Policy Research Working Paper 10229

Revisiting Entrepreneurial Ecosystems

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WORLD BANK GROUP
Finance, Competitiveness and Innovation Global Practice
November 2022

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Abstract

An entrepreneurial ecosystem consists of the set of complementary factors required to start a business with the potential to scale up and innovate in a particular geographic space. This paper develops a framework using an occupational choice model with knowledge-based hierarchies to assess entrepreneurial ecosystems. The framework shows that improving human capital and managerial capabilities would increase the quality of entrepreneurship, while leading to a reduction in the entrepreneurship rate. Similarly, differences in the structure of output markets, endowments, or the business environment would lead to differences in the selection into entrepreneurship and the size distribution of firms. The paper combines these elements and proposes a method to conduct entrepreneurial ecosystem diagnostics that considers the key gaps at the country level, the potential and variation of local ecosystems, and the resources available from public programs and enabling organizations to inform policy recommendations.

This paper is a product of the Finance, Competitiveness and Innovation Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at marciocruz@ifc.org.

Revisiting Entrepreneurial Ecosystems*

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JEL classification: D21, L22, L26

Keywords: Entrepreneurial ecosystems, Entrepreneurship, Business environment

*We thank Erik Stam, Mona Haddad, Martha Martinez Licetti, Denis Medvedev, Xavier Cirera, Juni Zhu, and Venkat Nadella for many helpful comments. We also thank the excellent research assistance of Mellany Pintado and Joao Bevilaqua Teixeira Basto. All errors or omissions are our own. The views expressed in this publication are those of the authors and do not necessarily reflect the views of the institutions they are affiliated with.

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1. Introduction

A seismic shift has shaken thinking in both research and policy alike about the key catalyst for economic development. Where earlier generations looked to inward foreign direct investment, entrepreneurship has more recently been uncovered as a key spark for economic growth and competitiveness. Still, the question remains: how can policy best ignite entrepreneurship forces to harness the potential for economic performance?

In the quest for an answer, thought leaders in research and policy have turned to the strategy of entrepreneurial ecosystems with the explicit goal of igniting entrepreneurship. An entrepreneurial ecosystem characterizes the spatial organization, structure, configuration, and interactions of organizations, firms, institutions, and individuals at a specific geographic place that is conducive to entrepreneurship. As in other works in the literature, an entrepreneurial ecosystem can be more precisely defined as "a set of interdependent actors and factors that are governed in such a way that they enable productive entrepreneurship in a particular territory" (Stam, 2015; Spigel and Stam, 2018; Stam and Van de Ven, 2021a). The role of policy is to influence and shape this environment in such a manner that it generates the desired degree of entrepreneurship.

The extant literature has focused on better understanding the conditions for entrepreneurship at the macro, aggregate level, not per se for the individual entrepreneur. Individual entrepreneurs are often not even aware of the role of institutions and culture for their own behavior, like a fish in a pond not being aware of the quality of the water. The effects of the quality of entrepreneurial ecosystems are likely to be perceived at the aggregate level (the quantity and/or quality of entrepreneurship in a particular territory), not necessarily by the individual entrepreneur. By contrast, this paper aims at filling this gap in the literature by providing a framework for assessing an entrepreneurial ecosystem, identifying relevant factors from the perspective of an entrepreneur. We propose a methodology to diagnose the performance of entrepreneurial ecosystems and identify gaps in the business environment to help inform policy action. Our framework starts with the entrepreneur's problem, by asking first what the entrepreneur needs. This process helps to define what are the relevant factors that one should take into consideration when conducting an entrepreneurial ecosystem assessment.

A review of both the research literature as well as the policy discourse reveals that no singular definition for entrepreneurship exists. The Schumpeterian definition (Stam et al., 2012) has focused on the identification and pursuit of opportunities for new value creation by individuals. By contrast, according to the Knightian definition, individuals choose to be an entrepreneur on the basis of their own risk and reward. These two conceptualizations of entrepreneurship also necessitate different conditions: for the Schumpeterian one, knowledge conditions are paramount, while for the occupational choice (Lucas, 1978; Kihlstrom and Laffont, 1979), labor market conditions are paramount. In general, the definition of entrepreneurship is shaded by the particular context. This is not to say that when it comes to entrepreneurship, anything goes. In fact, three disparate views prevail about what constitutes entrepreneurship. The first view revolves around organizational status. Classifying an enterprise based on age, such as new or young, (small) size, or ownership (self-employed or legal ownership) constitutes "entrepreneurship." The second view revolves around behavior. An individual or firm discovering or creating new opportunities and acting on or commercializing those opportunities is deemed to be entrepreneurial. This view is orthogonal to the first, in that it is organizational neutral. Entrepreneurial behavior can occur in

any type of organizational context, regardless of age, size, legal status, and ownership status. The third view revolves around performance. A firm exhibiting a meteoric rise in key performance criteria, such as innovation and/or growth (or anticipated growth, such as venture capital financed), is classified as entrepreneurial. Thus, the feature distinguishing entrepreneurial and non-entrepreneurial firms in this view is performance.

The particular context, in terms of country, region, industry, and even demographic characteristics particular to the individual, typically colors the view of what constitutes bona fide entrepreneurship. In the case of the present study, the proposed conceptual framework is quite generic, but the context being considered for implementing is the broad swath of emerging and developing countries and regions, for which data availability is usually a constraint. Thus, the most compelling view of entrepreneurship in this paper combines all three perspectives, where entrepreneurship characterizes new high-performing firms. This view of entrepreneurship reflects the developmental contexts emphasizing and valuing new businesses with high growth and innovative potential that are best situated to fuel the arc of economic development for their regions (Cao and Shi, 2021; Chen et al., 2020; Robinson and Acemoglu, 2012; Rodrik, 2008; Hausmann et al., 2008).

The policy and research communities have responded to the mandate to create, develop, and sustain entrepreneurial ecosystems by generating a large and robust body of literature identifying and characterizing what constitutes a bona fide entrepreneurial ecosystem, along with commensurate policy guidelines (Andrews et al., 2022; Guzman and Stern, 2020; Wurth et al., 2021; Stam, 2015). This literature suffers from a glaring deficiency. This limitation emanates from the conceptual approach. Often, the concept of entrepreneurial ecosystems lacks a theoretical foundation. The extant studies and frameworks typically start with the geographic region and then focus on the organizations, institutions, agents, and interactions that can be linked to entrepreneurship. This puts the focus more on what the existing institutions and organizations need and less on what the entrepreneurs themselves need.

By contrast, the purpose of this paper is to address this limitation in the extant literature by providing a theoretical framework placing the entrepreneur at the focal point of the entrepreneurial ecosystem. In practical terms, this means, as we do in the following section, introducing a framework and theory that starts with the entrepreneur with a focus on her choices and her challenges.[1] The framework focuses on two simple entrepreneurship output measures, the entrepreneurship rate and the average size of the firm, which can be used as a proxy for quality.[2] The framework places skills in the form entrepreneurial talent, managerial capabilities, and human capital in the center of the analysis. We refer to these elements as "primitives," and add additional factors that are part of the entrepreneur's problem to define the key elements of an entrepreneurial ecosystem. The model allows us to generate simulation exercises describing how changes across different elements of the ecosystem may lead to improving the quality of entrepreneurship output, while in many cases, reducing the entrepreneurship rate.

Our work is linked to a wide literature aiming to understand the concept of entrepreneurial ecosystems. Overall, our conceptual framework is consistent with Stam and Van de Ven (2021b); Leendertse et al. (2021) and the concepts provided by Acs et al. (2017); Audretsch and Belitski (2017). Our main contribution is

[1] In our framework an entrepreneur is anyone not working for a wage, not only high-performing firms, and the sufficient measure of performance is the size of the firm, but this simple model helps highlight the role of primitives in the entrepreneurial process.

[2] The model is static, which means that entrepreneurship output in time 1 does not affect resources available in time 2.

to provide a theoretical micro-foundation, starting with the entrepreneur's problem that can drive the decision towards what factors one should consider as a part of an entrepreneurial ecosystem. For example, Stam and Van de Ven (2021b) provide a very comprehensive review of the literature on definitions and key elements and outputs that are part of an entrepreneurial ecosystem, which is consistent with our approach and the conceptual framework we propose. Our work is also inspired by the discussion of micro-foundations of national innovation systems and the framework described in Maloney (2017); Cusolito and Maloney (2018). Entrepreneurial ecosystems have been widely covered by the literature from many perspectives that can be linked to our proposed framework, with emphasis on the importance of heterogeneity across places. Guerrero et al. (2021) analyze how the environmental conditions vary per entrepreneurial stage of enterprises within different places. Audretsch et al. (2021); Audretsch and Belitski (2021) emphasize the importance of geographic heterogeneity across sub-national regions and cities and sources of variation of the quality of factors that drive entrepreneurship performance. Our model highlights that heterogeneous circumstances across any of the key factors that are part of the entrepreneur's problem can lead to these results.

