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Entrepreneurship vs Paid Employment: Multiple Skills and Financing

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Entrepreneurship: skills and financing

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Abstract This article analyzes an occupational choice model with risk-averse agents who are heterogeneous in terms of skills and wealth in a setting with financial frictions. We show that high- and middle-wealth individuals endowed with a balanced portfolio of skills upgrade their skills so that the resulting portfolio of skills is more balanced and choose entrepreneurship. In contrast, middle-wealth individuals endowed with an unbalanced portfolio of skills and low-wealth individuals specialize in the skill in which they have an absolute advantage and choose paid employment. Deeper financial development, a more balanced portfolio of skills, lower entrepreneurial risk, and a higher liquidation value for projects result in more entrepreneurship and higher welfare, while wealth redistributions and financial subsidies to entrepreneurs have an ambiguous effect on welfare.

Keywords Entrepreneurship · Paid employment · Multiple skills · Financial development · Wealth · Risk

JEL Classification G32 · J24 · L26 · M13

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1 Introduction

The economics literature has been concerned with entrepreneurs from the very beginnings.[1] The literature documents that personal wealth as well as credit constraints are crucial determinants of both the prevalence and success of entrepreneurship, and that individuals with more general human capital and more balanced portfolio of skills are more likely to undertake entrepreneurship and succeed at it.[2]

This article provides an occupational choice model that deals with multiple skills, wealth endowments, and financial frictions. Namely, a two-period model with risk-averse individuals that work as paid employees when young and choose between paid employment and entrepreneurship when old.[3] Individuals are

[1] Cantillon (1755) argue that entrepreneurship main function is to bear risk under uncertainty in exchange for high rewards, Adam Smith (1776) emphasized that entrepreneurs spur improvements in living standards, Say (1803) emphasized the vital and creative roles of the entrepreneur in the economy as a forecaster, project appraiser and risk taker, and Schumpeter (1911) argued that entrepreneurs drive economic growth by creating and introducing new goods, services, and production processes that displace old businesses.

[2] The empirical evidence is discussed in details in Section 6.

[3] The evidence points to the fact that a great majority of firms are born from workers from other firms. Bhide (1994) finds that 71% of the entrepreneurs found their start-ups by innovating or copying an idea they learned at their previous employment. Garvin (1983) documents that firms started by former employees are the most frequent source of entrepreneurial firms especially in the high-tech and human capital intensive sector.

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endowed with wealth and a portfolio of task-specific skills. Young individuals can increase their skills by mean of their time allocation while they work as paid employees when young; the more time allocated to one task, the higher the corresponding skill, and the less time allocated to other tasks. Wages are determined by a competitive labor market and, as suggested by the evidence in Lazear (2005), the production technology under paid employment is such that tasks are substitutes, while that under entrepreneurship is such that tasks are complements. The return to entrepreneurship is uncertain and rises linearly with the amount of money invested. Entrepreneurs face credit constraints since, before investing, they can abscond with the money due to imperfect creditor protection.

Because under paid employment tasks are substitutes and under entrepreneurship they are complement, output under paid employment is maximized by skill specialization in the more abundant skill, while that under entrepreneurship is maximized by equalizing skills across tasks. Thus, the return to skills is higher under paid employment. This implies that a return to capital is required to induce investments in balanced skills rather than specialization in the skill that is in excess of supply. However, entrepreneurs can abscond with a fraction of the investment. This means that capital will be rationed and leverage is only possible if it is worthwhile for the entrepreneur to repay debt. Because capital is irrelevant for wages, it is only those who are wealthy or those who are not as wealthy but have a sufficiently balanced portfolio of skills, who will choose entrepreneurship when old.

The main implication of this is that high-wealth individuals allocate their time when young so that their portfolio of skills becomes fully balanced and choose entrepreneurship when old. Middle-wealth individuals endowed with a balanced portfolio of skills invest their time when young to have a fully balanced portfolio of skills and choose entrepreneurship, while those endowed with an unbalanced portfolio invest their time when young so as to specialize in the skill in which they have an absolute advantage and choose paid employment. Low-wealth individuals also invest their time when young so as to specialize in the skill in which they have an absolute advantage and choose paid employment regardless of their initial portfolio of skills. Thus, entrepreneurship is the outcome of initial conditions regarding wealth and the portfolio of task-specific skills as well as individuals' skill upgrading and investment decisions.

We also show that deepening financial development, lowering entrepreneurial risk, and increasing liquidation value upon failure rise welfare. A wealth redistribution has an ambiguous effect on welfare and a lending support program for entrepreneurs also has an ambiguous effect on welfare. Yet, a program that provides entrepreneurs with a small subsidy is welfare enhancing.

The model predicts, consistent with the empirical evidence, that the cross-sectional mean probability of starting a new business increases with financial development and the size of liquidation value upon failure, and as the wealth distribution improves in the sense of first-order stochastic dominance. It falls as entrepreneurial risk increases and rises with the degree of balance of the portfolio of skills.

The literature on occupational choice under credit constraints has two different strands. One related to the long-run consequences of credit constraints on inequality and another related to selection of workers into entrepreneurship and their success. The former yields an important insight: poor workers cannot perform in jobs that require fixed setup costs such as entrepreneurship since they have restricted access to external funds (see, for instance, Banerjee and Newman 1993, 1994; Galor and Zeira 1993; Aghion and Bolton 1997). Therefore, poor individuals remain poor because they are born poor (the poverty trap). In these models there is no way to escape from that situation through hard work, effort or human capital investments. In contrast, Ghatak et al. (2001) argue that credit constraints, fixed setup costs, and moral hazard give rise to entrepreneurial rents which induce young workers to work hard and save to overcome credit constraints. Hence, being poor when young does not imply being poor when old, with hard work and a little bit of luck you can escape poverty. Quadrini (2000) also provides a model where there are stronger saving incentives as a result of capital market frictions for those individuals who through savings are able to engage in entrepreneurship. Buera (2009) also provides a model where workers who has a large

Gompers et al. (2005) carefully document the process by which firms located in Silicon Valley and Massachusetts greatly contribute to the creation of new firms by training, educating and preparing their workers for entrepreneurship. They report that 45% of the start-ups come from workers from publicly traded established firms.

entrepreneurial ability save enough to overcome borrowing constraints to become entrepreneurs, the rest choose to never become entrepreneurs. In short, the occupational choice literature argues that fixed set-up costs together with financial frictions may either hinder access to better occupations, which results in a poverty trap, or may create stronger incentives to work harder and save to escape from that situation. In the former case lowering financial entry barriers into occupations with fixed set-up costs increases welfare and in the latter that may decrease it. While this paper is not concerned with the long-run consequences on inequality, it considers some of the ideas behind this literature. In our model, entrepreneurship is not sufficiently attractive for low-wealth individual regardless of the initial portfolio of skills, while for middle-wealth individuals entrepreneurship is sufficiently attractive when they are endowed with a balanced portfolio of skills. Hence, there is a poverty trap which is not the result of indivisibilities since there are no fixed setup costs. It is the result of the fact that low-wealth individuals and middle-wealth individuals with an unbalanced portfolio of skills are able to raise too little external capital to make entrepreneurship more attractive than paid employment. Middle-wealth individuals with a balanced skill portfolio can escape this situation by appropriately choosing their time allocation when young since they can lever their skills.

