

POLICY RESEARCH WORKING PAPER

5940

# Beyond Keynesianism

## Global Infrastructure Investments in Times of Crisis

*Justin Yifu Lin*  
*Doerte Doemeland*

The World Bank  
Development Economics Vice Presidency  
Office of the Chief Economist  
January 2012



## Abstract

As the world recovers only slowly from the 2008 financial crisis and Europe is facing a looming debt crisis, concerns have increased that the “new normal”—a period of high unemployment, low returns on investment, high risks, and low growth—may become protracted in advanced economies. If growth remains weak, unemployment rates and debt levels will be slow to recede. Consequently, the global recovery may continue to be fragile for years to come. What the world needs now is a growth-lifting strategy. This strategy could take the form of a global infrastructure initiative. Since debt levels are high, governments in the United States and Europe could increase demand and support growth through

investments in bottleneck-releasing infrastructure projects that are self-financing. An infrastructure initiative should, however, go beyond the borders of advanced countries and include developing countries. Economic and social returns to infrastructure investments tend to be high in developing countries, which have become increasingly important drivers of global growth. At the same time, infrastructure investments require capital goods, most of which are produced in high-income countries. Scaling up infrastructure investment in developing countries could therefore help generate a virtuous cycle in support of a global recovery.

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# **Beyond Keynesianism: Global Infrastructure Investments in Times of Crisis<sup>1</sup>**

Justin Yifu Lin and Doerte Doemeland

JEL Classifications: E61, E62, O18

Keywords: Infrastructure, Growth, Financial Crisis, Fiscal Policy

Sector Board: EPOL

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<sup>1</sup>The authors would like to thank Mansoor Dailami, Jean-Jacques Dethier, Marianne Fay, Zia Qureshi, David Rosenblatt and Volker Treichel for their excellent comments. Julia Barmeier, Dimitris Mavridis, and James Trevino provided outstanding research assistance.

## I. Introduction

1. Although the financial crisis of 2008 officially came to an end in the United States in June 2009<sup>2</sup>, its repercussions continue to be felt across the globe. In many advanced economies, industrial production lingers below pre-crisis levels. Unemployment remains stubbornly high and balance sheets of governments, European financial institutions and U.S. households continue to be weak. In continental Europe's highly-indebted economies, a crisis of confidence has led to plummeting stock markets and widening spreads. Signs of vulnerability are also surging in emerging market economies. The anxiety over a weak global growth outlook is rising. World growth is expected to slow down from 4 percent in 2010 to around 2.5 percent through 2012, as growth in advanced economies is projected to contract (World Bank 2012). The combination of excess capacity, low returns on investment, high risks and lower growth in advanced economies has been referred to as the "new normal."<sup>3</sup> If this "new normal" becomes entrenched, several advanced countries may face a lost decade<sup>4</sup>—with negative consequences for the entire world.

2. What the world needs now is a growth lifting strategy. With a looming public debt crisis in Europe and high public debt levels in the U.S., the private sector should ideally become the driver of growth; however, as long as excess capacity persists and investment risks remain high, private sector investment is likely to remain subdued. In order to reduce debt levels, many governments have turned their attention to implementing austerity measures and structural reforms, but austerity measures bear the danger of further weakening growth and worsening unemployment. Structural reforms, while key to boosting growth in the medium term, will only gain traction once demand increases. This raises the question of how governments can support demand and employment without adding further to debt levels in the medium run. Investments in green technology, education, and infrastructure come to mind. Under current economic circumstances, however, investing in bottleneck-releasing infrastructure projects that are self-financing may be the best option. Infrastructure investments create jobs in sectors such as construction and manufacturing, which have been hit hard by the crisis, while also enhancing countries' future competitiveness and growth. In addition, countries could explore innovative

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<sup>2</sup> According to the Business Cycle Dating Committee of the National Bureau of Economic Research at <http://www.nber.org/cycles/cyclesmain.html>

<sup>3</sup> PIMCO (2009).

<sup>4</sup> For a recent reference to the lost decade, see Lagarde 2011.

financing mechanisms to bring in the private sector and minimize the impact of these investments on the public debt burden.

3. Any growth lifting strategy would need to encompass developing countries which have become increasingly important drivers of global economic growth. Opportunities for investing in bottleneck-releasing infrastructure are limited in advanced economies, which on average tend to already have rather well developed infrastructure. As discussed below, infrastructure needs in developing countries are large and lack of infrastructure is often a key bottleneck to growth. Since infrastructure projects require capital goods, many of which are produced in advanced economies, infrastructure investments in developing countries would also support the manufacturing sector in advanced economies. In addition, as growth in developing countries is lifted, their demand for products produced in advanced economies would increase further, possibly triggering a virtuous circle of mutually reinforcing growth.

4. In the aftermath of the recent crisis, several economists and politicians have expressed skepticism that Keynesian-type stimulus really works. A global infrastructure investment initiative, which scales up bottleneck-releasing infrastructure projects in advanced as well as developing countries, would go beyond the traditional Keynesianism stimulus along several key dimensions. First, instead of increasing government spending in times of crisis “by digging a hole and filling a hole,” it emphasizes that any growth-lifting solution should focus on implementing bottleneck-releasing investments which will not only increase demand in the short-term but also raise longer term growth prospects. Second, the traditional Keynesian stimulus directs spending toward the domestic economy, while this proposal recommends a globally coordinated investment initiative. Finally, a global infrastructure initiative would not necessarily be financed through additional government spending. The government could, however, use existing financial resources, technical assistance and improvements in policies and the institutional environment to make infrastructure projects more attractive for private investors.

5. Several core aspects of this “Beyond Keynesianism” proposal are likely to support its positive impact on world growth. First, fiscal stimulus that is targeted toward high return, bottleneck-releasing investment rather than increasing government consumption is likely to have

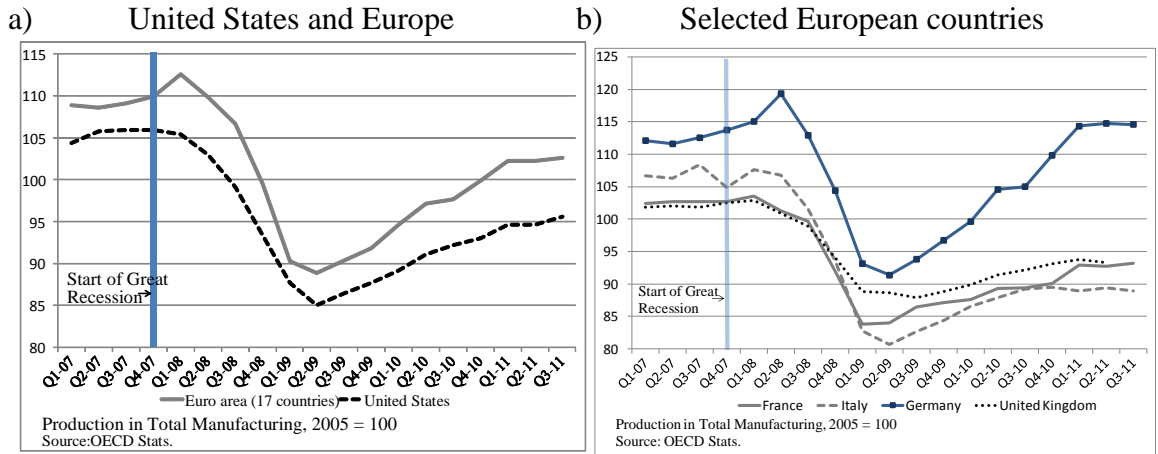
a larger impact on GDP, at least in the longer run. Second, fiscal stimulus that takes place in several countries tends to reinforce itself and its effect can be magnified (Freedman et al. 2009). The recent crisis highlighted the benefits of a global policy response as strong coordination by international financial institutions and governments helped buffer its adverse effects. Third, there is strong empirical evidence that infrastructure investment in developing countries has a large and positive effect on growth and tends to be higher for countries with a lower level of income. These points will be discussed in more detail below.

6. This paper is organized as follows: Section II discusses why advanced economies with excess capacity should continue to invest in infrastructure under the current economic circumstances. Section III focuses on the benefits of infrastructure investment for developing countries. Section IV lays out the global implications of infrastructure investments in developing countries. Section V highlights implementation issues. Section VI concludes.

