



Department  
for International  
Development



## Growth Research News December 2012



Photo credit: Sven Torfinn / Panos

## WELCOME!

This quarterly edition of *Growth Research News* focuses on **Infrastructure and Growth** in low income countries (LICs). We look at what we can learn from recent research in both low and middle income countries and a few of the challenges we still face.

Infrastructure in itself is a broad topic and we concentrate here mainly on transport infrastructure, which is linked to growth.

Transport investments are large and lumpy, difficult to appraise, monitor and evaluate, and the scope for mismanagement at all stages is vast. Furthermore, geography, climate and topology in LICs pose engineering design, construction and maintenance challenges that have not always been solved, or if they have, not adequately disseminated and embedded within LICs. This is why it is so important to ensure we have the evidence for strong decisions on type and combinations of infrastructure, technology and related services.

It is an exciting time for DFID on infrastructure at the moment. We will soon publish an infrastructure position paper: *Connecting People, Creating Wealth: Infrastructure for Growth and Poverty Reduction*. In 2009/10, DFID channelled more than £900 million to infrastructure activities, out of a total budget of £6.6 billion, investing in infrastructure via our bilateral and bilateral programmes.

DFID's Growth Research Team is developing a transport and growth research programme. This newsletter helps to explain the context for this work.

Best wishes,

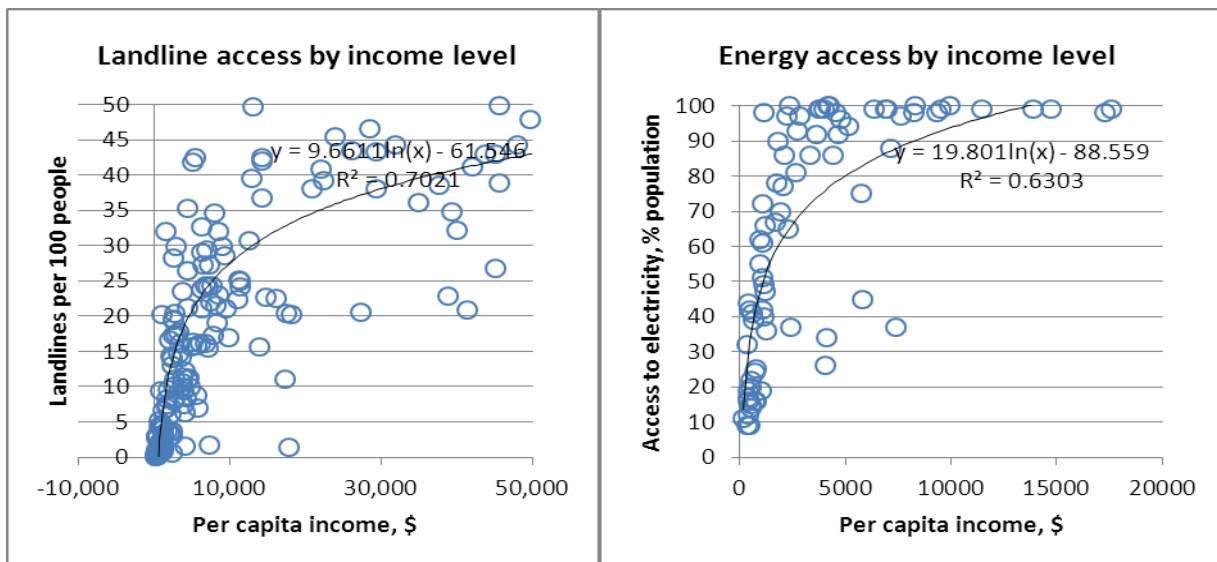
**Stefan Dercon**  
Chief Economist, DFID

**Stevan Lee**  
Team Leader, Growth Research, RED, DFID

## EVIDENCE ON INFRASTRUCTURE AND GROWTH

### **Growth creates a demand for infrastructure which is usually met**

Richer countries have much more infrastructure than poorer countries as the graphs below illustrate. But infrastructure is a fixed asset supplying a stream of infrastructure related services which are consumed. Richer countries consume more of everything and in general have the fixed capital to supply that consumption. So it would be very surprising if richer countries didn't have more infrastructure just as it would be surprising if they didn't consume more food or have bigger houses. This doesn't mean that infrastructure has caused the growth or the higher incomes.



