Access to Credit Markets and Decisions of an Entrepreneur

Kaushal Basnet

ABSTRACT

One of the biggest characteristics in the developing world is the existence of large informal sectors. In this paper, we develop a model of an individual’s choice between the formal sector and informal sector. Using the occupational choice model developed by Lucas (1978) and Haniff (2015), we map the choices of an individual based on skills and assets and access to credit markets. This paper examines how access to credit markets affect the decisions made by entrepreneurs. We find that entrepreneurs with high ability but lack assets for collateral will not be able to get loans to pay for the costs associated with formalization. Lack of access to credit markets further increases the cost of formalization due to increase in financial costs. The entrepreneur will then choose to be operated in the informal sector. An individual who lacks both assets and skill will choose to be worker in the formal sector.

JEL Classification: E5, J4, 016, L26

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1. Introduction

According to OECD (2000), small and medium-sized enterprises (SMEs) account for over 95% of firms and 60%-70% of employment and generate a large share of new jobs in developing countries. They have specific strengths and weaknesses that may require special policy responses. One of the important aspects of SMEs is the evidence of informality. Informal businesses in developing countries fill employment gaps and provide incomes to individuals (Tarway-Twalla and Geegbae, 2012). However, they do not pay fees and do not contribute taxes to the economy. It is important to note that there is no single generally accepted definition of informality. Informality could be based on size, registration with a governing body, abiding by labour legislation, and taxes. For this study, we describe informality with respect to the tax registration with governing body.

Informal firms that operate without formal acknowledgment from a governing body are forced to operate without services fundamental to the growth of their businesses. They lack access to public goods such as contract enforcement, property rights, government assistantships and to private goods such as business loans and insurance. Their growth is ultimately affected by the absence of these essential services. Guimon (2008) stated that many developing countries invest a significant amount of capital resources in bringing in multi-national firms to create jobs in the hopes of revitalizing their respective economies. Instead, any number of informal businesses that can be converted into formal business may allow for the economy to strengthen from within by empowering their citizens and utilizing their wasted talent.

This paper focuses on Small and Micro-Enterprises for many important reasons. A Micro-Enterprise is generally defined as a small business employing nine people or fewer. Small firms make various indispensable contributions to the economy. They act as major job providers, produce a significant part of the total value added and feed the larger industries with their needed inputs of product. According to Mead and Liedholm (1998), MSE’s contribute approximately 27% of employment in developing countries in Africa. More specifically, MSE’s in Zimbabwe accounted for 64% of the manufacturing in the urban areas and 75% in the rural areas in the years 1992 and 1993. Small firms also represent a useful channel through which small savings are being translated into investments. Finally, small enterprises could become major sources of constant innovation and experimentation and could thereby in some cases change the market structure (OECD, 2015).

We indentify important variables that affect an individual’s decision to become a formal entrepreneur, a worker in the formal sector, or an informal entrepreneur. Using the occupational choice model developed by Lucas (1978), and modified in Haniff (2015), we are able to connect the key variables to the decision-making process. The model considers skills and assets which are used as collateral for loans as individual characteristics together with the economy’s accessibility to credit markets to be the main catalysts in the decision-making process. Legal assets are a type of assets that are used as collateral to receive loans which the formal entrepreneur uses to pay for registration cost, fees, and capital necessary for the business. We find that individuals with high levels of skills and sufficient legal assets
become entrepreneurs in the formal sector. A high-skilled individual with insufficient legal assets is forced to operate in the informal sector due to the registration fees and capital which the individual cannot afford without obtaining loans from the credit market (which are collateralized). Improving accessibility to financial markets reduces the amount of assets needed as collateral and allows a set of entrepreneurs to formalize.

This paper is organized as follows: In Section 2, we present a review of the literature. Section 3 provides an overview of the descriptive statistics studied in the small and medium size enterprises. The model is developed in Section 4. Following the model, Section 5 explains the calibration to the data and presents the findings. Section 6 explains our results and discusses their implications. Section 7 concludes.

2. Literature Review

The growth of a business largely depends on its productivity and its growth in capital and labor. Amaral and Quintin (2005) report that formal workers tend to be more experienced, more educated, and earn more than informal workers. They find that managers in informal sectors have access to less or no outside financing and, therefore, they are forced to substitute capital with low-skill labor. The model in the paper compares the cost of producing in formal and informal markets, given that informal markets have limited access to capital and contract enforcement. Provided that the assumptions on the limitations that are present in the informal markets, they show that the most productive managers self-select themselves to the formal sector and operate with more capital. Allowing for free movement of labor between sectors, they conclude that the formal sector emphasizes skilled labor combined with higher physical capital, and the informal sector employs high unskilled labor and lower physical capital. We find the main findings of Amaral and Quintin (2005) to be consistent with our analysis of the Egypt Micro Enterprises Survey (2014). The data show that informal entrepreneurs are faced with low levels of skill and they are not able to attract high skilled labour due to their inability to offer higher wages. Moreover, our theory implies that individuals with high productivity either become workers in the formal sector or formal entrepreneurs which coincides with Amaral and Quintin (2005).

