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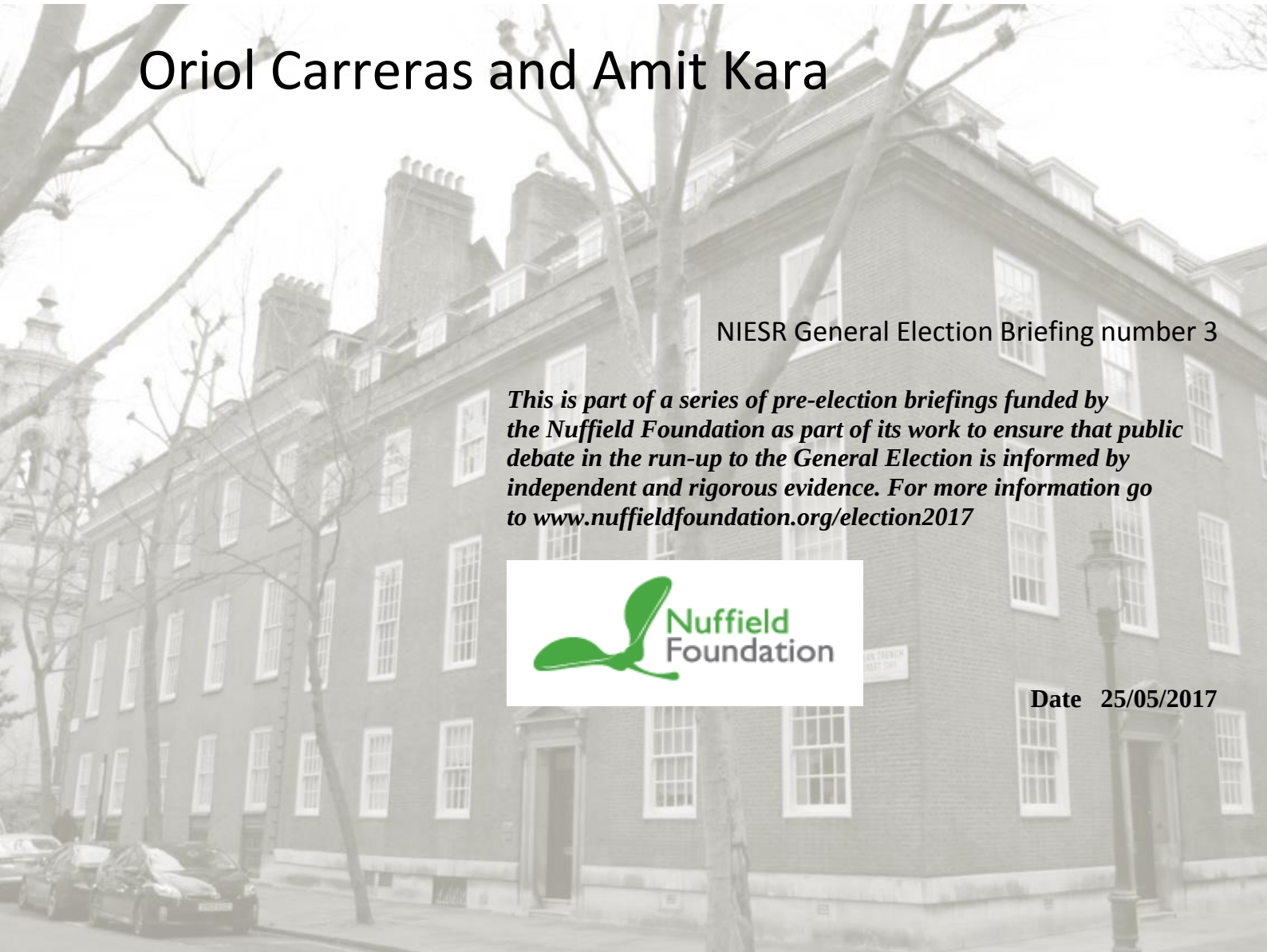
INFRASTRUCTURE IN THE UK - TIME TO REBUILD?

