

The Effect on Innovation of Beginning Informal: Empirical Evidence from Kenya

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Abstract

We analyze firm-level data from a survey conducted in Kenya in 2013 referring to innovation activities in the 2010-12 period. We use the data to study the impact on a firm's innovation decisions of the firm beginning operations as an informal firm, specifically on technological innovativeness, which comprises the introduction of new products and processes, marketing innovativeness, organizational innovativeness, and on the importance of obstacles to technological innovation. We find past informality status to negatively affect technological innovativeness, with the effect persisting as we leave out relatively younger firms. We find that the difference lies especially on process innovations. Regarding obstacles to innovation, we find that beginning operations in the informal sector mostly affects a firm's perceptions on the need to innovate. We interpret this result as suggestive of the existence of severe informational disadvantages of firms that began informally and eventually transitioned to formality relative to firms that began in the formal sector.

Keywords: Innovation; Informality.

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1 Introduction

While it has long been argued that the adoption of new technologies lies at the core of the development process, relatively little evidence has been presented to understand the determinants of the innovation performance of firms in developing countries in Africa. The context in which these firms operate is different than that in developed countries. In particular, a salient feature of most African countries is the presence of a large informal sector, which in many cases is comparable in size with the formal sector (La Porta and Shleifer, 2014). The coexistence of a formal and an informal sector implies that formal firms face competition from informal firms (Banerji and Jain, 2007; Amaral and Quintin, 2006). At the same time, some informal firms decide to make the transition towards formality. While the impact of informality on firms operations (McGahan, 2012) or the incentives to formalize (McKenzie and Seynabou Sakho, 2010; Bruhn, 2013) have been the object of a number of studies, the consequences of beginning operations in the informal sector have not received much attention.

This paper tries to fill this gap in the literature by presenting and analyzing firm-level evidence from Kenya that is used to address the question of whether beginning operations in the informal sector has any lasting effects on firms' innovation activities after the transition to the formal sector. This is an empirical question that has remained unexplored and is motivated by the fact that many firms in developing countries begin operations as informal firms and then later transition to formal firms. We use firm-level data from an innovation survey¹ conducted in 2013 on innovation activities in the 2010-12 period to study whether the innovative behavior of firms that began operations as informal firms is different than that of firms that began operations formally. Specifically, we analyze a cross-section of firms that were surveyed in 2013 regarding their innovation activities in the 2010-12 period. While the questionnaire is mostly based on the Community Innovation Survey, used in many countries in the European Union, it was adapted to the Kenyan context, and specifically a question was included on whether the firm began operations as an informal firm. We explore whether the initial status of the firm, formal or informal, has any effects on its current innovation activities. Our results suggest that beginning informal indeed has effects on firms' innovation decisions, even after formalization. This

¹We thank the World Bank for financing this survey. Cirera (2015) analyzes innovation data in Kenya using the World Bank's Enterprise Survey data, which was also collected in 2013.

suggests that the period spent in the informal sector induce firms to take a different path than firms that began operations as formal, even after transitioning to formality.

The impact of informality on innovation is an important issue because innovative activities bring about increases in total factor productivity (Mendi, 2007), which are ultimately responsible for cross-country differences in per capita incomes (Hall and Jones, 1999). Indeed, the coexistence of formal and informal firms in developing countries (La Porta and Shleifer, 2008) force many formal firms to compete directly against informal firms for the same resources. This could lead to an inefficient allocation of resources in the economy and therefore an efficiency loss. This is the well-known misallocation problem, which has been the object of study of many contributions to the literature in Economics (Hsieh and Klenow, 2009; Bartelsman et al., 2013; Restuccia and Rogerson, 2013; D'Erasmus et al., 2013). Additionally, the type of products offered by informal firms are typically of lower quality of those produced by formal firms (Amaral and Quintin, 2006), leading to a scenario of competition with vertically differentiated products (Mendi, 2015). Informal firms also have traits that differ from those of formal firms. For instance, La Porta and Shleifer (2008) or La Porta and Shleifer (2014) find that sales per worker among formal firms are larger than those of informal firms of comparable size. Furthermore, in terms of education of the workforce, Funkhouser (1996) finds substantial differences between formal and informal firms. Hence, informality has important consequences on firms' decisions and on the overall allocation of resources.

In this study we use the term informality as legal economic activity taking place below the radar of government (Oviedo et al., 2009). In developing countries like Kenya it mainly takes the form of small unregistered firms and street vendors. In Kenya, the informal sector is estimated at 34.3% of GDP and accounts for 77% of employment (Institute of Economic Affairs, 2012). The informal sector in Kenya created 713.6 thousand new jobs in 2015 compared to 695.9 thousand new jobs in 2014. This constituted 84.8% of all new jobs created outside the small scale agricultural sector and pastoralist activities (Republic of Kenya, 2016). Although formal jobs in Kenya are in high growth and high productivity sectors, the job creating potential of these sectors is low, so most seekers end up working in low-productivity, informal activities. The majority of job seekers go to the informal sector in trade, hospitality or manufacturing, and many of them end up being underemployed (World Bank, 2016).

The context in which innovation takes place in developing countries is different from that in developed countries. In addition to informality, firms in developing countries face a number of constraints not present in developed countries. For instance, constraints on resources limit the innovation choices of firms (Pansera and Owen, 2015; Baker and Nelson, 2005; Gibbert et al., 2007; Keupp and Gassmann, 2013). Contextual factors are also an important constraint on innovation, with the institutional setting as a salient contextual factor. Institutional theories consider that the institutional environment effectively constraints firms' actions (Dunning and Lundan, 2008; Peng et al., 2009). In this line, (Meyer and Peng, 2005, 2016) argue that in developing economies institutional factors are more likely to change and thus, firms' decisions are more likely to be context-specific than in developed countries, which are characterized by more stable institutions. This is even more evident in the case of countries with lowest income levels, as those in Sub-Saharan Africa, and in this line Zoogah et al. (2015) argue that institutions and resources are relevant in studying Management in Africa. The presence of institutions may constrain formal firms' choices by means of the persistence of mandatory cultural practices, which could perpetuate phenomena such as clientelism or corruption. These contextual factors may affect firms' innovation decisions (Egbetokun, 2015; Tigabu et al., 2015), or even country-level innovation strategy (Amankwah-Amoah, 2016). There is a close interconnection between institutions and the informal sector, in the sense that the informal sector may be in part explained by the country's institutional setting, and, conversely, the presence of an informal sector may affect institutional efficiency. In fact, developing countries are characterized by more extractive institutions. Where extractive institutions exist, the rules of the game benefit a small elite rather than the masses in the country. This is important in understanding the African context since many of the countries are struggling to make the transition from extractive to more inclusive institutions which contributes to institutional instability (Acemoglu et al., 2001; Acemoglu and Robinson, 2012).