Straub (2004) develops a model of firms’ choices between formality and informality. In that model, one of the key benefits of formalization is the obvious participation in the formal credit market. Furthermore, public goods such as property rights and contract enforceability are also available to formal entrepreneurs. However, the barriers to such participation are the costs associated with being formal such as costly registration procedures and taxes. The model in our paper focuses on the choice of the entrepreneurs given their assets, skills, and the economy’s level of accessibility to credit. Diagne et al. (2000) find that in rural parts of developing nations, individuals face transportation cost, communication costs, and substantial delays in receiving services from the credit markets. Hence, access to credit markets is an important factor in the decision-making process. From a policy point of view, Straub (2004) suggests that by making market interaction more efficient, we can reduce informality in the economy. Better judicial enforcements and rule of law can foster a more efficient interaction between firms. Moreover, by reducing the need of informal credit markets, there is an increase in the social value of projects due tobetter screening of projects being financed.(441,689),(882,965)
Massenot and Straub (2015) develop a general equilibrium approach which shows that removing barriers to entry and improving judicial enforcement may not be effective in countries with a constrained supply of funds caused by a concentrated banking sector and lower financial openness. Consistent with our model, this study limits informal entrepreneurs from using informal credit markets. The individual’s decision on either operating formally or informally is based upon the income generated in the two sectors. They propose that a lower interest rate, lower entry costs, or better enforcement reduces the size of the informal sector. They perform within-country, and cross-country estimation using a firm level dataset covering more than 21,000 firms in 67 countries between 2002 and 2006. The paper finds that the characteristics of credit markets such as their degree of concentration have an impact on entry costs and judicial enforcements on formality and output. They state that concentrated credit markets increase entry costs by under serving parts of the rural areas.

World Bank (2009) examines the high informality rate in Bolivia, the country with the largest informal sector in Latin America. The report explores the factors that encourage entrepreneurs to operate in the informal sector. The authors employ data from the Micro and Small firms of Bolivia and examine how the burden of registration, the weakness of public institutions, and the lack of perceived benefits such as contract enforcement affect the formalization decision of an entrepreneur. Their results show that registration costs affect the largest and the smallest firms more than the firms in the middle range. The smallest and the largest firms in the sample have lower profits as a result of tax registration. Formalizing involves an immediate higher cost of registration fees and taxes for the smallest firms which reduces their profit. The result does not find an increase in customer base for smallest firms from formalization. Taxes are consequently larger for the largest firms which reduces their profit without any increase in customer base. However, the middle range firms benefit from tax registration from the increased customer base who prefer tax receipts. Moreover, their study finds that governments should design policies that increase training, access to credit markets and business support to increase the benefits of formalization.

Sutter et al. (2017) examines the transition of entrepreneurs from informal to formal markets. They explore how an institutional intermediary, such as a Board of Trade, can help small informal producers to transition from selling their goods and services in the informal to the formal market. They study approximately 1,800 dairy farmers in rural Nicaragua who transitioned from informal markets to formal markets and find that success of such transition depends on a series of policies that encourage and facilitate informal entrepreneur’s participation in formal markets. They find that informal entrepreneurs themselves are unable to make the transition into the formal sector due to their reluctance of adopting new practices, norms and legal compliance. They conclude that government intervention such as institutional intermediaries are necessary to facilitate and encourage the adoption of new norms, practices, and legal system for informal entrepreneurs.

Haniff (2015) focuses on determining the economic causes of Egypt’s 2011 revolution. The author examines the impact of Egyptian dictatorial regime’s policy on the labor market using a simple occupational choice model based on Lucas (1978). The effect of the former Egyptian Prime Minister Hosini Mubarak’s policy on both the public sector and private
sector where the private sector includes informal entrepreneurs and formal entrepreneurs are identified. The study reveals that privatization, lack of access to financial resources, and rising tax rates on formal businesses contributed to the uprising of the public and collapse of the regime. The lack of access to capital is likely to be the reason the majority of informal jobs are located outside of metropolitan Egypt.

