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Institutions, resources and innovation in East Africa: A firm level approach

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ABSTRACT

This study examines how firm-level resources interact with regional institutional quality to explain innovation in East Africa. We hypothesize that the institutional environment within which the firm operates moderates the effect of firm-level resources on innovative output. We examine the moderating role of institutions with regards to the transformation of firm-level resources including internal research and development, human capital and managerial experience into innovative output using firm-level data from the World Bank Enterprise Survey and the Innovation Follow-up Survey for three countries in East Africa including Kenya, Tanzania and Uganda. We test our hypotheses using a clustered robust standard errors logistic model. We find that the effects of firm-level resources vary depending on the institutional environment and that regional institutional quality positively moderates the effects of the firm-level resources.

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1. Introduction

Innovation has been considered a key driver for economic growth, enhancing competitive advantage and stimulating the productivity of firms (Schumpeter, 1934) in developed and developing countries alike (Chudnovsky et al., 2006; Crespi and Zuniga, 2011). Our study focuses on product innovation, which is defined as the introduction of a new good or service or the significant improvement of an existing product with respect to its characteristics and intended use (Oslo Manual, 2005; Ayyagari et al., 2012; Chadee and Roxas, 2013). Although firms in developing countries operate below the technology frontier with lower levels of managerial and production skills (Goedhuys, 2007; Goedhuys and Sleuwaegen, 2010), individual firms play a key role in developing innovations. While progress has been made in developing countries to improve the general business climate, in terms of property rights, access to finance and enhanced human capital (Alvarez and Barney, 2014), firms in developing countries continue to face a specific set of challenges that influence their innovation activity and the results thereof (Bradley et al., 2012). These largely pertain to two dominant factors.

The first factor is related to specific firm-level resources and capabilities. As indicated in previous research, firm resources are directly related to "the search for, absorption of and generation of new technology" (Srholec, 2011: 1545). Firm-level resources allow firms to distinguish themselves from their competitors and develop a competitive advantage. According to the resource-based view (RBV) of the firm, this is only possible, however, when resources are valuable, rare, inimitable and non-substitutable (Barney, 1991). The main problem for competitors in imitating a successful resource base is the time it takes to create and develop such resources and the causal ambiguity surrounding these resources, which makes it difficult to identify exactly what resources lead to competitive advantage (Peteraf, 1993). Also in developing countries, firms require resources, competencies and skills, which can be build up through RandD or training, to become innovative and competitive (Goedhuys et al., 2014). However, possessing such resources does not automatically lead to the creation of value (Sirmon et al., 2007; Ndofor et al., 2015). Firms must accumulate, combine and exploit resources in order to extract value from them (Grant, 1991). However, Barney (2001) argued that the value of these firm resources must be understood in the broader context in which the firm is embedded. In other words, even if a firm possesses and uses valuable, rare, inimitable and non-substitutable resources more 'astutely' than competitors (Eisenhardt and Martin, 2000), the extent to which it can actually extract value from them is likely to

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also depend on the environment of the firm (Sirmon et al., 2007). Hence, merely possessing and using firm resources is not enough to extract value from them and, in our case, develop new innovative products. This brings us to the second challenge firms in developing countries face.

The second challenge is the role of institutions (Acemoglu and Robinson, 2008). Properly designed institutions can stimulate productive behaviours (Dollar and Kraay, 2003), yet weak institutions often lead to unproductive behaviours (Greif, 2006). Institutions can reduce transaction costs and uncertainty and ease coordination between economic agents (Alonso and Garcimartín, 2013). Institutional quality encompasses (1) the process by which a government is selected, monitored and replaced (2) a government's capacity to effectively formulate and implement sound policies and (3) the economic and social interactions between citizens and the state are governed (Kaufmann et al., 2011). As such, the institutional environment can influence the propensity of firms to innovate in a variety of ways (North, 1990). For instance, weak enforcement of regulations and the absence of intellectual property rights may hinder innovation. Compared to countries in Latin America, Southeast Asia and Middle East and North Africa, countries in sub-Saharan Africa perform poorly in upholding the rule of law, regulatory quality, control of corruption and government effectiveness (Alence, 2004).

In our study, we focus on the *regional* institutional environment within which the firm is embedded. Notwithstanding the importance of country-level institutions, we argue that the quality of institutions will also significantly differ across regions in a country. Regions can be characterized by a specific set of formal (laws, rules and regulations) and informal institutions (norms and values) (cf. North, 1990) that function as durable structures specific to the territory (Boschma and Frenken, 2009). Regions in developing countries are often culturally, politically and economically heterogeneous. In addition, within-country variation in the implementation of formal institutions is also likely to exist in large and complex countries (Shi et al., 2012). In line with Laursen et al. (2012) we contend that the regional environment affects the ability of firms to introduce new innovations. Yet, perhaps more importantly, we argue that poor regional institutional quality within a focal country makes it more difficult to extract value from a firm's resources that are needed to innovate (cf. Zhu et al., 2015). Poor institutional quality, or the presence of weak institutions, has been reported to undermine the functioning of factor markets, increase transaction costs and magnify information asymmetries (Meyer et al., 2009), which has a negative effect on the possibilities to extract value from current resources. Regional institutional quality refers to a situation in which there is low corruption, a strong rule of law and a high degree of regulatory quality within a region. As such, we infer that the extent to which firms can successfully use their resources to innovate is likely to differ between regions due to differences in regional institutional quality. Thus, it is critical that we understand how the regional institutional environment of a firm influences the transformation of firm-level resources into innovative output for firms in developing countries (Martin-de Castro et al., 2013).

Moreover, it has been argued that the linkage between macro-institutional frameworks of national and regional innovation systems is of paramount importance in shaping firms' innovation processes (Cooke et al., 1998; Asheim and Coenen, 2006). Regional innovation systems relate to the creation of policy frameworks that aim at the systematic promotion of learning processes for innovation and competitive advantage in regional economies (Cooke et al., 1998). Regions are important mediums of governance and economic coordination at the meso-level (Lundvall and Borrás, 1997). More importantly, exploring the role of governance structures including regional regulatory and institutional frameworks is vital for deepening the understanding of the innovation process (Ekman et al., 2011). In addition, geographical clustering of firms gives rise to non-pecuniary knowledge spillovers that creates a highly innovative environment influencing territorial growth (Garavaglia and Breschi, 2009). Hence, entrepreneurial activity in a geographical area provides a means by which firms exploit positive external spillovers for innovation in a region (Cooke et al., 1998). All of these insights underline the salience of studying innovation in its regional institutional context.

