# Are They All Like Bill, Mark, and Steve? The Education Premium for Entrepreneurs*

Claudio Michelacci
EIEF

Fabiano Schivardi
Università Bocconi and EIEF

June 24, 2015

PRELIMINARY AND INCOMPLETE

**Abstract**

We study how the educational composition and the return to education of US entrepreneurs has evolved since the late 80's. The fraction of entrepreneurs with a college degree has increased, while the fraction of entrepreneurs with a post-college degree has remained stable over time at around one third. The premium of having a college degree relative to a high school degree has increased, but roughly as much as the analogous premium for workers. The premium for postgraduate education relative to college education has increased substantially more for entrepreneurs than for workers: now an entrepreneur with a post-graduate degree earns more than twice us much as he used to earn in the 90's. The analogous percentage increase for entrepreneurs with a college degree is just 50 percent. The sharp increase in the skill premium for entrepreneurs with post-graduate education is partly due to the higher value of their businesses (in terms of dividend payments and firm valuation) and partly due to the greater speed at which they sell their businesses. The premium to post-graduate education has remained high during the Great Recession, it is unlikely to be explained by selection issues related to business failure and it is still present when looking at the higher deciles of the entrepreneurs income distribution.

*Keywords*: Skill premium, entrepreneurship
*JEL classification numbers*: J24, J31, M13

*We thank Annette Vissing-Jorgensen for useful comments and Marco Forletta for excellent research assistance. E-mail: c.michelacci1968@gmail.com, fabiano.schivardi@unibocconi.it.

## 1 Introduction

There is widespread evidence that the return to skill of workers (defined, for example, as the wage premium attributable to college or post-college education) has increased over the last decades in most industrialized countries. Prominent explanations for this trend are skill biased technological change and international trade. The available evidence has focused on employees (see for example (Card, 1999) for a review), while we know very little—if anything—on the evolution of the skill premium of entrepreneurs. This is somewhat surprising given that entrepreneurial activity drives business creation, innovation and ultimately the demand for labor, which is the key determinant of the skill premium for workers. The anecdotal evidence for entrepreneurs is somewhat mixed. The boom in the number of high tech firms created by US entrepreneurs with a PhD degree suggests a potential increase in the return to education of entrepreneurs. But it is also true that some of the most successful recent US companies, such as Apple, Microsoft, Facebook, Twitter or Napster have been started up by Steve Jobs, Bill Gates, Mark Zuckerberg, Evan Williams, and Sean Parker, respectively. These entrepreneurs are all college drop-out, which might indicate that successful entrepreneurs view formal education as increasingly costly, possibly because of its high opportunity cost in terms of time. But their case is all but exceptional. Past history contains plenty of examples of successful entrepreneurs who received little or no formal education: Michael Dell founder of Dell Computers and Ralph Lauren CEO and Chairman of Ralph Lauren Corp are examples of well known entrepreneurs who dropped out of college. George Eastman founder of Kodak, Henry Ford founder of Ford Motor Company, John D. Rockefeller Senior founder of Standard Oil, Ray Kroc founder of McDonald's and Walt Disney founder of the Walt Disney Company are all examples of entrepreneurs who did not even attend college and in some cases (Eastman, Kroc, Rockefeller, and Disney) did not even complete their high school studies.

In this paper we use the Survey of Consumer Finances (SCF) to collect evidence on the evolution since the late 80's of the educational composition and the return to education of US entrepreneurs. To measure the return to entrepreneurship we recognize that an important fraction of the income of entrepreneurs comes from capital gains realized upon selling the business. An entrepreneur also immobilizes part of his wealth as well as his human capital when running a business. Upon exit (due to failure or because the business is sold), the entrepreneur obtains back some wealth that can be re-invested somewhere else or consumed, while his human capital can be re-employed in the labor market. We define the *excess return from entrepreneurship* as equal to the income that the entrepreneur obtains because of running the business in excess of the income that the entrepreneur would have obtained if he had invested or consumed his wealth and employed his human capital in the labor market. For the sake of comparison with conventional wage regressions, the entrepreneurial excess return is converted into a flow value, by calculating the average additional income that the entrepreneur obtains during his life as an entrepreneur. With this definition the duration of the entrepreneurial activity matters for the entrepreneurial excess return, as a quicker exit implies that the entrepreneur can re-employ his wealth and his human capital more quickly in alternative uses, which pushes up the entrepreneurial return. Based on this insight we construct a simple measure for the return to entrepreneurship, which can be implemented using data from SCF, which is a cross-sectional survey that contain information just on the current income obtained by the entrepreneur (in the form of either labor income or dividend payments), the current valuation of the business ran by the entrepreneur and the initial investment made by the entrepreneur to acquire or to start-up his business. We also discuss how our measure for the return from entrepreneurship can be extended to account for selection issues due to business failure, to firm growth and to the fact that entrepreneurs can sometimes recycle their entrepreneurial skills to start-up new entrepreneurial activities.

In our data the fraction of entrepreneurs with a college degree has increased, while the fraction of entrepreneurs with a post-college degree has remained stable over time around a value of one third. The premium of having a college degree relative to a high school degree has increased, but roughly as much as the analogous premium for workers. The premium for postgraduate education relative to college education has increased substantially more for entrepreneurs than for workers: now an entrepreneurs with a post-graduate degree earns more than twice us much he used to earn in the early 90's. The analogous percentage increase for entrepreneurs with a college degree is just 50 percent. The sharp increase in the skill premium for entrepreneurs with post-graduate education is partly due to the higher dividends paid by the firm they ran and partly due to the higher capital gains realized when selling their business. Realized capital gains have increased mostly because entrepreneurs with a post-graduate degree sell their business more quickly than they used to do in the late 80's and thereby can more rapidly recycle their human capital and their wealth for alternative uses. The premium to post-graduate education has remained high during the Great Recession, it is unlikely to be explained by selection issues related to business failure and it is still present when looking at the higher deciles of the entrepreneurs income distribution. This suggests that the experience of "Bill", "Mark" and "Steve" has been rather exceptional and that the last generation of successful US entrepreneurs has rather been mostly similar to "Chris".

There are at least two reasons why the return to skill of entrepreneurs and the return to skill of workers might be related. The first is what we call the labor supply channel: many individuals face the choice between working as an employee and creating their own business. So the higher the return to skill of entrepreneurs, the higher is their outside option as an employee, which pushes up their wage in the labor market. But entrepreneurs also determine the demand for labor. If high skilled entrepreneurs happen to have a labor demand biased towards high skill labor (i.e. there is complementarity between the skill of the entrepreneur running the business and the skill of her employees), an increase in the return to skill of entrepreneurs cause an increase in the demand for skill in the labor market and thereby in the return to skill of workers, which can potentially contribute to explain the time evolution of the skill premium for workers.

We believe that our finding that the return to post graduate education has increased substantially more for entrepreneurs than for workers over the last twenty years is novel. We are aware of no existing evidence documenting the time evolution of the skill premium for entrepreneurs. This lack of evidence is partly explained by issues with the measurement of earnings for entrepreneurs. There is some cross-sectional evidence on the return to education for entrepreneurs, which is reviewed in Van der Sluis et al. (2008). Generally there is a positive relationship between the educational level of the entrepreneur and the performance of the firm in terms of survival probabilities, firm profits, and growth. Van der Sluis et al. (2008) also review studies that compare the return to education for entrepreneurs and employees. Van Praag et al. (2013) uses the National Longitudinal Survey of Youth (NLSY) and find a higher return to education for entrepreneurs than for employees, which is consistent with our findings.

The paper by Hamilton (2000) is also related to ours. He studies earnings differentials between self-employed and employees by focusing on a sample of male school leavers from the Survey of Income and Program Participation (SIPP) over the 1983-1986 period. The yearly return from entrepreneurship is measured as the sum of the total income obtained in the year (in the form of either salaries or dividend payments) plus the self-reported change in the value of business equity over the year. He finds that the majority of entrepreneurs earns less than employees with comparable characteristics. Here we focus on the return to education in entrepreneurship, we use a representative sample of the US population (rather than focusing just on school leavers) and we propose an index for the overall long-run return from entrepreneurship.

Several other studies have used SCF to study features of US entrepreneurs. For example Moskowitz and Vissing-Jorgensen (2002) and Kartashova (2014) estimate the return to private equity for entrepreneurs and compare it to the return from investing in public equity. De Nardi et al. (2007) establish a series of stylized facts on the role of liquidity constraints and personal wealth for business development. None of these papers has focused on the return to education for entrepreneurs and how this skill premium has evolved over time.

Section 2 discuss our framework to measure the entrepreneurial excess return with data from SCF. Section 3 describes the data. 4 characterizes the evolution of the entrepreneurial excess return across educational groups. Section 5 contains a regression analysis. Section 6 concludes.

## 2 Measuring the excess return from entrepreneurship

An entrepreneur immobilizes part of his wealth as well as his human capital when running a business. Upon exit (due to failure or because the business is sold), the entrepreneur obtains back some wealth that can be invested somewhere else or consumed, while his human capital can be re-employed in the labor market. We define the *excess return from entrepreneurship* as the income that the entrepreneur obtains because of running the business in excess to the income that the entrepreneur would have obtained if he had invested or consumed his wealth and employed his human capital in the labor market. For the sake of comparison with conventional wage regressions, the entrepreneurial return is converted into a flow value, by calculating the average additional income that the entrepreneur obtains during his life as an entrepreneur. Notice that the exiting strategy from entrepreneurship matters for the entrepreneurial excess return: a quicker exit implies that the entrepreneur can re-employ his wealth and his human capital more quickly in alternative uses, which pushes up the return from the entrepreneurial activity.

### 2.1 Framework

Time is continuous. Assume for simplicity that the entrepreneur is infinitely lived, risk-neutral and he can run at most one business in his life. Let $\tau \geq 0$ denote the age of the firm. Let $k$ denote the initial investment in the business, at $\tau = 0$. Let $d$ denote the dividend payments of the firm in a period. In theory these values can be negative if the entrepreneur injects capital into the business. Let $l$ denote the labor income obtained by the entrepreneur. The total income obtained by the entrepreneur is then equal to $y \equiv d + l$. We start assuming that these quantities are constant through time. Nothing changes if $y$ evolves stochastically over time, provided these fluctuations don't lead to an endogenous liquidation of the business. Assume the market interest rate is $r \geq 0$ and that the entrepreneur discounts cash flows at rate $\rho > r$. This characterizes the fact that securities placed in hands of a large number of investors have greater liquidity and are better diversified than those privately held by the entrepreneur. We assume that the difference between $\rho$ and $r$ is large enough so that the entrepreneur always sells the business whenever a selling opportunity arises in the market. The business can disappear and be liquidated with Poisson arrival rate $\delta$. The liquidation value is $F$. The entrepreneur can sell the business at its market value $M$ with instantaneous (independent) arrival rate $\mu$. The overall instantaneous probability that the entrepreneur exits the business is then equal to $\lambda \equiv \delta + \mu \geq \delta$. The parameter $\lambda$ characterizes the rate at which the entrepreneur can recycle his wealth and his human capital into some alternative uses. $1/\lambda$ measures the expected duration of the entrepreneurial experience. The entrepreneur has the opportunity to work in the labor market at any $\tau \geq 0$ to obtain income $w$. The labor market value of his human capital is then equal to

$$W = \frac{w}{\rho} \tag{1}$$

Notice that the entrepreneur discounts cash flows at his discount rate $\rho > r$. This is the relevant discount rate given that the entrepreneur is more impatient that the market—so he will immediately consume cash flows rather than investing them in financial markets. The value to the entrepreneur of the business with initial investment $k$ is equal to $U$ that solves the following standard asset type equation:

$$\rho U = y + \delta \left(F + W - U\right) + \mu \left(M + W - U\right) \tag{2}$$

