Growth Research Programme

Innovation and productivity change in low-income countries

A brief overview of policy and academic debates and potential links to current research projects in the DFID-ESRC Growth Research Programme

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23 July 2013

The DFID-ESRC Growth Research Programme (DEGRP) will produce a range of knowledge publications and products aimed at linking the research of DEGRP to a number of research and policy debates in the area of agriculture, financial markets, innovation and growth. This paper outlines (i) a number of key academic and policy debates central to the theme of innovation and (ii) the role for DEGRP and individual projects in understanding research and policy on innovation.

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1. INTRODUCTION

The DFID-ESRC Growth Research Programme (DEGRP) funds world class scientific research on issues relating to economic growth in low-income countries (LICs), with high potential for impact on policy and practice. In addition to this, the programme aims to ensure evidence is used and has an impact on growth policy, and to develop the capacity of researchers to undertake and use research in developing countries.

The programme's research currently focuses on three themes: agriculture, finance and innovation. Within each of these themes, the programme is expected to (i) provide evidence on the details behind the growth process and structural transformation more generally (e.g. linkages amongst sectors); ii) explain drivers of productivity change and effective contributions of the themes to growth; and iii) highlight significant research gaps.

Research projects funded by the programme are expected to provide evidence on the appropriate nature and balance of, on the one hand, measures to free up and enhance the working of markets (addressing government failures, e.g. through implementing competition policies) and, on the other hand, measures to facilitate, steer and regulate the market (addressing market and co-ordination failures, e.g. through skills, credit, health services, infrastructure or technology development). There is therefore a great potential for the programme to influence a range of key policy debates.

Box 1: Defining innovation in DEGRP

There are various definitions of innovation. For example, the Oslo Manual (OECD, 2005) defines innovation as the implementation of a new or significantly improved (i) product (good or service), or (ii) process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. It relates to implemented innovation and hence is different from capabilities (e.g. for innovation) embodied in the enterprise map approach (c.f. Sutton and Kellow, 2010).

We suggest using a broader definition of innovation, encompassing new to the world invention but also the spread, adaptation and adoption of pre-existing know-how and techniques, services, processes and ways of working. Innovation encompasses the processes by which firms master and get into practice product designs and processes that are new to them.

There are a number of ways of measuring innovation such as innovation impacts (which we could define here as total factor productivity change at firm or sector level) or the presence of new technology (introduction of new technology such as the use of computers), or measures such as whether a firm has received an internationally known quality certificate, uses email for production and operations and has a website for production and operations.

Sources: OECD (2005); Sutton and Kellow (2010)

This knowledge paper discusses issues the programme will consider within the innovation theme and reflects on how the programme links to relevant policy debates. Box 1 defines innovation as the term is commonly used. Section 2 introduces a range of policy debates and current academic contributions relevant to innovation and growth; section 3 examines possible roles for the programme in this area; and section 4 concludes. The paper highlights the potential relevance of current DEGRP research projects in relation to the innovation theme (six successful projects from the first call are classified under innovation) and results are expected to become available in coming months and years.

2. POLICY AND ACADEMIC BACKGROUND

The programme's research on innovation takes place in the context of a number of wider issues:

- A remarkable revival of growth of many low income countries over the past two decades, with strong growth rates and emerging signs of structural transformation including in sub-Saharan Africa (IMF, 2012). How can such strong economic growth rates be sustained and structural change be enhanced (UNECA, 2011)? And how can innovation help to promote job rich growth in LICs?
- A reappraisal of the role of the state in promoting innovation, structural transformation and especially creating jobs (WDR, 2012 and IMF, 2012 emphasise the positive role of the state in promoting structural transformation). What can the state do to promote the spread of innovation in LICs?
- Remarkable successes in the spread of technology of ICT, mobile phones and activities such as the M-PESA model in Kenya where mobile phone technology facilitates use of financial transactions. What can we learn from those for LICs?
- Continued importance of innovation to address global challenges such as health or environmental change (ERD, 2011/2012).
- Growth, productivity, ICT and skills are key issues raised in the 2011 Istanbul Plan for Action (a ten year plan decided at the UN conference for all LICs) and hence will be important aspects of what LICs might raise in the context of the discussion on development goals post-2015.