The rest of the paper is organized as follows. Section 2 describes the entrepreneur's problem and presents a simple theoretical foundation combining the Roy framework (Roy, 1951; Levine and Rubinstein, 2017) with knowledge of hierarchies (Garicano and Rossi-Hansberg, 2004, 2006). Section 3 of the paper links the problem of the entrepreneur, or actually her ability to deal with that problem, to the external environment, which forms the basis for the entrepreneurial ecosystem. Section 4 describes what exactly constitutes an entrepreneurial ecosystem, including the reasons why it is spatially constrained and geographically localized across the geographic space. In section 5, a method to evaluate and benchmark entrepreneurial ecosystems across and within countries is introduced. The assessment also proposes a clear role of public policy in igniting, shaping and sustaining an entrepreneurial ecosystem. Finally, section 6 provides conclusion remarks.

2. The entrepreneur's problem: Transforming inputs and ideas into final goods

Entrepreneurs access ideas, knowledge, and resources in input markets; combine these resources applying their entrepreneurial talent and managerial capabilities to the production process; and sell the final good or service in output markets. A production function summarizes the transformation of knowledge and ideas A; human capital n; equipment and machinery k; land, electricity, water, and telecommunications t; and intermediate inputs m into a final good or service y:

$$y = f\left[z, A, n, k, t, m\right], \tag{1}$$

where z denotes the characteristics of the manager. The form for the production function will depend on the capabilities of the firm, the technology employed, and the productivity of the firm in combining resources to produce the final good. The optimization problem for an entrepreneur characterized by z and with access to a given production process is to choose a level of each input that will maximize profits, written as revenues minus production costs:

$$\pi = p_y f\left[z, A, n, k, t, m\right] - p_A A - p_n n - p_k k - p_t t - p_m m. \tag{2}$$

Potential entrepreneurs will become entrepreneurs only if their earnings from running a firm (π in equation 2) are higher than the opportunity cost of their time and skills (for example, their earnings working for a wage). Over time, successful entrepreneurs will grow in sales or into new markets and develop new products and new production processes, whereas less successful entrepreneurs will not grow or innovate, if they survive, or might eventually exit business ownership.

This simple set up highlights three groups of factors that influence the performance of firms: (i) the characteristics of the entrepreneur (the selection into entrepreneurship); (ii) the structure of input markets, that is, whether they are easily accessible and competitive, and the quality or capacity of the resources available (knowledge, labor, machinery and equipment, infrastructure, intermediate inputs), and (iii) the structure of output markets, which affects the demand for the final good. We illustrate the influence of each in a simple general equilibrium model where workers sort into occupations and resources are allocated across the distribution of firms.

2.1. The Roy model with entrepreneurial and managerial skills

Entrepreneurial talent and managerial capabilities are scarce sources of knowledge, especially in developing countries. Cusolito and Maloney (2018) distinguish between entrepreneurial skills—grit, risk taking, patience, the ability to identify business opportunities, the need for achievement, conscientiousness, openness, innovativeness, self-efficacy, locus of control, preferences for autonomy and control, and overconfidence—and managerial capabilities—the capacity to use financial statements, to collect and interpret information, to organize the project logistically and analyze the technical feasibility, to form the long-term risk-return profile of the project and compare it to other alternatives, and to navigate government regulations.[3] We assume that output of the final good y requires entrepreneurial talent z and only labor n for simplicity, and assume that both managerial capabilities α and the skill of wage workers p_z limit the span of control of the entrepreneur (the size of the firm).

We follow Garicano and Rossi-Hansberg (2004, 2006) and López and Torres (2019) and write

$$y = z\left[n\left(p_z\right)\right]^{\alpha}, \tag{3}$$

where $n' > 0$, $n'' > 0$, and $\alpha < 1$ (Lucas, 1978). In this production process wage workers with more human capital (for example, workers with more years of schooling or more years of sector-specific experience) allow the entrepreneur to increase more than proportionally the size of his firm. Similarly, business owners with more entrepreneurial talent z or with better managerial capabilities (a larger value of α) run better performing (larger) firms (Lucas, 1978). In other words, in this economy size (in number of workers) measures the performance of firms.

We assume that the market for the final good and the market for labor are both competitive—the manager can easily access the market for labor and hire as many workers as needed (conditional on a level of skill) at the current wage profile, and he can access the market for the final good and sell as many units as he deems profitable at the current output price. We set $n = \exp\left(p\right)$ and constrain wages to vary with productive skill according to $w\left(p\right) = \exp\left(\beta p\right)$. The final good is the numeraire.

[3]The literature further distinguishes between managerial skills for business development, which are most relevant in the context of micro firms (McKenzie and Woodruff, 2017) and management practices, more of a leadership (individual) and organizational characteristic (Bloom and Van Reenen, 2007).

The manager's problem is to choose the skill of his wage workers p_z to maximize profits, written as revenues minus production costs, taking the output price and the wage profile as given:

$$\pi = z\left[n\left(p_z\right)\right]^{\alpha} - w\left(p_z\right) n\left(p_z\right). \tag{4}$$

We derive the solution to the optimization problem in equation 4 in the Appendix. The resulting optimal firm size for manager z with entrepreneurial capabilities α is

$$n\left(z\right) = \left(\frac{z\alpha}{1+\beta}\right)^{\frac{1}{1-\alpha+\beta}}, \tag{5}$$

and profits at an optimal follow

$$\pi\left(z\right) = \left(1-\alpha+\beta\right) z^{\frac{1+\beta}{1-\alpha+\beta}} \left(\frac{1}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}} \alpha^{\frac{\alpha}{1-\alpha+\beta}}. \tag{6}$$

Both sizes and profits increase with entrepreneurial talent and the managerial capabilities of the firm, and decrease with the price of labor, that is, the return to wage working skill (β).

To introduce occupational choices in this setup, we assume workers are endowed with both managerial skill z and wage working skill p (managerial capabilities α do not vary in the population) and that the distribution of these abilities follows $g\left(z,p\right)$. We follow Roy (1951) and assume that workers can either apply z to become entrepreneurs and start a firm, or apply p to work for someone else for a wage, and that they sort into occupations based on their comparative advantage—they become entrepreneurs only if their earnings running a firm $\pi\left(z\right)$ (equation 6) are higher than their earnings working for a wage $w\left(p\right)$.[4] Note that for every value of p there is a function $z\left(p\right)$ such that if $z \geq z\left(p\right)$, the worker becomes an entrepreneur, whereas if $z < z\left(p\right)$, he becomes a wage worker. This function solves

$$\pi\left[z\left(p\right)\right] = w\left(p\right), \tag{7}$$

and is equal to

$$z\left(p\right) = A_1 \exp\left(A_2 p\right), \tag{8}$$

where $\kappa \equiv \left(1-\alpha+\beta\right)\left(\frac{1}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}} \alpha^{\frac{\alpha}{1-\alpha+\beta}}$, $A_1 \equiv \frac{1}{\kappa^{\frac{1-\alpha+\beta}{1+\beta}}}$, and $A_2 \equiv \beta\left[\frac{1-\alpha+\beta}{1+\beta}\right]$ (see Appendix for details).

In this framework workers choose their occupation (whether to work for a wage or run a firm managing others), and managers choose the size of their firm and the human capital of their employees. The primitives in this economy are the skill distribution, the technology transforming human capital and entrepreneurial talent into units of the final good, and the parameter α governing managerial capabilities. To close the model, we solve for the value of β that clears the market for wage workers. Note that conditional on $p = \widetilde{p}$, the (conditional) supply of wage workers is

$$G_{z|p}\left[z\left(\widetilde{p}\right) \mid \widetilde{p}\right] = G_{z|p}\left[A_1 \exp\left(A_2 \widetilde{p}\right) \mid \widetilde{p}\right], \tag{9}$$

[4]The analysis does not consider additional hierarchies in the firm that could result in a market for CEOs or managing directors. Similarly, we do not make a distinction between opportunity and necessity entrepreneurs.

Figure 1: Selection into entrepreneurship in equilibrium. Baseline exercise.

