investments have brought broader benefits, including by creating pressures for improved SOE performance. SOEs will continue to play a crucial role in infrastructure provision in countries such as Indonesia, and can also contribute to expanded private participation, including through business-to-business schemes.

Third, international cooperation has been invaluable but fragmented and sometimes overlapping, meaning that a large number of entities are involved and the sequencing of individual initiatives is often sub-optimal. This suggests a possible role for the G20 in promoting better coordination among the main actors.

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## 2. Maria Monica Wihardja

The agenda during this year's G20 presidency has a clear goal of stronger and more resilient growth, supported by a vigorous and robust private sector contribution and necessary structural reforms. Earlier this year, the G20 Finance Ministers and Central Bank Governors reached a consensus to boost global growth by 2 per cent over the next five years, and each G20 member will submit their commitments to support this in November 2014, to be encapsulated in a 'Brisbane Action Plan'. One strategy to stimulate growth has stood out and been consistently and concertedly championed: infrastructure investment. The Australian presidency has put a lot of focus on private sector participation in infrastructure financing through PPPs and institutional investor support. These comments will draw together some lessons learned on PPP development in Indonesia.

## History of PPPs in Indonesia

Indonesia has a long history of PPPs, which has evolved significantly in regard to the number of projects, the types of projects and how they are implemented. From the 1950s to the early 1990s, infrastructure projects were undertaken through a series of five-year national development plans by the public sector. From the early 1990s through to 1997 – a period of high growth and export-oriented industrial policy – the private sector was invited to invest in infrastructure development as partners with the government. By 1997, Indonesia had invested over US\$20 billion in PPP projects, including electricity (US\$10.2 billion), telecommunications (US\$8.4 billion) and transport (US\$2.1 billion) (Wibisono, Delmon and Hahm 2011). However, over this 1990s period, projects were awarded and selected based on patronage in an ad hoc manner. The Asian financial crisis (AFC) hit Indonesia in 1997–1998, and a lot of projects, especially those in highly subsidised high-tech industries, were stopped or renegotiated. For example, there were lengthy renegotiations between the central government and the country's 27 independent power producers (Wibisono *et al* 2011).

During the Reformasi era (1999–present), after the collapse of the Soeharto regime, there have been many reforms in the regulatory framework, institutions and project preparation for PPPs, but very little has been achieved in terms of actual project implementation (Table 1). Additionally, at present, private sector investment in Indonesia has not recovered to its pre-AFC peak in 1996 of US\$6.9 billion. It averaged US\$5.5 billion per annum between 1995 and 1997, around US\$1.6 billion between 1998 and 2006, and then recovered to an average of US\$4.0 billion between 2007 and 2010 (World Bank 2011). Despite Indonesia's robust growth and a relatively low (risk-unadjusted) cost of financing in the past decade (especially before the global financial crisis), PPPs have not taken off.

**Table 1: The Realisation of PPP Projects  
2005–2011**

Date/event	Number of planned projects			Realised/ contract awarded
	Potential	Priority	Ready-to-offer	
2005 Infra Summit 1	91	na	na	na
2006 Infra Summit 2	101	10	na	na
2010 Infra Summit 3	72	27	1	na
August 2010	na	5	na	na
April 2011 Infra Summit	11	5	na	na
May 2011 MP3EI <sup>(a)</sup>	na	na	32	na
June 2011 PPP Book	45	21	13	1

Notes: Projects over years are not necessarily the same projects

(a) Masterplan for Acceleration and Expansion of Indonesia's Economic Development

Source: Wibisono *et al* (2011)



## The first ‘P’ for ‘public’

In most countries, the government funds the majority of infrastructure needs. Hence, the first ‘P’ in PPP remains critical. In Indonesia, total infrastructure investment has remained at only 3–4 per cent of GDP over the past decade compared with 10 and 7.5 per cent for China and India, respectively (World Bank 2014). Infrastructure development rests on improving the quality of central and sub-national governments’ public spending; however, in recent years, central government spending on fuel subsidies reached 2.6 per cent of GDP, ‘crowding out’ spending on infrastructure (World Bank 2014). Phasing out fuel subsidies alone could allow central government spending on infrastructure to more than double from its current level of 1 per cent of GDP (World Bank 2011). In addition, about 90 per cent of sub-national government budgets come from the central government, without any strings attached. If these transfers were earmarked for more infrastructure projects, infrastructure development at the sub-national level might also be improved from its current level of 1.5 per cent of GDP. A potential risk is that with more and more officials, including high-ranked officials and people in the President’s inner circle, being caught by Indonesia’s Corruption Eradication Commission, remaining officials may become more risk averse, which could deter the start of new infrastructure projects.

## The second ‘P’ for ‘private’

Because of the big funding gap between infrastructure needs and available public funds, the Indonesian Government has probably relied too much on private sector investment in its medium- and long-term development plans. Indonesia’s National Medium-term Development Plan (RPJMN) 2010–2014 assumes 70 per cent of its US\$150 billion funding needs will come from the private sector, and Indonesia’s Master Plan for the Acceleration and Expansion of Indonesia’s Economic Development 2011–2025 expects 51 per cent of its US\$468 billion funding needs to come from the private sector. The National Development Planning Agency identified a funding gap for infrastructure development of 2 741 trillion rupiah (or about US\$274 billion) between 2015 and 2019, with an additional 1 183 trillion rupiah expected to come from PPPs (Priatna 2014).

In terms of financing, the banking sector does not yet have sufficient capacity to finance long-term infrastructure projects. Indonesia is a bank-dominated economy, with the banking sector’s assets making up about 78 per cent of the total financial sector’s assets (World Bank 2014). Although banks do have the capacity and capital to lend, they cannot provide long-term credit, mainly because the tenor of financing infrastructure projects (up to 20–30 years) does not match the largely short-term tenor of banking liabilities. The majority of bank credit has a maturity of less than one year. Although bank loans can be used during the construction phase of a project, longer-term financial instruments, such as infrastructure bonds, are more suitable during the operational phase.

The capital market also does not yet provide financial instruments that can be used to finance long-term infrastructure projects. The bond market is still very thin and about 30 per cent of sovereign bonds are held by foreign investors, making it more vulnerable to foreign capital flight. The shallow financial market in Indonesia partly reflects the risk-averse behaviour of both investors and savers following the AFC (World Bank 2014). Some Indonesian state-owned companies in the infrastructure sector do issue bonds but they are merely a fungible part of these companies’ portfolios rather than project-specific bonds intended to finance an infrastructure

project. Insurance, pension funds and investment fund assets have also grown in recent years but they have not contributed to the pool of domestic long-term savings and investments because they are often invested in short-term equities (so called 'unit-linked') for high immediate returns (World Bank 2014). The goal of the newly established Financial Services Authority is to link the banking sector and the capital market to help with financial deepening. Indonesia's Social Security Administrative Bodies are also potential sources of financing through their pension program, which is due to start by July 2015. In summary, one of the main financing constraints for the private sector is finding financial instruments for the longer-term operational phases of a project's lifetime.

### The third 'P' for 'partnership'

The most difficult 'P' out of the three 'P's is probably 'partnership'. It involves changing the mindset of high-level politicians from 'project owners' to 'project sellers'. Private investors are often seen only as sources of capital that can help fill the investment financing gap, rather than as partners who can help improve efficiency in the allocation of risk and reward, accountability, asset delivery and service performance over the lifetime of a project.

Improving the capacity to 'sell projects' is also a critical key of 'partnership'. Project selection is often based on political imperatives and not a 'value-for-money' mindset. Currently, there are around 80 projects in the pipeline, worth more than US\$50 billion, but only a few of these projects are viable. Project selection also often focuses on 'strategic' projects and different government agencies hold different 'PPP lists' (Wibisono *et al* 2011). Moreover, changes in political imperatives or government policy priorities create uncertainties for investors.

Project preparation is also poor: many PPP projects are prepared without any feasibility study; there is no appropriate process for dealing with unsolicited proposals; and the modelling and allocation of risk are also still very weak (Wibisono *et al* 2011). Until 2011, there had been no support for project preparation within the government, except for one project that was prepared by a state-owned electricity company with help from the International Finance Corporation (Wibisono *et al* 2011). Furthermore, the Ministry of Finance is often not involved from the beginning, so time can be wasted on projects that ultimately cannot be financed.

Project implementation capacity in terms of structuring, procuring and managing PPP contracts is limited (Wibisono *et al* 2011). Land acquisition is a major issue in Indonesia, which may take many years to resolve, and this poses serious challenges to private investors. In fact, more than 80 per cent of infrastructure issues in Indonesia are land-related, including land acquisition problems and land conflicts. Having said that, in 2012, the government issued a new land law (National Law No 2 of 2012 on Land Procurement for Development in the Public Interest) to speed up land acquisition for public goods, including infrastructure. Moreover, there have been changes to the legal framework, which might support involvement of private sector participants (see Wibisono *et al* (2011)).

### Indonesia's international role in infrastructure financing

In 2011, Indonesia proposed infrastructure investment as a new focus for the G20's Framework for Strong, Sustainable and Balanced Growth. The goal is to help lift growth, reduce global imbalances and promote development by redirecting excess savings, especially in Asia, to finance

infrastructure investment in both developing and advanced economies as an alternative to the current portfolio investments that focus on advanced economy debt. It also proposed a framework to develop a pipeline of projects focused on the assessment of country-level capacities to deliver and implement bankable projects. Lastly, Indonesia proposed that the G20 develop a global infrastructure financing arrangement to explore innovative ways to channel global savings into productive economic infrastructure, and to find new sources of financing and new mechanisms to diversify investment risks.

