

MODELING PRODUCTIVE ENTREPRENEURSHIP IN DEVELOPING COUNTRIES

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Abstract

This paper develops a model of entrepreneurial start ups in an economy with costly firm creation, costly entry to the skilled labor market, and a mismatch between skilled workers and available jobs, as prevailing in many developing countries. It examines several mitigating policies, such as improving the business environment, reducing tax rates and cost of starting business, and subsidizing entrepreneurial search and skilled employment. To be effective policies need to target the most binding constraints to productive entrepreneurship. When the constraints are on the side of firms, search subsidies would be more effective in encouraging productive start ups than subsidies to skilled employment, although fewer entrepreneurs may choose to operate in the formal sector than under the latter. Both types of subsidies should be phased out with reforms of the business environment and improved labor markets.

Keywords: Model of entrepreneurial start ups, costly market entry, policies, informal sector, developing countries

JEL classification: L26, O12, H25, J24

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I. Introduction

Policy makers in developing countries are well aware of the positive role that productive entrepreneurship can play in development of their economies. Entrepreneurs can create jobs, broaden the tax base, diversify risks, innovate and adopt new technology. The role of entrepreneurship as an engine of growth was shown by the postwar recovery in Austria and Germany and also by the diverging paths of the Central European and Baltic countries from those of the CIS countries, among others. In transition economies, the productivity gains, employment, and the convergence to the income levels of the EU-15 countries have hinged on a dynamic private sector, and especially new firms (Brixiova and Egert, forthcoming, and others). Entrepreneurship and SMEs have been a driving force in China's recent growth.²

Entrepreneurship and SMEs have also received increased interest in the context of the global financial and economic crisis, with developing countries searching for other sources of growth than exports and FDI. As countries more integrated into the global economy were hit more severely by the crisis, their policy makers turned attention to domestic and regional demand to diversify risks. The crisis has raised the role of SMEs as the potential drivers of structural change, employment, and growth. It also showed that state has an important role to play in development and underscored usefulness of well-targeted government interventions.

This paper develops a model of entrepreneurial start-ups in an economy with costly entry into the skilled work labor market, costly entrepreneurial search, and a sizeable informal sector, as is the case in most developing countries. While substantial empirical and survey evidence exists on the constraints to entrepreneurship in developing countries, theoretical studies have been relatively scarce. The main motivation for the paper is thus to contribute to closing the gap in this area. The model builds on two strands of literature:

First, it develops a framework along the lines of Snower (1996) and more recently Bougheas and Reizman (2010), which allows modeling various imperfections in labor and product markets in developing countries, such as: (i) the costly entrance of workers into the skilled labor market and costly entrepreneurial search for business opportunities; (ii) the mismatch between skilled workers and available jobs. These market imperfections lead to suboptimal outcomes, especially in developing countries where exchanges in the skilled labor market are sparse and institutions underdeveloped. The model focuses on creation of new firms and the informal sector, key elements in the labor markets in developing countries.

Second, the model captures firms' decision whether to operate in the formal or the informal sector. The framework differs from that of Gelb et al. (2008) as it considers how regulations influence firms' decision to formalize. In this aspect, the model is also related to the dual labor market model of Harris and Todaro (1970), where a modern and productive formal sector coexists with an informal sector. The model is applied to examining policies that can help create the productive entrepreneurship and SMEs in developing countries, including taxation and subsidies.³ This part of the paper is related to Kanbur (1981) who showed the trade-offs between taxing entrepreneurs and providing wage subsidies to workers.

² As Parker (2009) underscores, a distinction needs to be made between entrepreneurship and SMEs, as firm size definitions do not necessarily correspond to entrepreneurship. This paper defines entrepreneur as someone who 'perceives an opportunity, and creates an organization to pursue it' (Bygrave and Hofer, 1991, page 14).

³ A more technical version of the model, utilizing the dynamic programming approach, is in Brixiova (2010). This paper addresses a broader set of issues though, as the framework explicitly models: (i) workers' decision to

In sum, the model developed in this paper examines encouraging start-ups of productive private firms in developing countries, as their absence limits productivity growth and job creation.⁴ Baumol (2010), Parker (2009), and others underscored the importance of including the ‘elusive’ entrepreneur – either as a firm organizer or innovator – in the mainstream economics literature. More broadly, this paper strives to contribute to this stream of research through modeling some of the key constraints to entrepreneurship in developing countries.⁵

The paper is organized as follows. Utilizing the World Bank Enterprise Surveys, Section 2 discusses stylized facts about the key firm constraints in developing countries. It also presents the Global Entrepreneurship Monitor Conceptual Framework, which forms a basis for the model. Section 3 presents the model, while Section 4 utilizes it to show the impact of several policies, especially subsidies, on entrepreneurial start ups. Section 5 concludes.

1. Stylized Facts and the Conceptual Framework

This section highlights the key constraints that entrepreneurs face in their activities. It draws on two data sources: (i) World Bank Enterprise Surveys and (ii) the Global Entrepreneurship Monitor data. The World Bank Surveys examine to what extent are the firms’ activities impeded by the following constraints: high tax rates, inefficient tax administration, cumbersome business licensing and permits, high cost of credit, corruption, poor infrastructure (power, roads), heavy labor and other regulations (customs, trade), inadequate functioning of courts, and the lack of skilled workers, among others.

