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Evidence from Ghana

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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Firm employment, exit and growth in the food processing sector: Evidence from Ghana

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Abstract

Although the expansion of food processing is a key component of agricultural transformation in developing countries, there are few empirical studies focusing on firms operating in this sector. In this paper we examine employment generation, firm exit, and growth of food processing firms in Ghana. In analyzing firm growth, we focus on the effects of formality, defined in this paper as tax registration and registration for regulatory oversight by Ghana's Food and Drugs Authority. We account for the potential endogeneity of the firm's decision to formalize by using a set of variables—the firm's location in the capital region, distance to the nearest tarred road, and firm location in a market or industrial area—as instruments for formal status. We use a nationally-representative dataset of 679 firms that were first listed for a census in 2014 and subsequently interviewed in 2017. From 2014 to 2017, 168 of the firms exited the food processing industry. Firms were less likely to exit if they were in an urban district, if they produced more types of products, and if they were younger and smaller. The remaining firms generally reduced their employment during the period, and we estimate that Ghana's food processing sector shed at least 37,000 jobs from 2014 to 2017. Our study shows that formality had positive impacts on firm growth, but that tax registration alone had a smaller positive effect. These findings suggest that, for the food processing sector, efforts to promote integration of informal firms into the formal economy would yield positive results in employment generation if food processing firms are also encouraged to undergo regulatory inspections and certification.

Key words: employment, firm exit, firm growth, formality, food safety regulations, Ghana

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1 Introduction

Development practitioners consider a successful food processing sector to be an important component of economic development (ACET 2014; AfDB 2016). Especially for countries in Africa South of the Sahara (SSA), food processing is a potential market for agriculture's primary products, a potential source of employment, especially for the youth, and a potential source of foreign exchange earnings through exports. Consequently, policy-makers and development agencies have promoted food processing in diverse ways. Despite the keen policy interest in food processing, it remains an under-researched area, a part of the food value chain that has been described as the 'hidden middle' (Reardon 2015). Research on evolving food systems generally focuses on farm-level production, and relatively little is known about firms that are engaged in post-harvest processing. In general, limited data are available for research on firms operating in developing countries, especially small, informal firms (Li and Rama 2015).

This paper uses data from a sample of 679 food processing firms in Ghana to estimate changes in employment by the food processing sector from 2014 to 2017, to analyze the determinants of firm exit during the same period, and to analyze the determinants of firm growth from the firm's establishment up to 2017. In modeling the determinants of firm growth, the focus is on the effects of formal status as a food processing firm, which is defined in this paper as registration as a business for tax purposes and registration with the national food regulator, the Food and Drugs Authority (FDA). There is already a rich literature on the effects of formality on firm performance, and the general conclusion is that formal registration contributes to firm growth and profitability (McKenzie and Sakho 2010; Rand

and Torm 2012), although the literature also recognizes the diversity in measuring a firm's formal status. Most studies have used tax registration as the measure of a firm's formality. However, as Mead and Morrisson (1996) have pointed out, the definition of formality matters when comparing the effects of formalization across countries. We extend this argument to postulate that the definition of formality matters when comparing the effects of formalization across sectors, and we demonstrate this by using a measure of formality for food processing firms that goes beyond tax registration to include registration for regular inspection and certification by the mandated government agency.

A firm's decision to achieve formal status depends on factors such as the amount of information available to the firm about the formalization process (McKenzie and Sakho 2010) and the perceived risks of operating informally. This decision is potentially endogenous in a firm performance or growth model, in part because of possible omitted variables in the model, since there are many potential drivers of firm growth (Nichter and Goldmark 2009). Endogeniety may also arise from reverse causality, if firm performance or growth drives the decision to formalize (Sleuwaegen and Goedhuys 2002; McKenzie and Sakho 2010). Accordingly, we account for the potential endogeneity of the firm's decision to formalize by using a set of instrumental variables that are likely to affect the decision to formalize but which, we argue, do not independently affect firm growth—the firm's location in the capital region, distance to the nearest tarred road, and firm location in a market or industrial area. We show the robustness of the instrumental variables approach by confirming the endogeneity of the registration variables, by testing for the explanatory power of the instrumental variables, and checking that the instrumental variables are exogenous (Wooldridge 2016).[2]

[2] As a further robustness check on the instrumental variables approach, we exclude distance to tarred roads from the set of instruments, since it could arguably be a determinant of a firm's market size and therefore of firm

Bearing in mind the heterogeneity in definitions of firm formality in previous studies, it is worth providing some background about the study context. For food processing firms in Ghana, as in most other countries, tax and FDA registrations are carried out in separate steps. Firm registration is required for FDA registration. Formal registration provides the firm with a tax registration number, whereas FDA registration entails signing up for regular inspections and, importantly, confers a certification stamp for the firm's products. The FDA is mandated to inspect food manufacturers' premises and all packaged and unpackaged food products (FDA 2018). Our sample reflects the extent of informality in Ghana's food processing sector. Respectively, 17 percent and 9 percent of the firms in the sample have tax registration and full formal status (tax and FDA registration). Therefore, in practice, formality does not seem to be a prerequisite for entering the industry and selling products in most food markets, and in our qualitative interviews with processing firms, managers have limited knowledge about the registration process and generally a low level of concern about enforcement and penalties for not registering.

From a policy perspective, this paper's focus on employment generation and firm performance in the food processing sector reflects areas that are important aspects of Ghana's economic growth. Expansion of the food manufacturing sector is one of the main goals of Ghana's transformation agenda[3]. However, the past two decades have seen relatively sharp growth of the services sector relative to agriculture and manufacturing (Honorati and de Silva 2016). Manufacturing is not growing as desired by policymakers, and there is no clear evidence that the food processing sector, which is included under manufacturing in official

growth. Estimating the growth models in this way does not change the study's qualitative conclusions (see Section 5).

[3] Ghana has had a long history of promoting industrialization based on agriculture. Manufacturing and agro-processing are key elements in Ghana's current transformation agenda, according to the country's Coordinated Programme of Economic and Social Development Policies for 2014-2020. In 2017 the government of Ghana launched an ambitious program to promote agro-processing in every district in the country, with the goal of generating employment for rural youth and promoting food availability.

data, is growing either. Recent estimates show that manufacturing contributes 4.6 percent of GDP (GSS 2017) and employs 9.1 percent of the labor force (GSS 2014). Per national accounts data, the food and beverage processing subsector was the largest share (30 percent) of manufacturing GDP in 2013 (Nti 2015).

From a research perspective, this paper contributes to our understanding of the food processing sector and firm performance in SSA. Increasing urbanization and agricultural transformation in SSA have brought attention to the pace of food system transformation and the implications of a growing food processing sector for employment (Tshirley et al. 2015; Minten et al. 2016). For firm performance, there is a broader literature to draw on. For example, the determinants of firm growth in developing countries have been researched extensively (see review by Nichter and Goldmark 2009). Closely related to this study, Davies and Kerr (2017) estimated the determinants of firm exit for manufacturing firms in Ghana and found that smaller, younger firms were more likely to exit the industry. This paper updates and complements that study. The sampling frame for the data used by Davies and Kerr (2017) was the 2003 nation-wide industrial census, and their study sample was restricted to five urban areas. The data for the present study comes from the 2014 nationwide industrial census as a sampling frame, and we aimed for a nationally-representative sample that includes firms located in rural areas.

Although there are several studies on manufacturing in SSA, as far as we know this study is the first to employ a nationally-representative survey for the food processing sector. Ideally, an analysis of firm performance would use a full panel dataset (Rand and Torm 2012). This would allow for clear detection of the impacts of any registrations between the data collection rounds. It would also allow researchers to clearly establish the factors that led to the exit of firms between the data collection rounds, and, if new entrants are included in later survey rounds, to clearly establish the factors that lead to firm entry as well. Since panel

data are unavailable, this study is based on a cross-sectional survey of firms carried out in 2017.

Using cross-sectional data puts this study in line with other studies (e.g. Amin and Islam 2015), but this approach suffers from some shortcomings, and we have sought to mitigate these accordingly. First, we take advantage of the fact that the firms were first listed in 2014, and that some basic data were collected during the listing. To achieve this, for 168 firms that were listed in 2014 but were no longer operating in 2017 we tracked down key informants (former owners or managers) to provide information on the closed firms. Thus, for example, in our analysis of the determinants of firm exit from 2014 to 2017 we use the size of the firm in 2014 as an explanatory variable. Secondly, through recall questions we collected information on key historical aspects of the firm (such as employment numbers at start-up and location changes). Given the paucity of data on the food processing sector in developing countries, especially the informal firms, the data used in this study can be seen as providing a preliminary analysis of key aspects of firm exit and growth in the sector, until more detailed data become available.

This paper makes three main contributions to the literature on firms in developing countries. First, as Li and Rama (2015) have argued, the existing knowledge is skewed towards large, formal firms and presents a distorted picture of job creation. By using a recent, nationally-representative dataset that includes small, informal firms, we can provide a clearer picture of employment generation by the food processing sector. Second, the paper is a complement to the relatively small number of studies on the determinants of firm exit. Third, in assessing the determinants of firm growth the paper contributes to the literature on the effects of formality by focusing on the food processing sector, by adding a sector-specific measure of registration with the national food regulator to the more widely used measure of

tax registration, and by measuring the impact of registration with local authorities in addition to national-level formalization.

The results point to some areas to consider for policy discussions. For example, we estimate that in the short period from 2014 to 2017, Ghana's food processing sector experienced sluggish growth and firm exit, and lost about 37,000 jobs. This estimate includes an approximation, not a direct measure, of jobs generated by new firms entering the sector during period, because the sampling methodology did not include new entrants. We also find that younger firms and firms located in rural areas were more likely to exit. On the other hand, formalization had positive impacts on firm growth. The findings suggest that, in addition to the benefits that may attend formalization through tax registration (benefits such as increased eligibility for bank loans), encouraging FDA registration and the accompanying regulatory inspections and certification would be helpful for building a thriving food processing sector that generates jobs.