Indonesia is currently co-chairing the G20 Investment and Infrastructure Working Group (Germany and Mexico are the other co-chairs), which has a mandate to: create a supportive investment climate for long-term financing of infrastructure investment; promote intermediation of global savings into infrastructure investment; optimise multilateral development banks' resources as a catalyst for private sector involvement; and improve processes and transparency in the project planning, prioritisation and funding of infrastructure investments.

ASEAN, of which Indonesia is a member, is also working to facilitate infrastructure financing, including through the ASEAN Infrastructure Fund. In 2013, under Indonesia's chairmanship, APEC leaders also committed to creating a comprehensively connected Asia-Pacific region that will lead to significant investment in the software and hardware needed to enhance physical, institutional and people-to-people connectivity.

Indonesia has also welcomed and stated its intention to participate in the proposed Asian Infrastructure Investment Bank. This is a potential game changer initiated by China. The Asian Infrastructure Investment Bank can make a contribution to lending, on a commercial basis, to infrastructure projects with acceptable rates of return.

## Leading by example

The outcomes of the Indonesian Presidential election in July 2014 may lead to democratic consolidation in Indonesia, which will hopefully be accompanied by pragmatic reforms, including for infrastructure development and PPPs. Pressures from outside, through Indonesia's involvement with the G20, APEC and ASEAN, should also help to accelerate domestic reforms on approaches to infrastructure financing. Upgrading Indonesia's ports and airports is one priority, as are pilot projects designed to improve Indonesia's domestic supply chain and connectivity, which have weighed on Indonesia's competitiveness.

Indonesia's newly revised Negative Investment List will create more opportunities for the private sector to participate in PPP arrangements, which should be welcome. For example, in the sea transportation industry, which includes docks, buildings, terminals and/or container ships, foreign investors will be allowed to hold up to 95 per cent ownership within a PPP and 49 per cent within a non-PPP during the concession period. Likewise in the energy sector, foreign ownership will be allowed to be up to 100 per cent for PPPs and 95 per cent for non-PPPs in the transmission and distribution sector and for power plants producing more than 10 megawatts during the concession period.

## The way forward for Indonesia

The first step is to deepen capital markets to facilitate long-term financing. This includes regulatory reforms to increase the domestic institutional investor base. Second, to attract private financing, it is important to improve the quality of project selection, preparation and implementation. Reforms include: more effective implementation of the new Land Law; establishment of an infrastructure prioritisation agency (similar to Infrastructure Australia and Infrastructure UK); and coordination within broad institutional settings of infrastructure projects by ensuring that the responsibilities of relevant government institutions are clear. Indonesia currently has three PPP centres – one under the State Ministry of National Development Planning, one under the Ministry of Finance and another under the Investment Coordinating Board. There are also ‘PPP umbrellas’ such as the Committee for the Acceleration of Priority Infrastructure Development. All these have to be coordinated so that there is only one ‘lead agency’ and one ‘PPP priority list’. Third, it is necessary to create a success story by finding small viable projects that work. Finally, it is necessary to find a ‘project champion’ for each priority PPP project equipped with convening power to move the project forward through the bureaucracy.

## References

**Priatna DS (2014)**, ‘RPJMN 2015–2019 Bidang Infrastruktur’, Presentation at Roadmap Perekonomian 2014–2019, APINDO, Jakarta, 28 March.

**Wibisono A, J Delmon and H Hahm (2011)**, ‘Unlocking the Public-Private Partnerships Deadlock in Indonesia’, Working Paper, World Bank, May.

**World Bank (2011)**, *Indonesia Economic Quarterly: Turbulent Times*, October, World Bank, Washington DC.

**World Bank (2014)**, *Indonesia – Avoiding the Trap: Development Policy Review 2014*, World Bank Group, Washington DC.

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### 3. Peter Regan

I am going to talk about recent developments in the infrastructure finance space in the state of New South Wales (NSW), with a particular focus on the use of PPPs. NSW is currently in the midst of a substantial infrastructure procurement phase, with around A\$25 billion in big-ticket infrastructure projects being procured. While we believe that PPPs are a good mechanism to achieve the right balance of risk transfer, we are very much employing a ‘horses-for-courses’ approach to transferring risk, with the exact nature of risk transfer differing from project to project. I will describe the primary challenges that we have faced in procuring infrastructure, as well as the infrastructure procurement program that we have been running over the last three years. I will also talk specifically about some of the features of the PPPs that have been used in this procurement.

There a number of challenges that the NSW Government faces in procuring infrastructure. Like a lot of governments, both in Australia and around the world, our number one challenge is that we cannot afford to finance all the infrastructure that is required. This constraint arises both from our own balance sheet considerations and from credit rating constraints. Another challenge arises from the relatively shallow market for the construction and delivery of major projects; activity is highly

concentrated in only a handful of players and costs are high, particularly in the area of greenfield development. Furthermore, government and industry have perhaps not worked closely enough historically, resulting in negative outcomes that have weighed on the private sector's interest in subsequent projects. On the government side, there has possibly been an over-engineering of financial structures in an attempt to pass risks to the private sector that probably should have been retained by the government. At the same time, industry has sometimes taken risks that were probably imprudent. Finally, international experience has shown that slightly different accounting treatment of PPPs can drive their adoption. We certainly view this as a challenge that needs to be managed, as it is important that PPPs are being used for the right reasons.

In NSW, we have a very specific policy of 'capital recycling' as part of our framework for infrastructure provision. While there have certainly been many examples of governments around the world selling assets to finance the provision of infrastructure, we are operating a fairly unique program where proceeds from asset sales, long-term leases of assets and certain prescribed upside revenues are, by legislation, ring-fenced. These proceeds (net of debt) are placed in a ring-fenced fund within the government and are earmarked for infrastructure provision. The practice is somewhat removed from the political process through the involvement of Infrastructure NSW, which is a semi-independent government body. A part of their task is to make recommendations for the use of recycled funds, a process that also allows the government to make a stronger case for reinvesting the proceeds of capital recycling. Additionally, it is unnecessary to select new projects before existing assets are privatised, as the fund retains the proceeds of privatisation until appropriate projects present themselves. To date, a range of projects has been funded through this mechanism.

In addition to having a source of funds from capital recycling, the NSW Government has been focused on developing appropriate financing structures across different projects. There are six major projects currently being procured: two rail projects (the Sydney Light Rail Program and the North West Rail Link); the Darling Harbour Live project, which is a redevelopment of the exhibition and conference facilities in the Darling Harbour area of Sydney; the Northern Beaches Hospital in Sydney; and two large toll motorways (WestConnex and NorthConnex).

These six projects nicely illustrate the different financing approaches being employed. The rail projects are being procured using availability-based PPP contracts, with no transfer of demand risk. There is probably little value in transferring demand risk on an integrated public transport project, so we are employing service-based concessions with a full transfer of construction and operating risk to the private sector. In both cases there is also a form of government contribution either at completion of construction or after two years of operation. In particular, provided that certain delivery and performance standards have been satisfied (i.e. construction risk is extinguished), we are looking to reduce the amount of private sector capital by refinancing directly into (lower-cost) state borrowing. The Darling Harbour Live project and the Northern Beaches Hospital are both forms of social infrastructure that are being procured through models that combine a high degree of output specification with construction finance and other commercial opportunities. The hospital is somewhat unique in that it is the first time in Australia that a PPP structure has been used for the full outsourcing of clinical services.

I would like to focus a little more on the toll roads, as they have a number of interesting features. These roads are predominately tunnels within the Sydney urban area, which provide bypasses of free but very congested routes. These two projects are similar to four other motorway projects in Australia that have had financial problems, in that they are all bypasses of free routes and require high capital expenditures. This kind of scenario poses a complex problem for traffic forecasting, and certainly there have been large forecast errors in these types of projects historically. In both of these projects we are looking to use models that share demand risk in different ways. For example, the NorthConnex project is linked to three adjoining motorways that are already operated by the private sector, and there is a large degree of blending of traffic risk across these concessions. On WestConnex, we are setting up a ring-fenced investment vehicle with initial state ownership to hold the equity in that project. As each segment of the road is completed, tolls will be imposed with a view to selling the state's interest in these segments to the private sector. The approach is designed to capture the value uplift that the state can achieve by selling stakes in the post-project delivery when there is known traffic demand, compared with selling beforehand when traffic is unknown. This is a very deliberate retention of risk on our part.

Associated with the large pipeline of major projects, we have been grappling with some key issues related to Australian markets' limited capacities for financing and contracting. We have had to stagger our projects to ensure that we have the most appropriate interests bidding on them, as well as to ensure that the government has enough capacity. We are also seeing a limitation around the tenor of bank debt, which has tended to cap out at around seven years. While there is no real volume constraint in the bank market, the tenor is unmatched to the asset life that is being procured. We have less liquid capital markets in Australia to make up for this, and no project bond market. As a consequence, governments in Australia have been looking to expand capital markets in the infrastructure space to relieve some of these constraints. To some extent, these issues have been improving with greater international joint venturing on the construction side and further internationalisation of capital markets.