In this context, beginning operations as an informal firm may be a viable option for an entrepreneur. In fact, Bennett (2010) theoretically analyzes this issue to conclude that informality is a natural first stage, which may eventually lead towards formality. This is especially the case when there are high barriers to formality (McKenzie and Seynabou Sakho, 2010; Bruhn, 2013). In addition to its effects on employment (Ayyagari et al., 2014; Bennett, 2011) or access to credit (Distinguin et al., 2016), the existence of informality may affect formal firms' innovation decisions in a number

of ways. On the one hand, informal firms that compete with firms in the formal sector may alter the formal firms' incentives to innovate, especially if the informal firms' products are close substitutes for those of formal firms. For instance, in a recent study, Mendi and Costamagna (2016) find, using 2006 data from the World Bank's Enterprise Survey, that competitive pressure from informal producers indeed influenced firms' innovation strategies. In addition, Fu et al. (2015) find in a study of both formal and informal firms that innovation can positively impact the labor productivity of firms, and that learning instead of technical based innovations are the significant factor. The effect is significantly greater for informal establishments. They argue that innovation is a factor that may push developing informal firms to the formal economy. On the other hand, the survival of informal firms may be linked to their ability to innovate. Schipper (2014) examines how the ability to innovate affects firms' decisions to operate informally and the aggregate consequences of their sectoral choice. He embeds a sectoral choice model where firms choose to operate in the formal or informal economy into a richer general equilibrium environment to analyse the aggregate effects of firm-level decisions in response to government taxation. Conversely, sometimes the informal sector itself has been a source of innovations (Bhattacharyya et al., 2010; Prahalad, 2005; Radjou et al., 2012), and in some cases formal and informal firms collaborate in the introduction of innovations (George et al., 2012; von Hippel, 2005).

While most of the above references study the interaction between firms in the formal and informal sectors, in this paper we focus instead on formal firms only and whether the fact that a formal firm began operations informally affects innovation in some way. In particular, we study whether firms that began as informal firms have different behavior in terms of innovation activities than firms that were always registered. Our focus is on the probability of introducing new products and processes, as on firms' perceptions of different obstacles to innovation. In a sense, we are analyzing whether firms that used informality as a stepping stone, as argued in Bennett (2010) behave differently in terms of innovation than firms that were formal from the start. Our empirical findings suggest that there are indeed differences, especially regarding the introduction of new processes.

The remainder of the paper is organized as follows. Section 2 proposes the hypotheses to be tested in the empirical analysis. Section 3 describes how the survey was conducted and the data. Section 4 carries out an econometric analysis of the data, and finally Section 6 presents some concluding comments.

2 Hypotheses

In this section, we propose the hypotheses to be tested using the firm-level survey data collected in Kenya. The purpose of this paper is not to test whether there are differences between formal and informal firms, but whether formal firms that began their activity in an informal way behave differently than those firms that began operations formally. That is, we study whether the informal status at some point in the past has durable consequences on firms' activities. Our focus will be first on technological innovation, distinguishing between product and process innovations, then on marketing and organizational innovations, and finally on the importance of different obstacles to technological innovation.

Formal and informal firms differ in a number of dimensions. La Porta and Shleifer (2014) discuss the main differences between formal and informal firms in Africa. They argue that informal firms are less productive, and run by less educated managers. Furthermore, they rarely advertise their products, and sell mainly to informal clients for cash. Regarding product quality, Banerji and Jain (2007) argue that informal firms typically produce lower-quality versions of the products produced by firms in the formal sector. In principle, the transition to formality should allow an informal firm to compete with other formal firms on a level playing field. Hence, whether firms began operations as formal or informal should be regarded as irrelevant, and therefore a firm's beginning operations in the informal sector should have no effect on its ability and incentives to introduce new products and processes, or any other marketing or organizational innovations. We now proceed to discuss whether there are reasons to think that this might not always be the case. This discussion will motivate the hypotheses enunciated in this section, which will be tested using firm-level survey data from Kenya to be described in Section 3.

2.1 Innovativeness

We now discuss whether the initial informality status of a firm may change its incentives to engage in technological innovation –which comprises the introduction of new products and processes-, as well as the use of new marketing methods, or new organizational forms. First, regarding technological innovation, the incentives to introduce new products and processes are markedly different between firms that operate in the formal and informal sectors. By their very nature, informal firms have

to keep off the government's radar screen, which often involves not being able to deal with other formal customers or suppliers, and in some occasions, bribing government officials to avoid fines. Additionally, one of the main problems of informality, often times associated with the small scale of operations of informal firms, is that it entails a lack of access to funding sources (Beck et al., 2006, 2008), which largely constraints the ability of firms to innovate.

Some firm-specific features could survive the transition to formal status. First, while in principle access to formality should remove barriers to access to credit, formal firms that began operations as informal have a shorter credit history, which could give rise to worse borrowing conditions, which ultimately lead to liquidity constraints. Another important factor is the use of previously acquired machinery and equipment. Lack of access to credit may have induced the previously informal firm to choose an inefficient technology, leading to inefficient production, typically at a low scale. The existence of this installed equipment may prevent the firm from accessing a superior technology, which may have been chosen if it had to start up from scratch, as well as accessing knowledge necessary for technology upgrading. Lack of previous exporting experience may also be a factor reducing a firm's propensity to innovate, given the observed correlation between innovation and exporting activities (Roper and Love, 2002; Wakelin, 1998).