The exercise sets $\alpha = 0.8$ and $\mu_z = 4, \sigma_z^2 = 1, \mu_p = 4, \sigma_p^2 = 1, \rho = 0.85$.

and the (conditional) demand is

$$\int_{z(\widetilde{p})}^{\infty} \left[\left(\frac{i\alpha}{1+\beta} \right)^{\frac{1}{1-\alpha+\beta}} \right] g_{z|p} \left[i \mid \widetilde{p} \right] di, \tag{10}$$

where $g\left(z \mid \widetilde{p}\right)$ is the distribution of managerial skill conditional on p. The market for wage workers clears when the aggregate supply of wage workers equals the aggregate demand:

$$\int_{-\infty}^{\infty} \left[G_{z|p} \left[A_1 \exp\left(A_2 \widetilde{p} \right) \mid \widetilde{p} \right] \right] g_p\left(\widetilde{p}\right) d\widetilde{p} = \int_{-\infty}^{\infty} \left[\int_{z(\widetilde{p})}^{\infty} \left[\left(\frac{i\alpha}{1+\beta} \right)^{\frac{1}{1-\alpha+\beta}} \right] g_{z|p} \left[i \mid \widetilde{p} \right] di \right] g_p\left(\widetilde{p}\right) d\widetilde{p}, \tag{11}$$

where $g_p\left(\widetilde{p}\right)$ is the marginal distribution of wage working skill. We assume that $(z, p) \sim Normal$ with parameters $\mu_z, \sigma_z, \mu_p, \sigma_p, \rho$ (Heckman and Honore, 1990). A competitive equilibrium is a value of β such that managers maximize their profits, no agent desires to switch to another occupation, and the market for wage workers clears (equation 11).

In Figure 6 we illustrate the allocation of workers into occupations in equilibrium when $\alpha = 0.8$, $\mu_z = \mu_p = 4$, $\sigma_z = \sigma_p = 1$, and $\rho = 0.85$.[5] In this example the equilibrium return to skill among wage workers is $\beta = 0.445$, the rate of entrepreneurship is 18.4%, and the average firm employs 4.4 employees.

In the model the performance of firms will vary if the selection into entrepreneurship and/or the allocation of factors of production across entrepreneurs (the assignment of workers into firms) vary as well. In other words, the characteristics of entrepreneurs, the structure of input markets, the skills of wage workers, or the structure of output markets will affect the entrepreneurial talent distribution of those who become entrepreneurs and/or the allocation of resources into firms (the matching of wage workers and entrepreneurs in the model), which in turn will ultimately affect the observed performance of firms in equilibrium. The roles of selection and resource allocation have been highlighted in other works in the literature. Bento and Restuccia (2017) and Restuccia (2019), for example, identify these two mechanisms

[5]The resulting size distribution of firms would follow a power law for appropriately calibrated parameters, which is beyond the scope of this paper. Alternatively, the model could be set of match moments of the distribution of log sizes if the model results in a bell-shaped size distribution of firms.

in their framework to study the effects of distortions on aggregate productivity.

2.2. Characteristics of the entrepreneur

Differences in the characteristics of entrepreneurs or their managerial capabilities will result in differences in the performance of firms. In Table 1 we simulate the effects in our model of improving entrepreneurial talent (column 2) and increasing managerial capabilities (column 3).

Table 1: Occupational choices and average performance of firms with shocks to entrepreneurial and managerial skills.

Equilibrium outcomes	Baseline (1)	Increase in μ_z (2)	Increase in α (3)
β	0.445	0.486	0.476
Rate of entrepreneurship	18.4%	19.88%	16.87%
Average firm size (n)	4.4	4.03	4.89
Average sales (output)*	1	0.96	1.18

*/ Relative to baseline. Column (1) corresponds to the baseline scenario in Figure 6. In column (2) we increase the population mean of entrepreneurial skill by 12.5% (from 4 to 4.5). In column (3) we increase the span of control of the entrepreneur from 0.8 to 0.85.

When average entrepreneurial talent is higher, the rate of entrepreneurship is higher. In other words, when entrepreneurial characteristics improve, more workers will start a firm. The effect on the performance of the firm, however, depends on whether the correlation between managerial skill and wage working skill is positive or negative. In our baseline exercise we assume that the correlation between managerial skill and wage working skill is positive: when more workers become entrepreneurs, the most talented wage workers switch occupations, which results in smaller firms on average (see row 4 in Table 1).

When managers are able to coordinate a larger number of wage workers (the increase in the span of control α in column 3), there will be fewer entrepreneurs in larger and better performing firms (managers match with the same wage workers but produce more, which in equilibrium results in fewer managers coordinating larger firms). This is consistent with previous findings presented by Cusolito and Maloney (2018), showing a negative correlation between self-employed entrepreneurs and per capita income across countries, while a reverse pattern is observed if focused on the share of entrepreneurs leading firms with at least one employee, or share of entrepreneurs with tertiary education in the labor force. Cruz et al. (2022) also show a positive correlation between new business density, measured by the number of new formal firms with respect to the working age population and the per capita GDP across countries.

2.3. Input markets: The quality of factors of production

Variation in the quality or the capacity of the factors of production will result in variation in the observed performance of the firm. In Table 2 we show how changes in the distribution of wage working skill affect the distribution of sizes and sales in the economy.

Consider first a decrease in the average human capital of wage workers (column 2). When wage workers have lower levels of human capital on average, firms employ fewer workers and sell less relative to the baseline. Note that the rate of entrepreneurship is higher: if wage workers are teamed in smaller firms, the market needs a larger number of managers to coordinate their production. The average talent of entrepreneurs, however, is lower—wage workers with less human capital result in a less talented selection of entrepreneurs.

In column 3 the human capital of wage workers is scarcer, that is, relative to the baseline, there is more dispersion in the distribution of wage working skill. The qualitative effects are similar to a decrease in average wage working skill: firms are smaller, sell less on average, there are more entrepreneurs, but they are of lower entrepreneurial skill.

Table 2: Occupational choices and average performance of firms with shocks in input markets.

Equilibrium outcomes	Baseline (1)	Decrease in μ_p (2)	Increase in σ_p (3)
β	0.445	0.483	0.456
Rate of entrepreneurship	18.4%	21.3%	25.45%
Average entrepreneurial skill*	1	0.96	0.78
Average firm size (n)	4.4	3.7	2.9
Average sales (output)*	1	0.84	0.57

*/ Relative to baseline. Column (1) corresponds to the baseline scenario in Figure 6. In column (2) we decrease the population mean of wage working skill by 12.5% (from 4 to 3.5). In column (3) we double the variance of wage working skill (from 1 to 2).

2.4. Output markets

We simulate the effects of increasing the price of the final good by 10% in our simple model with no capital and compare outcomes with the baseline economy. An increase in the price of the final good (as a result of marketing campaigns or an improvement in the quality of the good or service) allows the same manager matched with the same wage workers to sell more, which in equilibrium results in fewer managers coordinating larger firms. The rate of entrepreneurship decreases from 18.4% to 14.72%, average firm size increases from 4.4 to 5.77, and average sales increase in 21% (more than double the increase in the price). The return to wage workers increases from 0.445 to 0.4519. Notice that an increase in productivity, an increase in the knowledge of managers, an improvement in infrastructure, or an innovation in the technology of firms would amount to a similar shock, with similar qualitative effects.

3. The business environment: Distortions to the entrepreneurship process

Distortions in the entrepreneurship environment constrain entrepreneurship and the flow of factors of production into firms, affecting both occupational choices and the resource allocation and ultimately the

performance of firms. The most talented potential entrepreneurs may not start businesses, or they may not produce with the resources with the most capacity, resulting in a suboptimal performance of firms (relative to the equilibrium without these barriers). We briefly examine the effects of credit constraints, cultural barriers, and regulations in our model economy with only labor as a production factor.

3.1. Input markets: Credit constraints

We assume now that workers differ in managerial skill z, wage working skill p, and their wealth endowment a, and that the distribution of these traits in the population varies according to the density function $g(z, p, a)$. The production in firms now follows

$$y = z\left[n\left(p_z\right)\right]^{\alpha} k^{1-\alpha}, \tag{12}$$

where k denotes the stock of capital. We follow Evans and Jovanovic (1989) and assume that the amount that individuals can borrow cannot exceed $(\lambda - 1)\, a$, where $\lambda \geq 1$ captures the financial development of the economy (the geographical location or ecosystem). The most that a potential entrepreneur can invest in his business is then $a + (\lambda - 1)\, a = \lambda a$, and the financing constraint of the firm is $k \leq \lambda a$ (in developed financial markets $\lambda \to \infty$, and entrepreneurs would face no credit constraint).