NIESR General Election 2017 - Briefing No. 3

Oriol Carreras and Amit Kara



NIESR General Election Briefing number 3

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Infrastructure in the UK

Oriol Carreras and Amit Kara

Key points

- Infrastructure pays for itself: infrastructure projects tend to have large upfront costs and benefits that accrue over many years. The economic literature struggles to establish a clear link between infrastructure spending and GDP growth, but NIESR believes that projects that are cost effective and well-designed pay for themselves.
- Governance: Infrastructure projects in the UK have been plagued by long delays and cost overruns, often because of myopic thinking and political considerations. There is a pressing need to address these failures by creating a non-partisan body that can provide the government of the day sound advice based on the long term infrastructure needs based on research and without the distraction of political pressures. The National Infrastructure Commission (NIC) has been specifically set-up to do just that, but the Commission must be strengthened through statutory powers to be able to drive the infrastructure agenda more fully.
- Fiscal rules: NIESR has for long recommended that fiscal rules related to budget deficit and debt targets should not crowd out investment spending. Here again there is progress – as part of the latest fiscal remit, the government has pledged spending of between 1.0-1.2% of GDP on infrastructure for 30 years from 2020. The fiscal remit has undergone many changes over the last 10 years and there is little confidence in the durability of the fiscal rules. We urge the government to stick to its commitment to investment, including infrastructure spending.

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Introduction

Infrastructure investment is vital for sustainable economic growth and research shows that the UK lags behind its major competitors in the quality of its infrastructure assets. There is a well-established case for the government to intervene where there is market failure and in our view the government needs to play a lead role as a provider, facilitator and financer of infrastructure projects and services.

We have three key points:

1. Infrastructure pays for itself: infrastructure projects tend to have large upfront costs and benefits that accrue over many years. The economic literature struggles to establish a clear link between infrastructure spending and GDP growth, but NIESR believes that projects that are cost effective and well-designed pay for themselves.
2. Governance: Infrastructure projects in the UK have been plagued by long delays and cost overruns, often because of myopic thinking and political considerations. There is a pressing need to address these failures by creating a non-partisan body that can provide the government of the day sound advice based on the long term infrastructure needs based on research and without the distraction of political pressures. The National Infrastructure Commission (NIC) has been specifically set-up to do just that, but the Commission must be strengthened through statutory powers to be able to drive the infrastructure agenda more fully.
3. Fiscal rules: NIESR has for long recommended that fiscal rules related to budget deficit and debt targets should not crowd out investment spending. Here again there is progress – as part of the latest fiscal remit, the government has pledged spending of between 1.0-1.2% of GDP on infrastructure for 30 years from 2020. The fiscal remit has undergone many changes over the last 10 years and there is little confidence in the durability of the fiscal rules. We urge the government to stick to its commitment to investment, including infrastructure spending.

To be sure, this note does not seek to identify the infrastructure bottlenecks in the UK or to comment on ongoing or planned projects. That is the role of the National Infrastructure Commission (NIC). In what follows, we present the economic evidence for infrastructure spending, identify some of the limitations of the studies that link infrastructure spending and economic growth, and discuss the role of the state and the private sector as a provider of infrastructure investment and finance.

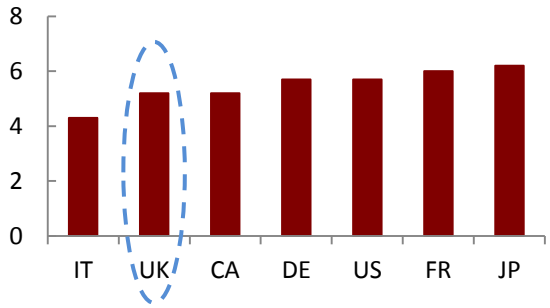
The UK invests little relative to its international peers

There is a strong case for infrastructure spending in the UK. To start with, the UK lags behind many major economies within and outside the European Union. The latest World Economic Forum report Global Competitiveness Report (Global Competitiveness Report, 2016-17) ranks the UK 24th of 138 countries in the world on the perceived quality of infrastructure (Figure 1 and 2). [1] The quarterly

[1] The World Economic Forum Global Competitiveness Report is a qualitative survey based on the opinions of executives as captured in its Executive Opinion Survey.

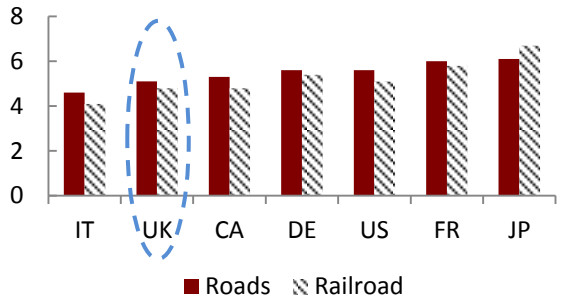
Deloitte survey of chief financial officers (CFO) echoes that message. CFO's identify productivity and competitiveness as one of the key risks for doing business in the UK.