Previous operations under informality may also condition firm behavior after the transition to formality. For instance, the firm may have developed a network of suppliers and customers while informal, which may be associated with some product needs that make them less suitable to formal markets. Indeed, the informal sector has been documented to be a source of innovations that are different than those in the formal sector (Bhattacharyya et al., 2010; Prahalad, 2005; Radjou et al., 2012). This may be aggravated by the location of the premises of the firm, which may be an obstacle to accessing customers for formal products, especially in the services industries, and in a context of a very large degree of market fragmentation. Finally, there may be unobservable characteristics of the entrepreneur, such as lower managerial abilities, or less ambitious goals that may have induced him or her to begin operations informally². All these arguments induce us to expect a negative impact of beginning operations as an informal firm on technological innovations, understood as the introduction of new products and processes. While we expect both product and process innovations to be affected,

²An implicit assumption in this study is that the management of the firm does not change substantially with the transition to formality. This constitutes a limitation of the present study and calls for further research, using suitable data.

we expect the impact to be stronger for process innovations, since this type of innovations relies more strongly on the firm's absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002). This discussion is summarized in the following hypotheses:

Hypothesis 1a *Beginning operations as an informal firm has a negative impact on the introduction of technological innovations.*

Hypothesis 1b *Beginning operations as an informal firm has a negative impact on the introduction of product innovations.*

Hypothesis 1c *Beginning operations as an informal firm has a negative impact on the introduction of process innovations.*

In addition to technological innovations, and often times associated with them, the behavior of firms that began operations informally may differ from that of firms that began operations formally with respect to the introduction of non-technological innovations, namely marketing and organizational innovations. Bloom et al. (2013) document the surprising lack of adoption of some managerial practices that would have increased firm productivity in India. Contributions such as (McKenzie and Woodruff, 2014) reflect the increasing interest in experimental evidence on the effect of managerial practices.

Regarding the specific case of marketing innovations, while many consumers in low-income countries have uncertain incomes and demands (Banerjee and Duflo, 2007), this is more likely to be the case among customers of informal firms. Additionally, Ramani et al. (2012) document the existence of distribution systems that are specific for consumers at the bottom of the pyramid. We expect firms that began in the informal sector to be less aware of distribution channels that are different than those that they currently use, because of organizational inertia, and preexisting suppliers and distributions channels. Furthermore, the introduction of new products typically requires the simultaneous introduction of new distribution channels. Hence, if no new products are introduced, the likelihood of introducing new marketing innovations is reduced. For these reasons, we expect firms that began operations informally to be less likely to introduce marketing innovations.

Hypothesis 2 *Beginning operations as an informal firm has a negative impact on the introduction of marketing innovations.*

Finally, regarding the introduction of organizational innovations, McGahan (2012) argues that governance in informal businesses is different than that in formal organizations. Presence in the informal sector may have given rise to an organizational design and corporate culture not suitable for competition in the formal sector. Then, firms that began operations as informal firms are more likely to retain inefficient organizational forms. These may embed the corporate culture, thus introducing resistance to organizational change if, for instance, the status of incumbent workers is compromised in some way (Atkin et al., 2017). This increases corporate inertia (Tripsas and Gavetti, 2000), and may be a driving factor behind the surprising lack of adoption of productivity-enhancing managerial activities (Bloom et al., 2013). For this reason, we expect firms that began operations as informal firms to be less likely to introduce organizational innovations.

Hypothesis 3 *Beginning operations as an informal firm has a negative impact on the introduction of organizational innovations.*

2.2 Obstacles to technological innovation

Financial issues may constitute an important constraint to firm operations in developing countries (Beck et al., 2006; Distinguin et al., 2016). As an example, for the particular case of Kenya, Beaman et al. (2014) provide experimental evidence of the relevance of the operating costs associated with cash management. This type of costs are more likely to arise if firms are operating in the informal sector. As pointed out in the previous subsection, even though in principle access to formality should remove any credit constraints that may be in place, past informality shortens a firm's credit history, which could make access to credit more difficult. For this reason, we expect financial obstacles to be more relevant among firms that started up informally. This is presented in the following hypothesis:

Hypothesis 4 *Firms that began operations as informal firms are more likely to declare cost and financing obstacles at least as important as any other factor than firms that began operations formally.*

Furthermore, as also indicated in the previous subsection, operating informally is likely to compromise the development of absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002). This lack of absorptive capacity may prevent firms from having access to important information for future innovations, especially regarding the characteristics of frontier technology, or other

relevant information about markets. For instance, Bloom et al. (2013), point at the existence of informational barriers as a factor that explains the lack of adoption of common productivity-enhancing managerial practices by firms in India. In its most extreme form, this lack of access to relevant information may manifest itself in an underestimation of the importance of informational barriers to innovation, and the belief that there is no need to innovate (Galia and Legros, 2004). Furthermore, if managers that decide to begin operations informally are less active than those that begin operations formally, and management does not change with formalization, access to information will more likely be a more relevant obstacle to innovation among firms that start up as informal firms. This is presented in the following hypothesis:

Hypothesis 5 *Firms that began operations as informal firms are more likely to declare obstacles to the acquisition of information at least as important as any other factor than firms that began operations formally.*

3 Data and Descriptive Statistics

3.1 Data

As it was pointed out in the introduction section, in this paper we use data from a survey among firms in Kenya that was conducted in 2013, referring to innovation activities carried out in the 2010-12 period. A questionnaire was designed mostly following the same methodology as the Community Innovation Survey (CIS), including a number of questions to adapt it to the Kenyan context. This class of innovation surveys were first launched in 1993 and is now carried out in 27 Member States of the European Union, some other EFTA and candidate countries, and a few countries outside of Europe. The CIS is based on the Oslo Manual, see OECD (2005), which introduces general guidelines for collecting and interpreting innovation data, in particular it provides definitions for product and process innovations and introduces criteria to classify a given action as an innovation. The same dataset that we use in this paper -combined with Nigerian survey data- is used in Egbetokun et al. (2016), where a discussion of the guidelines included in the Oslo Manual is also included.

As in other CIS-type questionnaires, the questions are classified into ten sections, namely: 1) General information about the enterprise; 2) Product innovation; 3) Process innovation; 4) Ongoing

or abandoned innovations; 5) Innovation activities and expenditures; 6) Sources of information and cooperation for innovation activities; 7) Effects of innovation during 2010-12; 8) Factors hampering innovation activities; 9) Intellectual property rights; 10) Organizational and marketing innovations. Responses were collected by means of in-site personal interviews, and we coordinated the field work carried out by a survey team. Prior to engaging in field work, we requested a random stratified sample of 500 firms from the Kenya National Bureau of Statistics (KNBS), distributed among six counties: Nairobi, Kiambu, Nakuru, Uasin Gishu, Kisumu and Mombasa. The rest of the counties were combined into a single category, and only 50 firms were selected due to large geographic dispersion. In the sampling procedure, each county represents a stratum. Firms within each stratum were then divided into five categories, according to number of employees, specifically: 0-9, 10-19, 20-49, 50-99 and 100 or above. The number of firms in each stratum was selected proportional to the size of the categories and stratum so that the firms are self-weighting within a stratum. The firms not selected for the other stratum were distributed proportionally among the remaining strata. The overall response rate was 62%, leading to a final sample size of 310 firms, which constitutes the dataset used in the present study. Since some observations are missing for some variables, the maximum number of observations that we can use in our empirical estimations is 291.