## **II. Advanced economies – Investing in Infrastructure in Times of Crisis**

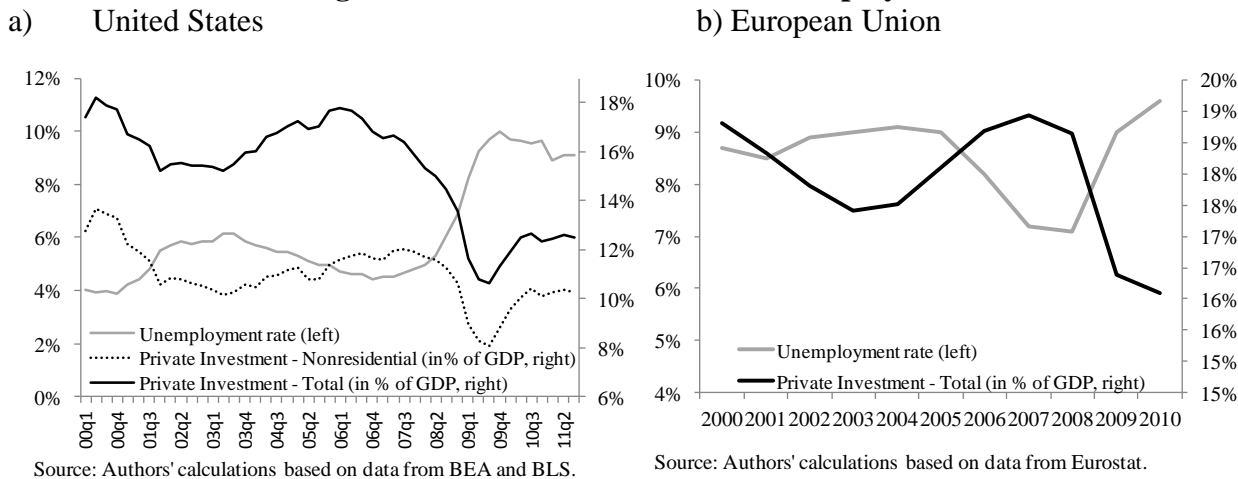
7. More than three years after the start of the Great Recession, manufacturing production in the United States and major European countries, with the exception of Germany, has not yet been restored to pre-crisis levels (see Figure 1). Unemployment remains persistently high in the U.S. and continues to increase in the Euro zone (see Figure 2). These high unemployment rates are putting pressure on government budgets. In the U.S., unemployment aid increased four-fold between 2007 and 2009, climbing from 0.24 percent of GDP to nearly 1 percent of GDP. In Spain, fiscal expenses of the general government related to social benefits in terms of GDP climbed from 15.1 percent in 2008 to 18.1 in 2010. High unemployment rates are also reducing household incomes, weakening demand, and eroding the tax base. As tax revenues fell, social expenditures climbed and governments tried to stem the crisis by recapitalizing financial institutions and stimulating demand, sovereign debt levels in the U.S. and several European countries reached levels that raise concerns about their financial stability.

**Figure 1: Manufacturing production in the United States and Europe**



13. At the same time, private investment has been falling. In countries where unemployment rates increased steeply, housing prices have been falling, weakening household balance sheets even further. This effect was particularly pronounced in the U.S. where the burst of the housing bubble in 2008 triggered a vicious cycle with foreclosures, falling housing prices, and reduced household spending. Private investment fell steeply, largely driven by a decline in residential investments, but given the persistent excess capacity, non-residential investment also remains weak (see Figure 2). Similarly, private investment in Europe has fallen. Good private investment opportunities are hard to find when factories continue to carry spare capacity and office buildings remain vacant.

**Figure 2: Private investment and unemployment**



14. At the same time, the growth outlook of advanced economies has weakened. Without strong growth, it will take a long time to reduce unemployment rates and debt levels. How can advanced economies boost growth without adding further to their already high public debt burden? As long as excess capacity persists and investment risks are high, however, private sector investment is likely to remain subdued. Household consumption is likely to remain depressed as long as unemployment rates are high and households are deleveraging. This raises the question: What can governments do to enhance growth<sup>5</sup> without adding to high debt levels and given that many macroeconomic tools are less effective in the presence of excess capacity?

15. Monetary policy has limited traction if countries are in a liquidity trap; that is, if aggregate demand falls short of productive capacity despite having already close-to-zero short-term nominal interest rates (Krugman 1999). In a liquidity trap, monetary expansion works mainly through affecting inflationary expectations. If people do not perceive the expansion as a change in policy that will persist even after the economy has recovered, however, then even big changes in the monetary base will have little effect on the real economy (Woodford 2011). To make things worse, fears of inflation may even prompt some high-income countries to tighten their monetary policy. This could lead to further financial stress as interest rates and re-financing costs could rise and both banks and firms may find their balance sheets under renewed pressure, bearing the danger that hidden vulnerabilities may be exposed (World Bank 2011a).

16. Structural reforms that, for example, remove barriers to investment, competition, and job creation can contribute to boosting growth. As long as aggregate demand is weak, however, they are likely to provide only little traction in terms of jobs and growth. Governments could also resort to protectionist measures to support industries that have been affected by a steep fall in trade flows. The World Bank's Global Monitoring Report (2009a) notes that, "A pattern is beginning to emerge of increases in import licensing, import tariffs and surcharges, and trade remedies to support industries facing difficulties early on in the crisis." Luckily, contrary to the Great Depression of the 1930s, the 2008-09 recession has not triggered a negative spiral of "beggar-thy-neighbor" policies.

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<sup>5</sup> For an insightful discussion of the role of the government in balance sheet recessions, also see Koo (2009).



17. High debt levels have turned fiscal consolidation into a political priority in several advanced countries. Fiscal consolidation, however, bears the danger of depressing growth. Guajardo, Leigh, and Pescatori (2011) find that a 1 percent of GDP fiscal consolidation reduces real private consumption over the next two years by 0.75 percent, while real GDP declines by 0.62 percent. The authors confirm that large-scale spending based fiscal consolidation is even contractionary in economies with a high perceived sovereign default risk. In turn, weaker growth will put upward pressures on debt levels. In addition, it can breed social unrest, as illustrated in Greece and perhaps to some extent during the recent street riots in the UK.

18. Increasing government spending could be one way to raise demand and reduce unemployment, but given concerns about high debt levels, increases in government spending would have to be compensated by higher fiscal revenues. This could be achieved if governments were to invest in areas with a significant growth impact that are ultimately self-financing and add little to governments' debt service. Given current concerns about financial stability in some high-income countries, this investment scheme would ideally be embedded in a fiscal framework that also aims at tackling long-term fiscal pressures. Alternatively, governments could use existing public resources to leverage private sector investment, as discussed below. Potential areas to target this type of investment could be education, green technology, and infrastructure. But, under the current circumstances, investing in the *right* infrastructure projects may be particularly promising.

19. First, infrastructure investments can generate a significant number of jobs in the short term, and in sectors such as construction and manufacturing that have been hit hard by the crisis. Not only do infrastructure projects create jobs on site, but they also generate indirect employment in tangential industries. Since infrastructure projects use capital goods, such as turbines and excavators, they generate indirectly jobs in the manufacturing sector. This direct and indirect employment raises household incomes and consumption, which can create additional (induced) jobs. For the U.S., it has been estimated that infrastructure for energy, transportation, public schools, and water systems will create 18,000 total jobs for every US\$1 billion in new investment spending, of which about 40 percent will be in the construction sector (Heintz, Pollin, and

Garrett-Peltier 2009).<sup>6</sup> The total impact of infrastructure investment on employment is likely to differ by the sector,<sup>7</sup> the technology used, the percentage of imports (estimated around 12-22 percent of manufacturing supplies for energy, transportation, school building and water infrastructure), and the possible substitution effects.<sup>8</sup> Still, these estimates suggest that the employment impact could be significant.

20. Second, manufacturing jobs are important for sustaining a strong middle class in advanced economies since the manufacturing sector provides employment opportunities in capital-intensive sectors where labor-productivity levels are consistent with the income levels of advanced countries. In many advanced economies, however, the manufacturing sector has been in a steady decline (Lin 2011c, Spence 2011).

21. Third, there is a significant infrastructure gap in some advanced economies. In London, over 20 percent of the main water pipes are more than 150 years old. In the United States, the median age of coal power stations exceeds 40 years (World Economic Forum 2010). The European Commission recently stressed the importance of continuing to invest in infrastructure (European Commission 2011). It estimates that the EU alone needs US\$2.1 trillion to US\$2.8 trillion in infrastructure investments over the next decade to remain competitive.<sup>9</sup> The American Society of Civil Engineers (2009) estimates that the United States needs US\$2.2 trillion of infrastructure spending during the next five years, of which US\$1.18 trillion has not been budgeted. While this could be an upper bound estimate, many government agencies<sup>10</sup> confirm that there is a need for significant infrastructure repairs and upgrades. The recently released Global Competitiveness Report of the World Economic Forum (2011a) ranks the United States 16<sup>th</sup> in the

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<sup>6</sup> Here, infrastructure investments refer to new investments and maintenance. The authors assume that for roads, for example, about 43 percent of public investment in roads went to expand the system and 57 percent toward maintenance. Estimates from the U.S. Highway Administration (2006) are even higher: they find that US\$1 billion in road construction generates a total of 27,840 jobs, of which are created 6,055 on site and 7,790 related to the manufacturing of equipment. This implies that about 14,000 jobs would be created through multiplier effects.

<sup>7</sup> Heintz, Pollin, and Garrett-Peltier (2009) state that US\$1 billion infrastructure investment in either energy, transportation, school buildings, or water creates 16,763, 18,930, 19,262 and 19,769 total jobs, respectively. They find that the highest direct and indirect employment impacts are associated with investments in mass transit systems.