Figure 1: Perceived quality of infrastructure spending



Source: The Global Competitiveness Report, 2016-2017
Notes: The scale ranges from 1 to 7, with 1 denoting the worst outcome and 7 the best.

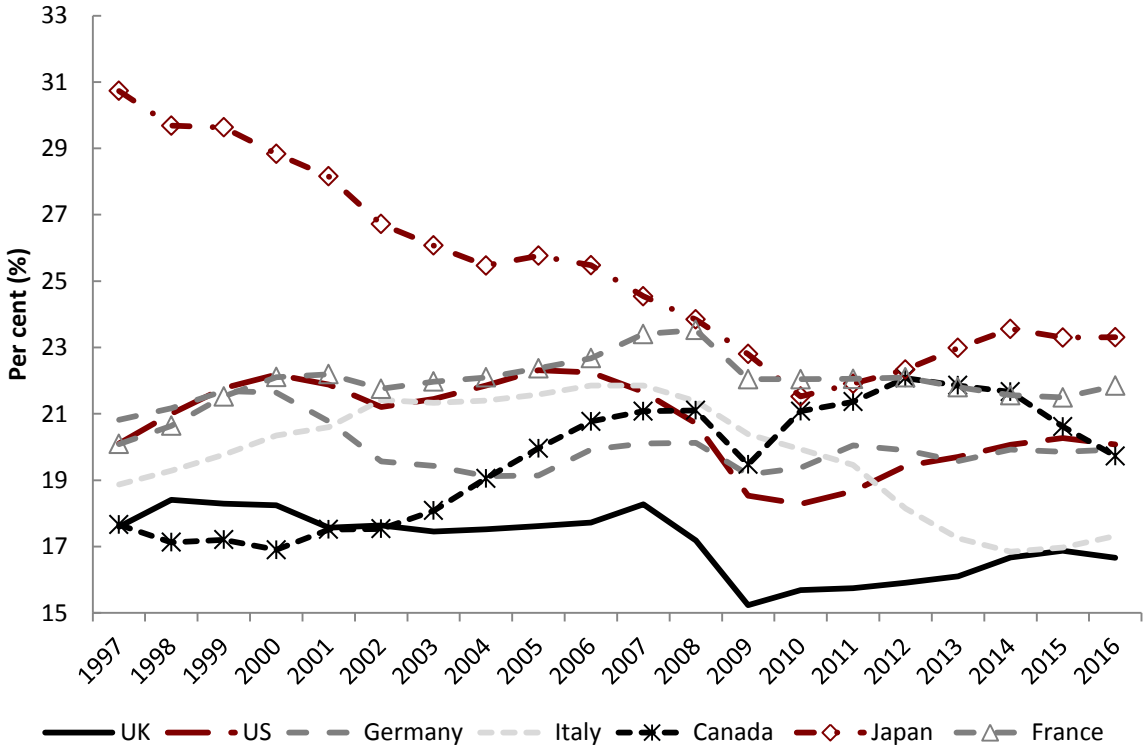
Figure 2: Perceived quality of roads and railroad infrastructure



Source: The Global Competitiveness Report, 2016-2017
Notes: The scale ranges from 1 to 7, with 1 denoting the worst outcome and 7 the best.

Second, the UK invests less as a share of GDP compared with its peers (Figure 3). The figure shows that that the UK sits at the bottom end of the scale, some 4pp below France and similar to Italy. This persistent underinvestment has an enduring impact on the capital stock with likely knock-on effects on productivity and competitiveness.

Figure 3: Gross fixed capital formation to GDP ratio



Source: Source: NiGEM database

Public investment is not always a good proxy for infrastructure spending (discussed below), but the data is indicative especially because we do not have a reliable long term data series on infrastructure spending in the UK. Perhaps another good proxy for infrastructure spending or investment more generally might be the evolution of capital stock per employee, and here the story is staggering. Growth in capital stock per employee has fallen since 2011 (Figure 4).