While there are numerous studies examining innovation, most investigate the determinants of innovation in the context of advanced economies (De Jong and Vermeulen, 2006; McAdam et al., 2014). The findings of these studies have limited implications for innovation in developing economies due to the different nature of innovation in developing countries (e.g. Bradley et al., 2012) and disparities in institutional quality at the regional-level. There are virtually no empirical studies examining how regional institutional quality moderates the relationship between firm-level resources and innovative output in East Africa. This may be attributed to the fact that data on innovation in developing countries has been unavailable only until recently or was not collected in a systematic manner (Ayyagari et al., 2012; Goedhuys and Veugelers, 2012). This warrants an investigation into how regional institutional quality influences the ability of firms to extract value from their resources. In our case, value extraction is represented by the innovative output of firms. The rationale behind our choice of the three countries in East Africa is their geographical and institutional proximity, which have been suggested as vital for innovation (Boschma, 2005). Additionally, these three countries embody common characteristics of countries in the East African region particularly with regards to striking disparities in regional institutional quality encompassing differences in the levels of corruption, regulatory quality, government effectiveness and rule of law (Alence, 2004). Our study makes two contributions. First, it sheds light on the micro level relation between firm-level resources and innovation in developing countries, an area of study that has only received scarce attention for a long time due to the absence of firm level data (e.g. Goedhuys et al., 2014). Second, this study deepens the understanding of how the regional institutional environment interacts with firm-level resources to explain the innovative output of firms in developing countries. We argue that regional heterogeneity within countries gives rise to variation in regional institutional quality (cf. Picard et al., 2006). Taking into account the different cultures and governance systems, we expect that the variation in regional institutional quality is likely to influence the relation between firm resources and innovation. As such, our study empirically investigates how the regional institutional environment influences the extent to which firms are able to extract value from their resources for innovative output.

2. Theoretical background

Firm-level resources, defined as the tangible and intangible assets a firm uses (Barney and Arikan, 2001), form the basis of differential performance between firms in terms of value creation (Ireland et al., 2003). From the perspective of the RBV, firm-specific resources need to be effectively managed to create and extract value from them (Mahoney, 1995; Ireland et al., 2003; Sirmon et al., 2007). Hence, the managerial ability to manage the resource portfolio into bundles of unique capabilities that can be leveraged within a certain competitive environment is critical for extracting value from firm-level resources (Ireland et al., 2003: 977). Firm-level resources that are known to drive innovation include internal R&D, training, information search, communication facilities, human capital and a variety of input factors (e.g. Tybout, 2000; Goedhuys,

2007; Goedhuys and Sleuwaegen, 2010; Srholec, 2011; Crespi and Zuniga, 2011; Bradley et al., 2012).

Our study focuses on three firm-level resources that have received much attention in prior studies on innovation in developing countries: internal R&D, human capital and managerial experience. R&D expenditures, frequently used as a measure for innovation input (Arundel et al., 2007) are crucial for innovation at the firm level (Levin et al., 1987). The relation between internal R&D and innovation is mixed for developing countries (see Crespi and Zuniga, 2011). While several studies report a positive association between R&D and innovation in Asia (see Lee and Kang, 2007; Wang and Lin, 2013), evidence from Chile and Mexico does not support this finding (Crespi and Zuniga, 2011). For African countries, Goedhuys (2007) shows a positive relation between R&D and product innovation in Tanzania. In addition, Kamau and Munandi (2009) argue that R&D is an important component of innovation-based strategy for clothing and textile manufacturers in Kenya.

McGuirk and Lenihan (2013) argue that the role of individuals and the significance of their contribution to innovation activities is now widely recognized. Human capital, comprising formal education and on-the-job training (Romer, 1990), is viewed as a principal source of innovation (Al-Laham et al., 2011). In fact, more highly educated and more highly skilled workers have been found to be a direct source of innovation arising from an increase in a firm's absorptive capacity (Roper and Love, 2006). The importance of education for innovation has been demonstrated for developing countries as well For instance, Robson et al. (2009) find a positive relation between education level and innovation in Ghana. Moreover, Kamau and Munandi (2009) report that clothing and textile manufacturers in Kenya prefer hiring individuals with secondary school as opposed to those with only primary education because such employees easily absorb knowledge, which is crucial for innovation. Moreover, high levels of literacy are an indication of a highly skilled labor force (Goedhuys and Veugelers, 2012). Formal training, on the other hand, enhances a worker's skills set thereby increasing their ability to innovate (Blundell et al., 1999).

Innovation is a high risk and resource intensive activity that heavily draws on managerial resources. Managers rely on skills and experience that have been built over time for decision making in identifying innovation opportunities (Li and Atuahene-Gima, 2001). Indeed, empirical studies have shown that experienced managers are better able to understand the nuances of their competitive environment, which has a positive effect on the innovative performance of firms (McGee and Dowling, 1994). Similarly, Bantel and Jackson (1989) showed that more innovative banks benefitted from the experience of their management team. In developing countries, the work experience of small business owners has also been found to positively affect the growth potential of firms (Nichter and Goldmark, 2009).

Our study also includes the broader institutional environment in which firms are embedded for exploring the relationship between firm-resources and innovation in developing countries. Poor governance characterizes a majority of developing countries, implying the existence of institutions that are not well-functioning (Abed and Gupta, 2002). Olson et al. (2000) argue that differences in the quality of governance have led to varied growth rates in developing countries. Other empirical studies also point at the critical role of institutions for economic growth and development in developing countries (Glaeser et al., 2004; Acemoglu and Robinson, 2008). Acemoglu et al. (2003) show that countries with weak institutions report slow growth. In particular, such countries exhibit a high degree of political instability, widespread corruption, weak protection of property rights and weak functioning markets (see also Bräutigam and Knack, 2004).

According to Oyelaran-Oyeyinka (2004), strong institutions are imperative for innovation because of two reasons. First, institutions mitigate the uncertainty that surrounds innovation activities by providing regulations that govern economic agents and by enforcing contractual obligations. Secondly, institutions mediate intellectual property rights (IPRs) and patent laws that govern innovation activities. Oyelaran-Oyeyinka (2006) demonstrates that several countries in Africa adopted the industrialization model of developed countries but were less than successful at achieving technological progress due to weak institutions and inadequate human capital. Oluwatobi et al. (2015) examine the effect of institutional quality on innovation in 40 African countries. The authors suggest that control of corruption and improvement of regulatory quality result in higher rates of innovation in Africa.

The key argument that we develop in our paper is that firms will be less capable of extracting value from the resources needed to develop new innovative products depending on the functioning of institutions. Well-functioning institutions are imperative for entrepreneurial activity and innovation (Tebaldi and Elmslie, 2013). We include three institutions that have been reported to affect entrepreneurial activity and innovation: corruption, rule of law and regulatory quality (cf. Chadee and Roxas, 2013). Whereas these formal institutions may not differentiate at the level of regions within a country, we argue that the actual implementation or enforcement of these institutions does vary across regions within a country, due to local experiences with corruption, the rule of law and regulatory quality (cf. Asiedu and Freeman, 2009).