Concerning the second strand, Lazear (2005), from where this paper builds, provides a model in which those endowed with a more balanced set of skills choose entrepreneurship and the rest choose paid employment and shows that this prediction is borne out by data on Stanford MBA students. Evans and Jovanovic (1989) propose a learning model and argue that workers who are not entirely certain about their entrepreneurial talent may choose entrepreneurship to learn about it and those who have learned that their talent as entrepreneurs is low abandon entrepreneurship. Thus, average returns increase with tenure in the corresponding occupation and cross-sectional differences in returns may simply be the result of selection issues. MacDonald's (1988) rising star model predicts that the self-employed consists of a mix of high-ability experienced business owners and low-ability inexperienced owners who, for the most part, will return to paid employment in the future. Because success is rare and rewarded highly, the implied distribution of returns is positively skewed. Hvide (2009) proposes a model that considers workers' decisions to become entrepreneurs and employers' efforts to keep their best workers and ideas. The model predicts that larger firms produce entrepreneurs of higher quality than smaller firms. Using Norwegian data, he finds that previous employer size exerts a significant influence on entrepreneurial performance. Astebro et al. (2011) develop a multitasking model of occupational choice with labor market frictions that result in mismatches between firm and workers and misassignment of workers to tasks. The model is able to explain why entrants into self-employment are disproportionately drawn from the tails of the earning and ability distributions.

The rest of the paper is structured as follows. The next section, Section 2, presents the model. In Section 3, we derive several intermediate results that are interesting for their own sake. In the next section, Section 4, the optimal skill upgrading strategy and the equilibrium is derived and comparative statics are carried out. In Section 5, the welfare impact of different economic policies is discussed. In the next section, Section 6, the model's empirical predictions regarding the relationship between the prevalence of entrepreneurship, financial frictions, wealth and skills are presented and the empirical evidence regarding them is discussed. Finally, Section 7 offers some concluding remarks.

2 The model

Consider a two-period economy. Only one good is produced and its price is equalized to one. Labor is the only input and each established firm has access to the same constant-return to scale technology; i.e. the total productivity of a firm is equal to the sum of each worker's productivity.[4] To keep the analysis simple, firm and individuals do not discount the future. Firms are risk-neutral and individuals are risk averse. Namely, individuals have a utility of income $u(\cdot)$, with $u'(\cdot) > 0$, $u''(\cdot) < 0$, $u(0) = 0$, $\lim_{x\to 0} u'(x) \to \infty$ and $\lim_{x\to\infty} u'(x) \to 0$.

[4]This assumption is not as restrictive as it appears at first glance. If the technology is of constant returns to scale and inputs can be freely adjusted, the marginal contribution of a worker will be independent of the other inputs. The reason is that profit maximizing firms will keep the ratio between inputs constant.

Each worker is endowed with a wealth $A \in \mathcal{A} \equiv [0, \bar{A}]$ and a task-specific skill profile $(a_1, a_2) \in [\underline{a}, \bar{a}]^2$, with $\infty > \bar{a} > \underline{a} > 0$ and $a_1 \leq a_2$.[5] Thus, skill a_1 is in short supply. For instance, we can think of a_1 as cognitive skills and a_2 as non-cognitive skills. We assume that initial wealth and initial skills are jointly distributed according to $G(A, a)$, with density $g(A, a)$ and full support. Skills as well as wealth are publicly known. We therefore ignore problems arising from partial observability, costly state verification and diversification of entrepreneurial risk. This simplification is adopted to focus only on the effect of financial frictions on occupational choice. During the first period, workers decide how much time and attention to devote to improve each skill; $k_i \in [0, 1]$ is the time a worker spends improving skill i for $i \in \{1, 2\}$, with $k_1 + k_2 = 1$ and $k = (k_1, k_2)$. We assume that the skill production function is as follows:[6]

$$h_i(k_i) = h(a_i + a_i k_i), \ \forall \ i = 1, 2, \tag{1}$$

where

Assumption 1

(i) $h'(\cdot) \geq 0$, $h''(\cdot) < 0$ *and* $h(0) = 0$.
(ii) $2\underline{a} > \bar{a}$.

Item (i) says that holding the time allocation constant, individuals with a higher skill i accumulates more of that skill, but at a decreasing rate. Furthermore, the more time a worker spends improving a given skill, ceteris-paribus, the more he gets of that particular skill and the less he gets from the other skill. Item (ii) establishes that a worker who spends all his time improving skill a_i ends up with a higher amount of that skill in relation to the other skill, regardless of the initial endowment of skills. This guarantees that the skill endowment per se will not limit a worker's choice of an occupation and ensures that there exists a time allocation such that skill equalization between the two skills is possible.

During the first period, workers produce nothing.[7] Since the labor market is perfectly competitive, this implies that their first-period wage is zero.[8] When an individual performs as a worker in any given firm, his second-period output is given by $y_w(k) \equiv \max\{h_1(k_1), h_2(k_2)\}$. Hence, skills are substitutes and are general in Becker's sense since, ceteris-paribus, they are equally valuable inside as well as outside the firm. Revenues are verifiable and contractible.

An individual who does not perform as a paid-employee in the second period has the choice to set up his own small business. Entrepreneurship entails risk and requires to be a Jack-of-all trades as Lazear's (2005) evidence and theory suggests: that is, with probability p the return to entrepreneurship is $y_e(k) + \mu I$, where $y_e(k) \equiv \min\{h_1(k_1), h_2(k_2)\}$, I is the amount of capital invested and $\mu \geq 1$ is the marginal return to capital; and with probability $1 - p$ the return is zero.[9] Hence, skills are complements. We assume that $p\mu > 1$. Upon failure, the project has a liquidation value equal to $l \geq 0$, which is fully captured by the investor.

Following Burkart and Ellingsen (2004) and Balmaceda and Fischer (2010), we assume that entrepreneurs who borrow can either invest the money and repay their debt at the end of the period or run away without investing it. If they run away with the money they retain a fraction $\phi \in [0, 1]$ of their working capital, which includes their own assets and borrowed money, and their creditors seize the rest. Yet, we assume that they lose they possibility to work as

[5] None of the results in this article depends on the task-specific skill profile having two dimensions. This is adopted just to simplify the exposition.

[6] We could have chosen to model this by assuming that $k_1 + k_2 \leq 1$. It is straightforward to show, given the production technology adopted, that in equilibrium the time constraint binds. To avoid the extra algebra that this implies we have adopted the simpler form in which we assume that the time constraint always binds.

[7] This assumption can be easily modify to either consider that output is positive but independent of the initial skill endowment or increasing in either or both skills.

[8] This together with the fact that there is no discounting implies that there is no role for saving in the model. Thus, income in period 1 is equal to the wealth endowment, and income in period 2, which is fully consumed, is equal to the return to entrepreneurship for entrepreneurs and the wage plus initial wealth for paid employees.

[9] We could assume instead that the marginal productivity of capital is given by the random variable η, where the shock η is drawn from a distribution function $F(\cdot)$, with full support $[0, \bar{\eta}]$ and mean μ. We could also assume more general production functions in each case, any submodular function of $(h_1(k_1), h_2(k_2))$ in the case of paid employment and any supermodular function of $(h_1(k_1), h_2(k_2))$ in the case of entrepreneurship will yield the same results. We could also assume that the investment is complementary to skills or that productivity is a concave function of the amount invested I. None of these generalizations change the main results, but they do increase the mathematical burden.

paid employees for that period. In this setting, stronger legal protection is associated to a lower ϕ.

There are deep-pocket, risk neutral (or well diversified) investors. The opportunity cost of funds for them is equal to 1. Investors are subject to extended liability and cannot receive ex post more than the pledgable income and cannot pay the borrower at any state.