The left hand side is the yield that the business delivers to the entrepreneur, the right hand side is what the entrepreneur expects to get from the business. The first term is the instantaneous return, the second is the expected capital gain due to the liquidation of the business, the third is the expected capital gain in case the entrepreneur sells the business in the market. Notice that upon exiting the business, the entrepreneur can recover his human that can get re-employed in the labor market, at value $W$. Equation (2) can be rewritten as follows:

$$\rho U = y + \lambda \left[\mathbb{E}_x \left(V\right) + W - U\right] \tag{3}$$

where

$$\mathbb{E}_x \left(V\right) = \frac{\delta F + \mu M}{\lambda} \tag{4}$$

measures the expected value of the business upon exiting entrepreneurship and

$$V = \begin{cases} F & \text{with probability } 1 - \gamma \\ M & \text{with probability } \gamma \end{cases} \tag{5}$$

is simply the (random) value of the business upon exit, which with probability $1 - \gamma = \frac{\delta}{\lambda}$ is equal to the liquidation value of the business, while with probability $\gamma = \frac{\mu}{\lambda}$ is equal to to its market value. Notice that (3) can be interpreted as the value of entrepreneurship when the entrepreneur exits the business with Poisson arrival rate $\lambda$ and conditional upon exit the entrepreneur fails with probability $1 - \gamma$ while succeeds in placing the business in the market with probability $\gamma$. For consistency, we can think that the market value of the business $M$ is equal

$$M = \frac{d}{r+\delta} \tag{6}$$

which incorporates the fact that the market discount dividends at rate $r$ and that the business can fail at rate $\delta$. The net value of becoming entrepreneur is then equal to

$$S = U - k - W \tag{7}$$

This is the difference between the value of the business to the entrepreneur, $U$ and the opportunity cost of the physical capital and human capital that the entrepreneur invests into the business, which has value $k$ and $W$, respectively. We convert this return into flow values for the sake of comparison with wage regressions. The *excess return* from entrepreneurship for an entrepreneur who has invested $k$ units of wealth in the business is denoted by $\phi$. It is defined using the notion of Chisini mean (Chisini, 1929). To obtain an expression for $\phi$ consider the expected present value of wealth that the entrepreneur would obtain if he were to obtain income $\phi$ in each period of his life as an entrepreneur and then equate this expected wealth to the excess wealth that the entrepreneur obtains from running the business, which is given by $S$ in (7). Since the entrepreneur exits the business at rate $\lambda$, we have that $\phi$ should satisfy the following implicit Chisini's functional equation condition:

$$\frac{\phi}{\rho+\lambda} = S$$

This equates the hypothetical present value of wealth obtained under the constant per period income $\phi$ to the excess expected wealth actually obtained by the entrepreneur over his life as entrepreneur—which corresponds to the right-hand side of the expression. After using the definition of $S$ in (7) and after noticing that (3) implies that

$$U = \frac{y + \lambda\left[\mathbb{E}_x\left(V\right) + W\right]}{\rho+\lambda}$$

with $W$ given by (1), we obtain that

$$\phi = \theta - w \tag{8}$$

where $w$ measures the labor market opportunity flow cost from running the business while the term $\theta$ is equal to

$$\theta = d + l + \lambda\left[\mathbb{E}_x\left(V\right) - k\right] - \rho k \tag{9}$$

which measures the *total expected return* from becoming an entrepreneur gross of the labor market opportunities of entrepreneur. This the sum of three components. The first is the instantaneous income (in the form of dividend payments $d$ and labor income $l$) that the business delivers to the entrepreneur in each period, which corresponds to the sum of the first two terms in the right hand side of (9). The second component is the *per period* expected capital gain that the business generates. This corresponds to the third term in the right hand side of (9). To understand the expression notice that the entrepreneur invest $k$ units into the business and the expected value of the business upon exit is $V$, as given in (5). So $V - k$ is the capital gain from starting up the business, that the entrepreneur realizes upon exit. Now let $\tau$ denote the number of periods the entrepreneur spends into running the business. Since the entrepreneur exits the business with Poisson arrival rate $\lambda$, we have that $\tau$ is a negative exponential distribution random variable with expected value equal to $1/\lambda$. So the third term in the right hand side of(9) is simply equal to

$$\frac{\mathbb{E}_x(V) - k}{E(\tau)}, \tag{10}$$

which is a measure of the expected capital gain generated in each period of life of the businesses. Finally the last term in the right hand side of (9) measures the cost to the entrepreneur of immobilizing capital into the business. Notice the cost is calculated using $\rho$ rather than $r$, because the entrepreneur should be compensated for the lack liquidity and the high risk of his investment in the start-up.

### 2.2 Measurement

Our data are in discrete time, $t = 1, 2, 3...$ with $t = \frac{\tau}{h}$ where $h$ is the size the time interval over which we discretize the time line. In the data we observe (i) the value of businesses $V$ which might include the value of businesses which are about to be liquidated (see below for further discussion); (ii) the total income flow obtained by the entrepreneur over the period in the form of either dividend payments $dh$ or labor income $lh$; (iii) the discretized age of the business $t$; and (iv) the initial investment $k$ of the entrepreneur into the business. In the data we will measure (10) by calculating

$$\frac{V - k}{th} \simeq \lambda \left[\mathbb{E}_x(V) - k\right] + \varepsilon \tag{11}$$

where $\varepsilon$ is a zero mean error while "$\simeq$ " means that the cross sectional average is approximately equal to. To understand the logic of the approximation notice that the time of the entrepreneur in the business is independent of the value of the business. Also notice that the difference between $V - k$ and $\mathbb{E}_x(V) - k$ is just a zero mean expectational error. Finally notice that the probability that the entrepreneur stays in the business in an interval of size $h$ is equal to $e^{-\lambda h} \simeq 1 - \lambda h$, where the second equality holds when $\lambda h$ is small enough. This also implies that the probability of exiting the business over the time interval $h$ is equal to $\epsilon \simeq \lambda h$. Then one over the discretized time in the business is approximately equal to

$$E\left[\frac{1}{h\,(1+t)}\right] = \frac{\sum_{t=0}^{\infty} \frac{\epsilon^{t+1}}{(1+t)h}}{\sum_{t=0}^{\infty} \epsilon^{t+1}} = -\frac{(1-\epsilon)\ln(1-\epsilon)}{h\epsilon} \simeq \frac{1-\epsilon}{h} \simeq \lambda$$

where we used the fact that $\sum_{t=0}^{\infty} \frac{\epsilon^{t+1}}{1+t} = -\ln(1-\epsilon)$ and the approximations $\ln(1-\epsilon) \simeq -\epsilon$ and $1-\epsilon \simeq \lambda h$, which both hold when $\lambda h$ is small enough.[1] We then calculate a measure of the opportunity cost of capital as equal to

$$\rho = R(0,\tau)^{\frac{1}{\tau}} - 1$$

where zero is the date of creation of the business and $\tau$ is the current date while $R(0,\tau)$ is a measure of the total return obtained by investing in the US stock market over the period $(0,\tau)$, including dividend payments. So eventually $\theta$ is measured as equal to

$$\theta = d + l + \frac{V-k}{h\tau} - \left[R(0,\tau)^{\frac{1}{\tau}} - 1\right] k + \varepsilon \tag{12}$$

where the error term $\varepsilon$ arises because of (11) and because possible measurement error due to the discretization of the time line.

### 2.3 Selection bias due to firm failure

Our empirical measure for $\theta$ is constructed using cross-sectional data from the Survey of Consumer Finance (SCF). We call this the observed return to entrepreneurship. *Labour income* (which should proxy for $l$ in (12)) is measured using the following question in SCF (mnemonic X4112): "About how much do you earn before taxes on your main job?". *Dividend Payments* (which should proxy for $d$ in (12)) are measured using the following question in SCF (mnemonic X4131): "In addition to regular salary, how much

[1]To prove that $\sum_{t=0}^{\infty} \frac{\epsilon^{t+1}}{1+t} = -\ln(1-\epsilon)$, define the function $f(\epsilon)$

$$f(\epsilon) = \sum_{i=0}^{\infty} \frac{\epsilon^{i+1}}{1+i}$$

which satisfies $f(0) = 0$ and whose derivative is equal to

$$\frac{df}{d\epsilon} = \sum_{i=0}^{\infty} \epsilon^i = \frac{1}{1-\epsilon}$$

This implies that

$$f(\epsilon) = f(0) + \int_0^{\epsilon} \frac{1}{1-s} ds = -\ln(1-s)|_0^{\epsilon} = -\ln(1-\epsilon)$$

which concludes the proof.

do you personally earn from the business before taxes?". The measure for the *value of the business* (which should proxy for $V$ in (12)) is obtained from the following question in SCF (mnemonic X3129): "What is the net worth of (your share of) this business?; Probe: What could you sell it for? The value should be net of loans. If Respondent says the business is worth nothing or can not be sold ask: About how much would it cost to buy a similar asset?". The measure for *value of the entrepreneurs' investment in the business* (which should proxy for $k$ in (12)) is obtained using the following question (mnemonic X3130 in SCF): "If you sold the business now, what would be the cost basis for tax purposes (of your share of this business)? Probe: What was your original investment?/ What was the value when you received it? Definition: The tax basis is the amount of the original investment (or the value when it was received) plus additional investments."

In practice, after using these variables, (12) measures the return to entrepreneurship if the mean of the cross sectional distribution of the values of the business reported by entrepreneurs well approximates the expected value of wealth obtained by the entrepreneur upon exit $\mathbb{E}_x(V)$, which is what determines the overall expected return from entering entrepreneurship. In practice a selection bias arises because entrepreneurs who have failed are not in the sample, while active entrepreneurs when asked about the value at which they could sell their business would tend to report the hypothetical market value of the business $M$, rather than the expected value of the business upon exit $\mathbb{E}_x(V)$. This leads to a selection bias. We now discuss how we can control for this effect when studying the determinants of the evolution of the cross-sectional mean of $\theta$. So far we have assumed that the entrepreneur learns the exit value of the business only when the entrepreneur actually exits, which might be due to failure (which happens with probability $1-\gamma$) or because of selling the business (which happens with probability $\gamma$). But in practice the entrepreneur can acquire additional information about the exit value of the business while running the firm. For example the SCF question on the *value of the business* incorporates the possibility that the business might be worth nothing and might be liquidated.

To model this we can assume that with Poisson arrival rate $\pi$, the entrepreneur learns whether the business will eventually be liquidated or be sold in the market, which happens with probability $1-\gamma$ and $\gamma$, respectively. Notice that (3) can be interpreted as the value of entrepreneurship when the entrepreneur exits the business with Poisson arrival rate $\lambda$ and conditional upon exit the entrepreneur fails with probability $1-\gamma$ while succeeds in placing the business in the market with probability $\gamma$. The value of being an entrepreneur in a business that the entrepreneur knows will be eventually liquidated is denoted by $U_f$. We instead denote by $U_s$ the value of being an entrepreneur in a business that the entrepreneur knows will be eventually sold in the market. Clearly it has to be that

$$U = (1-\gamma)\,U_f + \gamma U_s$$

where $U_f$ and $U_s$satisfy

$$\begin{aligned} \rho U_f &= y + \lambda\left(F + W - U_f\right) && (13) \\ \rho U_s &= y + \lambda\left(M + W - U_s\right) && (14) \end{aligned}$$

Notice that $\frac{\delta}{1-\gamma} = \lambda$, which is the instantaneous probability of exiting conditional on failure while $\frac{\mu}{\gamma} = \lambda$ denotes the instantaneous probability of exiting conditional on selling the business in the market.[2] Let $n_0$, $n_f$ and $n_s$ denote the steady state mass of businesses where the entrepreneur does not know how he will exit, where the entrepreneur knows that the business will eventually fail and where the entrepreneur knows that he will eventually sell the business in the market, respectively. If we assume that at every point in time $\overline{n}$ new businesses are created we have that in steady state

$$\begin{aligned} n_0 &= \frac{\overline{n}}{\lambda + \pi\left(k\right)} \\ n_f &= \frac{\pi\left(1-\gamma\right)}{\lambda} n_0 \\ n_s &= \frac{\pi\gamma}{\lambda} n_0 \end{aligned}$$

Notice that we have that the total number of businesses ran by entrepreneurs is equal to $n_0 + n_f + n_f = \frac{\overline{n}}{\lambda}$. To calculate the cross sectional average of business values reported by entrepreneur, it is reasonable to assume that all entrepreneurs report that the value of their business is equal to the market value of the business in case of selling it $M$ except those entrepreneurs who know that their business will eventually fail and who report that it has value $F$. Under these assumptions the cross sectional average of the business valuations reported by entrepreneurs is equal to

$$\overline{V} = \frac{\left(n_0 + n_s\right)M + n_f F}{n_0 + n_f + n_s} = \mathbb{E}_x\left(V\right) + \sigma \tag{15}$$

where $\sigma$ measures the selection bias due to business failure:

$$\sigma = \frac{\lambda}{\lambda + \pi} \cdot \left[M - \mathbb{E}_x\left(V\right)\right] \tag{16}$$

[2]Notice that here we are implicitly assuming that if the entrepreneur knows that the business is going to be eventially liquidated he can not liquidate it today. Thi sassumption guarantees that the change in the information structure does not affect the exit rate of entrepreneurs.