3. Hypotheses

As indicated in the foregoing discussion, we argue that poor regional institutional quality within a focal country makes it more difficult for a firm to extract value from resources needed for innovation.[1] As such, we infer that the extent to which firms can successfully use their resources for innovation is dependent on the regional institutional environment. Following this line of thought, we hypothesize that stronger regional institutional quality enhances the transformation of firm-level resources, including internal R&D, educated employees, investments in formal training for skilled labor and managerial experience into innovation We elaborate our four interaction effects in the following sections.

3.1. Internal R&D and regional institutional quality

The relation between internal R&D and innovative output has been established in previous research. It is well known that firms that invest in R&D extend their scientific and/or technical knowledge base, which allows them to design and develop new innovative products or services. However, the extent to which firms are able to extract value from their internal R&D efforts to develop innovative output (Martin-de Castro et al., 2013) depends on regional institutional quality. Firms in poor institutional environments are less likely to conduct and, of specific relevance to our study, benefit from R&D (Zhao, 2006). Such environments are often resembled by poor protection of intellectual property rights, which means that firms cannot extract value from their R&D investments. When knowledge is not protected (for instance through patents) it is easily imitated and more difficult for a firm to appropriate value from it (Barney, 1991). Hence, in institutional environments where few imitation restrictions exist, it is likely that firms will be

[1] Even though we expect that the firm-level resources individually have direct effects on innovative output, we are mainly interested in how these resources interact with regional institutional quality to explain innovative output in developing countries (see McCann and Folta, 2011). As such, we do not formulate hypotheses for the main effects.

unsuccessful in transforming their R&D investments into innovative output.

Moreover, corrupt environments reduce the magnitude of the possibility for firms to invest in R&D and subsequently profit from innovation (Anokhin and Schulze, 2009: 475). Corruption is believed to discourage economic activities, including innovation and entrepreneurship (Estrin et al., 2013). Innovators are often subject to extortion from government officials, because they require licenses and permits. Refraining from obtaining these licenses reduces a firm's potential to invest in R&D and develop innovative new products. Alternatively, curbing the abuse of tax credits by firms, as well as reigning in corruption by tax officials, enhance the effect of R&D spending on innovation at the firm-level (cf. Bardhan, 1997). Thus, in our study we argue that the value firms can extract from their internal R&D is higher in an environment with a high degree of regional institutional quality, which will have a positive effect on innovative output. Thus, we hypothesize that:

H1: The level of regional institutional quality positively moderates the effect of internal R&D on innovative output.

3.2. Human capital and regional institutional quality

Absorptive capacity, a vital component of innovation, constitutes the ability to identify, assimilate and exploit knowledge from the external environment (Cohen and Levinthal, 1989). The degree of absorptive capacity depends on human capital, which is crucial for creating new knowledge (Griffith et al., 2004). Well-educated employees and a skilled labor force are therefore conducive to innovation (see Liu and Buck, 2007). Yet, we argue that the institutional environment plays a central role in the transformation of a firm's absorptive capacity into innovation. For instance, an educational system that is based on privilege rather than achievement is likely to seriously hamper the effect of human capital on innovation (cf. Heyneman, 2004), because employees will lack the necessary skills to identify and understand new knowledge and transform this into new products. As such, poorly governed educational systems do not allow firms to extract the full potential of human capital for innovation.

It is also possible that regional institutional quality influences the relation between human capital and innovation through the rate of enrollment in schools and the quality of education that is provided (cf. Heyneman, 2004). It is well known that teachers in developing countries are frequently absent or compensate their limited wages by having bribes built into their pay structure (Biswal, 1999). As such, the actual skills conducive to innovation possessed by skilled labor are likely to be relatively low in regions with low regional institutional quality. Varsakelis (2006) argued that improving regulatory quality could lead to the adoption of a science oriented educational system, which in turn would stimulate the innovative productivity of a country. Taking into account that absorptive capacity is principally driven by human capital (Vinding, 2006), we expect that firms with a strong human capital base comprising highly educated and highly skilled workers will be more innovative (Franco et al., 2012), and this effect will be strengthened when regional institutional quality is high (Roper and Love, 2006). Thus, we formulate our hypothesis as follows:

H2: The level of regional institutional quality positively moderates the effect of employee level of education on innovative output.

H3: The level of regional institutional quality positively moderates the effect of skilled labor on innovative output.

3.3. Managerial experience and regional institutional quality

Managerial experience is generally considered to be an important input for successful innovation (Schilirò, 2010). For example, managers possessing more experience are likely to explore more, and more varied, innovation projects. In that regard managerial experience reflects an important tacit skill required to select the most promising innovation projects (Custódio et al., 2014). It seems likely, however, that the relation between managerial experience and innovation will be influenced by the institutional environment This is because decision making at the managerial level involves an assessment of internal and external factors that may work against or support particular innovation projects. Excessive requirements imposed by government regulation or corruption increases the time senior management spend in dealing with government regulations and administrators. (Tybout, 2000). As such, low levels of regional institutional quality could lead to a displacement of the attention of senior managers away from innovation activities resulting in lower levels of innovation. In high regional institutional quality environments on the other hand, experienced managers can direct their attention towards finding and selecting new opportunities and markets for their firms resulting in higher levels of innovation.

In addition, managers need to be able to understand the broader institutional environment. When there is low institutional quality, government officials may be inclined to delay project approval or decline permits. Dealing with such barriers to innovation requires more patience, political will and experience from managers (Austin, 2002). Hence, we suggest that a strong institutional environment reinforces the effect of managerial experience on innovative output because firms will be more capable of extracting value from a manager's experience. We formulate the following hypothesis:

H4: The level of regional institutional quality positively moderates the effect of managerial experience on innovative output.

4. Data and methods

4.1. Data

We test our hypotheses using firm-level data from the World Bank Enterprise Survey (ES) and the Innovation Follow-up Survey (IFS) module covering the period 2010–2012 for Kenya, Tanzania and Uganda.[2] The ES collects data focusing on an economy's business environment and investment climate encompassing, corruption, competition, access to finance and performance measures. The World Bank has conducted firm-level surveys since the 1990′s, however, since 2005 data collection efforts have been centralized and instruments standardized for establishing comparability of data across countries. The IFS, launched in 2011, specifically focuses on innovation and innovation-related activities within firms. The ES involves administering firm-level surveys to a representative sample of firms in the non-agricultural formal sector in an economy comprising firms in the manufacturing, retail and service sector. In addition, ES are stratified according to the sector of activity, firm size and geographical location of the firm. The ES respondents comprise business owners and top managers from 713 firms in Kenya, 723 firms in Tanzania and 640 firms from Uganda. Similarly, respondents for the IFS include business owners and top managers from 549 firms in Kenya, 543 firms in Tanzania and 449 firms from Uganda. IFS respondents are a subset of the original ES and were randomly selected to form a sample of 75% of the ES respondents (www.enterprisesurveys.org). Considering that the datasets for the ES and the IFS comprise the same firms, our study merges these two

[2] Even though both surveys include sampling weights we refrained from using these. We did so as we merged data from these two surveys and not all firms in the ES appear in the IFS as the IFS targets a subset of the ES sample. This makes applying weights problematic as the weights differ between the two surveys. Additionally, not all the firms present in the merged sample are in our final analyses due to (limited) missing data issues, rendering the use of weights impractical.

datasets using the unique firm identifiers for each country to create a rich dataset for our empirical analysis.