Let r denote the interest rate. The profits of the firm are now

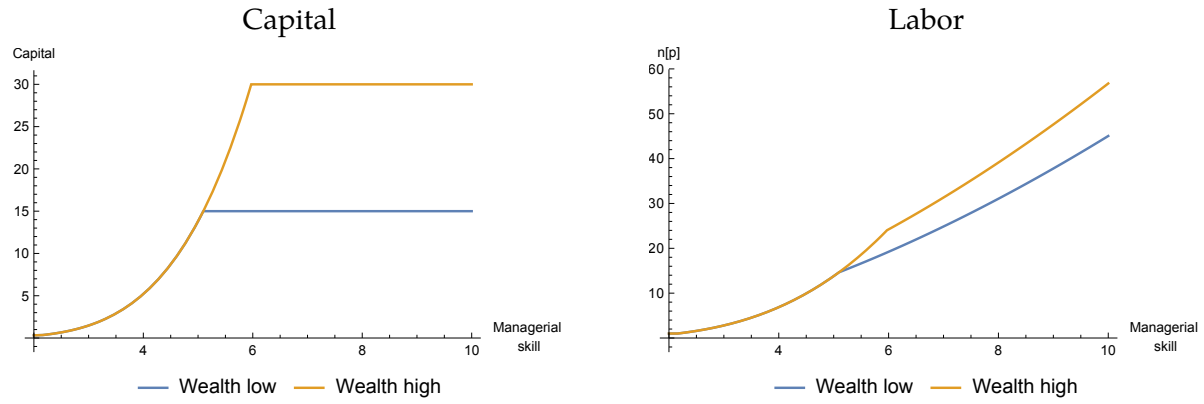
$$\pi = z\left[n\left(p_z\right)\right]^{\alpha} k^{1-\alpha} - w\left(p_z\right) n\left(p_z\right) - r\left[k - a\right], \tag{13}$$

and the manager's problem amounts to

$$\max_{p_z, k} z\left[n\left(p_z\right)\right]^{\alpha} k^{1-\alpha} - w\left(p_z\right) n\left(p_z\right) - r\left[k - a\right] \text{ s.t. } k \leq \lambda a.$$

If the firm is financially unconstrained ($k < \lambda a$, which occurs when he has high wealth a or the financial markets are developed), then the choices of labor and capital will be undistorted. In other words, wealth will not affect the firm's optimal factor choices. If the manager is credit constrained, ($k = \lambda a$) then the firm will constrain the choice of labor as well. In Figure 2 we illustrate the relation between managerial skill and the profit maximizing levels of capital and labor. Notice that the credit constraint is more likely to be binding for managers with high entrepreneurial talent and a low wealth endowment. Indeed, as managerial skill increases (and therefore the optimal amounts of capital and labor increase), the manager is more likely to be financially constrained, which results in lower amounts of labor and sub-optimal capital-labor ratios (see panel B).

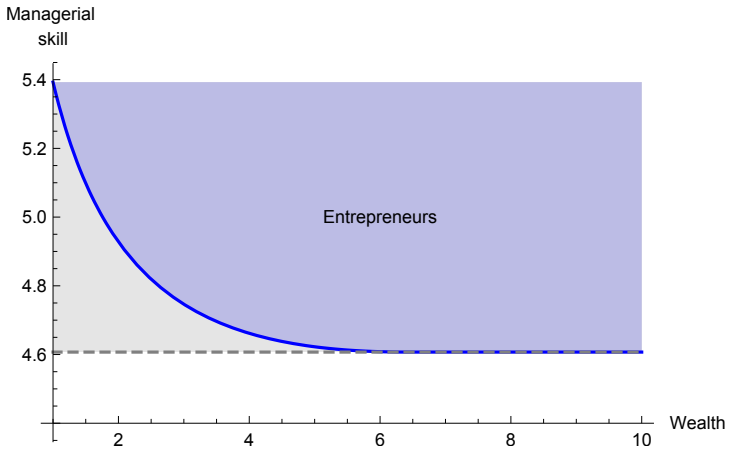
Figure 2: Optimal choice of capital and labor as a function of managerial skill with different levels of wealth.



The exercise assumes $\lambda = 1.5; r = 1; \alpha = 0.8; \beta = 0.4$. Wealth low corresponds to $a = 10$ whereas wealth high corresponds to $a = 20$.

Credit constraints also distort the selection into entrepreneurship. As before, workers compare their return working for a wage $w(p) + ra$ with their return running a firm $\pi(z, a)$ (which under financial constraints will depend on wealth a), and will choose the occupation that maximizes their earnings. Note that conditioning on wage working skill p, there is a level of entrepreneurial talent $z(a)$ such that only when $z > z(a)$ the individual becomes an entrepreneur. We illustrate this relation in Figure 3, which is the same qualitative result as in Evans and Jovanovic (1989): low wealth individuals will be credit constrained, and therefore they will need significantly more managerial talent to become entrepreneurs. The gray shared area in the figure are individuals that would have become entrepreneurs if financial markets were developed, but who work instead for a wage.

Figure 3: Selection into entrepreneurship under credit constraints.



The exercise assumes $\lambda = 1.5, r = 1, \alpha = 0.8, \beta = 0.4$, and $p = 6$.

Credit constraints then distort both the selection into entrepreneurship and the capital-labor ratio in the firm (the amount of resources that firms employ), which combined ultimately affect the performance of the firm. As $\lambda \to \infty$ (financial markets develop), wealth would exhibit no effect on these two optimization

margins.

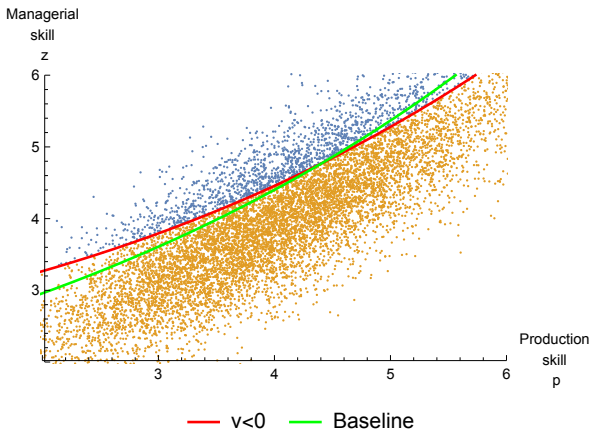
3.2. Cultural barriers

Cultural barriers (fear of failure, lack of role models, peer effects) amount to a fixed cost to entrepreneurship. When there are fixed costs to running a firm, the first order condition of the optimization problem of the firm remains the same, but the occupational choice is now distorted. If the individual becomes an entrepreneur, she now receives $\pi(z) - v$. Without loss of generality, we assume that the value of these non-pecuniary traits in the wage working sector are 0. The equation for the marginal entrepreneur $z(p)$ solves:

$$\pi(z) - v = w(p). \tag{14}$$

We introduce this fixed cost into our baseline environment, and examine the effects on the selection into entrepreneurship (Figure 4) and the performance of firms (Table 3) in equilibrium. When there are fixed costs of entering into entrepreneurship, some of the relatively least talented entrepreneurs become wage workers, and some of the relatively most talented wage workers become entrepreneurs. The resulting rate of entrepreneurship is lower, but the size and the output of the average firm are both higher.

Figure 4: Selection into entrepreneurship in equilibrium with fixed costs to entrepreneurship.



The exercise sets $\alpha = 0.8$ and $\mu_z = 4, \sigma_z^2 = 1, \mu_p = 4, \sigma_p^2 = 1, \rho = 0.85$, and $v = -0.75$.

Table 3: Occupational choices and average performance of firms with fixed costs to entrepreneurship.

Outcome	Baseline	$v < 0$
β	0.445	0.4333
Rate of entrepreneurship	18.4%	16.32%
Average firm size (n)	4.4	5.08
Average output (sales)*	1	1.18

* Relative to baseline. The baseline scenario corresponds to Figure 6.

An important limitation in this exercise is that we do not have heterogeneous cost by observable characteristics of individuals, not associated with entrepreneurial talent or managerial capabilities. For example, cultural barriers usually incur higher additional cost towards specific groups discriminated by demographic characteristics or behavior. Our framework suggests that within each of these groups when facing these barriers, the entrepreneurship rate would be lower, for a given level of entrepreneurial talent or managerial capabilities, leading to higher barriers of selection. If a particular group of society faces higher cost to become an entrepreneur, chances are that workers are allocated towards less talented entrepreneurs from a group that is not facing similar cost. The general equilibrium effect of this heterogeneous distortion is beyond the scope of this paper, but it reminds that these barriers can have detrimental effects economy wide.