3. Descriptive Statistics

3.1 Egypt: Small and Micro Enterprises Survey

Initiated by the Economic Research Forum, the Micro and Small Enterprises Survey provides estimates for key indicators related to the activities, manpower structure, and financial characteristics of MSE’s (OAMDI, 2013). The survey was conducted on approximately 5,000 Egyptian micro and small enterprises during the period between 2002 and 2004. It includes participants from across Egypt, in both metropolis and rural areas.

The survey consists of questions pertaining to whether the business had acquired a tax card and to the business’s legal status. We used that information to differentiate participants by allocating all the observations that pertained to informality of the survey to informal entrepreneurs and allocating all the observation that pertained to formality to formal entrepreneurs. We were then able to examine various factors such as education, assets, access to credit markets, labour, and wages between the two types of entrepreneurs. The data shows that approximately 75% of the participants of the survey were formal entrepreneurs.

3.2 Financing Needs

As part of the Micro-Enterprise Survey, entrepreneurs of both formal and informal sectors were asked how easily credit markets were available to them. The data show that access to credit markets in developing countries like Egypt is not determined by the legal status of the business. As shown in Table 1, more than 60% of entrepreneurs in both formal and informal sectors find it difficult to access the credit markets. This result is in congruence to the findings in Beck et al. (2009) where they conclude that less than half of the population has access to formal financial services in many developing countries.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Formal Entre.</th>
<th>Informal Entre.</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>20%</td>
<td>15%</td>
<td>13%</td>
<td>25%</td>
</tr>
<tr>
<td>Moderate</td>
<td>18%</td>
<td>15%</td>
<td>14%</td>
<td>22%</td>
</tr>
<tr>
<td>Difficult</td>
<td>61%</td>
<td>68%</td>
<td>72%</td>
<td>51%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>1%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Also, as shown in Table 1, more formal than informal entrepreneurs reported that it was easy to access credit markets than informal entrepreneurs. Lack of access to finance is often the critical mechanism that promotes persistent income inequality, as well as slower economic growth (Beck et al., 2009). Hence, expanding access to credit markets remains an
important challenge across the world, leaving it much for governments to do. Even though this is outside the scope of this study, lack of formal credit markets give birth to informal credit markets. Informal loans are normally lent by private individuals, professional moneylenders, traders, commission agents, landlords, friends, and relatives. Informal credit markets lack proper technology and the ability to perform background checks which the formal credit market uses as a screening and enforcement device. This raises the possibility of endemic default. Poor screening and imperfect information within the informal credit market make it very inefficient for the borrowers who generally are faced with a higher interest rate and a larger collateral (Haugen, 2005).

Moreover, Table 1 also compares access to finance in rural and urban Egypt. Urban areas include cities such as Cairo, Giza, Alexandria and Dasmitta. Rural areas include places in Fayoum, Assuit and Sohag. We observe that access to finance is more limited in rural areas. A staggering 72% of the rural SMEs report that they find it difficult to get access to finance whereas the number drops to 51% for urban SMEs. However, it is important to note that we observe a higher than expected difficulty in accessing finance for Urban SMEs. Beck et al. (2003) find that bank concentration in the urban areas increases financing obstacles, with a stronger effect for small and medium firms compared to large ones. This result is key for the introduction of our parameter ‘access to credit markets’.

In the data when both types of entrepreneurs were asked for their total cost of financing, urban entrepreneurs reported an average of approximately 892 Egyptian pounds whereas rural entrepreneurs reported an average of approximately 1200 Egyptian pounds. To summarize, we find that access to credit is lower for informal entrepreneurs and lower and more expensive for entrepreneurs in the rural areas.

4. The Model
We use the simple occupational choice model in Haniff (2015) with a few key modifications. Firstly, we concentrate on the private sector. Secondly, we include access to credit market as an economy’s characteristic which affects productivity in the formal sector as well as the minimum assets needed to secure a loan.

4.1 Environment
There is a measure of $N$ individuals in the economy that are heterogeneous in entrepreneurial ability, $s$, and legal assets, $a$. Legal assets are defined as assets that can be used as collateral in the credit markets. Therefore, an individual’s type is designated by a two dimensional vector ($a, s$). We assume that entrepreneurial ability and assets follows a uniform distribution with $s \in [0, S]$ and $a \in [0, A]$ where $A > 0$ is the upper limit on assets and $S$ is normalized to 1. The cumulative distribution of skills and assets are given by:

$$F(s) = \frac{s}{S}, \quad F(a) = \frac{a}{A}$$  \hspace{1cm} (1)

with probability density functions:

$$f(s) = \frac{1}{s}, \quad f(a) = \frac{1}{A}$$  \hspace{1cm} (2)
We assume that the individual’s level of skill and asset are independent draws from the standard uniform distribution so that an individual may be located at any level with equal probability. Given their characteristics, individuals in this economy choose their occupation. They can become formal or informal entrepreneurs or workers in the formal sector.