The precise timing is as follows (see Fig. 1). At the beginning of period 1, already established firms compete for workers in a Bertrand-like fashion by offering fixed wage for the period and, after this has been accepted, workers choose how to allocate their time and effort to improve their skills. At the beginning of period 2, the labor market makes each worker a wage offer and then, workers decide between paid employment and entrepreneurship. After this, if the worker decides to become an entrepreneur, he approaches lenders and asks them for a loan. If the loan is granted, the entrepreneur decides whether to invest the money or run away with it. If he runs away, he is able to consume a fraction ϕ of the amount he took with him. In contrast, if he invests the money, he gets the expected return to entrepreneurship (Fig. 1).

3 Prelimimaries

An individual who chooses entrepreneurship must raise external funds. External financing entails a debt D, a repayment P in the case of success and l in the case of failure. For any contract (D, P, l), the expected utility of an individual characterized by (a, A) is

$$U(I, k, P) \equiv pu(y_e(k) + \mu I - I - P + A + D) + (1-p)u(0).$$

where $I \leq A + D$. The entrepreneur's goal is to choose I to maximize $U(I, k, A)$ subject to $I \leq A + D$.[10]

Because the credit market is competitive, lenders must break even on average. Therefore, $pP + (1-p)l = D$. We assume parameters such that debt is not fully collateralized. Furthermore, the expected utility increases with I, since $\mu > 1$, and therefore $I = A + D$. These two things together imply that the expected utility from entrepreneurship is equal to

$$U(I, k) \equiv pu(\pi(k, I)) + (1-p)u(0),$$

where $\pi(k, I) \equiv y_e(k) + \mu I - \frac{I - A - (1-p)l}{p}$.

Because I is non-contractible, an entrepreneur is able to raise external funds if and only if his expected utility from investing the money is greater than his expected utility from running away with the share of the money that investors cannot recover; that is,

$$pu(\pi(k, I)) \geq u(\phi I).$$

In equilibrium, all loans made will satisfy this condition and therefore borrowers will not run away with the money. Observe that at $I = 0$, this condition holds, since $u(0) = 0$, and

$$u'(\pi(k, I))(p\mu - 1)|_{I=0} < \phi u'(\phi I)|_{I=0}.$$

If legal protection were complete (i.e., $\phi = 0$), the optimal level of external funding will be only related to technological parameters and will neither depend on initial wealth nor on the entrepreneur's productivity. So, in what follows we will assume that $\phi \in [p\mu - 1, 1]$, so that entrepreneurs can raise a positive, but finite amount of external funds. It readily follows from this that the optimal investment, denoted by $I(k, A, \phi)$, is the unique solution to the equation

$$pu(\pi(k, I)) = u(\phi I).$$

Observe that

$$\frac{\partial I(k, A, \phi)}{\partial \phi} = \frac{I u'(\phi I)}{u'(\pi(k, I))(p\mu - 1) - \phi u'(\phi I)}|_{I = I(k, A, \phi)} < 0,$$

$$\frac{\partial I(k, A, \phi)}{\partial A} = -\frac{u'(\pi(k, I))}{u'(\pi(k, I))(p\mu - 1) - \phi u'(\phi I)}|_{I = I(k, A, \phi)} > 0,$$

$$\frac{\partial I(k, A, \phi)}{\partial p} = -\frac{u(\pi(k, I)) + u'(\pi(k, I))(I - A - l)}{u'(\pi(k, I))(p\mu - 1) - \phi u'(\phi I)}|_{I = I(k, A, \phi)} > 0,$$

$$\frac{\partial I(k, A, \phi)}{\partial l} = -\frac{u'(\pi(k, I))(1-p)}{u'(\pi(k, I))(p\mu - 1) - \phi u'(\phi I)}|_{I = I(k, A, \phi)} > 0$$

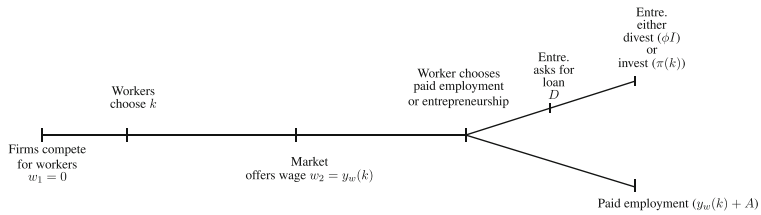
and

$$\frac{\partial I(k, A, \phi)}{\partial y_e(k)} = -\frac{u'(\pi(k, I))}{u'(\pi(k, I))(p\mu - 1) - \phi u'(\phi I)}|_{I = I(k, A, \phi)} > 0.$$

This implies the optimal investment is higher the more developed the financial market (i.e., the lower is ϕ), the higher the initial wealth, the lower the entrepreneurial risk, the higher the liquidation value and the higher the output from skills. Intuitively, the higher the amount of an entrepreneur's own wealth

[10] By investing all his wealth into the project an individual maximizes the size of the loan he can obtain.

Fig. 1 Timing



invested in the business, the larger the amount that the entrepreneur would lose in case of default, the lower the temptation to default, and the larger the sum that the creditor is willing to lend to the entrepreneur. Hence, the entrepreneur's wealth act as collateral, although the loan need not be fully collateralized. As a result, not all profitable business receive appropriate funding. Individuals with little wealth can borrow little, even if they have a balanced portfolio of skills. In fact, the entrepreneur's debt $D(A) = \max\{0, I(k, A, \phi) - A\}$ rises with A. Also, the fact that the optimal investment increases with $(A, y_e(k))$ shows that the borrower can lever his wealth and skills.

It readily follows from the discussion above that the value of entrepreneurship upon success for a worker initially endowed with a portfolio of skills a and wealth A and who allocates his time according to k in period 1 is given by

$$\pi(k) \equiv y_e(k) + \mu I(k, A, \phi) - \frac{I(k, A, \phi) - A - (1-p)l}{p}. \tag{2}$$

Because the labor market is competitive, Bertrand-like competition ensures that workers are paid their marginal productivity. Hence, the value of employment in the market for an old worker initially endowed with a portfolio of skills a and who allocates his time according to k in period 1 is

$$y_w(k) \equiv \max\{h_1(k_1), h_2(k_2)\}. \tag{3}$$

Let $k_=$ be the lowest time dedicated to upgrade skill 1 such that the following holds: $h_2(k_2) = h_1(k_1)$. It follows from this that $k_= = \frac{2a_2 - a_1}{a_1 + a_2}$. Also, let k_- be the lowest amount of time dedicated to upgrade skill 1 and k_+ be the highest amount of time dedicated to upgrade skill 1 such that the expected utility from entrepreneurship exceeds that from paid employment; that is, $pu(\pi(k)) \geq u(y_w(k) + A)$.[11] By definition $k_= \in [k_-, k_+]$. Let $K_e \equiv [k_-, k_+]$ and $K_w \equiv [0, 1] \setminus K_e$. Then, we get the following result.

Proposition 1 *A worker endowed with a portfolio of skills a and wealth A who allocates his time according to k when young chooses entrepreneurship when old if $k \in K_e$ and paid-employment if $k \in K_w$.*

The occupational choice of a worker is entrepreneurship when the expected utility from entrepreneurship is greater than the expected utility from the wage in the best alternative job plus his initial wealth. This happens when (i) the expected return to the wealth invested in its own venture exceeds the return that wealth yields under paid employment; that is, $p\mu > 1$; and (ii) the worker's first-period time allocation gives rise to a sufficiently balanced portfolio of skills; the strict complementarity between skills under entrepreneurship implies that the maximum return to skills is achieved when skills are equalized across tasks, while the strict substitution of skills in paid employment implies that the maximum return to skills is achieved under full specialization in the skill that is in excess of supply. This result is illustrated in Fig. 2.

