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Agenda

Advancing economics in business

The infrastructure for success: economics in long-term business planning

Infrastructure investment enjoys significant political support globally, even in this 'age of austerity'. What is the economic rationale for this, and how do recent decisions about infrastructure spending compare with historical levels of investment? Here we analyse the trends and characteristics of infrastructure investment by looking at a long time horizon in a range of world economies

In 2010, the UK government made its commitment to infrastructure investment abundantly clear. The Pre-Budget Report introduced Infrastructure UK, a discrete unit within HM Treasury responsible for providing strategic advice and maintaining focus on long-term infrastructure priorities. In its first publication, 'Strategy for National Infrastructure', Infrastructure UK states that:

> The capacity, quality and resilience of national infrastructure in the UK directly affects economic growth, competitiveness in the global economy, national security, the ability to meet climate change objectives, and the quality of life of everyone in the UK. It can be an important source of competitive advantage.[1]

These sentiments were made concrete in October's Comprehensive Spending Review.[2] With a strong emphasis on directing public expenditure towards 'growth enhancing' projects, the government made commitments to 'prioritise economic infrastructure that supports growth'. Crossrail,[3] assistance with the roll-out of superfast broadband, and measures that enable the transition to a low-carbon economy, were all given the go-ahead.

While infrastructure has its benefits, so do many other areas of government spending. In times of economic austerity, what allows investment in infrastructure to jump to the front of the queue?

Balfour Beatty asked Oxera to help it to understand how infrastructure investment interacts with the wider economy. Aspects of the resulting research were incorporated into a presentation given by Balfour Beatty plc at an investor seminar on November 30th 2010.[4] Drawing on that research, here we analyse the long-term trends and characteristics of infrastructure investment.

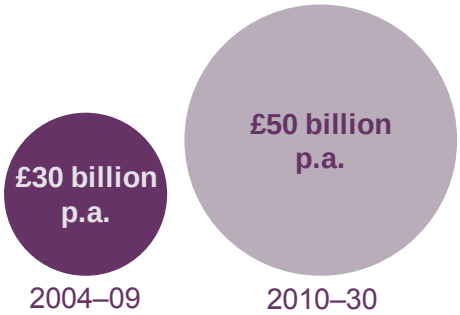
Investment levels are analysed in three stages: the economic rationale behind the political support for infrastructure is set out; for developed economies, the historical levels of investment relative to economic growth are analysed; and, lastly, comparisons are made between the long-term investment trends of different international economies.

Why is investing in infrastructure good for the economy?

Future investment in UK infrastructure seems likely to exceed historical levels by a substantial amount (see Figure 1). This trend is also expected to hold across the globe, with total investment over 2010–20 reaching more than £20 trillion.[5] This is all predicated on the logic that infrastructure is good for economic growth—but what are the specific economic mechanisms that underpin this logic?

First, infrastructure has more than one direct benefit. Improving transport networks, for example, reduces bottlenecks and allows the economy to function more efficiency—put simply, good infrastructure allows more outputs to be produced from the same amount, or cost,

Figure 1 Estimated average annual UK investment in infrastructure



Source: Infrastructure UK (2010), op. cit., p. 5.

of inputs. In the USA, these productivity benefits have been estimated to be six times as high for civil infrastructure (ie, the utilities plus transport) as for other construction activities.[6] Recent disruptions to UK rail and air networks illustrate this point, albeit in reverse. Infrastructure also has the power to allow the expansion of, or connection between, existing markets. The development of Ashford in the south-east of England through its strong transport connections to London and Europe (via High Speed 1 and the Channel Tunnel)[7] is a prime example. These productivity benefits can come about only if the right infrastructure is built in the right places—the cost–benefit analysis of any project remains an important hurdle.