4.2. Dependent variable

Our measure of innovative output in firms relates to product and service innovation. Specifically, the survey asks respondents whether the firm introduced any new or significantly improved product or service in the last three years. The IFS further provides that the innovative product or service can be new to the firm or new to the market. We use a dummy variable that takes the value of "1" if a firm has introduced any new or significantly improved innovative product or service and "0" if otherwise. This measure of innovation has been used in previous studies (Ayyagari et al., 2012; Chadee and Roxas, 2013).

4.3. Independent variables

4.3.1. Firm-level resources

4.3.1.1. R&D. The IFS asks respondents if their firm conducted internal R&D from fiscal year 2010 through 2012. To measure R&D, we use a dummy variable that takes a value of "1" if the response is yes and "0" if otherwise.

4.3.1.2. Employee level of education. The ES data provides information on the level of education attained by employees. We use the percentage of employees who have completed secondary school education as a measure of the level of education attained by employees.

4.3.1.3. Skilled labor. The IFS contains an item that asks respondents whether the firm provided employees with formal training for the development or production of innovative products or services, we use a dummy variable that takes a value of "1" in the case a firm did so and "0" if otherwise.

4.3.1.4. Managerial experience. For our study, managerial experience is the number of years the top manager or business owner has worked in the sector. Following Ayyagari et al. (2012) we use a dummy variable for representing managerial experience that takes a value of "1" where a business manager's experience in the sector is greater than 10 years and "0" if otherwise.

4.3.2. Regional institutional quality

Even though measures of institutional quality constructed from perceptions-based data are inherently subjective, the availability of a large array of institutional development indicators allows the construction of composite measures of institutional quality that are reliable and can be calculated at the regional (i.e. sub-national level) (Hajra, 2005). In addition, perceptions-based data have reliably reported governance outcomes very similar to more objective measures based on formal rules (Kaufmann et al., 2007). Moreover, Kuncic (2014) argues that finding a single measure of institutional quality is difficult because institutions are latent factors in an economic system. Hence he proposes that using a composite measure combining information from several measures of institutions offers a better solution for measuring institutional quality This study, therefore uses a composite measure of firm-level perceptions of governance at the regional level for measuring regional institutional quality. This measure is constructed from firm-level perceptions of corruption, rule of law and regulatory quality that are aggregated to the regional level.

More specifically, following previous studies (Fogel et al., 2006; Chadee and Roxas, 2013), various items from the ES are used to generate a composite measure of corruption, rule of law and regulatory quality. We use two items for generating a measure of corruption. The first item asks respondents whether they perceive the court system as fair, impartial and uncorrupted with responses being measured using a four-point scale (1 = strongly disagree, to 4 = strongly agree). The second item asks respondents to what degree they perceive corruption as an obstacle to the current operations of the firm. The respondents' perceptions of the degree of corruption are captured using a five-point scale (0 = not an obstacle, 4 = very severe obstacle). We also develop a composite measure of the rule of law using three items that relate to how respondents perceive the degree to which courts, political instability and crime, theft and disorder are obstacles to their business operations and are measured using a five-point scale (0 = not an obstacle, to 4 = very severe obstacle). Lastly, we measure regulatory quality using a composite measure of four items. These items ask respondents to indicate on a five-point scale (0 = not an obstacle, to 4 = very severe obstacle) to what degree they perceive tax rates, tax administration, customs and trade regulations, and business permits and licensing as obstacles to their business operations. Subsequently, we generated regional measures of corruption, rule of law and regulatory quality by standardizing the individual items and calculating the mean firm-level scores within each region. However, the three resulting variables are highly correlated (correlations between 0.73 and 0.88). We therefore ultimately calculated our composite measure of institutional quality as the mean of the scores for the three pillars of regional institutional quality for each region. Due to the standardization of the items, scores below zero reflect below average regional institutional quality whereas scores above 0 reflect above average regional institutional quality.

4.4. Control variables

4.4.1. Firm age

This study uses firm age as a control variable since previous studies support the finding that firm age is inversely related to innovative output (Ayyagari et al., 2012). Younger firms are more likely to introduce new products and processes as compared to older firms. We use the difference between the year of the survey and the year the firm was established to compute the firm age.

4.4.2. Firm size

This study also controls for firm size as previous studies have found a positive relation between firm size and innovation (Jiménez-Jiménez and Sanz-Valle, 2011; Ayyagari et al., 2012). Moreover, medium-sized ($20 \leq$ employees ≤ 99) and larger firms (employees ≥ 100) have been found to be more innovative in comparison to smaller firms (Ayyagari et al., 2012). The authors conclude that larger firms are in a position to provide economies of scale in innovation just as in production. We use the number of full-time permanent employees as our measure of firm size. We use a dummy variable to measure firm size with firms with greater than 20 employees taking a value of "1" and "0" if otherwise.

4.4.3. Legal status

Ayyagari et al. (2012) demonstrates that ownership and legal organization play a significant role for innovation. The authors show that firms organized as corporations report greater innovation activity in comparison to unincorporated forms of business (cooperatives, sole proprietorships or partnerships). The measure for legal status emanates from respondents being the asked to provide the legal organization of the firm. Legal status is a dummy variable taking the value of "1" if the firm is organized as a corporation (shareholding company with publicly traded shares and shareholding company with non-traded or privately traded shares), and "0" if the firm is legally organized as a sole proprietorship, partnership, limited partnership or has another form.

4.4.4. External financing

The IFS module asks managers to provide estimates of the proportion of working capital financed by various sources for the previous fiscal year. Following Ayyagari et al. (2012), the different sources of external financing are expressed in percentage form. The sources of external financing include banks, non-bank financial institutions, purchases on credit from suppliers and advances from customers and other sources. We measure external financing as the percentage of working capital obtained from external sources.

4.4.5. Technology licensed from a foreign-owned company

This variable is captured by an item in the ES that seeks to find out whether firms use technology licensed from foreign-owned companies in their operations. We expect that use of foreign technology may suppress innovation in a firm. We use a dummy variable that takes a value of "1" where a firm uses technology licensed from a foreign-owned company and "0" if otherwise

4.4.6. Sector dummy variables

The sample comprises firms from the manufacturing, retail and service sector. Our study controls for sector heterogeneity since sector specific effects may influence innovation. We use two sector dummies taking a value of "1" where a firm belongs to the manufacturing sector or retail sector respectively and "0" if otherwise. This setup implies that the service sector is the reference category.