Infrastructure and GDP have a symbiotic relationship. The demands on infrastructure – roads, railway, waste management, energy etc. – rise along with economic growth, and at the same time, economic growth requires high quality infrastructure facilities. The case for infrastructure spending is clear and the need for the government to get involved is compelling. This holds particularly true since the referendum vote. There are concerns of a possible withdrawal of EU infrastructure funds that will leave a vacuum that will have to be filled in.[2] That impact could be material. The European Investment Bank (EIB) has invested around £31 billion in the UK from 2012-16. This is compounded with a decline in private sector investment that is recently taking place as a result of uncertainties derived from the negotiation process that will establish the new relationship between the UK and the EU (see Baker et al., 2016, for further discussion on this channel).

Figure 4: Growth in net capital stock per employee, 1998 to 2015

Source: ONS.
Note: Reference year: 2013

[2] The European Investment Bank (EIB) states that "At present the UK shareholding in the EIB remains and the EIB's engagement in the UK is unchanged... We expect that the EIB's shareholders, the 28 EU Member States, will discuss the EIB's engagement in the UK as part of broader discussions to define the future relationship of the UK with Europe and European bodies". Available at: http://www.eib.org/infocentre/press/news/all/european-investment-bank-statement-following-uk-referendum-on-eu-membership.htm

Public or private sector?

Infrastructure projects tend to have a large up-front cost and on the other side, returns from these projects tend to be uncertain and typically spread over a very long period of time and to add to the complexities, the beneficiaries of these projects are sometimes hard to identify ex ante. Infrastructure also tends to have monopolistic features and that exposes its consumers to the risk of poor service and/or high costs. There is therefore, a market failure and for all these reasons there is a strong case for the government to intervene.

All that is not to suggest that there is no role for the private sector. The private sector has played a dominant role in building, financing, operating and managing infrastructure facilities in the UK, ranging from telecom services to utilities, and we expect that to continue, but in each case the government has played an important role, either to commission/licence projects, regulate the industry or to finance new projects and we expect the government to remain an active player in the future.

Given the dismal performance of labour productivity in the UK, anaemic economic recovery since the financial crisis and low borrowing costs, there is a compelling case for the government to work closely with the private sector on a more aggressive and innovative agenda that helps identify, prioritise and deliver infrastructure investment in the UK (Chadha, 2017).

Data from the 'Infrastructure and Projects Authority'[3] show that both the private sector has been an important investor in UK infrastructure. Broadly, the private sector has dominated a number of sectors including waste, utilities, energy and communications and the public sector has focussed on flood defences, road, rail and social infrastructure.

The table below summarises the projected contributions of the private and public sectors for pipeline infrastructure projects from 2016/7. Of the total infrastructure spend of £490billion, the private sector accounts for the lion's share with a £271billion contribution, the public sector will contribute around £190billion and the remaining £27billion was funded jointly by the private and public sectors.

Table 1: Pipeline infrastructure investment by sector split into private and public from 2016/7 (in £ billion)

	Social infrastructure	Energy	Transport	Utilities	Commun-ications	Flood	Waste
Public	44	18	125			4	
Public/ Private	6	12	7		2		
Private		177	6	75	13		1

Source: National Infrastructure Delivery Plan, Funding and Financing Supplement (2016)

[3]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/574282/National_Infrastructure_Delivery_Plan_Funding_and_Finance_Supplement.pdf

That private sector funding attracts diverse sources. Corporate finance accounts for the bulk of investments in the regulated sector, which essentially includes water and energy distribution. There are also a number of UK and international banks that are active in the infrastructure finance market, particularly for project finance. Other sources include dedicated infrastructure funds, insurance companies and finally pension funds, all of which tend to have a long investment horizon.

The departure of the UK from the EU poses a risk to planned infrastructure expenditure in the UK. Through its institutions the EU channels funds to the UK to support and finance a wide array of projects, including various infrastructure development plans. For instance, the European Investment Bank (EIB), which borrows funds from capital markets and lends them to finance investment projects of EU members,[4] has invested £31.2billion in the UK over the period 2012-16. Infrastructure projects accounted for 47 per cent of that amount and projects related with innovation and support to small business projects accounted for 17 per cent. This is not an insignificant amount and is in fact, larger than the sum that the government has committed to the National Productivity Investment Plan (NPIF) announced in the Autumn Statement last year. Looking ahead, the EIB has already approved new projects in the UK worth around £8billion. These will be implemented over a number of years. Policy uncertainty is a key impediment to private sector involvement in infrastructure and the decision to leave the EU will undoubtedly create a high level of uncertainty which the government will need to address.