<sup>8</sup> For a detailed discussion, see Schwartz, Andres, and Dragoiu (2009).

<sup>9</sup> The OECD (2006) estimates that global annual investment in telecommunications, land transport, water, and electricity will average 3.5 percent of GDP or approximately US\$2 trillion in 2009 prices for OECD countries.

<sup>10</sup> For example, see the Environmental Protection Agency on water infrastructure gaps at <http://www.epa.gov/ogwdw/gapfact.pdf> or the Federal Highway Administration on roads <http://www.fhwa.dot.gov/policy/2008cpr/index.htm>.

world with respect to its infrastructure and 5<sup>th</sup> with respect to its overall competitiveness, down from its 1<sup>st</sup> place rank in 2005.

22. Governments in advanced economies opting for supporting growth through infrastructure investments in the presence of high debt levels will face the challenge of doing more with less.<sup>11</sup> First, they would need to carefully identify bottleneck-releasing infrastructure projects with a maximum economic impact. These types of investments are not necessarily shovel-ready, requiring the government to make tough choices between speedy disbursements of funds and a more medium-term investment horizon aimed at optimizing the impact of the infrastructure projects. Japan's lost decade tells a cautionary tale. The burst of the Japanese financial and real estate bubbles at the beginning of the 1990s was followed by a decade of sluggish growth. The Japanese government implemented a series of stimulus packages to build roads and bridges and cut interest rates to near zero by 1995. But many of these programs did not produce large economic returns, investment multipliers were low, and growth remained subdued (Krugman 2009) due to the near saturation of many types of infrastructure in Japan. Maximizing the economic impact may also require combining infrastructure investments with investment in other types of capital, such as human capital, to increase the impact on productivity growth. In addition, since many infrastructure projects are financed and implemented at the sub-national government level, a successful implementation strategy would need to be coordinated across different levels of government (OECD 2011).

23. Second, governments could give priorities to bottleneck-releasing infrastructure projects such as bridges or highways, which earn revenues through user fees and thus can be repaid faster.<sup>12</sup> Third, innovative financing mechanisms could use available public funds to leverage private sector financing for infrastructure investments. The current economic uncertainties have prompted many long-term investors, such as pension funds and life insurers, to de-risk their portfolios and to move toward liquid assets. Infrastructure projects, however, require long-term

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<sup>11</sup> Governments should also embed such a stimulus in medium-term budgetary framework that sets debt trajectories on a sustainable path.

<sup>12</sup> For Brazil, Ferreira and Araujo (2008) find that a debt financed increase in the infrastructure stock of 1 percent of GDP in one year would have effectively paid for itself through tax revenues after 20 years. Of course, this result is very sensitive to change in key assumptions, such as the interest rate on government debt, the rate of tax collection and the depreciation of the infrastructure stock.

financing. In addition, private sector involvement tends to be concentrated in specific areas of infrastructure, such as telecommunications, and is more limited in others, such as roads. The government could therefore play a proactive role in attracting more private financing, especially in areas where this type of investment has been limited. The Obama Administration, for example, has backed the creation of a National Infrastructure Reinvestment Bank,<sup>13</sup> which could issue infrastructure bonds, provide subsidies to qualified infrastructure projects, and provide loan guarantees to state or local governments. Loans made by this bank would be matched by private sector investments and each project would generate its own revenues to facilitate repayments.<sup>14</sup> Europe is considering the implementation of a new European 2020 Project Bond Initiative, which would use public guarantees to leverage private sector financing from non-traditional investors, such as pension funds (European Commission 2011). This initiative proposes to invest 1.5 to 2 trillion Euros between 2011 and 2020.

24. Critics may argue that fiscal stimulus with an investment focus has been tried before, especially in the context of the current crisis, and has produced few results. Admittedly, empirical evidence on fiscal multipliers is mixed. Most studies ignore the state of the economy and do not distinguish between investment and consumption spending. Data on temporary, deficit-financed increases of government purchases in the U.S. yields estimates of multipliers ranging from 0.5 to 2.0 (Ramey 2011). However, multipliers are likely to be larger in recessions. Taking the state of the economy into account can lead to very different results (Parker 2011). Christiano, Eichenbaum, and Rebelo (2011), for example, show that the government spending multiplier can be in excess of three when the interest rate is held constant, such as at a zero lower bound in a model with sticky prices. Auerbach and Gorodnichenko (2010) use a nonlinear VAR structure, which allows the estimation of multipliers that differ in recession and in expansion. They find that the cumulative impact of multipliers over five years is higher during the recession, ranging from 1 to 1.5 (versus 0 to 0.5 during boom periods).

25. In addition, few empirical studies distinguish between types of government spending when estimating fiscal multipliers. Using a neoclassical model, Baxter and King (1993) find dramatic effects of public investment on output. If public capital raises the marginal product of

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<sup>13</sup> For more information, see <http://govtrack.us/congress/bill.xpd?bill=112-3259>.

<sup>14</sup> <http://www.whitehouse.gov/blog/2011/11/03/five-facts-about-national-infrastructure-bank>.

private inputs, the output multiplier ranges from 4 to 13 in the long run. Fishback and Kachanovskaya (2010) estimate the multiplier effects of different types of government spending during the New Deal and find that public works had the highest multiplier equal to 1.7. In general, studies of government spending multipliers in recessions and for different types of government spending are limited. Analyzing these questions could be a promising direction for future theoretical and empirical research.<sup>15</sup>

26. There exists, however, strong empirical evidence that infrastructure enhances economic growth. Exhaustive reviews of the literature show that while some authors find negative or zero returns, many find a high impact of infrastructure on growth.<sup>16</sup> Romp and de Haan (2005) undertake a comprehensive review of studies analyzing the relation between public and economic growth, many of which focused on high-income countries. They find in general an elasticity of output with respect to public capital in the order of 0.1 to 0.2. These effects differ significantly across countries, regions, and sectors, however. Using a meta-analysis based on 49 studies on OECD countries, Ligthart and Martin Suarez (2011) report an output elasticity of public capital of 0.14. There exists also some empirical evidence that returns of infrastructure investments in advanced countries tend to be particularly high if these investments complete a network that is already sufficiently developed.<sup>17</sup>

27. Critics of fiscal stimulus spending will point to the “Ricardian trap,” i.e. that government spending is crowding out private spending<sup>18</sup> and argue that scarce empirical evidence supports the fact that fiscal stimulus is likely to have larger economic benefits if it is spent on projects with high economic returns that lead to permanently higher productivity than on projects that consist of “digging a hole and filling a hole.” This is not to say that Ricardian equivalence is a good approximation of reality in the first place. Ricardian equivalence states that households increase savings in anticipation of future higher taxes to pay for debt-financed government spending, offsetting the short-run benefits of fiscal expansionary policies. A considerable literature

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<sup>15</sup> See Ramey (2011) and Parker (2011) for an insightful and comprehensive discussion.

<sup>16</sup> In general, studies using physical indicators of infrastructure stocks find a positive long-run effect of infrastructure on output, productivity, and growth rates, whereas results are more mixed among studies using measures of public capital stock or infrastructure spending flows (Straub 2008, Calderón and Servén 2010).

<sup>17</sup> See Roller and Waverman (2001) for a discussion on telecommunications in 21 OECD countries and Fernald (1999) for a discussion on roads in the U.S.

<sup>18</sup> See, for example Barro (2009, 2010).

considers theoretical conditions under which the Ricardian equivalence may fail, such as if the lifespan of individuals in infinite horizon economies is finite or if idiosyncratic risks exist that cannot be insured. Empirical evidence also does not support the existence of Ricardian equivalence. Solow (2005), for example, argues that it is likely that no more than half of current changes in public saving are cancelled by offsetting changes in private savings.

28. Opportunities for bottleneck-releasing infrastructure investments in advanced economies are likely to be limited, however, since their infrastructure capital stock tends to be on average well developed. Moreover, since developing countries are increasingly becoming key drivers of world growth, any infrastructure initiative should include them. In developing countries infrastructure investments can be truly transformative, as was the case in the United States decades ago. In 1919, when the young lieutenant colonel, Dwight D. Eisenhower, drove from Washington, D.C., to Oakland, California, with the Motor Transport Corps Convoy, it took him 56 days to cover the 3,250 miles, covering an average of 58 miles during daily 10-hour rides. Upon his return, he reported that bridges were destroyed by the convoy, trucks became stuck during rain, and some roads simply could not accommodate quick and easy travel (Eisenhower 1919). Later, as president, Eisenhower promoted the Federal-Aid Highway Act of 1956. In doing so, he envisioned that “its impact on the American economy—the jobs that it would produce in manufacturing and construction, the rural areas it would open up—was beyond calculation” (Eisenhower 1963). Opportunities to transform economies through infrastructure investments still abound in developing countries today—to the benefit of advanced economies.