A second mechanism through which infrastructure investment benefits the economy is that its physical construction creates an indirect round of benefits. The long supply chains involved in construction—which requires many inputs, often sourced locally—mean that other sectors experience higher demand as a consequence of investments in infrastructure. In the UK, the Office of National Statistics (ONS) estimates that this 'trickle-down' effect of construction-related activity is over 11% higher than the average of all other economic activity.[8] It is argued that there may even be further benefits—the additional demand may ripple through the economy, creating additional employment and consumer expenditure in several sectors up and down the various supply chains.

Together, these direct and indirect benefits create a link between investing in infrastructure and economic returns. Because the immediate short-term returns may well exceed other areas of government expenditure, it is no surprise that infrastructure investment—given appropriate investment opportunities—is often seen as an efficient part of any fiscal stimulus. Furthermore, the long-term productivity benefits make infrastructure investment a vital component of any long-term growth strategy.

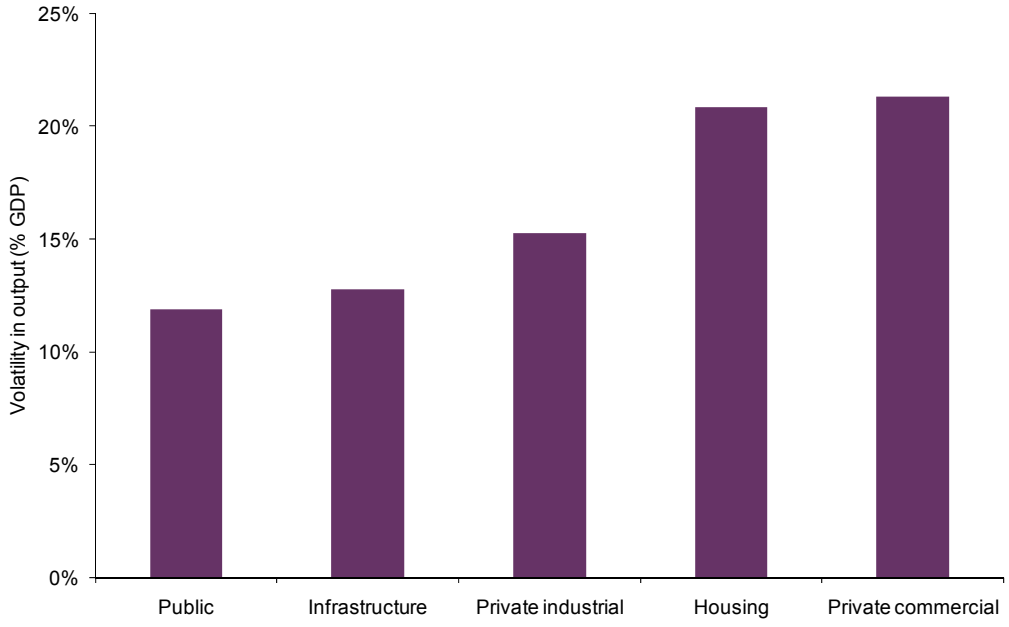
The specific type of investment and the economic return will vary in several ways. Productivity gains are likely to be greatest when the increase to the infrastructure stock is in the form of a new network rather than extensions or repair and maintenance to an existing network—for example, establishing the US interstate highway improved productivity significantly in comparison to the additional roads added after 1973.[9] Continually building new roads will not continually boost productivity.

The type of infrastructure can also lead to a different profile in the economic returns: civil infrastructure has been found to have larger returns that are realised over a shorter timeframe than social infrastructure (education and health).[10]

Does the recent commitment to infrastructure mark a change of policy?

Historical levels of infrastructure expenditure indicate that the recent policy commitments are nothing new. Indeed, the economic rationale set out here—that

Figure 2 Comparison of volatility in construction output as a proportion of GDP in the UK



Note: Volatility is measured as the standard deviation of annual construction output. Output values as a proportion of GDP have been de-trended and mean-adjusted. Public construction includes primarily entertainment and agriculture.
Source: Oxera analysis of ONS data.

infrastructure and economic growth are closely linked—has also been adhered to in the past. In the UK, USA and Canada, investment in infrastructure as a proportion of national income has remained broadly constant over a 50-year period (see Figure 3).