4.2 Formal Entrepreneurs

We define formal entrepreneurs as individuals who have registered their business with the government and pay relevant taxes as required by law. Production of a formal entrepreneur with characteristics \((s, a)\) is given by the following production function:

\[ y^F(s, a) = A_F \alpha l \bar{k} s \] (3)

Where \(A_F\) is a technology factor, \(l\) and \(\bar{k}\) are fixed labor and fixed capital needed to operate the formal technology and \(\alpha\) is the credit market accessibility parameter. We assume \(0 < \alpha < 1\), unit with higher \(\alpha\) indicating better accessibility. Define \(\bar{\alpha}_F = A_F l \bar{k}\).

Entrepreneurs have one unit of time, which they split between securing financing and operating the technology. If credit markets are not perfectly accessible, \((0 < \alpha < 1)\), entrepreneur divides her time between the production process and dealing with credit markets. For simplicity, we assume that at market accessibility level \(\alpha\), the entrepreneur needs to spend \((1 - \alpha)\) fraction of her time securing finance. A formal entrepreneur’s profit is defined by after-tax income minus wages and rental cost of capital is given by:

\[ \pi^F(s, a) = p(1 - r)\bar{\alpha}_F \alpha s - wl - r\bar{k} \] (5)

where, \(p\) denote the price of the good produced by the formal entrepreneur, \(w\) is wage, and \(r\) is interest rate. Hence, the income of an individual with characteristics \((s, a)\) who chooses to be a formal entrepreneur is given by:

\[ m^F(s, a) = \pi^F(s, a) + (1 + r)(\alpha - \gamma) - \bar{k} \] (6)

where, \(\gamma\) indicates registration costs. We assume that individual receives a fixed return \(r\) on her unused assets. As indicated above, individuals need to pledge their assets as collateral in order to obtain a loan to purchase capital \(k\) to use the formal technology. Let us denote by \(a^*\) the minimum legal assets required as collateral to be eligible for a bank loan. Given that the individual needs to be able to pay back the loan at the end of the period, with interest, for an individual to be eligible to be a formal entrepreneur, it has to have assets \(a \geq a^*\), where \(a^*\) is:

\[ a^* \geq (1 + r)k + \frac{\gamma}{\alpha} \] (7)

That is, for an individual to be able to get a loan and, therefore, use the formal technology, they have to have enough assets to be able to pay the loan, pay the registration fee \(\gamma\) and pay the costs associated with credit access, \((\delta/\alpha)\). We assume that these costs are inversely proportional to the measure of credit accessibility \(\alpha\).
A country with a weak institutional infrastructure such as poor records of title registration and lack of credit scoring will have a higher degree of financial constraints which we model as a higher \((\delta/\alpha)\). Financial constraint’s costs represent both private and public costs. Private costs include costs such as transportation costs, cost of communications, and cost of delays. Public costs include registration fees for loans, bribe and other similar soft costs.

4.3 Informal Entrepreneurs

For simplicity, we assume that entrepreneurs in the informal sector are self-employed. Furthermore, informal entrepreneurs are unable to receive any loans from the credit markets which hinders them from acquiring sufficient capital to use technology operated by formal entrepreneurs. This forces the informal entrepreneurs to use basic technologies which do not require capital where we assume that \(A_I > A_F\). The technology in the informal sector is defined by:

\[ y^I(s,a) = A_I s \]  \hspace{1cm} (8)

Similar to the formal sector, the profit of an informal entrepreneur is given by.

\[ \pi^I(s,a) = pA_I s \]  \hspace{1cm} (9)

Since an informal entrepreneur does not borrow any capital and hire any labor, her income is just profit plus the return on her assets:

4.4 Workers

Since the informal sector does not hire any labor, all the workers in this economy work in the formal entrepreneurial sector. The workers earn a wage, \(w\), which is determined endogenously. Given the levels of \(s\) and \(a\), a worker in the formal economy earns income:

\[ m^w(s,a) = w + (1 + r)a \]  \hspace{1cm} (10)