The remainder of this paper proceeds as follows. Section 2 provides further background on the two main topics of this study—food processing and firm exit and growth. Section 3 describes the data, Section 4 describes the methods, and Section 5 reports the results. We conclude in Section 6.

2 Conceptual Framework

2.1 Food processing in the developing country context

In Figure 1 we present a conceptual model of the food processing sector from the perspective of the growth and performance of firms operating in the sector. Figure 1 is based on our review of the literature on the transformation of food systems in developing countries and it highlights the links between performance of the food processing sector and the following: (1) the supply of raw materials from farm production, (2) the nature of demand

from modern food retail systems and consumers especially in urban areas, (3) factors such as migration and population growth and (4) the policies on firm registration and food product regulation. Each of these connections is explained below.

[Figure 1 about here]

First, the model shows the importance of the link between food processing (center) and *farm production* on the left side of Figure 1. Agriculture provides the raw materials for the food processing sector. Although farmers may sometimes participate directly in expanding value chains for high-value products such as vegetables (Rao, Brummer, and Qaim 2012; Wang et al. 2009), often the link between farmers and consumers is accompanied by an expansion of the food processing sector (Reardon et al. 2015). This is especially so for staples and grains (Minten et al. 2016) at an early stage in development. There is a bi-directional link between the farm and processing sectors. As farms supply raw materials needed for processing, a growing processing sector in turn drives intensification of farm production and may also provide incentives for farmers to diversify their production (Pingali and Rosegrant 1995).

Second, on the right side of Figure 1, the food processing sector is connected to *consumers* via the demand-side factors that drive the marketing of processed foods. These include consumers' preferences for foods that take shorter preparation time (Sheely 2008), lower prices, and more exotic foods supplied by supermarkets (Reardon, Henson, and Gulati 2010). Here too, the impacts go in both directions. As the processing sector emerges and expands to supply the market with products, the changes on the consumer side drive the evolution and performance of food processing firms. For example, consumers could become more concerned about food safety, which would drive mandatory and voluntary certification by processing firms.

Third, the performance of the food processing sector is also dependent on the *other factors* that drive food system transformation in the developing world. These include rising populations, rapid urbanization, migration, and increases in household income. The changes in diets resulting from these trends tend to go in the direction of higher consumption of processed foods (Popkin 2003), generating the consumer demand upon which the food processing sector depends.

The fourth feature in Figure 1 is the *macro-economic and regulatory environment* in a country, which affects the performance of all firms, and presumably would have impacts on the growth of the food processing sector. The macro-economic conditions in a developing economy affect purchasing power of consumers and hence their demand for processed foods. The regulatory environment for all firms in the country (tax registration), and specifically for food processing firms (FDA registration), is the focus of this study's analysis of the determinants of growth.

2.2 Firm exit and growth: Theory and empirical evidence from SSA

Jovanovic's (1982) learning model of theory of the firm provides one common perspective of firm growth that has been evaluated in the firm growth literature. In his model, firms have imperfect knowledge of the costs of their operations. Therefore, firms can only predict their performance in the next period. If their operations are costlier than predicted, firms are likely to fail. If the firm is efficient in its operations and its performance in the next period exceeds the earlier predictions, that firm is an efficient firm that can afford to grow. The surviving firm then predicts its performance in the next period, but with the additional information from its prior performance, the cost prediction (and therefore performance prediction) will be more accurate than the earlier prediction. As this process continues, and firms grow and become better at predicting their performance, the variability in firm growth

rates reduces. Based on this theory, younger, smaller firms are both more likely to exit from the market and more likely to grow if they survive.

Empirical evidence from countries in Sub-Saharan Africa confirms that younger, smaller firms grow faster than older firms (McPherson 1996; Mead and Liedholm 1998; Nichter and Goldmark 2009). In addition to firm age and size, several other variables have been empirically determined to affect the growth of firms in developing countries. Nichter and Goldmark (2009) reviewed 100 peer-reviewed articles and several working papers and books on the determinants of growth among small firms and concluded that the most common firm-related factors included firm location, age, informality, and access to finance. The existing literature on Sub-Saharan Africa, mostly consists of empirical evidence from Eastern and Southern Africa. In West Africa, this finding has been confirmed for firms in Cote D'Ivoire (Sleuwaegen and Goedhuys 2002), but in Ghana, on the contrary, larger firms experienced faster growth than smaller firms (Teal 1999; Obeng, Robson, and Haugh 2014).

There is an important difference in the data used in the studies from Eastern and Southern Africa and the data used in research on West African firms. In Eastern and Southern Africa, the data used by researchers such as Daniels (1999) and McPherson (1996) consisted of house-to-house or shop-to-shop listing of firms to generate a nationally-representative sample of firms that includes both formally-registered and informal firms. In contrast, the studies of firm growth and exit in West Africa have used data from industrial surveys that are likely to exclude smaller firms (Teal 1999; Sleuwaegen and Goedhuys 2002; Frazer 2005; Obeng, Robson, and Haugh 2014; Teal 2016; Davies and Kerr 2017). The present study is therefore unique for the Ghanaian and West African context, because data comes from a sampling frame created through a census that includes smaller, informal firms.

3 Data

3.1 Firm listing, 2014

In 2014, the Ghana Statistical Service (GSS) conducted a listing of all business establishments engaged in economic activities. To improve coverage in this census compared with previous industry surveys, the GSS adopted a spatial sampling approach in which enumerators visited every fixed building within the country (GSS 2015). If any economic activity was carried out at the location, enumerators collected basic information that included the type of activity or subsector based on the UN Inventory of Classifications[4], number of employees, and year of establishment. The listing included more than 16,000 food processing firms in 2014.[5] As noted above, this spatial sampling approach for survey enumeration follows the examples in the literature for surveys of enterprises in Africa (see Mead and Liedholm 1998; Daniels 1999). Further details regarding the listing methodology and the data collected in 2014 can be found in the survey report (GSS 2015).

3.2 Main survey, 2017

The authors conducted the second survey round in August-September 2017, in close collaboration with the GSS. The survey team selected respondent firms from the food processing firms identified in the 2014 firm listing exercise, using firm activity according to ISIC codes to select the population of food processors. The second survey targeted a sample of 800 firms, using a combination of random and purposive sampling techniques to identify firms from three strata (Table 1).

[4] Details of the codes are available at the ISIC Revision 4, Code 10 link: http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=27&Lg=1&Co=10

[5] Food processing firms represented about 16 percent of nearly 100,000 manufacturing firms listed in the census.

[Table 1 about here]

The first survey round showed a concentration of food processing activity in urban areas (GSS 2015). To capture this feature in the survey, the team targeted firms in the two largest cities, Accra and Kumasi, as one stratum. The second stratum included the six cities in Ghana with populations greater than 100,000. The third stratum included one district selected at random from each of the ten administrative regions of the country. To ensure that this third stratum would yield an adequate sample size, only districts with more than 100 food processors listed in 2014 were included in the selection. In addition to the three strata defined by geography, the sampling strategy aimed for the representation of all firm sizes. We adopted the firm size classification used by the GSS in industrial surveys, in which micro firms are those with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are those with more than 100 employees (Table 1, column 5). Within each of the three strata, the research team over-sampled the medium-sized and large-sized firms, since these firms tended to be under-represented in the firm lists.

Table 1 presents a summary of the sampling approach, targeted firms, and final sample sizes. Although we targeted 800 firms, 777 firms were contacted for the survey, because the survey team could not locate 23 firms, even after repeated attempts. Among the 777 firms that were successfully contacted, 78 firms (about 10 percent) that were still operating explicitly declined to participate in the survey, 14 firms postponed the interview until the survey period passed, and we excluded 6 of the establishments listed as firms because they were not profit-seeking entities (religious or social groups engaged in food processing), resulting in a final sample of 679 firms. 168 of the firms in the final sample had exited the

sector between the listing and interview periods. In the Results section we provide more details on firm transitions from 2014 to 2017.

The survey instrument for the second round was administered to firm owners and managers, and it included questions on the firm's basic history, including date of establishment, and number of employees at establishment, in 2014, and in 2017. We also collected data on the firm's registration status for tax purposes, the firm's registration status with the Food and Drugs Authority, and with the local district assembly. Other variables are listed in Table 2. For firms that had exited the industry, we used contact information from the first survey round to track down a reliable representative of the firm (former owner or manager) and asked a short series of questions on the firm's history, the type and number of products produced by the firm when it was in operation, and the primary reasons for closing the firm.

3.3 Sample characteristics

Table 2 provides descriptive statistics of the firms in the sample. On average, firms have been in existence for 16 years, and larger firms tend to be older, with an average of 24 years. The average firm employed 21 workers in 2017, nearly double the average size at which firms started out (11 workers), but a drop from the 2014 average of 30 workers. The average annual growth is low, at 0.01 workers added per year on average, but there is considerable variation across firm sizes. While 17 percent of firms have tax registration, and 14 percent of firms have FDA registration, 9 percent of the sample have completed both registrations and are therefore considered to be formal firms for this analysis. Compared with tax and FDA registration, district-level registration is much more common—65 percent of firms have registered with the local district assembly.

[Table 2 about here]

Firms are located predominantly in the Greater Accra region (34 percent) followed by the Ashanti region (17 percent) and 62 percent of firms operated in an urban district. On average, each firm produces two unique products, but larger firms are more diversified, producing on average four food products per firm. As would be expected for a developing country, food processing consists mainly of primary activities such as grain milling (35 percent), baking (21 percent) and manufacture of starch products such as cassava and plantain (8 percent), although firms are also involved in processing fruits and vegetables (7 percent) and fish (3 percent). The sample includes a handful of firms in categories such as dairy, sugar, and cocoa, so these are included under 'other food products'. Lastly, around two-thirds of food processing firms operate from a house or residential area, compared with about one-tenth each of firms operating from a market, industrial site, or other location.

