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# Partnership for inclusive growth

## Can linkages with large firms spur the growth of SMEs in Tanzania?

Josaphat Kweka[1] and Fadhili Sooi[2]

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UONGOZI Institute, 62 Msasani Road, Oyster Bay, PO Box 105753, Dar es Salaam, Tanzania.

**Abstract:** A recent strand of literature on small and medium enterprise (SME) development identifies linkages with large firms as some of the enablers of development and competitiveness. However, there is a dearth of empirical studies on the topic. In this study, we assess the extent and determinants of linkages between SMEs and large firms in Tanzania and to what degree the linkage is an important driver of SME performance. We find that, while linkages with large firms are potentially beneficial for the increased performance of SMEs, the level of such linkages is low in Tanzania and is likely to be influenced by the firm's production capacity, training, exporting, foreign ownership, industry association, and technology partnerships. This implies that the government's efforts to promote SMEs should include policies or programmes that nurture partnerships with large firms.

**Key words:** SMEs, firm linkages, SME growth

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**Note:** Tables 2 to 6 can be found at the end, before Appendix A.

[1] Talanta International and ESRF and REPOA, Dar es Salaam, Tanzania, corresponding author: josaphat.kweka@gmail.com; [2] Talanta International, Dar es Salaam, Tanzania.

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

# 1 Introduction

## 1.1 Background and motivation

Globally, small and medium enterprises (SMEs)[1] have increasingly been recognized by policy actors as important drivers of economic growth. In parallel, research on SME growth dynamics and their indispensable role in the economies of various nations has become an important field of study. Some of the key issues prominently covered in SME studies include the role of SMEs in productivity increase (Diao et al. 2018), enhanced access to credit (Sibanda et al. 2018), business environment improvement (Dut 2015), human capital investment (Pauli 2015), the role of the government (Eniola and Entebang 2015), and the impact of technology and innovation (Subrahmanya et al. 2010). Clearly the underlying motivation in most studies is the recognition that SMEs are significant drivers of entrepreneurship, job creation, and innovation (see, e.g., Katua 2014; OECD 2018). Apparently, owing to the structure of the economy, policy, and institutional environment, the importance of SMEs differs across countries. For instance, Diao et al. (2018, 2019) found that the bulk of employment growth between 2008 and 2012 in Tanzania was accounted for by small firms in the informal sector and contributed more than one percentage point to economy-wide labour productivity growth in that period. Estimates by the International Labour Organization (ILO) (2017) show that the SME sector accounts for more than one-third of total gross domestic product (GDP) in emerging and developing economies, while globally, employment by SMEs more than doubled from 79 million in 2003 to 156 million in 2016 (ILO 2017). Consequently, policy actors across the world have increased policy attention towards SMEs as an engine for inclusive growth and development (Tewari et al. 2013).

Despite their important role in the economy, SMEs in developing countries face a myriad of challenges that dampen their potential for growth. The challenges range from inadequate working capital and lack of access to market, credit, and technology to poor work premises and a generally unfavourable policy environment. Clearly, efforts to address these challenges have been limited because the majority of SMEs operate in the informal sector, which constrains their abilities to link with formal large enterprises. Recent literature on SME growth dynamics identifies linkages with large firms as some of the enablers of SME development and competitiveness (Barbin 2017; Francisco and Canare 2018) and finds that large firms can help small firms to grow and break into national and global markets (Hussain 2000; OECD 2005).

In this study, we assess the extent and determinants of linkages between SMEs and large firms in Tanzania and to what degree such linkages are an important driver of SME growth performance. Tanzania is an interesting case to examine this question for a number of contextual reasons. First, the country is endowed with enormous natural resources (e.g., mining, natural gas, expansive land, wildlife) that have been important factors for attracting investment (including foreign direct investment [FDI] by multinational enterprises [MNEs]). While FDI inflows have fuelled growth (especially the natural resource sectors such as mining, oil, and gas), a question is raised about the extent at which such growth is inclusive. Consequently, the government is strongly advocating for

[1] The definition of SME varies across countries, and there is no universal definition used globally (Mouhallab and Jianguo 2016). In addition, the definition of SME is cluttered by various conceptual details ranging from the informal sector to small business (see Kweka and Fox 2011). Nevertheless, this study uses the SME definition adopted by the micro, small, and medium enterprise (MSME) policy of 2002, which is micro (1–4 employees), small (5–49 employees), medium (50–99 employees), and large (100+ employees) (see URT 2002). However, for the purpose of this study, our definition is focused on enterprises with 10+ workers.

the need to strengthen linkages between MNEs/FDIs and local firms as one of the means to achieve inclusive growth. The SME policy (currently under review) focuses strongly on promoting linkages with large firms (URT 2016) and is considered an important pillar for the country's ongoing industrialization drive.

Despite the good policy intentions, the challenge remains that the majority of the domestic enterprise sector is largely characterized by a massive informal sector, which, despite being a notable source of jobs for the majority of youth entering the labour market, is limited in terms of ability to transform and tap the opportunities from economic growth. The recent analysis by Diao et al. (2018) shows that small informal firms account for the bulk of employment growth in the last decade and that a small subset of these firms experienced productivity growth that was higher than in the formal/large manufacturing sector. Clearly, it will be useful to understand whether or to what extent linkages with large firms will catalyze further growth of such firms, and which policy actions are critical for facilitating them.

### 1.2 Problem and rationale

While the literature identifies different types of linkages between SMEs and large firms as generally beneficial, the specific role played by these linkages in enhancing the growth performance of small firms is essentially an empirical question[2]. This is because the extent and impact of linkages are likely to vary between countries, reflecting the different policy and business environments for SMEs, which are usually country specific. First, we do not know how these linkages occur or which types of linkages work best for SME growth and under which conditions. More importantly, the role of linkages with large firms may depend on the specific country situation, including but not limited to the level of economic growth, policy, and institutional environment for enterprise sector development.

Furthermore, despite the generally acknowledged benefits of linkages, findings from some studies show that a linkage with a large firm may also be disadvantageous to SMEs. For instance, Francisco and Canare (2018) analysed the linkages between SMEs and large firms in the Philippines and concluded that Philippine SMEs are not extensively linked to large firms and that linkages with large firms have both positive and negative effects on SMEs. The main benefits to SMEs include knowledge transfer and access to markets, while the main disadvantages are bureaucracy in large firms and their strong bargaining power. Other studies identified cases where such linkages have been a setback to the growth of SMEs. For instance, Rothkegel et al. (2006) show that the benefits accruing to small firms may be offset by the risks and costs of associating with large firms. Nonetheless, the literature concludes that, despite limited linkages, the net benefits to SMEs are largely positive. This implies that, in the context of developing low-income countries, the extent and the role of linkages with large firms on SME growth is largely an empirical question.

More broadly, although the recent literature on SME growth has emphasized the role of linkages with large firms, there is a dearth of empirical evidence (Francisco and Canare 2018) where most studies are descriptive and based on a limited sample of firms. This study aims to provide empirical evidence for Tanzania to understand whether and to what extent the linkages between small (SMEs) and large enterprises can help spur the growth performance of SMEs. The only existing study on Tanzania is Ishengoma and Lokina (2013), which examined the role of linkages based on

[2] Note that, as will be clarified in a later section, the paper does not necessarily address linkages in the domestic economy. Our key focus is on the size of the enterprise (i.e. small and large firms). Basically, the data are insufficient to measure linkages between firms in the domestic economy, such that some of the linkage indicators pick linkage with foreign firms from the export and import relationships.

a dated survey (2006) of the construction sector in which subcontracting is common. Our study examines the linkages in the industrial sector where different types of production-oriented linkages (backward, forward, technology, and competition) are typical. In addition, our study will benefit from the availability of multi-year (2008–16) firm-level data on the nationally representative Annual Survey of Industrial Production (ASIP), which covers all the industrial sectors.

### 1.3 Objectives and structure

The main objective is to analyse SME linkages with large firms in Tanzania in order to examine the extent at which they enhance growth performance of small firms. Specifically, the study will (a) identify the types and extent of linkages between SMEs and large firms; (b) examine the factors that determine linkages between SMEs and large firms; and (c) estimate the impact of linkages on the growth performance of SMEs.

Following the introduction, the rest of the paper is structured as follows. Section 2 provides an overview of the SME sector in Tanzania, including the policy and institutional framework for promoting SME development. Section 3 outlines the approach and methodology for analysis, the results of which are presented and discussed in section 4. Section 5 concludes and outlines some implications for policy.

## 2 Overview of the SME sector in Tanzania

To provide a broader development context, this section gives an overview of the SME sector, including the policy and institutional framework for promoting SME development in Tanzania.

### 2.1 The size and role of the SME sector

The SMEs play a major role in the Tanzanian economy, and their productivity is essential for employment, growth, and poverty reduction. The Tanzania Development Vision 2025 highlighted the SME sector as one important contributor to the country's long-term development. Despite the importance of the SME sector in economic development, it is difficult to get recent and reliable data regarding the current status of the SME sector in Tanzania; hence, we rely on information from previous studies and surveys. The most reliable sources of information include the National Bureau of Statistics's (NBS's) ASIP and the 2013 Census of Industrial Production (CIP). Both the ASIP and CIP are based on industrial sectors only. The ASIP data (latest 2016) show that Tanzania had 2,462 establishments, out of which 88.3 per cent (2,173 establishments) were SMEs. The CIP shows that, out of the total 49,243 sampled establishments, 47,921 (97.3 per cent) were SMEs and 1,322 (2.7 per cent) were large enterprises. The report shows that in 2010 the industrial sector created 264,223 jobs, out of which 125,336 (47.4 per cent) were at SMEs and 138,887 (52.6 per cent) were at large industries.

However, in recognition of the increasing role of small firms and the informal sector in job creation, the government, through the Ministry of Industry and Trade and in collaboration with the Financial Sector Deepening Trust (FSDT), conducted a comprehensive MSME baseline survey countrywide in 2010, aimed at establishing the size, structure, and contribution of the MSME segment in Tanzania. The survey (published in 2012) reported that there are more than 3 million small businesses and over 5 million employees throughout Tanzania. Most of these establishments are informal and engaged in the trade and service sectors. About 60 per cent of these establishments are located in urban areas, with annual turnover of less than US$2,000.

From these data sets and a literature review, a number of conclusions can be made regarding the SME sector in Tanzania. The most important one is that the SMEs are dominated by very small firms mostly operating in the informal sector with a very low survival rate. Although SMEs are found in all sectors of the economy, they are dominant in trade (54 per cent) and services (34 per cent) as these sectors require minimum capital to start a microbusiness. Estimation of GDP contribution by SMEs has varied across different sources given rebasing of GDP. However, the most recent and reliable estimate is that of Diao et al. (2018), which shows that the value added of the MSME sector was about 17.3 per cent of national GDP in 2010[3]. Based on the ASIP data for 2016, the NBS estimates show that the sampled 2,173 SMEs contributed 23.1 per cent of industrial gross output, 24.8 per cent of total industrial value added, and 39.5 per cent of total industrial employment. In manufacturing, the MSMEs are concentrated in six subsectors: beverages, food processing, textiles, wood processing, furniture, and building materials.

Despite its importance in the national economy, the SMEs face a myriad of challenges, reflecting their weak capabilities and unfavourable business environment. These challenges have been extensively covered in literature (Argidius 2017). Coupled with widespread informality and low productivity, SMEs are generally considered as disadvantaged in that they operate outside the legal system and lack access to finance and other resources necessary for their growth.

## 2.2 Policy and institutional framework for SME development

The SME development policy of 2002 is the primary document that guides the government and other stakeholders in promoting the growth and role of SMEs in Tanzania. The SME policy (see URT 2002) provides a strong support to the strategic importance of linkages between SMEs and large firms and is cognizant that such linkages are weakly developed in Tanzania. The policy focuses on promoting business linkages between large and small enterprises as a strategy for enhancing the market for SMEs.

In Tanzania, the SME sector is under the line of the Ministry of Industry and Trade (MIT) and is supported by other agencies and organizations, including but not limited to the Small Industry Development Organization (SIDO), National Economic Empowerment Council (NEEC), and Tanzania Entrepreneurship and Competitiveness Centre (TECC). In addition, institutional framework for SME promotion includes the role of other relevant government ministries, departments, and agencies (MDAs) for implementing specific policies that affect SMEs. These include the Bank of Tanzania (The National Micro Finance Policy), Department of Industry (the Sustainable Industrial Development Policy: 1996–2020), Prime Minister's Office (the National Employment Policy), and the second Five Year Development Plan (2016/17–2020/21). Some of these policies and institutions, such as the Five-Year Development Plan (FYDP) II, local content policy, SIDO, and SME development policy (under MIT), have focused on enhancing linkages with large firms as a way to promote SME growth. However, implementation of these policies has been less optimal, mainly on account of limited (financial) resources. Clearly, a lack of resources reflects less priority and high-level commitment accorded on them. Other institutional support to the SME sector can be seen through maintaining a stable macroeconomic environment, reviewing the tax regime, simplifying licensing procedures, and implementing a competitive environment (Argidius 2017).