### **III. Developing Countries - Growth through Infrastructure**

29. Infrastructure shortfalls in the developing world are pervasive. Roughly 1.4 billion people have no access to electricity, about 880 million people still live without safe drinking water, and 2.6 billion are without access to basic sanitation (World Bank 2010b). About 1 billion rural dwellers worldwide are estimated to have no access to all-weather roads within two kilometers (International Road Federation 2010). And per capita electricity consumption in Sub-Saharan Africa (excluding South Africa) averages only 124 kilowatt-hours a year, hardly enough to power one light bulb per person for six hours a day (Foster and Briceño-Garmendia 2010).

30. Lack of infrastructure not only impinges on the daily lives of millions, it also renders firms less competitive as productivity, transaction costs, and output quality are adversely affected. Many businesses are never started, since the required infrastructure services are not available. Nowhere is this as apparent as in Sub-Saharan Africa. As electricity services are poor many firms opt for self-generation,<sup>19</sup> which on average is more than three times more expensive than electricity from the grid (Foster and Steinbuck 2009). As a result, firms in Mozambique, Benin, Burkina Faso, Senegal, the Gambia, Madagascar, and Niger spend more than 10 percent of their total costs on energy, whereas in China, the cost of energy is only 3 percent of total costs. Losses from power failure alone amounted to 10 percent of sales for the median Tanzanian firm compared to only 1 percent for the median Chinese firm (Eifert, Gelb, and Ramachandran 2005). Many Sub-Saharan Africans are also isolated from access to domestic and global markets (World Bank 2009b). Although about two-thirds of its population lives in rural areas and many countries are landlocked, Sub-Saharan Africa has the lowest road density in the world. Not surprisingly, transport costs are high, representing about 16 percent of firms' indirect costs (Iarossi 2009).

31. Going forward, the demand for infrastructure services is likely to increase rapidly in developing countries. The per capita GDP of developing countries is expected to grow at more than 5 percent in the medium-term (IMF 2011a), increasing the demand for infrastructure services. Moreover, the world's population is projected to approach 9 billion by 2050 and more people are likely to move to cities. As a result, the world's building stock is projected to double by 2050 (World Bank 2011c).

32. Infrastructure is not only a by-product of growth, but can also be an important driver of economic development.<sup>20</sup> Economic development in any country is a process of continuous technological innovation, industrial upgrading and diversification, and structural transformation. Countries start with more than 85 percent of the population making a living through agriculture when income levels are low. At this agrarian stage, farmers produce mostly for their own

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<sup>19</sup> This holds particularly true for firms in sectors that are not electricity-intensive and that face significant power outages (Alby, Dethier, and Straub 2011).

<sup>20</sup> Infrastructure in the context of this paper refers to various types of hard infrastructure, such as highways, telecommunications networks, port facilities, and power supplies. It does not refer to soft infrastructure, which consists of institutions, regulations, social capital, value systems, and other social and economic arrangements.

consumption and the need for infrastructure services is limited. When the production moves to manufacturing, economies of scale become larger, and producers will mostly produce for other people and no longer for themselves. As market range expands, good infrastructure will enable entrepreneurs to get their goods and services to market in a secure and timely manner and facilitate the movement of workers to the most suitable jobs (Lin 2011c). In addition, in the presence of global climate change and increasingly intense natural disasters, adequate infrastructure can support sustainable development, minimize vulnerability to natural disasters, and promote reliance on public transportation.

33. Improving infrastructure affects a country's output through a variety of channels. In the short run, infrastructure investment can create jobs and growth in the local economy. In the longer run, it enhances productivity, increases private capital formation<sup>21</sup> (by raising expected returns on private investments as the marginal productivity of inputs increases or transaction costs decline) and facilitates the exploitation of agglomeration economies. Infrastructure may also have a significant effect on health and education outcomes (Agenor and Moreno-Dodson 2006). The construction of all-weather roads in Morocco increased school attendance by girls from 28 percent to 68 percent between 1985 and 1995, as the improvements in roads significantly freed women's time.<sup>22</sup> They also improved health indicators as the number of visits to hospitals and health centers doubled during this time period (World Bank 1996).

34. Empirical cross-country studies confirm that infrastructure investment has a large effect on growth in developing countries. Calderón and Servén (2010a) estimate that as a result of infrastructure investments, annual growth among developing countries increased on average by 1.6 percent between the 1991-95 and 2001-05 periods. This effect was particularly large in South Asia, where it reached 2.7 percent per year. The authors shows that if Sub-Saharan African economies would cut the gap between their level of infrastructure and the average level of infrastructure in Pakistan or India by 50 percent, Central African low-income countries would

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<sup>21</sup> Using data from Uganda, Reinikka and Svensson (1999), for example, find that unreliable provision of electricity is a significant deterrent to investment.

<sup>22</sup> Before road improvements, women had to spend an average of two hours per day collecting and carrying wood for fuel. Butane gas, used extensively in urban areas, did not reach the rural areas due to the high transport and distribution costs. Initially, a bottle of butane cost 20 Dh. Following improvement of the road, the price dropped considerably, to as low as 11 Dh, making it affordable for many families (World Bank 1996).



grow on average by an additional 2.2 percentage points and East and West African countries by an additional 1.6 percentage points (Calderón and Servén 2010a). Similarly, if each Latin American country would match the average level of infrastructure observed among non-Latin American middle income countries (such as Turkey or Bulgaria), growth in Latin America would rise approximately by 2 percentage points per year (Calderón and Servén 2010b).

35. The Chinese experience illustrates the benefits of infrastructure investments. Between 1990 and 2005, China invested approximately US\$600 billion to upgrade its road system. The centerpiece of this investment was the National Expressway Network, which, spanning 41,000 km, was designed to eventually connect all cities with more than 200,000 inhabitants.<sup>23</sup> Only the U.S. Interstate Highway System, with a length of 75,000 km, exceeds its length. Roberts, Deichmann, Fingleton, and Shi (2010) show that aggregate Chinese real income was approximately 6 percent higher than it would have been in 2007 if the expressway network had not been built. Using annual data for the period 1975 to 2007, Sahoo, Dash, and Nataraj (2010) estimate that the output elasticity of infrastructure investment in China is around 0.2 to 0.41 percent. The authors conclude that China's infrastructure investment strategy was successful since it was embedded in an overall economic policy that focused not only on improving physical infrastructure, but also on enhancing private sector investment and human capital formation.

#### **IV. A Global Infrastructure Initiative – For the Benefit of All**

36. The gap between the demand and the supply of infrastructure services is large in developing countries, as it is difficult for developing countries to raise significant amounts of long-term financing, which is required for infrastructure investments. Putting a price tag on this gap requires making heroic assumptions as comprehensive and reliable data, which is required to calculate this gap, is unavailable.<sup>24</sup> Fay et al (2011) estimate annual infrastructure needs in the range of US\$1,250 billion to US\$1,500 billion and a financing gap in the range of US\$175 – 700 billion in

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<sup>23</sup> The length reached 74,100 km by 2010 (National Statistical Bureau 2011).

<sup>24</sup> See Fay et al (2011) for a detailed discussion. To overcome this constraint, the MDB Working Group on Infrastructure (2010) proposed to the G20 to launch an Infrastructure Benchmarking Initiative that undertakes on-going data collection on key infrastructure variables that can be compared across countries and over time.

developing countries in constant 2008 dollars for 2013 under different scenarios.<sup>25</sup> They also estimate that financing for infrastructure projects amounts currently to roughly US\$850 billion in developing countries. Assuming that this amount of financing continues to be available in the medium term, the estimated infrastructure financing gap would be between US\$400 billion and US\$650 billion per year.

37. What would be the impact on exports in advanced economies if this financing gap were to be closed? A US\$1 increase in investment in developing countries is associated with a US\$0.50 increase in imports.<sup>26</sup> In 2009, about 70 percent of traded capital goods from low-income countries were sourced from high-income countries (see Table 1). A US\$1 increase in investment in developing countries is therefore likely to be associated with a US\$0.35 increase in exports from high-income countries. Assuming that an infrastructure gap in the developing world of around US\$500 billion annually were to be closed, the associated demand for capital goods imports worldwide for infrastructure investment alone would correspond to US\$250 billion, of which about US\$175 billion would be sourced from high-income countries. This corresponds to about 7 percent of total capital goods exports from high-income countries in 2010.

**Table 1: Source of capital good imports to developing countries (2009)**

Exporters →	High Income Economies (HIE)				Low and Middle Income Economies (LMI)							
Importers ↓	All HIE	HIEuro <sup>1</sup>	USA	Other HIE	All LMI	EAP	China	ECA	LAC	MNA	SAS	SSA
LMI	69.06%	29.12%	20.65%	19.28%	28.85%	24.09%	17.89%	2.16%	2.02%	0.06%	0.04%	0.47%
LDC	50.69%	32.49%	10.93%	7.27%	48.59%	37.00%	31.21%	1.56%	1.47%	0.23%	0.34%	7.99%
EAP	73.73%	22.34%	14.77%	36.62%	25.58%	24.66%	12.44%	0.37%	0.48%	0.00%	0.02%	0.05%
ECA	62.42%	52.67%	4.90%	4.86%	28.42%	18.99%	18.45%	9.07%	0.22%	0.01%	0.01%	0.11%
LAC	72.59%	15.79%	49.79%	7.01%	26.80%	19.59%	17.78%	0.35%	6.72%	0.00%	0.04%	0.10%
MNA	68.94%	55.95%	6.48%	6.51%	29.18%	22.24%	20.75%	5.68%	0.38%	0.64%	0.07%	0.16%
SAS	50.38%	28.50%	10.14%	11.74%	48.32%	45.02%	39.60%	2.26%	0.66%	0.01%	0.18%	0.19%
SSA	62.25%	44.15%	11.13%	6.96%	35.88%	26.52%	24.44%	0.96%	1.68%	0.17%	0.07%	6.49%

\*Capital goods imports exclude transportation equipment.