4 Methods

We begin with a description of firm size transitions from 2014 to 2017, followed by estimations of national employment figures for the food processing sector, and then follows the analysis of the determinants of firm exit and growth. The dependent variable for firm exit is a binary variable that takes on a value of one if the firm closed from 2014 to 2017 and zero otherwise. Building a model of firm exit can be challenging due to the difficulty with tracking down and collecting data from reliable sources for closed firms (McPherson 1996; Frazer 2005; Davies and Kerr 2017). Following the examples of Frazer (2005) and Davies and Kerr (2017) we use a simple linear probability model to estimate the factors that explain firm exit. The explanatory variables for the firm exit model include firm location, age, size, number of products, and the ISIC categories of food processing. For both firm exit and growth, we are

concerned about heterogenous effects (McKenzie and Sakho, 2010) and therefore we run the models for different-sized firms.

We measure firm growth in terms of number of employees, following the example of previous studies in developing country settings (Evans 1987a; Evans 1987b; McPherson 1996; Sleuwaegen and Goedhuys 2002; Burger and Damijan 2014; Tarfasa et al. 2016). As discussed by McPherson (1996) for developing country studies, and especially for smaller firms, other measures of firm performance such as sales or profits are prone to measurement error, and firm managers can recall employment numbers with reasonable accuracy. We use the same measure of growth as Evans (1987a; 1987b), McPherson (1996) and Sleuwaegen and Goedhuys (2002) which is defined as follows:

$$Firm\ Growth = \frac{\ln(current\ employment) - \ln(initial\ employment)}{Firm\ Age} \quad (1)$$

where *current employment* is defined as the number of employees as at June 30, 2017, *initial employment* is the number of employees when the firm started operations, and *firm age* is measured in years. The explanatory variables for the determinants of firm growth focus on firm characteristics. The estimated model for the regression is as follows:

$$Firm\ Growth = \beta_0 + \beta_1 formfda + \beta_2 distreg + \beta_3 urban + \beta_4 nproducts + \beta_5 firmage + \beta_5 initialsize + \beta_6 catproducts + \varepsilon \quad (2)$$

Where the variable *formfda* is a dummy variable representing formality that takes on one for firms with both tax and food regulatory registrations and zero otherwise. This is our main variable of interest. Apart from the impacts on growth which we analyze below, our descriptive analysis of the data supports the view that formal firms may be quite different from informal firms. For example, 38 percent of formal firms had been able to borrow to

finance their operations, compared to 16 percent of informal firms, and while 82 percent of formal firms had bank accounts, only 25 percent of informal firms operated bank accounts.

The variable *distreg* measures the firm's registration status with the local District Assembly. The other explanatory variables are a dummy variable indicating firm location in an urban district (*urban*), the number of products produced by the firm (*nproducts*), the firm's age (*firmage*), the firm's size when it was first established (*initialsize*), and dummy variables indicating the ISIC categories of food processing carried out by the firm (*catproducts*).

We are concerned about the potential endogeneity in the regression model for firm growth, and therefore we use an instrumental variables approach. Endogeneity may arise from omitted variable bias[6], a bias for which Angrist and Krueger (2001) show that instrumental variables can be a remedy. In this model we are also concerned about endogeneity due to reverse causality, because while firm registration may have effects on firm growth, firm growth may precede registration (Sleuwaegen and Goedhuys 2002). Therefore, the registration variables *formfda* and *distreg* are potentially endogenous in the firm growth model. We select instruments for these two registration variables that are likely to drive the information available to a firm about formalization, following McKenzie and Sakho (2010) and Rand and Torm (2012), and that are likely to affect the level of concern a firm may have about detection for non-compliance. The instrumental variables are firm location within the Greater Accra region (the region in which the national capital is located and the headquarters of the tax registration department and the FDA), distance to nearest tarred road, and firm location within a market, industrial area or 'other' location.[7] As shown

[6] For example, in addition to firm characteristics such as age, size, formality (or informality), Nichter and Goldmark (2009) argue that owner/manager characteristics such as education, work experience, and gender play a role in the success or failure of small firms in developing countries. These attributes are likely to be relevant for small, single-owned firms, but they are not included in our analysis because of the range of firms in the sample, which includes large firms with multiple owners.

[7] A valid instrumental variable should be correlated with the instrumented (endogenous) variables. We hypothesize that location in the region hosting the national capital would make a firm more likely to register for

later in the results section, we reject the null hypothesis that the instrumented variables are exogenous, and, statistically insignificant results of the tests for over-identification give us confidence to use these instruments (Wooldridge 2016).

5 Results and Discussion

5.1 Firm growth and exit, 2014-2017

A growth and exit matrix in Table 3 summarizes the transitions during the years 2014-2017.[8] The survey response rate of 85 percent compares favorably with other firm surveys in Ghana (e.g. Davies and Kerr (2017) were able to track down 43 percent of firms after ten years). Response rates were generally higher among smaller firms. Forty-four percent of the large firms refused to participate, compared with 6-12 percent of the micro, small, and medium firms.

[Table 3 about here]

Two main findings stand out in Table 3, both pointing to a dismal performance of the food processing sector. First, in the three years between the listing and the survey, at least 168 firms closed their operations (Table 3, 'Exited' firms, last row), not counting firms that may have exited but could not be tracked down by the survey team[9]. If all the firms that

both tax collection and food regulations, as would proximity to a tarred road, and location within a market or industrial area. An instrumental variable should also be uncorrelated with the error term in the main equation. The selected variables should therefore not independently affect firm growth apart from their impacts via the firm registration variables. As one of the robustness checks we exclude distance to tarred road from the set of instrumental variables to confirm that our results are not driven by the choice of instruments.

[8] One concern with comparing the firm sizes for the two periods is the role of seasonality in employment, especially if employment levels in food processing firms fluctuate with the agricultural season. We addressed this concern in part by ensuring that the reference period for the second round (June 30, 2017) was as close as possible to the reference period for the first round (August 31, 2014). Both dates are within the rainfall season in Ghana. A second concern is with part-time employment. In 2014, firms were asked "how many persons are working for this establishment?". In 2017, we asked firms about both full-time and part-time workers.

[9] As noted earlier, the survey team planned to interview 800 firms but 55 firms could not be located despite the team's best efforts.

refused to participate in the survey are still in operation, this would represent a 23 percent exit rate. Exits were greatest among the micro firms (27 percent), followed by large firms (17 percent), medium (13 percent), and small (12 percent) (Table 3, 'Exited' firms).

A second key finding from Table 3 is the shrinkage and sluggish growth across all firm scales in the three-year period. This was most evident among small firms—nearly half (47 percent) of the small firms in the sample in 2014 had shrunk to micro-scale by 2017, and we find no transitions from small to medium-scale (Table 3, row 3). Among medium-scale firms, although 4 percent transitioned to become large firms over the period, 27 percent dropped to small-scale status, and 17 percent had become micro-scale firms (Table 3, row 4). The last result is particularly striking, considering that in order to drop from medium-scale to micro-scale a firm would need to cut the number of its employees by at least 25. The 27 percent exit rate among micro-scale firms also suggests that some small-scale and medium-scale firms that had shrunk to micro-scale by 2017 may also be on their way out of business.

The contraction trends observed in the data are somewhat surprising, because the Ghanaian economy grew during the period 2014-2017, and with increasing urbanization and other trends, one would expect an increase in demand for processed foods.[10] One possible explanation may be that the country relied on food imports to meet rising demand. We use data on processed food imports for 2014-2017 to assess whether this might be the case.[11] Processed food imports have indeed increased in recent years for items such as flour, processed cereals, and packaged nuts, from half a billion US dollars in 2010 to 1.3 billion USD by 2014, and 2.3 billion USD by 2017. The annual growth in the value of processed food imports was 23 percent from 2014 to 2017. In comparison, the annual population growth rate of the country for the same period was about 2.2 percent. Processed food exports have

[10] We are grateful to an anonymous reviewer for pointing this out.
[11] The assessment is based on unpublished data provided by the Ghana Statistical Service.

also increased during the period, though, reaching 0.88 billion USD for the same categories of products. These trends suggest that while Ghana's food processing sector has responded to growing demand for processed foods, and even increased some of its share of the export market, the bulk of the rising demand is being met by imports. The contraction in the sector that we observe in our data is therefore likely due to the sector's lack of global competitiveness, among other factors.

5.2 Employment trends

The firm exit and shrinkage reported in the previous section could have adverse implications for employment in the food processing sector, although any negative impacts could also be mitigated by new employment generated from the 'creative destruction' of inefficient firm closures followed by entry of new, possibly productive firms. To estimate the level of impacts on employment, we use sample weights to derive national-level employment figures based on the sample statistics. In the estimates described below and in Table 4, we also attempt to account for jobs generated by new firm entrants, since the sampling approach could not detect new entrants.

Starting from estimates of the aggregate employment of firms in 2014 (Table 4, rows 1-3) and 2017 (Table 4, row 4), we estimate the change in employment in the period 2014-2017. For firms still operating in 2017 that agreed to be interviewed, there was a net loss of 2,939 jobs in the sample (not shown in Table 4) from 2014 to 2017. Using sample weights, we estimate a national-level job loss of 28,521 (Table 4, row 5). We add this to a national estimate of jobs lost due to firm exits during the period (Table 4, row 3) to obtain a gross estimate of 69,160 jobs lost over the period (Table 4, row 6).

