Determinants of Informal Employment: A Case of Tanzania Construction Industry

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May, 2014

Abstract

This paper analyses the determinants of informal employment in Tanzania's construction industry. A Logit regression model is employed in estimating factors that influence the choice of type of employment (formal versus informal) for micro and small entrepreneurs. The results reveal that higher earnings in the informal compared to the formal settings – given the professional status of the micro and small practitioners – is among the major reasons for workers in this industry to choose informal rather than formal employment. The other factors that contribute to choosing informal employment include; lack of capital, which deters micro and small entrepreneurs from starting large formal firms, and low education. For firms, the possibility of paying the workers low salaries, and being female are factors that increase the possibility of informal employment. Policies suggested that can enhance creation of decent employment are; improving financial services through risk mitigation, credit information dissemination and outreach to MSEs; enhancing and rationalizing earnings in the economy; and improving the quantity and quality of education as an enabling instrument.

Key words: *informal employment, logit, construction, workers*

JEL Classification: E24, J21, M51

[1] The authors would like to thank the four anonymous reviewers for providing very useful comments and suggestions, which helped to improve the paper. The authors are also deeply indebted to the International Development Research Centre (IDRC), for providing funding for the research, and all the participants to the research workshop that was held in Entebbe (January 22nd to 23rd, 2014), for their useful suggestions.

Electronic copy available at: http://ssrn.com/abstract=2706021

1. Introduction

Informal employment is a type of employment that is not bound by formal contractual arrangements. An alternative definition uses job security as a measure of formality, defining participants in informal employment as those who do not have employment or work security, and thus go without social security (Lewis, 1955). Both definitions imply lack of choice for involvement in employment in the informal economy especially in the developing world[2]. However, participation in informal employment may also be driven by a wish to avoid regulations or taxation. It is important to note from the outset that although informal employment is largely an *informal economy*[3] phenomenon, it is also manifested in some formal organizations of developing countries, including Tanzania.

The rationale of informal economy as a mainstay of informal employment has been viewed in two major perspectives regarding its position in the national policies of developing countries: the first relates to those who believe that the informal economy is an important driver of income and growth, and hence it deserves due support. The second relates to those who associate the informal economy with economic disorganization, and thus it does not deserve support, but instead, requires reorganization to formalize it. The growth of informal economy activities has been due to the fact that many informal workers find their activities the major means for survival, and for some formal workers, informal economic activities are necessary for supplementing their earnings.

The informal economy is estimated to account for 42% of Gross Domestic Product (GDP) in sub-Saharan Africa (SSA), and specifically 34% of the national economy in Tanzania (Becker, 2004; and Economic and Social Research Foundation (ESRF), 2011). According to the International Labour Organization (ILO) (2013), the informal economy comprises half to three-quarters of all non-agricultural employment in developing countries. Some of the characteristic features of informal employment are lack of protection in the event of non-payment of wages, compulsory overtime or extra shifts, lay-offs without notice or compensation, unsafe working conditions and the absence of social benefits such as pensions, sick pay, leave and health insurance. Women, migrants and other vulnerable groups of workers who are excluded from other opportunities have little choice but to take informal low-quality jobs. In view of this, the informal economy has remained a useful concept to activists, policymakers and researchers since a large share of employment and income is outside the regulated formal economy (Chen, 2007).

[2]Parallel with growth of the informal sector in many countries, an increase in various forms of informal employment has happened. The concept of informal employment is relevant to developing, transition, and developed countries. From a broader context of informal employment, the question of informal sector is of limited relevance since informal employment can be attributed to globalization of economic processes and so can include employment of not only in the informal but also some of the formal and regulated sector's employment. Various forms of sub-contracting of workers render employment an informal status, especially where people would judge employment as alternative, atypical, non-standard, irregular and precarious or unsecure. A conceptual framework for defining informal employment was proposed in the ILO' report on '*Decent Work and the Informal Economy*' *(*Hussmans, 2001; ILO, 2002*)*. The conceptual framework retains informal employment as a terminology distinct from informal sector employment, albeit the two being closely related. *Informal sector employment* comes from disaggregation of jobs in terms of type of production units while *informal employment* disaggregates jobs in terms of underlying characteristics of particular employment regardless of the production unit where these jobs are created.

[3] The term *informal economy* is used interchangeably with *informal sector*. The context of informal sector was originally adopted by Lewis in 1950s but it has increasingly been replaced by informal economy in the recent literature.

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The informal economy exhibits a high degree of vibrancy in job creation in Tanzania. However, it is faced with a number of constraints and suffers from poor labour productivity and use of low technology or rudimentary tools. The reason for this is that informal economy organizations in the country, like elsewhere in SSA, are basically micro and small enterprises (MSEs). Nevertheless, the Integrated Labour Force Survey (ILFS) of 2006 shows that the informal economy in Tanzania is expanding rather than contracting (National Bureau of Statistics (NBS), 2007). For example, the proportion of all households in Tanzania mainland with informal sector activities increased from 35% in 2001 to 40% in 2006. Among the lingering questions so far are: why is the formalization process slow? What spurs informal employment? Using a case study of construction industry in Tanzania, this paper investigates the determinants of informal employment. The construction industry is chosen because it is one of the fastest emerging and growing sectors with a significant number of informal workers.

Tanzania's construction sector is currently experiencing high growth, primarily driven by recent developments in road construction, housing and mining industries. The growth rate of the construction sector increased from 0.8% in 2000 to 9% in 2011. Its contribution to GDP rose from 5% to 8% during the same period. While employment in road works and mining construction activities is largely formal, it is informal in the housing sector, save for large corporate constructions. Residential construction activities are regularly done informally, and substantial sub-contracting of informal contractors occurs in formally contracted projects. This study uses primary data which was collected in six most vibrant urban centres in Tanzania, namely Dar es Salaam, Mwanza, Arusha, Tanga, Mbeya and Dodoma.

The rest of the paper is organized as follows; after an introductory section, Section 2 gives an overview of informal employment status in Tanzania. Section 3 contains a literature review, and Section 4 gives an overview of empirical work on informal employment. The methodology is described in Section 5. Section 6 describes the data used for estimation and discusses the results, as well as provides analyses and technical interpretations. The conclusion and some policy implications are discussed in Section 7.