4.4.7. Country dummy variables

This study controls for differences across the three countries by means of country dummies taking a value of "1" where a firm is located in Tanzania or Uganda respectively and "0" if otherwise. Kenya is taken as the reference country.

4.5. Analysis

A logistic regression model is used for analyzing the data due to the binary nature of the dependent variable. Because our study employs clustered data where firms are nested within regions our data violate the assumption of independence of all observations and therefore residuals at the firm level are expected to be correlated with the regional level. We utilize clustering of the standard errors at the regional level to account for this dependency between observations. We opt to use this approach over estimation multilevel models due to the relatively small number of regions in our dataset (i.e. 16) to which multilevel estimation is relatively sensitive. However, we do report the results of such an analysis as a robustness test (see Section 5.1)

Thus, the study examines innovation in firms taking into consideration the effect of the two levels. The firm (level 1 unit) and the region (level 2 unit) explain the variation in innovation in firms. The general form of the logistic regression is:

$$Pr(Y_{i=}1|X) = \frac{e^{b'_0+b'_1X'+b'_2Z'+b'_3XZ'+\varepsilon}}{1+e^{b'_0+b'_1X'+b'_2Z'+b'_3XZ'+\varepsilon}} \quad (1)$$

Transforming equation one and formulating a 2-level model yields the following:

$$Log\left[\frac{Y}{1-Y}\right] = b_0 + b_1X + b_2Z + b_3XZ + \varepsilon_{i,j} \quad (2)$$

where Y, the dependent variable, represents innovation, X represents firm level resources, Z represents the regional institutional quality and XZ is the interaction of firm level resources and regional institutional quality.

Apart from reporting on the significance and the signs of the logit coefficients, it is more meaningful to examine the marginal effects of the variables and provide graphical interpretation of the interaction effects (Bowen and Wiersema, 2004). We follow the common practice of showing the marginal effects of a variable at it means as well as one standard deviation above and below the mean (Hoetker, 2007). In addition, we use the likelihood ratio test to assess the fit of our models (Long and Freese, 2006).

5. Results

Table 1 illustrates distinct variation in regional institutional quality for Kenya, Tanzania and Uganda. Kenya has better institutions in comparison to Tanzania and Uganda. Among the three countries, Tanzania has much weaker institutions. More importantly, we observe that perceptions of institutional quality are strikingly different not only across the three countries but also across regions within these countries.

Table 2 provides the descriptive statistics and correlations for our data. We observe that 36% of firms in the sample have innovative output. In addition, only 21% of the firms conduct internal R&D. Also interesting is the fact that about 60% of the employees have attained secondary school education. Finally, the correlations between the firm-level resources and innovation output have the expected positive signs.

We test our hypotheses by estimating Eq. (2) using a clustered robust standard errors model. The results of our estimation are summarized in Table 3, which contains six models. Model 1 is the baseline model, which contains results of the main effects of firm resources variables, the regional institutional quality variables and

Table 1
Regional institutional quality.

Country	Region	Regulatory Quality	Rule of Law	Corruption	Regional Institutional Quality
Kenya	Central	0.49	0.21	0.19	0.30
	Nyanza	0.39	0.13	0.31	0.28
	Mombasa	0.37	0.31	0.23	0.30
	Nairobi	0.32	0.21	0.17	0.23
	Nakuru	0.45	0.29	0.44	0.40
Tanzania	Arusha	−0.01	0.03	0.21	0.07
	Dar-es-Salaam	−0.51	−0.37	−0.49	−0.46
	Mbeya	0.20	0.54	0.59	0.45
	Mwanza	−0.09	−0.41	−0.37	−0.29
	Zanzibar	−0.76	−0.40	−0.70	−0.62
Uganda	Kampala	−0.22	0.13	0.17	0.03
	Jinja	0.04	−0.21	−0.31	−0.16
	Lira	0.07	−0.24	−0.28	−0.15
	Mbale	0.52	0.27	0.28	0.35
	Mbarara	0.04	−0.26	0.19	−0.01
	Wakiso	−0.16	−0.04	0.11	−0.03

Table 2
Descriptive statistics and correlation matrix (n = 1541).

		Mean	Std. Dev.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Innovation	0.36	0.48	0.00	1.00	–															
2	Age (log)	2.58	0.79	0.00	4.67	0.01	–														
3	Size (log)	2.84	1.31	0.00	8.61	0.11	0.23	–													
4	Legal status	0.10	0.31	0.00	1.00	0.09	0.13	0.15	–												
5	External financing	30.08	32.04	0.00	100.00	0.04	0.07	0.07	0.09	–											
6	Foreign technology licensing	0.09	0.29	0.00	1.00	0.13	0.13	0.21	0.12	0.08	–										
7	Manufacturing sector	0.49	0.50	0.00	1.00	0.05	0.23	0.13	0.05	0.10	0.32	–									
8	Retail sector	0.22	0.41	0.00	1.00	−0.03	−0.14	−0.13	−0.02	−0.02	−0.17	−0.52	–								
9	Service sector	0.29	0.45	0.00	1.00	−0.03	−0.13	−0.02	−0.03	−0.09	−0.20	−0.63	−0.34	–							
10	Kenya	0.36	0.48	0.00	1.00	0.09	0.20	0.17	0.16	0.19	0.09	0.03	0.01	−0.04	–						
11	Tanzania	0.35	0.48	0.00	1.00	−0.31	−0.07	−0.04	−0.13	−0.11	−0.15	0.01	−0.05	0.03	−0.55	–					
12	Uganda	0.29	0.45	0.00	1.00	0.22	−0.14	−0.13	−0.03	−0.09	0.07	−0.04	0.04	0.01	−0.48	−0.47	–				
13	Internal R&D	0.21	0.41	0.00	1.00	0.19	0.07	0.15	0.03	0.06	0.08	0.08	−0.06	−0.04	0.07	0.03	−0.10	–			
14	Education level of staff	59.81	34.83	0.00	100.00	0.10	0.05	0.18	0.08	−0.03	0.06	−0.07	0.06	0.03	0.38	−0.22	−0.16	0.06	–		
15	Skilled labor	0.28	0.45	0.00	1.00	0.18	0.11	0.18	0.06	0.08	0.12	0.11	−0.09	−0.04	0.13	−0.06	−0.07	0.37	0.09	–	
16	Managerial experience	0.62	0.49	0.00	1.00	0.06	0.41	0.18	0.08	0.01	0.06	0.13	−0.08	−0.07	0.12	−0.04	−0.09	0.11	0.08	0.07	–
17	Regional institutional quality	0.00	0.32	−0.62	0.45	0.14	0.08	0.05	0.11	0.09	0.10	0.03	0.06	−0.10	0.65	−0.66	0.01	−0.09	0.22	0.00	−0.01

control variables. In addition to reporting the results of the main effects of control variables and the independent variables, models 2–5 also separately report the results of the interaction effects between regional institutional quality and internal R&D, employee level education, skilled labor and managerial experience respectively. Model 6, which offers a superior model fit in comparison to models 2–5, provides the results of the full model with main effects and interaction effects including the control variables, independent variables and the interaction of the firm-level resources and the regional institutional quality. In addition to reporting the marginal effects of the multi-level logistic regression for the full model, we also provide interaction plots for exploring the form of the interaction of firm-level resource and regional institutional quality.