The historical data for these countries also highlights two other factors. First, investment in the UK has generally been lower than in the USA and Canada. Second, investment in the UK appears to have been more stable than in the other countries. One key differentiating factor is the larger landmass and topographical challenges of the USA and Canada. More distance and more people simply mean that larger and more expensive networks are required. This is most evident when networks are first established—notable examples are the creation of energy and transport networks in Canada (hydro-electric power) and the USA (interstate highway). Several other factors may also contribute, such as the requirements and benchmarks for infrastructure quality in each country.[11]

Comparing these patterns to those in other construction sectors provides an additional perspective. It might be that all construction has similar patterns of output due to the long build times and the indirect benefits of construction (the trickle-down effect). However, this does not appear to be the case: infrastructure output as a proportion of GDP has been less volatile than construction output in the residential and private sectors (see Figure 2); only public construction has been less volatile. Infrastructure investment relative to GDP is more stable than most other types of construction.

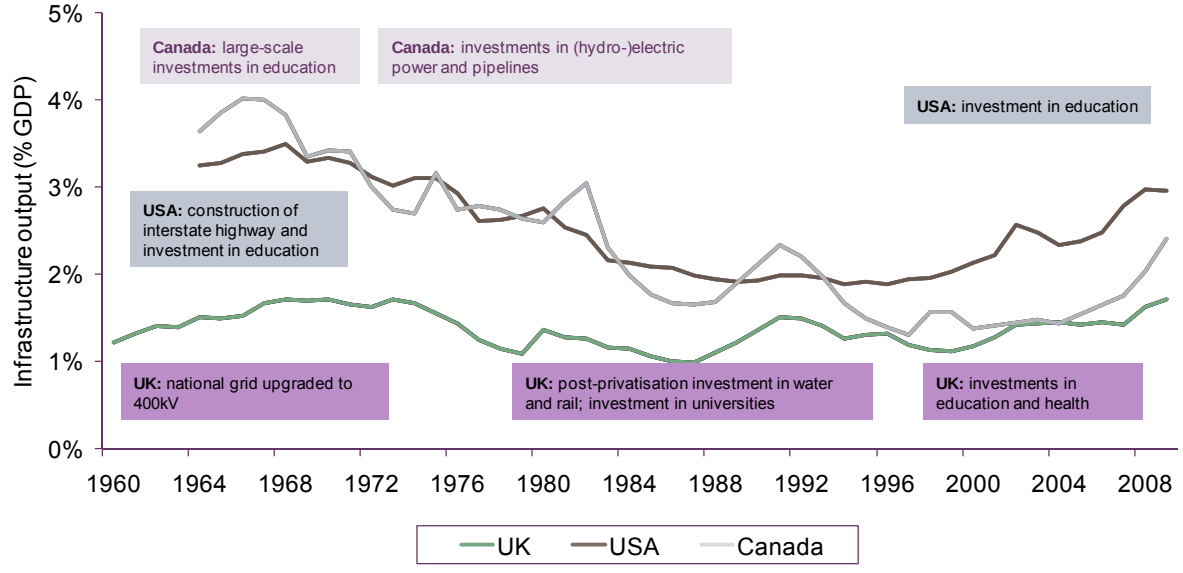
Overall, it appears that there has been a continued commitment to infrastructure investment in the UK. Furthermore, the link between infrastructure and economic growth appears stronger than for other sectors of construction. The findings are comparable in the USA and Canada; the main differences being that their greater landmass than the UK means that establishing and enhancing networks can lead to larger and more 'lumpy' levels of expenditure. Despite the recent recession, the latest policy commitments do not suggest that these historical patterns will be substantially different in the near future.

