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## Intermediate institutions and technology transfer in developing countries: The case of the construction industry in Ghana

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## ABSTRACT

There has been an emerging view that the quality of state institutions can influence technology transfer in host countries. The bulk of such studies have ignored the role of intermediate institutions which bridge government and industry. We compare academic and local expert views of how technology and knowledge (T&K) transfer could be enhanced in the developing world, taking the Ghanaian construction industry as an exemplar. The academic argument that the development of strong intermediate institutions is likely to improve T&K policy and practice is explicated. We then investigate expert perceptions of the industry's T&K transfer problems and their proposed solutions. Their views confirm, but also develop and nuance academic research by suggesting that certain types of intermediate institutions have a more significant role to play than others.

## 1. Introduction

Technology and knowledge (T&K) transfer may occur through foreign direct investment (FDI); trade; machinery and equipment imports; contacts with highly skilled diaspora members (nationals working abroad) and with other information networks, including those of academia and the media (Danquah and Ouattara, 2015; World Bank, 2008). Construction FDI can, uniquely, take significant advantage of the gamut of these T&K transfer elements within host countries in developing countries such as those in Africa (Osabutey et al., 2014). We examine expert perceptions of the effectiveness of different types of intermediate institutions in facilitating T&K transfer in the Ghanaian construction industry, comparing them with theory. The subject is important because FDI's major contribution to economic growth derives from 'its role as a conduit for transferring advanced technology' (Lim, 2001: 3). Whilst a considerable number of empirical works have noted technological gaps in Africa such studies have, at the same time, shown or emphasised the importance of technology transfer to economic growth in the region (Adenle et al., 2017; Chavula, 2013; Managi and Bwalya, 2010; Osabutey et al., 2014; Osabutey and Debrah, 2012; Rattso and Stokke, 2012). Advanced technology should be a key driver for firm- and country-level productivity enhancement (Lai, 2011; Zhang et al., 2010). Yet FDI in Ghana has been shown to have negative effects on local firms' productivity (Waldkirch and Ofori, 2010).

T&K benefits transferred to Ghana's local companies remain very limited: Ghana is ranked 112 of 139 countries in firm-level technology transfer (World Economic Forum, 2011). Aspects of the FDI literature

examine whether sufficient technology transfers occur to justify the incentives policymakers give to attract foreign investment (Eapen, 2013). Osabutey and Debrah (2012) argued that low T&K transfer in Ghana can be attributed to policy lacunae. They discern that policy-making was generally inconsistent and fragmented, with existing policy frameworks failing to adequately link, for example, FDI, trade and education policies. This suggests that government is generally unable to operate at the level required to enhance T&K transfer. Although this observation has some explanatory force, government capacities require supplementation in the context of Sub-Saharan Africa and researchers have not evaluated the role of intermediate institutions.

T&K transfer is likely to be influenced by local institutions (King, 1987). African states' institution-building activities to manage and mediate external interventions have recently been brought into sharp focus (Mohan and Lampert, 2013), but few studies explore the nature of the national institutional structures that may facilitate T&K transfer. Many researchers have simply adopted a state-centred approach, making prescriptions for government policy. A broader institutional view suggests fuller recognition of the limitations of state action when these institutions either do not exist or play an inadequate role. We therefore examine how T&K transfer, defined as the sharing of technology, 'know-how' and work organisation practices may be enhanced in the Ghanaian construction industry, testing academic theory through industry expert views.

The remainder of the paper is organised as follows: First, we outline our theoretical framework. Next, we provide a brief overview of the Ghanaian construction industry before describing the research design

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and method. Third we report on our experts' perceptions. Finally, we discuss how our theoretical perspectives relate to expert views and draw out conclusions and implications.

## 2. Theoretical framework

It is widely acknowledged that T&K is central to growth. A significant strand of the development literature has identified that firms' capabilities at the aggregate level of industries and countries have to develop as a condition for competitiveness and growth (Goedhuys et al., 2013). However, firm level theories alone cannot explain the technology transfer choices managers make since institutions regulate the activities and enforcement characteristics within which organisational and economic activities occur (North, 1990; Scott, 1995). Effective relationships between institutions, organisations and government are essential for economic development, particularly in developing countries. T&K transfer, a development activity important for economic growth and development, requires interaction between institutions, government and organisations. In a cross-national setting, national institutions influence technology flow between source and recipient organisations (Malik, 2013). In the case of developed countries, such as the US, formal and informal institutional rules and constraints explain the effectiveness of technology transfer (Patit et al., 2012). In the African context James (2000) draws attention to the high degree of institutional change required for the introduction of new technologies on a large scale.

Like institutions, national systems of innovation (NSIs) are essential for effective T&K transfer. The literature on NSIs has progressed from what was initially proposed by Lundvall (1992) to emphasise government, knowledge-based institutions, and industry as key actors (Etzkowitz and Leydesdorff, 2000). Knowledge brokers (arbitrageurs) serve as intermediaries between these actors to enhance T&K transfer and performance of firms (Baygan and Freudenberg, 2000; Zook, 2003). Institutional theory within the NSIs framework, therefore, provides a theoretical underpinning for the exploration of T&K transfer issues. The state often acts as a substitute for market failure to shape strategic choices that domestic firms make in emerging/developing economies (Hong et al., 2015). Therefore, intermediate institutions, working in the space between the state and industry, may assist in linking the two.