4.5 Thresholds in the Entrepreneurial Sector

Given the levels of \(s\) and \(a\), an individual has the choice of either becoming an informal entrepreneur, a worker, or a formal entrepreneur. As an individual’s decision is based solely on the income presented by all three channels of employment, we are able to solve for the cut-off levels of skill necessary for an individual to become a worker rather than informal entrepreneur, or a formal entrepreneur rather than an informal entrepreneur. The two cut-off points are given by the following equations:

1) An individual prefers to become an informal entrepreneur instead of a worker in the formal sector if: \(m^I(s,a) \geq m^w(s,a)\). Define \(s^{-I,W}\) such that \(m^I(s,a) = m^w(s,a)\). which determines an ability threshold (Informal-Worker Threshold):

\[ s^{-I,W} = \frac{w}{pA_I} \]  \hspace{1cm} (11)

Individuals with \(s \geq s^{-I,W}\) become informal entrepreneurs, and individuals with \(s < s^{-I,W}\) become workers.
2) An individual prefers to become a formal entrepreneur instead of an informal entrepreneur if: \( m^F(s,a) \geq m^I(s,a) \). Define \( s^{-F,I} \) such that \( m^F(s,a) = m^I(s,a) \). which determines the ability threshold (Formal-Worker Threshold):

\[
s^{-F,I} = \frac{w(1+r)(k+\gamma)}{p[A_F(1-\tau)-A_I]}
\] (12)

3) If \( s \geq s^{-F,I} \) the individual become a formal entrepreneur. If \( s < s^{-F,I} \) she becomes an informal entrepreneur.

4.6 Labour Market Equilibrium

The supply of labour is given by all individuals who choose to become workers. Labour supply and labour demand are given by the following equations:

\[
L^s = \frac{Nw}{pA^I S}
\] (13)

Given that only formal entrepreneurs hire workers, the labour demand is determined by the number of formal entrepreneurs times the fixed amount of labour they hire, \( l \):

\[
L^d = N \cdot \theta \cdot l \cdot (S - s^{-F,I})/S
\] (14)

Where \( \theta = (A - a^*)/A \) indicates the fraction of individuals with enough assets to substitute as collateral (with \( a \geq a^* \)).

Using that \( L^s = L^d \) in equilibrium, from [13] and [14] we are able to solve for the equilibrium wage for a given worker, defined by the equation below:

\[
W = \frac{\theta l \cdot A_I [S p (A_F \alpha(1-\tau)-A_I) - (1+r)(k+\gamma)]}{A_F \alpha(1-\tau)-A_I + \theta l^2 A_I}
\] (15)

Now, we can replace the computed wage into equation (10) and (11) to obtain the thresholds as functions of the parameters.

\[
S^{-I,W} = \frac{\theta l [S p (A_F \alpha(1-\tau)-A_I) - (1+r)(k+\gamma)]}{p[A_F \alpha(1-\tau)-A_I + \theta l^2 A_I]}
\] (16)

\[
S^{-F,I} = \frac{\theta l^2 A_I S p + (1+r)(k+\gamma)}{p[A_F \alpha(1-\tau)-A_I + \theta l^2 A_I]}
\] (17)

5. Calibration

In this section we calibrate the parameters of the model to match the Egyptian economy. The parameter in Table 2 are directly from the data. In particular, to obtain \( N \) we used the variable labor force from World Development Indicators (World Bank, 2004). To obtain \( l \) we used the variable ‘average labor employed in formal firm’ from MSE (2003). We used the variable total cost of formalization, and the firm tax on revenue from Egypt Statistics (Agency for Public Mobilization and Statistics) to obtain \( \gamma \) and \( \tau \).
We use variable Q171-total working capital from MSE (2003) to obtain \( k \). To obtain \( \alpha^* \), we use equation 

\[ \alpha^* = (1 + r)k + \frac{\delta}{\alpha} + \gamma, \]

with the values of \( k, r, \gamma, \) and \( \delta \) where the financial constraint costs, \( \delta \) equal to twice the cost.