[3] This is lower than the estimate provided by the MSME baseline survey report (25 per cent of GDP and 18 per cent of manufacturing value added) because it was based on rebased GDP figures.

## 3 Literature review

Although a recent strand of literature identified linkages with large firms as possible contributors to the growth of SMEs, there is a dearth of empirical evidence (Francisco and Canare 2018). Most of the reviewed studies on linkages between SMEs and large firms are mainly descriptive. The approaches used in the studies differ—ranging from a combination of descriptive and empirical analyses for country case studies, sectors, or a particular issue on the linkage between small and large firms. Appendix A summarizes the description of various sampled studies. Examples of topics covered in these studies include how the linkages can help spur SME growth by addressing different challenges (Musundi and Ogollah 2014), determinants and nature of linkages (Mohammed and Beshir 2019; Okeniyi and Branine 2017; Jamieson et al. 2012), costs and benefits of linkages (Francisco and Canare 2018), or identification of different types of linkages (Barbin 2017). A number of studies also exist that document the impact of linkages on SME growth. For instance, Quak (2019) assessed the impact of creating backward and forward linkages between lead firms and SMEs in conflict settings.

Another important feature in the literature review is that SME linkages with large firms have different patterns across sectors (Quak 2019). This has motivated some sector-specific studies, in the manufacturing sector as well as other sectors such as construction (Ishengoma and Lokina 2013) and financial (Atieno 2009). Within the manufacturing sector, a number of studies have focused on specific subsectors including, for example, automotive parts (Talebi et al. 2017), textiles (Mohammed and Beshir 2019), agriculture and tourism (Hussain 2000), and furniture (Sibanda et al. 2018).

In addition to the empirical literature, a number of studies are devoted to reviewing linkage programmes or initiatives. For example, Quak (2019) provides a useful review of a number of case studies at sector, country, and project level, ranging from lead firm-SME linkages in the Philippines, FDI and SMEs in Vietnam, the brewery industry in Africa, aluminium smelter in Mozambique, and a project to link smallholder farmers with large processing businesses in Latin America. The Organisation for Economic Co-operation and Development (OECD 2018) summarizes different initiatives by country governments to foster linkages, including through subsidies to enhance the capabilities of local SMEs. Economies often cited in this regard are Singapore, Ireland, Chinese Taipei, and Malaysia. Based on a case study of several industries, Bekefi (2006) provides useful lessons from a review of initiatives for building linkages between small and large firms in Tanzania.

Pant et al. (2018) used meta-analysis to review the lead firms-SME linkage initiatives and noted that SMEs are increasingly involved as the supplier of niche products for lead firms. Furthermore, the study found evidence that the impact of top-down, privately led linkage initiatives is mainly seen in increasing quality and organizational capacity in creating efficient supply chains compared to the (often bottom-up) publicly led linkage initiatives whose objectives (hence impact) have mainly included job creation, policy reforms, and investments.

In general, empirical evidence shows that linkages with large firms exist, albeit weaker compared to linkages among large or small firms. More importantly, almost all studies conclude that small-large firm linkage plays an important role in SME growth.

# 4 Methodology

As seen in the literature review, a number of methods have been used in different studies to assess firm linkages. Given the challenge of data availability and reliability, one would argue for the need to pursue the linkage question using primary survey data. Apparently, such methodology provides a powerful means to conduct qualitative and descriptive analysis and provides a more accurate and real picture of the types and extent of formal relationships between firms on the ground. However, given the limited scope for the study, we relied on the available ASIP data, which provide sufficient grounds to conduct an empirical analysis. Nonetheless, we supplemented the analysis with insights from secondary information on programmes/initiatives by various actors to promote linkages in Tanzania.

## 4.1 Conceptual framework

Firm linkage refers to relationships and interactions between firms. These can be in the form of trade (buying and selling), information sharing, and competition (firm entrance into the market causing another firm to improve capacity or go out of business) (Francisco and Canare 2018). Most empirical studies (including the current one) analyse linkages between SMEs and large firms based on the pioneering work of Dunning (1992), in which four types of linkages are measured, namely:

- *Linkages with competitors,* where a large firm may raise standards in the economy, thus forcing SMEs to improve their method of production, distribution, and marketing.
- *Backward linkages with suppliers (SMEs),* where large firms source their goods or services from SMEs and, in doing so, create opportunities for them. Such linkages may range from arm's-length transactions to deep inter-firm and long-term relationships.
- *Forward linkages with customers,* where large firms supply their output to SMEs including SMEs buying capital from large firms, SMEs selling merchandise produced by large firms, and SMEs insourcing auditing or other services from large firms.
- *Linkages with technology partners and other spillover effects,* where large firms supply technology and collaborate with SMEs in undertaking innovation or technological change.

We use the approach by Javorcik (2004), Blalock and Gertler (2008), and Sánchez-Martín et al. (2015) to measure forward and backward linkages. A forward linkage between two firms is measured as the proportion of total sales by one firm to another, while a backward linkage is the percentage of inputs (out of total inputs) of one firm obtained from another firm. Furthermore, according to Francisco and Canare (2018), competition linkage is measured by the number of SMEs competing with large firms while technology linkage is measured by the number of SMEs that have formed a joint venture or strategic alliance with large firms in which they share technology and innovation.

Because we measure a linkage to analyse its role in SME growth, it is important to clarify how we intend to measure SME growth. The literature classifies methods of estimating SME growth into subjective and objective methods. The former assesses the individual's (the owner) satisfaction on the business outcome while the latter is based on financial and non-financial indicators (Hassan and Hart 2016). Financial indicators include sales, profits, and market shares while non-financial indicators include employment growth (Delmar et al. 2003). For the purpose of this study, we use growth of employment and sales to measure SME growth performance.

### 4.2 Empirical model and estimation

To meet our research objectives, our empirical analysis will involve estimation of two models. Our first model is used to assess the extent of linkages among firms and estimate the determinants of linkages between SMEs and large firms. In the second model, we assess the role of linkages in (basically the extent at which linkages contribute to) the growth of SMEs. The first model shown in equation 1 identifies the determinants of linkages, which is estimated using equations 2 and 3. The second model (in equation 4) analyses the impact of linkages on the growth performance of SMEs by estimating equations 7 and 8. These models and equations for estimation are described as follows.

Following Mohammed and Beshir (2019), we use the following model to estimate the determinants of forward, backward, technology, and competition linkages.

$$L_i = \emptyset + \sum_{i=1}^{n} \alpha Z_i + \varepsilon_i \quad (1)$$

Where $L_i$ is a categorical dependent variable with values representing whether or not enterprise *i* participates in the linkage (forward, backward, technology, or competition linkage); $\emptyset$ is the constant term; $Z_i$ is a vector of independent variable (e.g., firm characteristics, owner characteristics, location, sector, training, as derived from the preliminary literature review); and α is a vector of parameters. The independent variables include firm experience (lexper); total production (ltotprod); and a number of dummy variables such as training (train), association to membership (association), exporting (export), raw materials shortage (shotrawm), capacity utilization (capacity2)[4], location in special economic zones (SEZ), and foreign ownership (foreignown).

While measurements of independent variables are straightforward, our data set is limited in the extent we can use it to measure forward and backward linkages. The ASIP contains information on sales and purchases by firms, but such a relationship is not specified by firm size. Given these limitations, we improvised a measure of forward and backward linkages by creating a proxy of SME export and import relationships as follows. To measure a *forward linkage* (*forward*), we created a dummy variable with values 1 if the firm (SME) exports any of its products and 0 otherwise (the firm does not export). To measure a *backward linkage* (*backward*), we created a dummy variable with values 1 if the firm (SME) imports any of its inputs and 0 otherwise (the firm does not import)[5]. Essentially, using exports and imports as proxies for forward/backward linkages means that, in effect, we are analysing the propensity to export or import. However, we tried to also use the measure of linkages in the data, albeit weak, but the results were generally similar. Nonetheless, we proceeded with these less-than-ideal proxies and show differences in results when using the alternative measures.

The data set contained sufficient information for measuring the other two dependent variables (technology and competition). *Technology linkage* (tech1) is measured as a dummy variable with values equal to 1 if the firm has either cooperated with (or received) technology and production services from public technology intermediaries (e.g., Tanzania Automotive Technology Centre,

[4] The dummy variables have values 0 for negative outcome (No) and 1 for positive outcome (Yes).

[5] We observe from the literature that exporting SMEs engage with more sophisticated foreign firms and learn the skill sets and techniques they (SMEs) are not familiar with. Consequently, such SMEs are more likely to supply sophisticated buyers (De Loecker 2007), which are mostly large firms. On the other hand, importing SMEs are able to source sophisticated inputs and are therefore more productive (Bas and Strauss-Kahn 2014). We believe this makes them more likely to buy from large firms compared to those that do not import.

Tanzania Bureau Standards) or has partnered with private companies in research and development (R&D) activities and 0 otherwise. Finally, the *competition linkage* (compet) was constructed as follows. First, we generated variable1 that records the proportion of large to small and medium firms based on industrial subsectors across each firm. Then we calculated the average value of variable1 across all firms in all sectors so that we generated a dummy variable (compet) with value 1 if variable1 had a value equal to or higher than the calculated average and 0 if the value of variable1 was lower than average. Our thinking here is that SMEs in subsectors with many large firms (with higher than average value of variable1) participate in a competition linkage while those in subsectors with few large firms do not (variable1 less than average)[6].

In estimation, we use the random effects (RE) logit model to estimate the determinants of linkages. This is because using the fixed effects (FE) model drops a significant number of observations because of having zero values within individual variation[7]. Whilst our estimation is limited by the nature of the available data, the use of RE compromises the unbiasedness of our estimates as this method does not address the challenge of omitted variables (Torres-Reyna 2007). Thus, given the normal distribution assumption N(0,$\delta_v^2$) and RE $v_i$, RE logit involves approximating panel-level likelihood $l_i$ (equation 2) by using the adaptive Gauss–Hermite quadrature (equation 3).

$$l_i = \int_{-\infty}^{\infty} \frac{e^{-v_i^2/2\delta_v^2}}{\delta v\sqrt{2\pi}} \left(\prod_{t=1}^{n_i} F(y_{it}, x_{it}\beta + v_i) dv_i \right. \quad (2)$$

$$L \approx \sum_{i=1}^{n} w_i log \left[\sqrt{2}\hat{\delta}_i \sum_{m=1}^{M} w_m^* exp(\{a_m^*\}^2) \frac{exp\left\{-\left([\sqrt{2}\hat{\delta}_i a_m^* + \hat{\mu}_i]^2/2\delta_v^2\right)\right\}}{\sqrt{2\pi}\delta_v} \prod_{t=1}^{n_i} F\left(y_{it}, x_{it}\beta\sqrt{2}\hat{\delta}_i a_m^* + \hat{\mu}_i\right)\right] \quad (3)$$

Whereby:

$w_i$ is the user-specified weight for panel i

$w_m^*$ denotes quadrature weights

$a_m^*$ denotes quadrature abscissas

$y_{it}, x_{it}\beta$ denotes the dependent variable and a vector of explanatory variables and respective parameters.

Subsequently, we analyse the effect of these linkages on SME growth using a semi-logarithmic model:

$$Ln\, Y_{it} = \gamma + \sum_{i=1}^{n} \alpha X_{it} + \sum_{i=1}^{n} \beta N_{it} + \varepsilon_{it} \quad (4)$$

Where $Y_{it}$ is the indicator for SME performance (sales or employment); $X_{it}$ is a vector of linkage variables[8] (backward, forward, competition, and technology linkages); $N_{it}$ is a vector of other factors determining the growth of SMEs including association to membership (association),

[6] In effect, compet=1 is essentially a firm size composition measure. Although not a perfect measure of competition linkage, we resort to this variable as it generally reflects the extent at which SMEs coexist with large firms. That is, we are capturing performance of SMEs in sectors where firms of different size compositions operate.

[7] That is, if a firm participated in linkages in all years available in the data, and it happens that over time there is no variation within firms, then the FE model will drop that observation.

[8] These are all dummy variables with values 0 for not participating in the linkage and 1 for participating in the linkage.

providing training (train), foreign ownership (foreignown), private ownership (private), log of experience (lexper), and log of capital (lK); $\gamma$ is the constant term; and $\varepsilon_{it}$ is the random error term. We estimate equation 4 using RE and FE techniques as follows.