As an approximation of new jobs generated by new entrants, we estimate the number of jobs created by firm entrants in the past. Firms that entered the industry in the three-year

windows before 2014 (2009-2012, 2010-2013, and 2011-2014) generated 27,840–32,056 new jobs (Table 4, row 7). Assuming that jobs were generated at the same levels by new entrants in 2014-2017, the range of net job loss would fall between 37,103 and 41,319 (Table 4, row 8). This estimation method is obviously not foolproof. However, as described below, the main difference between the period for which we have data on new entrants (2009-2014), and the period for which we are estimating (2014-2017) is that the latter period featured better economic performance and therefore probably greater job generation. There were no significant changes in employment regulations either over the entire period (2009-2017).[12]

Our estimated number of jobs lost is likely to be a lower bound for three reasons. First, it is notable that the Ghanaian economy generally performed better in 2009-2014 than in 2014-2016 (GSS 2017).[13] Therefore, our estimate of new jobs generated by new entrants in 2014-2017, based on jobs generated by new firm entry in 2008-2013, is likely to be higher than the actual figures. Secondly, the estimate does not include the net jobs shed by firms that were listed in 2014 but declined to be interviewed in 2017. These firms employed about 70,000 people in 2014 and they may have shed nearly 10,000 jobs, if one assumes that their net employment was like that of the firms that agreed to be interviewed. It is debatable, however, whether firms are more likely to agree to be interviewed when they are performing well or badly, so one should be cautious in estimating the loss of employment for these firms. Lastly, as noted above, the survey team could not track down 55 firms, which may also have closed and shed jobs from 2014 to 2017.

The analysis suggests that aggregate employment in the food processing sector declined by about 12 percent from 2014 to 2017. Food processing firms employed 312,622

[12] To confirm this, we used online searches and the International Labour Organization (ILO) website: http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=66955.
[13] The gross domestic product (GDP) of Ghana expanded by more than 10 percent per annum during 2011-2013, but it grew at a slower rate of 3.8 percent growth annually in 2014-2016.

workers in 2014 (Table 4, row 1), and by 2017, after accounting for about 32,000 new jobs generated by new firms, we estimate that on net at least 37,000 jobs (Table 4, row 8) had been shed due to firm exit or reductions in the number of employees for firms that were still operating. Overall, these figures portray a dismal performance in employment generation by the food processing sector in Ghana from 2014 to 2017.

5.3 Determinants of firm exit

In Table 5 we present a linear probability model of firm exit for the period 2014-2017, modeled with a set of location and firm characteristics as explanatory variables. The two location variables are a dummy variable indicating whether (1) or not (0) the firm was operating in an urban district, and a set of dummy variables for the region in which the firm was operating, which omits the Greater Accra region. The firm characteristics include two dummy variables measuring the number of years that the firm has been operating (omitted variable is for firms established since 2005), and three dummy variables measuring the size of the firm in 2014 (omitted variable is micro-scale firm). The last two firm variables are the number of unique products produced by the firm and a set of dummy variables for the firm's processing activity, based on the ISIC categories. The omitted variable in the latter is the manufacture of grain mill products.

We first use the entire sample (model 1), and subsequently drop large firms (in models 2 and 3) and medium firms (models 4 and 5). The results in models 3 and 5 exclude firms with only one employee (single-person firms) in 2014. We make these exclusions to test the robustness of the results when the sample exclude firms that exited the industry due to the owner's personal circumstances. In Sub-Saharan Africa, micro-enterprise firms are dominated by one-person businesses, often 'opportunistic entrepreneurs' who engage

intermittently in various enterprises for short periods. About third of the 168 firms that exited in our sample were one-person enterprises.

The results indicate that operating in an urban environment reduces the likelihood of exit from the industry. The size of the effect is quite large. Firms in urban districts have around 9-11 percent less likelihood of exit compared with rural-based firms, controlling for other factors (Table 5, models 1-3, row 1). When we restrict the sample to micro and small firms, the effect is more pronounced, and operating in an urban district improves the chances of survival by around 16-18 percent (Table 5, models 4-5, row 1). The numbers of unique food products manufactured by a firm has a small negative impact on the likelihood of exit, but this holds only for firms with more than one employee. An additional product reduces the likelihood of exit by 2-3 percent (Table 5, row 2).

Firm age and size variables have the expected effects on firm exit, based on firm growth theories (Jovanovic 1982). Table 5 shows that controlling for other factors, small firms are 11 percent less likely to exit than micro firms, medium firms are 19 percent less likely to exit, but there are no significant effects for large firms compared to micro firms (Table 5, rows 5-7). The firm size effects in model 1 are also evident in models 2 and 4, but in models 3 and 5, where single-person firms are dropped, there is no detectable impact of being a small firm compared with being a micro firm. This suggests that once single-person firms are excluded, the positive scale effects of firm size do not kick in until firms reach the medium range (more than 30 employees).

Lastly, in terms of age effects, the results confirm that older firms are less likely to exit, confirming the importance of experience. Firms learn over time to withstand the shocks that at earlier stages may have led to exit, and this effect is more pronounced for firms that have been operating for more than 20 years. Those firms were 7-12 percent less likely to exit

compared with firms operating for less than 10 years, although in model 4 it is only significant at the 10 percent level (Table 5, rows 3-4). We find some evidence in model 1 that firms in operation for at least 10 years are also 7.5 percent less likely to exit than the younger firms, but this evidence is weak in model 3 and is not significant in the other models.

One concern with our analysis of the determinants of exit is the potential bias due to missing observations. As noted in the data section, although we aimed to interview 800 firms in 2017, we could not track down 24 of the firms that had been listed in 2014. These firms are likely to have exited the sector, and their exclusion from the sample may cause attrition bias. Although we cannot address this potential bias directly, we can make some inferences from the extant information on these 24 firms from the 2014 listing data. There were 16 micro-sized firms among the 24 missing firms, and 21 of the firms were in the Greater Accra and Ashanti regions, which are more urbanized than the rest of Ghana. We expect that including the missing observations in the models in Table 5 could dampen the effect of urban location and increase the magnitude of the observed coefficients on the firm size variables.

5.4 Determinants of firm growth

The firm growth model results are presented in Table 6. The entire sample is used in model 1, and in model 2 the sample of micro-medium firms (excluding large firms) are used. Model 3 includes micro-small firms, and model 4 uses only micro firms. The first row in Table 6 shows the main result. Formality has positive effects on firm growth, significant at the 1 percent level in models 1-3 and significant at the 5 percent level in model 4. A formal firm, registered for tax collection and regulatory oversight with the FDA, has an annual growth rate that is higher than the annual growth rate of an informal firm by 0.19 to 0.26, controlling for the other variables in the model (Table 6, row 1). This translates to employee

growth of around one additional employee every four or five years for formal firms compared with informal firms.

In contrast with the positive impacts of formality, Table 6 shows that registration with the local district assembly has negative effects on the firm's growth. On average, a firm registered with the local district assembly has a lower annual growth rate, by around 0.04 to 0.07, than the growth rate of a firm that is not registered with the district assembly, when other factors are controlled in the model (Table 6, row 2). This result is counter-intuitive and difficult to explain, because one would expect the positive benefits of formalization at the national level to be repeated at the district level. A possible explanation is that while national-level formalization confers benefits such as ability to obtain bank loans, district registration acts as a drag on firm performance and growth. For example, firms that are registered with the district assembly may be less likely to grow because growth would attract greater attention from local officials and possible demands for higher annual registration fees.[14]

We find no significant effects of firm age on growth, but firm size is related to growth. Small and medium firms have lower growth rates than micro firms, but some of these effects are only weakly significant at the 10 percent level (Table 6, rows 6-8). Considered together with the results in the previous section on determinants of firm exit, the findings confirm aspects of the Jovanovic (1982) theory in which firms learn over time. Younger, smaller firms are more likely to exit (Table 5) and smaller firms are more likely to grow (Table 6).

5.5 Robustness Checks: Definition of Formality and Truncated Regression Model

[14] The observed district registration effect could also be due to a high correlation between the two registration measures. We examined this possibility by entering the two variables separately into the regression. The sign of the district registration does not change, but it is no longer significant in the separate regression model. The sign and significance level of the impact of formality does not change in the separate regression model (results not shown but available from authors on request).

We conducted robustness checks of the growth models to determine whether the results change significantly when the definition of formality is changed to the more commonly used definition of tax registration alone or when distance to tarred roads is excluded from the set of instruments. We also tested whether the exclusion of closed firms from the growth models affects the results. None of the tests, described below, would alter the qualitative conclusions of the study.

In the literature, tax registration is typically used as the measure of a firm's formality (McKenzie and Sakho 2010; Rand and Torm 2012). Adding a sector-specific measure such as FDA registration to the definition as we have done in this paper is a more stringent definition, but one which we believe is more appropriate for the food processing sector. If we relax the definition of formality to the usual measure of tax registration (irrespective of a firm's registration status with the FDA) the results do not change qualitatively—the average formal firm would then have an annual growth rate that is higher than that of an informal firm by 0.16 to 0.21, controlling for the other variables in the model. The full results are presented in in Table 7.

A second robustness check explores whether distance to tarred roads should not be used as an instrument and rather should be included as an explanatory variable in the growth models. The results are shown in Table 8. The range of formality coefficients are slightly higher than those reported in Table 6. The first row in Table A2 shows that a formal firm, registered for tax collection and regulatory oversight with the FDA, has an annual growth rate that is higher than that of an informal firm by 0.20 to 0.27, controlling for the other variables in the model. The second row in Table 8 shows that the significantly negative impacts of registration at the district level observed in Table 6 are not robust to the new specification. The magnitudes of the coefficient are still negative but the effect is no longer significant. However, while the first-stage F-statistics in Table 6 were greater than 10 and therefore met

Wooldridge's (2006) rule of thumb for determining the explanatory power of instrumental variables, in Table A2 the F-statistics in the first-stage regression models for district assembly registration are much lower than 10. The remaining results in Table 8 are like those in Table 6. The impact of distance to tarred roads on firm growth is small and not significantly different from zero.