While there is no ‘one size fits all’ answer regarding the most severe constraints, the Enterprise Surveys suggest that the severity of most of the constraints tends to change over time, as countries develop. Figure 1 shows that constraints on the side of firms -- infrastructure (e.g., limited access to electricity) and the limited access to credit -- impede firms at the earlier (e.g., factor driven) stage of development, constraints on the side of workers -- the lack of skilled labor, labor regulations -- are more binding in the later stages (e.g., efficiency-driven and innovation-driven).⁶ Moreover, Figure 1 reveals that in the majority of countries electricity, access to finance, tax rates and shortage and skills are of a greater concern than on average. While labor regulations and licensing are of a lesser concern than on average, the importance of these constraints rises with the level of development.

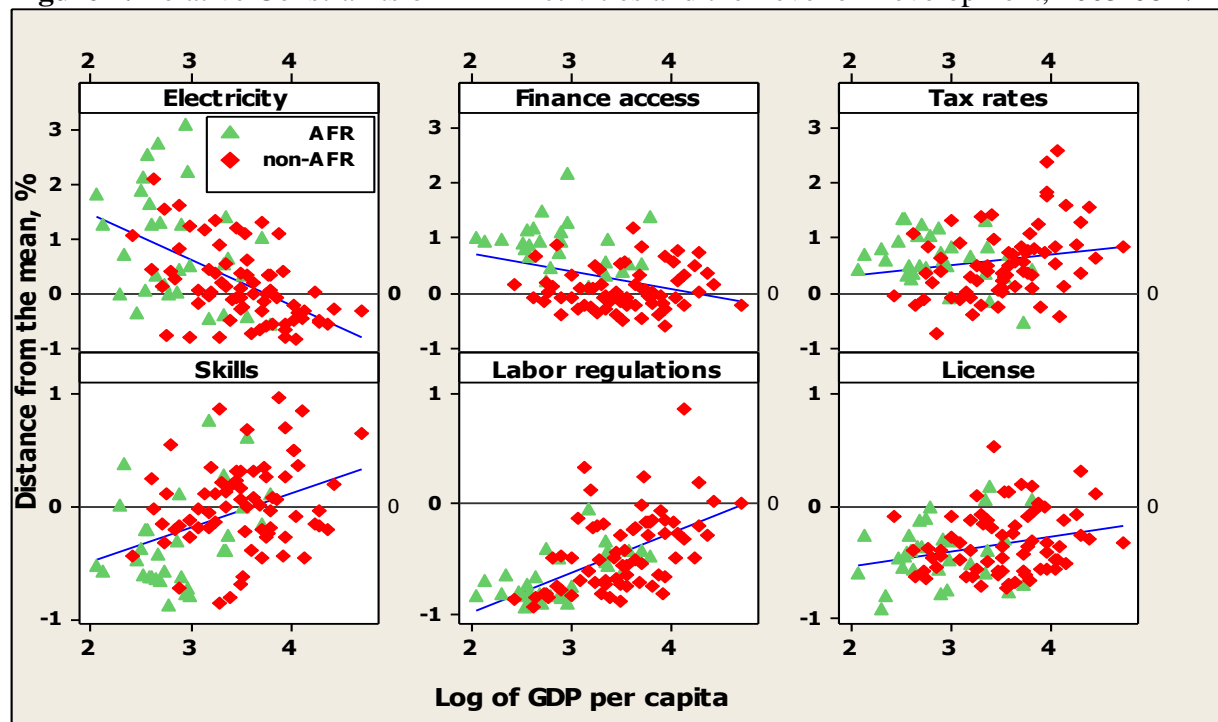
acquire skills; (ii) entrepreneurs’ decision to open their firm in either the formal or the informal sector; and (iii) cost-benefit comparison of subsidizing entrepreneurs’ search and employment of skilled workers.

⁴ See Balamoune-Lutz (2007). This paper emphasizes productive firms. As Baumol (1990) underscores, policies and cultural norms determine if entrepreneurs get involved in highly productive, socially beneficial activities or not. In many developing countries, especially in Africa, the high unemployment rates have put a renewed focus on entrepreneurship, since it can contribute to growth and job creation (Herrington et al., 2008).

⁵ Not all constraints that entrepreneurs face are explicitly modelled here. For example, because of their importance -- especially in low income countries -- credit constraints have already received substantial attention in the literature; this paper leaves them for further research. On the other hand, the model in this paper provides a detailed analysis of constraints on the workers’ side, especially skill shortages, which has been understudied.

⁶ This terminology is adopted from the Global Entrepreneurship Monitoring Reports. In the factor-driven stage, economies are driven by their factor endowments—primarily unskilled labor and natural resources. In the efficiency-driven stage, their production processes become more efficient and/or quality of products higher. In the innovation-driven stage, countries compete on the basis of new and unique products.