Data source: World Development Indicators (WDI) 2009

**Infrastructure brings down costs, increases the return to other investments and can catalyse further investment, productivity increases and growth... but not always.**

A positive example is given in [Jacoby and Minten](#) (2009); another frequently cited work is [Fan and Chan-Kang](#) (2005). [Straub and Terada-Hagiwara](#) (2011) looked at infrastructure and



Photo credit: Pradeep Sliwal/Multimedia lab

growth-accounting in several Asian countries and found that increases in infrastructure stock correlated significantly with growth. But the evidence showed this was mostly the result of general increases in capital and skills and evidence on infrastructure's impact on productivity was rather inconclusive. A correlation of infrastructure and output is not enough to show its contribution to growth.

**When does infrastructure investment cause growth?**

There is a problem for researchers because the causality goes both ways. We can't run a controlled experiment with something as large as infrastructure investment in a country. So it's necessary to resort to imaginative techniques to gain a solid result, in many cases some sort of instrumental variable technique where the amount of infrastructure is estimated using something which is nothing to do with growth or income. In theory, this should confirm that infrastructure has caused the income growth and not vice versa.



Photo credit: DFID

Many recent studies have shown quite strong evidence that infrastructure can cause an increase in output (an impact on the “growth rate” is harder to establish). The techniques can get quite elaborate:

- [Dercon et al](#) (2009) use instrumental variables to show a relationship between road improvement and agricultural output in Ethiopia.
- When the [World Bank](#) (2010) looked at production relative to potential, agricultural output was far higher in areas with a shorter travel time to city markets rather than a longer one (not the same as just a correlation between production and infrastructure), suggesting that infrastructure improvements which reduced travel time really made a difference to output.
- [Duflo and Banerjee](#) (2009) use geography/geometry to instrument for the actual location of transport in China and show that there seems to be an income effect associated with being near a (potential) transport corridor, rather than near a city. They conclude that randomly located transport infrastructure would be expected to increase output.
- [Lipscomb et al](#) (2011) has some similarities to the Duflo and Banerjee paper but for power generation, i.e. they use geography to instrument for the actual location of power investments in Brazil, and find this also has an income effect. Randomly located power infrastructure may be expected to increase output.
- [Baum-Snow et al](#) (2012) show that transport links in Chinese cities caused changes in the land use in and around those cities, allowing much bigger cities than otherwise. Further research may link this to faster growth.
- [Sahoo, Dash and Nataraj](#) (2012) and [Sahoo and Dash](#) (2012) use a lot of data, in China and other parts of Asia to try and get at causality. In China they seem to find quite significant causality running from infrastructure to output gains. In the rest of Asia it is clearly two-way.
- [Ren and De Walle](#) (2011) assess impacts of rural road rehabilitation on market development at the commune level in rural Vietnam. At this micro level it is fairly clear that the rehabilitation is exogenous and some impact is found from this quasi-random investment.

These papers all suggest that investment in infrastructure is often causal in the increase of incomes, not a consequence of it. Note that they mainly look at micro or partial market effects of infrastructure, not macro or general equilibrium effects although Duflo and Banerjee and also Lipscomb do try and look at GDP and GDP growth.



Photo credit: DFID Iraq

If we control for other factors or concentrate on countries with a lot of growth then we can find a link between infrastructure and growth which looks causal. But we know that infrastructure investment does not necessarily cause growth or major income effects. Therefore just as interesting a question is, **under what conditions does more infrastructure cause growth?**

## Are politics, public sector incentives, the quality of planning, procurement and technology choice important or potentially a barrier to infrastructure causing growth?