This bias is zero when $\pi$ is equal to infinity because in this case all entrepreneurs correctly report the wealth they will collect upon exit. Generally there is a bias because, when asked about the value of their business, entrepreneurs do not know how they will exit their entrepreneurial experience and tend to report a business value equal to its hypothetical market value $M$ rather than the expected value of the business upon exit $\mathbb{E}_x(V)$.[3] In theory this selection problem can account for differences in the trend and in the value of the observed entrepreneurial premium measured with cross-sectional data. So it is important to measure the importance of the bias $\sigma$ in (16). To measure $\sigma$, we can calculate the difference between the top decile of the cross-sectional distribution of firm valuations and the average cross-sectional valuation. This difference in the model is equal to

$$D_{1m} \equiv M - \overline{V} = \frac{(n_f + n_s)[M - \mathbb{E}_x(V)]}{n_0 + n_f + n_s} = \frac{\pi}{\lambda + \pi} \cdot [M - \mathbb{E}_x(V)]$$

Here we denoted by $D_{1m}$ the difference between the top decile of the reported value of businesses and the average valuation of their businesses. After obtaining a measure for $\lambda$ and one for $\pi$, we can evaluate the importance of the selection bias due to firm exit in (16) using the fact that

$$\sigma = \frac{\lambda}{\pi} \cdot D_{1m} \tag{18}$$

Notice that this correction requires that $\pi > 0$, which means that at least some entrepreneurs in the sample should report the liquidation value of the business. As discussed above we can measure $\lambda$ by looking at the average age of businesses, while we can infer $\pi$ by looking at how the cross sectional dispersion of firm valuations increases as entrepreneurs remain in the business. In particular notice that the cross-sectional distribution of firm valuation at age $\tau$ is characterized by the random variable $V(\tau)$ which has the following properties

$$V(\tau) = \begin{cases} F & \text{with probability } \left(1 - e^{-\pi\tau}\right)(1-\gamma) \\ M & \text{with probability } e^{-\pi\tau} + \left(1 - e^{-\pi\tau}\right)\gamma \end{cases}$$

So the cross sectional mean of $V(\tau)$ is

$$E[V(\tau)] = M - \left(1 - e^{-\pi\tau}\right)(1-\gamma)(M - F).$$

[3]If entrepreneurs were instead to report that the business has value $\mathbb{E}_x(V)$ rather than $M$ no bias would arise. Under this alternative assumption the cross sectional average of firm valuation would indeed be equal to

$$\overline{V}^* = \frac{n_0 \mathbb{E}_x(V) + n_f F + n_s M}{n_0 + n_f + n_s} = \mathbb{E}_x(V) \tag{17}$$

This implies that the log differences of the top decile of the cross sectional distribution of business valuation and the average valuation of businesses of age $\tau$, $D_{1m}(\tau)$ is equal to

$$\ln D_{1m}(\tau) \equiv \ln\left[M - E\left[V\left(\tau\right)\right]\right] = \ln\left[\left(1-\gamma\right)\left(M-F\right)\right] + \ln\left(1 - e^{-\pi\tau}\right) \simeq cte. - e^{-\pi\tau} \quad (19)$$

If we linearize the last term in (19) around $\tau = 0$ we obtain that

$$\ln D_{1m}(\tau) \simeq cte. + \pi\tau \quad (20)$$

which can be used to identify $\pi$ by measuring how the difference between the top decile of the distribution of firm valuation and the mean valuation of firm of given age $\tau$ increases with the duration of the entrepreneurial experience. After we have a measure of $\pi$ we can use (18) to measure how the selection bias due to business failure in (16) accounts for the evolution of the entrepreneurs risk premium.

### 2.4 The exercise

In practice in the data we measure the total return $\theta$ in (9) where the third term in (9) is approximated using (11), which corresponds to $\theta$ in (12). We then impute a measure $w$ for each individual and then calculate the excess return from entrepreneurship $\phi$ using (8). Our exercise can be thought as a decomposition of the total return to entrepreneurship $\theta = \phi + w$. The overall return from entrepreneurship in the economy is equal to

$$\Theta = E\left(\theta\right), \quad (21)$$

which can be calculated for different groups of individuals, classified according to their educational levels so to have $\Theta_s$, $s = l, h$. The skill premium of entrepreneurship can be defined as equal to $\Sigma_1 = \Theta_h - \Theta_l$, or alternatively as equal to $\Sigma_2 = \frac{\Theta_h - \Theta_l}{\Theta_l}$. Changes in the entrepreneurial skill premium $\Sigma_i$, $i = 1, 2$ can be due to:

1. *Opportunity cost effect* Changes in the opportunity cost of entrepreneurship $w_s$, $s = l, h$, which could have evolved differently for different skill groups.

2. *Financial investment* Changes in the average amount of wealth $k$ invested into the business, whose amount could vary depending of the skill level of entrepreneurs.

3. *Wealth-skill complementarity* Changes in the derivative $\phi'$ of the excess entrepreneurial premium $\phi$ to initial investment $k$, which could have increased differently for different skill groups.

4. *Pure-skill premium* Changes in the value and importance of skill for entrepreneurs that can affect all components of the excess return in a different manner depending of the skill level of entrepreneurs..

5. *Recycling opportunities* Changes in the rate at which the entrepreneur can recycle his human capital and wealth, as measured by changes in $\lambda$, which could vary depending of the skill group of entrepreneurs. Changes in $\lambda$ can be inferred by the average duration of the entrepreneurial experience into the business $\tau$.

6. *Selection bias* Finally the observed entrepreneurs return $\theta$ could be driven by the evolution of the selection bias $\sigma$ in (16). We measure this effect using (18) and then control for how $\sigma$ can explain the observed return to entrepenurship $\theta$.

Decomposing the determinants of the time series variation of the entrepreneurial skill premium amounts to performing a Blinder-Oaxaca decomposition over the entrepreneurial skill premium $\Sigma_i$, $i = 1, 2$, using the regression coefficient obtained using linear regressions using $\theta$in (12) as dependent variables (and for example including $w$ as dependent variable).

### 2.5 Extensions

We now extend the basic framework of Section 2.1, by first allowing the income of the firm to grow and then we consider the possibility that the entrepreneur upon exit can start-up another business.

#### 2.5.1 Firm growth

It is useful to consider a simple extension of the above framework where the revenue of the firm increases over time, which is a very well known features of the data. Let again $\tau$ denote the age of the firm. Assume that a firm of age $\tau$ pays dividends $d(\tau) = i + de^{g\tau}$ and labor income $l$ to the entrepreneur. A positive $g$ implies that revenue in the firm increases as the firm ages. The case $i = 0$, is consistent with Gibrat's law. If $i < 0$, we have that the entrepreneur keeps injecting funds into the business in the first years of life of the firm. We use notation $y(\tau) = y_0 + de^{g\tau}$ with $y_0 = i + l$ to denote the total income generated to the entrepreneur by the business of age $\tau$. Again the business might become unprofitable with arrival rate $\delta$. The liquidation value is $Fe^{g\tau}$. The entrepreneur can sell the business at its market value $M(\tau)$ with instantaneous arrival rate $\mu$. Once sold the business, pays dividends $de^{g\tau}$ in each period. The overall instantaneous probability that the entrepreneur exits the business is then again equal to $\lambda \equiv \delta + \mu \geq \delta$. The labor market value of the his human capital is still given by (1). The value to the entrepreneur of the business of age $\tau$ with initial investment $k$ is equal to $U(\tau)$ that solves the following standard asset type equation

$$\rho U(\tau) = y(\tau) + \lambda \{\mathbb{E}_x [V(\tau)] + W - U(\tau)\} + \dot{U} \tag{22}$$

where $\dot{U} \equiv \frac{\partial U(\tau)}{\partial \tau}$ and

$$\mathbb{E}_x [V(\tau)] = \frac{\delta F e^{g\tau} + \mu M(\tau)}{\delta + \mu} \tag{23}$$

measures the expected value of the business to the business in case of exiting the entrepreneurial activity at age $\tau$. The market value of the business $M(\tau)$ solves the asset type equation

$$rM(\tau) = d(\tau) - \delta M(\tau) + \dot{M} \tag{24}$$

where $\dot{M} \equiv \frac{\partial M(\tau)}{\partial \tau}$ which implies that

$$M(\tau) = Me^{g\tau} = \frac{d}{r + \delta - g} e^{g\tau} \tag{25}$$

One can easily verify that (25) solves (24). After substituting (25) into (22), we obtain that

$$U(\tau) = \frac{i + l + \lambda W}{\rho + \lambda} + \frac{d + \lambda \mathbb{E}_x [V(\tau)]}{\rho + \lambda - g} e^{g\tau} \tag{26}$$

where

$$\mathbb{E}_x [V(\tau)] = \frac{\delta F(\tau) + \mu M(\tau)}{\delta + \mu}$$

denotes the detrended market value of the business. We denote by

$$S = U(0) - k - W \tag{27}$$

the net value of becoming an entrepreneur. This is the difference between the value of the business to the entrepreneur upon creation $U(0)$ and the opportunity cost of the physical capital $k$ and human capital $W$ that the entrepreneur invests into the business. We again convert this return into a flow value where we assume that the entrepreneur obtains income $\phi_g$ over his career entrepreneur. The value of being entrepreneur is then equal to

$$\Phi = \frac{\phi_g}{\rho + \lambda}$$

We impose that

$$\Phi = S, \tag{28}$$

where $S$ is given in (27). After using (26), evaluated at at $\tau = 0$, the condition (28), implies that

$$\phi_g = \theta_g - w$$

where the entrepreneurial return $\theta_g$ is now given by

$$\theta_g = i + l + \omega(g) \{d + \lambda \mathbb{E}_x [V(\tau)]\} - \lambda k - \rho k \tag{29}$$

where $\theta_g$ differs from $\theta$ in (9) due to the term

$$\omega(g) = \frac{\rho+\lambda}{\rho+\lambda-g} \tag{30}$$

which is a capitalization effect that arises because dividend payments and the value of the firm increases as the firm ages so $\omega(g) > 1$ when $g > 0$. We again use the following approximation

$$\begin{aligned}\lambda\mathbb{E}_x\left[V(\tau)\right] &= \frac{V}{1+t} + \epsilon \\ \lambda k &= \frac{k}{1+t} + \epsilon\end{aligned}$$

In the data we observe firm income and firm's value at different ages of the firm so in practice we observe

$$y(\tau) = i + l + de^{g\tau} \tag{31}$$

$$V(\tau) = \mathbb{E}_x\left(V\right)e^{g\tau} + \epsilon \tag{32}$$

We use cross sectional data on firm income by age to identify the age profile of income, by assuming that $i = \bar{y}$, $l = \bar{y}l$ and $d = \bar{y}d$ so that

$$y(\tau) = \bar{y}\left[i + l + de^{g\tau}\right] \tag{33}$$

Under these assumptions we ran cross sectional data regressions to estimate $g$, $i$, $l$, and $d$, in (33). Given these estimated parameters and a single observation per firm we can then recover the firm specific component $\bar{y}$ and impute $i$, $l$ and $d$. We can then use our estimates to measure for $g$ to impute a measure for the capitalization effect $\omega(g)$ in (30) so as to estimate

$$\theta_g = i + l + \omega(g)d + \frac{\omega(g)V - k}{\tau} - \rho k + \epsilon \tag{34}$$

This is our measure of the entrepreneurial return corrected for firm growth effects. This is an alternative to the $\theta$-measure for the return to entrepreneurship in (12).