Table 2: Calibration I

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>( S )</td>
<td>Upper bound of skills levels</td>
<td>1</td>
<td>1 (Normalization)</td>
</tr>
<tr>
<td>( p )</td>
<td>Price of good</td>
<td>1</td>
<td>1 (Normalization)</td>
</tr>
<tr>
<td>( r )</td>
<td>Gross Interest Rate</td>
<td>0.065</td>
<td>World Development Indicator 2015. Annual interest rate (%)</td>
</tr>
<tr>
<td>( l )</td>
<td>Average labor hired by a formal entrepreneur</td>
<td>2.6</td>
<td>MSE Survey 2003. Labor hired by formal entrepreneur</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>Registration costs</td>
<td>1500</td>
<td>Egypt Statistics 2015. Total cost of formalization</td>
</tr>
<tr>
<td>( \tau )</td>
<td>Output tax on formal firms</td>
<td>0.25</td>
<td>Egypt Statistics 2015. Firm tax on revenue (% of revenue)</td>
</tr>
<tr>
<td>( \theta )</td>
<td>Fraction of people with collateral to borrow from credit markets</td>
<td>0.22</td>
<td>Obtained from Hannif (2003)</td>
</tr>
<tr>
<td>( k )</td>
<td>Capital</td>
<td>4892724</td>
<td>MSE Survey 2003. Average total capital used, formal firms</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>Access to credit markets</td>
<td>0.614</td>
<td>Calibrated using MSE survey 2003. Financial Constraints</td>
</tr>
<tr>
<td>( \delta )</td>
<td>Cost of access to finance</td>
<td>892</td>
<td>MSE Survey 2003. Average cost of access to finance</td>
</tr>
</tbody>
</table>

Table 3: Calibration II

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \hat{\alpha}_F )</td>
<td>Productivity parameter in formal sector</td>
<td>15482157</td>
<td>Calibrated, see under Calibration</td>
</tr>
<tr>
<td>( A_I )</td>
<td>Productivity parameter in informal sector</td>
<td>45984</td>
<td>Calibrated jointly, see under Calibration</td>
</tr>
</tbody>
</table>

48
To obtain the value for access to credit markets, we use MSE Survey 2003, Q218 (Constraints: Severity of Financial Services) Participants in the survey either reported financial constraints as: easy, moderate, and difficult. We calculate the weighted average value of $\alpha = 0.614$ by using $\alpha = 0.9$ for easy, $\alpha = 0.7$ for moderate, and $\alpha = 0.5$ for hard; using the data provided by the participants of the survey. We obtain wages from Trading Economics, Egypt wage (monthly), which we normalize to yearly by simply multiplying the value by 12. We obtain $\theta$ from Haniff (2015).

We calibrate $A_I$ and $A_F$ to match the share of formal workers in the labor force, $\frac{L^E}{N}$ and the share of formal entrepreneurs, respectively. Let $L^E$ be the number of employed workers in the formal sector. In our model, $L^E = N s^{-I,W}$ that is all individuals with skills below the Informal-Worker threshold. We obtain $L^E$ from the MSE (2003) survey report as the percentage of participants reporting to work in the formal sector at 55%. Using the calibrated value of $N$, we obtain $s^{-I,W} = 0.149$.

6. Results and Comparative Statistics

In Figure 1, by plotting the thresholds using the calibrated values, we show the distribution of occupations across individuals as a function of their skill and asset levels. Any entrepreneurs who do not have the required legal assets for collateral are represented by the area left of $a^*$. These individuals cannot become formal entrepreneurs and therefore, we do not observe any formal entrepreneurs with assets below the level $a^*$.

Figure 1: Equilibrium

We observe all individuals with levels of skill below the Informal-Worker threshold become workers, and the ones with levels of skills between the Informal-Worker and the Formal-Informal threshold become informal entrepreneurs. Entrepreneurs with assets level greater than $a^*$ and skills greater than the Formal-Informal threshold become formal entrepreneurs. The skill thresholds do not depend on assets in this model and it is therefore the threshold lines are flat on the asset dimension.

6.1 Comparative Statics: Increased accessibility to credit markets

Figure 2 shows the effect of an increase in $\alpha$ (accessibility to credit markets) by 25% to the distribution of occupations. We observe a fall in the Formal-Informal threshold and a rise in Informal-Worker threshold due to this increase in access to finance. Easier access to
credit markets, represented by a higher value of $\alpha$, affects formal entrepreneurs in two ways: through an increase in the productivity and through lower amounts of legal assets required. On the other hand, an increased access to finance reduces the time needed to spend in dealing with the credit market and increases the time available for generating the technology, which increases the productivity of the entrepreneur.

On the other hand, lower collateral reduces $a^*$, giving more individuals the option to become formal entrepreneurs.

The results show that a 25% increase in $\alpha$ reduces the Formal-Informal threshold by approximately 21% (from 0.75 to 0.591) and increases the Informal-Worker threshold by 56% (from 0.149 to 0.233). The increase in the Informal-Worker threshold is caused by an increase in the number of formal entrepreneurs. The increase in the number of formal entrepreneurs causes the demand for workers to increase resulting in the Informal-Worker threshold to increase. This is reflected in an increase of the baseline wage from 6881 to 10756 (about a 56% increase) with a 25% increase in $\alpha$. This results in a lower number of informal entrepreneurs and a higher number of formal entrepreneurs and workers in the economy. Moreover, a 25% increase in $\alpha$ reduces the collateral threshold $a^*$, by less than 1%.

