TALENT, WEALTH AND ENTREPRENEURSHIP *

ROSS LEVINE AND YONA RUBINSTEIN

June 2018

Abstract: Although influential theories suggest that (a) entrepreneurs have unique, highly-valued human capital, (b) liquidity constraints impede entry into entrepreneurship, and (c) entrepreneurship is procyclical, evidence suggests that the self-employed do not have distinctive, highly-remunerated skills, liquidity constraints bind for few, and self-employment is countercyclical. To address gaps between theory and evidence, we develop a model that differentiates between entrepreneurs and other self-employed individuals. The model predicts—and the data confirm—that entrepreneurs are positively selected on highly-valued human capital, but other self-employed are negatively selected on those skills; entrepreneurs are positively selected on collateral, but not other self-employed; and entrepreneurship is procyclical but self-employment is countercyclical.

Keywords: Entrepreneurship; Human capital; Occupational choice; Corporate finance; Business cycles

JEL Classifications: L26; J24; G32; E32

@* Levine: University of California, Berkeley, and the NBER, rosslevine@berkeley.edu. Rubinstein: London School of Economics, CEP, and the CEPR, y.rubinstein@lse.ac.uk. We thank Josh Angrist, David De Meza, Paul Gertler, Florian Heider, Erik Hurst, Chinhui Juhn, Ed Lazear, Alex Popov, Jim Poterba, John van Reenen, Noam Yuchtman, and seminar participants at the London School of Economics, University of California-Berkeley, University of Houston, the National University of Singapore, MIT, and the European Central Bank.

I. INTRODUCTION

Entrepreneurship plays a central role in influential theories of economic growth and business cycles. For example, Smith (1776), Schumpeter (1911), and Aghion and Howitt (1992) emphasize that entrepreneurs facilitate economic growth by bring new goods, services, and technologies to the economy. Lucas (1978), Baumol (1990), Murphy et al (1991), and Gennaioli et al (2013) stress that the allocation of entrepreneurial talent influences the productivity of firms and the growth rates of economies. On business cycles, Veblen (1904), Fisher (1933), Keynes (1936), Shleifer (1986), Bernanke and Gertler (1989), Caballero and Hammour (1994) and others explain that the response of entrepreneurs to aggregate shocks shapes how those shocks propagate through the economy. Unsurprisingly, therefore, a rich body of research explores selection into entrepreneurship.

Research, however, highlights three unresolved tensions between theory and evidence concerning the human capital, earnings, and liquidity constraints of entrepreneurs. First, influential theories emphasize that entrepreneurs have unique human capital traits—including creativity, analytical skills, risk taking, confidence, education, and managerial acumen (e.g., Schumpeter 1991, Lucas 1978, Kihlstrom and Laffont 1979, Evans and Jovanovic 1979, Baumol 1990, Murphy et al 1991, and Gennaioli et al 2013) that are highly remunerated. Yet, empirical studies find that the typical self-employed person and salaried worker have similar education levels, learning aptitude scores, personality characteristics, and earnings. (e.g., Borjas and Bronars 1989, Evans and Leighton 1989, Hamilton 2000, and Moskowitz and Vissing-Jorgensen 2002, and Levine and Rubinstein 2017).[1]

The second puzzle concerns liquidity constraints. Although theory stresses that liquidity constraints materially influence entry into entrepreneurship (e.g., Knight 1921, Bernanke and

[1] Researchers offer explanations of the earnings component of this human capital puzzle. Hurst and Pugsley (2011) show that people value the non-pecuniary benefits of self-employment, which might account for the earnings discount. Bernardo and Welch (2001), De Meza and Southey (1996), and Dawson et al. (2014) stress that "overly confident" business owners could explain both entry into self-employment and their comparatively low earnings. Manso (2016) notes that "survivorship bias" could bias estimates of the returns to entrepreneurship. These studies, however, do not address either the non-earnings component of the human capital puzzle or the other two puzzles.

Gertler 1989, Evans and Jovanovic 1989, and Kyotaki and Moore 1997), the evidence is more nuanced. Researchers generally discover a significant, positive relationship between collateral and entry into self-employment,[2] but Hurst and Lusardi (2004) show that liquidity constraints bind for only a small proportion of wealthy business owners.

The third unresolved tension between theory and evidence involves the cyclicality of entrepreneurship. Several prominent business cycle theories stress that the procyclicality of entrepreneurship amplifies aggregate shocks (e.g., Shleifer 1986, Bernanke and Gertler 1989, Kiyotaki and Moore 1997, Francois and Lloyd-Ellis 2003, and Barlevy 2007). Other work highlights countercyclical forces, emphasizing that the opportunity costs of investment are lower in recessions (Caballero and Hammour 1994) and weak demand for salaried employees in recessions pushes workers temporarily into self-employment (e.g., Kihlstrom and Laffont 1979, and Banerjee and Newman 1993). Although empirical research often finds that self-employment is countercyclicality, (e.g., Evans and Leighton 1989, Farber 1999, Parker 2009, Koellinger and Thurik 2012, Fairlie 2013, and Yu, Orazem, and Jolly 2014), many of the business cycle theories that guide policy deliberations are built on the assumption of procyclical entrepreneurship.