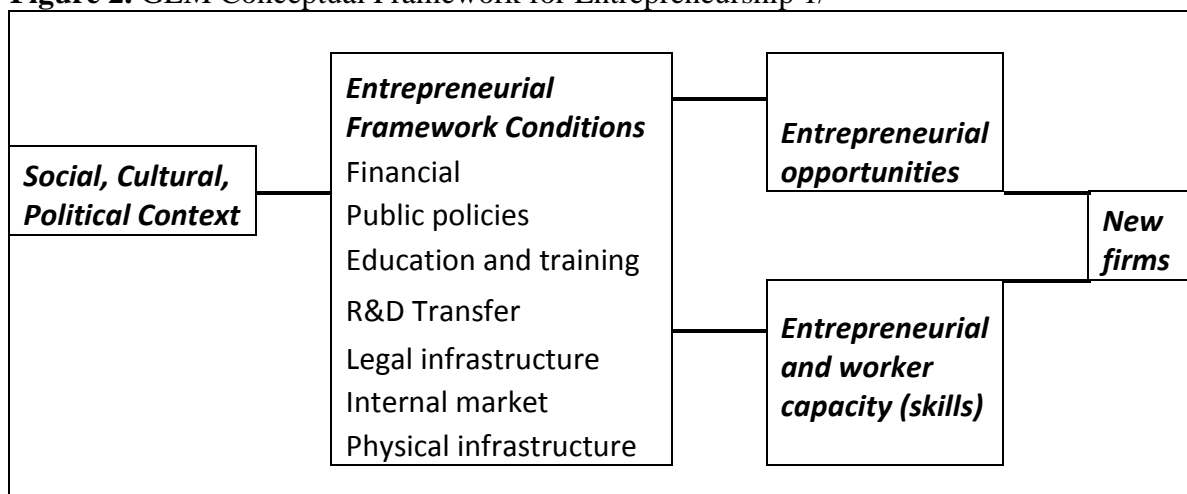
Figure 1. Relative Constraints on Firm Activities and the Level of Development, 2005-08 1/



Source: Author’s calculations based on the World Bank Enterprise Surveys 2005–08 and the IMF WEO. 1/ For each country, the distance from the mean (in %) is a difference from the average share of firms that identified a given factor as a major constraint to their activities. AFR denotes African countries; non-AFR the rest.

The conceptual framework for the entrepreneurial process developed by the Global Entrepreneurship Monitor (Figure 2) captures many of the constraints from the Enterprise Surveys as entrepreneurial starting conditions. This conceptual framework provides a starting point for the theoretical model developed in the next section.⁷

Figure 2. GEM Conceptual Framework for Entrepreneurship 1/



Source: Adapted from Herrington et al. (2009). 1/ Worker capacity was added to the diagram to reflect the fact from the Enterprise Surveys that skill shortages constrain firm activities in a number of developing countries.

⁷ Framework conditions can be divided further, depending on the level of the country’s development into ‘basic requirements’ (e.g., infrastructure, institutions); ‘efficiency enhancers’ (e.g., financial markets, goods and labor market efficiency); ‘innovation’ (e.g., R&D transfer) (Herrington et al., 2009).

2. The Model

This section develops a model of entrepreneurship in developing countries, which reflects the main constraints recorded in the World Bank Enterprise surveys. By capturing the entrepreneurial search for business opportunities and the capacity (skill) limitations of workers and entrepreneurs to turn these opportunities into productive private firms, the model also develops further the GEM's conceptual framework.

3.1 The Environment

The population is normalized to 1. There are two types of agents, entrepreneurs and workers, with population shares μ and $1-\mu$, respectively.⁸ They live for 1 period, are endowed with \bar{w} amount of consumption good, and have risk neutral preferences in consumption, c .

Entrepreneurs

At the beginning of the period, entrepreneurs search for opportunities to open private firms. This effort costs them $d(x) = x^2 / 2\gamma$, $\gamma > 0$, units of consumption good, and results in the probability x of finding a business opportunity, z . In order to turn the opportunity into a firm, each entrepreneur needs to hire \bar{n} number of skilled workers. Denoting m_p as the number of entrepreneurs that found a business opportunity, the aggregate number of skilled jobs becomes $V_s = m_p \bar{n}$. Denoting N_s as total number of skilled workers available and h number of matches formed, the matching function can be described as:

$$h = A \min[N_s, V_s] = A \min[N_s, m_p \bar{n}] \quad (1)$$

where $0 < A < 1$ is constant.⁹ Entrepreneurs with business opportunities thus find skilled workers with probability $\rho = A \min[\frac{N_s}{V_s}, 1]$. The efficiency of the matching process A can be increased through policy measures such as job search support, establishment of a job databases and labor market placement offices. Transport infrastructure and housing link suitable jobs and workers in different locations, overcoming regional mismatches.

After finding a business opportunity and skilled workers, the entrepreneur decides whether to operate in the formal or the informal sector. To operate in the formal sector, the entrepreneur

⁸ A similar assumption – that supply of entrepreneurs is exogenous -- is used in Gelb et al. (2008) for Africa. Baumol (1990) noted that supplies of entrepreneurs in societies tend to be constant, and policies do not impact them much. This can be explained, for example, by an observation that entrepreneurs tend to be individuals with specific family characteristics; this had a strong influence on becoming an entrepreneur in China and Russia, respectively (Djankov et. al., 2005a and Djankov et al. 2005b). A more rigorous, occupational choice approach would assume substantial differences in entrepreneurial abilities between the two groups (Parker, 2009).

