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**Article**

## Editor's introduction

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# Editor's introduction

Member states of the European Union are facing large infrastructure investment needs over the coming decade as a significant part of the existing assets comes up for renewal in the old member states and the new member states still have scope for raising their infrastructure capital stock. Developing countries are still facing a large infrastructure deficit compared with the Millennium Development Goals, and needs continue to rise with population and economic growth. Moreover, throughout the world, there are new infrastructure needs resulting from mega-trends such as climate change and population ageing. As a consequence, the demand for infrastructure is up, both Europe- and worldwide.

At the same time, the economic and financial crisis has left a deep mark on the supply of infrastructure finance. Finance at longer maturities has become difficult to obtain. Bond finance dried up in the wake of the breakdown of mono-line insurance, and the search for other forms of credit enhancement is still on. Governments enacted large stimulus packages to stabilize aggregate demand. Together with tax revenue shortfalls and increased social expenditure, this brought deficit and debt levels to new peacetime highs, calling for significant and sustained fiscal consolidation going forward. While some of the financing bottlenecks are likely to be temporary, the need for fiscal consolidation is here to stay. If history is any guide, this will affect government investment significantly, including in infrastructure.

As a consequence, more private finance needs to be mobilized to meet the increasing demand. Since this might not happen smoothly or automatically, the market and government failures inherent in infrastructure should be identified and addressed. Against this backdrop, the contributions to the 2010 *EIB Conference in Economics and Finance*, which are compiled in this volume of the *EIB Papers*, discuss to what extent post-crisis infrastructure finance will differ from pre-crisis patterns; the roles of the government and private sector; and how to address the various obstacles to more private infrastructure finance.

This guided tour through Volume 15 follows the structure of the *EIB Conference* by presenting first the main facts and figures about infrastructure finance (Section 1) and then zooming in on the various issues in private investment in infrastructure (Section 2). Section 3 spells out some of the key public-policy issues related to infrastructure finance. Section 4 concludes.

## 1. Facts and figures and the economics of infrastructure finance

At face value, there is a consensus about long-term trends and the crisis impact on infrastructure. The government share was on a sustained decline until the crisis as the private share was growing. The crisis turned this trend upside down, at least temporarily, as private investors drew out of infrastructure, especially the riskier early-stage investments, while stimulus packages meant government investment held up well. In their opening article to Volume 15, **Rien Wagenvoort**, **Carlo de Nicola** and **Andreas Kappeler** demonstrate how inadequate macro and sectoral data availability makes it difficult to establish even these basic facts and figures with precision. Making as comprehensive an analysis as possible despite the data limitations, the authors come up with a quite differentiated picture.

As for the composition of infrastructure finance in Europe, investment is higher in the new member states than in the old, with the difference fully accounted for by higher government financing. Further, project finance, which accounts for less than ten percent of total private finance, has a higher gearing (one to six) than corporate-sector entities such as utilities investing in infrastructure. Moreover, there are large differences in the source of funding across sectors of activity, with the government providing 85 percent of investment finance in the education sector but only one fifth in utilities. As for the crisis impact, the authors' estimates document that project finance was indeed hit hard as bond finance dried up.

More on the facts than on the figures side, the contribution by **Eduardo Engel**, **Ronald Fischer** and **Alexander Galetovic** presents the most important economic insights about Public-Private Partnerships (PPPs) and public procurement of infrastructure investment projects. The article provides a useful conceptual framework that helps to put in a proper context the individual issues discussed throughout the volume. The authors explain that project finance meshes well with the basic economic characteristics of many infrastructure assets – that is, large upfront investment; companies reaching efficient scale even when managing only one physical asset; saving on life-cycle costs by bundling construction and operation; and widespread use of outsourcing the many specialized services. In terms of financing, this implies that sponsor equity and bank loans dominate in the risky construction phase whereas the lower-risk operational phase allows for a higher share of bonds. In terms of organizational form, it makes sense to have a Special Purpose Vehicle (SPV) own and manage the infrastructure asset until the investment cost has been recouped.

