

Abstract

How may innovation policies and the length of cycle of technologies determine the ability of developing states to achieve technological leapfrogging?

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Purpose of the Study

This study explores the phenomena of ‘technological leapfrogging’ of developing states and asks the question ‘what are the predictors of technological transformation of these economies?’ The study builds on analyses of short-cycle technologies as a pathway to technological upgrading and the convergence of middle-income economies with developed states. A gap in the literature reveals a lack of research on decision-making of domestic firms within developing states, particularly as influenced by national innovation systems and government policy. Bridging this gap in the literature could further understanding of how these firms navigate competitive forces as they seek to upgrade technology or move into new technologies? This paper considers whether predictions may be made of the point at which a country passes a ‘technological leapfrogging marker or turning point?’ Whilst a number of studies in the literature present concepts on how technological transformation and leapfrogging may occur, there is limited research analysis presented on the theoretical prediction of the leapfrogging phenomena. Further research would enrich understanding of the technological transformation process within key sectors of developing states.

Research Design Methodology and Findings

The research utilizes a quantitative research methodological approach. A regression analysis was undertaken utilizing patent data of 46 countries over a 25-year period sourced from the US patent classification agency, the National Bureau of Economic Research (NBER). The relationship between different classes of patent registration and the short cycle leapfrogging proxy is assessed. The results show an increase in patent registrations across three out of six industry classifications for middle-income countries over the 25-year period, is correlated with short cycle technologies defined in the study.

The methodological approach for this paper is deeply embedded in the positivist tradition and post-positivist schools of thought, both of which embrace a deductive reasoning and quantitative approach.

The regression results revealed the model is statistically significant and that there is a positive linear relationship between the variables.

Value & Originality

This paper argues that technology transfer, whilst not costless, if managed well, will enhance the productivity and competitiveness of developing economies. It is also notable that a sufficient amount of technology transfer may be required before countries may be in a position to pursue or achieve technological leapfrogging. Further, it contends that innovation, especially through 'learning by doing' or a focus on 'continuous improvement' can result in scaling up of the productivity and competitiveness of developing economies, prior to leapfrogging taking place. Thus, it is argued that 'learning by doing'²³ and 'leapfrogging' are not mutually exclusive, as much of the current literature appears to imply. This paper posits that learning by doing may be a precursor to the technological leapfrogging process, positioning of companies and government policies, prior to technology transfer, upgrading, retooling and eventual technological leapfrogging. There is a gap in the literature around this issue, which makes it challenging to further discuss the linkages between these elements, particularly from the perspective of firm-decision making at the sector level.

Policy Implications and Potential Future Research

It was challenging to introduce the national innovation system (NIS) as a predictor variable within the model. Sophisticated analysis is required to effectively translate advanced countries' NIS frameworks to a developing country context, which is beyond the boundaries of a masters' research. The NIS consists of many components, which vary by country, according to how indigenous processes and capabilities build into the framework to promote innovation at the domestic level. Typical definitions for the NIS of advanced economies cannot be easily translated to the realities of middle-income or developing countries. Challenges with regards to the dearth of institutional frameworks and processes undermine effective development of an innovation system, which truly encourages firms to innovate.

This paper does not present analysis on the decision-making processes of firms when deciding when to move into new technological sectors or upgrading. These processes are complex and not easily incentivized. Sufficient in-depth analysis at the firm level would need to be conducted in order to undertake this.

Future work could include a more extensive consideration of the NIS framework from a developing country perspective and the analysis of data, perhaps through a case study approach, of the decision-making rubric for innovating firms.