<sup>1</sup>HIEuro is comprised of the following high income European nations: Belgium, Cyprus, Denmark, Finland, France, Germany, Greece,

Source: Authors' calculations based on WITS, UN COMTRADE database.

<sup>25</sup> Yepes (2008) presents an estimate of about US\$1.1 billion dollar in 2005 constant US dollars. These estimates are based on the methodology presented in Fay and Yepes (2003), which uses predicted GDP growth to estimate the demand for infrastructure services. This may be considered a lower bound. On the one hand, Yepes (2008) does not estimate infrastructure services required to achieve a given level of growth. On the other hand, detailed country studies provide estimates of the demand for infrastructure services in excess of Yepes' estimates. For Sub-Saharan Africa, Yepes estimates correspond to 94 billion, or 8.9 percent of GDP. A recent study by Foster and Briceño-Garmendia (2010) concludes that expenditure needs for Africa are significantly higher, corresponding to 15 percent to GDP.

<sup>26</sup> Based on 2008 trade data from WITS/COMTRADE.

38. For the United States, it has been estimated that US\$165,000 worth of manufacturing exports in 2008 supported one job (U.S. Department of Commerce 2010). The OECD estimates that on average US\$60,975 worth of manufacturing exports correspond to one job. These estimates suggest that closing the infrastructure gap in developing countries could create between 1.1 and 2.9 million jobs in advanced economies. While these figures might seem small when compared to total unemployment in advanced economies, they would constitute a significant increase in manufacturing jobs. In the U.S., exports currently support 2.7 million manufacturing jobs, and President Obama's National Export Initiative aims at creating 2 million new jobs in the United States over the next five years by increasing exports.<sup>27</sup> The proposed global infrastructure investment initiative could significantly support this objective.<sup>28</sup>

39. Of course, these calculations are based on simple correlations. Ultimately the effect of infrastructure investments on exports and employment will vary across countries and sectors, and will differ depending on the technology used, the possible substitution effects, and the future changes in global trade patterns. Capital goods, for example, are increasingly produced in developing countries, particularly in China. As wages in China rise and as technology progresses, Chinese exporters are moving up the value chain. China's global export market share of construction equipment has increased more than twofold from 4.4 percent in 2005 to 10.2 percent in 2010. In 2011, China may overtake Japan and Germany in construction equipment exports (EIU 2011). Most of the cranes, tractors and steam turbines from China go to developing countries. In general, low-income countries tend to import as much in capital goods from other developing countries, in particular from China, as from high-income countries (Table 1).

40. A good example is power generation, which is a highly capital intensive form of infrastructure investment. Estimates from different types of power plants in India indicate that more than 60 percent and sometimes up to 90 percent of the cost estimates of turn-key power plants and substations are related to a few key mechanical devices, such as turbines and

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<sup>27</sup> The National Export Initiative (NEI) was created on March 11, 2010, by Executive Order.

<sup>28</sup> Of course, infrastructure investments will also create jobs in the developing countries where these investments take place. Schwartz et al. (2009) find that investments in energy tend to have low short-term impact on employment, creating sometimes no more than 1,000 jobs per US\$1 billion spent. To the contrary, water and sanitation can create up to 100,000 annual direct and indirect jobs and road maintenance projects more than 250,000.

compressors, which have to be imported (Pauschert 2009). Turbines of larger power plants are generally produced in factories in the United States and Europe. But a significant share (about 40 percent to 50 percent) of capital for substations today is imported from emerging markets, such as India and China. As can be seen in Table 2, low-income countries import more power generating-equipment from China than from the United States.

**Table 2: Imports of power-generating equipment (2010)**

Exporters →	High Income Economies (HIE)				Low and Middle Income Economies (LMI)							
Importers ↓	All HIE	HIEuro <sup>2</sup>	USA	Other HIE	All LMI	EAP	China	ECA	LAC	MNA	SAS	SSA
LMI	76.47%	34.17%	16.87%	25.43%	19.93%	12.01%	9.89%	4.57%	2.78%	0.22%	0.01%	0.33%
LDC	63.54%	43.79%	6.48%	13.27%	35.41%	27.50%	24.15%	1.53%	0.91%	1.31%	0.07%	4.08%
EAP	81.25%	23.15%	8.68%	49.42%	16.27%	13.72%	9.31%	1.96%	0.54%	0.00%	0.01%	0.04%
ECA	64.24%	51.42%	5.43%	7.40%	23.36%	6.66%	6.49%	16.09%	0.58%	0.02%	0.00%	0.00%
LAC	82.74%	23.80%	46.58%	12.36%	15.67%	5.41%	4.21%	0.50%	9.34%	0.00%	0.00%	0.42%
MNA	82.84%	61.78%	6.74%	14.31%	15.61%	8.15%	7.86%	5.16%	0.35%	1.73%	0.01%	0.21%
SAS	59.50%	32.36%	6.92%	20.22%	38.91%	30.64%	28.76%	7.37%	0.65%	0.17%	0.03%	0.05%
SSA	74.16%	52.17%	6.96%	15.03%	24.91%	18.73%	17.57%	0.80%	2.04%	0.74%	0.00%	2.59%

<sup>1</sup>Power generating equipment corresponds with SITC Revision 4 code 71, which is comprised of steam boilers, steam turbines, internal combustion piston engines, various other non-electric engines and motors, rotating electric plants, and other power-generating machinery and parts thereof not elsewhere specified

<sup>2</sup>HIEuro is comprised of the following high income European nations: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia, Spain, Sweden, and the United Kingdom.

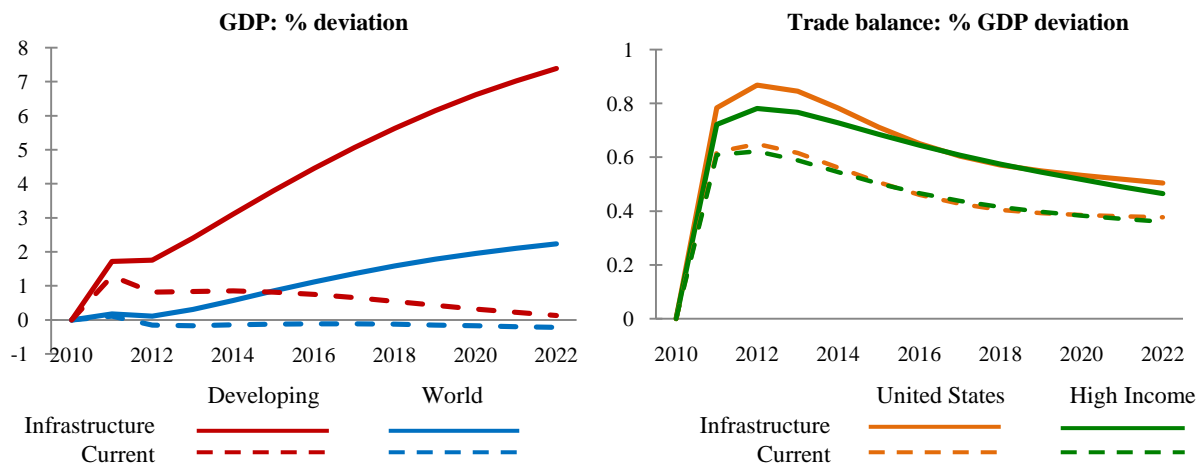
Source: Author's calculations based on WITS, UN COMTRADE database.

41. Simulations confirm that infrastructure investments in developing countries can significantly contribute to a global recovery and improve the trade balance in advanced economies. McKibbin, Stoeckel and Lu (2011) contrast the results of a permanent 1 percent increase of world GDP in government infrastructure investment versus an equivalent increase in current spending on goods and services in developing countries using a multicountry, multisector intertemporal general equilibrium model of the world economy (Figure 3).<sup>29</sup> They find that a rise in current spending leads to only a small increase in output that dissipates over time as a larger stock of government debt acts as a drag on overall economic activity. In contrast, the authors estimate that with a rise in infrastructure investment, GDP in developing countries rises by almost 7 percent over a ten-year period. World GDP rises by about 2 percent. Because spending on infrastructure raises private returns to capital in emerging countries, more capital flows into these economies to finance the expansion of the government as well as the private sector. As a result,

<sup>29</sup> Simulations on infrastructure spending in this paper use the findings of a recent study that used panel data for 88 countries to determine that output rises by 0.8 percent for each 10 percent increase in infrastructure stock (Calderón, Moral-Benito, and Servén 2011).

the trade balance of advanced economies improves by more than when the emerging country spending is purely on goods and services.

