



Interactive learning and firm-level capabilities in latecomer settings: The Nigerian manufacturing industry



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ABSTRACT

Combining insight from strategic management, evolutionary economics and latecomer capability literatures, this paper analyses the relationship between interactive learning and capabilities in a sample of Nigerian manufacturing firms. A distinction is made between formal and informal modes of interactive learning. Results from multi-variate probit estimations show that both modes are positively associated with firm-level capabilities but informal interactions dominate. These results have some implications for policy and practice. Firms may become more capable of innovating if they connect with externally-generated knowledge. However, the apparent difference in importance of formal and informal linkages suggests that the choice of how and when to form linkages is non-trivial. It also suggests the need for broad-based policies to nurture both types of linkages.

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1. Introduction

In discussions on economic development and catch-up, the role of enterprise-level innovation has been emphasised. Innovative firms, especially in manufacturing, are seen as drivers of structural change and productivity enhancements at the national level. This is particularly true for developing countries which can potentially benefit from their technological distance to the frontier (Szirmai, 2011; Fagerberg et al., 2010; Archibugi and Pietrobelli, 2003). However, the innovation environment particularly in sub-Saharan Africa is usually harsh. Infrastructure, human capital and institutions required for learning and capability building are highly constrained.

How can firms manage to learn and innovate in such environments? This particular question has received significant attention in the literature on innovation in latecomer contexts (see Dutrénit, 2004, for a review). The common understanding is that by building up their technological capabilities, the firms can indeed generate endogenous technical change. Technological capabilities refer to the resources needed to generate and manage technical change. To build their capabilities,

firms must engage in a process of technological learning in which imported technologies and interaction with knowledge-bearing entities (such as universities and customers) play a crucial role (Bell and Pavitt, 1993; Archibugi and Pietrobelli, 2003).

Despite its richness, the existing literature is lacking in certain respects. In studies of developing countries, the mastery of foreign technologies is often emphasised at the expense of learning from sources within the local innovation system (see, for instance, Narayanan and Bhat, 2009). Moreover, in studies that analyse interactions within systems (e.g., Oyelaran-Oyeyinka, 2007), the distinction between different modes of interaction, i.e., formal or informal, is commonly ignored. Besides, apart from a few exceptions like Iammarino et al. (2008), most studies treat capabilities as inputs and outcomes at the same time, leading to some fuzziness in the understanding of the learning–capability relationship.¹ And there is hardly any analysis of non-technological capabilities, i.e., those related to marketing and organisational changes, which are, no doubt, very crucial for developing country firms. By

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¹ The perception of capabilities as inputs stems from the resource-based view of the firm (RBV) where capabilities are seen as part of a firm's strategic resources through which it builds competitive advantage (Barney, 1991). While this broad perception is agreeable, the theoretical leaning of this paper is that capabilities as a resource help the firm to combine other resources in specific ways to achieve specific aims.

addressing these issues, this paper seeks to add to the growing literature on latecomer learning and innovation. The main contribution of this paper is to use data from a pioneer survey of Nigerian manufacturing firms to provide evidence on the relationship between interactive learning and the build-up of capabilities by firms in an import-dominated developing country.

For the sake of our analyses, innovation is broadly defined to include “all types of search and improvement effort” by the firm (Lall, 1992, p. 166) for the purpose of generating technical change. Capabilities, the outcome of learning and accumulation of new knowledge particularly from local sources such as customers and universities, lie at the root of this process. Thus, a firm's innovative activities² constitute useful proxies for its level of capabilities (Iammarino et al., 2008). These are disaggregated in this paper into product, process, marketing and organisational.³ Two modes of interaction, formal and informal, are distinguished. Formal interaction involves a collaboration agreement while informal interaction means that an external source acts as source of information for innovation (Freitas et al., 2011). These distinctions enrich the analyses since, as will be shown later, the relationship between different modes of interaction and innovative activities are not necessarily the same.

The rest of the paper unfolds as follows. In the next section the empirical context and its implications for the research design and expected results are discussed. The theoretical underpinnings are subsequently laid out in more detail. Attention is paid to the operational distinction between competencies and capabilities, and the theoretical distinction between formal and informal interactions. The data, method and results are thereafter discussed. It is shown that the sampled firms engage more in informal interactions and tend to rely more on market-based than science-based sources of external knowledge for capability accumulation. In a multivariate probit analysis, it is demonstrated that interactive learning correlates non-uniformly with the accumulation of different capability types. The paper concludes by drawing some implications from these results.