### 2.5.2 Recycling of entrepreneurial skills

We now extend the model by allowing for the possibility that the entrepreneur can recycling his entrepreneurial skills and start-up another business. We assume that after exiting the current business, the entrepreneur can restart another business with probability $\nu \in [0, 1]$. All the other assumptions are as in the baseline framework of Section 2.1. The value to the entrepreneur of the business with initial investment $k$ is still denoted by $U$, which now evolves as follows:

$$\rho U = y + \lambda\left[\mathbb{E}_x\left(V\right) + \nu S + W - U\right] \tag{35}$$

where $\mathbb{E}_x(V)$ is still given by (4) and $W$ by (1), while $\nu S$ incorporates the fact that upon exit, with probability $\nu$, the entrepreneur can recycle his entrepreneurial skills and start-up another business of which has net value

$$S = U - k - W,$$

which is as in (7). As in Section 2.1, the value of becoming an entrepreneur is converted into flow value by imposing the condition

$$\frac{\phi_r}{\rho + \lambda} = S, \tag{36}$$

which equates the hypothetical present value of wealth obtained under the constant per period income $\phi_r$ to the excess expected wealth actually obtained by the entrepreneur by running the current firm, which corresponds to the right-hand side of the expression. After using the definition of $S$ in (7) and after noticing that (3), we obtain that (35) implies that

$$U = \frac{y + \lambda\left[\mathbb{E}_x(V) + \nu S + W - U\right]}{\rho + \lambda},$$

which can be used in (36) to solve for $\phi_r$ as follows:

$$\phi_r = \varphi(\nu)(\theta - w) = \varphi(\nu)\phi \tag{37}$$

where

$$\varphi(\nu) = \frac{\rho + \lambda}{\rho + \lambda(1 - \nu)}$$

takes now into account that entrepreneurial skills can be recycled while the entrepreneurial return, while

$$\theta = d + l + \lambda\left[\mathbb{E}_x(V) - k\right] - \rho k$$

exactly as in (9), which explain the last equality in (37). Changes in the recycling possibilities of entrepreneurial skills $\varphi(\nu)$ due to changes in $\nu$ can then explain why the return to entrepreneurial skills have evolved differently over time for different skill group of workers. It is not clear what we want to do with (37). Probably we should have it as a extension, to explain the time trend in the unexplained component of $\phi$. For example $\phi$ can fall if $\varphi(\nu)$, increases because any free entry condition in an entrepreneurial career should imply that $\phi_r$ is what matter for the return to entrepreneurship. This would be a candidate to explain the trend in the unexplained component of the excess return from entrepreneurship.

## 3 Data

We use the data from of the Survey of Consumer Finances (SCF) to explore how the excess return from entrepreneurship varies by educational groups and how it has evolved over time. SCF is a triennial cross-sectional survey on US households' characteristics conducted by the Federal Reserve Board of Governors. Over the period 1983-2013, data were collected for around 4,000 households per wave, see Table 1. Households in the

Table 1: Number of households and entrepreneurs in the Survey of Consumer Finances

| 1989 | 1992 | 1995 | 1998 | 2001 | 2004 | 2007 | 2010 | 2013 |
|---|---|---|---|---|---|---|---|---|
| Number of households | | | | | | | | |
| 3,143 | 3,906 | 4,299 | 4,305 | 4,442 | 4,519 | 4,417 | 6,482 | 6,015 |
| Number of entrepreneurs | | | | | | | | |
| 899 | 1,132 | 1,133 | 1,136 | 1,180 | 1,255 | 1,235 | 1,428 | 1,330 |

sample are selected using a two-step stratification technique to ensure geographical representativeness and wealthy households are over-sampled to better characterize the right tail of the income and wealth distribution of US households where entrepreneurs are more likely to be present.[4] We use information on the occupational status of the Head of the household and his Spouse/Partner to classify an individual as an *Entrepreneur* if the the individual **owns business** (an individual with code equal to one in the variable X3103 of SCF), which is **actively managed** (code one in the variable X3104 of SCF). Table 1 reports the number of individuals who are classified as entrepreneurs according to these two criteria in the different waves of SCF.

SCF has essentially the nature of a repeated cross-section. The return to entrepreneurship is measured as equal to

$$\theta = d + l + \frac{V - k}{h\tau} - \rho k \tag{38}$$

[4]To account for measurement error and missing observations SCF reports 5 replicates for each record. Missing or inconsistent data are imputed via a an iterative procedure (see Kennickell (1998) for details). Data are available in the following two formats: the Public Full Dataset, that contains the answers to the whole questionnaire (over 5000 variables); and the Summary Extracts, that contains aggregates and synthetic variables computed by the Fed which are also used for official publications such as the Federal Reserve Bulletin. To compute statistics, we follow the SCF suggested procedure to calculate for each replicate the desired statistic using the sample weights (mnemonic X42001 in SCF) and then average across the five replicates.

where $l$ is *Labour income* as defined above, $d$ are *Dividend Payments*, $V$ is our measure for the *Value of the business* while $k$ is the *Value of the entrepreneurs' investment in the business*. Finally $\rho$ is a measure of the opportunity cost of capital over the relevant time period for the entrepreneur, which is calculated as follows:

$$\rho = R(0,\tau)^{\frac{1}{\tau}} - 1$$

where zero is the date of creation of the business and $\tau$ is the current date while $R(0,\tau)$ is a measure of the total return obtained by investing in the US stock market over the period $(0,\tau)$, measured using the real (using CPI) value of the S&P500 Total Return Index taken from Bloomberg, which also includes income from dividend payments. All values are calculated for up to two businesses actively managed by the entrepreneur.[5]

Table 2 below report descriptive statistics for the full sample in SCF, and separately for the population of employees and entrepreneurs. Entrepreneurs represent 7 percent of the US population, they are more likely to be white male and they are more educated than a typical employee. Entrepreneurs and employee have similar labor income, but after including dividend payments and expected capita gains an average entrepreneur earns more than twice as much as an average employee.

Table 3 reports characteristics of the cross-sectional distribution of returns from entrepreneurship $\theta$ as measured in (38) across all waves in SCF. More than 10 percent of entrepreneurs have negative returns, but also more then percent of entrepreneurs have annual income above 300000 dollars in 2010 units. The top 1 percent entrepreneur earns more than one million and a half per year.

Figure 1 characterizes the evolution of the educational composition of the population of entrepreneurs (panel a) and employees (panel b) in SCF. Individuals (either entrepreneurs or employees) are classified in 5 groups depending on whether they have a post-graduate degree, or have a college degree, or they have received some college education but obtained no college degree, or they are high school graduates, or they are high school dropouts. More than one third of entrepreneurs in the sample have a graduate degree. The share of entrepreneurs with a college degree has increased by around 10 percent since the late 80's. This has compensated for the fall in the share of entrepreneurs with less than a high school degree. The share of entrepreneurs with a post-college degree has remained stable at a value of around one third. For employees both the share of employees with a college degree and the share with a postgraduate degree have increased.

[5] In the SCF respondents report details for up to three actively managed businesses until 2007. Since 2007, individuals reports just about the first two businesses, so to achieve consistency we focus the analysis just on the first two businesses.

Table 2: Descriptive Statistics, Whole Sample, Weighted

| Variable | Mean | sd | p25 | p50 | p75 | Max | N |
|---|---|---|---|---|---|---|---|
| **Full sample** | | | | | | | |
| Entrepreneur | 0.07 | 0.26 | 0 | 0 | 0 | 1 | 41,503 |
| Employee | 0.54 | 0.50 | 0 | 1 | 1 | 1 | 41,503 |
| Age | 49.40 | 17.30 | 35 | 47 | 62 | 95 | 41,503 |
| Female | 0.28 | 0.45 | 0 | 0 | 1 | 1 | 41,503 |
| White | 0.74 | 0.44 | 0 | 1 | 1 | 1 | 41,503 |
| Years of schooling | 13.13 | 2.93 | 12 | 13 | 16 | 17 | 41,503 |
| Experience | 36.28 | 18.00 | 22 | 34 | 49 | 92 | 41,503 |
| Labor income $l$ | 36,130 | 96,950 | 0 | 22,102 | 49,511 | 86,280,027 | 41,503 |
| **Employees** | | | | | | | |
| Age | 41.91 | 12.68 | 32 | 41 | 51 | 91 | 18,281 |
| Female | 0.25 | 0.43 | 0 | 0 | 1 | 1 | 18,281 |
| White | 0.71 | 0.45 | 0 | 1 | 1 | 1 | 18,281 |
| Years of schooling | 13.47 | 2.65 | 12 | 13 | 16 | 17 | 18,281 |
| Experience | 28.44 | 13.02 | 18 | 27 | 37 | 78 | 18,281 |
| Labor income, $l$ | 52,606 | 95,331 | 24,459 | 40,459 | 62,057 | 76,390,000 | 18,281 |
| **Entrepreneurs** | | | | | | | |
| Age | 49.18 | 12.83 | 40 | 49 | 58 | 94 | 7,903 |
| Female | 0.09 | 0.28 | 0 | 0 | 0 | 1 | 7,903 |
| White | 0.87 | 0.33 | 1 | 1 | 1 | 1 | 7,903 |
| Years of schooling | 14.13 | 2.60 | 12 | 14 | 16 | 17 | 7,903 |
| Experience | 35.04 | 13.02 | 25 | 34 | 44 | 89 | 7903 |
| Labor income, $l$ | 42,312 | 133,333 | 0 | 0 | 46,621 | 26,754,024 | 7,903 |
| Dividends, $d$ | 67567 | 402729 | 0 | 10,893 | 49,555 | 183,296,090 | 7,903 |
| Entrepreneurial Return, $\theta$ | 135,394 | 726,447 | 12,011 | 45,475 | 125,648 | 188,852,880 | 7,903 |
| Value of business 1, $V_1$ | 684,196 | 4,443,018 | 18,183 | 93,773 | 362,714 | 911,804,838 | 7,903 |
| Investment in business 1, $k_1$ | 341,372 | 3,146,469 | 2,040 | 26,264 | 133,868 | 2,443,934,208 | 7,903 |
| Age of business 1, $\tau_1$ | 13.67 | 11.19 | 5 | 10 | 20 | 67 | 7,903 |
| Value of business 2, $V_2$ | 98,535 | 1,012,049 | 0 | 0 | 0 | 397,832,762 | 7,903 |
| Investment in business 2, $k_2$ | 305,835 | 383,7248 | 154 | 17,158 | 127,027 | 98,4543,987 | 2,664 |
| Age of business 2, $\tau_2$ | 9.25 | 8.82 | 2 | 6 | 13 | 54 | 2,664 |
| Expected capital gains, $\frac{V-k}{\tau} - \rho k$ | 25,514 | 532,725 | -4,010 | 337 | 16,083 | 113,204,693 | 7,903 |

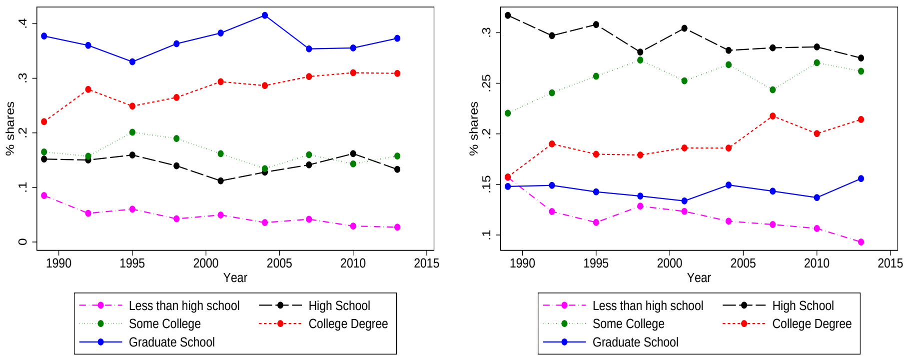
## 4 Empirical results

We start describing how the return from entrepreneurship $\theta$ has evolved over time for different educational groups. Then we perform some regression analysis, to better understand the determinants of the differences. The analysis focus on four educational groups, for simplicity we drop entrepreneurs who did not even obtain a high-school degree. Results are very similar when we group high school drop-outs together with high school graduate.