Another fundamental observation is that the per-dollar cost of PPP finance exceeds that of government debt, with the difference sometimes labelled as the “PPP premium”. The latter can be ascribed to two sets of reasons: faulty contract design, whereby the SPV has to bear exogenous risk (e.g. demand risk in a fixed-term PPP contract); and the need to give the SPV incentives to aim at life cycle cost savings such as organizational innovations in maintenance.

Finally, based on their analytical insights, the authors take a stance on the fiscal-accounting debate, calling for a need to improve intertemporal fiscal accounting of PPPs to avoid that contingent debt is hidden from the government balance sheet. The authors postulate that the present value of the PPP contract should be considered as government capital expenditure regardless of the PPP’s risk of failure, and government debt should be increased by the same amount. The stream of revenues to the PPP during the operational phase – whatever their source – would then contribute to gradually extinguishing the amount of that PPP debt. To conclude, Engel and his co-authors stress that the main rationale for PPPs is that their organizational form matches the economics of infrastructure projects and contributes to better accountability.

## 2. Private infrastructure finance

The volume then shifts the perspective from a bird’s eye view to that of private investors to examine their benefits from investing in infrastructure assets as well as the obstacles facing them. An important question in this respect, which **Georg Inderst** sets out to answer, is whether infrastructure represents a financial asset in its own right. Infrastructure investments are often said to have several distinct characteristics such as stable, long-term and inflation-protected returns. However, the empirical evidence reported in this article suggests an alternative proposition that treats infrastructure simply as a sector within each of the financing vehicles used (listed and private equity and funds thereof, bonds *etc.*), not least because of the high degree of heterogeneity across and within infrastructure sectors. Participants in the financial markets differ as to how they classify their investments in the infrastructure domain. So the first sobering answer is that infrastructure assets are not a well-defined asset class with a distinct “stylized” risk-return profile.

That said, investors specialising in infrastructure have enjoyed solid returns in the past one and a half decades. For example, unlisted infrastructure funds slightly outperformed private-equity funds as a whole over the period 1993-2007, according to evidence gathered from the worldwide Preqin database. This outperformance also holds for risk-adjusted returns as investments in infrastructure are found to be less risky, on average, than those in many other areas of private equity. Further, infrastructure funds have seen more stable returns over time (*i.e.* over consecutive vintages of funds) than, for example, buyout and real-estate funds where often spectacular returns for the vintages of the first half of this decade were followed by negative returns for funds issued between 2005 and 2007.

Comprehensive data are so far scarcer for the crisis years 2008 and 2009. Nonetheless, it can be said that infrastructure investments have not escaped the financial crisis unscathed. For one thing, the latest pre-crisis vintages of unlisted infrastructure funds have returned only little of the paid-in capital back to investors even though due to the natural “J-like” time profile of returns over the fund’s life, final assessments of

investment multiples and rates of returns can only be made once an infrastructure fund has completed its activity. For another, actual allocations to infrastructure by private-equity investors are below declared targets and increases in allocations have repeatedly fallen short of intentions, too. Still, if investment intentions materialized, one could expect substantial new demand for infrastructure assets in the medium term. To illustrate, a 3-percent asset allocation shift into infrastructure by pension funds worldwide would result in an additional demand of some USD 700 billion, the equivalent of the estimated annual infrastructure investment gap in developing countries.

**Florian Bitsch, Axel Buchner and Christoph Kaserer** present empirical results on the risk-return characteristics of infrastructure investments unaffected by the J-curve by looking only at completed private-equity transactions. Their study is complementary to Inderst's in two further respects. First, they study the risk-return profile of unlisted infrastructure and other private equity at the deal level rather than the fund level. Second, they use a different international data source (CEPRES database). The authors dismiss some widely held views on unlisted infrastructure funds. For example, infrastructure fund investments do *not* have longer duration; more stable cash flows; lower returns; and inflation-linked returns; also, returns do not appear to have suffered, like other private equity, from capital over-supply during the boom years of the mid-2000s. That said, the "conventional wisdom" is proven right on other aspects in that infrastructure deals are found to be more capital intensive; have lower risk; and are uncorrelated with GDP. All in all, the authors cannot confirm the allegedly bond-like characteristics of infrastructure deals.