**Figure 3: Growth and rebalancing implications of infrastructure versus current spending**



Source: McKibbin, Stoeckel, and Lu (2011). Simulations with G-cubed model. All results are expressed as percent deviations from baseline.

42. A global infrastructure initiative, if properly designed and implemented, could raise exports from and reduce unemployment in high-income countries, while reducing poverty and enhancing growth in developing countries. Infrastructure investment would raise the demand for capital goods from capital good-exporting countries, most of which are advanced economies, as well as raise their exports, employment, GDP, and, ultimately, fiscal revenues. It would also contribute to a diversification of the export base of some capital goods-exporting emerging economies, such as China, reducing their dependencies on export demand from a few high-income countries. A global infrastructure initiative could generate a virtuous cycle of global growth. As the income of developing countries is raised, their import demand for products produced around the globe would increase. Boosting exports in advanced economies would not only reduce unemployment and lift their growth, it would also reduce external borrowing needs, potentially unleashing more surplus global savings in support of investment and growth in developing countries. This in turn would lead to additional investment opportunities and potentially open up new markets. Ultimately, this could create a virtuous, self-reinforcing cycle where surplus global savings flows to support investment and growth in developing countries, which in turn would generate more import demand, thereby reinforcing global growth (Qureshi 2011). Such an initiative could support the global crisis recovery and help the world economy become more inclusive and stable.

## V. Implementing a Global Infrastructure Investment Initiative

43. The successful implementation of a global infrastructure investment initiative in developing countries hinges upon two key factors: First, countries will have to make the best of existing resources by implementing the *right* bottleneck-releasing projects cost-effectively. Second, developing countries will need to raise the funds necessary to close the infrastructure financing gap. As the scope for increasing government spending may be limited in many developing countries and official development assistance (ODA) flows are unlikely to increase in the near future, developing countries will need to look for new innovative financing mechanisms. They could follow the example of recent infrastructure financing initiatives in advanced economics, such as the National Infrastructure Reinvestment Bank in the United States and the Europe 2020 Project Bond Initiative, which use existing resources to attract additional private sector financing. Moreover, governments will need to reduce the risk borne by private investors. The international community could play an important role in assisting countries in overcoming these constraints through targeted financial resources and technical assistance.

### V.1. Implementing the *right*, bottle-neck releasing infrastructure projects

44. Infrastructure projects can be transformational in developing countries. But selecting the *right* bottleneck-releasing projects requires very specific know-how that is not always available in developing countries. Cross-country empirical evidence confirms that the quality of project selection and implementation plays a crucial role in determining the return on investment and ultimately its growth dividend (see, for example, Esfahani and Ramirez 2003). Furthermore, project appraisal and selection capacities, both of which are key for identifying bottleneck-releasing investments, tend to be particularly low in low-income countries (Dabla-Norris et al. 2011).

45. Identifying bottleneck-releasing projects with high economic returns can be very challenging and complex task. First, the institutional context may affect returns of different types of infrastructure projects differently. Second, as a result of decentralization waves in many developing countries, revenue and expenditure assignments related to infrastructure spending

have been pushed to lower levels of government. This requires a comprehensive alignment of fiscal responsibility and accountability, but also coordination in terms of project selection. Third, regional integration could significantly help in reducing infrastructure costs and improving access to regional and global markets. Benefits from exploiting large economies of scale in ports, airports, or power generation and transmission could be reaped through enhanced regional cooperation (World Bank 2009). In Africa, for example, regional power trading could reduce energy costs by US\$2 billion and carbon emissions by 70 million tons annually (Foster and Briceño-Garmendia 2010). Fourth, the long-term growth impact of infrastructure investments may be mitigated if they lead to significant environmental damages. Fossil fuel energy generation, for example, can create emissions that contribute to acid rain and global warming. Irrigation works can lead to overuse of water, land degradation, and water pollution. In total, environmental costs associated with infrastructure investments have been estimated to reach 4 to 8 percent of GDP for some developing countries (World Bank 2007). Supporting environmentally-sustainable infrastructure investment could significantly reduce these costs.

46. Not surprisingly, identifying the *right* projects often requires significant resources aimed at project selection and preparation. Developing a project ideally requires an array of institutional, legal, social, environment, financial, regulatory, and engineering studies. These studies tend to be costly, particularly for complex projects (see World Bank 2011c). For example, project preparation costs for the Nam Theun 2 hydropower project in Lao PDR, with total investments of US\$1.4 billion, amounted to US\$124 million, or 9 percent of investment costs. By one estimate, bringing Africa's key transformational projects to a stage where they can actually attract investors (public or private) would require some US\$500 million (Foster and Briceño-Garmendia 2010). Generally, both governments and the private sector are reluctant to allocate substantial resources upfront to support project preparation activities, however. The international community could help developing countries by providing targeted financial resources and technical assistance.

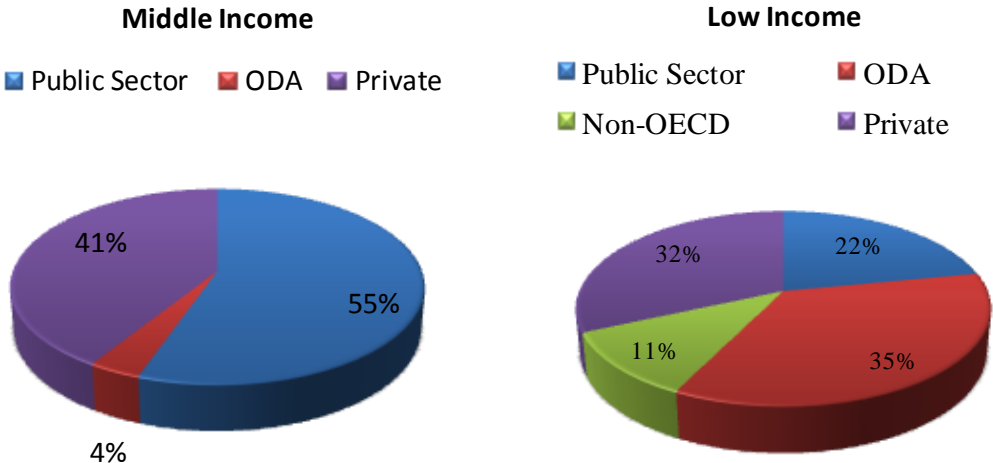
47. Some new initiatives are underway to address these shortcomings. In November 2010, the World Bank Group launched the Infrastructure Finance Center of Excellence, which aims at leveraging Singapore's expertise in urban development and financing and the World Bank's global development knowledge and operational experience to attract more private capital for

public infrastructure projects throughout Asia. The center provides tailored technical assistance to governments on project identification, preparation, and marketing and assists client government in securing project preparation funds via third party facilities (World Bank 2011a). In addition, in the context of G20 meetings, the Multilateral Development Banks have developed an Action Plan which proposes concrete actions to improve project preparation, develop regional projects and help countries to improve spending efficiencies (MDB Working Group on Infrastructure 2011).

**V.2. Closing the financing gap**

48. Public infrastructure projects in developing countries can be financed from taxes, bilateral and multilateral lenders and the private sector. Depending on the stage of development, countries rely more on one type of financing versus another. Official development assistance (ODA) which is lending from multilateral institutions and donors on concessional terms is particularly important for investment in low-income countries, financing about 35 percent of new capital spending (see Figure 4). To the contrary in many middle income countries, infrastructure investments are to a large extent financed by the public sector through taxes. Reliable data on tax-financed spending however is very limited, to some extent reflecting the fact that a significant share of infrastructure spending is moved off-budget.<sup>30</sup>

**Figure 4: Spending by type of financier (annualized flows)**



Source: Foster and Briceño-Garmenida (2010).

<sup>30</sup> In Africa, this is more than 60 percent (Briceño-Garmendia, Smits, and Foster 2008).



49. Increasing tax-financed infrastructure investments is unlikely to close the infrastructure gap in the short-run, especially if growth remains weak. In many developing countries, the tax base is low, tax administration weak and increases in taxation can be highly distortionary. Foster and Briceño-Garmendia (2010) argue that “each dollar raised spent by a Sub-Saharan African government has a marginal cost of public funds of almost 20 percent”. Moreover, if infrastructure financing leads to a crowding out of private sector investment whether through “excessive” levels of taxation or increases in interest rates, its impact on growth will be diminished. In addition, the fiscal space to invest in infrastructure has narrowed for some emerging market economies in the wake of the financial crisis. Still, some governments could make strides in closing the infrastructure gap by spending existing resources more efficiently. The World Bank (2011a) estimates that more than 11 percent of electricity and about 24-50 percent of water is unaccounted for in developing countries. In Africa, as much as US\$17 billion out of an overall spending need of about US\$93 billion could be met, if existing resources were used more effectively. Steps to enhance efficiency include safeguarding maintenance spending, improving the performance of utilities and other service providers, addressing deficiency in public expenditure frameworks, and modernizing administrative and regulatory frameworks (Foster and Briceño-Garmendia 2010).