Table 3: Distribution of $\theta$, 2010 dollars

| | Percentiles | | |
|---|---|---|---|
| 1% | -257207 | Obs | 7903 |
| 5% | -25955.4 | % obs<0 | 13.46% |
| 10% | -2344.59 | | |
| 25% | 12011.05 | | |
| | | Mean | 135394.7 |
| 50% | 45474.69 | Std. Dev. | 726448 |
| 75% | 125647.9 | | |
| 90% | 321513.6 | Variance | 5.28E+11 |
| 95% | 579372.4 | Skewness | 33.3709 |
| 99% | 1725771 | Kurtosis | 7799.506 |

Figure 1: Entrepreneurs and Employees: Shares by education, weighted

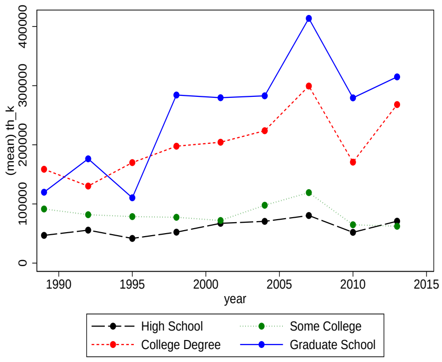



(a) Entrepreneurs (all) (b) Employees (all)

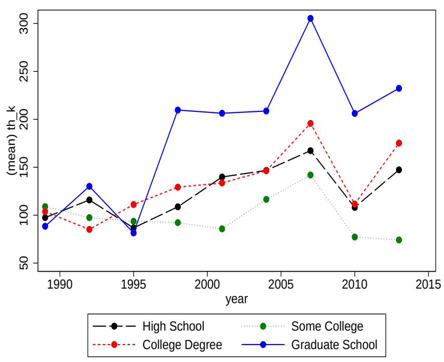
### 4.1 Entrepreneurs' and employee income over time

Panel (a) of Figure 2 characterizes the evolution of the return from entrepreneurship for the four educational group. Panel (b) is analogous but normalizes returns by the average returns in the first thee waves of SCF (1989, 1992, 1995), which better allows to visualize percentage increases in the return from entrepreneurship over time. We use the first three waves rather than only the first to reduce the weight of a single wave when interpreting time trends. The return from entrepreneurship has remained stable for entrepreneurs with a high school degree while it has slightly decreased for college-drop-outs. Until the mid 90's the return from entrepreneurship was similar for entrepreneurs with a college degree and for entrepreneurs with a post-graduate degree. Today an entrepreneur with a post-college degree earns on average 100000 dollars more than an analogous entrepreneur with just a college degree. The return from entrepreneurship has increased by 50 percent for entrepreneurs with a college degree while it has more than doubled for entrepreneurs with a post-graduate degree.

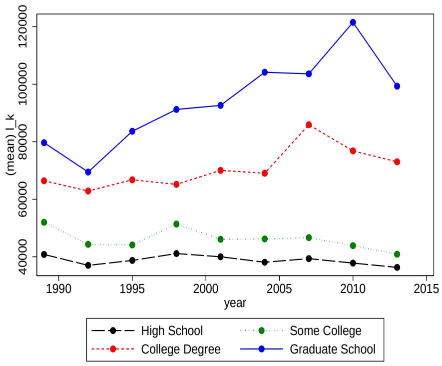
Figure 2: Entrepreneurs and Employees: Education premium (CPI deflated 2010 prices, weighted)



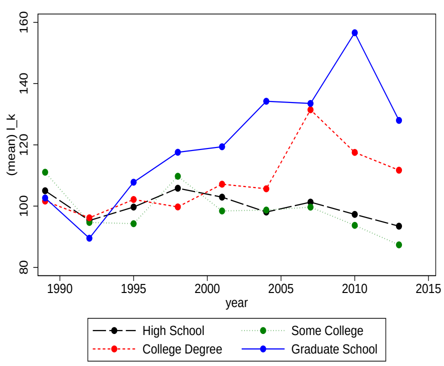

(a) Entrepreneurs Value



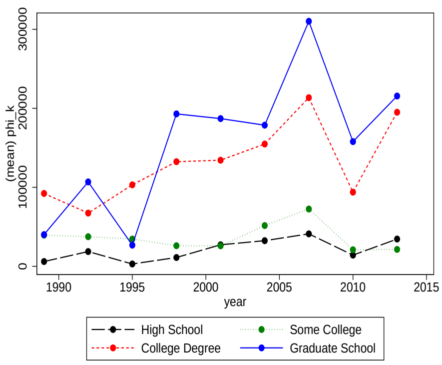

(b) Entrepreneurs Index



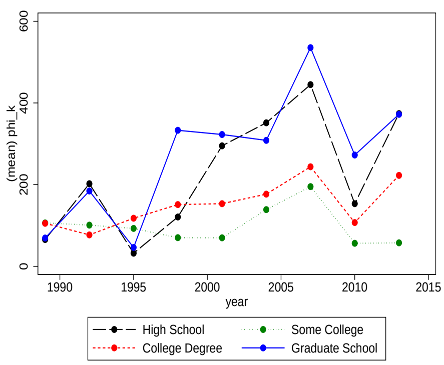

(c) Employees Value




(d) Employees Index




(e) Excess Return, $\phi$, Value




(f) Excess Return, $\phi$, Index

Panel (c) and (d) are analogous to panel (a) and (b) but they consider employees. The labor income of high school graduates and college drop-outs have remained fairly stable over time. The labor income of employees with a college degree has increased by around 20 percent since the mid 90's, the analogous increase for employees with a post-graduate degree has been around 30 percent. This implies that the excess return from entrepreneurship as measured by the difference between the total return and wages, $\phi = \theta - w$, has increased substantially more for entrepreneurs with a post-graduate degree than for entrepreneurs with just a college degree. The excess return from entrepreneurship has almost quadrupled for entrepreneurs with a post-graduate degree while the excess return for entrepreneurs with a a college degree has "just" doubled (see panel f).

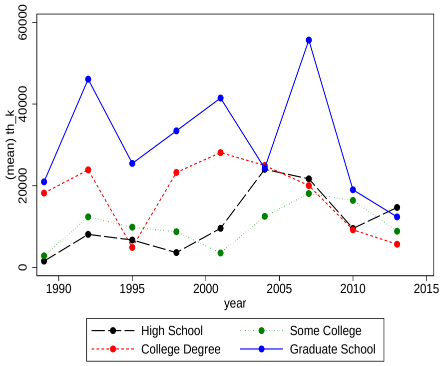
Figure 3 is analogous to panel (a) of Figure 2, but where we now look at different percentiles of the distribution of the total return from entrepreneurship. Figure 4 is instead analogous to panel (b) of Figure 2, but where we now look at different percentiles of the distribution of the index of total return from entrepreneurship. At the bottom of the return distribution from entrepreneurship, entrepreneurs with a college degree and with a post graduate degree have experienced a similar evolution, with returns that have remained pretty stable over time. At the median, at the top quartile and at the top decile of the distribution of returns, the return from entrepreneurship has instead increased substantially more for entrepreneurs with a post-graduate degree than for entrepreneurs with a college degree. The increase in the return from entrepreneurship has been 50 percent higher for entrepreneurs with a postgraduate degree than for entrepreneurs with a college degree.

Figures 5 and 6 are analogous to Figure 3 and Figure 4, but where we now focus on employees. The skill premium to post-graduate education versus college education has increased also for employees, especially when looking at the right tail of the labor income distribution of employees. But overall the difference between the percentage increase in labor income for post-graduate versus employee with a college degree is at most equal to 10-15 percent compared with an average difference of 50% when looking at entrepreneurs.

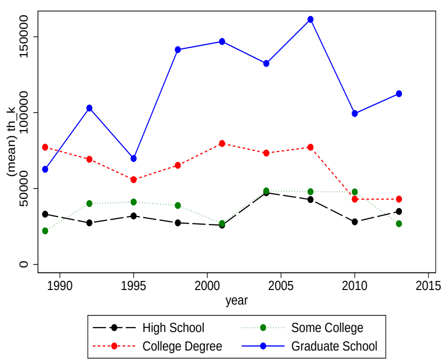
Figure 7 looks at the share of the return from entrepreneurship $\theta$ that comes from labor income $l/\theta$, from dividend payments $d/\theta$ and from expected capital gains $(\frac{V-k}{\tau} - \rho k)/\theta$. One can see that the share of the return due to expected capital gains and dividend payments has increased substantially for entrepreneurs with a post-graduate degree.

We now study the contribution of the different components of $\theta$ by focusing on entrepreneurs with a post-graduate degree. Figure 8 plots the evolution of the different components of the total return $\theta$ for entrepreneurs with a post-graduate degree for different portions of the returns distribution. Panel (a) focuses on the overall average; panel (b)

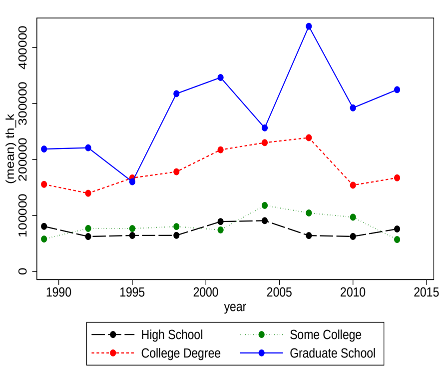
Figure 3: Entrepreneurs Value: Education premium (CPI deflated 2010 prices, weighted) different percentiles



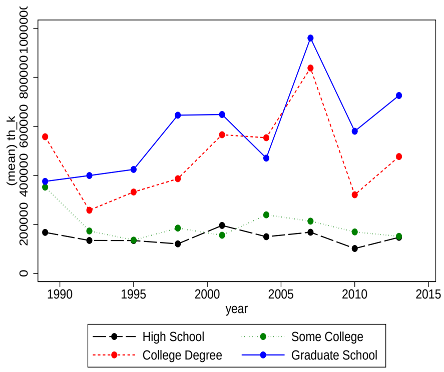

(a) p25




(b) p50




(c) p75

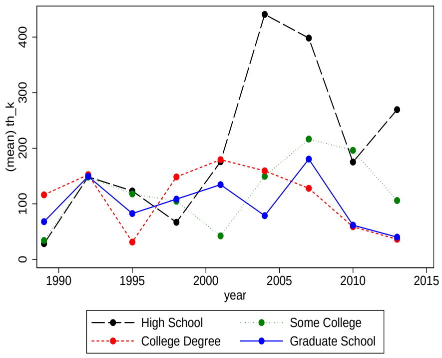



(d) p90

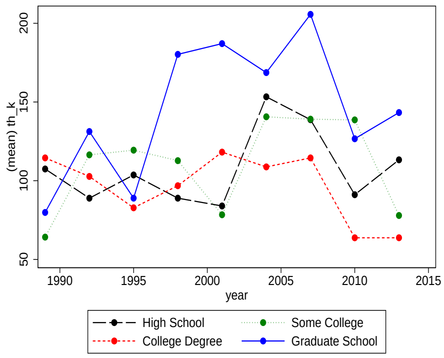
on entrepreneurs with total returns below the median return; panel (c) with total returns between the bottom and the top quartile; panel (d) with total return above the median; panel (e) with total returns above the top quartile; and panel (f) with total returns above the top decile. In general, the controubtion of capital gains is higher the higher overall returns, while the opposite occurs for labor compensation. In terms of time trends, especially when looking at the right tail of the distribution of returns from entrepreneurship the component due to capital gains has increased substantially and it now plays a much more important role for the overall return from entrepreneurship than in the late 80's.