The striking combination of lower risk with higher returns holds both for the comparison between infrastructure and other private-equity deals and, within the infrastructure realm, for the comparison between Greenfield and Brownfield investments. This could have to do with the fact that the authors look only at equity participations in portfolio companies, and infrastructure deals are known to be highly leveraged, especially when projects are at a more advanced stage. Yet the flip side of higher leverage is higher market risk – as reflected in the positive correlation of infrastructure investment performance to stock market performance – and greater sensitivity of returns to changes in the interest rate compared to other private-equity investments.

### 3. Public-policy issues in mobilizing finance

While the empirical analysis of private infrastructure finance is gradually improving, a full understanding of the determinants of private participation in infrastructure also requires a look at the policy side. The network characteristics of many types of infrastructure and the resulting externalities imply that the government will remain an important player in infrastructure finance. Thus, the relationship between the government and the private sector is at the core of the infrastructure financing problem. Following the typical division of roles, it is for public policy to decide which types of infrastructure to put in place at which network size, to govern the planning and licensing activities and to set the regulatory framework, which determines *inter alia* the price of using the infrastructure services. Within the framework set by public policies, the private sector may then own and operate existing and new infrastructure assets and deliver infrastructure services to clients.

A core economic characteristic of infrastructure is that it involves the creation of long-lived assets with high sunk costs. The marginal cost of providing infrastructure services is thus much lower than the average cost. In the article opening Issue 2 of this volume, **Dieter Helm** argues that the lack of private finance in infrastructure is due to a time inconsistency problem for the government: the latter has to promise prices based on average cost for private investors to come forward; yet once the asset or network is up and running, it is tempted to break the promise and drive prices down to marginal costs to increase the number of users and hence, consumer welfare. In the view of the author, the effects on private infrastructure finance of the 2008-2009 crisis pale against this fundamental regulatory-policy failure. The crisis has merely compounded the urgency of providing a viable exit for private finance to capital expenditure on new infrastructure assets.

Regulatory policy has made some progress towards overcoming the time inconsistency problem, notably by creating Regulated Asset Bases (RABs), which comprise the initial value of the privatised assets *plus* the flows of annual capital expenditure not yet recovered by bill revenues. Helm calls for an extension of the RAB concept to infrastructure more generally through the creation of new RABs. New intermediary institutions such as the Green Investment Bank under discussion in the UK – or other infrastructure banks – could lend additional credibility to new RABs, enhancing the flow of finance to capital formation. The infrastructure bank would buy completed infrastructure investment projects, put a guarantee around them to create RABs and sell the assets to pension funds in a debt-financed package. As an intermediary, the infrastructure bank would require little own capital.

The UK is an interesting case to look at also in terms of the government's role as an infrastructure planner. **James Stewart** sketches the essentials of the new UK Infrastructure Plan. It is an integrated approach to infrastructure planning in that it looks at all spending ministries from a macro perspective; at all financing sources; and announces government allocations for a period of five years. The plan backs regulatory and other actions to encourage greater private-sector investment, for example the creation of the Green Investment Bank. On substance, the plan marks a break with the past decade by increasing government allocations to economic infrastructure, with new scientific research facilities receiving an explicit mention.

The last two articles of this volume broaden the perspective by studying the infrastructure financing problems of developing countries. Clearly, the challenges are bigger in the developing world. As **Antonio Estache** argues, some financing options, *e.g.* the choice between user fees and tax finance, are severely constrained in low-income countries while at the same time investment needs are much bigger. Using the Millennium Development Goals as a benchmark, he shows that the equivalent of almost 7 percent of the developing world's GDP needs to be invested in each of the coming five years, the bulk of it in electricity and transport.