The third robustness check is motivated by the fact that in estimating the effects of firm characteristics on growth, we include only those firms that have already survived up to 2017. The omission of exited firms may introduce bias in the model estimates, but other researchers (e.g. McPherson 1996; Sleuwaegen and Goedhuys 2002) have found otherwise. Nevertheless, to account for this potential bias from a non-random sample of firms in our data set, we introduce a truncated regression model (Wooldridge 2016). The conclusions for the truncated regression results, shown in Table 9 are consistent with the conclusions from the IV regression results in Table 6. The results indicate that formal registration (tax and FDA) increases the annual rate of growth by about 0.13 (significant at the 5 percent level).

6 Conclusion

The food processing sectors in developing countries will become increasingly important as a focus of food policy, as countries transition from primary agricultural production to more commercial agriculture and production of secondary products. The transition will be driven in part by the changing needs and preferences of urbanized households with growing incomes. For developing countries in SSA, development practitioners consider this transition to be a key aspect of economic transformation (ACET 2014; AfDB 2016). Despite the attention paid to food processing by policymakers in SSA, research on the sector is lacking, compared with the attention devoted to primary agriculture (Reardon 2015). Food processing is carried out by small enterprises, and the knowledge gap

is further exacerbated by a dearth of firm data in developing countries, especially information on small, informal firms (Li and Rama 2015). With these research gaps in mind, this paper set out to examine employment generation, exit, and growth of food processing firms using a nationally-representative dataset of 771 firms in Ghana.

Policymakers' promotion of food processing is motivated largely by its potential source of employment for rural youth. This study shows little evidence that Ghana's food processing sector generated jobs from 2014 to 2017. Our data indicate that most firms, especially smaller and medium sized enterprises, either shrunk in size or exited the food processing sector. About a quarter of micro firms, more than 10 percent of small and medium firms, and around 17 percent of large firms exited the sector, and about 50 percent of the small firms had become micro firms. This dismal performance of the food processing sector led to an estimated loss of 69,000 jobs by the sector. This gross estimate does not account for new jobs generated by firms entering the sector, and it may partly be explained by the fact that Ghana had a generally weak economic performance during the period under review, with a 3.8 percent growth in GDP in 2014-2016 (GSS 2017). However, even if an estimate of new jobs generated in 2014-2017 is derived from the new jobs generated in 2009-2014, we estimate a net contraction in employment by the food processing sector that would be between 37,000-41,000. These findings echo the generally weak performance of Ghana's manufacturing sector (Davis and Kerr 2017), and support the view that Ghana, and possibly other countries in SSA are 'transforming without industrializing'.

Our analysis of the determinants of firm exit points to some potential areas for government or donor interventions to support the food processing sector to generate employment. Firms located in urban districts have a higher chance of survival: they are 9-11 percent less likely to exit compared to similar firms located in rural areas. This finding, possibly due to agglomeration effects or positive benefits from being closer to urban markets

for processed foods, suggests that the food processing sector is likely to expand and grow as Ghana becomes more urbanized. Recent research shows that Ghana's young, rural population is shifting to non-farm employment instead of migrating to cities (Diao et al. 2017). This paper's finding suggests that the jobs available for rural youth in food processing are more precarious than those available for urban youth. The fact that large firms appear to be just as likely to exit as micro firms should also be a source of concern, considering the scale of job loss implicated in each large firm exit.

The primary finding from our analysis of the determinants of firm growth is the importance of formal status, defined as tax registration and registration with the national food regulator, the Food and Drugs Authority (FDA). The impact of formal status on firm growth has been extensively researched, but formality can be defined in various ways (Mead and Morrisson 1996; Perry et al. 2007). Formality is usually defined only in terms of registration for tax purposes (McKenzie and Sakho 2010; Rand and Torm 2012). This study demonstrates the additional information that can be gained from including sector-specific regulatory registration to the definition of firm formality. The main difficulty in establishing the impact of formal status on firm growth is the reverse causality between status and growth. To combat this potential error in estimation, we have used an instrumental variable approach.

We find that formality—tax *and* FDA registration—is associated with significant positive benefits in terms of firm growth, suggesting that in the food processing sector, formality has a positive effect on firm growth, especially when combined with regulatory inspections. The findings are consistent when controlling for the other established determinants of firm growth, including firm size, age, and type of activity. This finding confirms other research that shows formality is a contributor to firm growth in developing countries. In this case, the effect of formality for an individual firm is about one additional worker every four or five years. Considering that the 2014 census identified more than 6,000

informal firms, this effect is not trivial. In a recent paper, Diao, Kweka, and McMillan (2018) recommend the use of firms' observable characteristics to identify their potential for growth.[15] This paper's findings suggest that for Ghana's food processing sector, formal status may be used as an indicator of potential for employment generation.

This paper's findings support efforts to formalize firms that are currently operating in the informal economy. This includes initiatives to improve the types of measures used to measure improvements in the private sectors' operating environment, such as the components of the World Bank's Doing Business rankings. Indeed, the Ghanaian government has signaled its intention to improve on such aspects as the ease of registering businesses. Moreover, our study points to the need to go beyond formalization in terms of tax registration alone, and to consider the benefits from sector-specific regulatory regimes such as food product inspection and certification.

[15] The paper is based on analysis of data from micro, small, and medium firms in Tanzania,

7 References

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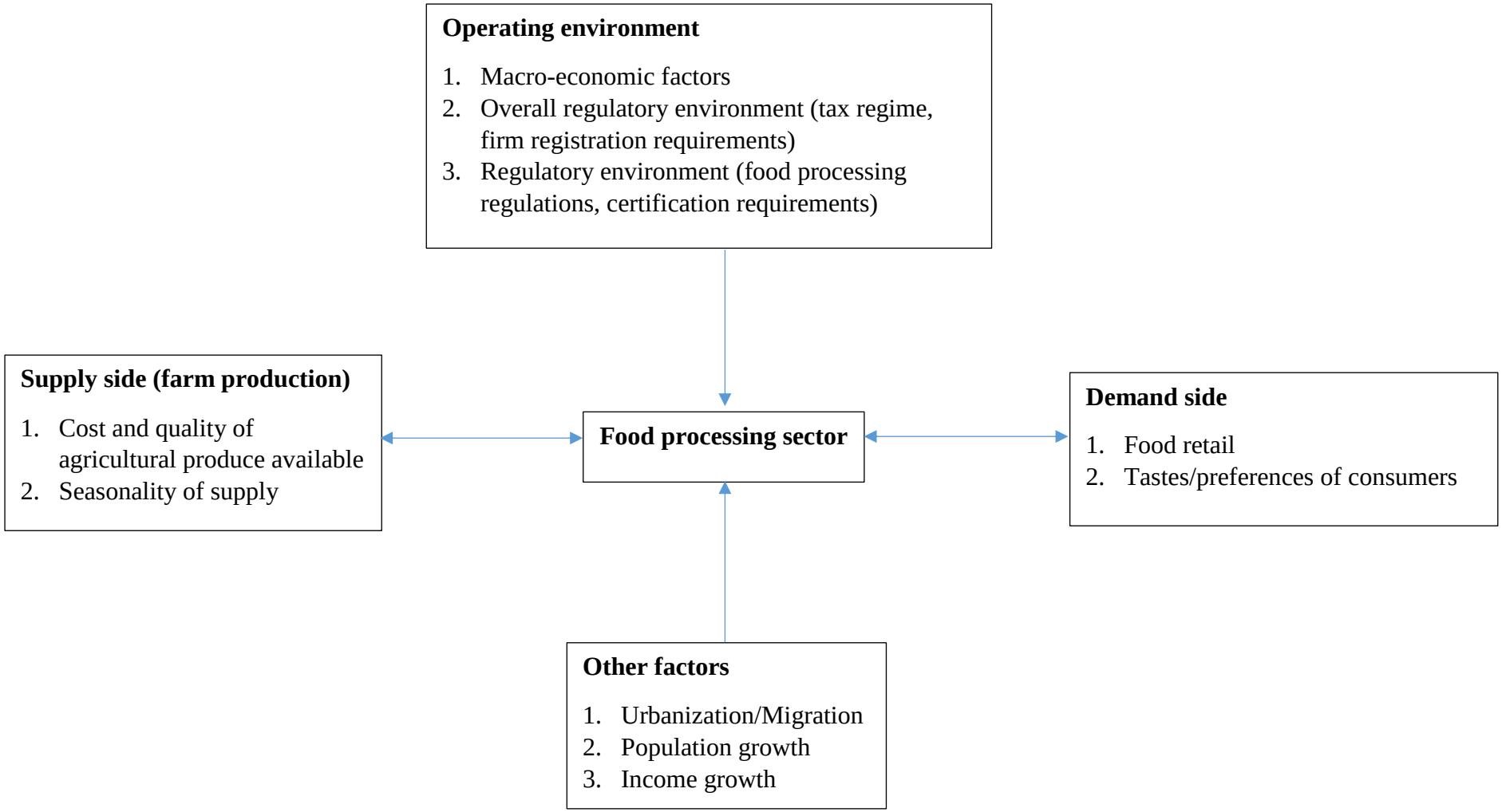

Figure 1. Conceptual model of factors affecting food processing sector performance
Source: Authors' depiction based on literature review

Table 1. Survey sample stratification by location and firm size

Survey stratum description	City or district	Firms listed in Integrated Business Enterprise Survey (IBES) in 2014	Targeted sample size for 2017 survey	Firm size classification****	Targeted sample size for 2017 survey	Final sample
Primary cities with populations greater than 1,000,000*	Accra (includes Tema) and Kumasi	982	400	Large	All	31
				Medium	All	34
				Small	290	48
				Micro	290	269
Secondary cities with populations greater than 100,000	Cape Coast, Ho, Koforidua, Sekondi-Takoradi, Tamale, and Sunyani**	349	200	Large	All	14
				Medium	All	81
				Small	All (~170)	14
				Micro	All (~170)	91
Rest of Ghana: One district each from each of Ghana's ten administrative regions, from all districts with more than 100 processors***	Ada West, Asokore Mampong, Bolgatanga, Jirapa, Mamprugu Moagduri, Mfantsiman, Nkwanta South, Prestea/Huni Valley, Pru/Techiman, and Upper Manya	6,019	200	Large	All	1
				Medium	All	4
				Small	~170	19
				Micro	~170	165
Total		7,350	800			771

Source: Authors.