4 The equilibrium occupational choice

Because skill upgrading is non-contractible, each worker chooses k to maximize his second-period expected utility, denoted by $U(k)$. Hence, a young worker's problem is given by

$$\max_{k \in [0,1]^2, k_1 + k_2 = 1} \{U(k)\},$$

where

$$U(k) = \begin{cases} pu(\pi(k)) & \text{if } k \in K_e, \\ u(y_w(k) + A) & \text{if } k \in K_w. \end{cases}$$

When a young worker anticipates that he will choose entrepreneurship when old, the optimal

[11] Observe that $k_- = 0$ if $u(h_2(1) + A) \leq pu(\pi(0, 1))$ and $k_+ = 1$ if $u(h_1(1) + A) \leq pu(\pi(1, 0))$.

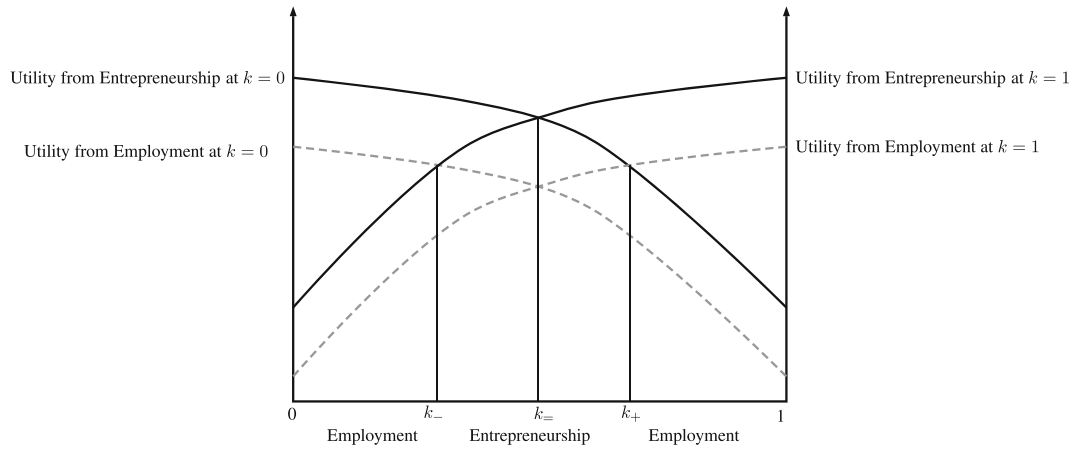


Fig. 2 Occupational Choice as a Function of k for a given A

investment strategy is to choose k so that skills are equalized across tasks; that is,

$$h(a_1 + a_1 k_1) = h(a_2 + a_2 k_2).$$

The solution is to choose $k = (k_=, 1 - k_=)$, since this allows the worker to maximize the expected return to entrepreneurship upon success and therefore the expected utility from it. In contrast, when a young worker anticipates that he will work as a paid employee, he will choose $k = (0, 1)$. This stems from the following facts: tasks are substitutes and therefore the return to skills is maximized when the worker specialize in one skill, a_1 is in short supply and the technology by which skills are accumulated is identical across tasks. Hence, a young worker will choose $k = (k_=, 1 - k_=)$ when the expected utility from entrepreneurship is higher than or equal to that under paid employment and he will choose specialization in the skill that is more abundant; i.e., $k = (0, 1)$, otherwise. This leads to the following result.

Lemma 1 *There exists a unique time allocation that solves the worker's optimization problem and this is given by:*

$$k^* = \begin{cases} (0,1) & \text{if } pu(\pi(k_=, 1-k_=)) < u(y_w(0,1)+A), \\ (k_=, 1-k_=) & \text{if } pu(\pi(k_=, 1-k_=)) \geq u(y_w(0,1)+A). \end{cases} \tag{4}$$

In what follows, we will assume the following

Assumption 2 $u(y_w(0,1)) > pu(\pi(k_=, 1-k_=))|_{A=0}$ *and* $pu(\pi(k_=, 1-k_=))|_{A=\bar{A}} > u(y_w(0,1)+\bar{A})$.

The first part of this assumption establishes that the expected utility from paid-employment for a penniless individual who specializes in the skills that is more abundant is higher than the expected utility from entrepreneurship for a penniless individual who equalizes skills across tasks. The second establishes the opposite for the wealthiest individual in the economy.

Observe that

$$\frac{\partial(pu(\pi(k_=,1-k_=)))}{\partial A} = -\frac{u'(\pi(k_=,1-k_=))\phi u'(\phi I((k_=,1-k_=),A,\phi))}{u'(\pi(k_=,1-k_=))(p\mu-1)-\phi u'(\phi I((k_=,1-k_=),A,\phi))} > 0$$

and

$$\frac{\partial u(y_w(0,1)+A)}{\partial A} = u'(y_w(0,1)+A).$$

It readily follows from this that whenever $u(y_w(0,1)+A) = pu(\pi(k_=, 1-k_=))$, $pu(\pi(k_=, 1-k_=))$ increases with A at a higher rate than $u(y_w(0,1)+A)$ does so. This follows from the fact that $\phi \geq p\mu - 1$, and $u(y_w(0,1)+A) = pu(\pi(k_=, 1-k_=)) = u(\phi I((k_=, 1-k_=), A, \phi))$. Thus, assumption 2 together with the Intermediate Value theorem imply that there exists a unique wealth level, denoted by $A(a, \phi, p, l) \in (0, \bar{A})$, such that $pu(\pi(k_=, 1-k_=)) \geq u(y_w(0,1)+A)$ for all $A \geq A(a, \phi, p, l)$. Namely, the utility from entrepreneurship rises with wealth at a higher rate than the utility from paid-employment since an increase in wealth softens credit constraints, which has a multiplier effect, and the marginal return to wealth is higher, since credit is constraint due to imperfect creditors' protection.

Lets define the set of individuals that choose entrepreneurship as $\mathcal{A}_e \equiv \{A \in \mathcal{A} \mid A \geq A(a, \phi, p, l)\}$ and the set of individuals that choose paid employment as $\mathcal{A}_w \equiv \mathcal{A} \setminus \mathcal{A}_e$. Then, we have the following result.

Proposition 2 *The optimal time allocation is the following*

$$k^* = \begin{cases} (0, 1) & \text{if } A \in \mathcal{A}_w \\ (k_=, 1 - k_=) & \text{if } A \in \mathcal{A}_e, \end{cases}$$

Holding the skill endowment constant, wealthy workers' optimal skill upgrading strategy results in a fully balanced portfolio of skills since they anticipate that entrepreneurship will be their occupational choice when old. The reason is twofold: first, the higher the amount that an entrepreneur invests in his business, the larger the amount that he will lose in case he runs away with the money, the lower the temptation to default, and the larger the sum that the creditor is willing to lend to the entrepreneur; and second, because skills are perfect complements, a wealthy worker anticipates that by adopting a skill upgrading strategy that gives rise to a fully balanced portfolio of skills, he will be able to invest his personal wealth in a more profitable manner and also will be able to raise more external funds. Namely, the marginal return to each dollar invested in his own business is higher than the marginal return he gets from each dollar when he chooses paid employment. In fact, when personal wealth yields the same return under entrepreneurship and paid employment, no one will leave the current firm to be an entrepreneur. This is due to the fact that the marginal return to skills under entrepreneurship is always lower than or equal to that under paid employment and entrepreneurship entails risk, while paid-employment ensures a risk-free compensation. Poor workers' optimal skill-upgrading strategy entails full specialization in the skill in which they have an absolute advantage since they anticipate that they will work as paid employees in the future and skills are substitutes under paid employment. Hence, entrepreneurship, together with financial frictions, provides rich workers with incentives to upgrade their skills so that their portfolio of skills is fully balanced, while paid employment provides poor workers with incentives to specialize in the skill in which they have an absolute advantage; i.e., skill 2.