Can the citizens of developing countries afford to pay for these investments? Estache shows that fully private provision of the needed infrastructure is out of reach for average – let alone poor – citizens of low-income countries. Indeed, full cost recovery would imply *per capita* fees equivalent to 25-35 percent of income in South-East Asia and in Sub-Saharan Africa, well above the hardship threshold of 15 percent applied by practitioners. It is therefore not surprising that the extent to which countries attempt to recover infrastructure expenditure is the lower the poorer the region. In the water sector, for example, all countries in South Asia and Sub-Saharan Africa refrain from any cost recovery. Given the low prospects for cost recovery, it is not surprising that private participation in infrastructure is comparatively low in sectors concerned with survival and health (*e.g.* water and sanitation or secondary rural roads) as compared to growth-enabling infrastructure such as telecommunication. All this underlines that in low-income countries, cost recovery issues need to be analyzed from an equity angle as well as the familiar efficiency angle.

Given these circumstances, private commitments in developing countries are quite substantial. Estache estimates that total private commitments represent roughly one fifth of total infrastructure capital expenditure. At less than ten percent, official development aid is a small but indispensable part of total investment.

The author describes how the early enthusiasm about the scope for private infrastructure finance has given way to a more sober assessment. In recent years, the development finance landscape has become very dynamic again as China and other emerging economies have entered the market with attractive terms. These new players increase the amount of finance available but sometimes at the cost of greater political dependence. Looking ahead, what is needed is a policy mix of better planning and construction to bring down the needs, better targeting of consumer subsidies, more competition-friendly public procurement, and speeding up the transfer of knowledge on regulatory best practice, notably with the help of international development agencies that will remain a key player.

Finally, to what extent is climate change exacerbating the challenge to finance infrastructure in developing countries? This is the question that **Marianne Fay, Atsushi Iimi and Baptiste Périssin-Fabert** analyze in their article. It has so far been addressed from the mitigation angle: How to reduce the climate-damaging effects of infrastructure? The novelty here is to address the question also from the adaptation angle: What does it take to make infrastructure more climate-resilient? While mitigation and adaptation needs tend to increase the required capital expenditure, they offer the prospect of significant benefits to society, too. Still, the latter occur later in time than the former, requiring innovative instruments to secure private finance such as the Green Fund proposed by the IMF, green bonds, and an international agreement to incorporate the social cost of carbon in all project appraisals. The authors show that all in all, adaptation needs are relatively small compared to the overall development gap. In fact, what makes societies in developing countries so vulnerable to climate change is the lack of basic infrastructure to start with. But not all is negative. Climate change increases the returns to good management. While more regular maintenance of infrastructure assets would pay for itself in many developing countries already under normal circumstances, it is even more the case in the presence of climate change.

#### **4. Conclusion**

To recap, Europe and the world face growing infrastructure needs in the coming years against the backdrop of severely constrained government finance, calling for greater contributions from private finance. The volume presents several valuable insights into the critical issues that need to be addressed to mobilize more private finance. For one thing, improved contract design would be an important step forward. In particular, only those risks that the private sector can actually control should be allocated to it. For another, uncertainty about the return on infrastructure investment is increased by regulatory failure – in particular governments’ inability to credibly commit to allowing network owners to recoup their capital expenditure. Further policy innovation and learning is required in the area of regulation. Improving RABs as a commitment device and extending them to more infrastructure domains might be a way forward, creating intermediary institutions channelling private debt finance into new RAB-protected infrastructure projects another.

On the financial-market side, the volume shows that private-equity investment in infrastructure is still an under-researched area. More systematic data collection, analysis and dissemination as well as advances in financial theory would provide the kind of public good that many hesitant investors intending to increase the share of infrastructure in their portfolios would welcome. The two pioneering studies on unlisted infrastructure funds in Issue 1 represent a significant step forward in that direction.

In developing countries, infrastructure needs are more acute and some of the standard financing tools are hardly available. What is required, among other things, is a policy mix to improve subsidy targeting, public procurement and regulation. Climate change is shown to further increase the financing need for infrastructure even though the incremental mitigation and adaptation needs are small in comparison to the overall infrastructure deficit. On the upside, climate change increases the returns to good infrastructure management.

Finally, it is worth stressing that the shrinking role of the government as a financier does not mean that infrastructure policy has become any less important. Infrastructure is a genuine public-policy issue, which requires long-term planning regardless of how it is ultimately financed. It is for society to decide what infrastructure the economy needs, when, and where.

*Hubert Strauss*