The coefficients of the independent variables including internal R&D, employee level of education, skilled labor and managerial experience are positive and statistically significant as expected. Marginal effects analyses reveal that internal R&D has a strong positive effect on innovation. The likelihood of innovation was about 19% higher for firms conducting internal R&D in comparison to firms not conducting internal R&D (32 vs. 51%). Employee level of education has a very small positive effect on innovation with the likelihood of innovation being approximately 0.06% higher for a 1% increase in the percentage of employees with secondary school education. The likelihood of innovation was about 11% higher for firms that provided their workers with formal training for the introduction or development of innovative products or services (44% vs. 33%). The effect of managerial experience on innovation was about 3% higher for managers with more than ten years of experience. The coefficient of the context variable, regional institutional quality, was negative and statistically significant.

An important observation regarding the coefficients of the interaction of the firm-level resources with regional institutional quality is that with the exception of managerial experience, the internal R&D, employee level of education and skilled labor were found to be positive and statistically significant. To a large extent, our results support our hypotheses that institutions reinforce the effect of firm-level resources on the likelihood of innovation. The subsequent discussion explains the interaction terms in the full model by means of marginal effects plots. We examine the form of interaction of firm-level resources with regional institutional quality beginning with internal R&D, followed by employee level of education and skilled labor and managerial experience respectively. The margin plots indicate the form of interaction of firm-level resources with different levels of regional institutional quality including when it is at (1) the minimum value, (2) a low degree (1 standard deviation below the mean), (3) the mean value, (4) a high degree (1 standard deviation above the mean), and (5) the maximum.

Fig. 1 displays the form of the interaction of internal R&D and regional institutional quality. Indeed, the effect of conducting internal R&D varies for different levels of regional institutional quality. We observe that when regional institutional quality is at its minimum, the effect of conducting internal R&D on innovation is negligible. It is also evident that with a low degree of regional institutional quality (1 standard deviation below the mean), the effect of conducting internal R&D is still relatively small. However, a high degree of regional institutional quality (1 standard deviation above the mean) amplifies the effect of conducting internal R&D. Similarly, maximum values of regional institutional quality have a strong amplifying effect on the effect of internal R&D. Thus, we see a sizeable positive effect in this interaction signaling that the institutional environment within which firms operate is imperative for successful transformation of firm-level resources into innovative output. This finding offers very strong support for hypothesis 1 where we propose that internal R&D in combination with a high

Table 3
Multivariate logistic regression coefficients with clustered robust standard errors (n = 1541).

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Control variables												
Age (log)	−0.159	(0.107)	−0.156	(0.108)	−0.156	(0.108)	−0.162	(0.112)	−0.157	(0.107)	−0.155	(0.110)
Size (log)	0.115**	(0.054)	0.108*	(0.057)	0.114**	(0.054)	0.109*	(0.058)	0.114**	(0.054)	0.105*	(0.058)
Legal status	0.278	(0.274)	0.282	(0.283)	0.280	(0.274)	0.266	(0.286)	0.273	(0.277)	0.275	(0.289)
External financing	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)
Foreign technology licensing	0.252	(0.173)	0.200	(0.182)	0.258	(0.172)	0.244	(0.183)	0.249	(0.172)	0.211	(0.186)
Manufacturing sector	0.128	(0.124)	0.148	(0.129)	0.131	(0.125)	0.150	(0.124)	0.131	(0.124)	0.164	(0.128)
Retail sector	0.006	(0.218)	0.026	(0.226)	−0.001	(0.218)	0.027	(0.217)	0.010	(0.219)	0.030	(0.225)
Tanzania	−1.362***	(0.418)	−1.329***	(0.457)	−1.288***	(0.434)	−1.324***	(0.453)	−1.354***	(0.424)	−1.231**	(0.490)
Uganda	0.700***	(0.263)	0.672**	(0.277)	0.760***	(0.269)	0.681**	(0.269)	0.704***	(0.264)	0.732**	(0.288)
Resources and institutions												
Internal R&D	0.866***	(0.289)	0.878***	(0.179)	0.854***	(0.292)	0.898***	(0.290)	0.867***	(0.287)	0.890***	(0.199)
Employee level of education	0.004**	(0.002)	0.003**	(0.002)	0.004***	(0.001)	0.004**	(0.002)	0.004**	(0.002)	0.003**	(0.001)
Skilled labor	0.510***	(0.172)	0.532***	(0.169)	0.509***	(0.169)	0.452***	(0.119)	0.512***	(0.171)	0.493***	(0.112)
Managerial experience	0.180*	(0.103)	0.178*	(0.102)	0.172*	(0.103)	0.182*	(0.103)	0.171*	(0.098)	0.171*	(0.100)
Regional institutional quality	−0.350	(0.517)	−0.865	(0.627)	−0.671	(0.517)	−0.866	(0.631)	−0.521	(0.559)	−1.529**	(0.708)
Interactions												
Internal R&D*RIQ (H1)			1.811***	(0.563)							1.441***	(0.554)
Employee level of education*RIQ (H2)					0.007**	(0.003)					0.008**	(0.003)
Skilled labor*RIQ (H3)							1.500***	(0.436)			1.030***	(0.387)
Managerial experience*RIQ (H4)									0.274	(0.172)	0.097	(0.144)
Constant	−1.147***	(0.312)	−1.090***	(0.324)	−1.203***	(0.290)	−1.119***	(0.314)	−1.142***	(0.306)	−1.150***	(0.320)
LR Chi2			17.09		1.19		13.25		0.42		11.69	
Prob > chi2			0.000		0.275		0.000		0.516		0.009	

Robust clustered standard errors in parentheses.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

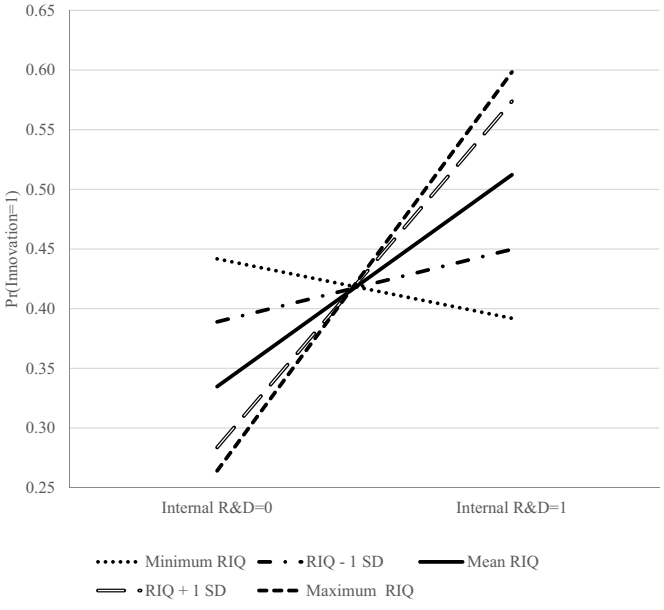

Fig. 1. Predictive margins of internal R&D.

degree of regional institutional quality strengthens the effect of internal R&D on innovation.