Figure 9 better characterizes why the component due to expected capital gains has increased so much in importance. The exit probability $\lambda$ matters for the expected capital gains. The exit probability $\lambda$ is calculated as the inverse of the duration of the entrepreneurial experience, $\tau$, by educational groups. Panel (a) shows the average across businesses (first ad second) if more than one business is available; panel (b) calculates av-

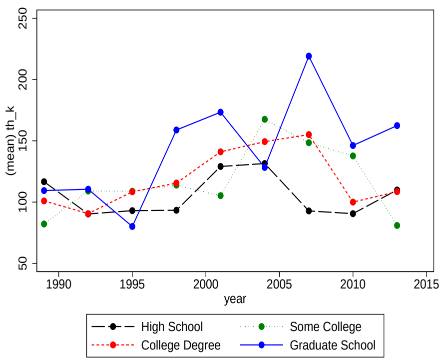
Figure 4: Entrepreneurs Index: Education premium (CPI deflated 2010 prices, weighted) different percentiles



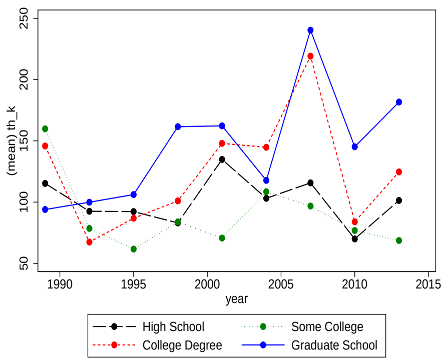

(a) p25




(b) p50




(c) p75



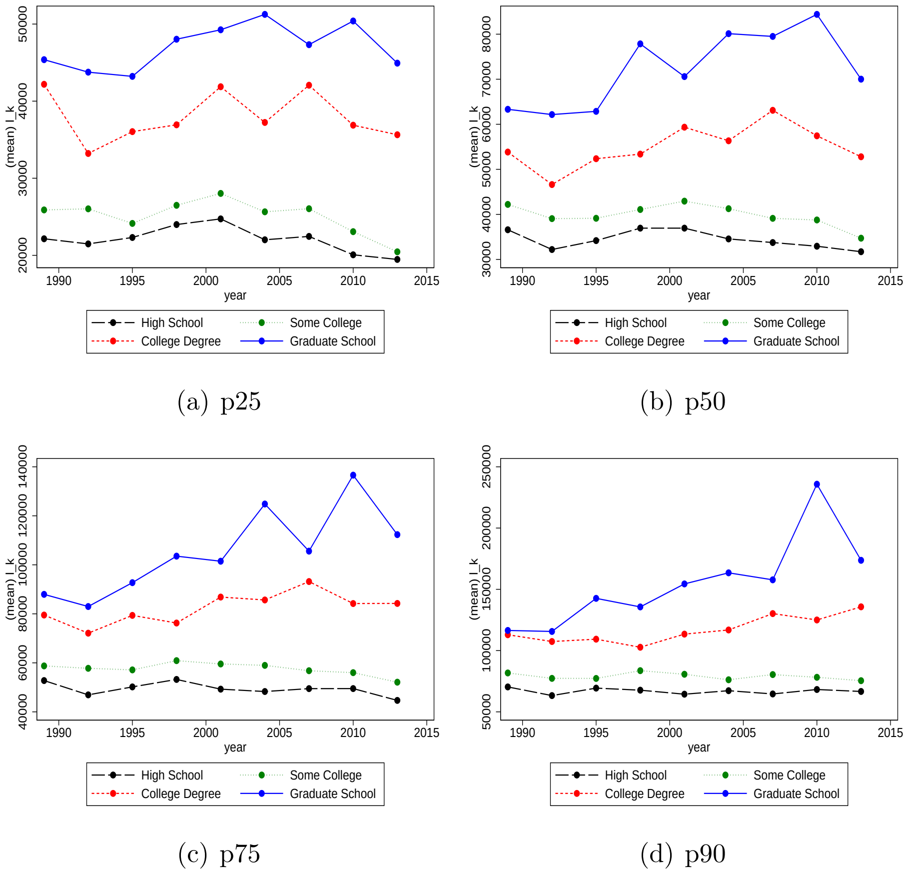

(d) p90

erage $\lambda$ just on the first business; panel (c) calculates $\lambda$ just for second business, panel (d) shows the fraction of entrepreneurs with a second business. Overall, entrepreneurs with a post-graduate degree exit from their entrepreneurial experience much more quickly in the second part of the time period than in the fist part. The opposite occurs for entrepreneurs with a college degree.

## 5 Regression analysis and decomposition

After the graphical analysis, we now move on to the regression framework, which allows to control for correlated effects and supplies standard errors to assess the statistical robustness of the trends that we have seen above. We regress returns to education and its various components on dummies for the educational groups, using entrepreneurs with college degree as the reference group. For each dependent variable we run two specifica-

Figure 5: Employees Values: Education premium (CPI deflated 2010 prices, weighted) different percentiles




(a) p25

(b) p50

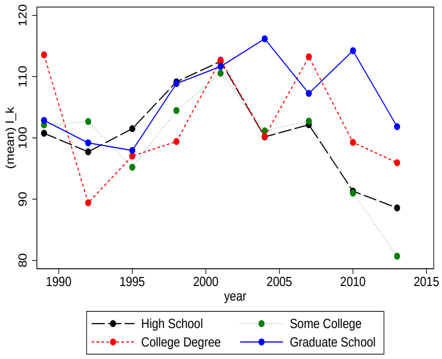
(c) p75

(d) p90

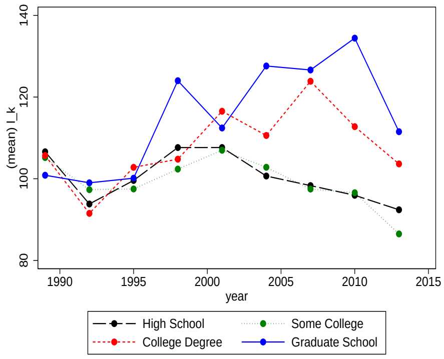
tions, one with only the dummies for educational groups and another with the addition of the same dummies interacted with a post 2000 dummy, that is a dummy that is equal to 1 for the years after 2000. The second specification captures any change that occurred over time in returns to entrepreneurship for the different educational groups. Returns are are in thousands dollars at 2010 constant prices. Given that a substantial share of entrepreneurs has negative returns, we run the regressions in levels rather than in logs. We include the standard control for wage equations: a quadratic in age, gender, a dummy for white and year dummies. The regressions are corrected for the existence of multiple replicates for the same record using a routine supplied by the Philadelphia Fed. Due the the presence of imputed values we report bootstrapped standard errors based on 200 replications.

Table 4 reports the main decompositions of returns to entrepreneurship. Not surprisingly, Column 1 shows that, over the whole period, entrepreneurial returns are increasing

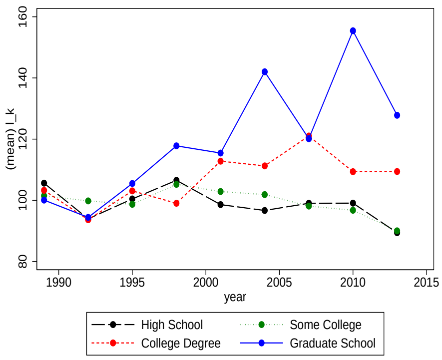
Figure 6: Employees: Education premium, Index (CPI deflated 2010 prices, weighted) different percentiles



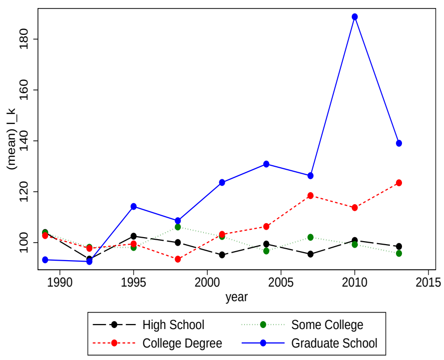

(a) p25




(b) p50



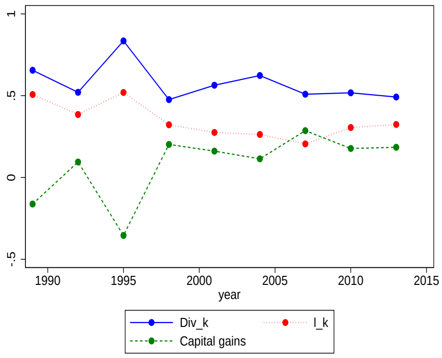

(c) p75



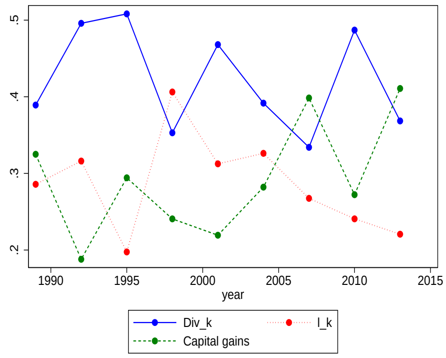

(d) p90

in education attainments. Entrepreneurs with a post graduate education earn almost 200.000 dollars more than high school graduates. More interestingly, Column 2 shows that the returns to education have increased substantially over time. College graduates earn an extra premium of around 60.000 dollars with respect to high school graduates and entrepreneurs with some college. Moreover, the the total returns from entrepreneurship has increased by 77 thousands dollars for entrepreneurs with a psot-graduate degree relative to entrepreneurs with a college degree. To analyze what the sources of such developments are, columns 3 to 8 decompose the overall returns into its main components. The increase in the premium for post graduate education is explained almost equally by the increase in dividend payments (column 6) and the increase in expected capital gains (column 8), while labor income records no change.