2. Overview of informal employment situation in Tanzania

Labour participation rate in this paper's view conforms to that of the ILFS of 2006[4], which takes the age of 15 years and above as the active age in the labour market in Tanzania (NBS, 2007). The employment context adopted in this overview is based on the national definition of employment, which excludes all persons who were temporarily absent from work during the reference period. Moreover, people who were working but whose work was not reliable with regard to its availability and adequacy in terms of hours were considered unemployed (NBS, 2007). This definition is different from the standard international definition of employment, which refers to people who worked for at least one hour in the reference period.

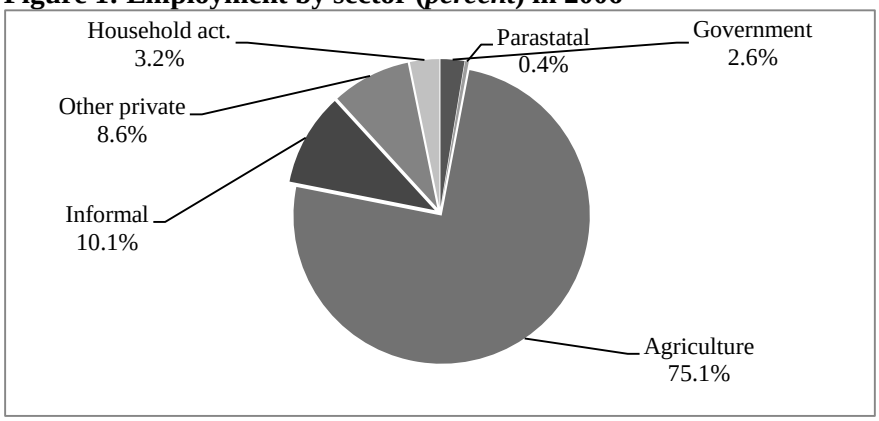
2.1 Size of informal employment in Tanzania

Official statistics from the ILFS show that about 40% of all non-agriculture sector workers in Tanzania are engaged in informal sector employment, which is offered largely by MSEs. The group of workers in this category is informally or casually employed, and in addition, a good number of employees engaged in the formal sector have an "informal" status. This

[4]The ILFS of 2006 is the latest available and most reliable source of labour and employment statistics in the Tanzania. It is indeed far behind the current developments.

observation is in tandem with the stylized argument that in developing countries, about half to three-quarters of the employees are informally engaged (Figure 1).

Figure 1: Employment by sector (*percent*) in 2006



Source: (NBS, 2007).

The ILFS explored reasons why a large proportion of workers were in informal employment, and the leading two causes were: (i) lack of formal employment; and (ii) a need for additional income to supplement insufficient earnings from formal employment. From this study's survey, there is evidence that a wide range of activities in the construction industry of Tanzania is informally done. The reasons why firms may opt to employ informally rather than formally point out additional causes of informal employment, which are: (i) lack of sufficient capital to establish large formal firms; (ii) hassles of tax laws; and (iii) low knowledge about procedures and requirements for formalization of micro and small enterprises.

2.2 Tanzania's policy view of informal economy

The current Employment Policy of Tanzania, which was drafted in 2008 as a revision of the previous National Employment Policy of 1997, states its main objective as increasing employment opportunities. This would lead to poverty reduction by creating an enabling environment for all stakeholders to participate fully in human capital development and decent employment promotion. The national employment policy acknowledges, among other things, that Tanzania has to: (i) put in place measures that will ensure the pattern of economic growth is made more employment-intensive and pro-poor; (ii) increase formal jobs because formal paid employment opportunities are increasing at a far lower rate than the rate at which the actual demand for those jobs is growing; and (iii) transform the informal sector so that it provides decent employment and increased labour productivity in the economy.

Other important policies in which creation and formalization of employment have been mainstreamed include: national youth development policy, 2007; sustainable industrial development policy, (1996 – 2020); national population policy (1992, reviewed in 2006); policy on women in development in Tanzania, 1992; and construction industry policy, 2003. In all these policies, there are some statements emphasizing the transformation of the informal sector into formal to enhance decent employment, *inter alia*. Overall, government policy is clear in that it does not support informal sector employment but strives to achieve formalization for some reasons comprising, among others, tapping the tax potential of the informal economy. Nevertheless, a question that most analysts and researchers worry about is on strengths and weaknesses of existing policies and the missing link, given that the

transformation process is slow, and at the same time, creation of jobs is increasing faster in the informal economy than in the formal economy.

2.3 General role of informal sector employment

In the literature, the informal economy, which creates informal employment in developing countries may be good or bad for economic performance. Resolving the dilemma around the relevance of the informal sector would generate a solution to another dilemma as to whether expanding or contracting the informal sector will provide a positive gain to the economy as a whole. While private benefits of informal employment may not be reduced by the informal settings, the fiscal dividend of growth of informal employment is compromised by tax avoidance or evasion. Although there can be a substantial difference in significance of the informal economy and its employment between developed and developing countries, some studies of the informal sector in developing countries underline its merits and demerits from economic, social and political dimensions (Tanzi, 1982; Harding and Jenkins 1989; Portes *et. al*., 1989; Feige, 1989; Renooy, 1990). Although these advantages and disadvantages cut across countries, they are different in their magnitude from one country to the other. A key message to researchers in this subject is that when evaluating the informal economy, a critical look at its economic, social and political contributions is necessary if one wants to establish its net impact to the whole economy[5] (Portes, *et. al*., 1989; Harding and Jenkins, 1989).

3. Context and theoretical perspectives

Informal employment in developing countries is in both formal and informal sectors, though it is fundamentally a phenomenon of the informal sector. Most studies adopt Harding and Jenkins' (1989) criteria to define the informal sector and hence informal employment. The institutional patterns that shape the informal sector comprise political, economic and social scopes. Whether in developing or developed countries, the formal-informal employment dividing factors are similar; some of them being social in nature (Breman, 1980). In Tanzania and in the construction sector in particular, most residential buildings in the booming cities are constructed informally and without government regulations. This explains why a number of areas in the cities have turned into slums as they have been developed without prior surveying and planning. There have been several cases of buildings collapsing due to sub-standard quality of work emanating from lack of enforcement of regulations. The illegality of activities has a reasonable weight in characterizing Tanzania's construction industry and its employment. This is because construction takes place in some reserved public places, and the demolishing of such buildings has usually been evident especially when roads and other infrastructure developments are done. Of course such buildings would have been situated in the wrong places for a number of years.