Suppose we fit models such as equation 5

$$y_{it} = \alpha + x_{it}\beta + v_i + \epsilon_{it} \quad (5)$$

Where $y_{it}$ and $x_{it}$ are the dependent and independent variables, respectively

$\alpha$ and $\beta$ are parameters

$v_i + \epsilon_{it}$ is the error term.

Note that $v_i$ is the individual specific error term that differs between individuals, while $\epsilon_{it}$ is the usual idiosyncratic error. If equation 5 is true, then equation 6 is also true[9]. Subtracting equation 6 from equation 5, we obtain equation 7. The use of ordinary least squares (OLS) to estimate equation 7 refers to FE estimation while the use of equation 6 leads to what is known as *between estimation*.

A combination of *between and within estimation* leads to RE estimator (equation 8).

$$\bar{y}_i = \alpha + \bar{x}_i\beta + v_i + \bar{\epsilon}_i \quad (6)$$

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\beta + (\epsilon_{it} - \bar{\epsilon}_i) \quad (7)$$

$$(y_{it} - \delta\bar{y}_i) = (1 - \delta)\alpha + (x_{it} - \delta\bar{x}_i)\beta + \{(1 - \delta)v_i + (\epsilon_{it} - \bar{\epsilon}_i)\} \quad (8)$$

### 4.3 Data

As noted earlier, we use the ASIP panel data covering years 2008–16. This is the most recent available firm-level survey data on Tanzania, covering establishments with 10 or more employees. It provides firm-level information including production, sales, nature of activities, and costs, among others. However, the data do not explicitly provide information on linkages by size (rather linkages more generally). For instance, the data provide total sales and purchases but do not state the *size* of the firm (whether SME or large firm) to/from which it sells/purchases. As noted above, we devised alternative ways of measuring these linkages.

## 5 Results and discussion

Firstly, we report results of a descriptive analysis including a profile of characteristics of firms in the sample followed by data measuring the extent of various linkages that exist in the industrial sector, thereby illustrating the dependent variable (linkages). In particular, we estimate the total and annual number of SMEs (percentage) that participate in each type of linkage with large firms and analyse the resulting trend of participation. In addition, we disaggregate SME linkage participation into respective industrial subsectors (mining, manufacturing, water, and electricity).

[9] The bar signs on top (equations 5 and 6) mean the variable is averaged over time (timed mean of a variable).

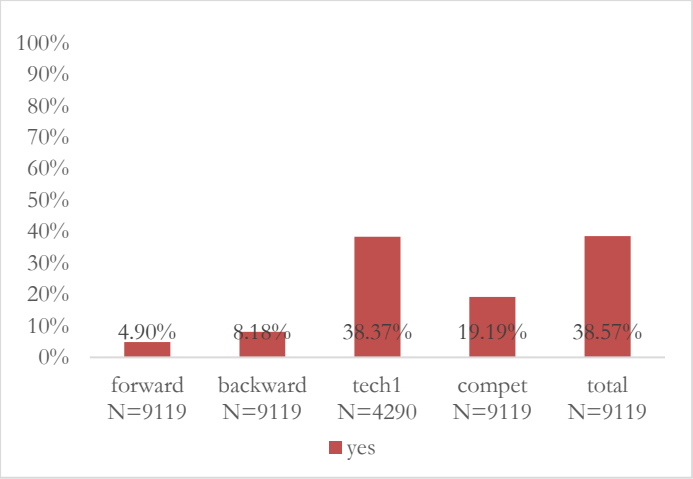
As noted earlier, our analysis does not necessarily measure the linkage with domestic firms because our proxies for the forward/backward capture linkages with foreign firms signify large firms.

### 5.1 Characteristic profiles of firms and extent of linkages

As reported in Table 2[10], our data have 10,892 observations representing the number of firms in the panel. Distribution by size shows that the majority of the firms are small (72.8 per cent) followed by large (16.1 per cent), while medium size firms constitute the smallest share (10.9 per cent)[11]. By sector, 85 per cent of firms are in the manufacturing sector, followed by mining (9.5 per cent), while water and electricity account for 3.6 per cent and 1.9 per cent, respectively. Over 91 per cent are privately owned, while the state-owned firms account for 7.8 per cent, and a few firms (125) are mixed ownership (1.1 per cent). Clearly, SMEs form a significant part of the industrial sector in Tanzania.

To put our results in context, we compare the linkages between SMEs and large firms with the linkages among large firms. In the case of SME-large firm linkages, technology and competition linkages appear to be highest (39 per cent and 16 per cent, respectively, signifying the proportion in sectors with relatively more large firms) compared to forward linkage (i.e. very few SMEs export output or import input). Overall, it appears that only a few SMEs participate in linkages with large firms, implying that the majority of SMEs in the industrial sector participate in linkages with other SMEs but less so with large firms. This result is not peculiar for Tanzania, as it corresponds with findings from other studies, including Jamieson et al. (2012), Musundi and Ogollah (2014), and Francisco and Canare (2018), that show that the linkages between SMEs and large firms exist but in a limited extent. Interestingly, the number of firms participating in different types of linkages between large and large firms is relatively bigger (see Figure 2), supporting the view that linkages occur more when firms are of a similar size. That is, as established, large firms are more likely to export and import. Results also suggest a tendency for large firms to cluster in certain subsectors (the compet measure).

Figure 1: SME-large firm linkage distribution

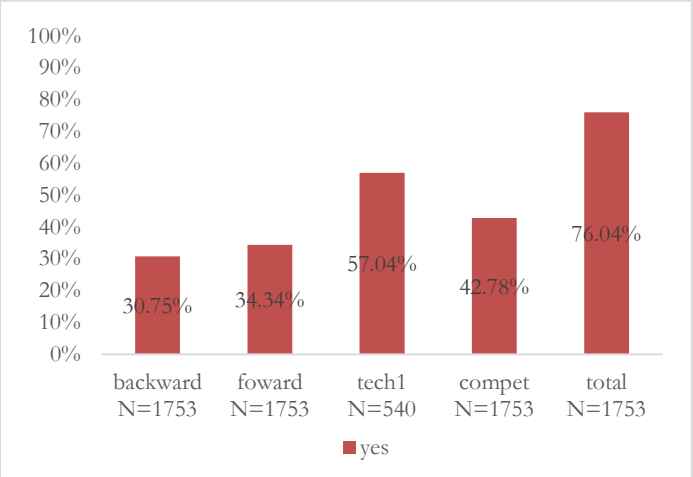



Source: authors' analysis based on ASIP data (2008–16) (URT 2018).

[10] Tables 2 to 6 can be found at the end, before Appendix A.

[11] In terms of size distribution, we have excluded 20 firms because of having zero employees, so the size distribution section will add up to 10,872 firms rather than 10,892.

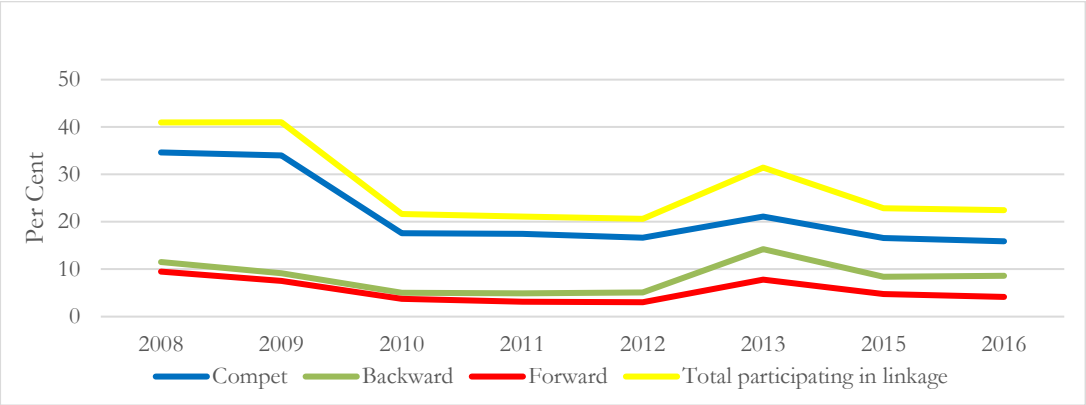
Figure 2. Large-large firm linkage distribution




Source: authors' analysis based on ASIP data (2008–16) (URT 2018).

As shown in Figure 3, while the proportion of SMEs with SME-large firm linkages decrease over time, the proportion of SMEs participating in any form of linkage increases[12]. The actual number of SMEs participating in linkages shows an increasing trend (Figure 4). Furthermore, the majority (80.1 per cent) of SMEs participating in linkages are in the manufacturing sector, followed by the mining (15.2 per cent), water (2.7 per cent), and electricity (2.0 per cent) subsectors.

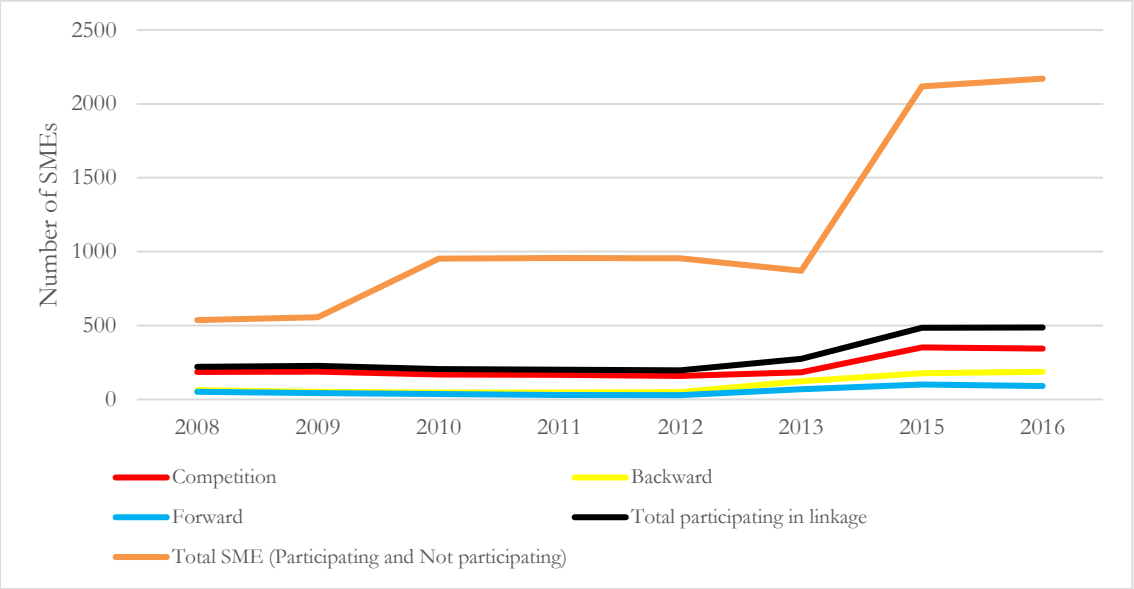
Figure 3: Proportion of SMEs participating in linkages annually




Source: authors' analysis based on ASIP data (2008–16) (URT 2018).

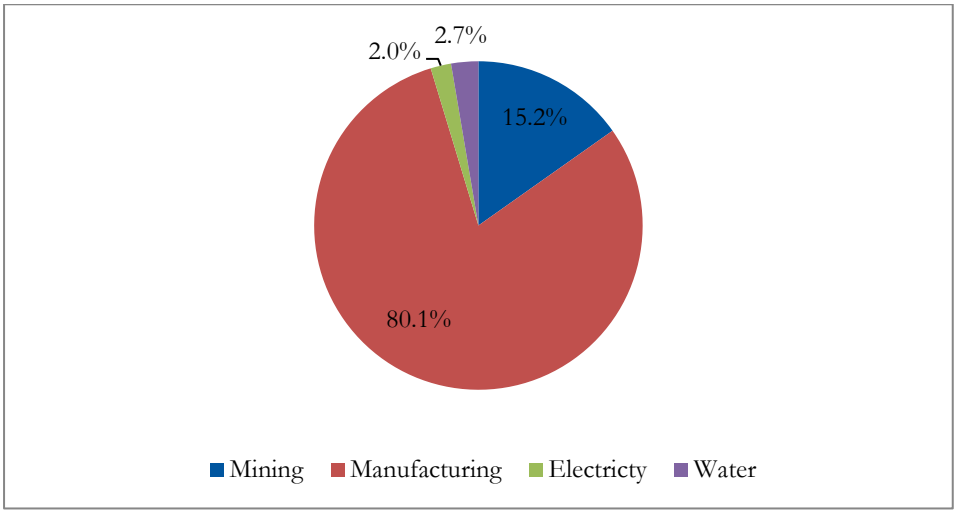
[12] This was calculated by finding the total number of SMEs participating in any linkage (forward, backward, tech1, or compet) divided by the total number of SMEs annually.