There are also recent advances in our knowledge on innovation and growth in LICs:

- Whilst there has been acknowledgment that innovation and productivity growth ultimately drive long-run growth of income per capita and development (Hall and Jones, 1999), more recently there has been more attention to the importance of country specificity, including institutions, in driving growth dynamics (Hausmann et al. 2005);
- The role played by the state, institutional background (e.g. inclusive institutions and state-business relations) and political economy in promoting innovation and structural transformation (see e.g. Lin, 2012; Acemoglu and Robison, 2012);
- A better understanding of the micro-economic foundations of innovation in developed and middle income countries (Hsieh and Klenow, 2009) and better research on entrepreneurship (Bosma et al, 2009; Klapper et al , 2010);
- Increased knowledge on the links between trade, foreign ownership, innovation and productivity (Hausman et al, 2006; Melitz, 2003), between research and development (R&D), skills, innovation and productivity (Dutz et al, 2011; Seker (2011)) and between innovation, productivity and

employment growth (Ugur et al, 2012; Autor, 2013; Katz and Margo, 2013) in developing and developed countries.

Several DFID funded programmes are promoting important research on aspects of growth: the International Growth Centre (IGC), Improving Institutions for Pro-Poor Growth (iiG), Private Enterprise Development in Low-Income Countries (PEDL) and Growth and Labour Markets in LICs (GLM-LIC). However, with respect to the specifics on innovation and productivity, there is a lack of research on most of the issues raised above in low-income countries.

3. UNDERSTANDING DEGRP RESEARCH IN THE AREA OF INNOVATION AND GROWTH IN LICS

Following the substantial consultations conducted by DFID prior to the first call and the growing body of research, DEGRP research commissioned on innovation and productivity under the first ESRC/DFID growth call will focus on more research in LICs to (i) understand innovation better and (ii) examine appropriate institutional and policy factors behind innovation.

From a policy perspective, it is crucial to understand whether innovation happens mainly within firms, amongst firms in a sector, or through shifts amongst sectors. We need in-depth research on these issues in LICs, mapping out where and how innovation occurs. There is also a need for systematic documentation of what policies and institutions have worked for innovation, and in which contexts. In conceptual terms, the research programme differentiates (horizontal) policies that provide appropriate incentives for innovation by increasing competitive markets (addressing governance failures) from targeted (vertical) policies and institutions that set the right institutional support framework for firms to innovation (addressing market failures).

DEGRP covers the following areas: (i) Competition, Market structure, and Productivity Growth; (ii) Economic Institutions, Industrial Policy and Productivity Growth; and (iii) Service Sectors and Productivity Growth. The link between innovation/productivity and labour intensive growth is of particular importance, and this will be an important issue for the future (Ugur et al, 2012; Autor, 2013; Katz and Margo, 2013).

3.1 Identifying innovation

Much of aggregate productivity change happens within firms in advanced countries (Bartelsman et al., 2009) implying that innovation can be fostered through firm upgrading. For example, firm upgrading could occur through managerial changes (Bloom and Van Reenen, 2007). Others argue that productivity differentials are particularly large in developing countries among rather than within firms within a sector (Hsieh and Klenow, 2009), suggesting that productivity growth happens through enabling entry

and exit of firms. Recently, researchers McMillian and Rodrik (2011) and the IMF (2012) have highlighted the potential of aggregate productivity change through enabling shifts of labour between sectors. The emphasis on policy implications may differ according to where there is the greatest potential for innovation, but unfortunately we do not yet have good aggregate maps of innovation in LICs. Creating further knowledge on this will help policy-makers to understand the nature of innovation. Box 2 contains an example of how one DEGRP project is examining the incidence of innovation and structural change in Africa.

3.2 Framing policies for innovation and productivity change

We consider a policy relevant framework in which we can examine the high quality research outputs of the DEGRP programme. The innovation theme differentiates between horizontal policies that provide appropriate incentives for innovation by increasing competitive markets from targeted vertical

> **Box 2: DEGRP project (Professor Mcmillan): Structural Change and Productivity Growth in Africa**
>
> This research seeks to understand the causes and consequences of structural transformation in Africa. While it is well understood that structural change and economic growth go hand in hand, there is little consensus among researchers – and, in the case of Africa, little actual research - on the determinants of structural transformation. A major contribution of this project is the construction of a harmonised, long-term, sectoral dataset for several countries in sub-Saharan Africa. This dataset will consist of time series information on value added in international prices and employment for ten broad economic sectors for the period from 1960 to 2010. With this new dataset, the researchers will identify countries in which structural change has been growth enhancing as well as countries in which structural change has reduced economic growth.
> *Source: http://bit.ly/134aL76*

policies and institutions that set the right institutional support framework for firms to innovate. It focuses particularly on two policy research areas (i) Competition, Market structure, and Productivity Growth (linked to horizontal policies) and (ii) Economic Institutions, Industrial Policy and Productivity Growth (linked to vertical policies). These areas link to those identified in the first and second call of the DFID-ESRC Growth Research Programme:

(i)   Competition, Market structure, and Productivity Growth

An important policy debate in the economic literature to which DEGRP will relate is whether greater competition in factor and product markets leads to higher aggregate productivity. First, actual competition or the threat of competition will shift market share towards more efficient producers, whilst less efficient firms shrink or leave the market. Second, competition will lead to productivity increases within firms, including through lower-cost inputs. This area of research is concerned with how competition can be best fostered so that it provides firms with the best incentives for innovation and firm survival. Increased competition can change the incentives for innovation through (i) easing market-entry conditions, (ii) increased threat or incidence of foreign competition, and (iii) improved regulatory changes. Some research is beginning to emerge in this area (Syverson, 2011), but there is very little for LICs (and none of the current DEGRP projects focus on this substantially). Enabling up private sector

activity and entrepreneurship through addressing governance and regulatory failures can be an important factor behind innovation.

(ii) Economic Institutions, Industrial Policy and Productivity Growth (linked to vertical policies)

The second policy debate the programme relates to is on how the state and specific national innovation systems can foster innovation. The process of innovation involves learning, institutional development and systematic interactions between various actors (Nelson, 1993) and is beset by a range of market, co-ordination and government failures. Market and coordination failures are prevalent in areas such as skills development and technological development (Lall, 2001), infrastructure provision, and capital markets (Stiglitz, 1996). Co-ordination failures also operate between linked firms, in clusters of firms and relating to the economy as a whole and might prevent an economy from reaching a higher development path (Rodrik, 1996). There is a debate on the empirical relevance of such failures for the lack of innovation in LICs. Box 3 provides an example of a DEGRP project that aims to examine the determinants of the spread of technology (especially with respect to Ghana).

> **Box 3: DEGRP project led by Prof Xiaolan Fu: The diffusion of innovation in Low Income Countries**
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> This project aims to (i) understand the barriers to innovation creation and diffusion in LICs under institutional, resource and affordability constraints and spaces for innovation policy; (ii) analyse the determinants of knowledge diffusion in LICs from leading innovators to latecomers, in particular the role of university-industry linkage and inter-firm networks; (iii) examine the effect of external knowledge diffusion to LICs, in particular the productivity impact of South-South trade and FDI with a special focus on Chinese trade and FDI in Africa; and (iv) develop an SME open innovation network model to increase frugal innovation for the poorer societies in LICs.
> *Source: http://bit.ly/15femyX*

Governments may fail to correct market failures because (i) they are unlikely to have perfect information; (ii) they can suffer from moral hazard problems; (iii) joint private action is sometimes more appropriate; and (iv) they face risks of misallocation and rent-seeking behaviour. Research questions therefore also need to examine what is the best institutional framework for appropriate and good quality government policies for innovation.

National innovation systems are networks of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies (Freeman, 1995). Non-market institutions play a vital role in building technological capabilities, in addition to addressing market failures more generally, as elaborated in the evolutionary approach to industrial development (Lall and Pietrobelli, 2002). What characterises good national innovation systems?

> ## Box 4: Defining national innovation systems
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> A national system of innovation has been defined as follows (OECD, 1997):
> - 'the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies' (Freeman, 1987)
> - 'the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge... and are either located within or rooted inside the borders of a nation state' (Lundvall, 1992)
> - 'a set of institutions whose interactions determine the innovative performance... of national firms' (Nelson, 1993)
> - 'the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country' (Patel and Pavitt, 1994)
> - 'that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies.' (Metcalfe, 1995).

In the past, industrial policies often failed to achieve their intention in LICs (especially sub-Saharan Africa), but industrial policies are now seen in a more positive light based on better learning from existing models of industrial policies, the development of more market friendly industrial strategies, and improvements in state capacities to administer the policies (Lin et al, 2011). Effective state-business relations may foster growth and productivity change at firm level (Qureshi and Te Velde, 2012). For example, good quality public-private interaction may lead to better industrial policies such as time-limited incentives, efficient regulatory frameworks, appropriate government expenditure, market-relevant technological development and reductions in uncertainty.