From an economic view, informal activities are a sum of all economic engagements, excluding those outside the regulated and legally recognized sector. The sub-criteria used in economic context of informal employment are several, but this study only identifies the most critical criteria that are closely related to informal employment for the sake of specificity and

[5]This study does not seek to resolve the dichotomy between formal and informal sectors, and as to whether the informal sector is a useful concept in terms of its economic benefits. Rather, it takes a positive view that already exists of employing a reasonable amount of workforce. The interest is not to resolve this dichotomy – probably prematurely – but in the dynamics that bolster employment in the informal sector, including a focus on informal employment that takes place in the formal sector. The approach adopted is disaggregation of jobs by their characteristics rather than sectoral distinctions.

focus. From the ILO's point of view, which is underpinned by Harding and Jenkins (1989) and Renooy (1990), the economic sub-criteria of interest include: (i) labour market or status of labour; (ii) professional status; and (iii) national statistics and tax evasion.

On *status of labour*, if the market is characterized by undeclared wages or salaries entitlements, absence of social benefits, inappropriate working conditions, and other organizational difficulties due to being outside formal settings, its employment is regarded as informal. In the booming construction sector of Tanzania, a large number of active workers who do manual work do so without safety tools, are under-paid, and have no social security or hardship allowances. Regarding *professional status*, wage employees and non-wage employees are distinguished, with a view that wage employees are in the formal category, while non-wage are in the informal category. While in developed countries it can sound absurd for a formal entity to hire some workers informally, in the construction industry of Tanzania for example, there are cases of formally licensed firms operating informally, and thus employ some of the wage workers informally. The other aspect of professional status is about self-employment which is ideally considered informal (Hart, 1973). In Tanzania, those engaged in constructing residential buildings are largely self-employed and some of them use unremunerated family workers or servants entitled to very low wages. The *national statistics and tax evasion* context regards the informal sector as all economic activities hidden from statistical systems, either to avoid reporting altogether or to under-report information (Feige, 1989). In Tanzania, employment in the construction industry is not entirely transparent to records and thus can be regarded as either hiding or under-reporting to evade tax.

The conceptual framework for describing informal employment suggests that jobs rather than persons should be used to assess informality. The reason is that a person can hold two or more jobs and among those, one or more can be informal. According to the ILO (2003), the conceptual framework of informal employment disaggregates total employment according to two dimensions: type of production unit; and type of a job as given in Table 1.

Table 1: Conceptual framework of informal employment

Production units by type	**Jobs by status in employment**								
	Own-account workers		Employers		Employers Contributing family	Employees		Members of producers' cooperatives	
	Informal	*Formal*	*Informal*	*Formal*	*Informal*	*Informal*	*Formal*	*Informal*	*Formal*
Formal sector enterprises					1	2			
Informal sector enterprises (*a*)	3		4		5	6	7	8	
Households (*b*)	9					10			

Source: ILO (2003).

Notes on rows denoted (a) and (b):

(a) As defined by the Fifteenth International Conference of Labour Statisticians (excluding households employing paid domestic workers).

(b) Households producing goods exclusively for their own final use and households employing paid domestic workers.

The dark grey cells in the table refer to jobs that, by definition, do not exist in the type of production unit in question while the light grey cells refer to formal jobs. Un-shaded cells represent the various types of informal jobs. Definitions by cells of the framework are as follows:

Cells 1 and 5: Contributing family workers: no contract of employment and no legal or social protection arising from the job, in formal sector enterprises (Cell 1) or informal sector enterprises (Cell5).
Cells 2, 6 and 10: Employees holding informal jobs, whether employed by formal sector enterprises (Cell 2), informal sector enterprises (Cell 6) or as paid domestic workers by households (Cell 10).
Cells 3 and 4: Own-account workers (Cell 3) and employers (Cell 4) employed in their own informal sector enterprises.
Cell 7: Employees holding formal jobs in the informal sector enterprises.
Cell 8: Members of informal producers' cooperatives. The informal nature of their jobs follows directly from the characteristics of the producers' cooperative.
Cell 9: Own-account workers engaged in the production of goods exclusively for own final use by their household (e.g. subsistence farming).

In developing countries, the debate on the informal sector has been mainly conceptual, while in industrialised countries it has been methodological, focusing principally on measurement techniques. The disagreement in developing countries is over what the informal sector comprises. Therefore, its employment distinction is difficult to make, although there is agreement over what to call it. In contrast, for advanced countries there is general agreement over what it is but no agreement on what to call it. Thus, it is referred to as employment. This is why several terms evolved to describe production which escapes taxation and/or GDP estimates, like informal, parallel, black, shadow, underground, unrecorded, irregular, hidden, subterranean economy (Bernabè, 2002).

The informal sector debate which dominated much of the 1970s and 1980s took a *duality approach* that focused on the informal-formal sector relationship. This approach distinguishes between two urban economies: (i) the *poor* where workers are informally employed; and (ii) *the rich* where workers are formally employed. The second strand was the critic of the first view, which dominated most of the late 1980s and 1990s especially in Latin America. It looked at both the poor-informally employed and the rich-formally employed as two sides of the same phenomenon which reinforce each other (de Soto, 1989; Moser, 1994; Weeks, 1975); Mazumdar, 1976); and Roberts, 1990). If we consider characteristics of informal employment in Tanzania and other developing countries, aspects of labour belong both of these categories (Allen, 1998; Birkbeck, 1979; Bromley and Gerry, 1979; Moser, 1994; Portes, 1978; Portes, *et. al.*, 1989).

4. Empirical perspectives

According to Yamada (1996) the central question is whether individuals choose to work in the informal sector to earn competitive incomes and obtain returns to their entrepreneurial abilities or they opt to work in the sector as the only alternative at their disposal. Using data from Lima and Peru for 1985, 1986 and 1990, Yamada tested the basic hypothesis that people self-select themselves to informal jobs in the urban areas by choice. This understanding contrasts sharply with the alternative popular view that informal sector employment is an involuntary and transitory option that provides meagre incomes. The results from the study generally support the hypothesis of voluntary self-selection and higher earnings in informal self-employment. There are other studies that have been done in the developing countries which show that informal employment may be a desirable job choice (Maloney, 1999; Marcoullier *et al*., 1997; Pradhan and van Soest, 1997). These views are insightful for this study as there might be a good number of people opting to work informally who could also be

employable formally but chose to employ themselves in the informal sector to either earn more, escape the tax net, or for any other reasons.