Does infrastructure matter?

Assessing the impact of infrastructure spending on GDP growth is fraught with difficulties. The literature review below highlights some of the challenges of estimating the impact of infrastructure on economic growth. The impact estimates are wide and prima facie the literature presents a tenuous link between economic growth and infrastructure spend, but in our view that mainly reflects shortcomings in data/research and sometimes the quality/cost of projects rather than a sweeping rejection of the need for infrastructure spending. Taking a step back and asking the counterfactual - what might be the impact on the economy without a functioning railway service, reliable utilities, well-maintained network of roads and high quality broadband etc. - points to a clear answer in our view.

Of the many challenges, perhaps the most basic is that there is no universally accepted definition of an infrastructure asset. Features such as a natural monopoly, network effects, long asset life and high initial costs are a good shortlist of characteristics that help define an infrastructure asset, but they are by no means exhaustive.

Given the difficulties it is not surprising that good quality data on infrastructure is hard to obtain. Even within the OECD, there are only a small group of countries for which national accounts data for capital stock is split by sector and where this data is available, the quality is variable and more often than not also with limited history (Egert el al, 2009).

As a result, many studies use public investment or public capital as a proxy, but not all publically-owned capital is infrastructure and equally, and as discussed above, infrastructure is no longer exclusively owned or even managed by the public sector. Public capital includes schools and

[4] EIB funds are not part of the EU budget.

hospitals which are not generally considered as infrastructure assets, even though they share many of the typical characteristics of an infrastructure asset, namely a stream of benefits over time, large upfront costs and also network effects. Public capital also includes buildings and other real estate that is not generally classified as infrastructure. On the flip side, trains, utilities, telephone and broadband networks etc., which are widely accepted as infrastructure, are more-and-more owned by the private sector in the UK. In other words, even where sectoral capital goods data is available, classification and measurement of that data into infrastructure and non-infrastructure is murky. Definitions aside, a list of non-contentious infrastructure assets as includes the transport network, power generation and distribution, the communications network which includes broadband and mobile.

What can we learn from the empirical literature found on the economic impact of infrastructures? Before reviewing the main results, we stress that most of the literature has used public sector capital as a synonym of infrastructure capital, a point that we have already suggested may be problematic. The literature has also paid most attention to the long-run output effects of infrastructure, which is reasonable. While infrastructure expenditure provides a boost to demand in the short-run, the crucial feature of infrastructure expenditure relative to other types of government expenditure is the expectation of reaping a sustained and positive return over a span of many years.

Estimates based on the production function

A large strand of the literature has used the aggregate production approach to estimate the macroeconomic implications of public capital. Led by the seminal contribution of Aschauer (1989), this strand of the literature postulates a production function which assumes complementarities between public and private sector capital –additions to the stock of public capital increase the marginal productivity of private capital- and proceeds to estimate the production function partial output elasticity of public capital. The larger the partial elasticity, the larger the direct impact of public investment on output and the spillovers derived from it, where the latter captures the positive impact of public investment on the marginal product of the remaining factors of production.

Aschauer (1989) used annual aggregate US data and found a rather large estimate of the output elasticity of public capital. A one per cent increase in public capital lead to a 0.39 per cent increase in output. According to Gramlich (1994), this estimate implies for the US, broadly, a 100 per cent return on the investment, which means that the cost would be recouped after just one year.[5] Unsurprisingly, the literature has deemed such estimate as implausible. Later studies, which attempted to control for unobserved effects either controlling for time effects using aggregate US data in differences or controlling for state fixed effects using US state level data, found much smaller estimates; in some instances, the estimates came up not statistically different from zero.[6] Based on a survey of the literature and using meta-analysis regression techniques, Bom and Ligthart (2014) find a partial elasticity of 0.08 which increases to 0.17 if the sample of estimates is restricted to those that include, among other things, infrastructure spending as part of public expenditure. The latter estimate entails, for the US, a return of around 30 per cent on public investment expenditure.

[5] The figure for the marginal return of the investment is obtained computing, directly, the marginal return of public sector capital from the estimated Cobb-Douglas production function. That is, multiplying the derivative of the production function with respect to public capital by the public sector capital to output ratio.