⁹ $A < 1$ since skilled workers have imperfect information about available vacancies and entrepreneurs with skilled vacancies about available skilled workers. As Snower (1996) points out, in such circumstances even skills that are useful to all firms are not general since not all firms have access to these workers. Such skills are also not specific since more than one firm has access to an available skilled worker.

needs to pay start up costs c (e.g., registration fee), while the profit is taxed at rate τ , $0 < \tau < 1$. The entrepreneur thus earns after-tax profit, net of cost of setting up a firm:

$$\pi^F = (1 - \tau)(\varepsilon z \bar{n} - w \bar{n}) - c \quad (2)$$

where w is the wage of skilled workers determined through bargaining and output is $y = \varepsilon z \bar{n}$. The output is thus influenced not only by the productivity of the opportunity, z , and the number of skilled workers, \bar{n} , but also by the quality of the business climate, which enters as an efficiency component of the production function ε , $0 \leq \varepsilon \leq 1$.¹⁰

When operating in the informal sector, the entrepreneur pays neither profit taxes nor start up cost. However, the government monitors tax payments and detects evading firms with probability $\phi \in (0,1)$. The tax-evading entrepreneur is detected with probability ϕ , which he takes as given. Assuming that the government confiscates the firm's entire profit if it detects tax evasion, the expected profit in the informal sector amounts to:

$$\pi^I = (1 - \phi)(\varepsilon z \bar{n} - w \bar{n}) \quad (3)$$

The entrepreneur will thus choose to operate in the informal sector if the net profit in the formal sector is less than the expected profit in the informal sector, that is if $\pi^I > \pi^F$. More specifically, entrepreneurs will choose to be in the informal sector if:

$$(\tau - \phi)(\varepsilon z \bar{n} - w \bar{n}) > -c \quad (4)$$

Entrepreneurs who do not find business opportunities or skilled workers become self-employed in the informal sector and earn income b .¹¹

Workers

Workers acquire skills demanded in the private firms, and incur cost $k(q) = q^2 / 2\theta$, where $\theta > 0$. Their training effort results in probability q of obtaining skills.¹² Skilled workers find employment in a private firm with probability $\xi = A \min[\frac{V_s}{N_s}, 1]$. Workers who do not obtain skills or do not find jobs in the private firm become self-employed and earn income b .

¹⁰ More generally, ε reflects quality of formal institutions. Amoros (2009) shows empirically that differences in institutional quality help explain differences in entrepreneurship across countries.

¹¹ The model thus distinguishes between 'necessity' and 'opportunity' entrepreneurship. Consistently with Acs and Vagra (2005), the opportunity entrepreneurship has a significant positive effect on development, but the necessity one has almost none.

¹² x (and q) are restricted to be between 0 and 1. This assumes that despite their efforts, workers (entrepreneurs) occasionally fail to acquire skills (find business opportunities).

Wages are set through decentralized Nash bargaining between skilled workers and the private firms.¹³ If an agreement is not reached, both workers and entrepreneurs would be self-employed in the informal sector and earn b . The outcome of the bargaining depends on the relative strength of the skilled worker α , $0 < \alpha < 1$, and the firm, with the resulting wage as:

$$w = \alpha(\varepsilon z - b/\bar{n}) + (1-\alpha)b \quad (5)$$

Labor Market Equilibrium

The characterization of the environment is completed by the labor market equilibrium conditions. Denoting m_u as the share of self-employed entrepreneurs in the informal sector, and m_s^h as entrepreneurs running a private firm in sector $h=I,F$, the market equilibrium condition for the entrepreneurs is:

$$\mu = m_s^h + m_u, \quad h = F, I \quad (6)$$

Similarly, denoting $n_s^h = m_s^h \bar{n}$, $h=F,I$, as the total number of skilled labor employed in the private sector (either in the formal or the informal sector), and n_u total number of workers self-employed in the informal sector, the market equilibrium condition for workers is:

$$1 - \mu = n_s^h + n_u, \quad h = F, I \quad (7)$$

3.2 Solution

Maximizing the utility of workers and entrepreneurs and substituting from the labor market conditions yields the following decentralized equilibrium conditions:

$$\frac{x}{\gamma} = \rho(\pi^h - b) = A \min \left[\frac{(1-\mu)q}{\mu x \bar{n}}; 1 \right] (\pi^h - b); \quad h = F, I \quad (8)$$

$$\frac{q}{\theta} = \xi(w - b) = A \min \left[\frac{\mu x \bar{n}}{(1-\mu)q}; 1 \right] (w - b) \quad (9)$$

where w is specified in (5). Equation (8) states that in equilibrium, the marginal cost of entrepreneur's search for a business opportunity, x/γ , is equal to the profit from search. According to (9), the workers' marginal cost of acquiring skills equals the net marginal benefit from working, which amounts to the expected difference between the skilled wages and the income from self-employment. In (8) and (9), the number of skilled job openings is $V_s = \mu x \bar{n}$, and the number of skilled workers searching for skilled jobs is $N_s = (1-\mu)q$.¹⁴

¹³ Recontracting is assumed away. Bougheas and Reizman (2010) use mechanism where surplus from the match is divided between workers and firms and show that results are robust to alternative matching mechanisms.

¹⁴ The model either has (i) a unique trivial equilibrium where workers and entrepreneurs exert zero effort, or (ii) a trivial equilibrium and a unique one with positive effort by workers and entrepreneurs. In what follows, we focus on the unique equilibrium with positive workers' and entrepreneurs' efforts.

The *equilibrium* in this economy is characterized by allocations of workers and entrepreneurs by wages and by probability that entrepreneurs operate in the formal sector such that: (i) entrepreneurs choose effort they put into search for business opportunities (x); (ii) workers decide how much effort to put into training (q); (iii) wages satisfy (5); (iv) probability that firms choose to operate in the informal sector is 1 when (4) is satisfied; (v) product market clears, and (vi) labor market conditions (6) and (7) are met.

