



Technological innovation in Brazil, Russia, India, China, and South Africa (BRICS): An organizational ecology perspective



Yu Cui ^a, Jie Jiao ^b, Hao Jiao ^{c,*}

^a School of Economics and Management, Beijing Information Science & Technology University, Beijing, China

^b School of Economics and Management, Tsinghua University, Beijing, China

^c Business School, Beijing Normal University, Beijing, China, No. 19, Xijie Kou Wai Street, Beijing 100875, China

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ABSTRACT

This study investigates how a firm's engagement in technological innovation in Brazil, Russia, India, China, and South Africa (BRICS) is shaped by its organizational attributes. Drawing on the logic of organizational ecology theory, we suggest that a firm's engagement in technological innovation is influenced by its (1) organizational resource and capability (e.g., product certificate and employee training), (2) transactional-based competition (e.g., sales to government and export ratio), and (3) ownership structure (e.g., public listing, foreign ownership, and government ownership). Using the World Bank's data, we analyzed firms in BRICS economies and found partial support for the hypotheses. The results suggest that in BRICS economies, firms with more investment in employee training beyond on the job training and product certificates and that are publicly listed will have higher probability of engaging in technological innovation. Moreover, firms with a higher export ratio and a higher government ownership share will have lower probability of engaging in technological innovation. These results suggest that a firm's engagement in technological innovation is, at least in part, an organizational phenomenon influenced by the firm's resource conditions, required legitimization in the market, and founding conditions.

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1. Introduction

The relationship between innovation (specifically technological innovation) and firm performance has attracted much research interest, but we still know relatively little about why some firms successfully use technological innovation to achieve a sustainable competitive advantage in rapidly changing environments while others do not. The extant literature suggests that technological innovation can result in superior performance by integrating resources and collaborating with partners (Teece, 1986; Howell and Higgins, 1990; Pillania, 2012; Kurt and Kurt, 2015). Our study aims to contribute to this literature by focusing on two issues that are relatively neglected: (1) how a firm's engagement in technological innovation is shaped by its organizational attributes; and (2) the actual conditions of technological innovation in Brazil, Russia, India, China, and South Africa (BRICS).

With the aim of redressing this void, this study is designed to examine how technological innovation is influenced by organizational conditions, that is, why are firms in the same country or industry often disparate in their engagement in technological innovation? Why are some firms better than others in the same business or geographic region in technological innovation performance? What are some organizational attributes within a firm that are responsible for shaping a firm's

technological innovation behavior? Answering these questions will help understand how to develop and implement technological innovation activities in emerging countries.

Although a handful of studies have discussed macro-level antecedents of technological innovation, these studies emphasized national environments, social culture, industries, and networks (e.g., Shan et al., 1994; Goes and Park, 1997; Ahuja, 2000; Sonne, 2012), leaving a firm's organizational predispositions to technological innovation largely unaddressed. This study complements the studies above and explores organizational conditions within a firm which influence firm-level technological innovation. We view this as an important issue because, according to the organizational ecology theory, a firm's internal capabilities, continuous competitive pressure in industry, and founding conditions can affect its organizational behavior, such as its innovation strategy (Amburgey and Hajagreeva, 1996; Hannan and Freeman, 1989).

Building on the logic of organizational ecology, which emphasizes both the shaping forces of organizational environments and capabilities on the development of organizations and imprinting effects of founding conditions (e.g., Baum and Oliver, 1996; Boeker, 1989; Hannan and Freeman, 1989), this study argues that technological innovation in a firm is influenced by a firm's resources and capability (e.g., product certificate and employee training), transactional-based competition (e.g., sales to government and export ratio), and ownership structure (e.g., public listing, foreign ownership, and government ownership).

* Corresponding author.

E-mail address: haojiao@bnu.edu.cn (H. Jiao).

Using the World Bank’s data, our analysis of firms in Brazil, Russia, India, China, and South Africa demonstrates that as the percentage of government ownership of a firm’s total ownership increases, the firm will have lower probability of engaging in technological innovation. Moreover, technological innovation is also decreased when a firm has a higher export ratio. However, technological innovation is increased when a firm has a high level of product quality, employee training, and public-listed status.

2. Literature review and hypotheses development

Conventionally, the ecological perspective is used to explain how social, economic, and political conditions affect the diversity of organizations and account for their changing composition over time (Baum, 1996). In emerging economies, where competition in the industry is fierce, technological innovation is often considered widespread and an effective business method employed by most firms to compete with others. We start from three perspectives, resource and capability, transaction-based competition, and ownership status, to explore their effects on technological innovation (Baum and Oliver, 1996; Hannan and Freeman, 1989; Manser et al., 2015).