3.2 Variables

The information in the questionnaire was processed to produce the variables used in the econometric analysis. Table 1 lists the variables used in the analysis, providing definitions, and distinguishing between dependent, independent, and control variables. Regarding the dependent variables, they are in all cases binary variables, taking values one or zero depending on whether a given condition is satisfied. This will make us use econometric techniques appropriate for the case of binary dependent variables, specifically Probit and Bivariate Probit models. First, *techinnov* is a binary variable that indicates whether the firm was technologically innovative in the period 2010-12. A firm is considered to be technologically innovative if it introduced at least a new product, and/or a new process and/or had any ongoing or abandoned innovation activities in 2010-12. Similarly, *prodinn* and *procinn* are binary variables that indicate the introduction of new products and new processes, respectively, during the period 2010-12. Notice that the way *techinnov* is constructed implies that a sufficient condition

for it to take value one is that either *prodinn* or *procinn* take value one.

In addition to technological innovations, we consider non-technological innovations in our analysis, namely marketing and organizational innovations, also referring to the 2010-12 period. This way, *marketinnov* is a binary variable that takes value one if the firm introduced any marketing innovation during the 2010-12 period, zero otherwise. The marketing innovations considered were: "Significant changes to the design or packaging of a good or service", and "New or significantly changed sales or distribution methods, such as internet, sales, franchising, direct sales, or distributions licenses". In both cases, the firm had to report whether or not it had introduced these marketing innovations. Regarding the introduction of organizational innovations, *organinnov* is a dummy variable that takes value one if the firm introduced any organizational innovation during the 2010-12 period, zero otherwise. The questionnaire includes the following organizational innovations: "New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise", "Major changes to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities", and "New or significant changes in your external relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting". In a similar way as in the case of marketing innovations, the firm had to declare whether or not the firm introduced any of these organizational changes during 2010-12, and *organinnov* takes value one if any of these organizational innovations was introduced in the 2010-12 period, zero otherwise.

Finally, the remaining four variables that will be regarded as dependent variables in the econometric specifications are indicators of the importance of different obstacles to innovation³. This way, *mainobst_cost*, *mainobst_know*, *mainobst_mar*, and *mainobst_noinn* are binary variables that take value one if at least one item in the specific category is at least as important as any other item in the rest of the categories. For instance, *mainobst_cost* takes value one if at least one of the three factors included in the cost category is at least as important as any other obstacle to innovation. Notice

³Specifically, firms were asked to evaluate, in a 1-4 scale, how important were twelve potential obstacles to innovation. These are classified into cost factors ("Lack of funds within your enterprise or group", "Lack of finance from sources outside your enterprise", "Innovation costs too high"), knowledge factors ("Lack of qualified personnel", "Lack of information on technology", "Lack of information on markets", "Difficulty in finding cooperation partners for innovation"), market factors ("Market dominated by established enterprises", "Uncertain demand for innovative goods or services"), and reasons not to innovate ("No need due to prior innovations", "No need because of no demand for innovations", and "Excessive regulation and red tape discourages innovation")

that these variables are constructed based on the relative importance that different obstacles to innovation have for the same firm, and not on the comparison of scores across different firms. This should mitigate the impact of common method bias (Chang et al., 2010), since the cross-firm comparison is not on levels, but on the relative importance of different factors.

Regarding the independent variable of interest, *begin_infor* is a binary variable that takes value one if the firm began operations as an informal firm, zero otherwise. Notice that the fact that this variable was determined at some point in the past reduces potential endogeneity concerns arising from simultaneity and reverse causality issues. Additionally, all the econometric specifications include a number of controls, in order to take into account the effect of other factors that have been found in the previous literature to drive firms' innovation decisions. First, *services* is a dummy variable that takes value one if the firm belongs to a services industry, zero otherwise. It controls for the potential heterogeneity in innovation activities and obstacles to innovation between manufacturing and services. Another important determinant of innovation activities is firm size. For instance, on the one hand larger firms typically have access to more financial resources, and on the other are more likely to be multiproduct firms, and thus more likely to introduce new products or processes. Firm size is proxied by the *lnemploy*, the logarithm of the firm's employees at the beginning of the period considered, that is 2010. While data on number of employees is also available for 2012, our size measure predetermined relative to observed innovation activities. In fact, it may be the case that firm size is a consequence of innovation: successful innovators grow large and have more employees. *lnuniv*, the logarithm of one plus the percentage of employees with a university degree, measures the average quality of the labor force. Adding one to the percentage allows us to use the observations where the percentage is zero. We expect this variable to be positively correlated with innovation activities. *lnage* is the logarithm of firm age, in years. We also include two binary variables, *group* and *export*, that indicate whether the firm belongs to a group of firms and was active in foreign markets in 2010-12, respectively. In both cases, we expect these variables to be positively correlated with innovation activities. On the one hand, firms that belong to a group of firms are likely to benefit from innovation activities developed elsewhere within the group of firms, and thus more likely to introduce new products and processes. On the other hand, firms that export have access to a broader knowledge base and are more likely to be aware of frontier technologies than firms that do not export.