Besides firms' probability to operate in the informal sector, firms' probabilities of finding skilled workers and workers' probabilities of finding skilled jobs also need to be specified to fully characterize the equilibrium. Hence denoting the ratio of skilled job opening to skilled workers searching for jobs as φ , i.e. $\varphi = \frac{\mu x \bar{n}}{(1-\mu)q}$, two cases can be considered: (i) shortages of entrepreneurs with skilled vacancies, i.e. $\varphi < 1$ and (ii) shortages of skilled workers, i.e. $\varphi > 1$.¹⁵ The probability ρ that entrepreneurs find skilled workers and the probability ξ that skilled workers find skilled jobs become:

$$\rho = \begin{cases} A & \text{when } \varphi \leq 1 \\ A \frac{1}{\varphi} & \text{when } \varphi > 1 \end{cases} \quad (10)$$

$$\xi = \begin{cases} A & \text{when } \varphi \geq 1 \\ A\varphi & \text{when } \varphi < 1 \end{cases} \quad (11)$$

The equilibrium conditions (5), (8) – (11) lead to suboptimal outcomes in terms of workers' training efforts and entrepreneurs' search efforts and hence the number of private firms and skilled employment. Conditions (10) and (11) show the interdependence of actions of entrepreneurs and workers explicitly. If entrepreneurs increase their search effort from a situation of $\varphi \leq 1$ (shortage of skilled job openings), probability that skilled workers find skilled jobs rises. If entrepreneurs increase their effort so that $\varphi \geq 1$ (shortage of skilled workers), probability that workers find jobs jumps to A , but probability that entrepreneurs find skilled workers becomes less than A . However, when deciding about their search intensity, entrepreneurs take the ratio of skilled job openings to skilled workers, φ , as given.

More specifically, assume that the starting point of the economy is the shortage of entrepreneurs with skilled vacancies. Weakening of the business environment would cause entrepreneurs reduce their search for business opportunities. By lowering productivity and hence skilled wages, the weak business environment in turn discourages workers from acquiring skills. Other factors that impede entrepreneurs' search through lowering profit and that also encourage operating in the informal sector are high tax rates and high start up cost. With even greater shortages of skilled jobs, workers would reduce their training efforts. These actions of entrepreneurs thus also have direct impact on training effort of workers, but entrepreneurs do not take it into account when choosing their effort level. If workers would reduce their training effort to the point that the economy would have shortages of skilled workers, the downward spiral would continue. Mitigating policies are discussed below.

¹⁵ The third case, when $\varphi = 1$, will not be considered as it implies efficient allocation with no shortages, where the number of skilled workers equals the number of skilled job openings.

3. Policy Analysis

In the above economy entrepreneurs face numerous constraints to their activities, which policies can help address. Government interventions to ease these constraints include (i) *improving business environment* through, for example, building infrastructure, making tax administration more efficient and courts functioning, and reducing corruption (increasing ε); (ii) *reducing profit tax rates* (lowering τ); (iii) *reducing start up cost* through deregulating business licensing and reducing cost of credit (lowering c); (iv) *reducing entrepreneurs' search cost* through training and information about opportunities (increasing γ); (v) *subsidizing skilled employment* (increasing π^F); (vi) *subsidizing workers' training and improving its quality* (increasing θ); and (vii) *making the matching process more efficient* through effective labor offices and deregulating labor laws (increasing A).¹⁶ Table 1 groups these interventions according to the channels through which they operate.

Table 1. Policy instruments to support productive entrepreneurship and skilled employment

Stimulating entrepreneurs' search for productive business opportunities	Improving availability of skilled workers by supporting their training	Improving matching process
<i>Improving business environment (raising π^h, $h = F, I$, through higher ε)</i>	<i>Increasing quality of education and training (increasing θ)</i>	<i>Improving information at the skilled labor market; creating public-private partnerships in vocational training institutes (increasing A)</i>
<i>Providing information about business opportunities and subsidizing entrepreneurs search effort (increasing γ)</i>	<i>Subsidizing workers' training effort (increasing θ)</i>	<i>Removing barriers to mobility through language training, housing (increasing A)</i>
<i>Reducing cost of setting up a business by easing licensing (raising π^F by reducing c)</i>	<i>Subsidizing employment of skilled workers (raising take-home wage w^s)</i>	<i>Deregulating labor laws, especially hiring restrictions (increasing A)</i>
<i>Subsidizing employment of skilled workers (raising π^F directly)</i>		
<i>Reducing profit taxation (raising π^F by lowering τ)</i>		

Sections below focus on impact of policies when: (i) private firms are scarce, that is $\varphi < 1$ and (ii) skilled workers are scarce, that is $\varphi > 1$.

¹⁶ As Figure 1 showed, labor market regulations constitute a less severe constraint in the Enterprise Surveys and hence are not explicitly modeled here. Their impact is examined in Davidson and Henrekson (2002). Since the focus of the paper is on interaction between labor and product markets, credit constraints – while important -- are captured only roughly as part of cost of setting up businesses. Li (1998) analyzes the issue of entrepreneurs' access to credit in general and Gries and Naude (2010) do so in the context of the global financial crisis.

4.1 The Shortage of Private Firms ($\varphi < 1$)

In this case, $\rho = A$ and $\xi = A\varphi$. The equilibrium is characterized by the wage equation (5) and:

$$\frac{x}{\gamma} = A(\pi^h - b), h=I, F \quad (12)$$

$$\frac{q}{\theta} = A \frac{\mu x \bar{n}}{(1-\mu)q} (w-b) \quad (13)$$

where $h = I \Leftrightarrow \pi^I > \pi^h$. Policy changes causing exogenous shifts in any of the three equations ((12), (13), and (5)) affect the intensity of entrepreneurs' search, x , the intensity of workers' training, q , the probability that skilled workers find jobs, ξ , and their wages, w .