[6] See, for instance, Tatom (1991), Hulten and Schwab (1991), Evans and Karras (1994) and Garcia-Milà et al. (1996).

Structural VAR

An alternative methodological approach uses structural VARs (SVAR) to isolate government investment shocks and explore their impact on output in both the short- and long-run. The advantages of the VAR approach include ameliorating the endogeneity concern given the use of higher frequency data and a modelling of the dynamic feedbacks between endogenous variables. The main drawback is the same as for any analysis using an SVAR; the robustness of the results rest on the validity of the identification strategy to isolate structural shocks.

Among the studies that use SVARs, Voss (2002), using quarterly data for the US and Canada, finds evidence that public investment crowds out private investment. In contrast, Mittnik and Newmann (2001), using, again, quarterly data from 6 OECD countries, find a small but positive long-run effect of public investment on GDP, although the estimated coefficients are usually not statistically different than zero.[7] Kamps (2005) carries out a similar exercise for the US and also finds a small positive effect on GDP. However, Perotti (2004), using a different VAR specification, finds no evidence of a long-run effect of public investment to output. More recently, Ilzetzki (2013), using a large quarterly dataset of developed and developing countries, finds a positive but not statistically significant long-run effect of public investment on output.

Recently, it has been pointed out that unless there is a sudden change of patterns in demand, maintaining high quality infrastructure may yield higher returns than investing in new infrastructure, see Rioja (2013) and IMF (2014). In addition, the returns from expenditure on maintaining existing infrastructure are likely to be subject to much lower degree of uncertainty than those from investing in new infrastructure.

Other Empirical Results

Overall, the literature suggests that there is evidence that public investment leads to higher and sustained output growth in the long-run, although the evidence is weak. Several hypotheses have been put forward to explain the weakness of the empirical results.

First, it has been suggested that some developed countries have too much capital and further investment may yield negative returns. Intuitively, this argument makes sense. It is hard to imagine that the return from building the first road connecting two cities can be the same as that from building a road that provides an alternative route to reach a point where one already exists. Fournier (2016) suggests Japan may be a country that suffers from this problem (Figure 1)

Second, higher government expenditure, either because it may entail future higher taxes or because it may generate inflationary pressures and trigger a hike in intervention rates, may crowd-out private consumption and investment. This is more likely to occur in times when the economy is running at full capacity. A question therefore arises regarding the extent to which the expansionary fiscal stance of the public sector required to finance infrastructure projects may crowd-out private demand and, as a result, reduce the potential beneficial impacts of infrastructure expenditure. This concern becomes much more acute if the data sample underlying an estimate is short, as these

[7] The countries are: Canada, Great Britain, West Germany, France, Japan and the Netherlands.

crowding out effects might take years to dissipate while the life of an infrastructure asset is typically very long.

Finally, is the point made by Pritchett (2000) that not all public investment materializes into public capital. As a result, those empirical studies that use national account data on public investment to proxy for increments of public capital may suffer from an omitted variable bias. A closely related point related with the previous argument is the possibility that some public investment decisions may have been driven by political considerations rather than economic rationale. This clearly highlights the need to build a sound governance framework for identifying, designing and implementing infrastructure projects.

NiGEM simulation

These and other factors lead us to believe that many studies discussed above underestimate the returns from infrastructure investment. Before turning to the specific discussion on the governance framework for infrastructure projects, we illustrate the importance of the long term returns on investment spending using our global econometric model, NiGEM.