Notes:

Targeted 800 firms, could not locate 23, 78 outright refusals, 14 delayed until after survey period passed (92 did not consent to participate), we dropped 6 establishments that were not profit-making firms (social and religious groups engaging in food processing), and 168 firms had exited the sector from 2014 to 2017.

* City population levels were obtained from the last national census (2010)

** Sunyani had a population below 100,000, but it was included in the sample for two reasons. First, we wanted to ensure that at least one city in Ghana's Transition Zone, where the bulk of maize production occurs, was included in stratum 2, and secondly, this ensured that we included some of the medium and large firms in Brong Ahafo which are in Sunyani.

*** For this stratum, we imposed an additional restriction: the district must have had more than 100 food processors listed in the 2014 survey round. In Brong Ahafo and Greater Accra regions, there were no districts in stratum 3 that had at least 100 processors listed, so we selected the districts with the highest number of processors.

****Micro firms are those with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are those with more than 100 employees.

Table 2. Descriptive statistics of firms: Sample means and standard deviations (in parenthesis)

Variable	Number of observations (N)	Entire sample	Disaggregation by firm size (2017) for firms operating in 2017 (N=511)			
			Micro firms (N=374)	Small firms (N=87)	Medium firms (N=32)	Large firms (N=18)
Age of the firm (years)	670	16 (12)	16 (13)	19 (12)	17 (10)	24 (16)
Number of workers when firm was first established	511	11 (80)	3 (5)	12 (10)	31 (20)	159 (407)
Number of workers in 2014	679	24 (176)	5 (9)	22 (24)	55 (26)	459 (998)
Number of workers in 2017	511	21 (128)	2 (1)	14 (7)	53 (20)	399 (575)
Firm exits, 2014-2017 (dummy)	679	0.25 (0.43)				
Annual firm growth from establishment to 2017	511	0.01 (0.10)	<0.01 (0.09)	0.02 (0.07)	0.06 (0.07)	0.18 (0.29)
Registered for tax collection (dummy)	511	0.17 (0.38)	0.10 (0.31)	0.29 (0.46)	0.38 (0.49)	0.61 (0.50)
Registered with Food and Drugs Authority (FDA) (dummy)	511	0.14 (0.35)	0.10 (0.30)	0.17 (0.38)	0.34 (0.48)	0.56 (0.51)
Registered for tax collection and with FDA (dummy)	511	0.09 (0.28)	0.04 (0.20)	0.11 (0.32)	0.28 (0.46)	0.56 (0.51)
Registered with district assembly (dummy)	511	0.65 (0.48)	0.63 (0.48)	0.64 (0.48)	0.84 (0.37)	0.78 (0.43)
Located in urban district (dummy)	679	0.61 (0.49)	0.70 (0.46)	0.55 (0.50)	0.13 (0.34)	0.33 (0.49)
Distance to nearest tarred road (meters)	511	140 (341)	130 (329)	97 (258)	302 (532)	277 (429)
Region in which firm is located (dummies)						
Western	679	0.09 (0.28)	0.09 (0.28)	0.05 (0.21)	0.03 (0.18)	0.17 (0.38)
Central	679	0.07 (0.25)	0.05 (0.23)	0.14 (0.35)	0.13 (0.34)	0 (0)
Greater Accra	679	0.29 (0.46)	0.35 (0.48)	0.17 (0.38)	0.06 (0.25)	0.22 (0.43)
Volta	679	0.10 (0.25)	0.05 (0.22)	0.05 (0.21)	0 (0)	0 (0)
Eastern	679	0.10 (0.30)	0.09 (0.28)	0.11 (0.32)	0.16 (0.37)	0.28 (0.46)
Ashanti	679	0.19 (0.39)	0.22 (0.41)	0.26 (0.44)	0.13 (0.34)	0.11 (0.32)
Brong Ahafo	679	0.05 (0.22)	0.03 (0.16)	0.11 (0.32)	0.13 (0.34)	0.11 (0.32)
Northern	679	0.09 (0.28)	0.06 (0.23)	0.06 (0.23)	0.38 (0.49)	0.11 (0.32)
Upper East	679	0.03 (0.18)	0.04 (0.20)	0.05 (0.21)	0 (0)	0 (0)
Upper West	679	0.03 (0.16)	0.04 (0.19)	0 (0)	0 (0)	0 (0)

Number of products produced by firm	679	2.19 (2.08)	2.22 (1.60)	2.36 (1.66)	2.19 (1.79)	4.06 (9.04)
Food processing sub-sector (by ISIC category)						
Post-harvest crop activities	679	0.01 (0.09)	0.01 (0.10)	0.01 (0.11)	0 (0)	0 (0)
Processing and preserving of meat	679	0.01 (0.11)	0.01 (0.09)	0.05 (0.21)	0 (0)	0.06 (0.24)
Processing and preserving of fish and seafoods	679	0.28 (0.17)	0.04 (0.20)	0.02 (0.15)	0 (0)	0 (0)
Processing and preserving of fruits and vegetables	679	0.08 (0.27)	0.06 (0.24)	0.13 (0.33)	0.13 (0.34)	0.22 (0.43)
Manufacture of vegetable and animal oils and fats	679	0.07 (0.26)	0.04 (0.19)	0.12 (0.32)	0.41 (0.50)	0.11 (0.32)
Manufacture of grain mill products	679	0.38 (0.49)	0.48 (0.50)	0.09 (0.29)	0.16 (0.37)	0.22 (0.43)
Manufacture of starch products	679	0.09 (0.29)	0.07 (0.26)	0.10 (0.31)	0.09 (0.30)	0.11 (0.32)
Manufacture of bakery products	679	0.24 (0.42)	0.22 (0.42)	0.46 (0.50)	0.09 (0.30)	0.06 (0.24)
Manufacture of other food products	679	0.05 (0.22)	0.03 (0.17)	0.02 (0.15)	0.13 (0.34)	0.22 (0.43)
Location of production activities (dummies)						
House or residential area	511	0.66 (0.48)	0.70 (0.46)	0.63 (0.49)	0.38 (0.49)	0.33 (0.49)
Market	511	0.12 (0.33)	0.13 (0.34)	0.07 (0.25)	0.16 (0.37)	0.11 (0.32)
Industrial site	511	0.12 (0.32)	0.09 (0.28)	0.16 (0.37)	0.25 (0.44)	0.33 (0.49)
Other location	511	0.11 (0.31)	0.08 (0.28)	0.14 (0.35)	0.22 (0.42)	0.22 (0.43)

Source: Survey of processing firms (2017)
Note:
Sample sizes vary because while 679 firms consented to provide additional information in the 2017 survey round, only 511 firms were still in operation. The category 'manufacture of other food products' includes dairy, sugar, cocoa and confectioneries, and other prepared meals.
Micro firms are those with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are those with more than 100 employees.

Table 3. Firm size transitions, 2014-2017

Firms size in 2014 (N)			Share of firms in size category by 2017				Exited	Refused to participate
			Micro	Small	Medium	Large		
Micro	515	→	62%	6%	<1%	<1%	27%	6%
Small	76	→	47%	34%	<1%	<1%	12%	7%
Medium	113	→	17%	27%	26%	4%	13%	12%
Large	41	→	<1%	2%	5%	32%	17%	44%
Total number of firms in 2014	Entire sample		Number of firms in size category by 2017					
			Micro	Small	Medium	Large	Exited	Refused to participate
	771	→	374	87	32	18	168	92

Source: IBES listing by Ghana Statistical Service (2014) and IFPRI firm survey 2017
Notes:
Row percentages may not add up to 100% due to rounding up of figures.
Micro firms are those with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are those with more than 100 employees.

Table 4. Changes in aggregate national employment (2014-2017) in Ghana's food processing sector

	Total number of employees				
	Entire sample	Micro	Small	Medium	Large
Aggregate employment in 2014:					
1. Of all firms	312,622	64,619	43,525	56,708	147,770
2. (a) Of firms still operating in 2017 (estimated from firms interviewed in 2017)	201,837	66,210	36,616	17,519	81,491
(b) Of firms still operating in 2017 (estimated from firms that declined to be interviewed in 2017)	70,147	4,308	4,316	8,189	53,334
3. Of firms that exited 2014-2017 (estimated from closed firms that were tracked down)	40,638	15,506	4,593	6,995	13,644
Aggregate employment 2017:					
4. Of firms still operating in 20017 (estimated from firms interviewed in 2017)	173,315	40,531	43,526	18,392	70,866
Change in aggregate employment 2014-2017:					
5. Jobs shed by firms still operating in 2017 (row 2(a) – row 4)	28,521	25,678	(6,910)	(873)	10,625
6. Jobs lost due to firm exit and jobs shed by existing firms (row 3 + row 5)	69,160	41,085	(2,317)	6,122	24,270
7. Estimated range of jobs generated by new entrants 2014-2017 (estimated from jobs generated by new entrants before 2014) *	27,840–32,056	9,027–9,917	1,044–3,526	3,275–4,075	6,423–9,185
8. Estimated range of net contraction in employment (row 6 – row 7)	37,103–41,319	31,167–32,058	(3,361)–(5,843)	2,047–2,847	15,085–17,847

Source: Authors' estimates based on 2014 firm listing and 2017 firm survey, adjusted to national level using sample weights.

Notes: * Estimates of jobs generated by new entrants are based on estimates of jobs generated by new entrants in the sample in the three-year windows before 2014 (2008-2012, 2009-2013, 2010-2014). Figures in parenthesis represent jobs added.