The comparative statics for the impact of various policies are as in Table 2. Equation (12) shows that measures releasing constraints on the firm side such as improvements to the business environment, lowering of the profit tax, reducing tax cost and increased efficiency of entrepreneurs' search have unambiguously positive impact on entrepreneurs' search. From (13), increased entrepreneurs' search raises skilled workers' chances of finding skilled jobs, while a better business environment also raises the wage they receive. These factors improve workers' incentives for training. More efficient matching process (A) has a positive impact on both workers' training and entrepreneurs' search. Assuming that prior to policy changes entrepreneurs are in the formal sector, sufficiently large cuts in the profit tax and the registration cost increase probability that they will transfer to the formal sector.

Table 2. Comparative statics under shortages of private firms 1/

Effects of an increase in	On the equilibrium value of		
	Entrepreneurs' search effort	Workers' training effort	Probability that firms operate in the formal sector
Quality of the business environment, ε	+	+	No impact
Efficiency of entr. search, γ	+	+	No impact
Profit tax rate, τ	-	-	-
Efficiency of matching, A	+	+	No impact
Start up cost, c	-	-	-
Workers' bargaining power, α	-	+	No impact

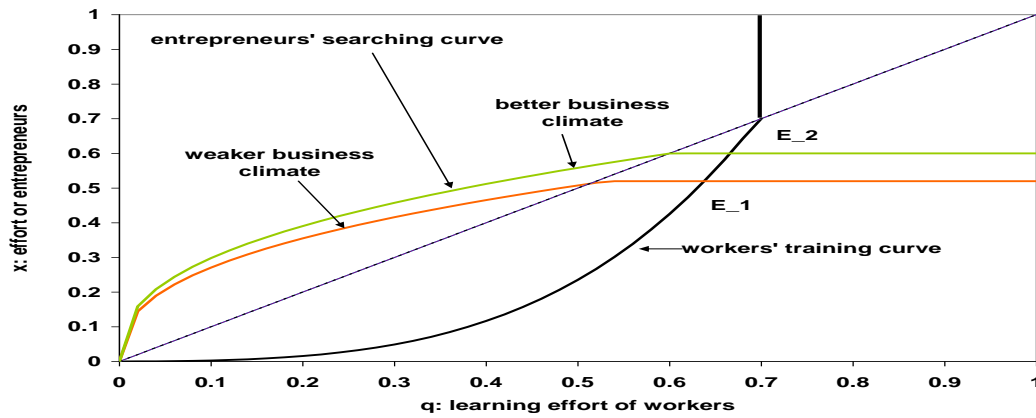
Source: Author's calculations. 1/ Equation (12) shows that reducing cost of training would not have any impact on the number of searching entrepreneurs as long as the binding constraint would remain on the side of firms.

Improving the Business Climate

This subsection takes a closer look at the impact of improvements in the business climate, a key priority in many African countries. Suppose that in the initial equilibrium, E_1 , the economy experiences shortages of private firms. With improvements to the business climate, ε , entrepreneurs will intensify their search for businesses. In turn, the increased number of skilled vacancies will encourage workers' to acquire skills. Thus in the new equilibrium E_2 , both entrepreneurs' and workers' efforts would be higher (Figure 3).

However, policies encouraging workers to acquire skills (below) when the economy suffers from shortages of firms would only lead to more skilled workers being self-employed.

Figure 3. The Impact of Improved Business Climate



4.2 The Shortage of Skilled Workers ($\varphi > 1$)

In this case, $\xi = A$ and $\rho = A\varphi^{-1}$. The equilibrium again consists of the wage equation (5) and:

$$\frac{x}{\gamma} = A \frac{(1-\mu)q}{\mu\alpha\bar{n}} (\pi^h - b) \quad h=I, F \quad (14)$$

$$\frac{q}{\theta} = A(w - b) \quad (15)$$

where $h = I \Leftrightarrow \pi^I > \pi^h$. Policy changes causing exogenous shifts in any of the three equations ((12), (13), and (5)) affect the intensity of entrepreneurs' search, x , the intensity of workers' training, q , the probability that skilled workers find jobs, ξ , and their wages, w .

The comparative statics for the impact of various policies are as in Table 3. Equation (15) shows that measures such as worker training subsidies or increased quality of training and improved efficiency of the matching process have unambiguously positive impact on the effort workers put into acquiring skills. Large increase in workers bargaining power, however, has an ambiguous impact, as the incentive to acquire skills stemming from higher wages can be offset by lower effort that entrepreneurs put into search for business opportunities and hence fewer private firms.

Table 3. Comparative statics under shortages of private firms 1/

Effects of an increase in	On the equilibrium value of	
	Workers' training effort	Entrepreneurs' search effort
Quality of the workers' training/training subsidy, θ	+	+
Efficiency of matching, A	+	+
Workers' bargaining power, α	?	?

Source: Author's calculations. 1/ ? indicates unambiguous impact.