Figure 4: Number of SMEs participating in linkages annually




Source: authors' analysis based on ASIP data (2008–16) (URT 2018).

Figure 5: Sector distribution of SMEs participating in linkage with large firms (per cent)




Source: authors' analysis based on ASIP data (2008–16) (URT 2018).

Using descriptive statistics, we compared characteristics of firms that participate in linkages with those that do not (Appendix B). Our comparison shows that the majority of the SMEs that participate in a technology linkage are highly associated with SMEs that have a membership in an industry association (59.2 per cent), provide training (58.8 per cent), and operate in SEZs (24 per cent) compared to those that do not (Appendix Figure B1). In addition, SMEs participating in a technology linkage had higher mean production (12.9 per cent) and experience (2.1 per cent) compared to those that do not (12.2 per cent and 1.8 per cent, respectively). Similarly, SMEs participating in a competition linkage (i.e. in sectors with relatively more large firms) exhibit higher mean production (13.2 per cent) compared to those that do not (12.3 per cent).

As shown in Appendix Figure B2, participating in a competition linkage was associated with a proportionately higher number of SMEs that provide training (50.9 per cent), export (9.9 per cent), and are foreign owned (17.4 per cent) compared to SMEs without such characteristics (40.3 per cent, 3.74 per cent, and 3.9 per cent, respectively). Furthermore, participating in a backward linkage

was associated with a higher proportion of SMEs with private ownership (97.8 per cent), association membership (59.5 per cent), and foreign ownership (28.8 per cent) compared to SMEs that do not participate in a linkage (see Appendix Figure B3).

Concerning forward linkage (proxied by exporting relationship), Appendix Figure B4 shows that there are proportionately more foreign-owned firms that participate in forward linkage (32.9 per cent) than those that do not participate (4.7 per cent)[13]. In addition, as shown in Appendix C, the SMEs participating in forward linkage demonstrate higher mean production (14.8 per cent) compared to those that do not participate (12.3 per cent).

Overall, the results of our descriptive analysis have informed our understanding of the firm characteristics that are most likely to influence SME linkage with large firms. That is, SMEs that have a membership to an industry association, provide training, operate in SEZs, export, and are foreign owned and privately owned are more likely to participate in linkages with large firms compared to those without such characteristics.

### 5.2 Determinants of linkages between SMEs and large firms

Because the policy objective is to promote linkages between small and large firms, analysis of determinants of linkages will be informative to the policy actor in view of identifying ways to increase participation of firms. It is worth noting that variables used in the regression determined the number of observations in the panel. For example, the SEZ variable is available for two years only (2015 and 2016), which means its inclusion in regression omitted all observations before 2015. Thus, the number of observations was reduced almost by half, from 10,892 to 4,094 and 3,729, respectively. The results of the RE model are reported in Table 3. They show that, consistent with the descriptive statistics, significant factors determining firms' participation in technology linkage include total production (4.4 per cent), industry association (22.5 per cent), training (13.8 per cent), and location in a SEZ (4.8 per cent). Furthermore, Table 3 shows that private ownership, association membership, and foreign ownership improves the likelihood of a firm to participate in backward linkage (exporting). Only two factors are significant determinants of forward linkage (exporting), total production and foreign ownership.

We included control variables for region, sector, and year in the regressions. The RE results show that SMEs in the manufacturing sector are 2.7 per cent more likely to participate in forward linkage compared to those in the mining sector, while SMEs in the electricity sector are 24 per cent less likely to participate in technology linkage compared to SMEs in the mining sector. Nonetheless, the results of all RE models had very high constants, presumably showing there are other significant explanatory variables not included in the model. We tried to use an alternative specification, the population averaged (PA) logit model. This model estimates the average effect of a predictor variable rather than the effect of individual observation differences, as used by the RE model[14]. With this model, the constant magnitude reduced significantly, and the significant explanatory variables are to a large extent similar to those reported by the RE model. However, contrary to RE, PA regression reports that private ownership and training provision are not significant determinants of backward and competition linkage. We also estimated determinants of

[13] This is expected as foreign owned are more likely to export and, by definition, have foreign linkages; they also would be more likely to import.

[14] PA coefficients are obtained using a generalised estimating equation (GEE)—and are asymptotically equivalent to RE coefficients as GEE involves specifying a normal distribution for the dependent variable using an identity link function and assuming exchangeable errors (Cameron and Trivedi 2008).

linkage using the FE model, but this dropped way too many observations because the linkage variable had very little within individual variability; hence, we do not report its results.

To increase the number of observations and to enhance robustness of our findings, we attempted to estimate determinants of overall linkage. In this case we use *total linkage* as our dependent variable (with value 1 if the SME participated in any type of linkage and 0 otherwise). The results show that all the aforementioned factors (except private ownership) are significant (column 10 in Table 3). In general, while some factors such as total production, foreign ownership, association, and training were significant determinants in more than one type of linkage, others such as private ownership, being located in a SEZ, and firm's age (experience) appeared only in the technology linkage and private ownership in the backward linkage. Clearly, our results are highly similar to those in Mohamed and Beshir (2019), except for the shortage of raw material (shotrawm) variable that is insignificant in our case.

Clearly, the results also show that the extent of linkages is likely to be influenced by the nature of industrial activities[15]. Indeed, only the manufacturing sector appears to be significant among the four industrial sectors. We therefore run similar regressions focusing only on the manufacturing sector. Results are shown in Table 4. We find that while there is no change in sign of coefficients, some variables become insignificant and others become significant. A shortage of raw materials became a significant determinant of linkage—apparently reflecting the nature of manufacturing sector activities that use a significant amount of intermediate inputs as raw materials. In backward linkage, association has now become insignificant while capacity2 (operating below 80 per cent capacity) is significant and positive. The positive relationship between capacity2 and backward linkage (SMEs that import) reflects the fact that SMEs are constrained by a shortage of domestic inputs, which may force them to import. As a result, 31 per cent of SMEs that import (participate in backward linkage) operate below 80 per cent capacity (compared to 27 per cent for SMEs that do not participate but import). While production and exporting were significant determinants of competition linkage at the industrial level, these became insignificant in the manufacturing sector.

As noted earlier, using exporting and importing as proxies for forward and backward linkages is less ideal as there are SMEs that are linked with large firms but not necessarily exporting or importing. Furthermore, using exporting and importing implies that we are capturing SMEs that have linkage with foreign firms rather than local firms. We therefore attempted to address this challenge by using local sales and local purchases made by SMEs as proxies for forward and backward linkages, respectively. Understandably, such measures are also less ideal as they do not capture the size aspects of the linkage. Nonetheless, we report results in Table 6, which show that total production is a significant determinant of both forward and backward linkages—a finding similar to that in Table 3. Private ownership is associated with 43.3 per cent higher local purchase, although this factor was insignificant in Table 3. A 1 per cent increase in firm age (experience) is associated with a 12.5 per cent lower local purchase. This implies that firms that have existed for a long time tend to be more informed about the market and know where they can source their inputs cheaply compared to newly established firms. SMEs that spend on training were associated with 16.6 per cent higher extent of backward linkage participation compared to those that do not. However, training was an insignificant factor when we used importing (Table 3). While foreign ownership and operating in the manufacturing sector seem to matter for exporting (Table 3), these

[15] This is in line with the finding in Quak (2019) that SME linkages with large firms have different patterns across sectors.

factors were insignificant when we used local sales, reflecting the fact that foreign-owned firms and firms in the manufacturing sector export most of their output.

Having established the factor determining the extent of linkage between small and large firms, we now turn to the most critical question: to what extent do these linkages contribute to the growth performance of SMEs?

### 5.3 Relationship between linkage participation and SME performance

We estimate the relationship between our performance measure (lemploy and lsales) and SME characteristics using both pooled OLS and firm fixed effects. Using firm-level fixed effects permits us to control for any time invariant unobserved heterogeneity within firms—for example, education of the entrepreneur or the corporate culture within the firm. Because of the challenge of missing observations for some years in the panel, we do not use growth measures per se. Instead, we run the regression using employment and sales in levels to measure SME performance. In particular, data variables such as association membership and technology and SEZs are available only for 2015 and 2016. Furthermore, some firms entered the survey starting in 2016 with no data on previous years and vice versa[16].

We present results of determinants of SME performance in Table 5. The first two columns and the last column, respectively, show pooled, FE, and RE results for log of employment (lemp_all) while the final three columns report pooled, FE, and RE results for log of sales (lsales). The first column shows that participating in forward and backward linkages is significantly associated with 21.4 per cent and 22.9 per cent higher employment than not participating. Furthermore, technology and competition linkages (tech1 and compet) are not significant. However, using the FE model, all the linkage variables become insignificant. In the third column of Table 5, we report results using sales as a measure of growth. We find that SMEs participating in forward, competition, and technology linkages have 33.8 per cent, 23.9 per cent, and 25.1 per cent higher sales, respectively (compared to those that do not). Backward linkage was insignificant.

In the FE results (column 4), only forward linkage was significant. However, its coefficient is now negative, meaning that participating in forward linkage is associated with lower sales. To gain a better understanding of this result, we further examined our descriptive statistics, which show that almost no firms in the sample participated in forward linkage in the two years. In fact, the few that participated in 2015 were the same firms that participated in 2016. This means that there is very little variation in forward linkage, which would render the use of FE problematic.

We report results of the RE model (for both employment and sales measures) in columns 5 and 6. We find that participating in forward, technology, and competition linkages is associated with 25.6 per cent, 23.5 per cent, and 23.2 per cent higher sales, respectively, compared to not participating. The backward linkage was not significant. Given the different results from the two (FE and RE) models, we conducted a Hausman test to identify which model was more appropriate for presenting our data. The probability value from the Hausman test (prob>chi2=0.0000) was less than 5 per cent, implying that the FE is more appropriate. In general, all our linkage variables

[16] However, we attempted to run an additional regression using growth variables for which we had to omit the variables that had missing years including SEZ, tech1 (technology linkage), association, train, and capital. The estimated results are reported in Appendix D. We find that, unlike in the level regression, none of the linkage variables were significant and the R-squares were very small, presumably because of omitting the aforementioned variables. Some of these variables such as capital, association, and training are very significantly correlated with the linkage variables such that their omission biases the results. The results for most of the other variables (except for 'age') are generally similar for both levels and growth regressions.

become insignificant once we control for time invariant factors through the FE model, which would suggest that linkage dummies are picking up other factors such as business culture and management experience.

Overall, we observe that the importance of SME-large firm linkages differs depending on the dependent variable used (sales or employment). Backward linkage edges other variables when we use *employment*, while forward linkage edges other variables when we use *sales*. Nonetheless, despite the varying extent of importance, these results show that linkages between SMEs and large firms are beneficial to the growth performance of SMEs. This conclusion is similar to that of Francisco and Canare (2018) that SMEs enjoy such benefits as improved productivity through competition and learning from large firms—not just getting better access to the market.

A broad conclusion from the above empirical and descriptive findings is that the current status of SME-large firm linkage is weak, but potential exists for strengthening it given its beneficial impact on the growth performance of SMEs. The question is whether there are any successful cases of linkage initiatives from which to draw lessons for future support. The next section outlines such cases based on the literature review.

### 5.4 Are there successful linkage cases to learn from?

A review of experiences for Tanzania shows that there have been few initiatives by different development actors (mainly as part of government and donor programmes) to promote linkage between SMEs and large firms. Although some appear to have led to a significant impact on SME growth performance, these initiatives have been less dramatic, owing to the fact that they are isolated cases with limited if any replication. However, very few cases (we are aware of only one—Tanzania Breweries Ltd) have taken initiatives to assist SMEs in improving basic requirements for forging linkages. The majority of large firms consider SMEs as less qualified/prepared for entering such relationships given the challenges of informality and weak capacity. For instance, the UNIDO survey of 2010 showed that only a few large firms (including FDIs) were engaged in subcontracting local suppliers (forward linkage) and many declined to purchase from a local supplier because of poor quality (Oyen and Gedi 2013). Below are few examples of past initiatives.

*Case 1: UNCTAD-ITC Empretec linkage programme.* In 2013, UNIDO in collaboration with the International Trade Centre (ITC) established a business linkage programme as part of Empretec. It is a flagship capacity-building programme for promoting entrepreneurship and MSMEs to facilitate inclusive growth. In this case, the programme aimed at facilitating new linkages and deepening existing partnerships between trans-national corporations (TNCs)/large companies and SMEs to enhance the sustainability. In a workshop conducted in 2015 to discuss progress and challenges facing the programme, it was highlighted that SME suppliers for hotels were not knowledgeable of the required standards for the supplied goods needed by high-end hotels. Further, local suppliers face competition from low-price imported products. More generally, the high-end hotels operate with registered businesses, suggesting informality as the barrier for SMEs towards building linkages (UNCTAD 2015).