Kay (2011) used the South African Statistics definition to explain informal employment as

> "… economic activity that occurs outside the purview of state regulation and … originating from a business or firm that *is not* registered with the state" (p.1).

Kay attempted to establish the relationship between formal and informal employment in South Africa. This study did not make strong conclusions on the determinants of informal sector and its employment in South Africa but identified heterogeneous sub-sectors within the informal sector of the country. This reflects the case of Tanzania in terms of heterogeneity, but the study seems to have left a vacuum on the causes of informality. Kay's approach is narrow in that it is limited to only registration and regulation aspects of informality.

Stoevska (2012) analyses a case of Jordan and highlights factors spurring informal employment in the country including: loss of jobs; and decreased earnings (where former wage workers, unemployed and underemployed seek work in the informal economy especially after job crises). There is also an indication that growth led to increasing vulnerability, job insecurity and inequality. This is a kind of growth that has been referred to as "immiserizing", which comes with offsetting negative effects especially to the poor. Stoevska indicates that in Jordan, informal employment evolves as a survival strategy following lack of formal jobs, obstacles to employment in the formal sector, and a need to supplement family income, among others.

Different studies have found some key determinants of informal employment. Rodman's (2007) study on employment and shared growth in North Africa and Middle East found that lack of formal employment and government controls, including tax hassles, increased informal employment. Owing to a shortage of well-paying decent jobs, low incomes contributed to employees being pushed to accepting informal employment. A World Bank (1999) private sector assessment for Morocco also found fiscal restraints (including taxes) as one of the factors that enhanced informality of jobs. Other determinants of informal employment especially in the Middle East and North Africa are discussed in Diego and Tanabe (2012), and they include education (taken a proxy for human capital), and gender. Education was found to be negatively related to informal employment, and women's pay was found to be lower than that of men. This motivated employers to recruit more women than men for low salary jobs both in the formal and informal sectors.

While there has been an argument that some workers move to informal employment to earn more than they could get from the formal sector, this is not always the case. The experience of Serbia shows that some employees engage in informal employment only as a last resort due to earnings that are relatively lower compared to what they could otherwise earn in formal employment (Krstić and Sanfey, 2010).

Even though most studies done in Tanzania on informal employment do not focus on the construction sector as a case study, one study by Milinga and Lema (2002) analysed informal contractors focussing on their characteristics and reasons for informality. The study used the National Informal Sector Survey (NISS) of 1991, the Dar-es-Salaam Informal Sector Survey (DISS) of 1995, and a Study on Tanzania Informal Contractors (STIC) 1999/2000. They examined why contractors would not register with the Contractors Registration Board (CRB)

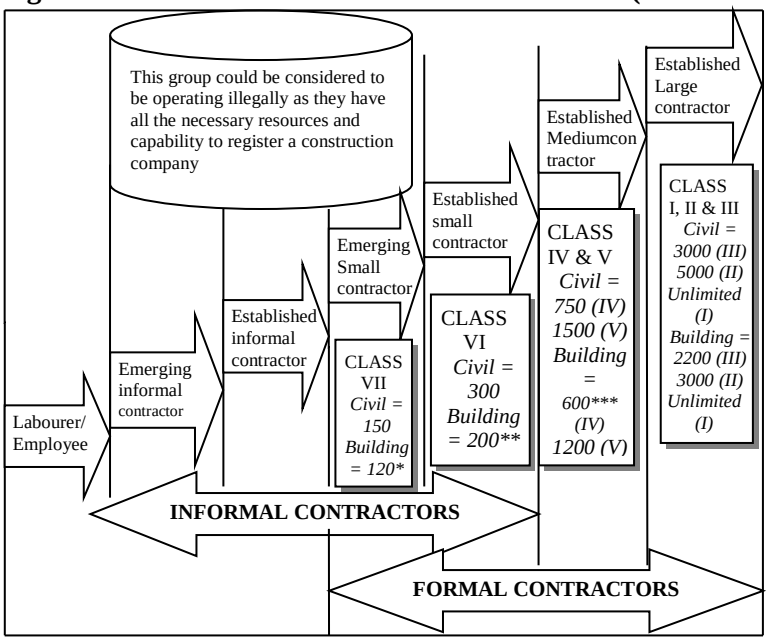
and instead employ and operate informally. The reasons they found include, among others, existence of possibilities to operate without registration, high cost of registration dynamics, and difficult requirements.

Mlinga and Lema explain that there is strong collaboration between formal and informal constructors in Tanzania (i.e., reinforcement theory holds) and recommend that this has to be nurtured to enhance transfer of technology to the informal sector so as to increase employment opportunities. They judiciously note that,

> "Any meaningful development programmes for construction industry should also aim at developing this important but usually ignored sector" (p.9).

Concerning cost of the formalization process in Tanzania, currently, the registration fees have been adjusting downwards over time from the cross-cutting amount of Tsh. 2.5 million (equivalent to US$ 1,700) reported by Mlinga and Lema during the 1990s and early 2000s. The adjustments are according to the relative size of the enterprises. Nonetheless, there are annual contributions to the CRB (excluding income tax) which can in a way hinder registration for some informal construction firms. Figure 2 shows the CRB requirements, and in this framework, this study looks at civil and building sub-sectors ceilings that projects are supposed to observe.

Figure 2: Framework for contractor classification (Civil & Building – Value in Million Tsh.)



* Class Seven not allowed to build storey building.
** Class Six are restricted to 3 storeys structures.
*** Class Five are restricted to 4 storeys structures.
Source: Contractors Registration Board (2013).

Figure 2 shows that emerging and small informal contractors take small projects. If they register a bid for higher values while in class IV, their values should not exceed Tsh. 120 million (equivalent to US$ 75,472) and Tsh. 150 million (equivalent to US$ 90,340) for building and civil construction categories, respectively. But as Mlinga and Lema put it, some of the informal contractors undertake a number of projects worth far more values than the required ceilings. This simply means that even the interface between formal and informal sectors is not clear-cut.

5. Modelling workers choice between formal and informal employment

The study adopts a conventional approach to model employment participation decision based on earnings and other individual characteristics, since an individual engages in either formal or informal employment depending on his/her characteristics. We model determinants of informal employment using a multivariate logit regression model, a variant of probabilistic statistical model (Balakrishnan, 1991; Hosmer and Lemeshow, 2000; Agresti, 2002; Green, 2003). It is a model that can be applied to predict the probabilities of employees to take either of the two types of employment given a set of independent variables (i.e., employees' characteristics).