In the next proposition, comparative statics regarding the main parameters of interest are carried out.

Proposition 3

(i) *If* $\phi' > \phi$, *then* $\mathcal{A}'_e \subseteq \mathcal{A}_e$;
(ii) *If* $a'_1 > a_1$, *then* $\mathcal{A}'_e \supseteq \mathcal{A}_e$;
(iii) *If* $a'_2 > a_2$, *then either* $\mathcal{A}'_e \supseteq \mathcal{A}_e$ *or* $\mathcal{A}'_e \subseteq \mathcal{A}_e$;
(iv) *If* $p' > p$, *then* $\mathcal{A}'_e \supseteq \mathcal{A}_e$;
(v) *If* $l' > l$, *then* $\mathcal{A}'_e \supseteq \mathcal{A}_e$;

This proposition shows that after financial frictions decrease, ceteris-paribus, there are poor individuals who choose to upgrade their skills so that their portfolio is fully balanced and before that they were upgrading their skills so as to specialize in the skill in which they have an absolute advantage. The reason is that a decrease in financial frictions lowers incentives to abscond with the money, which loosens credit constraints, while this has no impact under paid employment. An increase in (p, l) also softens credit constraints. The former happens because the entrepreneur is more likely to pay back debt and the latter happens because investors recover a greater share of the unpaid debt in the case of default. Hence, an increase in (p, l) increases the set (in the sense of strong set ordering) $\mathcal{A}_e$.

An increase in the skill that is in short supply (skill 1) increases the set $\mathcal{A}_e$, since this raises the return to entrepreneurship due to the fact that the portfolio of skills becomes more balanced and does not change the return to paid employment, since the worker is already specialized in skill 2. An increase in the skill that is in excess of supply has an ambiguous effect. On the one hand, under paid employment, the worker is already specialized in skill 2 and thus an increase in this skill makes specialization even more profitable. On the other hand, an increase in skill 2 increases the productivity of skills under entrepreneurship since the worker adjusts its investment to keep its portfolio of skills balanced. This productivity gain allows the individual to raise more external funds. Thus, an increase in skill a_2 results in a multiplier effect under entrepreneurship. The aggregated impact of an increase in the skill in which the individual has an absolute advantage is ambiguous and depends on the initial endowment of skills and the degree of financial development ϕ.

To understand how the degree of balance of the skill portfolio affects the optimal occupational choice we will use polar coordinates; that is, $a_1 = r \cos \varphi$ and

$a_1 = r\sin\varphi$, where $r = \sqrt{a_1^2 + a_2^2}$ and $\varphi \in [\frac{\pi}{4}, \frac{\pi}{2}]$ is the angle of the vector (a_1, a_2). This allows us to vary skill inequality without increasing their levels. φ is the measure of skill inequality used here.

The wealth threshold falls as skills become more homogeneous if and only if

$$\frac{\partial A(a,\phi,p,l)}{\partial\varphi} = \frac{\partial A(a,\phi,p,l)}{\partial y_e(k^*)}\frac{\partial y_e(k^*)}{\partial\varphi} + \frac{\partial A(a,\phi,p,l)}{\partial y_w(k^*)}\frac{\partial y_w(k^*)}{\partial\varphi} > 0.$$

Substituting into for the corresponding derivatives we get that

$$\begin{aligned}&\frac{\partial A(a,\phi,p,l)}{\partial\varphi}\\ &= \frac{\partial A(a,\phi,p,l)}{\partial y_e(k^*)}h'(3\alpha(\varphi)r\sin\varphi)3r\frac{\cos^3\varphi - \sin^3\varphi}{(\cos\varphi+\sin\varphi)^2}\\ &+ \frac{\partial A(a,\phi,p,l)}{\partial y_w(k^*)}h'(2r\sin\varphi)2r\cos\varphi.\end{aligned}$$

where $\alpha(\varphi) = \frac{\cos\varphi}{\cos\varphi+\sin\varphi}$,

$$\frac{\partial A(a,\phi,p,l)}{\partial y_w(k^*)} = \frac{\frac{\partial u(y_w(0,1)+A)}{\partial y_w(k^*)}}{\frac{\partial(pu(\pi(k_=,1-k_=)))}{\partial A} - \frac{\partial u(y_w(0,1)+A)}{\partial A}}|_{A=A(a,\phi,p,l)} > 0 \tag{5}$$

and

$$\frac{\partial A(a,\phi,p,l)}{\partial y_e(k^*)} = -\frac{\frac{\partial(pu(\pi(k^*))}{\partial y_e(k^*)}}{\frac{\partial(pu(\pi(k^*))}{\partial A} - \frac{\partial u(y_w(0,1)+A)}{\partial A}}|_{A=A(a,\phi,p,l)} < 0. \tag{6}$$

Hence, $A(a,\phi,p,l)$ rises as φ increases if and only if

$$\begin{aligned}&-pu'(\pi(k^*))h'(3\alpha(\varphi)r\sin\varphi)3\frac{\cos^3\varphi - \sin^3\varphi}{(\cos\varphi+\sin\varphi)^2}\\ &+u'(y_w(0,1)+A)h'(2r\sin\varphi)2\cos\varphi > 0.\end{aligned}$$

The inequality holds since $\sin\varphi \in [\frac{\sqrt{2}}{2}, 1]$ and $\cos\varphi \in [0, \frac{\sqrt{2}}{2}]$.

Because as φ increases, the skill portfolio becomes more unbalanced, we conclude the following.

Proposition 4 *As the skill endowment becomes more balanced, $A(a,\phi,p,l)$ falls.*

This shows that a more balanced endowment of skills results in a lower wealth threshold above which entrepreneurship is optimal. Because the skill production technology is strictly concave, $3\alpha(\varphi)r\sin\varphi \leq 2r\sin\varphi$ and the individual adjusts the optimal time allocation to keep the portfolio fully balanced, the more homogeneous the skills, the higher the marginal return to skills at the point where skills are equalized across tasks. Thus, the return to skills under entrepreneurship is higher. This not only increases the return to entrepreneurship directly but also softens credit constraints, which increases investment even further.

Lets define a low-wealth individual as one whose his initial wealth is such that he will choose paid employment regardless of how balance is his portfolio of skills; that is, $A \leq A(a,\phi,p,l)|_{\alpha(a)=1/2}$; a high-wealth individual as one whose initial wealth is such that he will choose entrepreneurship regardless of how balance is his portfolio of skills; i.e., $A > A(a,\phi,p,l)|_{\alpha(a)=\alpha(\underline{a},\bar{a})}$; and a middle-wealth individual when his initial wealth is such that $A(a,\phi,p,l)|_{\alpha(a)=\alpha(\underline{a},\bar{a})} \geq A > A(a,\phi,p,l)|_{\alpha(a)=1/2}$.