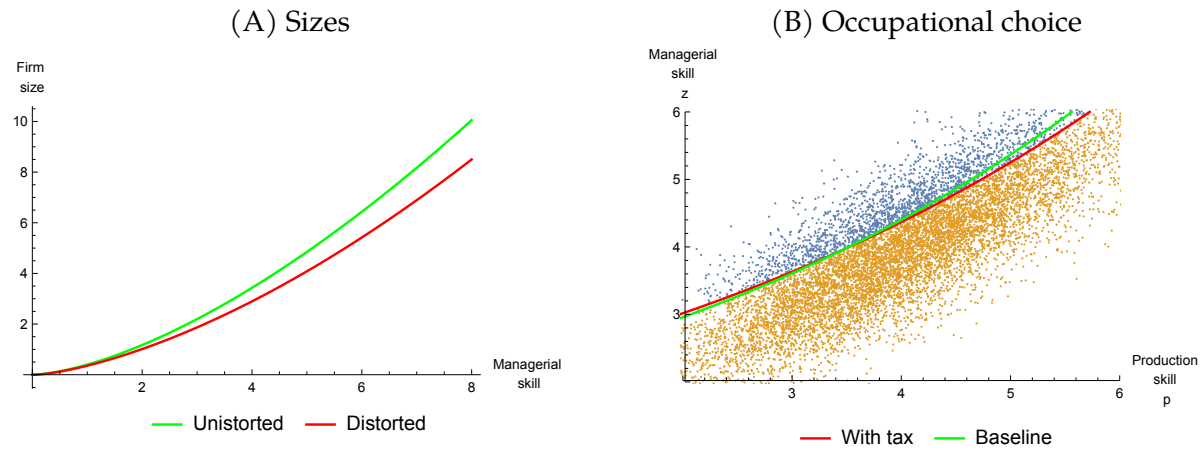
3.3. Regulations

Regulations usually distort relative prices, and these distortions in turn affect occupational choices and the allocation of resources as well. We consider the effects of a payroll tax τ that increases with the size of the firm: $\tau(n)$ with $\tau'(n) > 0$. We set $\tau(n) = \overline{\tau}\left[1 - (1+n)^{-\kappa}\right]$ where $\overline{\tau}$ is the statutory tax rate. Profits are now

$$\pi = z\left[n(p)\right]^{\alpha} - w(p)\, n(p)\left(1 + \tau\left[n(p)\right]\right). \tag{15}$$

In Figure 5 we show the effects of introducing a size-dependent payroll tax of 30% into our baseline framework. With the policy, firms are smaller on average (average size decreases from 4.4 to 3.83). The policy results in a higher rate of entrepreneurship (from 18.4% to 20.64%) and induces the most talented wage workers to become entrepreneurs, and the least talented entrepreneurs to become wage workers.

Figure 5: Distortion to firm sizes and occupational choices from a size-dependent tax.



The exercise sets $\alpha = 0.8$ and $\mu_z = 4, \sigma_z^2 = 1, \mu_p = 4, \sigma_p^2 = 1, \rho = 0.85$.
The parameters of the tax policy are $\overline{\tau} = 30\%$ and $\kappa = 0.5$.

4. Entrepreneurial ecosystems: The role of interactions and the space dimension

The above model helps to clarify some key functions driving the decision and the performance of entrepreneurship, but it largely ignores the interdependencies between them. The entrepreneurial ecosystem elements put tension on the assumption of independence of effects, especially in a longitudinal setting, and thus require a complex systems approach to the economy (Stam and Van de Ven, 2021a; Arthur, 2021). There are four key elements to an entrepreneurial ecosystem: functions, actors, interactions (spatial dimension), and impact. Taken together, these elements comprise an entrepreneurial ecosystem, with the explicit goal of spurring entrepreneurship as a means for enhancing spatial economic performance.

The first element, functions, characterizes the main influences and underlying forces conducive to or impeding entrepreneurship. Such influences include factors of production and resources, such as physical capital, human capital, and knowledge. It also includes the factors that drive the demand for these resources, such as the output market, and the factors that may work as a barrier for allocation between resource endowment and the demand for those resources, such as finance, regulations, and culture.The framework in sections 2 and 3, helps to delineate what are these key functions belonging to an entrepreneurial ecosystem and their potential impacts under specific assumptions.

The second element involves the form in which these factors and resources, along with institutions and culture are delivered, which includes the actors, organizations, firms and institutions involved with the provision of these influences shaping entrepreneurial activity. A corresponding function, or type of actor, institution or organization corresponds to each form. However, that function or actor may be specific or idiosyncratic to the particular entrepreneurial ecosystem. For example, it is widely known that the government is the main or sole provider of the crucial function of the creation and enforcement of property rights. While this implicit assumption may hold in the developed country context, De Soto (1989) point out that in the context of developing countries, the provision and protection of property rights may come from a very different actor, which can be found in the underground private sector. Similarly, it is widely assumed that investments in human capital and worker skills will come from the public sector, typically from governments. By contrast, in the context of developing countries, a very different actor or organization, large foreign corporations engaged in inward foreign direct investment, may provide the source of investments to enhance human capital and worker skills. Thus, in both examples, the same function is provided by very different actors and organizations.

The third feature characterizing entrepreneurial ecosystems involves interactions among the various actors, institutions, organizations, individuals, and firms. These interactions provide the source of spatially localized increasing returns or knowledge externalities because these interfaces, collaborations, and contacts generate an enhanced output for any given level of inputs, broadly considered. The source of such spatially constrained knowledge spillovers emanates from factors such as knowledge and infrastructure which are characterized by positive externalities which decay as they traverse geographic space. A rich and robust literature has confirmed not only that knowledge spills over from the organization or institution where it is created for third-party use but that such knowledge spillovers are spatially localized within close geographic proximity of that knowledge source. The spatial dimension not only includes transaction-cum-transaction costs (Gordon and McCann, 2000), but also "place attachment" (Stam, 2007) and formative institutional conditions.

The framework in sections 2 and 3 does not consider the geography of production, but in reality the

transformation of knowledge and ideas into final goods takes place in space. Entrepreneurs interact with suppliers (workers, other producers) and buyers (individuals, other businesses) across space, whether locally, in the macro economy, or abroad. In other words, the entrepreneurial process requires interactions and resources flowing across space: some material goods may be imported from abroad while other inputs are sourced locally; the final good may be shipped to other locations in the macro economy or abroad, while other products are sold locally. These spatial flows and interactions have a transportation or mobility cost and the spatial dimensions of the network of producers and suppliers will depend on the transportation costs of every input and the transportation costs of the final good in each sector. For example, while transportation costs for the final good in some narrow sectors in tourism are infinity (such as sightseeing the Grand Canyon), which results in a relatively localized network, the cost of transporting components in motor vehicle manufacturing across borders is not prohibitively high, and the corresponding network could potentially span multiple countries (as in the case of the U.S.-Canada-Mexico free trade agreement).

Modifying the entrepreneur's problem in our occupational choice framework to include the selection of a location is complex and beyond the scope of this paper (Oberfield et al., 2020), but we offer a brief sketch of her spatial optimization problem. Take entrepreneurial and managerial characteristics as given and assume that entrepreneurs are fully mobile across space. The entrepreneur will compare locations considering the choices and challenges of each: the availability and quality of inputs (including infrastructure) and their transportation costs (which inputs will have to be transported locally and which ones will have to be shipped from other locations); the availability of capital; the transportation costs of the final good to the destination markets (local, the macro economy, abroad); and the environment, characterized by different institutions and different laws and regulations. In addition, she will consider the potential for knowledge spillovers and agglomeration economies since it is less costly to learn, innovate, and generate new ideas when there are other industry producers or suppliers in a specific location. The entrepreneur will choose the location that generates the highest return, taking into account the different gains (for example, agglomeration economies or the high quality of an essential input) and costs (for example, transportation costs or costly regulations). However, it is important to note that for entrepreneurs the location choice is often not explicitly made when they start: they start in the area where they live and/or work, and rationally choose what kind of business (in a particular product-market) to start. This is a received wisdom in the geography of entrepreneurship literature, with some important exceptions, e.g. serial entrepreneurs moving to Silicon Valley for acquiring venture capital (Conti and Guzman, 2021).

This brief sketch of the entrepreneur's location problem suggests that analyzing the distribution of entrepreneurship in space, and in particular the localization patterns of entrepreneurship (Duranton and Overman, 2005), helps shed light on the conditions in each location in terms of (1) primitives; (2) the business environment; (3) spillover/agglomeration effects; and (4) transportation costs in each sector. In other words, the agglomeration of new high-performing businesses in an industry in specific locations would indicate an advantage in at least one of these four major factors relative to other locations.

The fourth feature characterizing an entrepreneurial ecosystem is impact. Such impact is generally considered to be in terms of first and foremost entrepreneurial activity. However, it is impact on regional economic and societal performance that is ultimately prioritized. Obviously the greater the (positive impact) of an entrepreneurial ecosystem on entrepreneurship and economic performance, the more effective it is. What is less considered and analyzed are the concomitant effects of an entrepreneurial

ecosystem on each of the individual components, ranging from actors to organizations, institutions, firms and individuals. Are all boats lifted by a rising tide? Or does an entrepreneurial effect have differential impacts on each specific component constituting the entrepreneurial ecosystem? These questions remain unaddressed in the extant literature.