The model specification is based on Green (2003). The logic behind this model is to construct a linear predictor function that can make a score from a set of weights that are linearly combined with the explanatory variables of a given observation using a dot product, as in equation (1);

1) $$score(\boldsymbol{X}_i, k) = (\boldsymbol{\beta}_k \cdot \boldsymbol{X}_i).$$

$\mathbf{X}_i$ denotes a vector of explanatory variables (or features) describing observation i (an employee in this case), $\boldsymbol{\beta}_k$ is a vector of weights (or regression coefficients) corresponding to outcome k (type of employment in this case), and score ($\mathbf{X}_i$, k) is the score associated with assigning individual i to category of employment k[6].

The explanatory variables and employment outcomes represent observed properties of the data points (employees), which imply they originate from the observations of N individuals in the labour market. While the choice options are two, the strength of the model is that it allows plugging in any alternative number of explanatory features (in different forms) to ascertain their influence on the two employment outcomes. Multivariate logistic regression uses a linear predictor function $f(k, i)$ to calculate the probability that employee i has employment outcome k, of the following form;

2) $$f(k, i) = \beta_{0,k} + \beta_{1,k} \cdot x_{1,i} + \beta_{2,k} \cdot x_{2,i} + \cdots + \beta_{M,k} \cdot x_{M,i}.$$

In equation (2), $x_{M,i}$ represents m^{th} explanatory variable for employee i, while $\beta_{M,k}$ defines a regression coefficient associated with the m^{th} explanatory variable and the k^{th} employment outcome. Usually the regression coefficients and explanatory variables are grouped into vectors of size $M+1$, to have the predictor function written compactly as,

3) $$f(k, i) = \boldsymbol{\beta}_k \cdot \boldsymbol{X}_i.$$

In this specification, $\boldsymbol{\beta}_k$ is the set of regression coefficients associated with employment outcome k, and $\mathbf{X_i}$ is a row vector of the set of explanatory variables associated with employee i. There are two main ways that the logit model can be specified, and it is as follows:

[6]In discrete choice theory, where observations represent people and outcomes represent choices like this, the score is considered the gain associated with person i choosing employment k. The predicted outcome or choice of work is the one with the highest score.

(i) *Set of independent linear binary regressions*. This formulation takes simple log-linear form of predictors. This is the approach adopted in this study since it is simple and suffices the need of identifying employment selection features.
(ii) *Latent-variable model*. It is usually used because it is easy to compare logistic regression with the related probit model, and also to extend simple logistic regression model to more complex models. Since this is not the objective in this study, it is ruled out.

5.1 As a generalized linear model

The rationale for taking the natural log of the probabilities is to transform the variable to meet the continuous criterion, and since it also has the practical effect of converting the probability (which is bounded to be between 0 and 1) to a variable that can range from $-\infty$ to $+\infty$. Thus,

4) $\text{Logit}\left(E[Y_i|X_{1,i}, \dots X_{m,i}\right) = \text{logit}(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \beta_{0,k} + \beta_{1,k} \cdot x_{1,i} + \beta_{2,k} \cdot x_{2,i} + \dots + \beta_{M,k} \cdot x_{M,i}.$

Equation (4) can be written more compactly as,

5) $\text{Logit}(E[Y_i|\boldsymbol{X_i}) = \text{logit}(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \boldsymbol{\beta}_k \cdot \boldsymbol{X}_i.$

The formulation in equation (5) expresses logit regression as a generalized linear model. It predicts variables with various types of probability distributions by fitting a linear predictor function of the above form in an arbitrary transformation of the expected value of the variable. Both the probabilities and the regression coefficients are unobserved, and they are determined by the model.

5.2 As a log linear model

Instead of writing the logit of the probabilities p_i as a linear predictor, a more practical formulation is adopted. It is one of the standard specifications borrowed from the multinomial logit, which takes a combination of the generalized linear model and "the two-way latent variable" specification.

There is a simple way to arrive at the log linear multivariate logit model for estimation of employment selection between formal and informal jobs. This involves coming up with possible employment decisions or outcomes, running *K*-1 independent binary logit regressions for *K* (*K* = 2 in this logit case), in which one outcome is chosen as a pivot and then the other employment outcome is separately regressed against the pivot employment outcome. If employment outcome *2* (the last one) is chosen as the pivot for example, then:

6) $\ln\frac{Pr(Y_i=1)}{Pr(Y_i=2)} = \boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i.$

By exponentiating both sides and then solving for the probabilities, we get;

7) $Pr(Y_i = 1) = Pr(Y_i = 2)e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i}.$

The sum of the two probabilities of choice of formal or informal categories of employment has to be 1. Solving for the probability of second choice (informal employment) gives,

8) $$Pr(Y_i = 2) = \frac{1}{1+e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i}}.$$

By the same token, the probability of formal employment selections can be specified as:

9) $$Pr(Y_i = 1) = \frac{1}{1+e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}}.$$

5.3 Estimating the parameters

The unknown parameters in each vector are $\boldsymbol{\beta}_k$ which are jointly estimated by maximum a posteriori (MAP) estimation (an extension of maximum likelihood through regularizing the weights to avoid extreme solutions). The solution is typically found using an iterative procedure such as iteratively reweighted least squares (IRLS). The logarithm of the probability of seeing a given employment choice is modelled using the linear predictor as well as an additional normalization factor, call it Z. An additional term, –lnZ, is needed to enter the separate probability estimations to ensure the whole set of probabilities forms a probability distribution such that they all sum to one, as the theory requires,

10) $$\sum_{k=1}^{K=2} Pr(Y_i = k) = 1\,.$$

The normalization term is additive rather than the usual multiplicative factor. The logarithm of the probabilities is taken to give;

11) $$\begin{cases} \ln Pr(Y_i = 1) = \boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i - Z, \\ \ln Pr(Y_i = 2) = \boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i - Z, \end{cases}$$

Exponentiating both sides turns the additive term into a multiplicative factor, and in this process, it shows why the term is written in the form of –lnZ rather than simply +lnZ. Exponentially, expressions in the system of equations in equation (9) are transformed into,

12) $$\begin{cases} Pr(Y_i = 1) = \frac{1}{Z} e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} \\ Pr(Y_i = 2) = \frac{1}{Z} e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i} \end{cases}$$

The value of Z is computed by applying the constraint that requires the sum of all probabilities to be equal to 1:

13) $$1 = \sum_{k=1}^{K=2} Pr(Y_i = k) = \frac{1}{Z}\left(e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} + e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}\right)$$

Solving for Z gives,

14) $Z = \sum_{k=1}^{K=2} e^{\beta_k \cdot X_i} = e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} + e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}$.