In sum, to be effective, the government interventions should target easing the relative scarcities in a given economy. In countries where productive firms are more limited than skilled workers, policies should promote entrepreneurial search. In economies with shortages of skilled workers, interventions encouraging training would be effective. Given the mutual dependency between firms and workers, measures that ease constraints on the entrepreneurs' search will also stimulate workers' training via indirect effects and vice versa. Improving efficiency of matching between skilled workers and entrepreneurs will raise effectiveness of measures aimed at addressing constraints on the side of both workers and entrepreneurs.

4.3 Impact of Subsidies on Private Firm Creation

The sections below examine and compare the impact of some frequently considered subsidies to stimulate creation of private firms with skilled workers: (i) subsidizing entrepreneurs' search for business opportunities;¹⁷ (ii) subsidizing employment of skilled workers.

This extension of the model is related to work of Kanbur (1981), who examined welfare implications between taxing entrepreneurial activities and subsidizing skilled workers in a risk-averse setting and found that increasing taxes would be preferable. While model in this paper assumes risk-neutral preferences, as sections below show such result could be also reached in an economy with shortages of skilled workers and abundance of entrepreneurs. Moreover, similarly to Black and de Meza (1997), this result would not hold if the number of entrepreneurs fell to such extent that they would become scarce. In such a situation, which is examined below, entrepreneurs should be subsidized rather than taxed.¹⁸

Subsidizing Entrepreneurs' Search

One of the policy options is the (partial) government financing of the entrepreneurs' search for business opportunities.¹⁹ In the case with shortages of private firms ($\varphi < 1$), subsidy that is proportional to the entrepreneurs' search, sx , changes equation (12) to:

$$\frac{x}{\gamma} = \rho(\pi^h - b) = A(\pi^h - b) + s, \quad h=F, I \quad (16)$$

The workers' training curve continues to be characterized by (13) and (5); while the entrepreneur's choice of sector is described by (4). Subsidizing search will raise

¹⁷ Entrepreneurs' search subsidies refers to business advice (e.g., mentoring, training) to mitigate the lack of information on how to start a business, develop business plan, obtain finance, and how to comply with regulations during the start up process, etc -- in either public institutions or publicly supported private institutions (Parker, 2009). Entrepreneurial training has been developed in, for example, South Africa where the lack of entrepreneurial skills is well recognized as a key constraint.

¹⁸ Biggs (2003) provides an argument for subsidizing SMEs, which is akin to the one modeled in this paper. Specifically, in the cases where the first best solution – removing of distortions or imperfections – is not feasible, subsidies may provide a complementary solution that will stimulate creation of SMEs. Korea, for example, adopted a proactive and successful policy towards SMEs.

¹⁹ Subsidies could be payments to entrepreneurs' who document their effort to open business, providing information about available opportunities as well as training of entrepreneurs. Martinez et al. (2010) found that greatest effect of such training on early-stage entrepreneurial activity is in countries with favorable institutional contexts, consistently with the model in this paper.

entrepreneurs' efforts, but it will not impact their choice of sectors, which will still depend on profit tax rate, τ , the probability that informal firms are detected ϕ , and start-up cost, c .²⁰

Subsidizing Employment of Skilled Workers

Another policy to encourage opening of highly productive businesses is subsidizing employment of skilled workers. When the employment subsidy per skilled worker amounts to ω , profit of entrepreneurs in the formal sector becomes: $\pi^F = (1 - \tau)[\varepsilon\bar{n} - (w - \omega)\bar{n}] - c$. Profit of entrepreneurs in the informal sector is still as in (3). Equation (12) thus changes to:

$$\frac{x}{\gamma} = A(\pi(\omega)) - b \quad (17)$$

Workers reduce the impact of the subsidy on entrepreneurs' search by receiving higher wages (and capturing the firms' higher profit) in proportion to their bargaining power while the wage of skilled workers employed in an informal sector firm is unchanged, $w^I = \alpha(\varepsilon - b/\bar{n}) + (1 - \alpha)b$. With higher wages of skilled workers due to the subsidy, the equilibrium condition (103) for workers' training changes to:

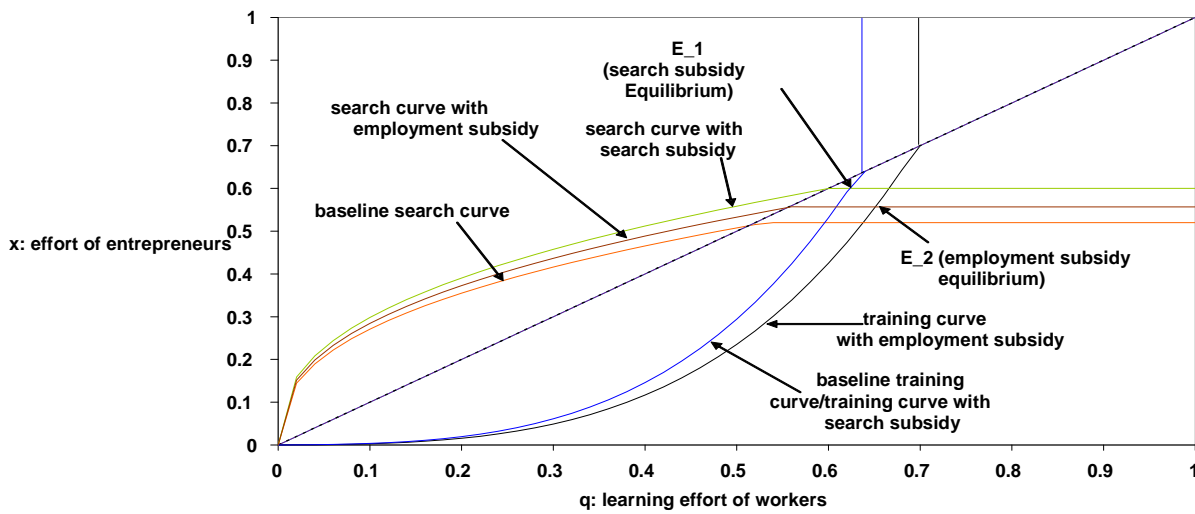
$$\frac{q}{\theta} = A \frac{\mu x \bar{n}}{(1 - \mu)q} (w(\omega) - b) \quad (18)$$