Considerable confusion abounds distinguishing an entrepreneurial ecosystem from a cluster or agglomeration. In fact, there can be considerable overlap, in that an entrepreneurial ecosystem could be classified as a type of cluster or agglomeration. Still, unless all of the four key elements are fulfilled, such a cluster or agglomeration of economic activity cannot be considered to constitute an entrepreneurial ecosystem. For example, many highly successful clusters lack the focus and priority on entrepreneurship as the key catalyst to ignite economic performance. An entrepreneurial ecosystem is not synonymous or a pre-condition for successful spatial economic and societal performance. However, for an entrepreneurial ecosystem to be considered effective, a successful economic and societal performance must exist, or be anticipated. The entrepreneurial ecosystem is distinct from industrial cluster and innovation system approaches in its focus on entrepreneurship as output, even though it contains many overlapping mechanisms with these two and other related "local economic development" approaches (Leendertse et al., 2021).

5. Evaluating entrepreneurial ecosystems

The model suggests potential measures of the performance of an entrepreneurial ecosystem: the rate of business creation, the average size of firms, and the average skill of business owners (measured with years of schooling, for example). Notice, however, that factors such as primitives and distortions sometimes cause movements in these measures of performance in opposite directions. For example, an ecosystem where skilled human capital is unavailable may exhibit a high rate of entrepreneurship but with relatively small firms, whereas cultural barriers may result in fewer entrepreneurs coordinating larger firms. Thus, to better assess the performance of firms in an entrepreneurial ecosystem and diagnose the influence of the underlying conditions, we need to consider several outcomes at the same time.

Note that not only occupational choices but also the rates of firm entry, survival, and exit influence the selection of firms in an ecosystem. Similarly, the growth of firms in number of employees, sales, productivity, new input or output markets, and adoption of technology influence the allocation of resources across firms. Consider for example the following hypothetical scenarios:

- The distribution of managerial capabilities differs between location A and location B, and therefore firms in these locations will grow at different rates;
- The distribution of managerial capabilities in location A is identical to the distribution of managerial capabilities in location B, but cultural barriers in A prevent the entry of potentially talented entrepreneurs, and therefore firms in these locations will grow at different rates and potentially untalented entrepreneurs in A will not exit;
- The selection into entrepreneurship in both locations is identical, but size-dependent policies in location A tax large firms at a significantly higher rate relative to small firms, whereas location B is undistorted, and therefore the size distribution of firms will differ across locations and firms in A will grow at a slower pace relative to firms in location B;

- The selection into entrepreneurship in both locations is identical, but firms in location A cannot access credit, whereas location B is more financially developed, and therefore firms in these locations will grow at different rates.

Measures of the dynamics of firms then complete the diagnosis of entrepreneurial ecosystems, and help identify the influence of different factors on the performance of firms.

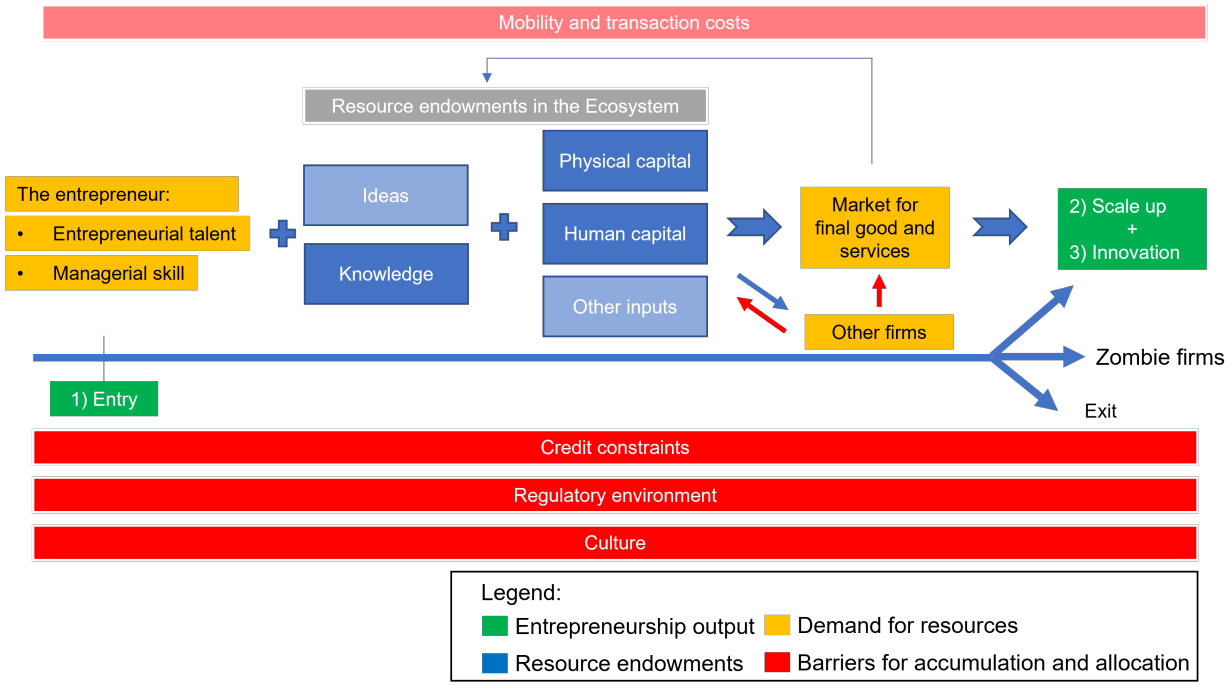
Table 4: Measures of entrepreneurship performance.

Margin of decision / Outcome		Static	Dynamic
Extensive margin	Selection into entrepreneurship	Occupational choice	Entry, survival, and exit
Intensive margin	Resource allocation	Number of workers (size), capital	Firm's growth, Innovation

Source: Authors' analysis combined with Bento and Restuccia (2017) and Restuccia (2019).

To contextualize the key functions and output of an entrepreneurial ecosystem, Figure 6 summarizes the entrepreneur problem described in sections 2 and 3, taking into account the different output measures from Table 4. This framework provides the fundamentals for an entrepreneurial ecosystem analysis. First, potential entrepreneurs with a given entrepreneurial talent and managerial skills need to decide between starting a businesses or being a wage worker. The entrepreneur combines resources that are available in the ecosystem (e.g., knowledge, physical capital, human capital) to produce good and service to the market, which will involve interactions with workers, other entrepreneurs, and other firms. To use the resources available in the ecosystem, the entrepreneur will need to have access to finance and play according to the formal (regulations) and informal (culture) rules of the game (institutions).

Figure 6: The Entrepreneur problem



The role of policies, public programs, and intermediary organizations

Figure 6 describes some of the critical elements in an entrepreneurial ecosystem, including the functions, the entrepreneurs and existent firms as key actor, and the impact. Yet, it does not emphasize the role of policies, public programs, and intermediary organizations – here defined as institutions supporting entrepreneurship or playing a key role as a provider in some of these functions (e.g., incubators, accelerators, universities). These actors can play a key role in defining the rules, incentives, and provision of resources that influence the way these functions work and interact.

Policies, public programs, and intermediary organizations play an important role across all factors that contribute to entrepreneurship performance. From this perspective, they should not be seen as an additional pillar, but rather as a crosscut of factors that can address market failures across the different pillars, but also create distortions. Having this perspective in place is important for conducting a diagnostic of the ecosystem aiming to propose policy interventions with the objective to entrepreneurship performance. Following the framework, these interventions would be focusing on addressing market failures that aim to improve the conditions of resources endowments, the demand for these resources, or allocation barriers across actors. Policies can change the regulatory environment, with the objective of improving the availability of resources available, facilitating entry, and promoting competitiveness. But they can also be implemented through specific instruments through public programs providing direct support to entrepreneurs (e.g., managerial training), or by intermediary organizations that in many circumstances as shaped by public resources, including donors in the case of developing countries.