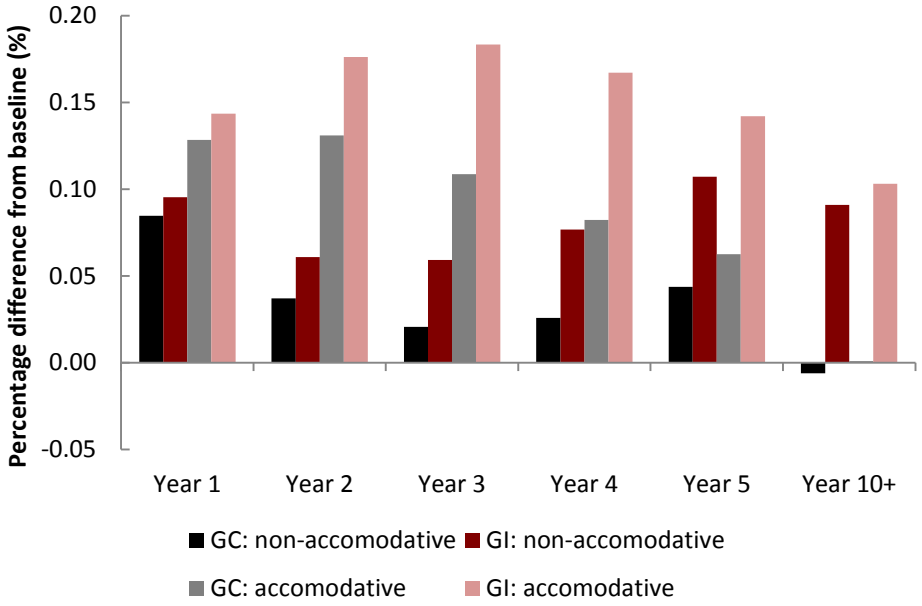
We consider four scenarios for this exercise. To start with, we apply, separately, an increase in UK government consumption and government investment and for both these simulations the MPC' policy rate is endogenous i.e. it responds to subsequent developments in the economy. These are the black and dark red bars in figure 5. In the second set of simulations, we apply the same fiscal package, but this time the Bank of England accommodates the expansionary fiscal package by holding the policy rate constant for as long as the stimulus lasts. These are the grey and light red bars in figure 5. This latter set of scenarios may proxy a situation where the central bank perceives that there is a large degree of spare capacity in the economy so that a tightening of policy is not warranted.

In all scenarios, the shock is equivalent to an increase in expenditure of 0.2 per cent of GDP per year that lasts for five years. This broadly equates to the size of the NPIF package that the government announced last year. Figure 5 reports the short-run output multiplier for each of the first five years of the simulation. The short-run multiplier is defined as the percentage deviation of output from its baseline level on a particular year. In addition, we also provide the long-run multiplier, defined as the average output multiplier that takes place during the last ten years of the simulation. The simulation has an overall time span of 20 years.[8] Underpinning our simulations is an assumption that public and private sector capital is complementary, which implies that public sector capital deepening increases the marginal returns of private sector capital.[9] However, our simulations do not include any of the effects that an increase in the stock of public capital may have on the rate of growth of total factor productivity, where by total factor productivity we refer to that component that accounts for that part of output growth unexplained by an accumulation of factors of production such as capital or labour.

[8] The simulation has an overall time span of 20 years.

[9] Further details on the model can be found at: https://nimodel.niesr.ac.uk/

Figure 5: Response of UK output to a fiscal expansionary shock



Source: NiGEM simulations.

Note: GC denotes government consumption; GI denotes government investment. Accommodative denotes that the central bank does not change interest rates for the first five years of the simulation, while non-accommodative denotes that the central bank reacts immediately to developments in the economy.

As shown in figure 5, higher expenditure in both government consumption and investment deliver positive output multipliers during the five years of the simulation. More relevant to our analysis is that higher government investment has permanent and positive effects on the level of output. This is in stark contrast with the results from government consumption which do not appear to deliver, according to our simulations, any long-term gain. Indeed, according to our simulations, in the long-run the government investment packages more than pay for their cost of implementation, a statement that does not hold true for the government consumption packages. While we acknowledge that the exact magnitude of the results are sensitive to the assumed parameter values, the underlying message that infrastructure capital may have long-term beneficial impacts on the economy remain for plausible parameter values.

A governance framework for infrastructure projects

Infrastructure projects in the UK and elsewhere have been plagued by political interference, myopic agendas, delays and cost over-runs. A good UK example is the decision to add another runway at Heathrow. The discussions for this project started nearly 50 years ago and governments have repeatedly postponed taking a decision to a point where congestion-led delays at both Heathrow and Gatwick have become the norm.

The government has started to take steps to address short-termism by setting up the National Infrastructure Commission (NIC). The NIC is an independent body that is tasked with identifying UK's

infrastructure needs and priorities and delivering sound advice on infrastructure policy and strategy. The NIC was set-up in 2016 and has already published a wide range of reports such as those on the Cambridge, Milton Keynes, Oxford Corridor, 5G infrastructure, power and High Speed North. The NIC will identify and recommend long term infrastructure needs to the government and also monitor the progress of the projects it has recommended. This is a positive development, but the government must go further by giving the NIC teeth - the LSE Growth Commission rightly points out that the NIC must be given statutory powers (LSE Growth Commission (2017) in much the same way as the Office for Budget Responsibility or the Monetary Policy Committee at the Bank of England.