Fig. 2 illustrates that lower levels of regional institutional quality diminish the effect of employee level of education on innovation. Also, the effect of employee level of education on innovation is positive but remains weak for lower degrees of regional institutional quality (1 standard deviation below the mean). We also observe that employee level of education in an environment with a high degree of regional institutional quality (1 standard deviation above the mean) has a relatively stronger positive effect on innovation. In addition, a high degree of regional institutional quality further reinforces the effect of employee level of education of innovation. This result offers support to hypothesis 2.

Fig. 3 shows that the effect of skilled labor on innovation is significantly diminished when the regional institutional quality is at the minimum value. Similarly, an environment with weak institutions (1 standard deviation below the mean) still exhibits low effects of skilled labor on innovation. We also note that a high degree of regional institutional quality (1 standard deviation above the mean) leads to a strong positive effect of skilled labor on innovation. Additionally, the effect of skilled labor on innovation is further reinforced when regional institutional quality is at its maximum value. In line with the findings for the employee level of education

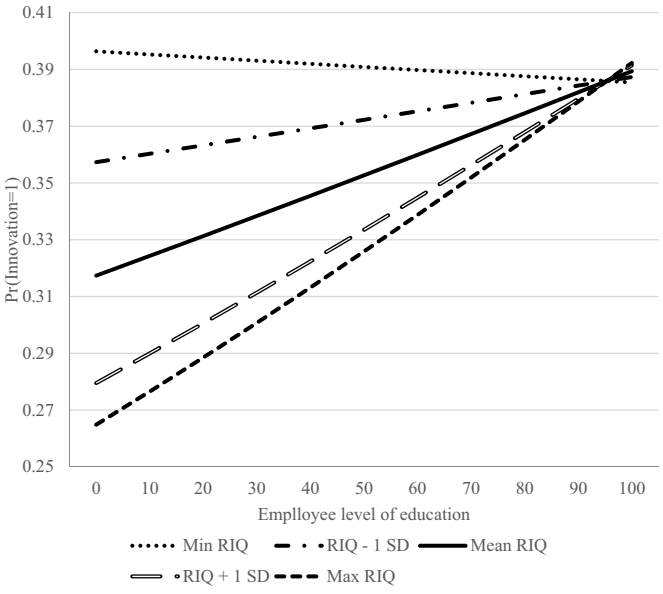

Fig. 2. Predictive margins of employee level of education.

Table 4
Robustness checks using a clustered robust standard errors model (n = 1541).

Variables	Model 7		Model 8	
Control variables				
Age (log)	−0.204*	(0.121)	−0.139	(0.109)
Size (log)	0.055	(0.065)	0.105*	(0.058)
Legal status	0.320	(0.325)	0.274	(0.287)
External financing	0.001	(0.002)	0.001	(0.002)
Foreign technology licensing	0.518**	(0.242)	0.289	(0.181)
Manufacturing sector	0.054	(0.182)		
Retail sector	0.015	(0.233)		
Tanzania			−1.211**	(0.488)
Uganda			0.735***	(0.280)
Resources and institutions				
Internal R&D	0.829***	(0.224)	0.895***	(0.197)
Employee level of education	0.001	(0.002)	0.003**	(0.001)
Skilled labor	0.490***	(0.135)	0.501***	(0.115)
Managerial experience	0.183*	(0.103)	0.180*	(0.097)
Regional institutional quality	−0.263	(0.633)	−1.481**	(0.717)
Interactions				
Internal R&D*RIQ (H1)	1.611***	(0.560)	1.433***	(0.548)
Employee level of education*RIQ (H2)	0.005	(0.005)	0.007**	(0.003)
Skilled labor*RIQ (H3)	1.280***	(0.396)	1.018***	(0.383)
Managerial experience*RIQ (H4)	0.149	(0.153)	0.098	(0.142)
Constant	−0.850*	(0.487)	−1.121***	(0.304)

Robust clustered standard errors in parentheses.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

this result strongly supports hypothesis 3 that strong institutions positively moderate the effect of skilled labor on innovation.

Finally, our results show no support for hypothesis 4. The effect of managerial experience on innovation seems completely unaffected by the regional institutional quality.

5.1. Robustness tests

Table 4 shows models 7–8 that test the robustness of the results of our full model to excluding country dummies in model 7 and excluding sector dummies in model 8 while still using a clustered robust standard errors estimation technique. Table 5 shows models 9–11 that test the robustness of our results to using a multilevel estimation technique. The latter is an alternative to our main approach which utilizes robust standard errors as the intraclass correlation (i.e. variance at the regional level) is approximately 22%; more than twice the minimum amount recommended when considering multilevel estimations. We use a two-level random intercept intercepts model comprising the firm level and the regional level.

Both robustness tests reveal that only one of our effects is sensitive to the inclusion of country dummies or the estimation technique used, namely the effect of the employee level of education. The fact that this effect is sensitive to both the inclusion of country dummies as well as to the specification of a multilevel model indicates that for this specific variable country differences might account for a lot of its variation. As a result the, relatively small, moderation effect of regional institutional quality on the relationship between the employee level of education and innovation can only be picked up once this large national variation is accounted for. This indicates that, next to regional variation, it remains important to account for national differences between countries.

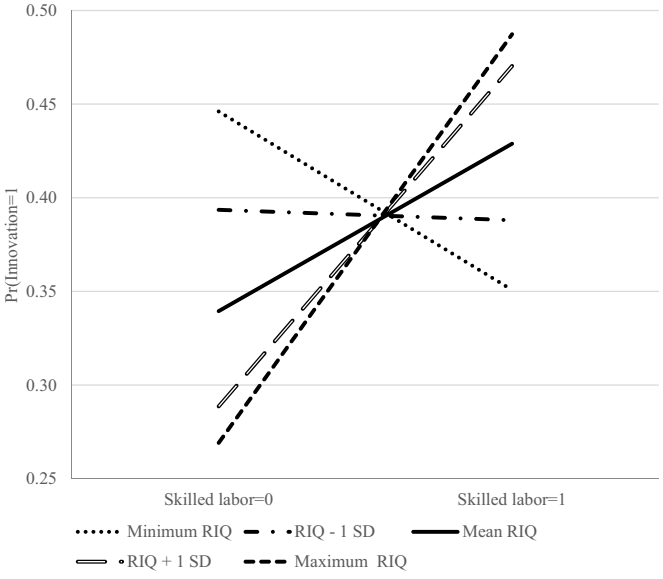

Fig. 3. Predictive margins of skilled labor.