The impact of employment subsidy on entrepreneurs' search differs from that of the search subsidy. First, if in the absence of the employment subsidy the firm would opt for operating in the informal sector and if the subsidy is not large enough to entice it to move to the formal sector, the subsidy would not change entrepreneurs' search effort. Put differently, the employment subsidy can raise entrepreneurs' search effort (and the number of private firms) only if the firms in the formal sector. Second, in addition to stimulating entrepreneurs' search, the subsidy also raises the net profit in the formal sector relative to that in the informal sector and thus influences in which sector – formal or informal – the entrepreneurs operate. Third, even when $s = \omega\bar{n}_s$, that is when amounts paid by the government are equal under both types of subsidies, the employment subsidies will be less effective in stimulating entrepreneurs' search than search subsidy. This is because part of it accrues to workers through higher wages. On the positive side, workers raise their training effort (Figure 4).

The dependence of the impact of the employment subsidy on the sector in which the firm ends up operating is a key difference in these two types of subsidies. Search subsidies, paid before entrepreneurs find their business opportunities, impact only their search effort, but not whether they work in the formal or the informal sector. With skilled employment subsidies, entrepreneurs increase their effort only when they will work in the formal sector after finding a business opportunity and skilled workers. In contrast to search subsidies, these subsidies also increase probability that entrepreneurs' will operate in the formal sector.

²⁰ Another way to subsidize entrepreneurs search would be through covering part of the cost or raising efficiency of search, γ . The subsidy is assumed to be financed by the lump-sum tax. Typically, consumption taxes are more efficient for financing these subsidies than profit taxes.

Figure 4. The Impact of Skilled Employment and Entrepreneurial Search Subsidies



This example reinforces the point that when choosing between various instruments, policymakers need to consider the binding conditions that the economy faces to be effective. If the pre-subsidy equilibrium is low because of the lack of skilled job openings, search subsidies would be appropriate to generate such openings, even though they may be in the informal sector. In contrast, the number of skilled workers seeking employment in highly-productive firms would rise more under skilled employment subsidies, but more of these skilled workers would end up in self-employment.

4. Conclusions

This paper has developed a model with costly firm creation, costly worker entry into the skilled market and mismatch between workers and available jobs, as existing in many developing countries. While substantial empirical and survey literature on constraints to entrepreneurship in developing countries exists, theoretical studies – especially on skill shortages as a constraint to entrepreneurship -- have so far been rare. This paper contributes to the literature aiming at closing this gap.

The model was applied to answer the following question: which policies are effective in supporting productive entrepreneurial start ups and skilled employment developing countries? The answer depends on the type of constraint that the new private sector faces. In ‘factor-driven’ countries with an underdeveloped private sector and constraints on the side of firms (e.g., Ethiopia), the interventions should aim at easing obstacles to entrepreneurial search and firm creation. In some ‘efficiency-driven’ and especially ‘innovation driven’ countries (e.g., South Africa, Mauritius), the constraints that need to be addressed are often on the side of workers, including shortages of skills.

A related issue is the role of the government in encouraging productive entrepreneurship and its stance towards the informal sector. Our analysis shows that well targeted subsidies support creation of productive firms. In countries where entrepreneurship is limited and productivity low, the aim should be to stimulate productive entrepreneurship, regardless whether in the formal or informal sector. In such a situation, the search subsidy is effective in encouraging entrepreneurs to open productive firms. In contrast, skilled employment subsidies would be less effective for start-ups as they do not much affect firms in the informal sector, where most SMEs in developing countries operate. They would be also less effective for firms in the

formal sector as they partly accrue to workers through higher wage. On the positive side, they may reduce income inequality, facilitate SME formalization, and broaden the tax base.

To facilitate start ups of highly productive SMEs and skilled employment, the underlying inefficiencies and failures in the factor markets also need to be addressed. Hence further reforms of the business climate and the labor markets are crucial, and so is the improvement of the information on the skilled labor market to raise efficiency of matching. Another important policy initiative towards better matching process could be creating public-private partnerships in vocational training institutes. With progress of these reforms, the need for subsidies would decline and these should be phased out.

Taking a broader view, the global financial and economic crisis has shown the importance of a diversified private sector, including dynamic SMEs. For policymakers in developing countries, the crisis has triggered rethinking of their growth strategies. Before the crisis, many small open economies, especially in Africa, relied almost exclusively on FDI and exports to drive growth. However, in light of the crisis, countries have strived to achieve a more broad-based growth by shifting some of their resources to domestic private firms and demand. In this context, enhancing efficiency of the financial sectors and releasing credit constraints would help channel savings to their most productive use. Magnitudes of such credit constraints to entrepreneurship and mitigating interventions will be subject of future research. Another area for further research could be developing a dynamic version of the model that would reflect how constraints to entrepreneurship change over time.

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