These results show that despite the fact that the are no fixed entry costs into entrepreneurship, low-wealth individuals will work as paid employees and will specialize in the skill in which they have an absolute advantage regardless of their initial endowment of skills. High-wealth individuals will end-up working as entrepreneurs regardless of their initial portfolio of skills. Middle-wealth individuals who are endowed with an unbalanced set of skills will end-up working as paid employees and will specialize in the skill in which they have an absolute advantage. In contrast, those endowed with a balanced set of skills will work as entrepreneurs and choose a first-period time allocation that equalizes skills across tasks. Thus, entrepreneurs come from high-wealth individuals and middle-wealth individuals endowed with a balanced portfolio of skills.

5 Welfare and economic policies

In this section, we discuss the welfare consequences of different policies aimed at increasing entrepreneurship. To better understand the results in this section, it is worthwhile to have in mind that in the absence of financial frictions, everyone will able to raise as much external funds as desired, and because the marginal return to capital is constant, everyone will choose entrepreneurship when old.

5.1 Financial development, entrepreneurial risk, and liquidation value

Lets define total expected welfare as the sum of the workers and firms's utilities. Because the labor market is competitive, firms' profits are zero in each period and therefore total welfare is equal to

$$W(\phi, p, l) \equiv \int_{a\in[\underline{a},\bar{a}]^2} \left(\int_{A\in\mathcal{A}_e} pu(\pi(k^*))dG(A,a) + \int_{A\in\mathcal{A}_w} u(y_w(k^*)+A)dG(A,a) \right) da.$$

A change in parameter $x \in \{\phi, p, l\}$ results in a change in welfare equal to

$$\frac{\partial W(\phi, p, l)}{\partial x} = \int_{a\in[\underline{a},\bar{a}]^2} \left(\int_{A\in\mathcal{A}_e} pu'(\pi(k^*))\frac{\partial \pi(k^*)}{\partial x} dG(A,a) + \int_{A\in\mathcal{A}_w} u(y_w(k^*)+A)\frac{\partial y_w(k^*)}{\partial x} dG(A,a) \right). \quad (7)$$

The first-term is the change in total welfare due to a change in x for those who choose entrepreneurship and the second term is the same for those who choose paid-employment. An improvement in financial development (i.e., a decrease in ϕ) results, ceteris-paribus, in an increase in the return to entrepreneurship since it enhances access to external funds. The second term is zero since financial frictions do not affect the value generated by paid employment. Hence, an improvement in financial development increases welfare. An increase entrepreneurial risk, as measured by the probability of success p, increases the utility of entrepreneurship since success is more likely and this increases access to external funds, and has no impact on paid employment since the payment from paid employment does not entail uncertainty. An increase in liquidation value also enhances access to external funds since, upon bankruptcy, investors recover a higher share of the loan. Hence, we have the following result.

Proposition 5 *Welfare falls with ϕ and rises with (p, l).*

The rationale regarding changes in ϕ is different from that in poverty trap models such as Banerjee and Newman (1993) where improving financial development also unambiguously leads to a welfare improvement. The reason stems from the fact that their result relies on indivisibilities due to the existence of fixed set-up costs, while ours is due to the relationship between financial development and the amount of external funds needed to make entrepreneurship more profitable than paid employment. It is also different from Ghatak et al. (2001) in that they consider financial and labor market frictions and show that improvements in financial frictions might exacerbate the negative impact of labor market frictions. In their model that occurs because financial frictions create rents. This rents motivate workers to work harder in order to save enough to be able to finance the fixed set-up costs that entrepreneurship requires and in that way being able to get the rents that entrepreneurship yields. This is, again, possible due to indivisibilities not present in our model.

5.2 Government lending support

Many of those who choose entrepreneurship do so in part because of the existence of government programs designed to promote exactly this. Tax-cut are given to small business and many of them are exempt from regulations that apply to large business. In the US, the Small Business Administration (SBA), whose mission is "to maintain and strengthen the nation's economy by enabling the establishment and vitality of small business" was authorized by mean of the Small Business Act of 2010 to increase the business lending support available to small business owners to more than $12 billion and to provide up to $50 million grants to Small Business Development Centers across the country. In the UK, angel investors receive generous tax credits under the EIS/SEIS program.[12] New Zealand has a government fund that matches private angel investments.[13] Wilson and Silva (2013) provide a comprehensive discussion of government policies for early stage funding across the OECD. Most countries have policies aimed at facilitating small entrepreneurs access to external funds.

Lets suppose there is a support program that provides an amount $S \in \Re_+$ to anyone who chooses entrepreneurship. An increase in S is equivalent to increase the wealth to anyone who chooses entrepreneurship. Because this policy entails fiscal resources, we will assume that there is a

[12] https://www.gov.uk/government/publications/the-enterprise-investment-scheme-introduction.

[13] See http://www.nzvif.co.nz/what-we-offer/seed-co-investment-fund.

shadow cost per dollar invested equal to c. Lets define $A(a, \phi, p, l, S)$ as the wealth level such that $U(k_=, 1 - k_=) = U(0, 1)$ when an individuals' wealth is given by $A + S \in [S, \bar{A} + S]$ for those who choose entrepreneurship and by $A \in [0, \bar{A}]$ for those choosing paid employment. We can also define $\mathcal{A}_e(S)$ and $\mathcal{A}_w(S)$ as before, but considering $A + S$ instead of A for individuals choosing entrepreneurship. Thus, the program has a total cost equal to $c \int_{a\in[\underline{a},\bar{a}]^2} \int_{A\in\mathcal{A}_e(S)} SdG(A, a)$.

Lets denote total welfare in this case by $W(\phi, p, l, S)$. Then, it is straightforward to show that

$$\frac{\partial W(\phi, p, l, S)}{\partial S} = \int_{a\in[\underline{a},\bar{a}]^2} \int_{A\in\mathcal{A}_e(S)} \left(pu'(\pi(k^*)) \frac{\partial \pi(k^*)}{\partial S} - c\right) dG(A, a) - \int_{a\in[\underline{a},\bar{a}]^2} cSg(A(a, \phi, p, l, S), a)da. \quad (8)$$

The return to entrepreneurship increases with S because this increases investment directly and indirectly by means of relaxing credit constraints. Holding the number of entrepreneurs constant, increasing the amount given to any entrepreneur entails a cost c per-dollar invested. Yet, it also induces more individuals to choose entrepreneurship, which raises the program's total costs. Hence, welfare increases with an increase in financial support to entrepreneurs whenever the gains from entrepreneurship exceed the shadow costs of the funds invested in the program. In fact, one can easily check that if $\frac{\partial \pi(k^*)}{\partial S}|_{S=0} > c$, welfare rises with S when evaluated at $S = 0$. Therefore, a support program providing entrepreneurs with a small amount will be welfare enhancing, since it softens credit constraints and entails small shadow costs.

5.3 Wealth redistribution

Lets consider a distributive-tax policy that imposes a tax t on wealth and tax revenues are redistributed uniformly to everyone in the economy. This policy takes wealth away from those who have an above average wealth and gives that to those with a below average wealth. In fact, the after-tax wealth for someone endowed with wealth A is given by $A(t) = A - t(A - \mathbb{E}(A))$. This implies that the before-tax wealth distribution is a mean-preserving spread of the after-tax wealth distribution.