On the other hand, we have noticed some benefits from procuring multiple large pieces of infrastructure simultaneously. The depth of the infrastructure pipeline, both in NSW and in other states, and the relatively low political risk around the delivery of major projects has encouraged a lot more international contractors and financiers to enter the Australian market. International parties may also have been attracted by the NSW Government's decision to provide a capped amount of reimbursement to consortiums that are unsuccessful in the bidding process, provided they have submitted compliant bids with a transfer of intellectual property to the state.

One of the key requirements for a government to be effective in procuring PPPs is the often overlooked necessity that governments develop and retain a skilled staff that are, in the long term, accountable for the outcomes of procuring infrastructure. Development of a skilled staff should also reduce the reliance on consultants in decision-making processes. For these reasons, we have been building our internal capabilities in both the financing and project delivery areas. For example, we are trying to address the shortage of long-term government-side project directors, who are essential during the bid and delivery phases. Most state governments and the Australian Government have created central infrastructure units in some form, where they can house this kind of specialised expertise.

In conclusion, the overall framework for the use of PPPs in NSW is evolving, but it still needs development. The existence of good legal structures – something that I think we have – is one important factor, but a consistent political will and well-developed markets are also important. It is also imperative to have a well-refined and relatively efficient government procurement framework.

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## 4. Gerassimos Thomas

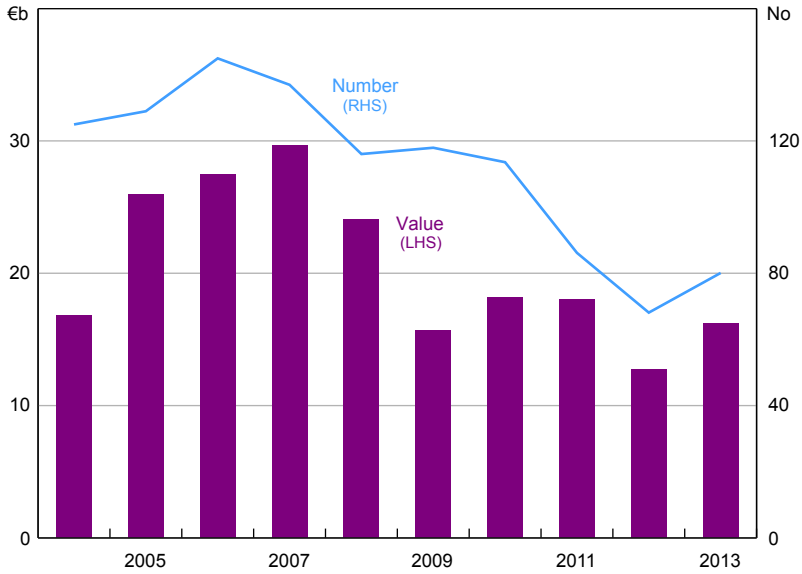
### Lessons learned from Europe

I've been asked to speak about the European experience of using PPPs. The support of PPPs at the European level has its origins in the promotion of the single market, the need to attract private financing to complement constrained public financing and the push to improve infrastructure procurement. Performance so far has been mixed. In terms of efficiency, European PPPs have often performed better than purely public-financed projects at various levels of government, but they have often proved expensive. Even in the areas where public administration is relatively efficient, very rarely is it good at both building and maintaining infrastructure. If we look over the total life of the project we find that there is a lot of benefit in continuing to learn from and improve our PPP model.

PPPs currently only account for a small subset of total infrastructure investment in Europe, at around €16 billion in 2013, and PPP volumes are substantially lower than before the crisis (Figure 1). However, the huge investment needs linked to our energy, climate change, information and communications technology, and transport policies have been driving a renewed interest in PPPs. There are various constraints that oblige us to find solutions together with the private sector. One comes from the government side. The public sector accounts for about one-third of total infrastructure investment in the European Union (EU). But, for fiscal policy reasons, future government investment in infrastructure will necessarily be constrained. Another constraint is bank financing. We estimate that bank financing will be insufficient to meet Europe's long-term infrastructure investment needs. This is why we are trying to promote infrastructure as an asset class and develop capital market solutions to complement bank financing.

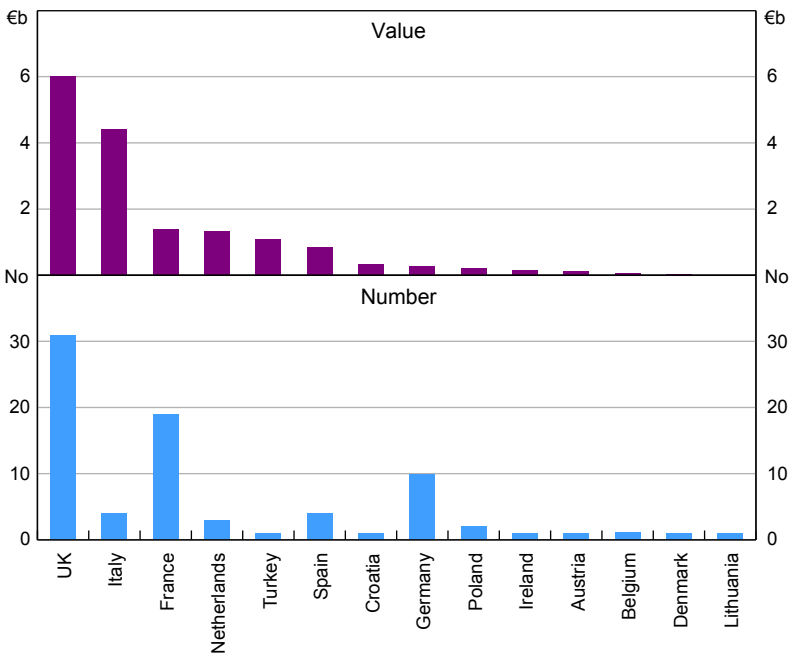
PPP volumes in Europe have been dominated by projects in the United Kingdom, but there are an increasing number of countries using the PPP model (Figure 2). For example, PPP projects have recently been undertaken in Austria, Poland and Lithuania, among others. This may partly reflect the fact that we have had a consistent policy of trying to promote PPPs in Europe for several years now. In 2008, we created the European PPP Expertise Centre (EPEC) with the purpose of sharing existing PPP-related expertise among different EPEC members. EPEC was useful in diffusing knowledge, although it did not have a mandate to help develop a pipeline of projects; in retrospect, this mandate was needed.

**Figure 1: PPPs in Europe**



Source: European PPP Expertise Centre

**Figure 2: PPPs in Europe – by Country**  
2013



Source: European PPP Expertise Centre



In 2009, the EU produced an action plan to promote PPPs. We improved procurement policies to better fit the needs of PPPs and allowed cross-border provision of services (e.g. for maintenance of infrastructure) by the private sector. We also clarified the treatment of PPPs in the national accounts – an issue that was highlighted in the paper by Engel, Fischer and Galetovic (in this volume) – as some governments had, in the past, used PPPs to circumvent fiscal limits.

Going forward, I think the main lesson to take from our experience of PPPs is the importance of looking at projects over their entire life cycle. This is in contrast to the procurement methods of the past, which would often consider only the bidding and construction processes. The second lesson is that we need fiscal transparency. The tightening of the statistical rules around PPP reporting has dealt with this issue. The third lesson is the importance of capacity building within the government to procure, regulate and monitor PPPs.

Another key lesson is that we need transparency in pipeline development. Interaction with the private sector through PPPs obliges us to develop this transparency and helps with the better prioritisation of projects in a true partnership spirit. Lastly, we need to connect more effectively with institutional investors and develop capital market instruments. Our economy has traditionally been financed by banks. We are trying to recalibrate this, but it takes effort.

We believe that all of these lessons that we have learned in Europe are relevant in an international context. International cooperation will also contribute to addressing the issues that we have identified, particularly by increasing transparency and improving skills through the sharing of expertise.

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## 5. General Discussion

The discussion began with one participant describing how the equity investor in a PPP is the residual claimant to any efficiency gains made by the PPP. Given that over the typical lifetime of a PPP there are likely to be many potential efficiency gains, the participant questioned whether some of these gains should be shared with taxpayers. Following on from this, another participant noted that a lot of the focus on PPPs is on the management of downside risk, and asked how the public sector can capture more upside risk. One participant likened the sharing of upside risk to the economic regulation of utilities, under which the cost structure of a utility is regularly reviewed and revised to share the benefits of efficiency gains with consumers. The participant went on to suggest that systematic economic regulation of PPPs may reduce the risk of unpredictable regulatory changes, as mature PPPs often become the focal point of political pressure due to a perception that they are making excessive profits. In response, Peter Regan suggested that it is important for governments to think carefully about how many upside risks they try to capture versus how many downside risks they transfer to the private sector. Mr Regan noted that in most cases, particularly concerning social infrastructure, the extreme downside risk unavoidably remains with the government as it is necessary that certain services are always provided. Mr Regan described some ways in which upside risks are shared between public and private partners, including gains from debt refinancing and revenues from greater-than-expected demand. He also noted that media commentary tends to focus on circumstances where the private partner in a PPP either does very well or does very poorly, but that there are many instances of PPPs that

fall between these extremes. Finally, Mr Regan suggested that reset mechanisms – similar to the economic regulation already discussed – are attractive, but are hard to implement in practice.