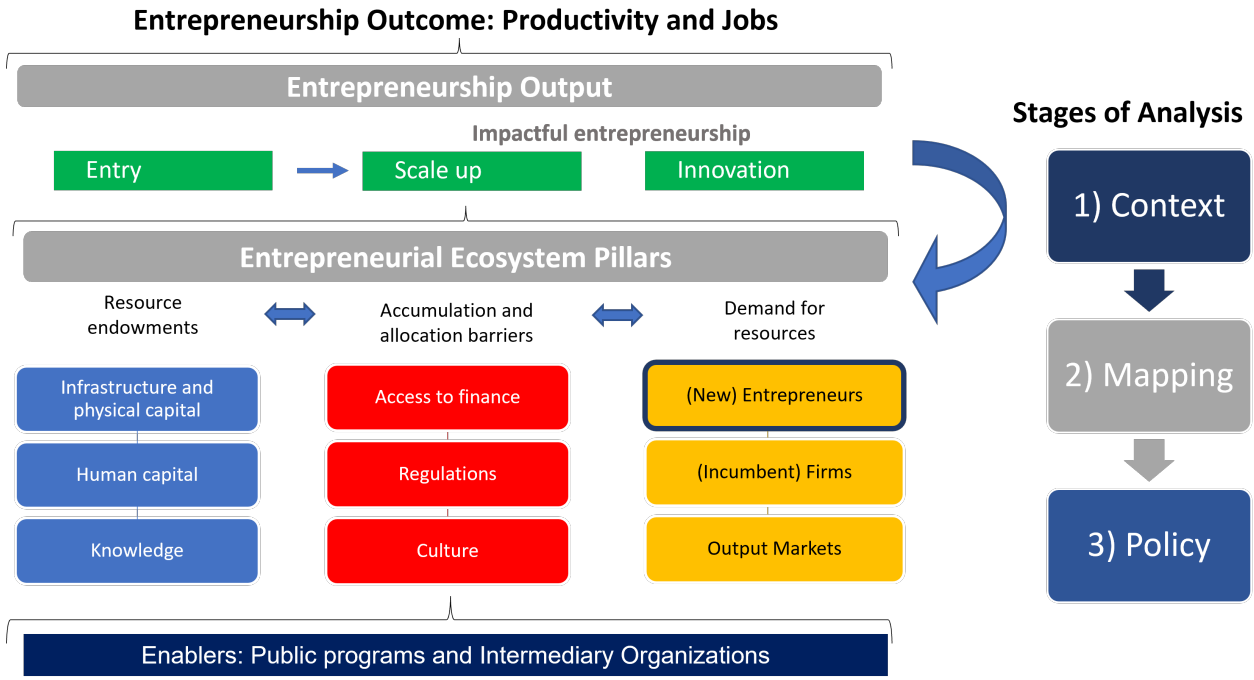
A framework for assessing entrepreneurial ecosystems

Based on the functions described in the entrepreneur's problem, the importance of considering different margins of entrepreneurship outputs and actors, we propose a simplified framework for assessing entrepreneurial ecosystems. First, we define the key outputs associated with entrepreneurship at the extensive (entry) and intensive margins (scale up and innovation). These different dimensions captures the quantity, but also the quality of entrepreneurship, which is critical to analyze the impact of an entrepreneurial ecosystem. Importantly, in a dynamic perspective they can affect the ecosystem pillars over time. Second, we define the entrepreneurial ecosystem pillars as key relevant functions that affect the entrepreneur's problem. We group these elements in three categories (see Figure 7): i) Resource endowments (physical capital, human capital, and knowledge); ii) Demand for resources in the ecosystem (Entrepreneur's characteristics, Markets, Firm Capabilities); iii) Accumulation and allocation barriers (Access to finance, Regulations, Culture). The entrepreneur plays a key role in the ecosystem, but she is connected to other relevant actors. The overall framework and the division of the entrepreneurship pillars in resource endowment (supply), demand for resources, and barriers for accumulation and allocation, is inspired in the national innovation system framework developed by Maloney (2017). This framework is also aligned with the approaches proposed by Stam and Van de Ven (2021b) and Leendertse et al. (2021), by emphasizing inputs and outputs of entrepreneurship activities.

This framework captures the key elements of an entrepreneurial ecosystem described in section 4 that should be part of a diagnostic exercise. The entrepreneurship pillars described the key functions, informed the entrepreneur's problem described in sections 2 and 3. The entrepreneurship output and outcome

describe the impact to be measured. The entrepreneurs, along with public programs and intermediary organizations define the key actors that should be part of an assessment. Finally, the interaction between these elements and components within them is a critical of the process.

Figure 7: Entrepreneurial Ecosystem Assessment Framework



Conducting a diagnostic to inform entrepreneurship policy

How to implement this framework to implement an entrepreneurial ecosystem assessment in practice? We propose a methodology for assessing entrepreneurial ecosystems in three stages: i) The context analysis (country and local levels); ii) Mapping enablers; iii) Policy recommendations and priority actions for stakeholders.

The first stage (context analysis) provides a snapshot of the entrepreneurial ecosystem following the conceptual framework. The snapshot focuses on ecosystem-level entrepreneurship performance output and outcome indicators. These analyses are complemented by an in-depth discussion of the ecosystem pillars (or initial conditions) of supply factors, demand factors, and accumulation/allocation barriers. We propose splitting the context analysis in two parts: i) A cross-country analysis; ii) A sub-national or local entrepreneurial ecosystem assessment.

The cross-country analysis provides a big picture of entrepreneurship performance and the pillars of ecosystem at aggregated level. This perspective is useful for understanding the key challenges for entrepreneurs and the focus of policies at the country-level, including the potential for institutional changes, such as regulatory reforms that are common. Moreover, identifying the weakness and strengthening on entrepreneurship performance and the pillars of ecosystem at the national level allows for more clarity towards factors that are relevant at aggregated level. Following the conceptual framework, the first objective is to compare entry and quality of entrepreneurship in terms of their capacity to scale up and innovate.

The sub-national or local entrepreneurial ecosystem assessment can provide a clearer picture of the heterogeneity of relevant factors within country with customized diagnostic. A vigorous and dynamic entrepreneurial ecosystem is critical, but it requires investment and time to mature. The availability of better resources combined with good institutions tend to facilitate the process of creating new firms, the expansion of young firms, and the technological catch-up of firms overall. Yet, the key factors necessary to strengthen an entrepreneurial ecosystem (e.g., knowledge, human capital, entrepreneur talent, managerial capacity) are structural and demand investment, resources, and time to mature. Identifying the potential of entrepreneurial ecosystems at the sector-regional level can provide a more precise diagnostic of the entrepreneur problem, given that the decision of starting a business, scale up, and innovate, happens in a particular place surrounded by specific complementary factors.

To identify the potential of local entrepreneurial ecosystems, we propose to start by assessing the agglomeration of firms in terms of diversity and quality in relevant economic activities. While indicators on entrepreneurship performance and pillars of the ecosystem are relatively limited at the aggregated level, they are even scarcer at the sub-national level in developing countries. At the same time, many developing countries have some sort of establishment census available, which gives information on characteristics of firms associated with age, sector, and other features that can be used as a proxy for quality (e.g., education of the entrepreneur, size, formal status, experience as exporter or importers, innovation). The assessment can address two purposes: First, by observing the diversity and quality of firms geographically agglomerated in a given economic activity, this exercise provides a proxy for the endowment factors, which are usually difficult to observe in developing countries. Second, if a country is looking to promote policies that support entrepreneurship performance in a given activity or value chain, this exercise can be used a filter to identify specific geographic regions with more potential as candidates for deep dive analysis.

The second stage provides an assessment of the policy mix and identifies the gaps in policy instruments and institutional capabilities. This exercise is inspired in the Public Expenditure Reviews in Science, Technology, and Innovation proposed by (Correa, 2014). Typically, countries have several policy instruments that support entrepreneurship without an overall picture of their main objectives and budget allocation. This lack of information leads to higher probability of overlapping and lack of consistency between policies and the development goals of the ecosystem. In many developing countries, particularly low-income countries, this issue also extends to programs supported by donors. The same applies to intermediary organizations (public or private). We seek to collect and analyze data at the policy instrument and institution levels. We will also visualize connections between ecosystem actors through network visualization to identify gaps and under-served areas in the ecosystem.

Finally, the diagnostic combining the cross-country analysis, the potential of local ecosystem characterization, and the mapping of enablers should be used to defined policy priorities. Such "mapping enablers" have a lot in common with the most binding constraint approach of growth diagnostics by Rodrik (2008) and Hausmann et al. (2008). As part of this process, it is important to consult stakeholders (actors) for the purpose of obtaining relevant information on the quality of functions, interactions, and the impact of the entrepreneurial ecosystem, but also to validate the key priorities and policy recommendations resulted from the assessment. It should be noted that for economic policy, it is not the (entrepreneurship) output that matters, but socio-economic outcomes. Thus, the policy goal of enhancing economic performance

should be considered in the broader context of socio-economic outcomes.

Further examples with detailed information on how such diagnostics could be implemented is provided by Cruz and Zhu (2022). The first part of the diagnostic toolkit describes in more details the implementation of each stage we propose, including references to data set and examples of implementation. A pilot of these diagnostics, following the conceptual framework and stages of assessment proposed in this paper, have been implemented in several countries, including Senegal (Cruz, Dutz, and Rodríguez-Castelán (2022) and Cruz, Torres, and Tran (2022)), Kenya (Cruz and Zenaida, 2022), and Romania (Cruz et al., 2022). In each of these countries, the implementation of the assessment relied on the most comprehensive and representative establishment-level data, used to identify the potential of key local entrepreneurial ecosystems, along primary data collection of enablers to providing support in the ecosystem.