Table 1: Variable definitions

Dependent variables	
<i>techinnov</i>	Dummy variable that takes value 1 if the firm introduced any new products and/or any new processes and/or had any ongoing innovation activities in 2010-12, zero otherwise.
<i>prodinn</i>	Dummy variable that takes value 1 if the firm introduced any new products in 2010-12, zero otherwise.
<i>procinn</i>	Dummy variable that takes value 1 if the firm introduced any new processes in 2010-12, zero otherwise.
<i>marketinnov</i>	Dummy variable that takes value 1 if the firm introduced any marketing innovations in 2010-12, zero otherwise.
<i>organinnov</i>	Dummy variable that takes value 1 if the firm introduced any organizational in 2010-12, zero otherwise.
<i>mainobst_cost</i>	Dummy variable that takes value 1 if the most important cost obstacle to innovation is at least as important as any other obstacle.
<i>mainobst_know</i>	Dummy variable that takes value 1 if the most important knowledge obstacle to innovation is at least as important as any other obstacle.
<i>mainobst_mar</i>	Dummy variable that takes value 1 if the most important market obstacle to innovation is at least as important as any other obstacle.
<i>mainobst_noinn</i>	Dummy variable that takes value 1 if the most important reason not to innovate obstacle to innovation is at least as important as any other obstacle.
Independent variable	
<i>begin_infor</i>	Dummy variable that takes value 1 if the firm began operations as an informal firm, zero otherwise.
Controls	
<i>services</i>	Dummy variable that takes value 1 if the firm operates in a services industry, zero otherwise.
<i>group</i>	Dummy variable that takes value 1 if the firm belongs to a group of firms, zero otherwise.
<i>lnemploy</i>	Logarithm of the number of employees in 2010.
<i>lnage</i>	Logarithm of firm age, in years
<i>export</i>	Dummy variable that takes value 1 if the firm exported in 2010-12, zero otherwise.
<i>lnuniv</i>	Logarithm of one plus the percentage of employees with a university degree.
<i>man_univ</i>	Dummy variable that takes value 1 if the firm's manager has university degree, zero otherwise.

Finally, *man_univ* is a binary variable that takes value one if the manager of the firm has a university degree, zero otherwise. The purpose of including this variable in the specifications is to control for unobserved managerial abilities that may affect innovation activities.

3.3 Descriptive Statistics

Table 2 contains descriptive statistics, distinguishing between firms that began operations as formal firms and firms that began as informal firms, eventually becoming formal. While the survey includes responses from 310 firms, only 291 will be used in the empirical analysis, since data from some variables are missing. In the sample of 291 firms, 216 of them began operations as formal firms, whereas the remaining 75 began operations as informal establishments. Among the 75 firms in our sample that began operations informally, 71 declare the year in which they registered. Out of these, 41 declared that they registered within the first year of activity. Regarding innovation activities, the overall innovation rate, measured by *techinnov* is quite high, approximately 67%, comparable with the rate of innovation in many developed countries. This surprising result is also found in other studies that use data from other countries in Africa (Egbetokun et al., 2016; Mustapha and Mendi, 2015). Firms in the sample are more likely to introduce new products (42%) than new processes (35%), and they are quite active in terms of introduction of marketing and organizational innovations, 56% and 64%, respectively. In all cases, firms that began operations as informal firms are less likely to innovate than firms that started up as formal firms.

Regarding the importance of different obstacles to technological innovation relative to other obstacles, 76% of the firms declare cost factors to be at least as important as any other obstacle to innovation. Regarding the other categories, the corresponding percentages of knowledge factors, market factors, and reasons not to innovate, are 45%, 56%, and 51%, respectively.

Regarding other firm characteristics, most of the firms in our sample (87%) are in services industries, reflecting the importance of services in the Kenyan economy. Associated with this fact, most firms cater to the domestic market, and only a quarter of the firms in our sample export. Firms in our sample are relatively small and young, with an average 14 employees and 13 years of age, and only 30% of them belong to a group of firms. The average percentage of firm employees with an university degree is slightly less than 20%, whereas two thirds of the firms are run by managers with at least

Table 2: Summary Statistics

	Firms that...		Total
	began informal	began formal	
Technological innovation	0.54 (0.50)	0.71 (0.46)	0.67 (0.47)
Product innovation	0.36 (0.48)	0.45 (0.50)	0.42 (0.50)
Process innovation	0.21 (0.41)	0.39 (0.49)	0.35 (0.48)
Marketing innovation	0.46 (0.50)	0.59 (0.49)	0.56 (0.50)
Organizational innovation	0.63 (0.49)	0.64 (0.48)	0.64 (0.48)
Main obstacle cost	0.81 (0.39)	0.74 (0.44)	0.76 (0.43)
Main obstacle knowledge	0.53 (0.50)	0.42 (0.50)	0.45 (0.50)
Main obstacle market	0.64 (0.48)	0.54 (0.50)	0.56 (0.50)
Main obstacle no need to innovate	0.67 (0.47)	0.46 (0.50)	0.51 (0.50)
Services	0.86 (0.35)	0.88 (0.33)	0.87 (0.33)
Ln number of employees	2.33 (1.70)	2.73 (1.62)	2.63 (1.65)
Ln employees w/univ. degree	2.69 (1.65)	3.05 (1.62)	2.96 (1.63)
Ln firm age	2.53 (0.83)	2.61 (0.81)	2.59 (0.81)
Group	0.31 (0.47)	0.28 (0.45)	0.29 (0.45)
Export	0.21 (0.41)	0.27 (0.44)	0.26 (0.44)
Manager has univ. degree	0.61 (0.49)	0.68 (0.47)	0.66 (0.47)
Observations	75	216	291

Standard errors in brackets below averages.

university degree. Firms that began informally are smaller, younger, and less likely to be run by a manager with a university degree. They are also less likely to export than firms that started up in the formal sector. All this information is contained in Table 2.

4 Econometric analysis

In the empirical analysis, we will make use of econometric techniques tailored to the nature of our dependent variable, which is binary. Specifically, we will estimate Probit models in Tables 3, 5, and 6, whereas in Table 4 we use Bivariate Probit models, since we simultaneously estimate two equations where the errors are allowed to be correlated. In particular, Table 3 presents estimated marginal effects of a Probit model where the dependent variable is *techinnov*. The dependent variables in the Probit models whose results will be reported in Table 5 are *marketinnov* and *organinnov*. Table 4 presents estimated coefficients of different Bivariate Probit models where the dependent variables are *prodinn* and *procinn*. Finally, Table 6 presents estimated marginal effects of different Probit models where the dependent variables are *mainobst_cost*, *mainobst_know*, *mainobst_mar*, and *mainobst_noinn*, respectively. In all cases, the independent variable of interest will be *begin_infor*, and in the estimation methods standard errors errors are robust.

First, we address the question of whether informality affects firms' propensity to innovate technologically. Table 3 reports marginal effects of the regressors computed from a Probit specification where the dependent variable is *techinnov*. The marginal effect of a binary independent variable, such as *begin_infor*, may be interpreted as the change in the probability of *techinnov* being one as the independent variable increases from zero to one, with the rest of the regressors at the mean.