50. The scope for increasing infrastructure financing from traditional donors seems limited under current economic circumstances. Infrastructure aid doubled between 2006 and 2009, as multilateral creditors scaled up their infrastructure financing to dampen the impact of the financial crisis on developing countries (see Figure 5). Multilateral creditors provided infrastructure financing of around US\$20 billion in 2006 to 2008, which climbed to US\$50 billion in 2009 as the World Bank Group provided record level support of US\$26 billion financing for infrastructure.<sup>31</sup> But since the 2008-09 economic crisis affected several donor countries, it is not unreasonable to expect that infrastructure aid is likely to decline in the years to come. Using panel data from 1977 to 2007, Dang, Knack, and Rogers (2009) find that banking crises in donor countries are associated with a significant decline in aid flows by 20 to 25 percent, starting to increase again only about a decade after the start of the crisis. This decline went beyond any

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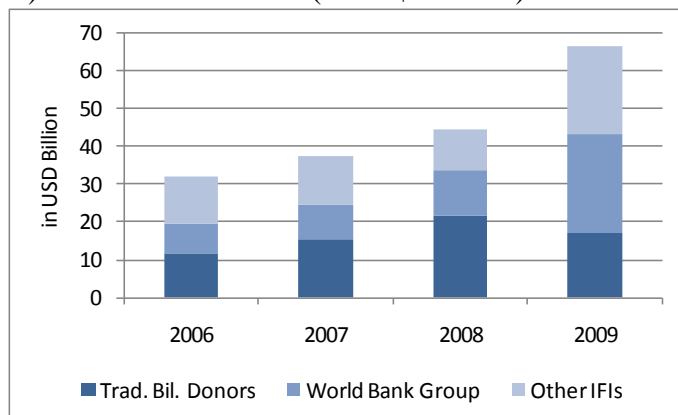
<sup>31</sup> The World Bank Group’s lending for infrastructure was even larger in 2010, but is projected to decline going forward.

income-related effects and was possibly the result of reduced fiscal space and higher debt levels after the crisis.

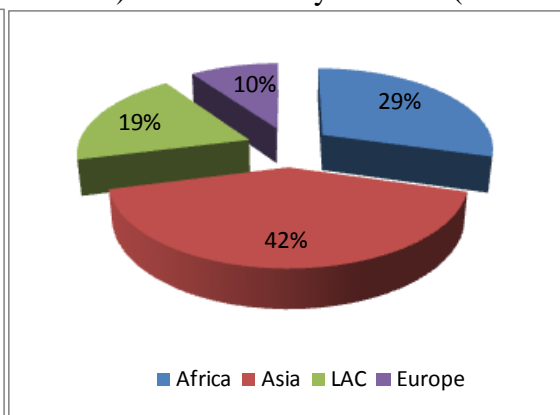
**Figure 5: Aid flows for infrastructure**

*From traditional bilateral donors and international financial institutions*

a) Evolution over time (in US\$ billions)



b) Distribution by Creditor (in 2009)



Source: Authors' calculations based on OECD/DAC database.

51. Several non-traditional bilateral donors, such as China, India, Arab countries and Brazil have financed major infrastructure projects in Africa. Overall, infrastructure resources provided to Africa by these countries through economic agencies jumped from US\$1 billion per year in the early 2000s to around US\$8 billion in 2006 (Foster and Briceño-Garmendia 2010). These investments tend often to be targeted to natural resource rich economies. Sovereign Wealth Funds (SWFs) from some of these countries have also started to invest in infrastructure.<sup>32</sup> Overall, SWFs are estimated to hold more than US\$3.2 trillion in financial assets at the end of 2008 (Klitzing, Lin, Lund, and Nordin 2010). The Emerging Markets Private Equity Association estimates that SWFs allocated approximately 18 percent of their portfolio to non-domestic emerging market investments, but only a small portion of was allocated to infrastructure. In the context of the current economic turmoil, investment opportunities that were once deemed safe and attractive may be losing their appeal, which has the potential to make investments in infrastructure in developing countries more desirable for long-term investors. In addition, many developing

<sup>32</sup> Examples include the China-Africa Development Fund, an equity fund that invests in Chinese enterprises with operations in Africa, which reportedly invested nearly US\$540 million in 27 projects in Africa that were expected to lead to total investments of US\$3.6 billion in 2010. Furthermore, the Qatar Investment Authority plans to invest US\$400 million in infrastructure in South Africa (Klitzing, Lin, Lund, and Nordin 2010).

countries have taken important steps to reduce the risks associated with long-term investments, which include, but are not limited to, implementing sound macroeconomic policies, improving regulatory frameworks, and strengthening capacity for project identification and preparation. In this context, it might however be worth exploring which concrete steps would need to be taken to make infrastructure investments in developing countries more attractive for Sovereign Wealth Funds (SWFs).

52. Some governments could also make more effective use of domestic savings. But in many lower-income countries, local capital markets tend to be illiquid and shallow, with limited secondary market activity and a limited range of short-term instruments, which are generally not suitable for infrastructure investments. Major investors tend to be local banks that prefer short maturities to better match their liability structure. Institutional investors such as pension funds and insurance companies, which tend to hold longer-term liabilities, are often underdeveloped. As a consequence, domestic funding for infrastructure investment is limited and very costly.<sup>33</sup> Looking forward, governments in lower-income countries could take steps to strengthen domestic capital markets. This could include keeping inflation rates low and stable (which tends to be a challenge in countries with a narrow, agricultural or natural resource dominated economic base), developing a well-established yield curve for government bonds that can serve as a benchmark for the corporate sector, and taking steps to enhance the institutional investor base. Improving the domestic capital market would have beneficial effects far beyond infrastructure investments per se. Still, for many low-income countries, the scope of significantly increasing domestic financing in the short-term seems limited if one considers that domestic savings are very low, sometimes even falling short of estimated infrastructure needs.

53. Several emerging market economies have managed to develop local bond markets to support longer-term issuances by infrastructure companies. Still, in others, bank loans play an important role. In China, public banks are providing long-term financing. In Brazil, long-term lending for infrastructure comes from the Banco Nacional de Desenvolvimento Economico e Social (BNDES), a publicly-owned development bank, which lent about US\$25 billion for infrastructure projects in 2009. It provides loans to companies investing in infrastructure and guarantees and

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<sup>33</sup> See, for example, Irving and Manroth 2009.

buys infrastructure bonds issued by some corporations. The BNDES is financed through a combination of retained earnings, foreign funding (including from bilateral and multilateral lenders) and government resources (Walsh, Park and Yu 2011).

54. Several developing countries have also started to tap into international financial markets to finance infrastructure projects.<sup>34</sup> International bond issuances are attractive for infrastructure investments, not only because they enable countries to augment domestic savings and broaden the investor base, but also because they have a back-loaded repayment profile. But they also entail significant risks, which include a reversal in the confidence of international investors, exchange rate exposure, high refinancing needs and potentially large costs-of-carry.

55. But the private sector's role in infrastructure investments has not been limited to these types of financing. It often engages in infrastructure financing through public-private partnerships (PPPs), which are established through a long-term contract between a government and a private investor, bundling investment and service provision into a single long-term contract. The investor (usually a group of private investors) finances and manages the construction of the project, and maintains and operates it over the time of the contract (usually around 20 to 30 years), before transferring the assets to the government. During the operation, the investor receives a stream of payments (for example, through user fees or government payments) as a compensation (see for example, Engel, Fischer and Galetovich 2010).

56. Governments in developing countries have been increasingly interested in attracting Private Public Partnerships (PPPs) for infrastructure investments. One source of information is the World Bank's data base on Private Participation in Infrastructure (PPI)<sup>35</sup> which provides information on infrastructure investment commitments in which private parties assume operating risks. These commitments reached a record high of US\$170 billion in 2010, but have been historically heavily concentrated in a few countries and in one sector, telecommunications. India has been the top recipient of private sector flows in infrastructure since 2006 (see Figure 6). Excluding the top recipients of private sector investments in infrastructure Brazil, China, India, Russia and Turkey, private investment commitments actually fell by around 30 percent between 2007 and 2010 as a

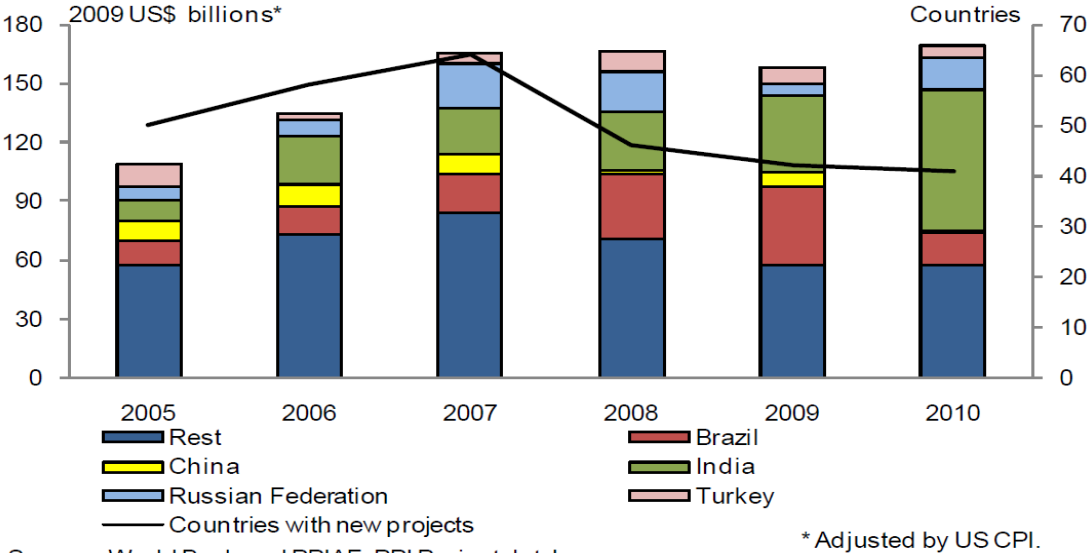
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<sup>34</sup> Senegal and Sri Lanka, for example, issue bonds for infrastructure projects.