3.3 Services and Productivity Growth: filling a gap in the literature on productivity

A particularly gap with respect to knowledge on innovation and productivity pertains to the services sector. This hampers growth policy-making generally. Structural change and the development of service sectors are crucial for future development. Some service sectors are directly pro-poor (e.g. some forms of tourism, retail etc.), and development in other service sectors (e.g. communications, finance) are vital because they form the backbone of an efficient, productive and innovative economy or because good quality and innovative social services, such as health and education, are valued in their own right (Cali et al, 2008).

The share of services value added is growing rapidly in many LICs, but there is a lack of knowledge on productivity and innovation in the service sectors. DEGRP aims to say more on (i) productivity in services sectors and (ii) ways in which efficient service provision links to innovation elsewhere in the economy. Empirical evidence suggests a significant relationship between financial depth and growth (see e.g. Beck et al 2000; Ayyagari et al, 2007). Researchers have also shown that financial depth is

particularly beneficial for the poor, reducing income inequality (Beck et al, 2005). Further, evidence shows that managerial practices are linked to differences in productivity, profitability, firm growth and firm survival, suggesting that skills and management training might help productivity and innovation (Bloom et al, 2011; WDR 2012).

Box 5 includes two DEGRP projects that examine the link between the health sector and industrial productivity, while box 6 includes a project that examines how the development of service sectors (e.g. for skills and finance) affects productivity. There are many gaps left in this rich research agenda.

Box 5: Link between health sector performance, industrial productivity and innovation - examples of relevant DEGRP projects

DEGRP project led by Prof Maureen Mackintosh: Industrial Productivity, Health Sector Performance and Policy Synergies for Inclusive Growth: A Study in Tanzania and Kenya

This project examines the supply chains of essential medicines and medical equipment and supplies from local industries and imports into health systems in Tanzania and Kenya. The hypothesis is that better integration between industrial and health policies could contribute to higher employment, industrial upgrading, and improved health system performance and accessibility. If this is correct, improved industrial production - higher productivity, more appropriate and cheaper products, and innovative production methods - could improve health service performance and contribute to inclusive growth.

DEGRP project led by Dr Andrew Dillon: Malaria, Productivity and Access to Treatment: Experimental Evidence from Nigeria

The study examines the consequences of ill health for productivity and economic development. To better understand this link, this study offers access to malaria treatment and insurance at exogenously varied prices to estimate its effect on take-up and frequency of health care. It will also measure the effect of malaria treatment on both worker productivity and physical activity.

Sources: http://bit.ly/11dhdHG and http://bit.ly/142lIl2

> ## Box 6: Skills, finance and productivity - examples of relevant DEGRP projects
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> **DEGRP project led by Prof Christopher Woodruff: Training, Productivity, and Upgrading: Evaluation of Female and Supervisor Training Programs in the Bangladesh Apparel Sector**
> The project examines the effect of female managers on firm-level productivity in the ready-made garment (RMG) sector in Bangladesh. It evaluates, through a Randomized Control Trial, a Female Supervisor Training Program supported by the German overseas aid agency (GIZ) and developed with industry stakeholders. Mid-level management training is widely seen as needed in the Bangladeshi RMG sector, and thus the training program is targeted to sector-specific needs. There is a potentially large demand for training in the sector, but also concerns among factory owners that trainees will leave the factory after completing training. The issue of migration has profound effects on demand for training and who optimally pays for the training.
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> **DEGRP project led by Prof Orazio Attanasio: Improving productivity in developing countries: Identifying bottlenecks and obstacles to investments and technology adoption**
> The aim of this research is to identify imperfections and frictions that prevent the adoption of profitable technology and innovations or, more generally, that may impede investment opportunities with a potentially high rate of return. To achieve this, the research will use data that have been collected to evaluate a number of interventions in developing countries in order to estimate models of individual behaviour and investment choices. There will be four different projects, covering parts of Africa, India, and Pakistan. Projects cover inter alia the effects of training and finance.
> *Sources: http://bit.ly/13ciSuO and http://bit.ly/17CJIzL*

4. CONCLUSIONS

This paper has proposed several ways on how the DFID-ESRC Growth Research Programme can stimulate and communicate policy relevant research on innovation and productivity in LICs. Policy research is needed to examine where and how innovation happens as countries structurally transform and to understand how the spread of innovation can be promoted. There seems to be a particular gap with respect to our understanding of how innovation occurs in the service sector. Research along these lines involves cutting-edge academic research with a great potential for impact on policy and practice.

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