We observe that in all four columns of Table 3, the coefficient on *begin_infor* is negative and statistically significant at least at the 90% level. In particular, the first column reports marginal effects using the 291 observations with complete data. Beginning operations as an informal firm reduces the likelihood of the firm engaging in innovation activities by 10%. The specification in the second column of Table 3 includes as additional controls three principal components of the obstacles to innovation (cost, knowledge, and market factors, as well as reasons not to innovate), obtained by factor analysis. Doing so increases the absolute value of the marginal effect of *begin_infor*, to 15% and its statistical significance increases to the 95% level.

So far we have found that firms that began operations as informal firms are less likely to innovate than firms that were formal right from the start. We now address the question of whether this difference is persistent over time or tends to fade away. For this reason, we will estimate the same model excluding relatively younger firms. The rationale for doing that is that if eventually the be-

Table 3: Impact of beginning informal on technological innovativeness

	Probit Technology Full sample	Probit Technology Full sample	Probit Technology Age>5	Probit Technology Age>10
Began informal	-0.100* (0.058)	-0.149** (0.061)	-0.180*** (0.066)	-0.162** (0.082)
Services	0.103 (0.078)	0.096 (0.081)	0.062 (0.094)	0.005 (0.118)
Ln number of employees	0.069*** (0.021)	0.067*** (0.022)	0.064*** (0.024)	0.063** (0.026)
Ln employees w/univ. degree	0.076*** (0.017)	0.079*** (0.017)	0.095*** (0.019)	0.086*** (0.025)
Ln firm age	-0.027 (0.034)	0.005 (0.036)	0.007 (0.046)	0.053 (0.065)
Group	0.064 (0.061)	0.044 (0.067)	0.010 (0.074)	-0.005 (0.090)
Export	0.040 (0.064)	0.094 (0.070)	0.074 (0.080)	0.143 (0.092)
Manager has univ. degree	-0.174*** (0.063)	-0.179*** (0.066)	-0.218*** (0.074)	-0.173* (0.094)
Observations	291	263	212	146

Standard errors in parenthesis below estimated marginal effects.

** $p < 0.01$, * $p < 0.05$, * $p < 0.1$.

The dependent variable is *techinnov*, the dummy variable that indicates whether the firm introduced a new product and/or a new process in 2010-12. Columns 2-4 include the principal components of the obstacles to innovation as additional regressors.

havior of firms with regards to innovation is the same independently of whether they were formal at the beginning, the effect of *begin_inform* should decay as we leave out a larger number of younger firms. In particular, in column (3) we estimate the model leaving out firms with less than five years of age and in column (4) we exclude firms with less than ten years of age. In these two specifications, we also include the principal components from the obstacles to innovation variables. We expect the coefficients to be smaller in absolute value relative to those in column (2). However, in column (3), the coefficient is actually larger in absolute value than that in column (2), and is significant at the 99% level. In column (4), the coefficient is also negative and larger than that in column (2), and significant at the 95% level. Hence, the evidence suggests that differences in innovativeness between firms that began formal and firms that began informal remain over time.

Regarding the control variables, size and the percentage of employees with a university degree have a positive and significant effect on the probability of innovation, as expected. Surprisingly, the coefficient on *man_univ* is negative in all four columns, although we would have expected a positive relationship between managers having a university degree and the probability of the firm engaging in innovative activities.

The specifications in Table 3 take as the dependent variable the probability of the firm introducing any new products and/or new processes and/or having some ongoing or abandoned innovation activities in 2010-12. We now proceed to take a closer look at the impact of beginning operations as an informal firm on each type of innovation, specifically product and process innovations. For this reason, we will estimate three bivariate probit models, where the dependent variables in each model will be *prodinn* and *procinn*, that is, the indicators of the firm introducing at least one new product and one new process in 2010-12, respectively. The use of a bivariate probit allows for the existence of common unobserved factors that could drive both the introduction of new products and new processes⁴. The set of control variables will be the same as in the specifications whose coefficients were reported in Table 3, including the principal components from the obstacles to innovation variables.

In a similar way as in Table 3, we will begin our analysis by including all observations, and then proceed to exclude those corresponding to firms with less than 5 years of age (columns 3 and 4), and

⁴Results from a multivariate probit model using the four types of innovations as dependent variables are similar to those using a bivariate probit model. In reporting results from a bivariate probit, we follow the literature, which typically consider the existence of common unobserved determinants of product and process innovations (Fu et al., 2015).

Table 4: Impact of beginning informal on product and process innovations

	Bivariate probit Full sample		Bivariate probit Age>5		Bivariate probit Age>10	
	Product	Process	Product	Process	Product	Process
Began informal	-0.149 (0.209)	-0.644*** (0.214)	-0.242 (0.234)	-0.867*** (0.246)	-0.096 (0.288)	-0.974*** (0.331)
Services	0.890*** (0.283)	-0.064 (0.253)	0.766** (0.315)	-0.033 (0.306)	0.502 (0.364)	-0.305 (0.388)
Ln number of employees	0.212*** (0.066)	0.160*** (0.060)	0.235*** (0.071)	0.161** (0.064)	0.246*** (0.082)	0.191*** (0.072)
Ln employees w/univ. degree	0.178*** (0.065)	0.179*** (0.061)	0.253*** (0.075)	0.187*** (0.066)	0.329*** (0.097)	0.214** (0.088)
Ln firm age	0.043 (0.112)	0.065 (0.111)	0.060 (0.150)	0.065 (0.148)	0.031 (0.205)	0.149 (0.223)
Group	0.176 (0.201)	-0.109 (0.203)	0.041 (0.228)	0.012 (0.226)	-0.107 (0.272)	0.132 (0.268)
Export	0.492** (0.211)	0.097 (0.205)	0.358 (0.242)	0.147 (0.235)	0.405 (0.287)	0.226 (0.271)
Manager has univ. degree	-0.378* (0.212)	-0.240 (0.211)	-0.524** (0.231)	-0.339 (0.235)	-0.720** (0.315)	-0.331 (0.308)
Observations	263		212		146	
Log likelihood	-300.641		-238.083		-159.340	

Standard errors in parenthesis below estimated coefficients.