Infrastructure financing is another bottleneck where there is a strong case for government intervention. Here again the Government has taken a step in the right direction by setting up the National Productivity Investment Fund (NPIF). The NPIF will focus on housing, science and innovation, transport and a 5G network and the plan is to add £23billion of additional spending over the next 5 years in these areas. The bulk of that spending will be directed towards the construction of new homes (£7.2billion) and of the total, infrastructure accounts for just £4billion. The government has however, asked the NIC to prepare plans for 2020-50 on the basis that the government will commit some 1.0-1.2% of GDP on infrastructure (National Infrastructure Delivery Plan – Funding and Financial Supplement).

The Labour Party and the Liberal Democrats are prepared to take the infrastructure funding initiative much further. The Labour manifesto proposes a new 'National Transformation Fund' worth £250 billion over 10 years (The Labour Party Manifesto, 2017). Just to place the proposed Labour Party numbers in perspective, the average £25billion/year spend compares with public sector net investment of £35billion in 2016 and peak spending of £55billion in 2008. According to their manifesto, the Labour government would borrow money to fund this initiative and the focus will be on rail infrastructure, science and technology, low carbon energy and superfast broadband.

The Liberal Democrats have pledged infrastructure spending of £100billion. The manifesto has not spelt out the time period, but we assume that the money will be spent over the course of the next parliament. The Liberal Democrats will use £5billion of that £100billion as initial capital for a new British Housing and Infrastructure Development Bank, with the express aim of attracting private money to leverage on the seed capital provided by the government.

Assuming that the Liberal Democrat £100billion allocation is spread over 5 years, the Liberal Democrat and Labour Party proposals for infrastructure spending are ambitious, but that ambition needs to be balanced against the capacity of the economy to build and deliver projects of that scale over a relatively short period of time. After all, there are plenty of examples across the world of politically-motivated infrastructure projects that fail to deliver the promised benefits.

Straightjacket of fiscal rules

The NIESR has long the view that the fiscal targets should be flexible enough to ensure that the government finances are on a sustainable path and operate counter-cyclically, but the targets should not crowd out public investment which is a vital ingredient for long term economic growth.

UK governments have changed the fiscal framework repeatedly since 2010 (Emerson, 2016) and the Chancellor introduced yet another set of rules last year, this time pledging to eliminate the fiscal deficit (including investment spending) by the end of the next parliament. Of course, the date of the next parliament has been brought forward by three years because of the early election and a literal translation of the fiscal rule implies that the deficit should be eliminated by 2021-22. The Conservative Party has however, tweaked the rule in its 2017 election manifesto by committing to eliminate the deficit by the middle of the next decade (The Conservative Party Manifesto, 2017).

Notwithstanding our broad reservations on the credibility of the fiscal remit and our specific recommendation to exclude investment spending in the fiscal rules, the Chancellor has committed spending of 1.0-1.2% of GDP on infrastructure spending from 2020 to 2050. This is progress, but it is still our view that the primary target should be cast against the current budget balance – the difference between tax revenue and spending on day-to-day activities that excludes investment spending – instead of total budget balance. That will ensure that other vital non-infrastructure investment is protected. The Labour Party has, in its manifesto, proposed a 'Fiscal Credibility Rule' that allows the government to borrow for investment, but not for day-to-day spending. The Liberal Democrats have also focussed on the current budget balance instead of the overall balance and pledged to eliminate the deficit by 2020.

Conclusion

UK spends less on investment as a share of GDP than other major economies. UK has also suffered a persistent productivity gap against its major competitors and alongside that, housing affordability remains acute. These are other factors have focussed the minds of policy makers in recent years and concrete steps have been taken in response. Each of the three main political parties has pledged substantial investments into infrastructure over the next few years - the Conservative Party has committed some £20 -23 billion each year, the Labour Party around £25 billion and the Liberal Democrats around £20 billion. This commitment is welcome, but policy makers need to ensure that that infrastructure spending decisions are based on sound evidence-based advice. The new National Infrastructure Commission and the National Productivity Investment Fund are examples of policy action in the right direction, but more can be done. The NIC should be granted statutory powers. Also, the budget targets in the fiscal rule should focus on day-to-day spending instead of overall spending.

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