There was some discussion around the objective of PPPs. One participant noted that other conference participants had identified a number of objectives of PPPs, including risk transfer, efficient procurement, public budget relief, promoting innovation and efficiency, and reducing poverty. The participant argued that it is difficult to develop policy without a clearly defined objective, and questioned whether PPPs have a commonly accepted primary objective. In response, another participant contended that public budget relief cannot be an objective of PPPs based on the arguments put forward in the paper by Engel, Fischer and Galetovic (i.e. that PPPs do not provide public budget relief once intertemporal accounting has been taken into account). The participant also suggested that the objectives of PPPs may differ from country to country based on differences in political economy. Gerassimos Thomas noted that the area of financial regulation often has multiple objectives, such as ensuring financial stability and promoting financial innovation, and argued that having one objective may not necessarily be optimal.

Another topic of discussion was 'capital recycling'. One participant picked up on the notion that capital recycling provides some insulation of the infrastructure investment decision-making process from political forces. The participant questioned whether these capital recycling schemes allow the associated capital to be subjected to the same types of budgetary processes that allocate spending across the broader range of government imperatives, which could yield greater benefits than infrastructure projects. Mr Regan suggested that, to some extent, the proceeds from privatisation were being used as off-budget funding to deliver PPPs. However, this process has also reflected a genuine release of capital, because 50- to 60-year capital is released and invested in projects that deliver their benefits over the next 20 to 30 years. Mr Regan also noted that the sources of this capital release have also tended to be businesses that are elsewhere operated by the private sector, such as ports and desalination plants.



# Panel Discussion: The Role of Institutional Investors

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The final part of the conference was a panel discussion about the role of institutional investors in infrastructure financing. The discussion was chaired by André Laboul, Head of the Financial Affairs Division at the Organisation for Economic Co-operation and Development (OECD), and included the following panellists:

- Frédéric Blanc-Brude, Research Director at the EDHEC Risk Institute-Asia and an economist specialising in unlisted investments
- Leo de Bever, Chief Executive Officer and Chief Investment Officer at Alberta Investment Management Corporation
- Jan Dehn, Global Head of Research at Ashmore Investment Management
- Michael Hanna, Head of Infrastructure – Australia at IFM Investors
- Shemara Wikramanayake, Head of the Macquarie Funds Group and a member of the Macquarie Group's Executive Committee.

The panel discussion had three sessions. The first was a broad discussion of the role of institutional investors in infrastructure financing. Following on from this was a more specific discussion of issues related to infrastructure investment in emerging market economies. These first two sessions began with a panellist providing some remarks on the topic, before Mr Laboul broadened the discussion to include other panellists and conference participants. The final session was a discussion among the panellists about the different business models employed by institutional investors when investing in infrastructure.

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## 1. The Role of Institutional Investors

The first session of the panel discussion began with André Laboul providing some background on why international organisations, such as the G20 and OECD, are interested in the potential for institutional investors to be involved in the financing of infrastructure investment. Mr Laboul outlined the headwinds facing infrastructure financing in general, including fiscal constraints, the decreasing role of banks due to deleveraging and regulatory reform, and the subdued economic environment in some economies. Despite the existence of a large pool of longer-term funds held by institutional investors, such as pension funds and insurers, these investors have not filled the financing gap left by banks. Mr Laboul attributed this lack of financing to an inadequate business environment in many economies, which includes unstable regulation, opaque governance, lack of expertise and planning, misaligned interests, excessive fees and a lack of data. He went on to describe how, in reaction to this, the G20 and OECD have developed some high-level principles on how to promote long-term investment by institutional investors (OECD 2013). Suggested

policies include developing appropriate financial instruments for long-term savings and improving governance, financial regulation and information sharing. The principles also highlight the importance of rigorous and transparent cost-benefit analysis at all levels of government. A joint G20/OECD taskforce has been asked to develop effective approaches to implementing these principles.

Mr Laboul then asked Frédéric Blanc-Brude to comment on the role of institutional investors in infrastructure financing.

### Frédéric Blanc-Brude

Why is there so much discussion about institutional investors putting money into infrastructure, given that it is not the responsibility of pension funds and insurance companies to finance the economy? There are two major paradigm shifts currently taking place in institutional money management that can help to explain this focus.

1. Direct investment: that is, investing outside of capital markets. This shift has followed the large losses experienced in bond and stock markets during the global financial crisis, and has partly been in response to increased volatility in these markets, which has, for example, made the funding ratios of some pension funds intolerably volatile.
2. Liability driven investment: investors with long-term liabilities, such as pension funds and insurers, manage these liabilities by building a portfolio of assets to match or hedge their duration profile. However, assets with a suitably long duration are not always available and, even if they are, may not have the most attractive yield (e.g. long-dated government bonds).

The results of these two trends are that institutional investors now desire long-term assets that can deliver: a) cash flows with a positive yield spread over government bonds of a similar duration; b) a low correlation with tradeable markets; and c) inflation correlation (particularly in the case of defined benefit pension funds). Infrastructure is meant to deliver all of these features because: a) it is associated with services that typically have a lower price elasticity of demand, so its value is less correlated with the business cycle; b) it often has monopoly features, so it creates pricing power and hence has revenues linked to inflation; and c) it has an attractive yield, partly because of its illiquidity. All of these features imply improved diversification and better liability matching, as well as lower volatility. I call this the 'infrastructure investment narrative'. It makes sense intuitively, but it has been difficult for intermediaries to deliver in practice. There are a large number of listed infrastructure products, but these have failed to decouple from other capital markets. Likewise, unlisted infrastructure funds have proven to be relatively short term, speculative, highly leveraged and expensive for final investors. Therefore, while infrastructure may represent a valid investment option, solid evidence supporting the infrastructure investment narrative is still missing, and fully fledged investment solutions demonstrating the benefits of infrastructure investment for institutional investors remain elusive.

The move toward disintermediated direct investment in infrastructure by final investors provides an alternative avenue for realising the 'infrastructure investment narrative'. However, this creates other issues. One is that it makes diversifying difficult, as individual stakes can be quite large, typically in the hundreds of millions of dollars. A lack of diversification is a problem, as the attractive features of infrastructure I just described are those of an average infrastructure project or a pool

of infrastructure projects, rather than any specific infrastructure project. Direct investing can also be costly, as it requires the institutional investor to internalise the project management skills that had previously been outsourced to infrastructure funds, and therefore requires the investor to be of a sufficiently large scale.

In fact, there is no clear definition of what infrastructure investment actually means from an asset allocation perspective and, as a consequence, there is no benchmark to guide asset allocations, making it difficult to make any significant allocations to infrastructure. The lack of benchmark also impacts the regulatory framework. For example, when it comes to the prudential regulation of insurers under Solvency II, as far as the regulator is concerned infrastructure is high risk because it is long-term and opaque.

To make infrastructure more accessible to institutional investors and better understood by regulators, it is necessary to create long-term infrastructure investment benchmarks. At the EDHEC-Risk Institute, we have defined an eight-step roadmap to create such investment benchmarks (Blanc-Brude 2014). We propose to use project finance under its Basel II definition as a starting point on both the debt and equity sides and have developed rigorous asset pricing models that take the infrequent trading of such instruments into account (Blanc-Brude, Hasan and Ismail 2014). We are now in the process of creating the first global database of infrastructure project cash flows that will make it possible to calibrate pricing and risk models and derive useful investment benchmarks for long-term investors considering infrastructure, as well as for regulators needing better measures of risk for long-term investments.

## Discussion

**Jan Dehn:** I profoundly disagree with the notion that we need benchmarks. Investing is about looking at an opportunity and putting a price on it. Whether it has a benchmark or not is irrelevant. The problem with benchmarks is that people think that once they hold a portfolio with similar weights to the market as a whole they have no risk. But as long as you have any investment whatsoever, you have risk. Benchmarks can distract from the proper prudent management of investments.

**Shemara Wikramanayake:** The infrastructure investment pool goes beyond project-financed assets. There are a few trillion dollars of listed infrastructure assets out there, and deep debt markets for funding these beyond the bank project finance market (e.g. the 144A and term loan B markets in the United States). Consequently, I think that what Frédéric says about benchmarks for project finance is possibly valid, but there are a lot of other places that investors can look to benchmark risks and returns related to infrastructure assets.

Regarding the 'infrastructure investment narrative', many infrastructure assets promise to deliver these desirable features. However, the reality is that they are complex operating businesses. An example is Sydney Airport, which was purchased by a Macquarie managed fund in 2002. That year, there were some large negative shocks to airport traffic, including 9/11, the SARS crisis in Asia and Ansett Australia being placed into administration. But one of the benefits of managing an infrastructure asset is that efficiency gains can be driven through operational improvements; for example, by taking out a layer of management and restructuring contracts with airlines.

**Michael Hanna:** As I listened to Frédéric's opening comments, it struck me that there is a risk that this becomes much more complex than my own personal experience of investing in infrastructure. IFM Investors has been investing in infrastructure on behalf of pension fund investors for almost 20 years, and we have had a very positive experience in investing in infrastructure debt and equity in both the listed and unlisted spaces. Frédéric is potentially making something that has a strong track record for a majority of investors in the space more complex than it needs to be. But I'm a pretty simple person and I like simple models. When we invest, we expect a reasonable rate of return for the risk we are taking. There are, however, some things that complicate matters. For example, there are liquidity constraints arising from the defined contribution system used in Australia.

**Leo de Bever:** There is an obsession among certain national regulators about the liquidity of pricing. If I tried to sell all my holdings in a listed company within 60 or even 100 days I would affect the price dramatically. So the notion that mark-to-market pricing is in some sense efficient is nonsense. Conversely, the notion that unlisted pricing is less volatile is nonsense too, because it is an artificial lack of volatility. I try to look through these things as a long-term investor. But in reality, people are inconsistent; they want me to make long-term returns as long as it makes money in the short run. This is an example of people wanting things that they cannot have.