Our only theory for how infrastructure might cause growth is related to costs and improving the returns on other capital investments. If these factors affect costs and the effectiveness of infrastructure they must be important. Several recent papers also shed light on this:

- Thoughtful design, planning and procurement can greatly improve the cost effectiveness of infrastructure, but often there are few incentives for public administrations to be creative about this. A [World Bank](#) study (funded by the DFID Transport Research Support Programme) of altered public sector incentives in the Gujarat State Public Works Department seemed to make a huge improvement in the performance of the Department and is generating interest across India.
- [Pinnard](#) 2011 (under the DFID-funded [African Community Access Project](#)) shows important life-cycle cost advantages of paving secondary roads in Malawi, linked to massive maintenance costs for unpaved roads. These findings are a good complement to advice to prioritise the maintenance of roads ([World Bank/Bennet](#), 2011). AFCAP funds on-going research into the Design, Construction and Monitoring of Demonstration Sites for District Road Improvements in Tanzania ([Roughtons](#), 2012).
- [Escobal and Ponce](#) (2011) under the DFID-funded Improving Institutions for Pro-Poor Growth Project, found that infrastructure plays a strong role in raising living standards of rich and poor where institutions are open and inclusive and can reflect the interests of rich and poor. Where institutions reflect the interests of only a small group, infrastructure loses its growth impact.

So there is evidence that institutions, public sector incentives and the capacity to make good planning and technology choices are important **but we are not in a strong position to say what needs to be done to avoid investing massive resources in infrastructure which does not result in economic growth – this despite massive resources from domestic savings and aid which are devoted to infrastructure investment in poor countries.**



Photo Credit: James Hole/ Multimedia Library

## DFID's new transport and growth research programme

We are developing a new transport and growth research programme which will combine:

- investigation of which types and combinations of transport infrastructure investment might yield the highest returns in low income countries, taking account of networking – in short, a more consistent body of evidence on how to prioritise an infrastructure budget to optimise its growth impact.

- an interrogation of the success of “big push” infrastructure investments
- research into practicable technologies and transport services that improve cost effectiveness
- the institutional factors and public sector incentives which might be a barrier to infrastructure leading to increased productivity and growth, or might improve the chances of that.



‘Pro-Routes’ programme, in the Democratic Republic of Congo (DRC)  
Photo credit: SOFRECO

#### Evidence from DFID’s Africa Community Access Project (AFCAP)



**AFCAP is our main, ongoing transport research programme. It generates useful findings about rural road technology and more, and there is clear evidence of [research uptake](#). Going forward, we need complementary research on how such technology can translate into programmes which increase growth. But [key findings](#) are interesting already.**

Research on appropriate design standards for low volume rural roads is a key part of AFCAP’s work, due to finish its first phase in mid-2013. The objective is to minimise the cost of providing reliable all weather access by utilising local materials in road pavement layers and surfacing. The project’s research has shown that gravel road surfacing is no longer appropriate in some cases due to depletion of gravel reserves and long haul distances to locate suitable material. It has also shown that sealed roads can have lower life cycle costs than gravel surfaced roads due to lower maintenance costs and lower vehicle operating costs. It has challenged conventional pavement design approaches that recommend multi-layer systems for low traffic roads. The research has identified a range of alternative surfacing options that can further reduce construction and maintenance costs.

AFCAP is commissioning an economic analysis, due to report in early 2013, which will focus on economic costs/benefits of: (i) adopting the Low Volume Sealed Roads (LVSR) approach compared with conventional design approaches for paved roads; (ii) upgrading gravel and

earth roads to paved road standards using the low volume sealed roads (LVSR) approach; (iii) adopting LVSR design standards within participating countries' road sector development programmes; and (iv) a comparison of the net economic benefits to countries adopting the LVSR approach compared with the cost of research under AFCAP.

AFCAP is also funding research into different, and more cost effective, materials testing for low volume roads. One such [research paper](#) is on the Dynamic Cone Penetrometer (DCP) AFCAP/KEN/89 - Research Project for Establishment of Appropriate Design Standards for Low Volume Sealed Roads in Kenya. The DCP is significantly more cost effective than the traditional laboratory testing of materials.