Figure 2: Change in financial market’s accessibility

Figure 3: Thresholds vs. financial market’s accessibility
From our result, we infer that an increase in $\alpha$ has a greater impact on the productivity of an entrepreneur than on the minimum assets required. To conclude, an increase in $\alpha$ results in a decrease of required assets, and increase in the Informal-Worker threshold, and a decrease in the Formal-Informal threshold which overall increases the number of formal entrepreneurs in the economy.

Figure 3 shows the relationship between thresholds and access to credit markets for a given level of assets, $a$. We observe that the difference between the Formal-Informal threshold and the Informal-Worker threshold is decreasing with $\alpha$. In particular, observe a difference of 0.60 between the thresholds for the baseline value of $\alpha = 0.614$ and a difference of 0.14 at $\alpha = 1$. A lower gap between the two thresholds results in a lower number of informal entrepreneurs and a greater number of formal entrepreneurs and workers. Following the previous reasoning, a greater access to finance results in lower registration costs, a lower level of assets required and an increase in productivity.

This increases the formalization of informal entrepreneurs who would find themselves marginally non-inclined to participate in the formal sector. This relationship is described by the decreasing slope of Formal-Informal threshold. The upward pressure on demand for labor and wages created by an increase in the number of formal entrepreneurs is reflected by the increasing slope of Informal-Worker threshold.

Table 4: Comparative Statics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline-Economy</th>
<th>Change in $\gamma$</th>
<th>Change in $\tau$</th>
<th>Change in $r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_{F,I}$</td>
<td>0.75</td>
<td>0.749</td>
<td>0.692</td>
<td>0.729</td>
</tr>
<tr>
<td>$S_{I,W}$</td>
<td>0.149</td>
<td>0.148</td>
<td>0.175</td>
<td>0.154</td>
</tr>
<tr>
<td>$w$</td>
<td>6881</td>
<td>6885</td>
<td>8092</td>
<td>7115</td>
</tr>
</tbody>
</table>

6.2 Thresholds on $\gamma$, $\tau$, and $r$

In order to perform comparative statics on the policy parameters, we first solve the model for our values for the baseline economy using $\alpha = 0.614$. We find that $\tilde{S}_{I,W} = 0.149$, $\tilde{S}_{F,I} = 0.755$, and $w = 6881$. We then change the policy parameters $\gamma$, $\tau$, and $r$ by reducing each of them at a time by 25%: $\gamma$ from 1500 to 1250, $\tau$ from 0.25 to 0.2, and $r$ from 0.065 to 0.052. The results are reported in Table 4.

We observe a decrease in the Formal-Informal threshold and an increase in the Informal-Worker threshold with a decrease in every parameter. A decrease in $\gamma$ decreases the fixed-cost of registration such as registration fees. This decreases the initial cost of formalization and lowers the level of assets required for collateral. Moreover, a decrease in $\gamma$ increases the income of being a formal entrepreneur and thus decreases the Formal-Informal threshold. Informal entrepreneurs with lower level of assets are able to formalize with lower fixed-costs. Similarly, a reduction in taxes, $\tau$, decreases the cost of formalization and increases the profit of being a formal entrepreneur, due to lesser tax payments. Some
individuals choose to formalize with the lower tax rates who previously did not choose to formalize. Lastly, a decrease in interest rates, \( r \) decreases the cost of capital for entrepreneurs which decreases the initial assets required for collateral. Entrepreneurs who did not have sufficient assets for collateral are now able to borrow capital to participate in the formal sector. Informal entrepreneurs with sufficient assets but relatively high skills choose to formalize, whereas the ones with lower skills remain informal.

It is important to note that the change in taxes produces the greatest effect on the Formal-Informal threshold (8% decrease). Registration costs and interest rates show a lesser effect on the threshold; approximately (1% and 2%). Similarly, changes in taxes produces the greater effect on the Informal-Worker threshold (17% increase). On the other hand, registration costs and interest rate show a lesser effect on the Informal-Worker threshold; approximately 3% and 1% respectively. Reduction in taxes has the greatest effect on wages (17.5% increase). Wages also increase with the reduction in \( y \) and \( r \) but with lesser extent (3% and 1%).