### 2.1. The 'state action' tradition

Government policy, it has been widely suggested, is vital for T&K transfer and construction industry development (Carrillo et al., 2006; Chatterji, 1990; Ofori, 1994). Much research on FDI analyses state action, giving little attention to the states' wider institutional relationships to civil society and industry; we describe this as the 'state action' tradition. Thus, Adams (2009) argues that FDI's impact depends on country-specific conditions and that African states require an approach which seeks to increase local firms' absorptive capacity. Lumbila (2005) emphasises that FDI's growth enhancement potential can only be fulfilled in a positive policy environment. Osabutey et al. (2014) argue for the integration of different aspects of policies since governmental responsibility for the industry is dispersed among different ministries.

Efficient states undoubtedly fulfil a role in developing company technological adoption (Bessant and Rush, 1995). High levels of government efficiency enhance technological adoption, inter alia, by promoting national identification, societal involvement and improving educational infrastructures (Galang, 2012). Thus, governments, their policies and their efficiency count. However, the 'state action' strand offers only a partial and thus inadequate analysis. African states frequently suffer from weak legitimacy and corruption (Wood and Frynas, 2006). Indeed, efforts to attract FDI may themselves further undermine their legitimacy by increasing possibilities for corruption. Lumbila (2005) shows that African countries perceived as highly corrupt also benefited *short-term* from FDI's impact on growth. He argues that this

may be due to incentives offered to attract FDI, which weaken local institutions by circumventing and undermining them creating a transitory positive effect that does not assist local industry's longer-term development. As Evans (1997) argued, to generate collective goods such as training states need to transcend developing-world states' tendency to impose 'the simplest possible set of centralized rules' (Evans, 1997: 81) and to create more sensitive policy tools. They appear likely to require assistance from local experts to do so.

### 2.2. Technology, institution, innovation systems and development

There is a growing literature that supports the thesis that technology plays a pivotal role in economic growth and development (Aghion and Howitt, 1992; Nelson and Winter, 1982; Romer, 1990). This is because early growth theories suggest that technological differences explain levels of economic development (Gerschenkron, 1962). FDI stimulates growth by improving technology which then enhances productivity (Borensztein et al., 1998) and, within the context of adequate labour quality and institutions; technology is expected to be transferred to host countries (Loko and Diouf, 2009). Arguably, developing countries with poor technological capabilities would lag behind in economic growth (Fagerberg and Srholec, 2008). Recent empirical works manifest that developing countries in general (Danquah et al., 2014) and SSA countries in particular (Danquah and Ouattara, 2015) require improved technology and quality of institutions to develop their economic growth. Institutional structures play an important role in shaping and supporting efforts to advance in technology (Freeman, 1982; Nelson and Nelson, 2002). Institutions influence knowledge creation (Regnér and Zander, 2014) and the institutional approach to developing NSIs cultivates the social contexts required for firm innovation (Coriat and Weinstein, 2002) and T&K transfer. NSIs refer to a set of distinct institutions which separately or collectively contribute to the development and diffusion of new technologies (Lundvall, 1992; Metcalfe, 1995). Fagerberg and Srholec (2008), using data covering Europe, North and South America, Asia and Oceania, and Africa concluded that innovation systems and good governance are fundamental for effective technological (and economic) catch-up.

Highly transferable technologies may not, generally, be affected by the quality of institutions. However, the quality of economic, social and political institutions influence the transfer of complex, tacit, and systematic T&K transfer respectively (Galang, 2012). Earlier studies on technological catch-up by Gerschenkron (1962) compared a number of European countries to the then technologically more advanced Great Britain and stressed the importance of developing appropriate institutions. Empirical literature generally point to a positive relationship between institutional quality and T&K transfer in both developed and developing countries (Costantini and Liberati, 2014; Krammer, 2015). Vasudeva (2009) showed that in the advanced economies of Japan, France, Norway and the U.S. socio-political institutions positively influenced knowledge-building strategies. Drine (2012) found that good institutions in developing countries in North Africa, Sub-Saharan Africa, and Asia and Latin America reduced the technology gap and quickened catch-up. Osabutey and Jin (2016) also suggested that weak institutions may well explain, unambiguously, Sub-Saharan Africa's low T&K transfer. This stresses the importance of institutional quality to T&K transfer processes. Many such studies, however, focus on macro-level institutional arrangements but give little credence to intermediate bodies (between states and firms). Given that the majority of construction firms in developing countries are small-to-medium sized entities which lack resources (Assibey-Mensah, 2009; Osabutey et al., 2014) it is important to explore how construction industry intermediate institutions could influence T&K transfer.

### 2.3. Intermediate institutions, industry and government

One mechanism through which intermediate institutions may

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