The initiative included technical assistance interventions to establish and consolidate business linkages between agricultural producers, large processors, and the tourism industry. One beneficiary of the programme has been the dairy farmers who supply milk to Tanga Fresh Limited (TFL), a company that processes and supplies milk all over Tanzania. Through the Tanzania Investment Centre (TIC)/ United Nations Conference on Trade and Development (UNCTAD) linkage programme, 565 TFL dairy farmers have been provided with training on good agricultural practices and entrepreneurship and helped to form linkages with tourist hotels in Arusha, Zanzibar, and Dar es Salaam (UNCTAD 2015). A subsequent evaluation on a sample of 126 dairy

farmers showed that there was a considerable increase in milk supply, where those who received entrepreneurship training more than doubled their supplies between 2014 and 2015 (see Table 1).

Table 1: Impact assessment of UNCTAD's business linkage programme

| Group of milk suppliers | Volume of milk supplied (per cent change over previous year) | | |
|---|---|---|---|
| | 2013 | 2014 | 2015 |
| 1. Farmers who received both Empretec and Farming as a Business (FaaB) training | 8% | 35% | 110% |
| 2. Farmers who received Empretec training only | 9.3% | 39% | 50% |
| 3. Farmers who received FaaB training only | 5% | 39% | 49% |
| 4. Farmers observing good practices from neighbours | 4% | 25% | 30% |
| 5. Control group | 6% | 10% | 14% |

Source: authors' calculations based on data from UN (2017).

An important lesson from the programme is the usefulness of consolidating resources from various donor programmes/agencies to avoid multiplicity and leverage the specific technical competency of the participating actors. In this case, UNCTAD leveraged resources from the Government of Tanzania, ITC, and UNIDO. In particular, UNCTAD and ITC addressed the downstream with farmer groups, while UNIDO worked on upstream with processors and government agencies on upgrading SME compliance with standards, developing marketing strategies, and accessing different markets. A review of the project evaluation shows that UNIDO's initiatives in arranging trade fairs and exhibitions, upgrading products, assistance in obtaining hazard analysis critical control point (HACCP) and International Organization for Standardization (ISO) certification, and providing technical assistance for SMEs have enhanced market linkages with large firms.

*Case 2: The Kilombero Business Linkage Project (KBLP).* This is an initiative between Kilombero Sugar Company Limited (KSCL), International Finance Corporation (IFC), and Africa Project Development Facility (APDF) that was established in 2002. The below narrative based on Bekefi (2006) shows the project led to significant impact. The KSCL envisioned becoming a low-cost producer of sugar in Tanzania, but its suppliers (SMEs) faced impediments including skill deficiencies, lack of finance, poor outgrower infrastructure, lack of basic social services, and lack of support services, which limited cane farmer expansion. Through KBLP, the SMEs were provided with finance, loan guarantees, and training on business skills. As a result, markets became more accessible through infrastructure improvement and improved capacities of the organizations that represented the SMEs. Consequently, outgrower farms almost doubled (from 2,760 to 5,000) in the first two years of the project while annual cane harvest tonnage increased by 42.5 per cent. Furthermore, the financial inputs of the project to the local community increased from TZS7–8 billion to TZS11 billion during the first year of the project (Bekefi 2006).

*Case 3: Tanzania Breweries Limited (TBL) and Kioo Ltd.* This case is also drawn from Bekefi (2006). TBL is a producer and distributor of malt beer, non-alcoholic malt beverages, and alcoholic fruit beverages in Tanzania. TBL saw the opportunity to source its inputs locally at lower costs and build local capacity. Initially, the company used to import 98 per cent of inputs. Most of the potential local suppliers neither had the competence nor capacity to produce the required quality and quantity. TBL invested in upgrading capacity of its potential local suppliers (glass, barley, and label suppliers), and as a result, these companies became important suppliers for TBL. For instance, Kioo Ltd. used to manufacture bottles, but the standards were poor with a high breakage

rate. TBL assured it would buy all bottles produced by Kioo Ltd. if they were of a required quality. TBL sent a South African engineer to assist with a production system upgrade. By 2006, Kioo Ltd. was the primary glass manufacturer in Africa, supplying 100 per cent of TBL bottles as well as producing for Coca-Cola and Pepsi in Tanzania.

In addition to the successful linkage programmes, other successful country cases provide several lessons for Tanzania. For example, *clustering in SEZs* had an impact in the Mauritius textile subsector in that it led to enhanced linkages, which made Floreal Knitwear (a leading Mauritius manufacturing firm and among the largest woolmark knitwear manufacturers in the world) cease using imported woollen yarn as there was enough supply of coloured yarn produced in the textile industry within the EPZ (Hussain 2000).

The weak nature of the SME sector means that *the government and large firms need to show more commitment* towards building linkages**.** In Vietnam, Unilever (a large manufacturer and distributer of personal care, home care, and food products) selected its small business partners and subsequently put them under its Manufacturing Sustainability Improvement Programme to upgrade their technology. In addition, Unilever diversified its products to include new products based on local tastes and culture, thus creating a new set of local partners and developing new linkages. By 2001, contract manufacturing formed 48 per cent of the volume produced by Unilever in Vietnam while local enterprises supplied 40 per cent and 80 per cent of Unilever raw materials and packaging, respectively. Technology transfer to local enterprises aided them to comply with international standards (Ruffing 2006).

In the absence of large firm support, such as in Vietnam, *Meso Institutions could play a useful role in supporting linkages.* Collaboration between academics and the private and public sectors (e.g., skills development centres) are a case in point. In Penang state of Malaysia, the Penang Skills Development Centre (PSDC: a joint meso-institution between the government and industry, which is SMEs, multi-national corporations [MNCs], and academia) established in 1989 was instrumental in fine-tuning the labour force into what the industry needed. PSDC trained 60,000 workers both from SMEs and MNCs, which not only equipped SMEs with required knowledge, skills, and capacity to participate in the linkages but also reduced the burden to large firms (MNCs) of capacity upgrading to their potential suppliers (Ruffing 2006). Similar cases of the role of the academic-industry linkage programme have also been tried among engineering faculties in Tanzania (e.g., University of Dar Industrial Production Unit in the Faculty of Engineering).

Overall, these cases show that the successfulness of the initiatives to enhance linkages between SMEs and large firms would depend on the measures taken to upgrade SME capacity and facilitate the role of the government. More generally, the Tanzania experience shows that the demand-driven initiatives by large firms are more successful than the supply-driven initiatives by public programmes (including donor agencies). The latter can play a useful role in capacity building and access to information, which appear critical for SME preparedness to enter the linkage relationships.

# 6 Conclusion and policy implications

## 6.1 Conclusion

Using firm-level industrial survey data, this paper analysed the extent, determinants, and role of linkages between small and large firms in the performance of SMEs in Tanzania. In particular, the paper pursued the following questions: What are the types and extent of linkages between SMEs and large firms? Which factors determine the extent of linkages between SMEs and large firms? And, what is the impact of linkages on SME performance? While the questions are legitimate, addressing them is challenging because of a lack of appropriate data, for which we had to resort to proxies in measuring linkages. Nonetheless, many clear findings emerge.

First, while important, the extent of linkages between SMEs and large firms is low compared to the linkages among large or small firms. Clearly, the extent of the linkage differs with the types of linkages, whereby most SMEs appear to have more linkage in technology (38.4 per cent) and competition (20 per cent) compared to backward (8 per cent) and forward (5 per cent) linkages. Furthermore, the manufacturing sector appears to have a much higher number of SMEs participating in linkages compared to other industrial sectors (water, energy, and mining).

While the level of production and foreign ownership appear to be significant factors influencing the degree of linkages across firms, other determinants vary depending on the types of linkages. In particular, technology linkage appears to be higher for older than younger firms and among firms that provide training and those located in a SEZ. The backward and forward linkages (which in reality are a measure of linkage with foreign firms) appear to be greater to exporting SMEs and SMEs with membership in industry associations. Similar factors are observed in the case of competition linkage. Clearly, specific factors appear important for certain sectors than the general case. In particular, raw materials and capacity utilization are the significant determinants of linkages in the manufacturing sector, apparently reflecting the nature of the manufacturing sector activities that use a significant amount of intermediate inputs.

The final part of the analysis assessed the role of linkages in SME performance, which is measured in terms of sales and employment levels. The findings show that linkages with large firms contribute to the higher performance of SMEs through such benefits as improved productivity, competition and learning from large firms, and expansion of markets. However, specific types of linkages appear to play a more significant role on different aspects of firm performance. Whereas backward linkage is associated with higher employment growth, forward linkage is associated with higher sales growth.

In conclusion, although linkages with large firms are potentially beneficial for the growth of SMEs, the weak firm linkages evident in Tanzania compromise the potential for linkages to promote inclusive growth and underscore the role of the government as an enabler of such linkages. That is, the government ought to step up efforts to build capacity of SMEs and facilitate an environment for nurturing linkages with large firms.

## 6.2 Policy implications

The above findings have several implications for industrial policy. Most importantly, the weak firm linkages evident in Tanzania compromise the potential for linkages to promote inclusive growth and underscore the role of the government as an enabler of linkages. That is, the government ought to step up efforts to build capacity of SMEs and facilitate an environment for nurturing

their linkages with large firms. The challenge is how such interventions could be implemented. Among other ways, we recommend the government to:

i. **Encourage large firms to engage in partnerships with small firms.** The paper shows that linkages with small firms is more effective when the initiative comes from a large firm (demand side). However, there are failure cases as well as few successful cases where large firms have (not) successfully engaged in upgrading SMEs to meet their requirements. Possible explanations include a lack of information about such opportunities or how to identify eligible SMEs. The government could identify the kinds of policy conditions or requirements needed to nurture or facilitate such linkages by leveraging enforcement of the existing policies and regulations (e.g., local content policy).

ii. **Promote linkages with foreign firms to help the growth of SMEs and eventually support internal linkages.** The findings show that backward and forward linkages are relatively weak in Tanzania's SME sector. The question is how the government could catalyze such linkages. Because these linkages were measured using import and export proxies, they primarily reflect weak foreign (trade) linkage capacity. The government could provide tax incentives to strategic sectors in which SMEs have significant sourcing with large firms.

iii. **Support SME upgrading for partnerships with large firms.** Apparently, given the inherent resource constraints and accountability challenges, it is not possible for the government to support individual/all SMEs to upgrade. However, the government could provide fiscal (tax-deductible) or other forms of incentives for SMEs to engage in capacity-building initiatives and for large firms or training institutions to provide such intervention. For instance, they could establish a rebate scheme in which large firms involved in upgrading SMEs to meet their linkage requirements are allowed to deduct/claim back a certain proportion of the skills development levy.

iv. **Strengthen R&D (technology) activities in the productive sectors.** As the study findings show, technology linkages are relatively higher compared to other types of linkages. This strength signifies a clear need for the government to strengthen R&D (technology) activities in the productive sectors of the economy, at least in two ways. First, the government needs to increase support to the R&D institutions including reinstating the R&D units that were almost mandatory in all the productive sectors in the past. Another way is for the government to support SMEs in technology acquisition as one of the mechanisms for promoting their relationships with large firms.

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## Tables

Table 2: Overall firm distribution by year, sector, employment size, and form of ownership

| Year | Number of firms | Sector | | | | Employment size | | | Form of ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mining | Manufacturing | Electricity | Water | Small | Medium | Large | Public | Private | Mixed |
| 2008 | 729 | 12 | 680 | 23 | 14 | 431 | 106 | 192 | 72 | 643 | 14 |
| 2009 | 733 | 9 | 686 | 24 | 14 | 444 | 112 | 177 | 56 | 667 | 10 |
| 2010 | 1,154 | 18 | 1,091 | 23 | 22 | 828 | 125 | 201 | 82 | 1,064 | 8 |
| 2011 | 1,162 | 18 | 1,099 | 23 | 22 | 828 | 129 | 205 | 69 | 1,084 | 9 |
| 2012 | 1,165 | 18 | 1,103 | 22 | 22 | 824 | 131 | 210 | 67 | 1,091 | 7 |
| 2013 | 1,098 | 192 | 801 | 26 | 79 | 719 | 152 | 227 | 118 | 956 | 24 |
| 2015 | 2,389 | 384 | 1,864 | 31 | 110 | 1,906 | 213 | 262 | 184 | 2,179 | 26 |
| 2016 | 2,462 | 385 | 1,931 | 36 | 110 | 1,954 | 217 | 279 | 199 | 2,236 | 27 |
| Total | 10,892 | 1,036 | 9,255 | 208 | 393 | 7,934 | 1,185 | 1,753 | 847 | 9,920 | 125 |

Source: authors' calculations based on ASIP data set (URT 2018).