Substituting equation (14) in (12), the probabilities equations resulting from these manipulations are:

15) $\begin{cases} Pr(Y_i = 1) = \frac{e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i}}{e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} + e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}} \\ Pr(Y_i = 2) = \frac{e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}}{e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} + e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}} \end{cases}$

The general form is specified as,

16) $Pr(Y_i = r) = \frac{e^{\boldsymbol{\beta}_r \cdot \boldsymbol{X}_i}}{e^{\boldsymbol{\beta}_1 \cdot \boldsymbol{X}_i} + e^{\boldsymbol{\beta}_2 \cdot \boldsymbol{X}_i}}$.

Further extension to the "softmax" function is done, which is specified as,

17) $softmax(k, x_1, \dots, x_n) = \frac{e^{x_k}}{\sum_{k=1}^{n} e^{x_i}}$.

By exponentiating the values $x_1, \dots, x_n$, there is exaggeration of the differences between them and this is the reason this function is named *softmax*. Therefore, *softmax* (k, x_1, ..., x_n) will return a value close to 0 whenever x_k is significantly less than the maximum of all the values, and will return a value close to 1 when applied to the maximum value, unless it is extremely close to the next-largest value. The *softmax* function is employed to construct a weighted average that behaves as a smooth function, which approximates the non-smooth function *max*(x_1, ..., x_n) given as,

18) $f(x_1, \dots, x_n) = \sum_{i=1}^{n} softmax(i, x_1, \dots, x_n) x_i \approx \max(x_1, \dots, x_n)$

The probability equation for one to choose either type of employment can be written as,

19) $Pr(Y_i = r) = softmax(r, \boldsymbol{\beta_1}.\boldsymbol{X}_i, \boldsymbol{\beta_2}.\boldsymbol{X}_i,)$.

All vectors of $\boldsymbol{\beta_k}$ coefficients are uniquely identifiable since the sum of probabilities must be equal to 1, making one of the respective probabilities completely determined once the other is known. Equation (19) shows the types of empirical factors or features that will maximize the employee's *softmax* function as modelled. It is common parlance that the assessment of such features is done based on the significance of the estimated parameters, the $\boldsymbol{\beta_k}'$s. From equation (19) we can specify empirical model as

20) $Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \varepsilon$.

This study employs equation (20) to estimate the determinants of employment choice in Tanzania's construction industry. The definitions of the respective variables which enter this equation for both micro and small entrepreneurs and the firms are given in sub-section 4.4.

5.4 Definition of Variables

Two data sets contain information on employment selection. These are (i) a set of micro and small entrepreneurs, and (ii) a set of constructions firms. Variables included are defined based on the theoretical and empirical underpinnings, and the way they are hypothesised in both contexts. This means that two respective models explaining informal employment (specified by equation (20) are estimated.

5.5 Micro and small entrepreneurs' informal employment estimation model

In estimating this model, a type of employment *(Y)* is a dependent variable, which depends on the X_i's (independent variables). *Y* is drawn from the survey information since the workers indicated whether they are in formal (denoted, 1) or informal (denoted, 2) employment. The probability that $Y = r$ ranges from 0 to 1. While ε is an error term, the included predetermined variables are defined and hypothesized as follows:

(i) *Education* (x_1): is constructed by different levels of education, with a continuum starting from no education (denoted by 0) to college/university (denoted by 5). It is hypothesized that the higher the level of education the lower the probability of an employee to choose informal employment (a negative relationship between education and employment choice).

(ii) *Income* (x_2): is reported directly in the data set. The overriding hypothesis is that the informal sector attracts micro and small entrepreneurs owing to relatively better earnings – for this category of businesses – than that of the formal sector. A positive relationship between income and employment choice is thus hypothesized in this case.

(iii) *Capital/financing constraint* (x_3): this is a binary variable, where capital access is perceived as a constraint (denoted by 1). It increases the probability of one to be informally employed. Where it is not a constraint (denoted by 0), it decreases the probability of being informally employed. A positive sign is thus hypothesized.

(iv) *Tax hassles* (x_4): it is also a binary variable. If this variable is perceived as a reason for micro and small entrepreneurs to engage in construction industry informally, it is given a value of 1; otherwise it is given a value of 0 if it is not mentioned as a factor. A direct relationship is expected between tax hassles and the probability of informal employment choice.

(v) Gender (x_5): this variable was recorded in the interviews, with 1 representing male and 2 female. In this case gender (x_5) is not included as one of the explanatory variables because activities of informal construction micro and small entrepreneurs are unambiguously male-dominated.

5.6 Firms' informal employment estimation model

The second estimation model takes advantage of employment choice option that was gathered in the firms' questionnaire. Three hypothesized explanatory variables under this case are education, income and gender. The education variable (*denoted as* x_2) is defined and hypothesized exactly as in the former case. There is, however, a change in the relationship between income and the two job categories in the construction companies. Gender is also included here as one of the variables of analytical interest since there is no overwhelming gender bias for official formal or informal employment as it was presupposed for the selection of manual construction employment of the micro and small freelancers. In firms there are some activities that can be attractive to either gender.

(i) *Income* (x_2): it is reported in the data set. The context of income of informal employment taken here is that of last resort. Thus, the informally employed workers in the formal sector may be increasing with the possibilities of paying low wages that can reduce costs to the firms. In this respect, the lower the income the higher is the probability of one to be informally employed in the firm. Thus, an inverse relationship with the employment variable is predicted.

(ii) *Gender* (x_5): in the firms' case, gender enters in the estimation. In the construction firms' context, contrary to micro and small construction entrepreneurial, females may be more informally employed to take charge of a number of activities that are not too masculine in nature. Therefore, the sign of the parameter on gender is positive.

6. Estimation of determinants of informal employment

6.1 Data description

The data used to analyse the determinants of informal employment were obtained from a survey[7] which was done in 2013 in six urban areas of Tanzania, namely: Dar es Salaam, Tanga, Arusha, Mwanza, Dodoma and Mbeya. The focus was on urban areas given the interest in informal non-agricultural activities, and particularly, the construction industry. It is reasonable to argue that non-agricultural informal employment competes with formal employment more than it does with agricultural activities in any developing economy like Tanzania. Furthermore, the construction industry can ideally be better modelled in urban than in rural areas given that the scale and intensity of these activities is more in cities and towns than in rural areas.