** $p < 0.01$, * $p < 0.05$, $p < 0.1$.

The dependent variable in columns 1, 3, and 5 is *prodinn*, the dummy variable that indicates whether the firm introduced a new product in 2010-12. The dependent variable in columns 2, 4, and 6 is *prodiinn*, the dummy variable that indicates whether the firm introduced a new process in 2010-12. Columns 1-2 report estimated coefficients of a bivariate probit using all observations. Columns 3-4 and 5-6 report estimated coefficients of a bivariate probit using observations from firms with at least 5 and 10 years of age, respectively.

those with less than 10 years of age (columns 5 and 6). As it is apparent from the reported coefficients on the table, the impact of beginning operations as an informal firm is negative in all cases, but only significant, at the 99% level, for process innovations. The sign and statistical significance of the effect of *begin_infor* on *procinn* is the same in columns (4) and (6), where we are excluding relatively younger firms (less than 5 and 10 years of age, respectively). Hence, the evidence suggests that beginning operations as an informal firm has lasting effects, especially on the introduction of new processes. We do not find statistical evidence of a different behavior regarding the introduction of new products. This suggests that firms that began operations as informal firms are less likely to upgrade their production processes and logistics, but not the range of products offered. For instance, retailers that began operations informally offer essentially the same type of products than those that began operations formally, but are less likely to improve on logistics or back-office operations. This is likely to perpetuate the lower efficiency of firms that began informal.

From hypotheses 2 and 3, we expect that the fact that a firm begins operations informally also affects its innovativeness in what regards non-technological innovations. In the survey, we have information on marketing and organizational innovations. We expect the effect of *begin_infor* to be negative on the different measures of non-technological innovativeness. Table 5 presents estimated marginal effects from Probit models where the dependent variables are *marketinnov* (columns (1) and (2)), and *organinnov* (columns (3) and (4)). Whereas in columns (1) and (3) we make use of all the observations in the sample, in columns (2) and (4) we restrict our attention to firms that are at least five years old, in order to check whether the effect vanishes with time⁵. Our results indicate that, for the whole sample of firms, the effect is negative, although only in the case of *marketinnov* is statistically significant (at the 10% level). In the case of *organinnov*, the sign of the marginal effect is negative, although it is very small in absolute value and not statistically significant. When we focus on the subset of firms that are at least five years old, the statistical significance of the estimated marginal effects is lost. Hence, while we find partial empirical support for hypothesis 2, we do not find support for hypothesis 3. Our results therefore suggest that the fact that a firm begins operations in the informal sector has an impact on its technological innovativeness, but the effect on non-technological innovativeness is less clear.

⁵Similar results are obtained when we restrict our attention to firms that are at least 10 years old.

Table 5: Impact of beginning informal on marketing and organizational innovativeness

	Probit Marketing Full sample	Probit Marketing Age>5	Probit Organization Full sample	Probit Organization Age>5
Began informal	-0.110* (0.064)	-0.102 (0.073)	0.040 (0.062)	0.047 (0.069)
Services	-0.090 (0.090)	-0.131 (0.103)	0.067 (0.084)	0.083 (0.096)
Ln number of employees	0.063*** (0.021)	0.048** (0.022)	0.095*** (0.023)	0.092*** (0.025)
Ln employees w/univ. degree	-0.003 (0.020)	0.008 (0.022)	0.027 (0.018)	0.026 (0.020)
Ln firm age	-0.006 (0.037)	0.003 (0.051)	-0.002 (0.036)	-0.003 (0.051)
Group	0.036 (0.069)	0.047 (0.079)	0.079 (0.069)	0.055 (0.078)
Export	0.135** (0.068)	0.135* (0.079)	-0.080 (0.066)	-0.068 (0.077)
Manager has univ. degree	0.005 (0.068)	0.013 (0.077)	0.052 (0.063)	0.067 (0.069)
Observations	280	224	281	224

Standard errors in parenthesis below estimated marginal effects.

** $p < 0.01$, * $p < 0.05$, * $p < 0.1$.

The dependent variable in columns 1-2 is *marketinnov*, the dummy variable that indicates whether the firm introduced a new marketing innovation in 2010-12. The dependent variable in columns 3-4 is *organinnov*, the dummy variable that indicates whether the firm introduced a new organizational innovation in 2010-12.

Table 6: Impact of beginning informal on obstacles to innovation

	Probit Cost	Probit Knowledge	Probit Market	Probit No innov.
Began informal	0.092 (0.060)	0.090 (0.066)	0.093 (0.065)	0.179*** (0.064)
Services	-0.120 (0.076)	-0.120 (0.086)	-0.061 (0.091)	-0.118 (0.090)
Ln number of employees	0.004 (0.019)	0.014 (0.021)	0.052** (0.020)	-0.006 (0.021)
Ln employees w/univ. degree	0.010 (0.018)	-0.016 (0.020)	-0.029 (0.020)	-0.030 (0.020)
Ln firm age	0.025 (0.033)	-0.014 (0.038)	-0.108*** (0.036)	-0.007 (0.037)
Group	-0.005 (0.057)	-0.054 (0.070)	-0.087 (0.067)	-0.043 (0.068)
Export	-0.098* (0.058)	-0.031 (0.070)	-0.001 (0.068)	-0.091 (0.069)
Manager has univ. degree	0.000 (0.062)	0.134* (0.072)	-0.017 (0.071)	0.074 (0.071)
Observations	291	291	291	291

Standard errors in parenthesis below estimated marginal effects.

** $p < 0.01$, * $p < 0.05$, * $p < 0.1$.

The dependent variables are $mainobst_{cost}$, $mainobst_{know}$, $mainobst_{mar}$, and $mainobst_{noinn}$, respectively. These are dummy variables that indicate whether cost, knowledge, market, and reason not to innovate obstacles are at least as important as any other obstacle to innovation.

Finally, we explore the question of whether the importance of obstacles to innovation is the same for firms that began operations as informal establishments. Table 6 reports marginal effects from Probit models where the dependent variables are *mainobs_cost*, *mainobs_know*, *mainobs_mar*, and *mainobs_noinn*, and the set of independent variables includes *begin_infor* and the rest of controls used in the first column of Table 3. The results suggest that beginning informal only affects the reasons not to innovate category. While the effect on cost, knowledge, and market factors is positive, as expected, it is only statistically significant, at the 99% level, only in the case of reasons not to innovate. Therefore, at first sight we do not find support for our hypotheses 4 and 5.