**André Laboul:** What is the main regulatory obstacle impeding the participation of institutional investors in infrastructure financing?

**Leo de Bever:** The unreliability of regulation. In 2012, Norway unilaterally decided to reduce tariffs on a gas pipeline by 90 per cent. This will probably go to court, and I hope the court will ask the government, 'What part of a contract do you not understand?' There has to be more of that, because if regulation becomes unstable, as it has in a number of countries, the end result will be that there is no more money flowing to those economies. Institutional investors like us will not invest in certain jurisdictions simply because of unreliable contract enforcement and regulation.

**Jan Dehn:** I would very much echo Leo's remarks. However, I would go even further and say that it is not just a country-specific problem. There is a huge global bias in the entire regulatory regime, which emanates from the 2008–2009 financial crisis. Governments have decided that to prevent another financial crisis they are going to institute broad-based financial repression, forcing pension funds and insurance companies to continue to hold the debt of advanced economies and finance governments with large deficits. It is becoming increasingly difficult to allocate capital to emerging markets because of regulatory regimes such as Basel III and Solvency II. On the other hand, these emerging markets are ultimately the economies that are going to have to drive most of the growth in the global economy as advanced economies try to deleverage. Emerging markets face a major challenge as they have to rotate to domestic-led growth from export-led growth. To do so, they cannot just increase domestic demand without increasing domestic supply or they will just create inflation. The only way to sustainably rotate an economy to domestic-led growth is to increase its productivity, and infrastructure is a key part of that. If we want these countries to continue to be able to grow in a non-inflationary sustainable manner, we need to enable them to attract the investment that they need. To do that, we need to dismantle what has become the origin of the next financial crisis, which is this regulatory regime we have imposed. This is unambiguously the single biggest obstacle to infrastructure investment in emerging markets.

**Shemara Wikramanayake:** I agree with Jan that illiquid investment in emerging markets has been hampered by what has gone on since the financial crisis, but quantitative easing has actually flooded emerging markets with liquid investment. It is now flooding away and that has created a lot of disruption. I think all of my fellow panellists would agree that there are a lot of pension funds, sovereign wealth funds and other institutional investors that are looking for liability matching, inflation hedging, diversification, etc, but a lot of factors have hampered their ability to find illiquid investments: there is a lack of local banks that can lend; investors are being forced into US liquid debt markets and are taking currency risk; and there is a lack of good construction companies that investors can partner with. Most of all, there has been a lack of a pipeline of investible projects. Sadly, this does not just apply to the emerging markets. When I was working in the United States between 2004 and 2007, we used to jokingly say that the United States needed a good crisis to stimulate infrastructure investment. But the United States has experienced the mother of all crises and has responded with monetary stimulus, while the fiscal side has not yet responded.

**Leo de Bever:** Following up on Shemara's points, governments send delegations to investors like me to implore us to invest more money in their economies, particularly in their infrastructure. But these delegates do not seem to be the same people who decide which projects go ahead. If the two parties could talk to each other maybe the net result would be a bit better than it has been. There is no point sending delegations to get people to commit money if there are no projects to commit it to.

**Michael Hanna:** Here in Australia, we have a dynamic within the energy sector that is unprecedented, where the carbon tax is about to be removed, the renewable energy target is under review, and a mix of public and privately owned assets is operating in the market with many public assets targeted for privatisation. In general, there is huge uncertainty for any player in the energy sector in Australia, and this policy environment has been in a state of flux for at least five years, to the point where very little money is being invested in this market by private investors. Indeed, the majority of investment in energy that IFM Investors has made in the past seven years has been offshore rather than in Australia. So policy and regulatory uncertainty are key issues. Another issue is the public's concern about the private sector owning and managing what were public assets. I think Australia is slowly getting over this aversion, partly through the use of 'capital recycling' to directly link the proceeds from privatisations to funding new greenfield infrastructure.

**Participant:** The issue of the regulatory regime impeding the flow of capital to illiquid assets such as infrastructure in emerging markets is important. But which channels are the binding constraints? For example, is it banks, insurance companies or some other channel?

**Leo de Bever:** When there is a regulatory hearing on what the rate of return on a piece of infrastructure ought to be, there is often a conflict between a few investors, who are often not from the local economy, and a lot of voters or users of the infrastructure. In this scenario, it is extremely easy for a regulator to side with the voters or users. More often than not, unless the regulator has a spine, the result will be a regulatory decision in favour of the voters or users. That is the big constraint. But the truly negative thing for infrastructure is that investors cannot rely on the consistency of regulation over time. If the mood changes every few years on what regulation should look like, the margin of risk increases.



**Shemara Wikramanayake:** The institutions that are affected by the regulatory issues are primarily banks and insurers. The pension funds are not really subject to the same regulatory risk rating on where they invest, and neither are the liquid debt markets, so capital constraints are not necessarily stopping infrastructure projects from happening. There is currently a lot of interest in investing in pan-Asia on the equity side. Equally, on the debt side, emerging economies have been able to access liquid debt markets. However, I think there are a couple of key challenges for the emerging markets. One is that the large institutional investors, like pension funds and insurers, have difficulty understanding each individual emerging economy because the deal volume is relatively small. As a result, it has been difficult to raise infrastructure funds to invest in individual economies. But now that Macquarie is raising a pan-Asian fund there is a lot more interest because investors do not need to spend as much energy trying to understand the deep details of each individual country.

In relation to Frédéric's point about the importance of quality data, we do lack data. For example, we do not have enough data on the extent to which emerging economies will stick to concessions. This sort of thing is a key risk. Macquarie's infrastructure funds have had some negative experiences in investing in emerging markets. For example, there have been toll roads where the government has decided to cap tolls in breach of concessions, without compensation. Another example was a wind farm where locals blocked our access to the site and the government would not enforce our access rights. For many fund investors, it is difficult (and expensive) to understand these risks or to have people on the ground to address them. I actually think that the biggest challenge for getting capital into infrastructure in emerging markets is related to emerging markets rather than regulation, although regulatory issues do constrain other pockets of investment.

**Participant:** The panellists are quite right in saying that the regulation of Basel III and Solvency II is going to affect the infrastructure investment flow, and that pension funds have become increasingly important in financing investment in emerging markets. Unfortunately, because of the trend towards having a single regulator, central banks in emerging markets are increasingly responsible for regulating pension funds, and they are used to regulating banks. This has led several emerging markets to discuss introducing capital requirements for pension funds, which I find absolutely mystifying. For example, in Kazakhstan capital requirements restricted the ability of pension funds to engage in long-term illiquid investment, and this was used as the motivation for nationalising these pension funds.

**Leo de Bever:** The central banks that do regulate the banking system often make a critical mistake when they regulate pension funds. Banks tend to have a duration mismatch between assets and liabilities, whereas pension funds can ride out things like the global financial crisis with very little effect, unless they are involved in some kind of derivative transaction that needs funding.

**Shemara Wikramanayake:** The G20/OECD report recommends establishing a governance regime to ensure that institutional investors have adequate skills and standards in place (OECD 2013). This should allow these investors to effectively assess their liability profile and make sure that their assets match it. Hopefully regulators will aim to regulate institutional investors such as pension funds in this way, rather than through a regime of capital requirements.

**Participant:** Formulating infrastructure investment as an asset class could promote the development of more standardised financial instruments and facilitate things like insurance. Is this a feasible solution, or are things not that simple?

**Leo de Bever:** At Alberta Investment Management Corporation, we deliberately try to avoid the notion of asset classes. There is only risk and return, and if you calculate the risk you can set the return commensurately. The best opportunities are often found 'between' asset classes, as that is where market inefficiencies usually deliver a better return.

**Jan Dehn:** I could not agree more. The fixed-income universe in emerging markets is valued at around US\$14 trillion, but only 11 per cent of this is included in the main benchmark indices. However, the bulk of investors only look at benchmark indices, which are becoming less representative of the broader emerging market fixed-income universe because the Volcker rule and other regulatory changes have led the big investment banks that create these indices to withdraw from emerging market investment. To the extent that investors are passively following benchmarks, they are becoming more concentrated in what is typically the investment-grade area of emerging market fixed income. Ratings-based regulatory regimes are distinctly biased against the higher-yielding lower-rated securities, and are therefore fundamentally biased against emerging markets. This tends to lead to significant underfinancing in those areas.

**André Laboul:** You are all promoted to minister of finance in your country. What is the first decision you make concerning the role of institutional investors in infrastructure?

**Frédéric Blanc-Brude:** I would involve institutional investors in the tendering of public projects at very early stages. This would help to figure out what types of structures and instruments would be agreeable to their balance sheet, while also meeting the objectives of public procurement.

**Shemara Wikramanayake:** I would follow the recommendations of the paper by Poole, Toohey and Harris (in this volume). I would stick to what the public sector should do, which is to create an environment that promotes infrastructure investment. I would create a prioritised list of infrastructure projects by doing value-for-money analysis. I would also look at the infrastructure assets on my balance sheet, consider whether my constituents should be funding these and ask whether I could liquidate these assets to fund other initiatives. I would also try to develop a transparent tendering process that can work with the market.