6.3 Policy Discussion

In order to design effective policies which will allow for informal entrepreneurs to formalize, the government should consider factors such as education and training programs which increase the productivity and skill levels of informal entrepreneurs. In many developing countries, a significant portion of the population consists of individuals with low levels of education who participate in the low-skill informal sector (Koto 2015). Therefore, the informal sector becomes an integral part of the economy which, with right policies, can see an increase in productivity. However, governments should try to find the right balance between policies that reduce the cost of participating in the informal sector while increasing the benefits of participating in the formal economy.

From our results, we observe that taxes produce the greatest effect on the Formal-Informal and the Informal-Worker thresholds. Reducing taxes can obviously be a means to reduce informality. On the other hand, governments can also introduce policies that can provide tax incentives to informal entrepreneurs to ease their burden of taxes. Tax incentives can lower the overall costs and increase profits which can either pay the costs of formalization or allow entrepreneurs invest in better technology which can eventually provide higher returns in profit with an entry into the formal sector. Governments can also reduce the costs into formalization by reducing registration fees. Policies that promote benefits of participating in the formal economy such as property rights, contract enforcements, and vocational training programs can play a role in providing additional benefits. The development of financial institutions in the economy can address the issues of financial constraints and decrease costs associated with access to finance. Decentralization of financial centers and an improvement on information sharing can also reduce frictional costs of financing.

Finally, there are other important factors which are outside the scope of this study that may play an important role in reducing informality. For instance, Ulyssea (2015) emphasizes the importance of enforcement levels of current institutions in reducing informality. Registration costs sometimes includes soft-costs such as bribery by public officials. Policies
that improve quality of administration can also help reduce costs of formalization. On the other hand, Prado (2008) suggests that reduction in regulations can potentially be a more effective policy for increasing private consumption and reducing informality. By removing credit frictions and distortions, efficiency can be improved which can encourage entrepreneurs to participate in the formal economy where technology is superior leaving behind labor intensive processes.

7. Conclusion

The aim of this paper is to examine the occupational decision making of individuals in the developing world. Using a simplified version of the occupational choice model developed by Lucas (1978), and modified in Haniiff (2015), we developed our own income-driven occupational choice model where individuals can either work in the formal sector, become formal entrepreneurs, or work as informal entrepreneurs.

We find that better access to finance reduces the number of informal entrepreneurs and increases the number of formal entrepreneurs and formal workers in the economy. In the model individuals with relatively high level of skills and sufficient legal assets operate as formal entrepreneurs. Individuals with relatively moderate level of skills and who lack sufficient legal assets choose to become informal entrepreneurs. And lastly, individuals who have relatively low level of skills and insufficient level of assets become workers in the formal sector.

Easier access to credit markets reduces the size of the informal sector in two ways: it increases the profitability of formalizing through higher productivity, and it lowers the need for collateral assets. As a result, high skilled, asset constrained informal entrepreneurs choose to formalize where accessibility improves. From policy recommendation viewpoint, this paper finds that reducing taxes has a higher impact on the formalization decision than reducing registration costs or interest rates.
Appendix

Section 4.5 – Labour and Wage

\[ L^s = \mu \cdot N \int_0^A \left( \int_0^{s^{l,w}} \frac{1}{s} \, ds \right) \, da = \mu \cdot N \cdot \frac{S - s^{l,w}}{S} = \frac{\mu \cdot N \cdot \left( \frac{w}{p \cdot A_i} \right)}{S} = \frac{\mu \cdot N \cdot w}{p \cdot A_i \cdot S} \]

\[ L^d = \mu \cdot N \int_A^S \left( \int_{s^{i,F}}^{s} l \cdot \frac{1}{s} \, ds \right) \, ds = \mu \cdot N \cdot \theta \int_{S_F, I}^{S} l \cdot \frac{1}{s} \, ds = \mu \cdot N \cdot \theta \cdot l \left( \frac{S - s^{F, I}}{S} \right) \]

Section 4.6 – Thresholds in the Entrepreneurial Sector

Income of Formal Entrepreneur > Income of Informal Entrepreneur:

\[ m_F > m_i \]

Substitution:

\[ p(1 - \tau)A_F \alpha s - w - r(k + 1 + r)(\alpha - \gamma) - k > pA_i s + (1 + r)a \]

Isolate for \( s \)

\[ s^{F, I} = \frac{w \cdot l + (1 + r)(k + \gamma)}{p[A_F (1 - \tau) - A_i]} \]

Income of Informal Entrepreneur > Income of worker:

\[ m_i > m_w \]

Substitution:

\[ pA_i s + (1 + r)a > w + (1 + r)a \]

Isolate for \( s \)

\[ s^{l,w} = \frac{w}{p \cdot A_i} \]
References


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