An interpretation of these results may be that there is evidence that firms that began informally have equal access to capital and information. However, an alternative interpretation of the categories included in reasons not to innovate ("No need due to prior innovations", "No need because of no demand for innovations", and "Excessive regulation and red tape discourages innovation") is that they reflect an absolute lack of knowledge of existing alternative technologies and market opportunities. This therefore could reflect a severe disadvantage in terms of knowledge, relative to firms that began operations in the informal sector, making them not even aware of the need to introduce innovations and therefore of the importance of financial, knowledge, and market obstacles to innovation. This suggests that policy and managerial interventions that correct this problem should facilitate innovation and thus raise productivity.

5 Discussion and limitations of the analysis

Our empirical results suggest that firms that began operations as informal firms are substantially less likely to introduce technological and marketing innovations, but not organizational innovations. In the case of technological innovations, the effect seems to be driven by process innovations: while the effect of beginning informal on the introduction of product innovations is negative, it is not statistically significant, although it is in the case of process innovations. This could be the case because while new product could be more easily imitated, given its observable characteristics, this is not so in the case of process innovations. In most cases process technologies remain within the confines of firms, thus being less easy to observe, and also imitation of a process used by a rival firm often requires the development of absorptive capacity. We would have expected beginning informal to have

an impact on organizational innovations, but it is not the case. One reason could be that the items considered in the questionnaire, which are the same ones as in the rest of the CIS-type questionnaires, may not be adequately capturing the type of organizational changes that take place in firms in developing countries, and thus we do not have enough variation in the observed answers. This calls for a rethinking of this part of the innovation questionnaires to be adapted to the idiosyncrasies of firms in developing countries. A more adequate design of these questions could also shed more light on the important issue of the existence of complementarities between technological and non-technological innovations.

We interpret the evidence presented in this paper as suggestive of the existence of factors specific to informal firms that induce them to make different choices than firms that began operations as formal firms, even after transitioning towards formality. We believe that this is due to inefficiencies inherited from the phase of informality. For this same reason, given the additional inefficiency of firms that began operations in the informal sector, the returns from the adoption of better managerial practices, and in Bloom et al. (2013) are potentially larger. While a more in-depth study of the specific factors that drive the results presented in this paper is called for, probably using case studies, there are some policy and managerial implications that stand out. First, given that a firm's informal status seems to constrain the firm's future behavior constitutes an additional reason to lower the barriers to formalization as much as possible, so as to minimize the proportion of firms that decide to begin operations informally. On the other hand, the provision of managerial formation should raise the average quality of existing managers, and thus probably make them better aware of market and technological opportunities that induce them to adopt new technologies. At the firm level, the introduction of information systems internal and external to the firm that allows them to be more aware of these opportunities should also have a positive impact on productivity.

Regarding the limitations of the present study, a clear limitation is the fact that we are dealing with a relatively small sample and a cross-section of firms. Additionally, most of the firms in our sample are in services industries. While this is representative of the overall Kenyan economy, the data used in this study does not allow us to address the issue of whether our results also apply to manufacturing industries. This endeavor should be undertaken by future research. Furthermore, access to larger datasets and panel data may allow future research to more precisely the effect of

informality. For instance, it could allow us to more precisely estimate whether the effect of variables that affect innovation is different for firms that began operations as informal firms, controlling for unobservable firm-specific, time-invariant effects. In this sense, we believe this paper is best viewed as a starting point and as a catalyst to motivate future research in this area, given that this is a crucial point in the achievement of an efficient allocation of resources within economies in developing countries.

6 Conclusions

In this paper, we have used firm-level data from an innovation survey of Kenyan firms conducted in 2013 and referring to the 2010-12 period, to shed some light on the impact on a firm's innovation decisions of the firm beginning operations as an informal firm. Specifically, we investigate whether a firm's belonging initially to the informal sector and eventually becoming formal has any effects on its probability of being technologically innovative in general, of introducing new products and/or processes, of introducing new marketing or organizational innovations, and on declaring some categories of obstacles to innovation to be at least as important as any other category of obstacles to innovation.

The results suggest that the effect of starting operations as an informal firm has lasting effects on firms' innovativeness. We find the indicator of informality to affect the probability of the firm being innovative, and this effect persists as we leave out relatively younger firms. Considering the type of innovation that is most affected by informality, we find that the difference between the two types of firms is on process innovations, while the effect on product innovations, while of the same sign is not statistically significant. While there is some negative effect on the probability to introduce marketing innovations, there is no evidence of organizational innovations being affected. Regarding obstacles to innovation, we find that the main effect is on reasons not to innovate, which could reflect a severe knowledge disadvantage of firms that began operations informally, relative to firms that began operations in the formal sector.

Our results have important policy implications. Kenya's Vision 2030 sets the goal of Kenya joining the rank of upper middle income countries by 2030. This would require an increase of almost four times Kenya's current per capita income. Irrespective of the sector considered, innovation is the critical element of accumulation of production capabilities or adding complexity to the economy (World Bank, 2016). In the light of the importance of innovation for economic growth in Kenya, it is vital

that the government puts in place policies to provide greater incentives for firms to formalize their operations. Greater formalization of firms will according to these results increase the overall level of innovativeness of firms which is a key objective of government policy in Kenya. For the Kenya government increased innovativeness of firms is considered vital for comparative advantage and competitiveness of the Kenyan economy in the long run. The Kenyan Government Second Medium Term Plan aims to achieve innovation at the county level under the new devolved system of government and levels of informality are a critical challenge in many counties in Kenya. The weak innovation culture among the population in general is reinforced by widespread informality of firms (Republic of Kenya, 2016). Formalization is likely to enhance the long run efficiency of firms. Process innovation which is also vital in the Kenyan context is particularly likely to be positively affected by formalization. Since there is widespread informality among firms in Kenya this implies that without greater formalization process innovation in Kenya is likely to suffer in the long run. Formalization would also mitigate a critical challenge to innovation in developing countries like Kenya which is cost as a barrier to innovation. Mitigating cost as a barrier to innovation through formalization will provide an important impetus to overall growth in the Kenyan economy. Based on our results, greater innovation could itself be cited as a benefit of formalization by government to informal firms to encourage them to formalize. The government could in its formalization policies encourage firms by arguing that innovation would make them more competitive and likely to survive in the long run. Mortality is extremely high among informal firms and formalization and greater innovation associated with this could increase their life span and survival prospects.

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