AFCAP has been nominated for two British Expertise International Awards 2013; Outstanding International Collaboration which is sponsored by UK Trade and Investment and Outstanding International Development Project. Further information about the awards can be found at [www.britisheuropeawards.com](http://www.britisheuropeawards.com)

The AFCAP newsletter summarises the recent AFCAP conference and some key papers and can be accessed at [www.crownagents.com/AFCAP/About-AFCAP.aspx](http://www.crownagents.com/AFCAP/About-AFCAP.aspx)

**DFID-funded Systematic Review on the impact of infrastructural investments in roads, electricity and irrigation on agricultural productivity**



This work, undertaken by Cranfield University, is now nearing completion. See details of this, and all DFID's Systematic Reviews, on [R4D](#) – DFID's research portal.

## **OTHER RESOURCES ON INFRASTRUCTURE AND GROWTH**

### **Links to other websites for information:**

On infrastructure:

<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC>

[http://www.csir.co.za/built\\_environment/index.html](http://www.csir.co.za/built_environment/index.html)

<http://www.infrastructureafrica.org/about>

<http://www.dfid.gov.uk/r4d/>

On transport:

<https://www.afcap.org/default.aspx>

<http://www.ifrtd.org/en/index.php>

<http://www.gtkp.com/>

<http://www.trl.co.uk/>

<http://www.arrb.com.au/home.aspx>

<http://www.ittransport.co.uk/>

On energy:

[www.sustainableenergyforall.org/](http://www.sustainableenergyforall.org/)

## OTHER DFID GROWTH RESEARCH NEWS

### **Growth and Labour Markets in Low Income Countries (GLM-LIC)**

The new *World Development Report 2013* focuses on jobs. DFID's £10.6 million research programme, jointly funded with IZA (Institute for the Study of Labour), looks specifically at how growth policies can lead to more and better quality jobs in low income countries (see the [project website](#)). The first seven large grants under the project have now been awarded and a second call for proposals has just closed. Interested researchers can also subscribe to the [GLM project newsletter](#). The project supported the *World Bank/IZA Conference on Employment and Development* in New Delhi, on 5-6 November 2012.

### **Private Enterprise Development in LICs (PEDL)**

The £15 million joint DFID-CEPR programme on private enterprise development in LICs continues to progress. The project's first call for large grants has concluded, with grants likely to be agreed in November. A second call will issue in Spring 2013. Details are on [PEDL's website](#) as well as presentations and videos from the project launch workshop. There is a continuous call available for small exploratory grants.

### **DFID-ESRC Growth Programme (DEGP)**

DEGP is a £20.9 million programme offering major grants for research on growth and agriculture, finance, and productivity in LICs, funded jointly by DFID and the Economic and Social Research Council (ESRC). A first call in 2011 led to 18 major new research projects. A second call, focused on similar areas, is likely to issue in the first quarter of 2013. For more details see the [ESRC website](#).

### **Lessons for LICs from Successful Emerging Economies**

Funds have been approved for a major new DFID growth research programme examining lessons for LICs from successful emerging economies. Bids for the first component, on lessons from Brazil, are currently being evaluated. Additional components of the programme are likely to be tendered in the first half of 2013. Interested bidders should look out for announcements on DFID's research4 development (R4D) [website](#).

### **New DFID-IDRC partnership on capacity building for developing country researchers**

DFID and IDRC have jointly approved funding up to £7.35 million in funding for the Partnership for Economic Policy's (PEP) project on Policy Analysis on Growth and Employment (PAGE). The project provides capacity-building grants, training and mentoring. DFID is funding substantial extra mentoring support for researchers from LIC countries. A [call for capacity building research proposals](#) is now available.

## SUBSCRIBE

If you have seen this newsletter and want to subscribe to our distribution list, please send an email to:

[dfidgrowthresearch@dfid.gov.uk](mailto:dfidgrowthresearch@dfid.gov.uk). Use this email address if you want to unsubscribe.

## FEEDBACK

We would welcome your comments or suggestions. Send them to

[dfidgrowthresearch@dfid.gov.uk](mailto:dfidgrowthresearch@dfid.gov.uk). Use this address also if you have ideas or comments on DFID's growth research programme.

**Disclaimer**

DFID is not responsible for the content of non-DFID websites.