**Michael Hanna:** Following my principle of keeping things very simple, I would seek to stay out of the market as much as possible and resist the urge to change things. The Australian market works fine. As I mentioned previously, IFM Investors has been in the market for 20 years and has a hugely successful track record of investing in public infrastructure in Australia. Where we have problems is around regulatory change. Uncertainty really is the enemy of good investing.

**Jan Dehn:** The second-order problem in emerging markets is corruption, scandals and misallocation of capital – things that destroy the business models of infrastructure investors. The first-order problem, however, is fear. Senior government officials fear doing anything that can possibly destabilise their economies, which leads to an unbelievable lack of ambition. If I were finance minister, I would be shaking in my pants with fear every single day and I would do absolutely nothing that in any way could jeopardise my position. And that is probably what is going to continue to happen.

**Leo de Bever:** We need to improve the efficiency of social decision-making. Countries that are desperately in need of infrastructure often find that the opposition to specific projects is fragmented but collectively detrimental to execution. The populace wants governments to

deliver services but is unwilling to pay for them. Unless we square that circle these issues will not disappear. For example, a municipality in Alberta realised that they had been undercharging for water and sewerage, so they put the correct pricing structures in place and were subsequently voted out. This is a prime example of good policy not being rewarded.

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## 2. Emerging Economies and Infrastructure Investment

To begin the second session of the panel discussion, André Laboul invited Jan Dehn to provide his views on the challenges associated with infrastructure investment in emerging economies.

### Jan Dehn

I have already hinted at a number of these challenges, which fall into three broad categories.

One is the overall global macroeconomic environment, which is nowhere near equilibrium: central banks have never printed so much money with so little inflation; governments and corporations have never issued so much debt at such low interest rates; and emerging markets have never had such large foreign currency reserves with such weak exchange rates. There is absolutely nothing sustainable about this whatsoever, and the big question is: how are advanced economies going to reduce their overall stock of debt?

Unless governments in advanced economies are willing to impose austerity on their populations for the next 25 years, or default on their debt, or pull a growth miracle out of their hats, the only way out of this debt is through inflation and, as a result, currency devaluation. This will be extremely detrimental for the emerging economies because their currencies are going to appreciate. As a consequence, they will have to rotate from export-led growth to domestic-led growth. Ashmore invests in 65 emerging economies and these economies vary in their appreciation of this reality – some are very forward looking and are preparing for it, while others are not. The rotation to domestic-led growth requires higher productivity, which is where infrastructure investment comes in. However, the amount of investment necessary to alleviate infrastructure constraints is probably around 10 per cent of emerging market GDP, or around US\$4.5 trillion. This is simply far greater than what can be raised locally. It requires the wholesale investment of insurance companies, pension funds, sovereign wealth funds and potentially even central banks.

The second challenge, which I alluded to earlier, is regulatory change. This will be a constant headwind for emerging economies going forward. One solution would be for the big holders of capital – that is, sovereign wealth funds and central banks in emerging markets – to cut advanced economies out of the loop by selling their US Treasuries and other types of risky assets and instead invest in each other's infrastructure.

The final challenge is within emerging economies themselves. Policymakers' fear of doing anything that would jeopardise their position leads to unambitious policymaking. The question is: how do you get around this, and does that leave any room whatsoever for investing in infrastructure in emerging markets? Public sector infrastructure investment is going to be

insufficient, and this means that the private sector will have to pick up the slack. To encourage this, we need to encourage institutional investors to provide long-term infrastructure financing.

## Discussion

**Participant:** Regulatory uncertainty has repeatedly been brought up as a constraint on infrastructure investment. Regulators sometimes recognise the need to regulate the pricing of monopoly-type assets only after the asset has been sold to the private sector. Shouldn't institutional investors anticipate this when buying an asset with monopoly pricing power and no regulatory framework around it? Is it reasonable to suggest that investors should buy these types of assets only after factoring in that regulatory changes will eventually occur?

**Shemara Wikramanayake:** The potential for regulatory change pushes up the risk premium required by investors when purchasing an infrastructure asset. You need a regime where there will be compensation if the government decides to change regulation after the sale of an asset to the private sector.

**Michael Hanna:** There is a different dynamic for assets that are unregulated. IFM Investors has invested in several unregulated assets recently, but there is always the potential that they could become regulated. We have an in-house view that if you own a monopoly asset, the last thing you should do is act like a monopolist. We run analysis to be sure that we are not earning above what would be a reasonable return if the asset were regulated, because once you start over-earning you have to expect someone to step in and regulate you.

**Frédéric Blanc-Brude:** All public infrastructure has some regulatory risk, so there is no way around it. The only solution is to diversify. If you are a large enough investor, diversification should allow you to stop thinking about the one project with specific regulatory or political risks.

**Participant:** What is the true potential for institutional investors in the market for infrastructure financing? I understand the argument for pension funds – they have long-term liabilities so investing in long-term assets makes sense – but many other institutional investors have shorter investment horizons.

**Frédéric Blanc-Brude:** Defined benefit pension funds have clear long-term liabilities. Moreover, insurance companies also have long-term liabilities, especially if members of defined contribution pension funds want or have to buy annuities from them. The mandate of sovereign wealth funds typically includes preserving the purchasing power of national savings for the long term (i.e. protecting against inflation). Consequently, there is plenty of scope for different types of institutional investors to invest in long-term assets like infrastructure. Furthermore, when institutional investors invest in illiquid assets like infrastructure, they have to hold these for long periods of time because these assets are not easily or quickly divested. Therefore, they cannot be used to satisfy short-term objectives.

**Participant:** What should the multilateral development banks (MDBs) be doing to encourage infrastructure investment in emerging markets?

**Jan Dehn:** Even if one government reneges on a contract, this drives the cost of financing up for all other governments. This is because investors do not know ahead of time whether their counterparty is going to renege. The problem is that governments that are not going to renege

are charged a risk premium that is higher than warranted by their 'true' risk, while governments that are planning to renege are willing to accept the higher financing cost, as ultimately they will not have to pay it. This is a classic market failure – adverse selection. Adverse selection leads investors to favour more liquid, financial-type securities over illiquid investments. One thing that MDBs can do is to try to address this type of market failure.

**Leo de Bever:** I am not currently invested in really low-income emerging economies. But if I were to do it, I would want an MDB alongside me, because the governments of these countries are far less likely to renege on a contract with an MDB.

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### 3. Business Models

To begin the third session of the panel discussion, André Laboul invited Leo de Bever, Shemara Wikramanayake and Michael Hanna to describe the different business models employed by institutions investors when investing in infrastructure.

**Leo de Bever:** The Alberta Investment Management Corporation follows the Canadian model, which can be described as a disintermediated model. The main feature of the model is that around 80 per cent of our assets are managed internally. If you have a large amount of capital and you can afford to hire private sector experts, then you can do things at roughly one-quarter of the cost than if you were to rely on external asset managers. We invest in the unlisted space – about 20 per cent of our total assets – because it gives us an incremental return over listed assets. On occasion we still work on specific projects with institutions like Macquarie, but Macquarie probably finds its clients more in the smaller pension funds that cannot develop the internal asset management capacity that we have. Has this business model worked out? We deliver a return on our assets that is 1–1½ percentage points higher than market, on average. Additionally, we are passionately interested in participating in international infrastructure. Part of this is because there is a socially desirable aspect to it. We have patient capital that can work with countries that have development needs. If there is expansion capital needed we can provide that, whereas a limited purpose fund with a shorter life span cannot. When looking for investment opportunities, we tend to focus on places where that extra flexibility earns a premium.

**Shemara Wikramanayake:** In terms of accessing the infrastructure asset class, the private sector uses a range of instruments, just as they do with other asset classes such as real estate. Leo's fund and the other similar Canadian funds, as well as some Australian funds, are probably at the more evolved end because they have been investing in the infrastructure sector for 15 to 20 years, so they have been able to build in-house expertise. These investment funds invest directly in infrastructure projects and then hold them basically forever, just as they do with direct real estate. Leo's fund has double the allocation to real estate than it does to infrastructure, which probably reflects that the direct infrastructure class is still developing. That is one end of the spectrum. The other end is the small funds using external managers. These funds probably start out by investing in liquid instruments, for example in the listed utilities sector in the United States. This allows them to begin building an understanding of the asset class.

**Michael Hanna:** IFM Investors is a fund manager that was set up by 30 Australian industry superannuation funds because they wanted to access large deals but could not do it themselves. Industry super funds exist only to generate profits for members, and that is very much a philosophy that we share, in that, much like Leo, we have a healthy disregard for intermediaries. Over time, our model has changed; we have had to work with other players in the market to get introduced to deals and we have learned important lessons from this. The key lesson is about the concept of incentive and investment alignment, and our business model has evolved whereby we now have full origination, transaction and asset management capabilities across the three markets that we focus on.

The Productivity Commission (2014) recently released a draft report on public infrastructure that covers the 'inverted bid model', which is something that IFM Investors and the industry fund movement have been promoting for some time. This push has been in response to the lack of alignment between the long-term concession opportunities put to market and the short-term interests that are typically leading the bidding consortia. This is what has really driven the significant toll road failures in Australia in the last 10 years. If the bidder is being rewarded on the basis of submitting the highest demand forecast, then guess what? Bidders will inflate their forecasts to win the bid, and then take their money out before the first car drives on the road, leaving longer-term equity participants to take the hit from lower-than-expected traffic demand when the road eventually opens. To address this, we have suggested that governments should change the procurement model to one where the operator or long-term equity participant is selected first, and then together the government and the equity participant can return to the market and select the most competitive debt package. We believe that this would encourage some major global infrastructure investors to participate in the greenfield public-private partnership market, which they have typically avoided for the past decade.