<sup>35</sup><http://ppi.worldbank.org>

result of the financial crisis and the number of countries attracting private sector involvement has reached its lowest level since the beginning of the early 1990s. As risk aversion has increased, investors are now seeking lower debt/equity ratios, shorter tenors, and higher overall expected rates of return (Izaguirre 2010). Moreover, total private sector financing going to infrastructure investments in developing countries is still small at the global scale. This raises question which steps countries would need to undertake to increase the appeal of PPPs in developing countries for investors.

**Figure 6: Investment in PPI projects in developing countries**



Source: World Bank and PPIAF, PPI Project database.

57. As infrastructure assets are illiquid, upfront capital financing is large, and repayments often take decades, PPPs entail significant risks for the investor. These risks include higher than projected projects costs; shortfalls in projected revenues, for example, if the demand for the infrastructure services and user-fees is lower than projected; exchange-rate risks if infrastructure financing is provided in foreign currency and if user fees are paid in domestic currency; force majeure; and political and regulatory risks.<sup>36</sup>

<sup>36</sup> In several low-income countries, demand for infrastructure services may simply not be high enough to attract private investors. This is particularly the case in Sub-Saharan Africa where population density is low. As a result, private investment in power, water, or railways has been very limited (Foster and Briceño-Garmendia 2010).

58. Several mechanisms exist that can diversify some of these risks and make investments in developing countries more attractive. Government guarantees can insure against project related risks, such as a shortfall in demand. But they are unlikely to mitigate investors' perception of governmental risk, such as policy reversal, regulatory failure, and concerns of creditworthiness of the government. Multilateral institutions and donors are likely to be better positioned to assume these risks. The World Bank has increasingly made use of guarantees to catalyze private finance by mitigating the risk of default by governments. As 2010, it had approved 36 guarantees, with a cumulative Bank guarantee amount of \$3.8 billion in 28 countries (World Bank 2010) since the beginning of the 1990s. MIGA, the arm of the World Bank that provides political risk insurance for foreign investments, recently adapted its products and expanded the potential applications of its guarantees in order to facilitate the underwriting of infrastructure projects.

59. Even more promising than guarantees that diversify risks, albeit at a cost, is the possibility of actually reducing the risk. This can span a wide range of actions, including improving the regulatory framework and implementing sound macroeconomic policy. In economies with high country risks, investors in infrastructure often ask for real returns on equity in the order of 20 percent or more and a country risk premium of up to 5 percent on debt (Klein 2005). Similarly, Guasch (2004) shows that regulatory risks to investments in Latin America can add up to 6 percent to the cost of capital. Analyzing credit spreads of infrastructure bonds, Dailami and Hauswald (2003) find that projects located in host countries with a stronger legal framework have lower funding costs and tighter spreads. And sustained macroeconomic stability is a key for earning an investment grade rating, which is essential to tap the large savings of institutional investors at attractive prices. Multilateral institutions and bilateral agencies could play an important role by building capacity and supporting improvements in these areas.

60. Public-private partnerships can help governments overcoming temporary budget constraints, but they do not necessarily provide additional financial resources. PPPs change the timing of government disbursements and revenues, but they have little impact on the government's inter-temporal budget constraint,<sup>37</sup> unless they increase the efficiency of the investment (Engel, Fischer, Galetovic 2010). There exists some empirical evidence that private management has been

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<sup>37</sup> With a PPP, the current government can forego the investment outlays, which can be significant for infrastructure projects, but, in turn, the government either relinquishes user fees or future tax revenues.

more efficient than public management (Guasch 2004, Foster and Briceño-Garmendia 2010). At the same time, the cost of PPPs can be significantly higher than under pure public provision (Engel, Fischer, Galetovic 2010).

61. In addition, PPPs can impose significant fiscal risks if not managed carefully. They often include contingent liabilities. These can include minimum revenue guarantees, foreign-exchange guarantees, or commitments from the government to acquire the service from the private holder should demand fall short of projections (Calderón and Servén 2010b). Clear accounting standards for PPPs are often unavailable and infrastructure spending related to PPPs is often moved off budget and the related debt off the government's balance sheet (Engel, Fischer, Galetovic 2003). The associated costs can be significant. Calderón and Servén (2010b) cite the example of Colombia where government guarantees led to fiscal costs that were 50 percent higher than the investment supplied by the private sector. The authors reach the conclusion that credible hard budget constraints on service providers, a comprehensive regulatory framework, and independent regulatory and supervisory bodies are important to contain the fiscal risks associated with PPPs. Little of this may be available in lower-income countries.

62. By choosing infrastructure investments with high economic returns and reducing contingent liabilities, countries can mitigate the impact of infrastructure investments on public debt levels. But there are also other factors to keep in mind. First, if infrastructure financing leads to a crowding out of private sector investment its growth impact will be mitigated, putting upward pressure on debt levels. Second, the ability of the government to capture at least part of the marginal product of infrastructure, whether through taxes or user fees, will determine how the investment affects the country's fiscal sustainability outlook. If, for example, the tax administration is weak and fiscal revenues capture only a small fraction of the extra income, even projects with high growth impacts will weaken government finances. The collection of user fees, on the other hand, may pose significant challenges, especially in low-income countries where the population is poor and administrative capacities weak. Third, government finances will also be affected by the cost of borrowing, which depends on the type of financing, the government's level of debt, and the risk perception of the investors. Debt relief under the Heavily Indebted Poor Countries (HIPC) and the Multilateral Debt Relief Initiatives (MDRI) substantially reduced debt

burden indicators in many low-income countries, enabling them to attract private investors, albeit often at a high cost. Prudent macroeconomic policy, a stable political environment, and good debt management policies could be helpful in improving the costs of borrowing.

## **VI. Conclusion**

63. Public debt and unemployment have reached uncomfortable levels in the United States and Europe. Without strong growth it will be difficult to reduce them significantly in the medium term, but the global growth outlook, and the growth outlook of advanced economies in particular, has weakened. The world needs a growth lifting solution that raises demand but does not add further to already high public debt levels in advanced economies. This solution could take the form of a global infrastructure initiative. Advanced economies could invest in bottleneck-releasing infrastructure projects that create jobs in the short term and raise competitiveness in the medium term. If projects are well chosen, they might be ultimately self-financing, either directly through user fees or indirectly through increases in fiscal revenues. Governments could also take steps to attract more private investors.

64. Since bottleneck-releasing, self-financing infrastructure investments are limited in advanced economies and since developing countries have become an increasingly important driver of global growth, this infrastructure initiative would also need to include developing countries. In November 2010, the G20 declared “to boost and sustain global demand, foster job creation, contribute to global rebalancing, and increase our growth potential” through “investment in infrastructure to address bottlenecks and enhance growth potential” (Group of Twenty 2010). It also highlighted the importance of focusing on concrete measures to reach the Millennium Development Goals and “to make a tangible and significant difference in people’s lives, including in particular through the development of infrastructure in developing countries” (Group of Twenty 2010).

65. For developing countries, infrastructure investments can be a powerful vehicle for transforming their economies through enabling their businesses to work unimpeded and without electricity shortages, facilitating communication, expanding their markets, and, ultimately,



helping them upgrade their technology. But the benefits of infrastructure investment do not stop there. Scaling up infrastructure investment in developing countries would generate much needed manufacturing jobs in advanced countries, raise their exports, reduce excess capacity, and support overall growth. A global infrastructure initiative, where advanced economies invest in bottleneck-releasing infrastructure projects and that closes the infrastructure financing gap of the developing world, could create a virtuous, self-reinforcing cycle where surplus global savings flow to support investment and growth in developing countries, which in turn would generate more import demand, thereby reinforcing global growth and putting the recovery on solid ground. The “New Normal,” a return of pre-crisis growth levels in advanced economies and strong growth in developing countries, could become a new reality.

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