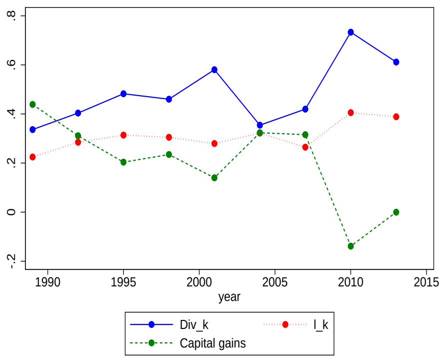
Figure 7: Decomposition of $\theta$ over time, shares



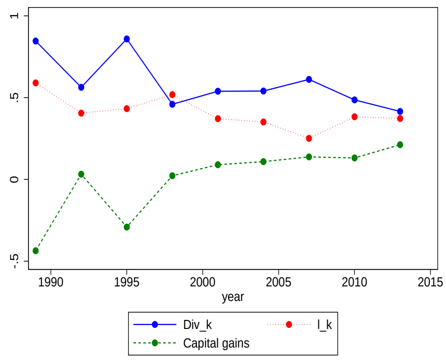

(a) Grad School




(b) College Degree

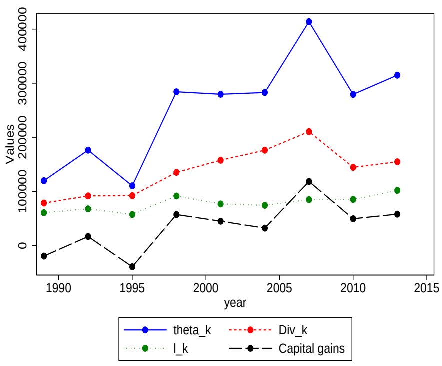



(c) Some College

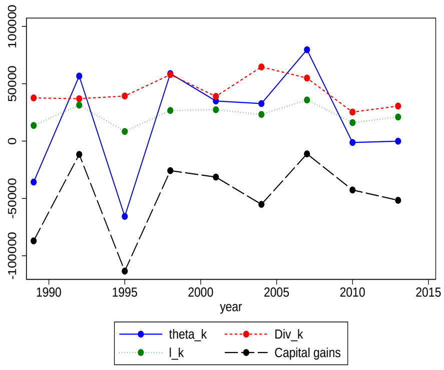



(d) High School

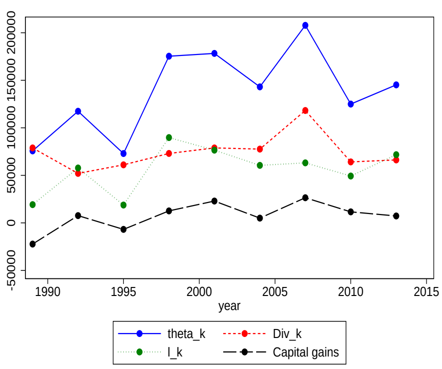
Figure 8: Decomposition of $\theta$ for for entrepreneurs with a Post-graduate degree over time, mean, levels



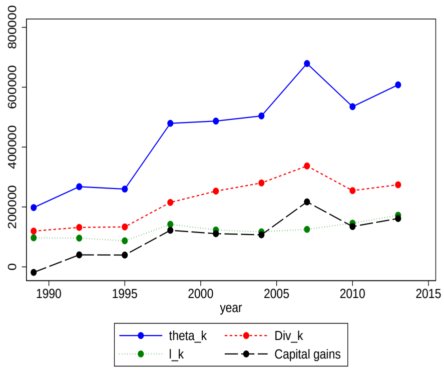

(a) Mean



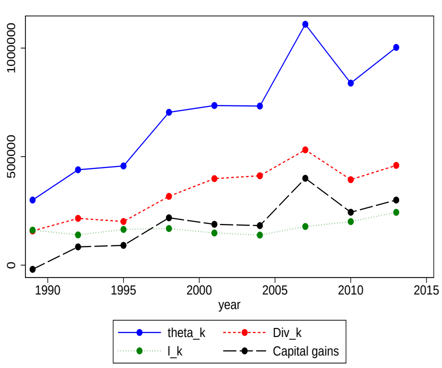

(b) Below median



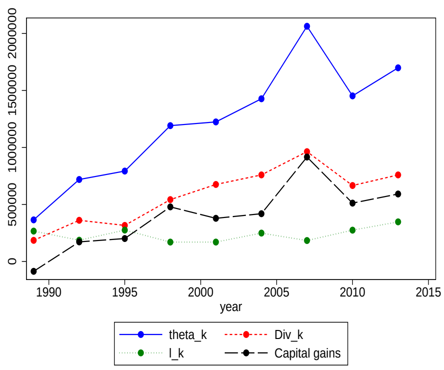

(c) Between bottom and top quartile




(d) Above median

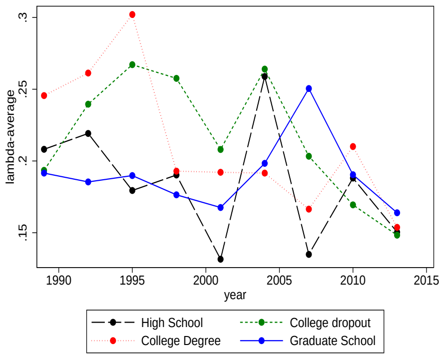



(e) Above top quartile

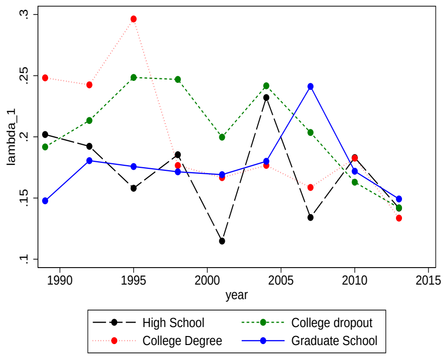



(f) Above top decile

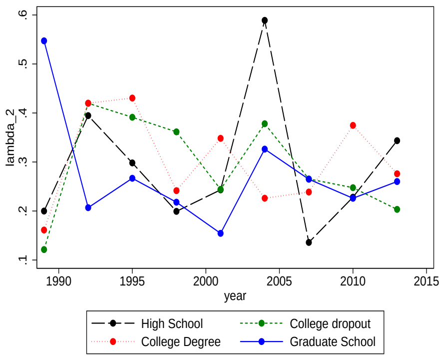
Figure 9: Exit probabilities



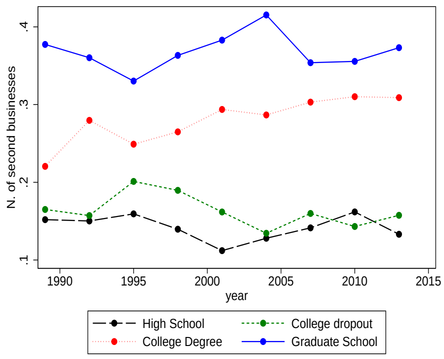

(a) Average $\lambda$




(b) $\lambda$ on 1st business




(c) $\lambda$ on 2nd business




(d) Number with 2nd business

Notes: The exit Probability $\lambda$ is calculated as the inverse of the duration of the entrepreneurial experience, $\tau$, by educational groups . Panel (a) shows the average across businesses (first ad second) if more than one business is available; panel (a) calculates average $\lambda$ just on first business; panel (c) doesit just for second business, panel (d) shows fraction of entrepreneurs with a second business.

Table 4: Trend in the Skill premium

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | $\theta$ | $\theta$ | $l$ | $l$ | $d$ | $d$ | $\lambda(V-k)-\rho k$ | $\lambda(V-k)-\rho k$ | $\phi=\theta-w$ | $\phi=\theta-w$ | $w$ | $w$ |
| High School | -135.70*** | -102.18*** | -31.43*** | -23.47*** | -47.34*** | -36.82*** | -56.93*** | -41.88*** | -103.02*** | -76.38*** | -32.68*** | -25.79*** |
| | (13.97) | (17.68) | (3.01) | (5.50) | (5.52) | (8.90) | (12.11) | (15.58) | (13.91) | (17.72) | (0.44) | (0.55) |
| Some College | -110.54*** | -74.07*** | -28.44*** | -24.82*** | -41.22*** | -34.45*** | -40.87*** | -14.80 | -85.26*** | -56.53*** | -25.28*** | -17.54*** |
| | (14.42) | (21.29) | (3.34) | (6.31) | (5.44) | (8.74) | (12.56) | (18.44) | (14.32) | (21.23) | (0.45) | (0.67) |
| Post Graduate | 58.58*** | 12.31 | 23.58*** | 23.10*** | 55.32*** | 27.52** | -20.32 | -38.31 | 34.72* | -3.00 | 23.86*** | 15.31*** |
| | (19.72) | (28.60) | (5.45) | (8.80) | (7.56) | (10.73) | (15.80) | (23.30) | (19.68) | (28.15) | (0.58) | (1.16) |
| High School × Post | | -54.63** | | -12.88* | | -17.67* | | -24.09 | | -43.44 | | -11.19*** |
| | | (27.27) | | (7.16) | | (9.96) | | (24.11) | | (27.37) | | (0.50) |
| Some College × Post | | -60.49* | | -5.66 | | -11.77 | | -43.05 | | -47.68 | | -12.81*** |
| | | (32.03) | | (7.68) | | (10.19) | | (27.26) | | (32.05) | | (0.64) |
| Post Graduate × Post | | 77.20** | | 1.13 | | 45.72*** | | 30.35 | | 62.89* | | 14.31*** |
| | | (36.34) | | (10.44) | | (16.01) | | (29.79) | | (36.00) | | (1.59) |
| Age | 11.48*** | 12.12*** | 4.01*** | 4.08*** | 6.03*** | 6.29*** | 1.43 | 1.75 | 11.59*** | 12.11*** | -0.12** | 0.01 |
| | (2.11) | (2.10) | (0.48) | (0.48) | (0.83) | (0.81) | (1.83) | (1.83) | (2.11) | (2.10) | (0.06) | (0.03) |
| $Age^2$ | -0.13*** | -0.14*** | -0.04*** | -0.04*** | -0.06*** | -0.06*** | -0.03* | -0.04** | -0.13*** | -0.14*** | 0.00** | -0.00 |
| | (0.02) | (0.02) | (0.00) | (0.00) | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) | (0.02) | (0.00) | (0.00) |
| Female | -86.99*** | -83.58*** | -32.54*** | -32.29*** | -40.92*** | -39.47*** | -13.53 | -11.82 | -86.24*** | -83.50*** | -0.75 | -0.07 |
| | (12.88) | (12.79) | (2.75) | (2.72) | (5.04) | (4.92) | (9.96) | (10.01) | (12.78) | (12.71) | (0.51) | (0.25) |
| White | 21.98 | 22.49 | 4.03 | 4.07 | 25.81*** | 26.18*** | -7.86 | -7.77 | 22.01 | 22.43 | -0.03 | 0.06 |
| | (17.94) | (17.93) | (3.73) | (3.73) | (5.55) | (5.55) | (16.59) | (16.69) | (17.91) | (17.93) | (0.37) | (0.22) |
| Year 1992 Dummy | 2.54 | 5.73 | -1.89 | -1.52 | 0.13 | 0.64 | 4.31 | 6.60 | 9.57 | 12.08 | -7.03*** | -6.35*** |
| | (24.83) | (24.11) | (7.44) | (7.47) | (8.69) | (8.13) | (20.52) | (20.35) | (24.52) | (24.01) | (1.36) | (0.91) |
| Year 1995 Dummy | -6.30 | -6.18 | -3.01 | -2.83 | 10.59 | 10.44 | -13.87 | -13.80 | -4.51 | -4.43 | -1.79 | -1.75* |
| | (28.62) | (27.96) | (6.91) | (6.84) | (8.43) | (8.12) | (25.35) | (25.23) | (28.39) | (27.93) | (1.29) | (0.95) |
| Year 1998 Dummy | 37.36 | 37.16 | 12.32 | 12.78* | 5.91 | 5.78 | 19.12 | 18.60 | 34.85 | 34.69 | 2.50* | 2.48** |
| | (28.45) | (28.16) | (7.68) | (7.51) | (7.71) | (7.61) | (24.27) | (24.25) | (27.88) | (27.69) | (1.29) | (1.03) |
| Year 2001 Dummy | 47.25* | 58.76* | 4.70 | 9.59 | 21.50** | 17.77 | 21.04 | 31.41 | 45.42* | 54.07 | 1.83 | 4.69*** |
| | (24.76) | (33.95) | (6.81) | (9.00) | (9.07) | (11.10) | (20.99) | (29.98) | (24.35) | (33.81) | (1.51) | (1.22) |
| Year 2004 Dummy | 56.96** | 69.73* | 8.22 | 13.25 | 23.28*** | 20.24* | 25.46 | 36.24 | 53.16** | 62.83* | 3.80*** | 6.90*** |
| | (26.70) | (36.31) | (7.28) | (9.72) | (8.04) | (11.44) | (22.94) | (30.40) | (26.27) | (36.13) | (1.01) | (0.58) |
| Year 2007 Dummy | 108.61*** | 122.25*** | 10.91 | 15.97 | 41.32*** | 38.52*** | 56.37** | 67.75** | 100.46*** | 110.82*** | 8.15*** | 11.43*** |
| | (26.95) | (35.16) | (7.46) | (9.88) | (8.96) | (11.79) | (23.40) | (30.61) | (26.52) | (34.95) | (1.34) | (0.81) |
| Year 2010 Dummy | 48.55* | 61.18* | 4.29 | 9.39 | 18.40** | 15.26 | 25.86 | 36.53 | 39.20 | 48.76 | 9.35*** | 12.42*** |
| | (26.33) | (35.72) | (6.74) | (8.92) | (8.13) | (11.11) | (23.57) | (30.70) | (25.82) | (35.39) | (1.43) | (0.86) |
| Year 2013 Dummy | 74.64** | 86.53** | 12.37 | 17.28* | 22.20** | 18.63 | 40.07* | 50.62 | 72.65** | 81.61* | 1.99* | 4.92*** |
| | (29.23) | (42.01) | (7.53) | (9.46) | (9.39) | (12.73) | (24.05) | (36.41) | (28.90) | (41.90) | (1.12) | (0.61) |
| Constant | -89.87 | -115.48** | -43.18*** | -48.18*** | -105.82*** | -110.78*** | 59.13 | 43.48 | -161.66*** | -181.82*** | 71.79*** | 66.34*** |
| | (60.09) | (55.44) | (12.31) | (13.05) | (21.46) | (20.96) | (56.67) | (52.81) | (60.09) | (55.37) | (1.58) | (1.00) |
| $R^2$ | 0.0196 | 0.0212 | 0.0372 | 0.0376 | 0.0137 | 0.0145 | 0.0055 | 0.0067 | 0.0127 | 0.0138 | 0.0617 | 0.0638 |
| Observations | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 16175 | 16175 |