I also just want to make a comment on unsolicited bids. Some of the states in Australia have formalised a process where the private sector can put forward ideas on how to deliver new infrastructure but still have their intellectual property protected. This gives terrific impetus and incentive to put forward ideas with some comfort that it is not going to be shopped around to the rest of the market.

**Leo de Bever:** Michael touches on something that we haven't discussed yet – the bidding process. The transparency of government bidding processes requires that everyone has access to the same information. But if six parties bid on a certain project, there will be five losers. Broken deals or unsuccessful bids cost organisations like ours a significant amount of money every year. It is incumbent on government to make the bidding process efficient and low cost. But I am constantly amazed at how this is not observed, because it seems that often bureaucrats do not know how to make the trade-off between making the bid process efficient and thorough.

**Shemara Wikramanayake:** In response to Michael, I think IFM is an intermediary just like Macquarie, in that we manage third-party money. I do not think the fact that it is your own money makes you immune to getting things wrong. Sometimes people get it right, sometimes people get it wrong, and we have to accept that as a feature of the free market.

**Michael Hanna:** The problem comes when the manager involved in these bids takes out huge amounts of money in fees before the equity participants see how the asset is going to perform. The point is one of incentive alignment.

**Shemara Wikramanayake:** But is it not the manager's obligation to negotiate the proper fees?

**Leo de Bever:** It took us a long time to figure out how all of that worked. Continuous re-gearing was something that Macquarie really perfected. And I think that is the sort of thing that Michael was talking about – a manager taking out cash long before the investors do. There should be transparency not just during the bidding process but also around where the money goes after the bidding process.

**Frédéric Blanc-Brude:** Under the usual infrastructure project financing model, the construction company is an equity investor. They make money both from equity investment and by effectively invoicing themselves for construction work. If you come in as a pure financial investor, obviously you may want to start asking questions about this – you effectively find yourself in the position of an economic regulator of a utility. I think that is quite an interesting dynamic.

**Leo de Bever:** It is. We bought an energy transmission company in Alberta (Canada), and that's exactly the dynamic that developed. You have a fundamentally different relationship with non-financial partners, for example an engineering or construction firm, because they are not just going to get their money from the investment but also from charging for their services. This kind of dynamic arises any time you have a financial player who needs an operator to manage the asset for them. Not all partners in an infrastructure project have the same incentives, and you have to really understand the differences to be able to make it work in the long run. But there are solutions to it.

**André Laboul:** Leo, I understand that the Government of Alberta is one of your main shareholders. Does this affect your investment strategy?

**Leo de Bever:** No. The only way the Canadian disintermediated model works is if you can park yourself far away from the government. When I was at another investment fund here in Australia, that part of the model broke down. But in my case, I have never had a Canadian provincial or territorial government intervene in any investment decision. It is absolutely essential that you have strong governance. We have an independent board, expert investors and no obligation to anybody other than the pension fund members.

**André Laboul:** Michael, your business model is really an open-ended pooling model. One of your colleagues was also recently talking about 'social privatisation'. Could you elaborate a little on that?

**Michael Hanna:** We were established by 30 superannuation funds and, although we now have over 150 investors, everyone is treated equally. That is, the founding members are treated the same as new investors coming in from Canada or the United States or Europe. With an open-ended model, we do not need to invest within a certain time period, so we invest for the medium to long term for every asset. The open-ended model was not really popular outside of Australia until the last two years, and we had a battle in trying to get asset consultants to recognise that this model actually made sense for a long-dated asset class like infrastructure. We have investors that are in net inflow mode for the next 15 to 20 years, so they do not want us to spend \$20 million buying an asset and then have us sell it within 5 years. They want that asset producing a cash yield and

growing in value over the next 20 years, and they will look to liquidate those exposures when they need to start paying out to their members.

The phrase 'social privatisation' seeks to address the stigma associated with privatisation. The argument we are making is based on the fact that we represent almost six million superannuants in Australia. Rather than those people owning infrastructure assets as taxpayers through state governments, they now own these assets as superannuants, so there has effectively been no change in ownership. We find that this is a powerful concept.

**André Laboul:** Shemara, Macquarie had quite a number of listed funds, but now only has a handful. Could you elaborate on the reason for this?

**Shemara Wikramanayake:** Our listed funds are externally managed infrastructure funds. Basically, what happened with the listed infrastructure market during the global financial crisis is what Frédéric described earlier – listed equities traded just like equities in other assets. And when the prices of these listed assets fell, some big institutional investors bought these assets from the listed market. Does that mean that there is no place for the listed players in infrastructure? I do not think so. There continues to be a thriving listed infrastructure market. The prices of those listed funds that were not privatised during the crisis have bounced back strongly. Much like real estate investment trusts, when the market has extreme events these listed infrastructure assets behave like equities, but when they are trading normally they have less volatility than other equities and trade more as a yield stock. The latest evolution in infrastructure financing is infrastructure debt funds. Banks are being disintermediated from longer-dated assets; previously when you did project finance, the banks were willing to lend at tenors of up to 20 years, whereas now they will only lend at tenors of 5 to 7 years, and at lower leverage levels. The institutional market is stepping in to fill this gap, as the tenor matches their liability profile. I think there will be a range of products that the market will deliver. Some of these will fail, and the market will come up with new innovations, just as has happened in many other asset classes.

**Jan Dehn:** There are a whole bunch of new models evolving in infrastructure financing that are disintermediated. Essentially there are two key ingredients for making these models work. The first is that the government absolutely cannot appear on the investment committee, so it gets no involvement whatsoever in decision-making. The other key ingredient is to have a manager that can sort deal flows.

## References

**Blanc-Brude F (2014)**, 'Benchmarking Long-Term Investment in Infrastructure: Objectives, Roadmap and Recent Progress', EDHEC-Risk Institute Position Paper.

**Blanc-Brude F, M Hasan and ORH Ismail (2014)**, 'Unlisted Infrastructure Debt Performance Management', EDHEC-Risk Institute.

**OECD (Organisation for Economic Co-operation and Development) (2013)**, 'G20/OECD High-Level Principles of Long-Term Investment Financing by Institutional Investors', Developed by the OECD Task Force on Institutional Investors and Long-Term Financing, September

**Productivity Commission (2014)**, *Public Infrastructure: Volume 1*, Draft Inquiry Report, Productivity Commission, Canberra.





# Biographies of Contributors

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Frédéric Blanc-Brude is Research Director at EDHEC Risk Institute-Asia and an economist specialising in unlisted investments from private equity to infrastructure, real estate and other direct and long-term forms of investment. Previously he worked for ten years in the infrastructure finance sector and was actively involved in transactions representing a cumulative value of more than US\$6 billion in Europe, Asia and the Middle East. His current research interests include long-term contracts, discounting, portfolio construction, asset pricing, asset allocation, infrastructure project finance and pension economics. He holds a PhD in Finance from King's College London, an MSc in Finance from the London School of Economics and Political Science, and an MSc in Economics from Sorbonne University, Paris, and is a graduate of the Paris Institute of Political Studies.

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Leo de Bever is the Chief Executive Officer and Chief Investment Officer at Alberta Investment Management Corporation. He is also a member of the Investment Advisory Committee of Dutch pension fund ABP. He began his 39-year career at the Bank of Canada in Ottawa, and has held leadership positions with eight institutions in Canada, the United States, Japan and Australia,

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Guy Debelle is the Assistant Governor (Financial Markets) at the Reserve Bank of Australia, a position he has held since March 2007. In that role, he has oversight of the Bank's operations in the domestic and global financial markets, including the management of Australia's foreign reserves. He briefs the Reserve Bank Board on developments in financial markets at the monthly Board meetings and participates as the Bank's representative in a number of global fora. Guy is the Chair of the BIS Markets Committee and the EMEAP Working Group on Financial Markets. He is the Bank's representative on the BIS Committee on Global Financial Stability. Guy joined the Reserve Bank in 1994. He has also worked at the International Monetary Fund, Bank for International Settlements, Australian Treasury and as a visiting professor in economics at the Massachusetts Institute of Technology (MIT). He graduated from the University of Adelaide with an honours degree in economics, and gained his PhD in economics at MIT.

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Eduardo Engel is currently Professor of Economics at the University of Chile and Visiting Professor at Yale University. He is a Fellow of the Econometric Society and was awarded the Society's Frisch Medal in 2002. He began working on public-private partnerships (PPPs) in the mid 1990s and has consulted on this topic for governments and multilaterals, such as the World Bank, the Inter-American Development Bank and the European Investment Bank. He is a member of the World Economic Forum's Global Agenda Council on Infrastructure and former chair of the Technical Advisory Committee of the Public-Private Infrastructure Advisory Facility in Washington DC. He has also taught short courses on PPPs at various universities and multilateral organisations, such as the International Monetary Fund, the Inter-American Development Bank and the Toulouse School of Economics.

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Ronald Fischer is currently Professor of Economics at the Industrial Engineering Department of the Universidad de Chile in Santiago. His research is on the economics of public-private partnerships (PPPs), the link between financial market inefficiencies and economic performance, and the economics of regulated industries, especially seaports. He has advised several national and multilateral organisations on PPPs, and consulted on this topic in Rwanda, Mozambique and Uganda for the International Growth Centre. He is a member of Chile's PPP Technical Panel, which examines legal and technical controversies between the regulator and private concessionaires. Formerly he was a member of the board of the San Antonio Port Authority (Chile's main port) and the Electricity Expert Panel, which adjudicates conflicts among utilities. He has also been a member of Chile's presidential advisory commissions on financial stability, energy policy and competition law.