Infrastructure as the road to development

Looking beyond developed economies, not all countries have had the same experience with infrastructure and growth. Levels of infrastructure stock and economic development vary a great deal, albeit there is one common pattern: investment in long-term assets appears to be positively linked to economic growth. High growth has typically been accompanied by high investment, and low growth by low investment. This holds across a wide range of countries (see Figure 4).

The economies considered earlier—the UK, USA and Canada—are all positioned in the bottom left of Figure 4, with the average economic growth across these three countries being around 2.8%, and investment as a proportion of GDP being around 3.7%. High-profile emerging economies, such as India and China, appear in the top right of the figure. The average economic

Figure 3 Infrastructure output as a proportion of national GDP



Note: UK data implied from overall public output pre-1980.
Source: Oxera analysis of ONS, Statistics Canada, and US Census Bureau data.

growth across these two countries is around 8.0%, and investment as a proportion of GDP around 9.3%. There is, however, a third group of countries, which also lie in the bottom-left corner of the figure and include Kenya, Brazil and Russia. These have experienced economic growth and investment levels as a proportion of GDP comparable to the developed economies, yet are at the other end of the development spectrum. Looking in more detail at these low-growth, low-investment economies reveals two important differences from the more developed economies: their stock of existing infrastructure and level of development was much lower in 1960; and their economic growth rates and level of investment in long-term assets have been much more volatile.

The bottom left of the diagram can therefore be split into two groups: developed economies and emerging economies. The developed economies appear to have reached a relatively stable relationship between economic growth and investment levels. In contrast, the emerging economies do not appear to have gained a sufficient base of infrastructure to reap the economic benefits observed in developed economies. Increasing investment in infrastructure in these countries is a challenging goal. The complexities of achieving political stability and appropriate institutional structures, and attracting financing, are already familiar to the World Bank and the International Monetary Fund.[12]

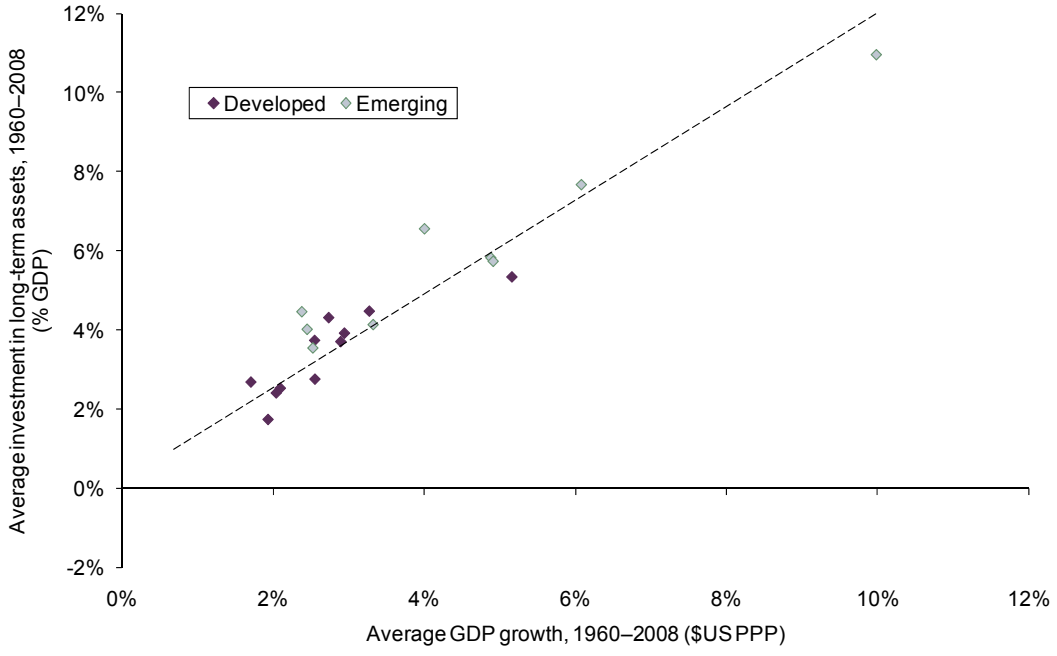
Beginning in the bottom left of Figure 4, however, countries that can initiate a growth path might expect to shift along the curve towards the top right, and then, as the stock of infrastructure becomes established and growth rates stabilise, shift back down towards the bottom left. Whether India and China will follow the second part of this path remains to be seen. The challenge for infrastructure investors is to identify, or help facilitate, movers from the bottom left.