**Notes:** Bootstrapped standard errors in parentheses, *** p-value $< 0.01$, ** p-value $< 0.05$, * p-value $< 0.1$

Column (10) focus on the excess return from entrepreneurship $\phi = \theta - w$ . In terms of the excess return, the skill premium for post-graduate education relative to college education has increased by 62 thousands dollars. In fact, also the average wage of workers with post-graduate education has increased with respect to college graduates, but only by 14 thousands dollars (column 12).

We now analyze the determinants of the increase in expected realized capital gains. We linearize the expression for the total return $\theta$ as follows:

$$\theta \simeq d + l + \overline{(V-k)}\frac{1}{\tau} + \overline{\lambda}V - \overline{(\lambda+\rho)}k - \overline{k}\rho$$

while $\phi$ is linearized as the sum of the following seven components

$$\phi \simeq d + l + \overline{(V-k)}\frac{1}{\tau} + \overline{\lambda}V - \overline{(\lambda+\rho)}k - \overline{k}\rho - w$$

All the quantities denoted as "" are scalar that are constant through time and are educational specific. All terms are written so that quantities enter positively in the determinants of $\theta$ or $\phi$. So when we decompose the effects on $\theta$ we have the following 6 independent variables: (i) $d$; (ii) $l$; (iii) $\overline{(V-k)}\frac{1}{\tau}$; (iv) $\overline{\lambda}V$; (v) $-\overline{(\lambda+\rho)}k$; (vi) $-\overline{k}\rho$. When decomposing $\phi$ we also have the term (vii) $-w$ in addition to the previous ones. We ran regressions separately for each of the different components of the decomposition. Table 5 contains the results. Column 2 indicates that virtually all of the increase in the expected realized capital gains for entrepreneurs with a post-graduate degree is due to the increase in the speed $\lambda$ at which entrepreneurs can recycle their human capital and their financial wealth into alternative uses.

## 6 Conclusions

We study how the educational composition and the return to education has evolved over time since the late 80's for US entrepreneurs. The fraction of entrepreneurs with a college degree has increased , while the fraction of entrepreneurs with a post-college degree has remained stable over time. The premium of having a college degree relative to a high school degree has increased, but roughly by the same amount as the analogous premium for workers. The premium for postgraduate education relative to a college degree has increased substantially more for entrepreneurs than for workers: now an entrepreneurs with a post-graduate degree earns fifty percent more than an entrepreneur with a college degree, while in the late 80's their earnings were approximately equal. The analogous skill premium for workers is just 10-20 percent. The sharp increase in the skill premium for entrepreneurs is partly due to the fact that they run better business (in terms of dividend payments and firm value) and partly because they realize capital gains earlier by selling the

Table 5: Decomposing Capital gains

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Variables | $\overline{(V-k)}\frac{1}{\tau}$ | $\overline{(V-k)}\frac{1}{\tau}$ | $\overline{\lambda V}$ | $\overline{\lambda V}$ | $-\overline{(\lambda+\rho)k}$ | $-\overline{(\lambda+\rho)k}$ | $-\overline{k}\rho$ | $-\overline{k}\rho$ |
| High School | -110.79*** | -135.21*** | -199.65*** | -122.64*** | 86.27*** | 45.06** | 17.80*** | 26.69*** |
| | (5.83) | (11.91) | (15.55) | (20.34) | (12.45) | (20.47) | (1.06) | (1.75) |
| Some College | -90.23*** | -113.08*** | -142.81*** | -63.61*** | 54.09*** | 31.64 | 16.11*** | 22.41*** |
| | (5.80) | (12.46) | (17.02) | (24.44) | (18.56) | (21.51) | (1.63) | (2.92) |
| Post Graduate | -20.03*** | -47.44*** | -65.57*** | -57.86** | 24.56 | 14.19 | -0.55 | 0.51 |
| | (7.22) | (13.22) | (18.56) | (23.31) | (15.41) | (26.03) | (1.68) | (2.74) |
| High School × Post | | 38.31*** | | -122.62*** | | 66.19** | | -14.26*** |
| | | (13.19) | | (28.37) | | (27.84) | | (1.89) |
| Some College × Post | | 35.71*** | | -127.25*** | | 34.99 | | -9.98*** |
| | | (13.57) | | (33.50) | | (32.41) | | (2.68) |
| Post Graduate × Post | | 43.24*** | | -8.16 | | 14.98 | | -1.28 |
| | | (14.32) | | (33.62) | | (32.27) | | (2.49) |
| Age | -6.97*** | -7.05*** | 9.04*** | 9.80*** | 3.06 | 2.77 | -0.66*** | -0.59*** |
| | (1.02) | (1.02) | (2.75) | (2.73) | (4.36) | (4.37) | (0.17) | (0.17) |
| $Age^2$ | 0.04*** | 0.04*** | -0.04 | -0.05* | -0.08* | -0.08 | 0.01*** | 0.00*** |
| | (0.01) | (0.01) | (0.03) | (0.03) | (0.05) | (0.05) | (0.00) | (0.00) |
| Female | 8.31 | 8.35 | -155.66*** | -152.43*** | 101.95*** | 101.06*** | 0.77 | 1.05 |
| | (5.95) | (5.89) | (12.83) | (12.76) | (10.75) | (10.85) | (1.14) | (1.10) |
| White | -8.14 | -7.79 | 33.16** | 32.95** | -27.95** | -27.97** | -0.34 | -0.34 |
| | (5.95) | (5.85) | (13.99) | (13.87) | (11.17) | (11.27) | (0.95) | (0.93) |
| Year 1992 Dummy | 16.05* | 13.69 | -63.21*** | -55.59*** | 64.11*** | 61.76*** | 8.78*** | 9.40*** |
| | (8.92) | (8.45) | (20.12) | (19.47) | (23.63) | (23.77) | (1.29) | (1.23) |
| Year 1995 Dummy | 26.59*** | 25.60*** | -20.46 | -18.47 | 24.06 | 22.89 | -1.52 | -1.29 |
| | (8.35) | (8.04) | (20.33) | (19.41) | (28.91) | (28.82) | (1.56) | (1.53) |
| Year 1998 Dummy | 6.28 | 4.80 | -13.21 | -10.71 | 56.90** | 54.40** | -19.74*** | -19.31*** |
| | (6.23) | (6.27) | (21.47) | (20.82) | (24.66) | (24.36) | (1.50) | (1.43) |
| Year 2001 Dummy | 8.21 | -23.43* | -2.24 | 68.60** | 37.14 | 5.06 | 17.22*** | 24.26*** |
| | (6.11) | (12.55) | (20.98) | (33.62) | (24.24) | (32.43) | (1.76) | (2.59) |
| Year 2004 Dummy | 17.64*** | -13.80 | 21.67 | 93.30*** | 30.04 | -2.54 | 17.72*** | 24.88*** |
| | (6.68) | (13.99) | (21.17) | (32.34) | (28.57) | (34.45) | (1.36) | (2.27) |
| Year 2007 Dummy | 12.91** | -18.71 | 85.01*** | 157.83*** | 28.03 | -4.68 | 16.48*** | 23.72*** |
| | (6.55) | (12.80) | (25.78) | (38.24) | (27.72) | (34.71) | (1.13) | (2.11) |
| Year 2010 Dummy | 13.32** | -18.41 | 19.65 | 91.68*** | -10.23 | -43.20 | 23.77*** | 31.00*** |
| | (5.96) | (13.44) | (20.87) | (32.20) | (35.10) | (38.98) | (1.25) | (2.18) |
| Year 2013 Dummy | -1.01 | -32.64** | 49.70** | 120.86*** | 0.11 | -32.05 | 8.63*** | 15.70*** |
| | (5.25) | (12.71) | (24.29) | (34.63) | (25.57) | (32.35) | (1.21) | (2.18) |
| Constant | 365.68*** | 388.34*** | -65.55 | -132.77* | -106.90 | -78.36 | -28.40*** | -35.02*** |
| | (29.19) | (32.36) | (69.62) | (71.93) | (88.78) | (93.32) | (4.58) | (5.01) |
| $R^2$ | 0.2176 | 0.2228 | 0.0115 | 0.0122 | 0.0081 | 0.0085 | 0.4293 | 0.4515 |
| Observations | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 | 7550 |

**Notes:** Bootstrapped standard errors in parentheses, *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1

business more quickly. The premium to post-graduate education has remained high during the Great Recession, it is unlikely to be explained by selection issues related to business failure and it is still present when looking at the higher deciles of the entrepreneurs income distribution.

## References

Card, D. (1999). The causal effect of education on earnings. In O. Ashenfelter (Ed.), *Handbook of labor economics, Vol. 3A*, pp. 1801–1863. Elsevier.

Chisini, O. (1929). Sul concetto di media. *Periodico di Matematiche 4*, 106–116.

De Nardi, M., P. Doctor, and S. D. Krane (2007). Evidence on entrepreneurs in the united states: Data from the 1989-2004 survey of consumer finances. *Economic Perspectives, Federal Reserve Bank of Chicago 31*(4), 18.

Hamilton, B. H. (2000). Does entrepreneurship pay? an empirical analysis of the returns to self-employment. *Journal of Political economy 108*(3), 604–631.

Kartashova, K. (2014). Private equity premium puzzle revisited. *The American Economic Review 104*(10), 3297–3334.

Kennickell, A. B. (1998). Multiple imputation in the survey of consumer finances. In *Proceedings of the Section on Survey Research Methods.*

Moskowitz, T. J. and A. Vissing-Jorgensen (2002). The returns of entrepreneurial investment: A private equity premium puzzle? *The American Economic Review 92*(4), 745.

Van der Sluis, J., M. Van Praag, and W. Vijverberg (2008). Education and entrepreneurship selection and performance: A review of the empirical literature. *Journal of economic surveys 22*(5), 795–841.

Van Praag, M., A. Van Witteloostuijn, and J. Van der Sluis (2013). The higher returns to formal education for entrepreneurs versus employees. *Small Business Economics 40*(2), 375–396.