In Romania, the cross-country context analysis conducted in the first phase suggested that despite the relatively high entry, there was a lack of high-growth and innovative entrepreneurship, with many necessity driven firms. A deeper dive into the entrepreneurial ecosystem pillars suggested significant room for improving allocation of existent human capital. The local analysis, supported by representative primary data focusing on digital startups demonstrated significant differences on resource endowments and allocation barriers between firms that received venture capital investment and the average young digital businesses. The mapping of public policies have identified significant needs to improve the policy mix for innovation, entrepreneurship, and digitalization and its institutional capabilities to implement these programs, by reallocating resources that were already being targeting private sector development. The complementary analysis, following the conceptual framework we propose in this paper, has facilitated the identification of key priority actions for government policy, as well as other stakeholders in the ecosystem. The description of the diagnostic following this conceptual framework is provided by (Cruz et al., 2022), while the detailed guidance for implementation of the recommended policies is described by (Kapil et al., 2022).

6. Concluding remarks

In their efforts to ignite economic growth and development, policy makers are increasingly turning to entrepreneurship in general, and entrepreneurial ecosystems. However, the enthusiasm for entrepreneurial ecosystems has not been matched with a concomitant theoretical basis for linking entrepreneurs and their decision making to the broader ecosystem context. This paper provides such a theoretical model focusing on the entrepreneur and their decision making at the center of the ecosystem.

This paper proposes a conceptual framework to evaluate entrepreneurial ecosystems. The framework posited in the paper is able to show that an entrepreneurial ecosystem context consisting of three key pillarsâ resource endowments, demand for resources, and allocation barriers - enhances entrepreneurial performance. This framework offers more than just a micro-based view linking entrepreneurs to the broader ecosystem context. The analysis identifying the components of these three pillars provides a compelling diagnostic to inform and guide policy makers as they devise, development, nurture and sustain their place specific entrepreneurial ecosystems.

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Appendix

FOC from manager's problem (choose p to maximize profits taking wage profile as given):

$$
\begin{aligned}
z\alpha\left[n\left(p\right)\right]^{\alpha-1}n'\left(p\right) &= w'\left(p\right)n\left(p\right)+w\left(p\right)n'\left(p\right)\\
z\alpha\left[\exp\left(p\right)\right]^{\alpha-1}\exp\left(p\right) &= w'\left(p\right)\exp\left(p\right)+w\left(p\right)\exp\left(p\right)\\
z\alpha\left[\exp\left(p\right)\right]^{\alpha-1} &= w'\left(p\right)+w\left(p\right)\\
\exp\left(p\right) &= \left[\frac{w'\left(p\right)+w\left(p\right)}{z\alpha}\right]^{\frac{1}{\alpha-1}}\\
n\left(p\right)=\exp\left(p\right) &= \left[\frac{z\alpha}{w'\left(p\right)+w\left(p\right)}\right]^{\frac{1}{1-\alpha}}\\
&= \left[\frac{z\alpha}{\beta\exp\left(\beta p\right)+\exp\left(\beta p\right)}\right]^{\frac{1}{1-\alpha}}\\
&= \left[\frac{z\alpha}{\left[1+\beta\right]\exp\left(\beta p\right)}\right]^{\frac{1}{1-\alpha}}\\
&= \frac{z^{\frac{1}{1-\alpha}}\alpha^{\frac{1}{1-\alpha}}}{\left[1+\beta\right]^{\frac{1}{1-\alpha}}\exp\left[\beta\left(\frac{1}{1-\alpha}\right)p\right]}\\
\exp\left(p\right)\exp\left[\beta\left(\frac{1}{1-\alpha}\right)p\right] &= \frac{z^{\frac{1}{1-\alpha}}\alpha^{\frac{1}{1-\alpha}}}{\left[1+\beta\right]^{\frac{1}{1-\alpha}}}\\
\exp\left[p+\beta\left(\frac{1}{1-\alpha}\right)p\right]=\exp\left[p\left(1+\beta\left(\frac{1}{1-\alpha}\right)\right)\right]=\exp\left[p\left(\frac{1-\alpha+\beta}{1-\alpha}\right)\right] &= \frac{z^{\frac{1}{1-\alpha}}\alpha^{\frac{1}{1-\alpha}}}{\left[1+\beta\right]^{\frac{1}{1-\alpha}}}\\
p\left(\frac{1-\alpha+\beta}{1-\alpha}\right) &= \ln\left[\frac{z^{\frac{1}{1-\alpha}}\alpha^{\frac{1}{1-\alpha}}}{\left[1+\beta\right]^{\frac{1}{1-\alpha}}}\right]\\
&= \ln\left[\left[\frac{z\alpha}{1+\beta}\right]^{\frac{1}{1-\alpha}}\right]\\
p &= \left(\frac{1-\alpha}{1-\alpha+\beta}\right)\left(\frac{1}{1-\alpha}\right)\ln\left[\frac{z\alpha}{1+\beta}\right]\\
&= \left(\frac{1}{1-\alpha+\beta}\right)\ln\left[\frac{z\alpha}{1+\beta}\right]\\
&= \ln\left[\left(\frac{z\alpha}{1+\beta}\right)^{\frac{1}{1-\alpha+\beta}}\right]
\end{aligned}
$$

Profits are:

$$
\begin{aligned}
\pi &= z\left[n\left(p\right)\right]^{\alpha} - w\left(p\right)n\left(p\right) \\
&= z\left[\exp\left(p\right)\right]^{\alpha} - \exp\left(\beta p\right)\exp\left(p\right) \\
&= z\left[\exp\left(p\right)\right]^{\alpha} - \exp\left(\left[1+\beta\right]p\right) \\
&= z\left[\exp\left(\ln\left[\left(\frac{z\alpha}{1+\beta}\right)^{\frac{1}{1-\alpha+\beta}}\right]\right)\right]^{\alpha} - \exp\left(\left[1+\beta\right]\ln\left[\left(\frac{z\alpha}{1+\beta}\right)^{\frac{1}{1-\alpha+\beta}}\right]\right) \\
&= z\left[\left(\frac{z\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}}\right] - \exp\left(\ln\left[\left(\frac{z\alpha}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}}\right]\right) \\
&= z\left(\frac{z\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} - \left(\frac{z\alpha}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}} \\
&= \left[z - \left(\frac{z\alpha}{1+\beta}\right)^{\frac{1-\alpha+\beta}{1-\alpha+\beta}}\right]\left(\frac{z\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} \\
&= \left[z - \frac{z\alpha}{1+\beta}\right]\left(\frac{z\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} \\
&= z\left(\frac{1-\alpha+\beta}{1+\beta}\right)\left(\frac{z\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} \\
&= z^{1+\frac{\alpha}{1-\alpha+\beta}}\left(\frac{1-\alpha+\beta}{1+\beta}\right)\left(\frac{\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} \\
&= z^{\frac{1-\alpha+\beta+\alpha}{1-\alpha+\beta}}\left(\frac{1-\alpha+\beta}{1+\beta}\right)\left(\frac{\alpha}{1+\beta}\right)^{\frac{\alpha}{1-\alpha+\beta}} \\
&= \left(1-\alpha+\beta\right)z^{\frac{1+\beta}{1-\alpha+\beta}}\left(\frac{1}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}}\alpha^{\frac{\alpha}{1-\alpha+\beta}} \\
&= \kappa z^{\frac{1+\beta}{1-\alpha+\beta}}
\end{aligned}
$$

For every value of p there is a function $z^{*}\left(p\right)$ such that $z \geq z^{*}\left(p\right)$ becomes an entrepreneur and $z < z^{*}\left(p\right)$ becomes a wage worker. This function is such that $\pi\left[z^{*}\left(p\right)\right] = w\left(p\right)$. We solve for that value of p:

$$
\begin{aligned}
\left(1-\alpha+\beta\right)z^{\frac{1+\beta}{1-\alpha+\beta}}\left(\frac{1}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}}\alpha^{\frac{\alpha}{1-\alpha+\beta}} = \kappa z^{\frac{1+\beta}{1-\alpha+\beta}} &= \exp\left(\beta p\right) \\
z &= \left[\frac{\exp\left(\beta p\right)}{\kappa}\right]^{\frac{1-\alpha+\beta}{1+\beta}} \\
&= \frac{\exp\left(\beta\left[\frac{1-\alpha+\beta}{1+\beta}\right]p\right)}{\kappa^{\frac{1-\alpha+\beta}{1+\beta}}} \\
&= A_1\exp\left(A_2 p\right)
\end{aligned}
$$

where $\kappa \equiv \left(1-\alpha+\beta\right)\left(\frac{1}{1+\beta}\right)^{\frac{1+\beta}{1-\alpha+\beta}}\alpha^{\frac{\alpha}{1-\alpha+\beta}}$, $A_1 \equiv \frac{1}{\kappa^{\frac{1-\alpha+\beta}{1+\beta}}}$, and $A_2 \equiv \beta\left[\frac{1-\alpha+\beta}{1+\beta}\right]$.