Table 5. Determinants of firm exit, 2014-2017

	(1) Entire sample	(2) Sample excluding large firms	(3) Sample excluding large firms and single-person firms	(4) Sample excluding medium and large firms	(5) Sample excluding medium and large firms, and single-person firms
	Dependent variable: Firm exit 2014-2017 (dummy)				
Located in urban district	-0.095**	-0.110**	-0.105*	-0.160***	-0.175***
	(0.048)	(0.049)	(0.056)	(0.053)	(0.062)
Number of products	-0.018**	-0.028***	-0.015	-0.031***	-0.018*
	(0.007)	(0.009)	(0.010)	(0.010)	(0.011)
			Firm age		
Established before 1994	-0.088**	-0.079**	-0.106**	-0.074*	-0.115**
	(0.040)	(0.040)	(0.042)	(0.044)	(0.047)
Established 1994-2004	-0.075**	-0.063	-0.072*	-0.040	-0.039
	(0.038)	(0.038)	(0.042)	(0.044)	(0.050)
			Firm size in 2014		
Small	-0.110**	-0.109**	-0.058	-0.115**	-0.055
	(0.051)	(0.051)	(0.051)	(0.052)	(0.052)
Medium	-0.190***	-0.205***	-0.205***		
	(0.059)	(0.059)	(0.068)		
Large	0.024				
	(0.109)				
			Type of food processing		
Post-harvest crop activities	-0.049	-0.056	0.152	-0.045	0.157
	(0.162)	(0.166)	(0.272)	(0.167)	(0.285)
Meat	-0.042	-0.026	-0.027	-0.193**	-0.213**
	(0.127)	(0.141)	(0.142)	(0.076)	(0.103)
Fish	-0.221***	-0.292***	-0.258***	-0.335***	-0.306***
	(0.064)	(0.050)	(0.058)	(0.054)	(0.063)
Fruit and vegetables	-0.025	-0.013	0.011	-0.004	0.064
	(0.066)	(0.068)	(0.074)	(0.088)	(0.097)
Oils and fats	0.004	0.012	0.020	0.110	0.167
	(0.077)	(0.078)	(0.087)	(0.114)	(0.138)
Starches	0.035	0.035	0.099	0.071	0.167
	(0.069)	(0.071)	(0.089)	(0.083)	(0.115)
Bakery	0.012	0.016	-0.043	0.028	-0.028
	(0.046)	(0.046)	(0.049)	(0.049)	(0.052)
Other	0.194**	0.155	0.175	0.002	-0.099
	(0.092)	(0.110)	(0.117)	(0.104)	(0.091)
			Region		
Western	0.038	0.023	-0.034	0.026	-0.037
	(0.068)	(0.070)	(0.074)	(0.073)	(0.075)
Central	-0.064	-0.088	-0.100	-0.043	-0.072
	(0.073)	(0.073)	(0.082)	(0.086)	(0.100)
Volta	0.175**	0.161*	0.278**	0.161*	0.295***
	(0.083)	(0.082)	(0.108)	(0.084)	(0.114)
Eastern	-0.032	-0.037	0.046	-0.060	0.091
	(0.071)	(0.072)	(0.089)	(0.086)	(0.121)

Ashanti	-0.091**	-0.100**	-0.060	-0.085*	-0.041
	(0.044)	(0.045)	(0.049)	(0.047)	(0.051)
Brong Ahafo	-0.014	0.006	-0.026	0.044	-0.012
	(0.088)	(0.089)	(0.093)	(0.126)	(0.139)
Northern	0.050	0.045	0.093	0.055	0.115
	(0.074)	(0.075)	(0.079)	(0.085)	(0.089)
Upper East	-0.084	-0.088	-0.117	-0.044	-0.040
	(0.086)	(0.087)	(0.079)	(0.087)	(0.078)
Upper West	-0.202*	-0.221**	-0.177	-0.250**	-0.207
	(0.108)	(0.108)	(0.133)	(0.112)	(0.137)
N	679	656	493	557	394
R^2	0.095	0.101	0.131	0.112	0.173
adj. R^2	0.062	0.069	0.088	0.075	0.124

Source: Linear probability models of firm exit, 2014-2017.

Notes:

(1) Samples for models are as follows: (1) Entire sample; (2) Micro, small, and medium firms; (3) Micro, small, and medium firms with at least two employees in 2014; (4) Micro and small firms; (5) Micro and small firms with at least two employees in 2014.

(2) Micro firms are firms with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are firms with more than 100 employees**.**

(3) Omitted categories are as follows: For firm age, firms established after 2004; for firm size, micro firms in 2014; for processing sub-category, grain milling; and for region, Greater Accra.

(4) Standard errors are in parentheses. All regressions use a constant term (not shown). Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. Determinants of firm growth

	(1) Entire sample	(2) Sample excluding large firms	(3) Sample excluding large and medium firms	(4) Sample excluding large, medium, and small firms
Dependent variable: Firm growth from establishment to 2017				
Formal: Registered for tax collection and product inspection (FDA)	0.259***	0.264***	0.224***	0.190**
	(0.089)	(0.091)	(0.081)	(0.084)
Registered with district assembly	-0.065**	-0.061**	-0.054**	-0.042*
	(0.027)	(0.026)	(0.025)	(0.024)
Firm located in urban district	-0.016	-0.018	-0.017	-0.010
	(0.011)	(0.011)	(0.012)	(0.011)
Firm age				
Established before 1994	0.014	0.012	0.002	-0.001
	(0.013)	(0.013)	(0.009)	(0.009)
Established 1994-2004	-0.002	-0.004	-0.010	0.001
	(0.012)	(0.012)	(0.011)	(0.010)
Initial size of firm				
Small	-0.033*	-0.034**	-0.034**	
	(0.018)	(0.018)	(0.017)	
Medium	-0.137*	-0.140*		
	(0.073)	(0.075)		
Large	-0.134			
	(0.082)			
Number of products manufactured	-0.003	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.003)	(0.003)
Type of food processing				
Post-harvest crop activities	0.004	0.006	0.008	0.002
	(0.015)	(0.014)	(0.013)	(0.012)
Meat	0.046*	0.030	0.034*	0.033
	(0.025)	(0.020)	(0.018)	(0.021)
Fish	-0.020	-0.019	-0.010	0.002
	(0.019)	(0.019)	(0.017)	(0.016)
Fruit and vegetables	-0.028	-0.029	0.007	0.035
	(0.037)	(0.038)	(0.023)	(0.035)
Oils and fats	0.027	0.027	0.025	-0.001
	(0.023)	(0.023)	(0.022)	(0.031)
Starches	0.003	0.004	0.003	-0.020
	(0.020)	(0.019)	(0.019)	(0.021)
Bakery	0.002	0.002	0.008	0.011
	(0.013)	(0.013)	(0.012)	(0.012)
Other	-0.009	-0.004	0.003	0.003
	(0.023)	(0.023)	(0.017)	(0.012)
N	511	507	485	383
Tests of endogeneity				
Robust score chi2	9.570***	9.156**	7.026**	6.606**

Robust regression F-statistic	4.821***	4.520**	3.390**	3.029**
	First stage regression F Statistic for instruments			
Registered for both tax collection and product inspection (FDA)	10.77***	10.51***	10.83***	12.10***
Registered with district assembly	14.18***	14.48***	12.65***	10.38***
	First stage regression Shea's partial R-squared			
Registered for both tax collection and product inspection (FDA)	0.074	0.052	0.057	0.087
Registered with district assembly	0.095	0.054	0.045	0.037
Test of over-identification (score chi2)	0.024	0.217	1.693	1.588

Source: Two-stage least squares regression of firm growth on explanatory variables.
Notes:
(1) Micro firms are firms with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are firms with more than 100 employees**.**
(2) Omitted categories are as follows: For firm age, firms established after 2004; for firm size, micro firms in 2014; for processing sub-category, grain milling.
(3) Robust standard errors in parentheses. All regressions use a constant term (not shown). Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
(4) Location in the capital region (Greater Accra), distance to nearest tarred road, production in market area, and production in industrial zone are used as the instrumental variables for formal/FDA registration, and registration with district assembly.
(5) We apply the rule of thumb recommended by Wooldridge (2016) for determining the explanatory power of the instrumental variables in the first stage regression, that the F-statistic for the instruments should be greater than 10. The test for endogeneity tests the null hypothesis that the endogenous regressors are in fact exogenous, as described by Wooldridge (2016).
(6) The test of over-identifying restrictions tests whether some of the instruments are uncorrelated with the structural error (Wooldridge 2016). Rejecting the null hypothesis would lead to a conclusion that at least one of the instrumental variables is not exogenous. In this case, we fail to reject the null hypothesis in all the models.