Table 3: Determinants of firm linkages in the industrial sector: random effects (RE) and population averaged (PA)

| Variable | 1.RE | 2.PA | 3.RE | 4.PA | 5.RE | 6.PA | 7.RE | 8.PA | 9.RE | 10.PA |
|---|---|---|---|---|---|---|---|---|---|---|
| | tech1 | tech1 | backward | backward | forward | forward | compet | compet | Total | Total |
| shotrawm | 0.0376 | 0.0275 | -0.00352 | -0.00343 | -0.0022 | -0.00667 | 0.00765 | 0.0175 | 0.0119 | 0.0102 |
| | -0.0214 | -0.0197 | -0.00563 | -0.0122 | -0.00242 | -0.00782 | -0.00465 | -0.0115 | (0.0232) | (0.0187) |
| ltotprod | 0.0441*** | 0.0327*** | 0.0158*** | 0.0215*** | 0.00557** | 0.0191*** | 0.00459** | 0.0113** | 0.0538*** | 0.0384*** |
| | -0.00672 | -0.00509 | -0.00292 | -0.00297 | -0.00188 | -0.00237 | -0.00143 | -0.00369 | (0.00715) | (0.00529) |
| train | 0.121*** | 0.0829*** | 0.00764 | 0.00383 | 0.0036 | 0.00794 | 0.0137** | 0.0224 | 0.160*** | 0.104*** |
| | -0.0225 | -0.0199 | -0.00553 | -0.0126 | -0.00231 | -0.00773 | -0.00453 | -0.0132 | (0.0244) | (0.0194) |
| lexper | 0.0439*** | 0.0316*** | -0.00054 | 0.00018 | 0.000679 | 0.000959 | 0.00171 | 0.00482 | 0.0438*** | 0.0306*** |
| | -0.0105 | -0.00821 | -0.00306 | -0.00443 | -0.00105 | -0.00354 | -0.00219 | -0.00571 | (0.0112) | (0.00824) |
| association | 0.225*** | 0.162*** | 0.0144* | 0.0262* | 0.00454 | 0.017 | 0.00483 | 0.0142 | 0.235*** | 0.166*** |
| | -0.0235 | -0.0221 | -0.00684 | -0.0118 | -0.00286 | -0.00877 | -0.00469 | -0.0168 | (0.0234) | (0.0216) |
| export | 0.0236 | 0.006 | 0.0276** | 0.0505** | Not used | | 0.0197* | 0.0365** | Not used | |
| | -0.0476 | -0.0256 | -0.0103 | -0.0154 | | | -0.00933 | -0.014 | | |
| capacity2 | 0.0132 | 0.0128 | 0.0135 | 0.0191 | 0.000193 | 0.00301 | 0.0036 | 0.00303 | -0.000949 | 0.00606 |
| | -0.0184 | -0.017 | -0.00604 | -0.00925 | -0.00213 | -0.00667 | -0.00408 | -0.00796 | (0.0206) | (0.0155) |
| foreignown | -0.0477 | -0.0262 | 0.0358*** | 0.0473** | 0.0131* | 0.0406*** | 0.0672*** | 0.130*** | 0.249*** | 0.171*** |
| | -0.0445 | -0.0401 | -0.00865 | -0.0175 | -0.00557 | -0.00961 | -0.0173 | -0.0299 | (0.0552) | (0.0398) |
| private | 0.0197 | -0.00234 | 0.0375* | 0.034 | 0.00316 | 0.00935 | -0.0102 | -0.0238 | 0.0229 | 0.0111 |
| | -0.043 | -0.0337 | -0.0179 | -0.0189 | -0.00552 | -0.0201 | -0.00914 | -0.0274 | (0.0463) | (0.0349) |
| SEZ | 0.138*** | 0.101*** | -0.00617 | 0.00196 | 0.00131 | 0.00773 | 0.00815 | 0.0194 | 0.158*** | 0.109*** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | -0.0267 | -0.0271 | -0.00747 | -0.0128 | -0.00263 | -0.00863 | -0.00578 | -0.0125 | (0.0300) | (0.0243) |
| 2016 year | -0.0126 | -0.00964 | -0.00142 | -0.00312 | -0.00291* | -0.0089** | -0.00246 | -0.00614 | -0.0113 | -0.00879 |
| | -0.00952 | -0.00636 | -0.00294 | -0.00363 | -0.00146 | -0.00327 | -0.002 | -0.00367 | (0.0107) | (0.00653) |
| 2.manufact | -0.065 | -0.0484 | 0.0174 | 0.039 | 0.0044 | 0.0269* | 0.0113 | 0.0372 | -0.111 | -0.0814* |
| | -0.0527 | -0.0329 | -0.0121 | -0.0249 | -0.00289 | -0.0106 | -0.0062 | -0.0205 | (0.0581) | (0.0364) |
| 3.electricity | -0.240* | -0.159 | Dropped | Dropped | Dropped | Dropped | Dropped | Dropped | -0.193* | -0.127* |
| | -0.114 | -0.138 | (.) | (.) | (.) | (.) | (.) | (.) | (0.0873) | (0.0618) |
| 4.water | -0.101 | -0.0789 | Dropped | Dropped | -0.00317 | -0.00782 | Dropped | Dropped | Dropped | Dropped |
| | -0.0812 | -0.056 | (.) | (.) | -0.00295 | -0.0169 | (.) | (.) | (.) | (.) |
| Region | Added | Added | Added | Added | Added | Added | Added | Added | Added | Added |
| Constant | -18.06*** | -3.472*** | -47.22*** | -8.77*** | -42.11*** | -12.53*** | -30.03*** | -3.3*** | .93*** | -3.33*** |
| | -2.8641 | -0.5129 | -6.8844 | -0.9934 | -7.0505 | -1.5326 | 4.7495 | 0.4634 | 2.5351 | 0.5032 |
| N | 4,094 | 4,094 | 3,729 | 3,729 | 4,001 | 4,001 | 3,878 | 3,878 | 4,094 | 4,094 |
| adj. R-sq | Not calculated | | | | | | | | | |

Note: * p<0.1; ** p<0.05; *** p<0.001. Standard errors in parentheses.

Source: authors' calculations based on ASIP data, 2008–16 (URT 2018).

Table 4: Determinants of linkages in the manufacturing sector using random effects (RE) and population averaged (PA) models

| Variable | 1.RE | 2.PA | 3.RE | 4.PA | 5.RE | 6.PA | 7.RE | 8.PA |
|---|---|---|---|---|---|---|---|---|
| | tech1 | tech1 | backward | backward | forward | forward | compet | compet |
| shotrawm | 0.0541* | 0.0441* | -0.00427 | -0.00177 | -0.00138 | -0.00484 | -0.00264 | -0.00461 |
| | (0.0228) | (0.0207) | (0.00917) | (0.0139) | (0.00365) | (0.00835) | (0.0132) | (0.0142) |
| ltotprod | 0.0514*** | 0.0394*** | 0.0244*** | 0.0260*** | 0.00931*** | 0.0216*** | 0.00418 | 0.00707 |
| | (0.00759) | (0.00576) | (0.00362) | (0.00385) | (0.00194) | (0.00272) | (0.00428) | (0.00519) |
| train | 0.0984*** | 0.0671** | 0.0168 | 0.0102 | 0.00510 | 0.00992 | 0.0512* | 0.0405** |
| | (0.0223) | (0.0213) | (0.00892) | (0.0145) | (0.00329) | (0.00863) | (0.0203) | (0.0153) |
| lexper | 0.0430*** | 0.0295** | -0.00342 | -0.00230 | 0.000967 | 0.00277 | 0.00914 | 0.00997 |
| | (0.0114) | (0.00962) | (0.00508) | (0.00555) | (0.00172) | (0.00430) | (0.00714) | (0.00848) |
| association | 0.195*** | 0.142*** | 0.0182 | 0.0255 | 0.00589 | 0.0175 | 0.0345 | 0.0267 |
| | (0.0266) | (0.0264) | (0.0110) | (0.0142) | (0.00383) | (0.0101) | (0.0190) | (0.0205) |
| export | -0.00434 | -0.0176 | 0.0370* | 0.0527** | Not used | | 0.0460 | 0.0311 |
| | (0.0521) | (0.0302) | (0.0151) | (0.0183) | | | (0.0330) | (0.0246) |
| capacity2 | 0.0147 | 0.0181 | 0.0266** | 0.0258* | 0.00407 | 0.0101 | 0.00744 | 0.00265 |
| | (0.0202) | (0.0191) | (0.00954) | (0.0116) | (0.00361) | (0.00702) | (0.0124) | (0.0111) |
| foreignown | -0.0589 | -0.0452 | 0.0405** | 0.0466** | 0.0219*** | 0.0464*** | 0.228*** | 0.165*** |
| | (0.0446) | (0.0388) | (0.0139) | (0.0175) | (0.00661) | (0.00940) | (0.0613) | (0.0300) |
| private | -0.0116 | -0.0292 | 0.0380 | 0.0240 | -0.00220 | -0.00459 | -0.00905 | -0.00479 |
| | (0.0466) | (0.0379) | (0.0276) | (0.0196) | (0.00785) | (0.0161) | (0.0247) | (0.0351) |
| SEZ | 0.119*** | 0.0827** | -0.00425 | 0.00353 | 0.00139 | 0.00489 | -0.000965 | 0.00641 |
| | (0.0273) | (0.0301) | (0.0120) | (0.0145) | (0.00413) | (0.00980) | (0.0170) | (0.0170) |
| 2016.year | -0.0162 | -0.0113 | -0.00142 | -0.00290 | -0.00350 | -0.00791* | -0.0103 | -0.00923 |
| | (0.0109) | (0.00725) | (0.00505) | (0.00461) | (0.00189) | (0.00341) | (0.00698) | (0.00494) |
| 1.subse | 0.0824* | 0.0552 | -0.0677*** | -0.0917*** | -0.00514 | -0.00843 | Combined with reference group (other sectors) | |
| | (0.0374) | (0.0282) | (0.0128) | (0.0186) | (0.00487) | (0.0122) | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5.subse | -0.113** | -0.123** | -0.0788*** | -0.125*** | 0.0106 | 0.0359 | Dropped | Dropped |
| | (0.0404) | (0.0436) | (0.0132) | (0.0230) | (0.0111) | (0.0266) | (.) | (.) |
| 12.subse | -0.0691 | -0.0651 | -0.0692*** | -0.0981*** | -0.0130* | -0.0468*** | -0.0855*** | -0.184*** |
| | (0.0372) | (0.0424) | (0.0135) | (0.0206) | (0.00506) | (0.0109) | (0.0163) | (0.0255) |
| 14.subse | -0.0110 | -0.0121 | 0.00870 | 0.0301 | -0.0135* | -0.0453** | Dropped | Dropped |
| | (0.0582) | (0.0637) | (0.0301) | (0.0409) | (0.00526) | (0.0138) | (.) | (.) |
| 20.subse | -0.0904* | -0.0740* | -0.0689*** | -0.107*** | -0.0113* | -0.0330 | Dropped | Dropped |
| | (0.0382) | (0.0336) | (0.0141) | (0.0233) | (0.00511) | (0.0179) | (.) | (.) |
| Region | Added | Added | Added | Added | Added | Added | Added | Added |
| Constant | -12.08*** | -2.65*** | -36.26*** | -7.79*** | -52.19*** | -10.37*** | -31.2*** | -3.11*** |
| | (1.7908) | (0.3475) | (5.917) | (1.009) | (9.106) | (1.0052) | (0.5744) | (4.184) |
| N | 3,197 | 3,197 | 2,891 | 2,891 | 3,197 | 3,197 | 2,471 | 2,471 |
| adj. R-sq | Not calculated | | | | | | | |

Note: * p<0.1; ** p<0.05; *** p<0.001. Standard errors in parentheses.

Source: authors' calculations based on ASIP data (2008–16) (URT 2018).