The sample population comprised of construction industry stakeholders in the top six urbanized regions in Tanzania. Three main categories of stakeholders were interviewed, namely, firms (both formal and informal); micro and small entrepreneurs; and policy makers and practitioners. It is worth mentioning that for the firms, owners and workers were interviewed, while for policymakers, all those who were in positions that can influence policies were interviewed.[8] The number of sample elements chosen from each region was based on the NBS population census weights. The weights were based on urban population in each town and were applied to decide on the number of respondents to be interviewed. For Dar es Salaam, sampling was done differently, with the weights based on population in each district as a way to distribute the number of envisaged respondents according to the population density of the municipals. The distribution of interviewees is given in Table 2. The construction activities that micro and small entrepreneurs do are as follows; masonry, ceiling board fixing, carpentry, electrical installation, painting, architecture, brick making, iron welding for door and window grills, plumbing, and floors finishing. For the 73 construction

[7] The reason we opted for a survey is that the available labour force statistics are of 2000/02 and 2006, which may not adequately reflect the current status. Further, some key information we wanted like inputs and outputs of construction firms are unavailable in the accessible data sets.

[8]Three separate questionnaires were used, namely: (i) *firms* – this captured employment statistics and views of owners or management of the firms on one side, and the same for their workers on the other; (ii) *micro and small enterprises* – this captured data on entrepreneurs and employees. This category of respondents is important to this study in a special way because in general, employees are hired informally, and owners are also employees, and (iii) *policy makers* – this questionnaire captured data from those in government ministries, agencies and departments. Further, the same questionnaire gathered information from the members of research and academic institutions and non-governmental organization (both local and multinationals). The understanding was to use this questionnaire to collect information from all who are in influential positions regarding policy making.

firms interviewed, 328 of their workers were also independently interviewed. This distribution makes an aggregate set of 1,874 interviewees.

Table 2: Regional distribution of interviewed respondents

	Micro & Small Entrep.		Firms		Policymakers	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Dar es salaam	785	54.3	26	35.6	16	57.1
Tanga	105	7.3	7	9.6	2	7.1
Arusha	132	9.1	12	16.4	2	7.1
Mwanza	211	14.6	13	17.8	4	14.3
Mbeya	143	9.9	9	12.3	4	14.3
Dodoma	69	4.8	6	8.2	–	–
Total	**1445**	**100**	**73**	**100.0**	**28**	**100**

Following the theoretical perspective, variables that are most influential to a worker's decision to opt for either of the choices, and are the ones hypothesized, entered into the estimation equation (equation 20). This equation includes employment choice as the dependent variable, and its regressors are; education, income prospects, capital or financing constraints and perceptions of tax hassles for the micro and small entrepreneurs' case. For the firms' case, equations (20) includes employment choice (the dependent) variable and the adopted regressors are education, income and gender.

6.2 Some descriptive statistics

Employment and earnings or income are usually intertwined. The context of income that is used for micro and small entrepreneurs in this study is that of income as an incentive for choice of employment. Figure 3 shows that for micro and small entrepreneurs, income is normally distributed. This means that the median and mode of this variable are on average the same as the mean, and in this view there may be some kind of stability of income distribution among the participating individuals. Micro and small entrepreneurs seem to have been established in the manner that distributes their earnings across with some reasonable equity among the participants and this can be one of the reasons voluntary formalization may be slow. Among the micro and small entrepreneurs, 55% of them have primary school level of education, and a negligible number of tertiary education qualifications. In contrast to MSEs, the firms' income distribution is non-normal (see Figure 4). The major reason behind this could be firms having diverse characteristics, and hence the income gap is significant across different categories of firms and individual workers.

Figure 3: Income distribution among micro and small entrepreneurs

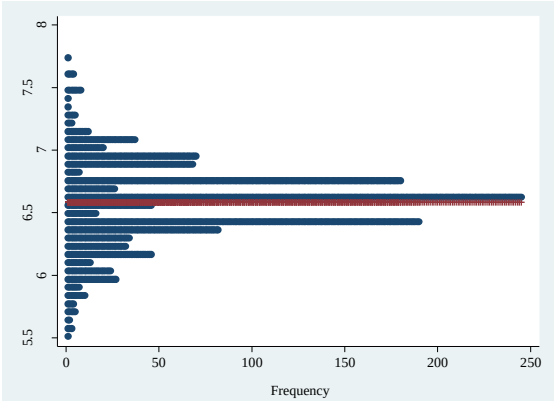
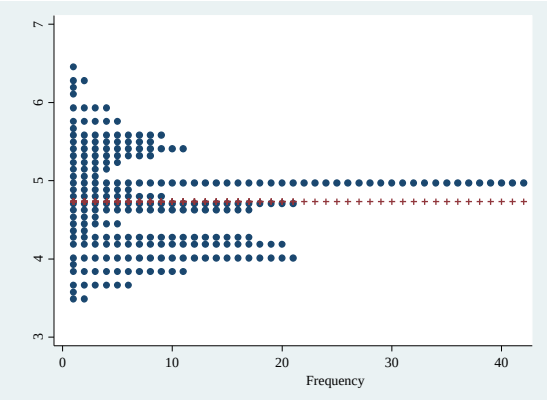


Figure 4: Income distribution among the firms' workers



6.3 Regression results

6.3.1 Micro and small entrepreneurs

Table 3 gives the estimation results for the micro and small entrepreneurs. Data cleaning, which involved dropping some of the respondents who had missing values for some variables, reduced the estimated sample from 1,445 to 1,230. The sample was still large enough to give reliable estimates for the logit regression.