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## Michael Hanna

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## Peter Harris AO

Peter Harris is Chairman of the Productivity Commission. Previously he served as Secretary of the Australian Department of Broadband, Communications and the Digital Economy, and the Victorian Government agencies responsible for Sustainability and the Environment, Primary Industries, and Public Transport. He has worked for the Ansett-Air New Zealand aviation group and as a consultant on transport policy. He has also worked in Canada on exchange with the Privy Council Office. His career with the government started with the Department of Overseas Trade and included periods with Treasury, Finance, the Prime Minister's Department, and Transport. He has also worked in the Prime Minister's Office, on secondment from the Prime Minister's Department, as a member of then Prime Minister Bob Hawke's personal staff. In 2013 he was made an Officer of the Order of Australia. He has a degree in Economics from the University of Queensland.

## David Hawes

David Hawes is Principal Infrastructure Specialist at the Department of Foreign Affairs and Trade. He was previously a director of Australia's Indonesia Economic Governance Facility and an Australian-funded infrastructure policy adviser to Indonesia's Ministry of Finance. Prior to this he worked for many years with the World Bank as infrastructure sector coordinator for the Indonesia country program, where he was responsible for policy reviews and projects in the transport, energy, water and sanitation, and telecommunications sectors. His earlier experience includes consulting on major infrastructure projects in Africa, Australia, Europe, China and the Pacific. He holds an MTech in Operations Research from Brunel (London) University and a BSc in Economics and Statistics from the University of Southampton.

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Jim Turnbull is the Senior Capital Markets Advisor for the Local Currency and Capital Markets (LC2) Initiative at the European Bank for Reconstruction and Development and coordinates LC2 Team activities in Russia, Turkey and the Balkans. He has over 30 years of experience in investment banking and funds management, covering debt and equity funds management, foreign exchange, fixed income, derivatives, and treasury management in both emerging and developed markets. Previously he led the project team that created and developed the AsianBondsOnline fixed income portal for the Asian Development Bank. He has significant 'in-country' expertise having acted as team leader for a number of capital market technical assistance projects for several international financial institutions, including the implementation of the Capital Markets Development Master Plan in Thailand, and other development assignments in the Philippines, Vietnam and Serbia. He has written several technical papers on aspects of local capital market development in emerging markets and financial stability. He holds a BCom from the University of New South Wales.

## Maria Monica Wihardja

Maria Monica Wihardja is an economist at the World Bank Jakarta Office. Before joining the World Bank, she was a researcher at the Centre of Strategic and International Studies (Indonesia) and a lecturer at the Faculty of Economics, University of Indonesia. She worked at Bank Indonesia

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## Shemara Wikramanayake

Shemara Wikramanayake is Head of the Macquarie Funds Group (MFG) and a member of the Macquarie Group's Executive Committee. Prior to becoming Head of MFG, she spent 20 years in the Macquarie Capital division and held roles as Head of Macquarie Infrastructure and Real Assets, North America (formerly known as Macquarie Capital Funds) and Head of Prudential, Sydney. In addition, she established and led Macquarie's corporate advisory businesses in New Zealand, Hong Kong and Malaysia. Prior to joining Macquarie in 1987, she worked as a corporate lawyer at Blake Dawson Waldron in Sydney. She holds a Bachelor of Commerce and a Bachelor of Laws from the University of New South Wales.

## Clifford Winston

Clifford Winston is the Searle Freedom Trust Senior Fellow in the Brookings Institution's Economic Studies program. He is an applied microeconomist who specialises in the analysis of industrial organisation, regulation and transportation. Dr Winston has also been co-editor of the annual microeconomics edition of *Brookings Papers on Economic Activity*. Prior to his fellowship at Brookings, he was an Associate Professor in the Transportation Systems Division of the Massachusetts Institute of Technology's Department of Civil Engineering. He has written numerous books and articles that have appeared in such journals as *The American Economic Review*, *Econometrica*, *Review of Economics and Statistics*, *Journal of Economic Literature*, *Bell Journal of Economics* and the *Rand Journal of Economics*. Dr Winston received his PhD in Economics from the University of California, Berkeley, his MSc from the London School of Economics and his AB in Economics from the University of California, Berkeley.

# Glossary

## Alphabetical List of Selected ISO Country Codes

(continued next page)

ISO code	Economy	ISO code	Economy	ISO code	Economy
AD	Andorra	BN	Brunei Darussalam	DJ	Djibouti
AE	United Arab Emirates (the)	BO	Bolivia, Plurinational State of	DK	Denmark
AF	Afghanistan	BR	Brazil	DO	Dominican Republic (the)
AG	Antigua and Barbuda	BS	Bahamas (the)	DZ	Algeria
AL	Albania	BT	Bhutan	EC	Ecuador
AM	Armenia	BW	Botswana	EE	Estonia
AN	Netherlands Antilles	BY	Belarus	EG	Egypt
AO	Angola	BZ	Belize	ER	Eritrea
AR	Argentina	CA	Canada	ES	Spain
AT	Austria	CD	Congo (the Democratic Republic of the)	ET	Ethiopia
AU	Australia	CG	Congo	FI	Finland
AW	Aruba	CH	Switzerland	FJ	Fiji
AZ	Azerbaijan	CI	Côte d'Ivoire	FR	France
BA	Bosnia and Herzegovina	CL	Chile	GA	Gabon
BB	Barbados	CM	Cameroon	GB	United Kingdom (the)
BD	Bangladesh	CN	China	GD	Grenada
BE	Belgium	CO	Colombia	GE	Georgia
BF	Burkina Faso	CR	Costa Rica	GH	Ghana
BG	Bulgaria	CU	Cuba	GL	Greenland
BH	Bahrain	CV	Cabo Verde	GM	Gambia (The)
BI	Burundi	CY	Cyprus	GN	Guinea
BJ	Benin	CZ	Czech Republic (the)	GQ	Equatorial Guinea
BM	Bermuda	DE	Germany	GR	Greece

### Alphabetical List of Selected ISO Country Codes (continued next page)

ISO code	Economy	ISO code	Economy	ISO code	Economy
GT	Guatemala	KR	Korea (the Republic of)	MO	Macao
GU	Guam	KW	Kuwait	MR	Mauritania
GW	Guinea-Bissau	KY	Cayman Islands (the)	MT	Malta
GY	Guyana	KZ	Kazakhstan	MU	Mauritius
HK	Hong Kong	LA	Lao People's Democratic Republic (the)	MV	Maldives
HN	Honduras	LB	Lebanon	MW	Malawi
HR	Croatia	LC	Saint Lucia	MX	Mexico
HT	Haiti	LK	Sri Lanka	MY	Malaysia
HU	Hungary	LR	Liberia	MZ	Mozambique
ID	Indonesia	LS	Lesotho	NA	Namibia
IE	Ireland	LT	Lithuania	NE	Niger (the)
IL	Israel	LU	Luxembourg	NG	Nigeria
IN	India	LV	Latvia	NI	Nicaragua
IQ	Iraq	LY	Libya	NL	Netherlands (the)
IR	Iran (the Islamic Republic of)	MA	Morocco	NO	Norway
IS	Iceland	MC	Monaco	NP	Nepal
IT	Italy	MD	Moldova (the Republic of)	NZ	New Zealand
JE	Jersey	ME	Montenegro	OM	Oman
JM	Jamaica	MF	Saint Martin (French part)	PA	Panama
JO	Jordan	MG	Madagascar	PE	Peru
JP	Japan	MH	Marshall Islands (the)	PG	Papua New Guinea
KE	Kenya	MK	Macedonia (the former Yugoslav Republic of)	PH	Philippines (the)
KG	Kyrgyzstan	ML	Mali	PK	Pakistan
KH	Cambodia	MM	Myanmar	PL	Poland
KN	Saint Kitts and Nevis	MN	Mongolia	PR	Puerto Rico

### Alphabetical List of Selected ISO Country Codes (continued)

ISO code	Economy	ISO code	Economy	ISO code	Economy
PS	Palestine, State of	SN	Senegal	TW	Taiwan
PT	Portugal	SS	South Sudan	TZ	Tanzania, United Republic of
PY	Paraguay	ST	Sao Tome and Principe	UA	Ukraine
QA	Qatar	SV	El Salvador	UG	Uganda
RO	Romania	SY	Syrian Arab Republic (the)	US	United States (the)
RS	Serbia	SZ	Swaziland	UY	Uruguay
RU	Russian Federation (the)	TC	Turks and Caicos Islands (the)	UZ	Uzbekistan
RW	Rwanda	TD	Chad	VE	Venezuela, Bolivarian Republic of
SA	Saudi Arabia	TG	Togo	VG	Virgin Islands (British)
SC	Seychelles	TH	Thailand	VI	Virgin Islands (US)
SD	Sudan (the)	TJ	Tajikistan	VN	Viet Nam
SE	Sweden	TM	Turkmenistan	VU	Vanuatu
SG	Singapore	TN	Tunisia	YE	Yemen
SI	Slovenia	TO	Tonga	ZA	South Africa
SK	Slovakia	TR	Turkey	ZM	Zambia
SL	Sierra Leone	TT	Trinidad and Tobago	ZW	Zimbabwe



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