A final observation about Figure 4 is that few economies lie far from the line of best fit on the diagram. Exceptions to this are the natural-resource exporter countries (such as Sierra Leone and Chad), and those that may previously have overinvested in infrastructure (such as Japan); these are not shown in the figure. The former economies have experienced growth rates that are very high but unsustainable in the long term. The latter are proof that the benefits of infrastructure investment are not without limit, and highlight the importance of investing in the right assets at the right time.

Concluding remarks

This article has shown why, if conducted appropriately, investing in infrastructure can provide positive benefits to an economy. Past investment levels for developed economies suggest that there has been a continued commitment to infrastructure and that, relative to other

Figure 4 Investment in long-term assets as a proportion of GDP and economic growth for selected countries



Note: Investment in long-term assets measured by gross-fixed capital formation (GFCF). GFCF used as a proxy for infrastructure investment; infrastructure-specific data over a long time horizon and wide range of countries does not exist. PPP, purchasing power parity.
Source: Oxera analysis of World Bank data.

forms of construction, this commitment is more stable as a proportion of GDP. Despite the recent economic turmoil, recent policy decisions suggest that this commitment has not fundamentally changed. Comparing across countries, it appears that the benefits of infrastructure investment, and its positive link to economic growth, extend beyond just the developed economies, although the challenges for emerging economies remain complex.

The type of analysis undertaken to gain a long-term understanding of this market, along with an assessment of the economic reasoning, provides an important foundation for any long-term strategy. With such a strategy in place—in this case, built on a continuing stability of investment in developed markets and the increasing importance of certain emerging markets in the future—short-term business decisions can be made in alignment with it.

[1] Infrastructure UK (2010), 'Strategy for National Infrastructure', March, p. 5.
[2] HM Treasury (2010), 'Spending Review 2010', October.
[3] Crossrail will be a high frequency railway for London and the South East, linking Heathrow Airport, the West End, the City of London and Canary Wharf.
[4] See Balfour Beatty (2010), 'The Infrastructure Company', Investor Seminar, November 30th.
[5] Infrastructure UK (2010), op. cit., p. 5.
[6] Aschauer, D.A. (1988), 'Is Public Expenditure Productive?', *Journal of Monetary Economics*, **23**, pp. 177–200.
[7] High Speed 1 is the railway between St Pancras in London and the Channel Tunnel, and connects with the international high speed routes between London and Paris, and London and Brussels.
[8] Office of National Statistics (1995), 'Input Output Analytical Tables'.
[9] Fernald, J.G. (1999), 'Roads to Prosperity? Assessing the Link Between Public Capital and Productivity', *American Economic Review*, **89**:3, pp. 619–38, June.
[10] Aschauer, D.A. (1988), 'Is public expenditure productive?', *Journal of Monetary Economics*, **23**, pp. 177–200.
[11] Minor differences in the data from each national statistics authority (eg, in survey methodology or definitions) may also limit comparability to some extent.
[12] See, for example, The World Bank (2009), 'Infrastructure Financing Gap Endangers Development Goals', April 23rd; and International Monetary Fund (2010), 'Sustainable Investment Holds Key to Growth in Low-Income Countries', *IMF Survey Magazine: Policy*, December 7th.