Table 3: Regression results for micro and small entrepreneurs

Number of obs = 1230
Wald chi2(4) = 135. 04
Prob > chi2 = 0
Log likelihood = -30.622

Employment	**Coefficient**	**Std. Err.**	**z**	**P > z**	**[95% Conf. Interval]**
Education	0.099	0.548	0.18	0.857	-0.976 - 0.174
Income	0.638	0.235	2.72	0.007***	0.177 - 1.098
Capital constraint	1.665	0.954	1.74	0.081*	-0.206 - 3.534
Taxes	0.572	1.159	0.49	0.622	-1.701 - 2.845

Note: ***1%; ** 5%; and * 10%

The goodness of fit of this model is generally fine. The results confirm that while education and tax hassles are insignificant factors for employment choice, income and capital constraints are positive and significant at 1% and 10% levels, respectively. Starting with income, these results show that the higher income earned from the informal sector than the formal sector, the higher the probability of choosing informal employment. This validates the hypothesis. The finding implies that micro and small entrepreneurs choose informal employment owing to better return prospects than they can actually earn from the formal employment. Capital constraints are also significant and in line with the hypothesis, which indicates that one of the features that lead to high probability of choice of informal employment is lack of capital.

6.3.2 Marginal effects – micro and small entrepreneurs

Marginal effects were then estimated to see the impact of change in the significant predictor variables on the probability of choice of informal employment. The results are given in Table 4.

Table 4: Marginal effects for micro and small entrepreneurs

Number of observations = 1230
Expression: Pr(employment), predict()
dy/dx w.r.t. : x1education x2income x3capital constraint x4taxes at
Education = 0.436 (mean)
Income = 6.582 (mean)
Capital constraints = 0.759 (mean)
Taxes = 0.206 (mean)

	Dy/dx	**Std. Err.**	**z**	**P>z**	**95% Conf. Interval**
Education	- 0.001	0.001	-0.97	0.332	-0.003 – 0.001
Income	0.002	0.001	1.80	0.072*	-0.000 – 0.004
Capital constraint	0.005	0.003	1.81	0.070*	-0.000 – 0.009
Taxes	0.001	0.003	0.42	0.673	-0.005 – 0.008

Note: *** 1%; ** 5%; and * 10%

The results show that the marginal effects of income and capital constraints are significant at 10% level. An increase in income by a unit can lead to a rise in probability of one to be informally employed by 0.002, while an increase in capital constraint by a unit raises the probability of informal employment by 0.005.

6.3.3 Informal employment in formal construction firms

Regression equation (20) was fitted to the dataset of workers of the construction firms. Data cleaning downsized the sample from 385 workers to 247. This is a reasonable sample size for estimation of a logit model. Table 5 presents the estimation results.

Table 5: Regression results for construction firms

Number of obs = 247
Wald chi2(3) = 63.23
Prob > chi2 = 0
Log likelihood = -119.755

Employment	**Coefficient**	**Std. Err.**	**z**	**P > z**	**[95% Conf. Interval]**
Education	-0.593	0.224	-2.64	0.008***	-1.033 – (-0.154)
Income	-0.957	0.303	-3.16	0.002***	-1.551 – (- 0.363)
Gender	7.213	1.392	5.18	0.000***	4.485 – 9.942

Note: ***1%; ** 5%; and * 10%

All explanatory variables are significant at 1% level, and the goodness of fit of this model is good. All signs are in tandem with the prior hypotheses. Regarding education, the higher the level of education, the less likely one will be employed informally in a firm. This implies that formal construction companies mostly hire informal workers with low or inadequate education, training and skills. For income, the results give a clear message that the lower the accepted payment or income for those who are informally employed in construction firms, the more likely the employers will hire them informally. In light of these results, informal employment is *inter alia*, propagated by a trade-off entailed in labour cost reduction versus engagement of high quality workers. Employing people formally means abiding by the labour

laws to pay specified wages or salaries, and providing the necessary packages of social security.

On the aspect of gender, the results indicate that in construction firms, women are more informally employed than formally. This means that as more women seek for work in these firms, the more the possibility of the firms to engage them informally for low wages and salaries. From intuitive deduction, since low education and informal employment choice are positively related, and because there is still imbalance between men and women trained in technical skills in Tanzania, it is most likely that gender would be directly related with informality in employment.

6.3.4 Marginal effects – firms' informal workers

Marginal effects were estimated to ascertain the impact of change in the respective significant predictor variables on the probability of the firms' choice of employing informally. The results are reported in Table 6.

Table 6: Marginal effects – firms' informal workers

Number of obs = 247 Expression: Pr(yempoy), predict() dy/dx w.r.t.: x1education x2income x3gender at Education = 2.502 (mean) Income = 4.734 (mean) Gender = 1.040 (mean)					
	Dy/dx	**Std. Err.**	**z**	**P>z**	**95% Conf. Interval**
Education	- 0.089	0.345	-2.59	0.010***	-0.157 – 0.002
Income	- 0.144	0.041	-3.51	0.000***	-0.224 – 0.063
Gender	1.084	0.167	6.49	0.000***	-0.757 – 1.411

Note: *** 1%; ** 5%; and * 10%

The marginal effects for the three predictors are all significant at 1%. Raising education by one level will reduce probability of one being informally employed in the firms by 0.09. If income increases by a unit, the probability of being informally employed is reduced by 0.14, while being a woman increases the probability of being informally employed by 0.08.

7. Conclusion and policy implications

This study aimed to empirically ascertain the factors that determine informal employment in Tanzania's construction industry. The study employed a logit regression model to unearth features that significantly influence the choice of informal employment for micro and small entrepreneurs. The results revealed that the higher earnings in informal jobs compared to those in formal ones, given the professional status of the micro and small practitioners, is one of the major incentives to choose informal rather than formal employment. Another factor that exacerbates choice of informal employment is lack of capital, which deters micro and small entrepreneurs from starting large formal firms but instead resort to unregistered petty undertakings.

From the firms' data set, the results show that low education (i.e. inadequate skills and knowledge) is one of the key reasons workers are hired informally by formal firms. The second reason is the possibility of the formal firms to hire these employees at low wages.

Lastly, on the gender issue, the findings show that more females are employed informally than men, most likely in jobs related to offices handling and clerical matters.

In line with the findings of this study, there are important policy issues for different employment creating stakeholders to note. First and foremost, improving financial services through risk mitigation, credit information dissemination and outreach to MSEs are critical to capital access and business operations finance. Improving these services are an incentive to start up formal construction firms. Secondly, policies to enhance and rationalize earnings in the economy could provide an incentive to micro and small entrepreneurs to formalize. Lastly, regarding formal employability of workers, improving quantity and quality of education is important as an enabling instrument. In pursuit of educational achievements, gender imbalance has to be addressed as a way of increasing professionalism of women and to emancipate them from being preys of informal employers. While the government plays its role in addressing these implied solutions, firms in the construction industry have to play their part in terms of providing on-the-job-training and educational sponsorships for their staff.

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