Table 5: Determinants of SME performance in the industrial sector

| Variable | 1.Pooled | 2.FE | 3.Pooled | 4.FE | 5.RE | 6.RE |
|---|---|---|---|---|---|---|
| | lemp_all | lemp_all | lsales | lsales | lsales | lemp_all |
| forward | 0.214*** | -0.0111 | 0.338** | -0.296* | 0.256* | 0.142** |
| | -0.0607 | -0.0495 | -0.113 | -0.14 | -0.117 | -0.0524 |
| backward | 0.229*** | 0.0122 | 0.189 | 0.0465 | 0.193 | 0.197* |
| | -0.0591 | -0.172 | -0.101 | -0.172 | -0.101 | -0.0781 |
| tech1 | 0.0452 | 0.00549 | 0.239*** | -0.0365 | 0.235*** | 0.0506 |
| | -0.0276 | -0.0547 | -0.0513 | -0.087 | -0.0535 | -0.0295 |
| compet | 0.0647 | 0.127 | 0.251*** | 0.152 | 0.232** | 0.0951* |
| | -0.0402 | -0.0987 | -0.0731 | -0.0916 | -0.0783 | -0.0439 |
| association | 0.122*** | 0.0278 | 0.161** | 0.0669 | 0.154* | 0.122*** |
| | -0.0289 | -0.0316 | -0.0564 | -0.143 | -0.0628 | -0.0286 |
| train | 0.123*** | 0.035 | 0.117* | 0.241 | 0.144** | 0.0951** |
| | -0.0284 | -0.0537 | -0.051 | -0.138 | -0.0544 | -0.0311 |
| lva | 0.0794*** | 0.0131 | 0.744*** | 0.691*** | 0.750*** | 0.0606*** |
| | -0.00922 | -0.0104 | -0.0177 | -0.0576 | -0.02 | -0.00885 |
| lK | 0.0372*** | 0.00211 | 0.0729*** | -0.0449 | 0.0592*** | 0.0250*** |
| | -0.00684 | -0.00943 | -0.0144 | -0.0256 | -0.0147 | -0.00648 |
| capacity2 | -0.0399 | -0.0594 | -0.145** | -0.0454 | -0.133** | -0.0603* |
| | -0.0235 | -0.0314 | -0.0468 | -0.111 | -0.0507 | -0.0241 |
| SEZ | -0.124*** | -0.0137 | 0.0438 | -0.0541 | 0.0351 | -0.0569 |
| | -0.0322 | -0.043 | -0.0651 | -0.135 | -0.0685 | -0.0341 |
| private | -0.133* | -0.0368 | -0.116 | -0.455 | -0.15 | -0.0836 |
| | -0.0668 | -0.0672 | -0.112 | -0.381 | -0.133 | -0.0686 |
| mixed | 0.222 | -0.153 | -0.0716 | -0.816* | -0.249 | 0.00721 |
| | -0.235 | -0.0816 | -0.249 | -0.407 | -0.243 | -0.168 |
| foreignown | 0.149* | -0.0177 | 0.00927 | 0.107 | 0.0638 | 0.214*** |
| | -0.062 | -0.0887 | -0.117 | -0.318 | -0.115 | -0.0611 |
| lexper | 0.0254* | -0.0253 | -0.0079 | 0.0128 | -0.00129 | 0.0121 |
| | -0.0111 | -0.0255 | -0.0205 | -0.0754 | -0.0222 | -0.0128 |
| 2016.year | -0.025 | 0.00482 | 0.0219 | 0.009 | 0.0177 | -0.00556 |
| | -0.0213 | -0.0112 | -0.0417 | -0.0344 | -0.0299 | -0.0103 |
| 2.manufact | -0.253*** | Dropped | -0.0719 | Dropped | -0.123 | -0.204** |
| | -0.0422 | | -0.0878 | | -0.102 | -0.0694 |
| 3.electricty | 0.101 | Dropped | 0.957 | Dropped | 0.898 | 0.209 |
| | -0.552 | | -0.54 | | -0.576 | -0.565 |
| 4.water | -0.252** | Dropped | -0.313 | Dropped | -0.384 | -0.121 |
| | -0.0869 | | -0.164 | | -0.196 | -0.112 |
| _cons | 1.799*** | 2.905*** | 3.676*** | 4.904*** | 3.778*** | 2.057*** |
| | -0.132 | -0.176 | -0.266 | -0.748 | -0.3 | -0.136 |
| N | 1,741 | 1,741 | 1,715 | 1,715 | 1,715 | 1,741 |
| adj. R-sq | 0.466 | 0.017 | 0.816 | 0.485 | 0.822 | 0.467 |

Note: * p<0.1; ** p<0.05; *** p<0.001. Standard errors in parentheses.

Source: authors' calculations based on ASIP data (2008–16) (URT 2018).

Table 6: Determinants of linkages using local sales and local purchases as proxies for forward and backward linkages

| Variable | POLS lsold | FE lsold | POLS lpurchase | FE lpurchase |
|---|---|---|---|---|
| shotrawm | -0.0408 | -0.0323 | -0.0287 | -0.104 |
| | (0.0209) | (0.0309) | (0.0549) | (0.162) |
| ltotprod | 0.960*** | 0.956*** | 0.880*** | 0.640*** |
| | (0.00802) | (0.0271) | (0.0205) | (0.0779) |
| train | 0.0408 | 0.108 | 0.0791 | 0.166* |
| | (0.0209) | (0.0878) | (0.0568) | (0.0901) |
| lexper | -0.0172 | -0.0514 | -0.0666* | -0.125* |
| | (0.00914) | (0.0500) | (0.0268) | (0.0691) |
| association | 0.0360 | 0.119 | -0.168** | -0.412 |
| | (0.0247) | (0.122) | (0.0642) | (0.243) |
| capacity2 | -0.0385 | -0.0233 | -0.00958 | -0.111 |
| | (0.0204) | (0.0449) | (0.0568) | (0.0858) |
| foreignown | -0.162* | -0.00829 | -0.565** | 0.594 |
| | (0.0633) | (0.0747) | (0.186) | (0.706) |
| private | 0.0453 | 0.00147 | 0.117 | 0.433* |
| | (0.0466) | (0.0397) | (0.112) | (0.189) |
| SEZ | -0.00803 | -0.00180 | 0.210** | -0.348 |
| | (0.0277) | (0.0441) | (0.0706) | (0.268) |
| 2016.year | -0.0140 | -0.00350 | -0.000553 | 0.0375 |
| | (0.0188) | (0.0124) | (0.0496) | (0.0279) |
| manufacturing | -0.243*** | -0.0685 | 0.134*** | 0.058 |
| | (0.0465) | (0.0546) | (0.182) | (0.495) |
| electricity | -0.0353 | -0.0667 | 0.322** | -0.091 |
| | (0.0763) | (0.117) | (0.467) | (0.765) |
| water | -0.242** | -0.0725 | -0.0755 | 0.468 |
| | (0.0750) | (0.0551) | (0.248) | (0.15) |
| region | Added | Not added | Added | Not added |
| _cons | 0.692*** | 0.436 | -0.737 | 3.116** |
| | (0.141) | (0.336) | (0.379) | (1.111) |
| N | 3,968 | 3,968 | 3,123 | 3,123 |
| adj. R-sq | 0.900 | 0.677 | 0.590 | 0.236 |

Note: * p<0.1; ** p<0.05; *** p<0.001. Standard errors in parentheses.

Source: authors' calculations based on ASIP data (2008–16) (URT 2018).

## Appendix A

Table A1: Summary of empirical studies

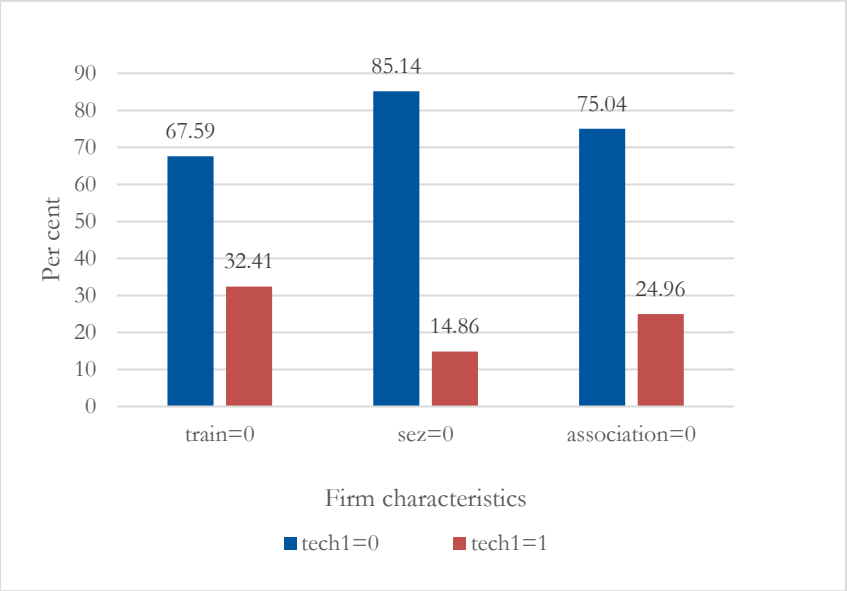
| Author, year, and country of study | Main objective | Method of analysis | Findings |
|---|---|---|---|
| 1. Musundi and Ogollah (2014) in Kenya | To explore the challenges constraining business linkages between SMEs and phone companies in Kenya | Descriptive and content analysis simple regression | SME linkages with mobile telephone companies were limited by small market size, lack of market information (on different linkage opportunities), skills, technology, and finance and high costs incurred when forming linkages. |
| 2. Mohammed and Beshir (2019) in Ethiopia | To determine the basic aspects of business linkages between SMEs and large business in the textile subsector in Kombolcha city | Logit regression model and simple descriptive statistics | SME-large firm linkages were limited mainly because of lacking enough raw materials.<br><br>Education levels, raw materials quantity, technology level, training, and leadership were significant determinants of the linkages, although most firms revealed a weak performance in terms of those factors. |
| 3. Ndemo and Smallbone (2015) in Kenya | To investigate the existence of different types of linkages between large multinational enterprises and SMEs in transition and developing countries while also reporting some results from a research investigation undertaken in Kenya | Qualitative approach, based on a non-random purposive design | Existence of backward linkages with suppliers, which can range from arm's-length market transactions to deep, long-term inter-firm relationships.<br><br>Existence of forward linkages with customers, such as marketing outlets, which may be outsourced, such as petrol stations and restaurant chains.<br><br>Existence of linkages with competitors because foreign investors may set new standards that local firms seek to compete with.<br><br>Linkages with technology partners because some MNCs may initiate common projects with indigenous SME partners, which are important potential sources of technology and know-how for local firms.<br><br>Other spillover effects, including demonstration effects, as inward investors demonstrate new and better ways of doing things to local firms and human capital spillovers, when, for example, trained personnel leave the inward investor to work for a local enterprise and/or set up their own business. |
| 4. Barbin (2017) in Philippines | To gain more insights on how SMEs connect with large firms, the benefits and costs of such linkages, and the obstacles and enabling factors in creating and sustaining linkages with large firms | A structured interview with six SME owners or managers in the owner's absence | All six SMEs had large forward and backward linkages as they supplied and purchased the majority of their output and input to and from large firms, respectively.<br><br>Partnerships and alliances were in the form of subcontracting and licensing agreements.<br><br>Benefits include improved internal processes, increased credibility, reliable quality and quantity of inputs, and reliable source of information. Disadvantages include delayed payments and unfavourable large firm demands.<br><br>Trust, personal networks, and having mutual benefits were important elements for creating and sustaining linkages.<br><br>The government has done little to promote linkages. |
| 5. Francisco and Canare (2018) in the Philippines | To address the lack of empirical analysis of the benefits, costs, extent, usefulness, and obstacles of | Used simple econometric analysis to measure the | Linkages to large businesses were positively associated with SME development in terms of improved market access and innovation. |

| | | | |
|---|---|---|---|
| | SME-large business linkages using data taken from the SME point of view. | extent of linkages; used logit regression to assess the effect of linkages on proxies of SME development (market access, innovation, and access to finance) | Access to finance was not affected by linkages.<br><br>Benefits of SME-large firm linkages were more evident for linkages, which were more formal, such as sub-contracting and outsourcing, than the traditional forward and backward linkages. |
| 6. Okeniyi and Branine (2017) in Ghana | To examine the success and failure factors influencing the formation of alliances between SMEs and large companies in Ghana | Used the case study technique and discussed with the lights of findings from literature (qualitative analysis) | Trust within the alliance was an important factor for policy implementation within the alliance and for resolving problems peacefully.<br><br>Competence of alliance partners, clarity of alliance goals, and commitment through sound negotiations were found to enhance trust among partners in the alliance.<br><br>Exploitation of resources and poor remuneration to employees at low levels of management in the alliance created mistrust among partners in the alliance. |
| 7. Jamieson et al. (2012) in the UK | Studied the prevalence and nature of relationships that exist between SMEs and large businesses | In-depth interviews | The study found that 77 per cent of all firms found themselves to be operating in a supply-chain relationship, although most of them worked independently rather than being in a strategic alliance or formal partnership.<br><br>Formal partnerships were more prevalent among SMEs than between large firms and SMEs as the former partnership led to a relatively more equitable share of the partnerships benefits.<br><br>Fifty-five per cent of SMEs agreed that there were benefits accrued to being associated with large firms and further reported the top three benefits to be improved sales or profit or turnover, improved quality and reputation, and new client retention. |
| 8. Ishengoma and Lokina (2013) in Tanzania | To study the role of linkages in determining informal and small firm performance in the Tanzania construction sector | Used the semi-log regression model | Firms that participated in active linkages (meaning those supplying for organizational clients rather than individual clients and those who had frequent interaction with their clients) had a better turnover performance compared to those that participated in passive linkages (linkages for firms supplying for one client). |
| 9. Atieno (2009) in Kenya | Explored the linkages existing between SMEs in the Kenya clothing sector and financial institutions and analysed their impact on SME access to finance and performance | Used survey data of 322 sampled SMEs and descriptive analysis techniques | There were limited linkages both among SMEs and between SMEs and financial institutions. Linkages occurred in two forms: through savings services and through credit provision services.<br><br>SMEs that were association members formed the majority of the group that applied for credit from commercial banks while the rest obtained credit from micro-finance institutions.<br><br>SMEs linked to financial institutions performed better than those that were not, while SMEs that interacted with financial institutions through savings performed better than those that interacted through loans. |

Source: authors' compilation based on the literature review.