2. The empirical context

2.1. Why Nigeria?

In a study of firm-level capabilities and innovation in sub-Saharan Africa, Nigeria is an attractive case given its economic importance in the sub-continent. With a GDP of \$145 billion in 2006 and \$244 billion in 2011, it is one of the largest economies in Africa. And with a population estimate well in excess of about 150 million as well as GDP and GNI per capita, in purchasing power parity, that have roughly doubled in the last one decade, it is arguably the largest market in Africa (World Bank, 2013). The country is essentially import dominated, its outward international trade being concentrated heavily on primary products. The value of total exports in 2007 comprised 98% minerals (mostly crude oil) and over 50% of total imports value comprised foods, beverages and processed industrial supplies, making the country a net importer of food and consumer products (NBS, 2010). The resulting problem for the manufacturing sector is the stiff competition that domestic products face from imports which are often of superior quality.

² Note here the distinction between ‘innovative’ and ‘innovation’ activities. The latter include R&D, training, purchase of equipment, and other activities carried out in preparation for innovation. They are related to the competencies that the firm inputs into the innovation process. The former describe the technical functions carried out by the firm as outcomes of the innovation process and signal its level of technological capabilities. See von Tunzelmann (2009) for a more complete discussion.

³ This disaggregation is based on the Oslo Manual (OECD, 2005) as adopted for the first set of innovation surveys in Africa. For a detailed discussion, see UNU-INTECH (2004) and AU-NEPAD (2010).

2.2. The innovation environment

Nigeria's innovation environment is similar to that of most other developing countries where the majority of firms do not perform basic R&D into new products and processes, innovation is mostly incremental in nature and the business environment is a major obstacle to firm performance. The national innovation system is weak and fragmented and many institutions needed for innovation—including venture capital, legal institutions and science and technology parks—are either underdeveloped or entirely missing.⁴

However, the constraints do not imply the absence of capabilities or interactive learning. In fact, overcoming the “holes” in the business environment is one of the firms' incentives that drive the formation of external linkages. African firms have been shown to ‘supplant the state’ by creating private governance systems and networks that make up for market failure and the lack of formal institutions (Oyelaran-Oyeyinka (2007); Biggs and Shah (2006)). The networks also act as a source of technical expertise, as facilitators of credit or market access and as conduits for information exchange (Barr, 2002; Fafchamps, 2001).

2.3. Implications for the study and expected results

The characteristics of the research context do have some implications for the empirical design and the expected results. As already explained, innovation is defined rather broadly to capture new-to-firm changes which are expected to be a major part of what the firms do. Also, in place of R&D as a proxy for the firm's internal knowledge accumulation efforts, staff training and innovation budget (which includes mostly expenses made into non-R&D innovation activities) are used.

With regard to the results, the study context—and also the theoretical discussion in Section 3—imply that informal interactions may, in general, be more prevalent and, more specifically, that market sources of knowledge (e.g., customers, suppliers and other firms) will be more dominant among the economic actors with whom firms interact. Also, turning to external sources will show a positive association with firm-level capabilities but, *sensu amplo*, informal interactions should be more important.

3. Theoretical and empirical background

The literature on firm-level innovation, capabilities and learning in developed countries is particularly vast. It is however limited in relevance for developing countries due to the significant contextual differences. There is a heavy bias in this literature towards technological product and process innovation. Besides, a vast majority of the studies define innovation very narrowly and measure it through patents or products that are new to the market. Yet, some of the principles and relationships established in this literature are context-neutral and, therefore, hold some relevance for developing countries (Cooper, 1991). As a result, this paper combines insight from this body of research, particularly strategic management and evolutionary economics, with the research on latecomer technological capabilities to motivate the analyses.

3.1. Competencies, capabilities: an operational distinction

In the resource based view (RBV) literature, capabilities are conceived as a source of competitive advantage (Barney, 1991). In that sense, a firm's capabilities constitute an input into the process of developing competitive advantage (Barney, 2001; Wernerfelt, 1984). But in relation to learning and innovation, which are the subjects of this study, capabilities are best seen as an output of the technological

⁴ See Hadjimanolis (2000, p. 236) for a discussion of contextual differences between developed and developing countries, and Bigsten and Söderbom (2006) for a discussion of the specific situation in African countries. For more general discussions on developing countries, see Niosi (2010) and Schmitz (1982).

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