Fig. 1 highlights our overall theoretic framework.

2.1. The effect of resource and capability conditions on technological innovation

Organizational ecology theory acknowledges that an organization’s susceptibility and adaptation to environmental constraints is impacted by its resources and capabilities (Hannan and Freeman, 1989; Zhou and Li, 2008). For instance, the lack of resources in a firm may cause a firm to lack in technological innovation. Per this logic, this study focuses on two firm resource and capability variables, product certificate and employee training, that may have different effects on technological innovation.

Generally speaking, if a firm obtains a product certificate, such as a Quality Management Standard ISO 9001 Certification, the firm will pay great attention to process improvement and produce a good-quality product. Marette and Crespi (2003) found that a quality certification can push a firm to develop a new product and improve an existing product, which can result in technological innovation.

A product certification can have a positive effect on technological innovation in the following way. First, product certification system audits will ensure the independence of the technological innovation process in

the organization. Love and Li (2000) believe that the technological innovation process will be in accordance with its actual goal due to the systematic and independent inspection function of product certification to avoid external interference with the product innovation and technological innovation. Second, product certification can improve the enterprise’s reputation and enhance market competitiveness, which further provides enough resources for innovation (Graffin and Ward, 2010). Third, product certification can help a firm create a modern enterprise management system and promote the development of an innovation culture within the enterprise (Terziovski and Guerrero, 2014). Based on this line of discussion, we anticipate:

H1. *Firms with a product certification will have higher probability of engaging in technological innovation than those that are not certified.*

Employee training also contributes to a firm’s predisposition for technological innovation. Acemoglu (1997) found that general training will lead to an amplification of product improvement and that firms are more willing to innovate when they expect the quality of the future workforce to be higher. Macdonald et al. (2007) found that European Commission funds for education and training for firms produced the desired innovation. Employee training is helpful for technological innovation by promoting interpersonal and organizational learning practices (Sung and Choi, 2014). Organizational expenditure for internal training employees predicts various learning practices and creates the conditions required to achieve organizational innovation, which in turn enhance the cohesive affinity and competitiveness (Birdi, 2007). We therefore expect:

H2. *Firms with more investment in employee training beyond on the job training will have higher probability of engaging in technological innovation.*

2.2. The effect of transactional-based competition on technological innovation

A key component of the organizational ecology is the shaping effect of environments on organizational development. Central to this view is the argument that environmental factors, such as competition and institutional rules, will affect the availability of resources for organizations as well as their legitimization in an environment, which in turn will determine the founding, survival, or changes of the organizations (Baum and Oliver, 1996; Hannan and Freeman, 1989). The ecological perspective

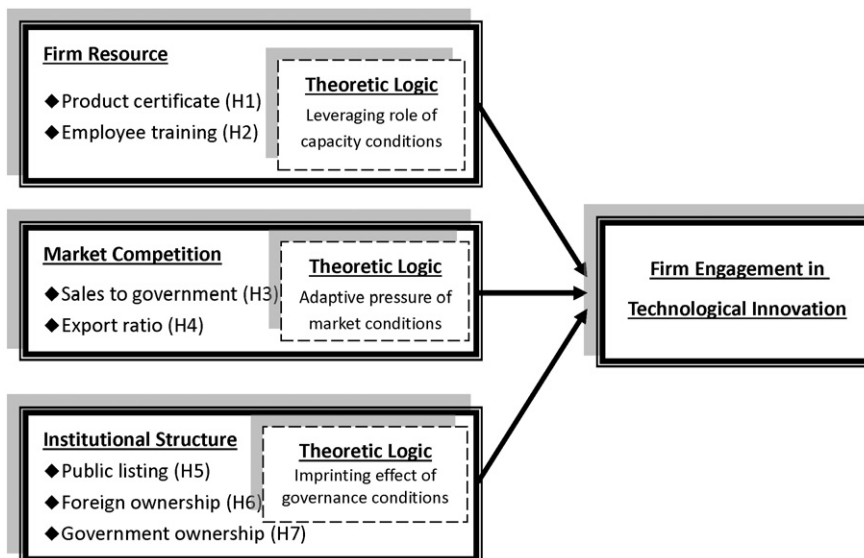


Fig. 1. An ecological framework of firm attributes and technological innovation.

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