Lets define $A(a, \phi, p, l, t)$ as the wealth level such that $U(k_=, 1 - k_=) = U(0, 1)$ when individuals' initial wealth is given by $A(t) \in [0, \bar{A}]$. We can also define $\mathcal{A}_e(t)$ and $\mathcal{A}_w(t)$ as before, but considering $A(t)$ instead of A. It is easy to check that

$$A(a, \phi, p, l, t) = \max\left\{0, \frac{1}{1-t} A(a, \phi, p, l) - \frac{t}{1-t}\mathbb{E}(A)\right\}.$$

It readily follows from this that $A(a, \phi, p, l, t)$ rises with t if $A(a, \phi, p, l) \leq \mathbb{E}(A)$ and falls otherwise. Hence, holding wealth constant, an increase in the redistributive tax makes entrepreneurship more likely when the average wealth $\mathbb{E}(A)$ is low and makes that less likely when the opposite holds. Lets denote total welfare when workers' initial wealth is $A(t) \in [0, \bar{A}]$ by $W(\phi, p, l, t)$. It is easy to check that

$$\frac{\partial W(\phi, p, l, t)}{\partial t} = \int_{a\in[\underline{a},\bar{a}]^2} \left(\int_{A\in\mathcal{A}_e(t)} pu'\left(\pi(k^*)\right) \frac{\partial \pi(k^*)}{\partial t} dG(A, a) + \int_{A\in\mathcal{A}_w(t)} u'\left(y_w(k^*) + A(t)\right) \frac{\partial \left(y_w(k^*) + A(t)\right)}{\partial t} dG(A, a) \right). \quad (9)$$

The first-term is the change in total welfare due to a change in the redistributive tax for those who choose entrepreneurship and the second term is the same for those who choose paid-employment. An increase in t rises, ceteris-paribus, the return to entrepreneurship for those with a below average wealth due to the fact that this improves their access to external funds, and worsens that for those with an above average wealth. It also increases the utility from paid employment for those with a below average wealth and decreases that for those with an above average wealth. Hence, a distributive-tax policy has an ambiguous effect on welfare.

In poverty trap models such as Banerjee and Newman (1993), redistribution of income can increase the number of firms operating in the economy. This effect is absent in the model proposed by Ghatak et al. (2001), since in theirs there is always full employment. In our model wealth redistributions have positive and negative consequences despite the fact that there is always full employment. The reason stands for the fact that wealth is non-transferable due to risk aversion and that changes in wealth affect the amount of external resources that an individual can raise. The overall effect will depend, among other things, on the correlation between personal wealth and skills.

6 Entrepreneurship, financing, wealth, and skills

The literature on the relationship between entrepreneurship and financing has two main strands: one that deals with variation across individuals' wealth to study how the likelihood of starting a new business varies with personal wealth or recent changes therein after controlling for other personal characteristics such as skills. The assumption underlying this literature is that a positive relationship between wealth and propensity to entrepreneurship should be observed only if financial constraints exists. The second strand examines the impact of financial development on entrepreneurship. This literature usually use variation across regions to study how differences in observable characteristics of financial sectors such as credit protection and bank competition relates to entrepreneurs access to finance and the rate of new firm formation. This literature finds that improvements in financial development increase entrepreneurship. In this sub-section we deal with both strands.

Lets define the cross-sectional mean probability that a worker chooses entrepreneurship by

$$Prob(\phi, p, l, \varphi) = \int_{a\in[\underline{a},\bar{a}]^2} \int_{A\in\mathcal{A}_e} dG(A, a).$$

This rises with parameter $x \in \{\phi, p, l, \varphi\}$ if and only if

$$\frac{\partial Prob(\phi, p, l, \varphi)}{\partial x} = -\int_{a\in[\underline{a},\bar{a}]^2} \frac{\partial A(a, \phi, p, l)}{\partial x} \times g(A(a, \phi, p, l), a)da.$$

Proposition 6

(i) *The cross-sectional mean probability that a worker chooses entrepreneurship decreases with ϕ and increases with (p, l, φ).*

(ii) *A first-order stochastic improvement in the wealth distribution, holding skills constant, increases the cross-sectional mean probability that a worker chooses entrepreneurship.*

The evidence pointing out to a positive relationship between financial development as measured by ϕ and entrepreneurship is vast. Berkowitz and White (2004) investigate how personal bankruptcy law affects small firms' access to credit. They find that small firms located in states with unlimited rather than low homestead exemptions are more likely to be denied credit, and when loans are made, they are smaller and interest rates are higher. Fisman and Love (2003) find that start-up firms have more problems dealing with weak financial development even when already established firms are able to use trade credit as a substitute for formal financing. Guiso et al. (2004) study local variation in the supply of credit across regions in Italy. They find that regions with more developed capital markets promote firm entry and growth of new firms and increase the probability that individuals start a new business. Paravisini (2008) shows using Argentinean banks facing constraints to external financing that these translate into credit constraints to undertake new business opportunities. Kerr and Nanda (2009a, b, 2010) study, using micro-data from the US Census Bureau, the effect of US branch banking deregulations on the entry size of new firms. They find that the average entry size for startups did not change following deregulations. However, among firms that survived at least four years, a greater proportion of firms entered either at their maximum size or closer to the maximum size in the first year. They report that the magnitude of these effects is small compared to the much larger changes in entry rates of small firms following the reforms. These results highlight that this large-scale entry at the extensive margin can obscure the more subtle intensive margin effects of changes in financing constraints. Beck and Demirgüç-Kunt (2005) finds using a sample of 54 countries that the smallest firms are the most constrained ones, and that financial and institutional development weakens the constraining effects of financial, legal, and corruption obstacles and that small firms are the ones that benefit the most. Beck et al. (2008) report that small firms and firms in countries with poor institutions use less external finance, especially bank finance. Protection of property rights increases external financing of small firms significantly more than of large firms, mainly due to its effect on bank finance. This suggests that the return to entrepreneurship or small firms is more sensitive to improvements in financial development.

The evidence regarding the existence of a positive relationship between different measures of personal wealth and propensity to become an entrepreneur is

bountiful. Evans and Jovanovic (1989), Evans and Leighton (1989), Berglann et al. (2011), Gentry and Hubbard (2004), Blanchflower and Oswald (1998), Holtz-Eakin et al. (1994a, b), Hurst and Lusardi (2004) and Nanda (2010) find, using different countries, control variables and estimators, a positive correlation between the probability to start a new business and personal or family wealth and whether the individual ever received an inheritance or a gift. However, Gentry and Hubbard (2004), Nanda (2010) and Hurst and Lusardi (2004) report that this relationship holds only for individuals at the top of the personal wealth distribution. One could argue that this result is driven by low-ability individuals who can afford to start (and sometimes continue running) weaker firms because they do not face the discipline of external finance. Mondragón-Vélez (2009) argue that this is due to the fact that skills and personal wealth are positively correlated. In fact, using the same data as Hurst and Lusardi (2004) and controlling for the positive correlation in his data, he shows that the estimated probability of transition to entrepreneurship is hump-shaped in personal wealth across cohorts defined by age and education.

