Research and Development (R&D), Foreign Technology and Technical Efficiency in Developing Countries

Policy brief DFID/Tilburg University research: *'Enabling Innovation and Productivity Growth in Low Income Countries' (EIP-LIC)'.*
http://www.tilburguniversity.edu/dfid-innovation-and-growth/

October 2016

In today's globalising world, economists and business community actors acknowledge the importance of innovation for productivity growth supporting economic growth and development. However, there is little literature and theory on innovation low income countries and particularly on manufacturing firms in Africa. In the framework of a DFID-funded research project entitled *'Enabling Innovation and Productivity Growth in Low Income Countries (EIP-LIC)'*, a team of researchers from the University of Nairobi and Radboud University Nijmegen investigated the interactions of Research and Development (R&D), foreign technology and technical efficiency in firms in Kenya, Tanzania and Uganda. The original working paper is entitled 'R&D, Foreign Technology and Technical Efficiency in Developing Countries' (2015) by Laura Barasa, Peter Kimuyu, Bethuel Kinyanjui, Patrick Vermeulen and Joris Knoben[1].

Research findings

The team examined whether innovation activities including internal research and development (R&D) and adoption of foreign technology have differential effects on technical efficiency (how efficiently a firm converts inputs of capital and labour into outputs). A first finding of the study was that R&D actually significantly decreased technical efficiency. This is surprising because it has been previously suggested that inefficiency in manufacturing firms in Africa arises from a lack of organized R&D and low levels of investment in internal R&D. Possible explanations could be that investment in R&D only has a lagged impact on efficiency, or that R&D spending by an individual firm may increase the efficiency of the firm relative to others (by virtue of the way efficiency in the sector is measured).

The adoption of foreign technology has a positive, but not statistically significant effect on technical efficiency. This may indicate that foreign technology imported from advanced economies require additional skills to match the African context of firms. The combination of internal R&D and the adoption of foreign technology is found to significantly decrease technical efficiency. Additionally, low rates of human capital found in Africa, necessary to make the adoption of advanced foreign technology worthwhile, may indicate a lack of capacity for sophisticated R&D activities,

[1] The paper is accessible at the project's website (http://www.tilburguniversity.edu/dfid-innovation-and-growth)

Policy implications

The results of the study indicate that internal R&D has a negative effect on technical efficiency. Firms may engage in R&D activities that are not conducive to increasing efficiency. Apparently, the R&D is not focusing on process innovation with a view to increasing productivity and efficiency, but likely on other forms of innovation such as product innovation. In factor-driven economies like Kenya, Uganda and Tanzania such product innovations, following the introduction of technologies that develop products from locally available raw materials, is a common phenomenon indeed.

This is confirmed in the EIP-LIC qualitative studies in Kenya and Tanzania; innovating entrepreneurs seek to compete with imports of manufactured goods, which could be produced locally. The entrepreneurs indicate that they only require the technology enabling them to actually manufacture the product. This R&D motive was much more the case than increasing the efficiency of the production process to increase efficiency.

Innovation support policies and programmes in those countries could take this more nuanced view on the types of innovation into account in the development of their programmes. Alternatively, government support may be imperative for fostering engagement in R&D activities that improve efficiency, if companies entered a more efficiency-driven way of operation.

Another position is that the operational environment may be the underlying factor behind the apparent mismatch between internal R&D and efficiency. The 'usual suspects' in the environment include limited access to credit and inputs, low levels of human capital, poor infrastructure and poor governance. Entrepreneurs may hope to increase efficiency through their R&D efforts, but eventually it does not materialize. This constitutes an argument for strengthening basic conditions for economic development and institutional reforms aimed at strengthening government. Likewise the internal absorptive capacity of enterprise may hamper the optimal use of the R&D.

Investing in internal R&D in combination with adoption of foreign technology is not conducive to mitigating inefficiency in manufacturing firms in developing countries. Notwithstanding, where internal R&D is absorptive in nature foreign technology may be modified to meet the needs of manufacturing firms that will in turn increase efficiency in developing countries.

This policy brief is the product of a research project funded by the British Department for International Development (DFID) entitled 'Enabling Innovation and Productivity Growth in Low Income Countries' (EIP-LIC)'. The project is implemented by Tilburg University (The Netherlands) and explores SME-level innovation in Low Income Countries (LICs) and factors that contribute to or limit its diffusion. Data collection and research collaborations take place in 10 African and Asian countries (Bangladesh, Ethiopia, Ghana, India, Indonesia, Kenya, Tanzania, South Africa, Uganda and Vietnam). The policy implications of research are presented in a series of policy briefs, targeted at a broad audience of policy makers within governments, business and development agencies with a view to quantifying research outcomes and promoting evidence-based policy making.