Table 7. Determinants of firm growth, defining formality by tax registration only

	(1) Entire sample	(2) Sample excluding large firms	(3) Sample excluding large and medium firms	(4) Sample excluding large, medium, and small firms
	Dependent variable: Firm growth from establishment to 2017			
Formal: Registered for tax collection	0.201***	0.206***	0.180***	0.159**
	(0.067)	(0.069)	(0.062)	(0.067)
Registered with district assembly	-0.095***	-0.097***	-0.085**	-0.055**
	(0.035)	(0.036)	(0.034)	(0.027)
Firm located in urban district	-0.011	-0.013	-0.015	-0.009
	(0.012)	(0.012)	(0.011)	(0.012)
		Firm age		
Established before 1994	0.017	0.017	0.006	0.000
	(0.014)	(0.014)	(0.011)	(0.010)
Established 1994-2004	-0.009	-0.009	-0.014	-0.001
	(0.014)	(0.014)	(0.012)	(0.011)
		Initial size of firm		
Small	-0.036*	-0.037**	-0.037**	
	(0.019)	(0.019)	(0.018)	
Medium	-0.130*	-0.133*		
	(0.068)	(0.070)		
Large	-0.155**			
	(0.065)			
Number of products manufactured	-0.003	-0.003	-0.004	-0.004
	(0.002)	(0.002)	(0.003)	(0.003)
		Type of food processing		
Post-harvest crop activities	0.006	0.007	0.008	0.005
	(0.021)	(0.021)	(0.018)	(0.015)
Meat	0.055*	0.037	0.039*	0.035
	(0.029)	(0.025)	(0.023)	(0.022)
Fish	-0.024	-0.026	-0.019	-0.004
	(0.020)	(0.021)	(0.019)	(0.017)
Fruit and vegetables	-0.032	-0.031	0.007	0.033
	(0.037)	(0.038)	(0.025)	(0.037)
Oils and fats	0.002	0.001	-0.006	-0.038
	(0.027)	(0.027)	(0.027)	(0.039)
Starches	-0.011	-0.012	-0.013	-0.028
	(0.022)	(0.022)	(0.021)	(0.023)
Bakery	-0.016	-0.017	-0.007	0.000
	(0.018)	(0.018)	(0.016)	(0.015)
Other	0.010	0.012	0.008	-0.004
	(0.022)	(0.022)	(0.019)	(0.018)
N	511	507	485	383
		Tests of endogeneity		
Robust score chi2	12.848***	11.840***	9.661***	6.419**
Robust regression	6.694***	6.132***	5.018***	3.147***

F-statistic				
	First stage regression F Statistic for instruments			
Registered for tax collection	12.08***	12.12***	12.93***	9.64***
Registered with district assembly	14.18***	14.48***	12.65***	10.38***
	First stage regression Shea's partial R-squared			
Registered for tax collection	0.065	0.066	0.074	0.092
Registered with district assembly	0.076	0.079	0.075	0.103
Test of over-identification (score chi2)	1.269	1.202	0.587	1.755

Source: Two-stage least squares regression of firm growth on explanatory variables.
Notes:
(1) Micro firms are firms with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are firms with more than 100 employees**.**
(2) Omitted categories are as follows: For firm age, firms established after 2004; for firm size, micro firms in 2014; for processing sub-category, grain milling.
(3) Robust standard errors in parentheses. All regressions use a constant term (not shown). Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
(4) Location in the capital region (Greater Accra), distance to nearest tarred road, production in market area, and production in industrial zone are used as the instrumental variables for formal/FDA registration, and registration with district assembly.
(5) We apply the rule of thumb recommended by Wooldridge (2016) for determining the explanatory power of the instrumental variables in the first stage regression, that the F-statistic for the instruments should be greater than 10. The test for endogeneity tests the null hypothesis that the endogenous regressors are in fact exogenous, as described by Wooldridge (2016).
(6) The test of over-identifying restrictions tests whether some of the instruments are uncorrelated with the structural error (Wooldridge 2016). Rejecting the null hypothesis would lead to a conclusion that at least one of the instrumental variables is not exogenous. In this case, we fail to reject the null hypothesis in all the models.

Table 8. Determinants of firm growth, dropping distance to tarred roads from set of instruments

	(1) Entire sample	(2) Sample excluding large firms	(3) Sample excluding large and medium firms	(4) Sample excluding large, medium, and small firms
Dependent variable: Firm growth from establishment to 2017				
Registered for both tax collection and product inspection (FDA)	0.262**	0.274**	0.219**	0.202**
	(0.103)	(0.108)	(0.094)	(0.097)
Registered with district assembly	-0.072	-0.083	-0.042	-0.079
	(0.078)	(0.083)	(0.077)	(0.077)
Firm located in urban district	-0.016	-0.019	-0.017	-0.010
	(0.012)	(0.013)	(0.011)	(0.012)
Firm age				
Established before 1994	0.015	0.014	0.001	0.004
	(0.015)	(0.015)	(0.010)	(0.011)
Established 1994-2004	-0.002	-0.003	-0.011	0.003
	(0.013)	(0.013)	(0.011)	(0.011)
Initial size of firm				
Small	-0.032*	-0.033*	-0.035**	
	(0.017)	(0.018)	(0.016)	
Medium	-0.137*	-0.141*		
	(0.073)	(0.075)		
Large	-0.134			
	(0.084)			
Number of products manufactured	-0.003	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.003)	(0.003)
Type of food processing				
Post-harvest crop activities	0.003	0.002	0.010	0.004
	(0.018)	(0.020)	(0.011)	(0.021)
Meat	0.046*	0.031	0.033*	0.036
	(0.026)	(0.022)	(0.018)	(0.024)
Fish	-0.023	-0.027	-0.006	-0.008
	(0.033)	(0.034)	(0.029)	(0.025)
Fruit and vegetables	-0.029	-0.032	0.008	0.031
	(0.039)	(0.040)	(0.022)	(0.031)
Oils and fats	0.027	0.026	0.025	-0.005
	(0.022)	(0.023)	(0.021)	(0.032)
Starches	0.002	-0.001	0.005	-0.028
	(0.024)	(0.025)	(0.022)	(0.028)
Bakery	0.002	0.001	0.009	0.013
	(0.014)	(0.014)	(0.012)	(0.013)
Other	-0.009	-0.004	0.003	0.005
	(0.024)	(0.024)	(0.016)	(0.017)
Distance to tarred road	0.000	0.000	0.000	0.000
	<0.001	<0.001	<0.001	<0.001
N	511	507	485	383

		Tests of endogeneity		
Robust score chi2	4.285	4.339	2.681	1.601
Robust regression F-statistic	2.186	2.218	1.356	0.773
		First stage regression F Statistic for instruments		
Registered for both tax collection and product inspection (FDA)	14.39***	14.03***	14.46***	15.84***
Registered with district assembly	5.18***	5.14***	3.95***	3.17**
		First stage regression Shea's partial R-squared		
Registered for both tax collection and product inspection (FDA)	0.063	0.061	0.067	0.107
Registered with district assembly	0.020	0.019	0.017	0.024
Test of over-identification (score chi2)	0.018	0.004	1.734	2.238

Source: Two-stage least squares regression of firm growth on explanatory variables.
Notes:
(1) Micro firms are firms with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are firms with more than 100 employees**.**
(2) Omitted categories are as follows: For firm age, firms established after 2004; for firm size, micro firms in 2014; for processing sub-category, grain milling.
(3) Robust standard errors in parentheses. All regressions use a constant term (not shown). Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
(4) Location in the capital region (Greater Accra), distance to nearest tarred road, production in market area, and production in industrial zone are used as the instrumental variables for formal/FDA registration, and registration with district assembly.
(5) We apply the rule of thumb recommended by Wooldridge (2016) for determining the explanatory power of the instrumental variables in the first stage regression, that the F-statistic for the instruments should be greater than 10. The test for endogeneity tests the null hypothesis that the endogenous regressors are in fact exogenous, as described by Wooldridge (2016).
(6) The test of over-identifying restrictions tests whether some of the instruments are uncorrelated with the structural error (Wooldridge 2016). Rejecting the null hypothesis would lead to a conclusion that at least one of the instrumental variables is not exogenous. In this case, we fail to reject the null hypothesis in all the models.

Table 9. Determinants of firm growth, truncated regression models

	(1) Entire sample	(2) Sample excluding large firms	(3) Sample excluding large and medium firms	(4) Sample excluding large, medium, and small firms
Dependent variable: Firm growth from establishment to 2017				
Registered for both tax collection and product inspection (FDA)	0.090**	0.093**	0.121**	0.585
	(0.036)	(0.041)	(0.056)	(0.544)
Registered with district assembly	0.003	0.002	0.007	0.075
	(0.008)	(0.009)	(0.011)	(0.080)
Firm located in urban district	-0.017*	-0.017	-0.019	-0.154
	(0.010)	(0.011)	(0.015)	(0.169)
Firm age				
Established before 1994	-0.013*	-0.019**	-0.030**	-0.296
	(0.007)	(0.009)	(0.013)	(0.270)
Established 1994-2004	-0.016*	-0.023**	-0.035**	-0.256
	(0.009)	(0.011)	(0.017)	(0.242)
Initial size of firm				
Small	-0.019	-0.019	-0.022	-0.129
	(0.014)	(0.016)	(0.021)	(0.172)
Medium	-0.019	-0.019	-0.044	-0.312
	(0.014)	(0.016)	(0.027)	(0.309)
Large	-0.019	-0.019	-0.121*	-0.876
	(0.014)	(0.016)	(0.071)	(0.867)
Number of products manufactured	-0.002	-0.002	-0.003	-0.020
	(0.002)	(0.002)	(0.003)	(0.031)
Type of food processing				
Post-harvest crop activities	0.001	-0.002	-0.005	-0.148
	(0.008)	(0.009)	(0.012)	(0.166)
Meat	0.031**	0.033**	0.043**	0.281
	(0.015)	(0.016)	(0.021)	(0.267)
Fish	0.015	0.017	0.024	0.249
	(0.013)	(0.013)	(0.016)	(0.210)
Fruit and vegetables	0.018	0.018	0.035	0.281
	(0.027)	(0.030)	(0.039)	(0.331)
Oils and fats	0.022	0.022	0.040*	0.308
	(0.017)	(0.019)	(0.022)	(0.288)
Starches	0.012	0.017	0.022	0.205
	(0.012)	(0.013)	(0.016)	(0.194)
Bakery	0.012	0.015	0.021	0.200
	(0.009)	(0.010)	(0.013)	(0.180)
Other	0.011	0.012	0.014	0.158
	(0.012)	(0.013)	(0.016)	(0.154)
Wald chi2	29.80	24.24	15.79	2.70
N	502	497	487	469
Lower	-0.20	-0.15	-0.10	-0.05

truncation limit

Source: Truncated regression of firm growth on explanatory variables.
Notes:
(1) Micro firms are firms with 1-5 employees, small firms have 6-30 employees, medium firms have 31-100 employees, and large firms are firms with more than 100 employees**.**
(2) Omitted categories are as follows: For firm age, firms established after 2004; for firm size, micro firms in 2014; for processing sub-category, grain milling.
(3) Robust standard errors in parentheses. All regressions use a constant term (not shown). Significance levels are denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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