6. Discussion

Our findings support our hypotheses to a large extent. In particular, the interaction of three firm-level resources (internal R&D, employee level of education and skilled labor) and regional institutional quality has a positive and statistically significant effect across all models. This implies that, while firm-level resources are pivotal for innovation, investigating the interaction of firm-level resources with regional quality institutions provides better insight into what resources matter for innovation given the institutional context within which the firms operate. Essentially, our study underscores the importance of institutions for innovation in developing countries.

We find evidence that the value of firm-level resources in terms or increasing the likelihood of innovation is conditional on the regional institutional environment. Better institutional environments increase the value of firm-level resources for innovation while weak institutions diminish the value of firm-level resources for innovation (Zhao, 2006). We argue that whilst firm-level resources are known to drive innovation, the moderation effect of institutions is imperative because institutions influence the extent to which firms extract and appropriate value from firm-level resources. Hence, the extent to which firms can successfully extract value from resources for innovation is contingent on regional institutional quality.

The moderating effect of institutions is observed even with low levels of institutional quality. As such, we suggest that incremental improvements in institutional quality are sufficient for enhancing value extraction from firm-level resources for innovation in developing countries. We argue that larger investment in firm-level resources will not necessarily result in higher levels of innovation since institutions influence how firms appropriate value from their resources. Thus, innovation at the firm level not only depends on firm-level resources but also on the institutional environment in which the firm operates. This argument leads us to an important theoretical implication. According to the RBV, firms are a bundle of resources and capabilities, which are combined and coordinated for competitive advantage (Barney, 1991). While the RBV contends that a firm's internal resources are important in sustaining competitive advantage, there is a growing literature on resource utilization that suggests that value can only be extracted from resources by using them in a smarter way than the competition (Eisenhardt and Martin, 2000; Sirmon et al., 2007; Ndofor et al., 2015). Notwithstanding the value of these studies, we show that the value extraction potential of firm resources depends not only on

Table 5
Robustness checks using a multilevel model (n = 1541).

Variables	Model 9		Model 10		Model 11	
Control variables						
Age (log)	−0.125	(0.086)	−0.122	(0.087)	−0.107	(0.085)
Size (log)	0.085*	(0.051)	0.081	(0.051)	0.087*	(0.051)
Legal status	0.349*	(0.195)	0.366*	(0.196)	0.344*	(0.196)
External financing	−0.000	(0.002)	−0.001	(0.002)	−0.000	(0.002)
Foreign technology licensing	0.194	(0.224)	0.208	(0.225)	0.295	(0.212)
High-technology sector	0.228	(0.154)	0.238	(0.155)		
Medium-technology sector	0.085	(0.172)	0.098	(0.172)		
Tanzania	−0.970**	(0.454)			−0.942**	(0.448)
Uganda	1.131***	(0.358)			1.129***	(0.353)
Resources and institutions						
Internal R&D	0.867***	(0.161)	0.849***	(0.161)	0.873***	(0.160)
Employee level of education	0.003	(0.002)	0.003	(0.002)	0.003	(0.002)
Skilled labor	0.515***	(0.143)	0.522***	(0.144)	0.522***	(0.143)
Managerial experience	0.217	(0.140)	0.229	(0.141)	0.229	(0.140)
Regional institutional quality	−1.468**	(0.700)	−0.977	(0.948)	−1.414**	(0.693)
Interactions						
Internal R&D*RIQ (H1)	1.478***	(0.490)	1.529***	(0.491)	1.478***	(0.490)
Employee level of education*RIQ (H2)	0.009	(0.007)	0.009	(0.007)	0.009	(0.007)
Skilled labor*RIQ (H3)	1.094**	(0.454)	1.146**	(0.454)	1.073**	(0.454)
Managerial experience*RIQ (H4)	0.127	(0.433)	0.144	(0.429)	0.130	(0.433)
Constant	−1.482***	(0.418)	−1.364***	(0.368)	−1.419***	(0.407)
Random-effects parameters	Est (sd error)	95% CI	Est (sd error)	95% CI	Est (sd error)	95% CI
Regional intercept	0.410 (0.110)	0.242–0.694	0.971 (0.196)	0.653–1.443	0.400 (0.108)	0.235–0.681

Standard errors in parentheses.

the managerial utilization of resources, but also on the institutional environment of the firm. In particular, we find that the regional institutional quality positively moderates the effect of using certain resources on innovative output. Moreover, the moderating effect varies across regions such that there is a stronger effect in regions with stronger institutions. Thus, a major theoretical implication of using a resources-based perspective on innovation is that the actual potential to extract value from firm-level resources depends heavily on the institutional quality of the firm's environment. Hence, we argue that integrating a resources-based perspective with an institutional perspective provides more insightful interpretation of factors influencing innovative output at the firm-level.

6.1. Policy implications

Our findings show that institutions play an important role in moderating the positive effect of firm-level resources on innovation. Regional institutional quality plays a critical role regarding the extent to which firms successfully extract value from resources into innovative output in developing countries. The value of firm-level resources for innovation significantly depends on the institutional environment from which the firms operate. In cognizance of the observed regional variation in institutional quality, it is imperative that policy makers focus on improving governance by fighting corruption, enforcing the rule of law and enhancing regulatory quality not only at the national level, but at the regional level too. Focusing on improving governance at the regional level may serve to reduce disparities in innovative output in individual countries. Overall, strengthening the institutional environment within which businesses operate provides a sound business environment that promotes entrepreneurial activities and ultimately innovation at the firm level. As such, sound institutions serve to increase the value of firm-level resources in relation to innovative output since firms are better able to appropriate value from resources into innovative output. Hence, adding firm resources (in terms of R&D investments or human capital) can only add value to the firm and its economic performance under the condition of a strong regional institutional environment.

Beyond the evidence put forward by our study, avenues for further research include investigating the effect of different categories of higher educational attainment on innovation, which our study does not accomplish due to unavailability of data. In addition, Mansfield (1984) opines that the composition of internal R&D expenditure is crucial to understanding how internal R&D impacts innovation in firms. As such this forms an interesting area for further research. Last but not least, given the institutional context within which the firm operates, future availability of panel data might allow researchers to examine the causal effects of firm-level resources on innovative output in developing countries.

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