The evidence regarding the relationship between skills and entrepreneurship shows that a more balanced portfolio of skills favors entrepreneurship. Hartog et al. (2010) find that general skills has a stronger impact on entrepreneurial incomes than on wages. Entrepreneurs and employees benefit from different sets of specific abilities: Language and clerical abilities have a stronger impact on wages, whereas mathematical, social and technical skills affect entrepreneurial incomes more strongly, but consistent with the model's predictions, a more balanced portfolio of skills results in higher income for entrepreneurs only. Lazear (2004) shows, using data from the Stanford MBA alumni and the CPS, that individuals who have had a more varied career, as measured by having perform more roles during their career, are more likely to be entrepreneurs. In addition, those who studied a more varied curricula are more likely to be entrepreneurs and to engage in starting a larger number of ventures during the career. There are two potential interpretations of this evidence: first, having a more balanced endowment of skills may correlate positively with the number of roles that a worker can play in his career; and second, this correlation is the result of conscious decisions to train themselves so that their portfolio of skills becomes more balanced over time. Lazear's (2004) argues that his evidence provides stronger support in favor of the second interpretation. Our model shows that whether the first or second rationalization of the evidence is correct will depend on the initial personal wealth level of each worker; for high- and low-wealth individuals the initial endowment of skills is irrelevant, while for middle-wealth individuals, the initial endowment as well as the skill upgrading strategy are decisive. Lazear's (2004) data base does not have information on personal wealth and therefore he cannot control for access to finance, and the relationship between that and the degree of balance of skill portfolio uncovered in this paper.

Hartog et al. (2010) show that the choice between entrepreneurship and wage employment is negatively related to education but non-significant. Sluis Van der et al. (2008), after a detailed review of the literature, find the impact of education on selection into entrepreneurship is insignificant; the effect of education on performance is positive and significant; and the effect of education on earnings is smaller for entrepreneurs than for employees in Europe, but equal or larger in the USA Cagetti and De Nardi (2006) find, using data from the Survey of Consumer Finance and defining entrepreneurs as business owners, that the fraction of entrepreneurs with a college degree is 15–20 percent higher than the fraction for the rest of the population, while the fraction of entrepreneurs with a high school degree or less is 15–20 percent lower than the rest of the population. Oosterbeek et al. (2010) show that entrepreneurs have higher returns to formal education than employees. Their analysis indicates that the higher returns to formal education for entrepreneurs might be due to the fewer organizational constraints they face, leading to more personal control over how to use their human capital, compared to employees. Astebro (2012) reports that skills and schooling has a greater return on entrepreneurship than on work and Astebro and Bernhardt (2005) estimate that 60% of the credit constraints are determined by human capital. Parker and Van Praag (2006) find that an extra year of schooling increases the return by 13.7% and decreases capital constraints by 1.18 percentage points.

Thus, the evidence here, together with the model results, suggests that studies looking at the relationship between schooling and occupational choice should: (i) focus on what schooling does in terms of

the skill portfolio more than on what it does to the skill levels themselves; and (ii) control for personal wealth.

7 Final comments

The choice between paid employment and entrepreneurship has been a concern for economists since the very beginnings due to the impact that it has on productivity, welfare and inequality. The evidence points to entrepreneurship as an important factor in determining these, yet we do not have a full understanding of why individuals undertake entrepreneurial activities and what are the characteristics of those who undertake and succeed at them. This is necessary to understand the mechanisms by which entrepreneurship impact productivity, welfare and inequality.

This paper provides a model that takes into account the main empirical determinants of entrepreneurship—personal wealth, credit constraints and the portfolio of skills—and argues that the likelihood of being an entrepreneur depends on the relationship between these. Namely, for high- and low-wealth individuals initial skills matter for performance, but they do not affect the choice between paid employment and entrepreneurship. In contrast, for middle-wealth individuals initial skills are crucial. Those who enter the labor market with a balanced portfolio of skills will undertake entrepreneurship and those who enter the labor market with an unbalanced portfolio of skills will specialize in the skill in which they have an absolute advantage and will chose paid employment. Thus, selection into entrepreneurship is a complex issue determined by the interaction between wealth, skill levels, and heterogeneity.

It is worthwhile to end noticing that this article does not deal with an important issue in the entrepreneurship literature, which is the relationship between cross-sectional and longitudinal mean returns. Astebro (2012) in a detailed review of the literature on the returns to entrepreneurship documents the existence of a return-to-entrepreneurship puzzle, i.e., that despite working longer hours and bearing greater risks, the cross-sectional median return to entrepreneurship is lower than that to paid employment, while the cross-sectional mean return is about the same (see, for instance, Evans and Leighton 1989; Carrington et al. 1996; Hamilton 2000; Moskowitz and Vissing-Jørgensen 2002).[14] Manso (2016) provides an explanation to this phenomena based on the potential biases that arise when the return to entrepreneurship is evaluated based on cross-sectional instead of longitudinal data. There are three potential biases in cross-sectional means: survivorship bias, experimentation bias, and attribution biases. Under certain particular assumptions, he shows that these biases may interact in such a way that cross-sectional mean returns to entrepreneurship are downward biased and cross-sectional mean returns to paid employment are upward biased. Using data from NLSY, he shows that we should be specially careful when using cross-sectional data to measure returns to entrepreneurship since they do not take into account the existence of a self-employment premium available to those entrepreneurs that go back to paid employment. Dillon and Stanton (2017) show that under initial uncertainty about entrepreneurial earnings, the expected lifetime value of self-employment is higher than that for paid employment when the fact that individuals that choose self-employment have the option to go back to paid employment is taken into account. The reason is that the option value of returning to paid work places a lower bound on the downside risk from entrepreneurship. Cross-sectional means are not able to capture this and therefore the cross-sectional expected value of self-employment is downward biased with respect to the expected lifetime value of self-employment. Daly (2015) find, after controlling selection on observables by employing nearest-neighbor matching with bias correction, that there is no significant evidence that individuals who attempt self-employment are punished for doing so: after 15 years, those who attempt self-employment receive an (insignificant) 8% and a (significant) 22% premium in labor income and in labor and asset income, respectively. Again the reason is that Daly takes into account the fact that individuals that undertake entrepreneurship have the option to come back to paid-employment if they so choose. Sarada (2015) find that there is serious underreporting in earnings. Using 38 years of longitudinal data from household expenditure and wealth as income proxies, she finds

[14] The working paper version of this paper deals with the case in which there are firm-specific shocks and wages are determined by bargaining with outside options by adopting the model in Balmaceda (2005). That model provides a cross-section selection explanation of the entrepreneurship puzzle.

that while individuals (mis)report earning on average 26.2% less in self-employment, their household expenditures are in fact 4.5% higher. This expenditure premium accrues over time with longer experience in self-employment, and is not offset by lower savings or higher uncertainty. This suggests that entrepreneurs are wealthy at the beginning of their entrepreneurship spells as well as during those spells. A consequence of this is that on average their mean returns are unlikely to be lower than those for paid employment. Astebro and Chen (2014) also provide evidence in favor of the underreporting based on a nationwide panel survey representing US households over 15 years. Hurst et al. (2014) quantify the extent to which the self-employed underreport their income in US household surveys. They use the Engel curve describing the relationship between income and expenditures of wage and salary workers to infer the actual income. They find, based on self-employed reported expenditures, that on average the self-employed underreport their income by about 25% relative to paid employees. In short, the evidence from longitudinal data suggests that cross-sectional estimated returns are biased or that underreporting of earning is such that returns to entrepreneurship are downward biased in greater magnitude than the returns to paid-employment. This evidence favors the hypothesis that entrepreneurship is a rational decision and the fact that that there is less entrepreneurship than efficiency calls for is due to financial frictions, which is in line with our model's predictions. Finally, the model also suggests that the comparison between cross-sectional mean returns and longitudinal returns must carefully control for differences in wealth as well as the skill portfolio, and the fact that the return to entrepreneurship is quite sensitive to financial development. Therefore, a complete theory of difference in returns must take into account cross-sectional and longitudinal dimensions.

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