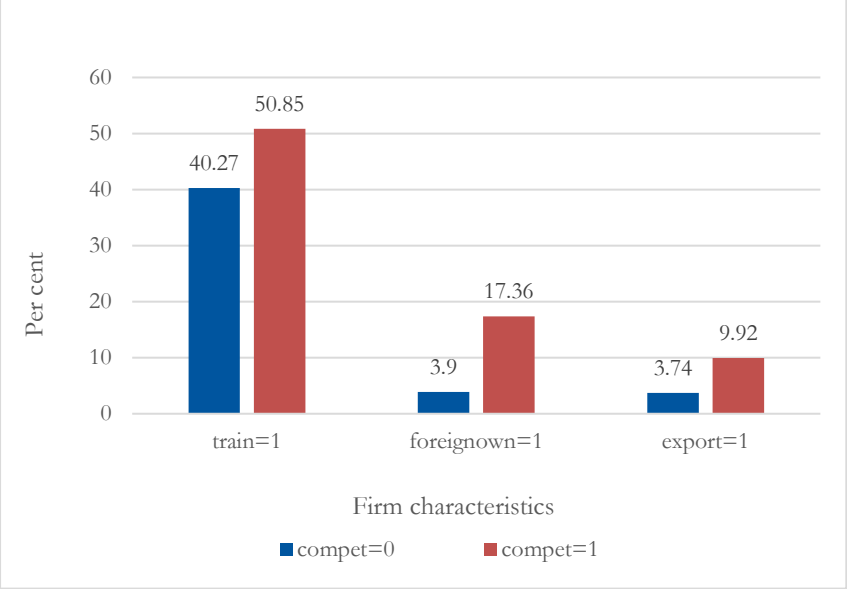
## Appendix B: descriptive statistics

Figure B1: Distribution of firm characteristics across technology linkage participation status



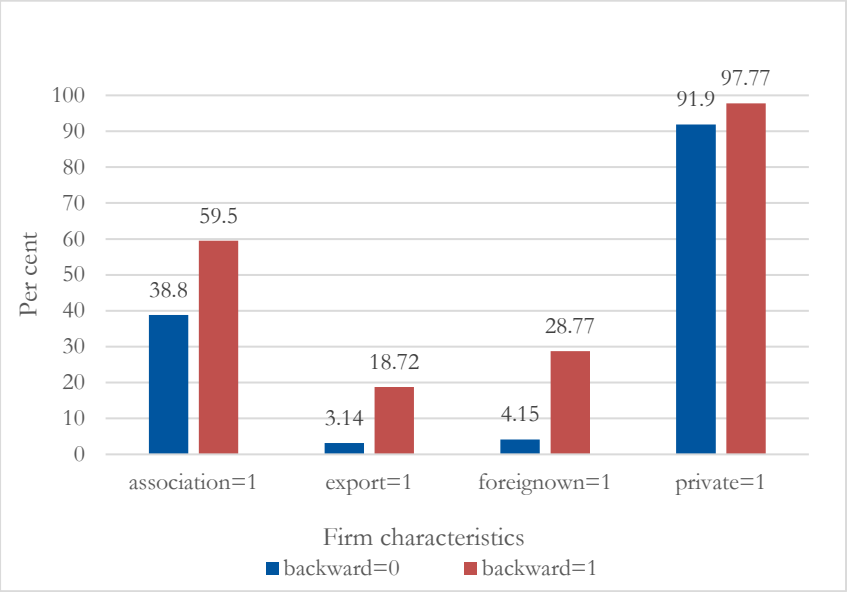

Source: ASIP Data, 2008–16 (URT 2018).

Figure B2: Distribution of firm characteristics across competition linkage participation status




Source: ASIP Data, 2008–16 (URT 2018).

Figure B3: Distribution of firm characteristics across backward linkage participation status




Source: ASIP Data, 2008–16 (URT 2018).

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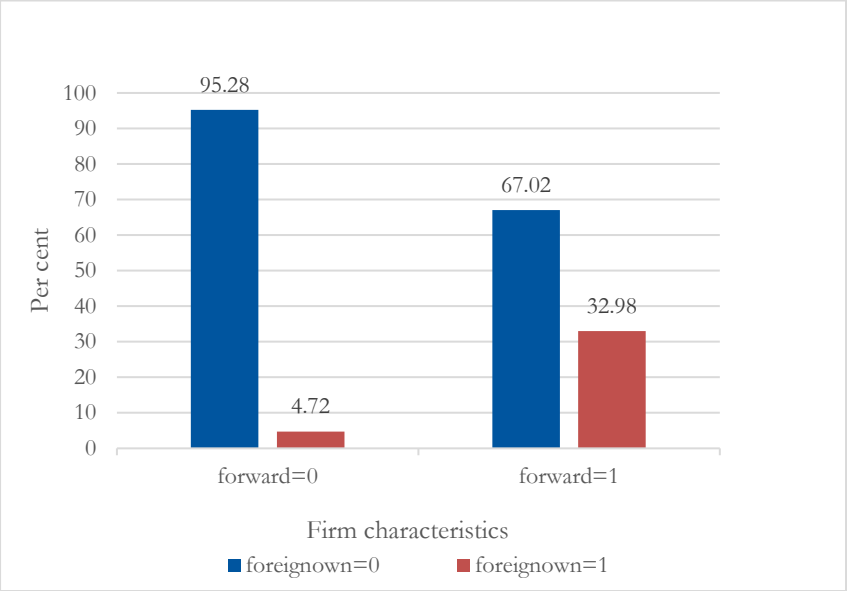
Figure B4: distribution of firm characteristics across forward linkage participation status




Source: ASIP Data, 2008–16 (URT 2018).

## Appendix C

Table C1: Mean production and experience across different types of linkages

| Variable | ltotprod | | lexper | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| forward | 14.82681 | 12.33979 | | |
| backward | 14.58107 | 12.27159 | Not significant | |
| compet | 13.15778 | 12.28065 | | |
| tech1 | 12.86607 | 12.20798 | 2.110385 | 1.781696 |

Source: authors' calculations using ASIP data (URT 2018).

## Appendix D

Table D1: Determinants of SME growth in the industrial sector

| Variable | 1.Pooled lemp_all | 2.FE lemp_all | 3.Pooled lsales | 4.FE lsales | 5.RE lsales | 6.RE lemp_all | 7. FE lsgrwth | 8.RE lempgrth |
|---|---|---|---|---|---|---|---|---|
| forward | 0.214*** | -0.0111 | 0.338** | -0.296* | 0.256* | 0.142** | 0.308 | -0.0326 |
| | -0.0607 | -0.0495 | -0.113 | -0.14 | -0.117 | -0.0524 | (0.217) | (0.0302) |
| backward | 0.229*** | 0.0122 | 0.189 | 0.0465 | 0.193 | 0.197* | 0.0837 | -0.00132 |
| | -0.0591 | -0.172 | -0.101 | -0.172 | -0.101 | -0.0781 | (0.108) | (0.0195) |
| tech1 | 0.0452 | 0.00549 | 0.239*** | -0.0365 | 0.235*** | 0.0506 | Dropped | |
| | -0.0276 | -0.0547 | -0.0513 | -0.087 | -0.0535 | -0.0295 | | |
| compet | 0.0647 | 0.127 | 0.251*** | 0.152 | 0.232** | 0.0951* | 0.0424 | -0.00618 |
| | -0.0402 | -0.0987 | -0.0731 | -0.0916 | -0.0783 | -0.0439 | (0.110) | (0.0135) |
| association | 0.122*** | 0.0278 | 0.161** | 0.0669 | 0.154* | 0.122*** | | |
| | -0.0289 | -0.0316 | -0.0564 | -0.143 | -0.0628 | -0.0286 | Dropped | |
| train | 0.123*** | 0.035 | 0.117* | 0.241 | 0.144** | 0.0951** | | |
| | -0.0284 | -0.0537 | -0.051 | -0.138 | -0.0544 | -0.0311 | | |
| lva | 0.0794*** | 0.0131 | 0.744*** | 0.691*** | 0.750*** | 0.06*** | 0.609*** | 0.0147*** |
| | -0.00922 | -0.0104 | -0.0177 | -0.0576 | -0.02 | -0.00885 | (0.0320) | (0.0033) |
| lk | 0.0372*** | 0.00211 | 0.0729*** | -0.0449 | 0.0592*** | 0.0250*** | Dropped | |
| | -0.00684 | -0.00943 | -0.0144 | -0.0256 | -0.0147 | -0.00648 | | |
| capacity2 | -0.0399 | -0.0594 | -0.145** | -0.0454 | -0.133** | -0.0603* | -0.0453 | 0.00259 |
| | -0.0235 | -0.0314 | -0.0468 | -0.111 | -0.0507 | -0.0241 | (0.109) | (0.0149) |
| SEZ | -0.124*** | -0.0137 | 0.0438 | -0.0541 | 0.0351 | -0.0569 | Dropped | |
| | -0.0322 | -0.043 | -0.0651 | -0.135 | -0.0685 | -0.0341 | | |
| private | -0.133* | -0.0368 | -0.116 | -0.455 | -0.15 | -0.0836 | 0.314* | 0.00597 |
| | -0.0668 | -0.0672 | -0.112 | -0.381 | -0.133 | -0.0686 | (0.155) | (0.0252) |
| mixed | 0.222 | -0.153 | -0.0716 | -0.816* | -0.249 | 0.00721 | 0.126 | -0.117 |
| | -0.235 | -0.0816 | -0.249 | -0.407 | -0.243 | -0.168 | -0.401 | -0.091 |
| foreignown | 0.149* | -0.0177 | 0.00927 | 0.107 | 0.0638 | 0.214*** | 0.115 | 0.0225 |
| | -0.062 | -0.0887 | -0.117 | -0.318 | -0.115 | -0.0611 | (0.150) | (0.0183) |
| lexper | 0.0254* | -0.0253 | -0.0079 | 0.0128 | -0.00129 | 0.0121 | 0.0542 | -0.016*** |
| | -0.0111 | -0.0255 | -0.0205 | -0.0754 | -0.0222 | -0.0128 | (0.0413) | (0.00462) |
| 2016.year | -0.025 | 0.00482 | 0.0219 | 0.009 | 0.0177 | -0.00556 | 0.142 | -0.0396 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -0.0213 | -0.0112 | -0.0417 | -0.0344 | -0.0299 | -0.0103 | (0.123) | (0.0303) |
| 2.manufact | -0.253*** | Dropped | -0.0719 | Dropped | -0.123 | -0.204** | 0.291 | -0.0236 |
| | -0.0422 | | -0.0878 | | -0.102 | -0.0694 | (0.492) | (0.0178) |
| 3.electricty | 0.101 | Dropped | 0.957 | Dropped | 0.898 | 0.209 | 0.342 | 0.0258 |
| | -0.552 | | -0.54 | | -0.576 | -0.565 | (0.491) | (0.0663) |
| 4.water | -0.252** | Dropped | -0.313 | Dropped | -0.384 | -0.121 | 0.504 | -0.0126 |
| | -0.0869 | | -0.164 | | -0.196 | -0.112 | (0.592) | (0.0283) |
| _cons | 1.799*** | 2.905*** | 3.676*** | 4.904*** | 3.778*** | 2.057*** | -7.828*** | 0.0178 |
| | -0.132 | -0.176 | -0.266 | -0.748 | -0.3 | -0.136 | (0.625) | (0.0630) |
| adj. R-sq | 0.466 | 0.017 | 0.816 | 0.485 | 0.822 | 0.467 | 0.12 | 0.09 |

Note: standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.001

Source: authors' calculations based on ASIP data (URT 2018).