Motivated by these puzzles, we (1) offer a new model of how human capital and liquidity constraints interact to shape selection into entrepreneurship and the cyclicality of entrepreneurship and (2) provide empirical evidence concerning the model's key assumptions and predictions. A key starting point in building our model is the growing body of evidence that self-employment is a problematic proxy for entrepreneurship because it fails to distinguish between entrepreneurs and other self-employed individuals. Evans and Leighton (1989), Schoar (2010), Hurst and Pugsley (2011), La Porta and Shleifer (2014), and Levine and Rubinstein (2017) indicate that some of the self-employed undertake highly-productive ventures that create jobs and introduce new goods and services to the market, i.e., "entrepreneurs," but most are one-

[2] See Bernanke (1983), Evans and Jovanovic (1989), Evans and Leighton (1989), Hoshi, Kashyap, and Scharfstein (1991), Blanchflower and Oswald (1998), Hubbard and Kashyap (1992), Gertler and Gilchrist (1994), Holtz-Eakin, Joulfaian, and Rosen (1994), Black, De Meza, and Jeffreys (1996), Fairlie (1999), Fairlie and Krashinsky (2012), Adelino, Schoar, and Severino (2015), Corradin and Popov (2015), Schmalz, Sraer, and Thesmar (2017), etc.

person, low-productivity "other self-employed" individuals, who were unsuccessful salaried workers, perform routine, manuals tasks, and have no ambitions to grow their businesses. Thus, bundling together these two different types of self-employment—conceptually and empirically—might yield misleading perspectives and inferences about entrepreneurs.

We first develop a three-sector Roy model that distinguishes between entrepreneurs, salaried employees, and other self-employed individuals. Our model differs from Evans and Jovanovic's (1989) (EJ) influential model of entrepreneurship in a key respect. While EJ aggregate business owners into one category of self-employment, we distinguish between entrepreneurship—which demands entrepreneurial ability, physical capital, and liquidity—and the other self-employed who demand none (or little) of these. Our model also differs from EJ in that we relax their assumption that entrepreneurial ability is uncorrelated with productivity as a salaried employee. We allow entrepreneurial ability to positively affect earnings in paid employment. Similar to EJ, our model includes complementarities between human and physical capital that give rise to a Knightian (1921) connection between the entrepreneur and capitalist. That is, the optimal capital stock is increasing in entrepreneurial ability, which means that liquidity constraints are more costly to higher-ability entrepreneurs.

The model yields two unique predictions with respect to human capital and liquidity constraints. First, ceteris paribus, entrepreneurs are *positively* selected on entrepreneurial ability and salaried wages, but the other self-employed are *negatively* selected on these same factors. Thus, aggregating the high-ability, high-wage entrepreneurs with low-ability, low-wage other self-employed may yield a composite group of self-employed individuals that has, on average, similar human capital traits to wage earnings, which accounts for the human capital puzzle. The model's second prediction is that entrepreneurs are negatively selected on liquidity constraints, but the other self-employed individuals are not. Thus, combining these two types of self-employment may yield an aggregate group in which only a small proportion is liquidity constrained.

The model also provides predictions about the cyclicality of both entrepreneurship and the other self-employed. In the context of our model, aggregate economic conditions shape the demand for salaried employees and the severity of liquidity constraints. In recessions, reductions in labor demand pulls people into both types of self-employment, i.e., the labor demand effect is countercyclical for both. Tighter liquidity constraints, however, reduces selection into entrepreneurship but has no effect on entry into other self-employment which demands little (or no) capital, i.e., the liquidity effect exerts a procyclical influence on entrepreneurship, but not on other self-employment. Thus, the model yields ambiguous predictions about the cyclicality of entrepreneurship but unambiguously predicts countercyclical selection into other self-employment. Examining the aggregate group of self-employed, therefore, might hide the potentially distinct cyclical patters of entrepreneurship.

In turning to the data, we follow Levine and Rubinstein (2017) (LR) and use the incorporated as a proxy for "entrepreneurs" and the unincorporated as a proxy for the model's other group of self-employed individuals. Conceptually, the corporation's defining legal characteristics—limited liability and a separate legal identity—are most useful for undertaking large, risky investments that require external financing. Thus, when people establish smaller businesses that do not require much external finance, they will choose the simpler unincorporated legal form; and, when they start larger, risky—more "entrepreneurial"—ventures, they will incorporate. Empirically, LR show that the incorporated and their businesses engage in activities that demand strong nonroutine analytical skills, such as creativity, complex problem-solving, and persuading, motivating, and managing others. In contrast, the unincorporated and their businesses perform activities that demand strong manual skills. To the extent that stronger cognitive skills are more closely aligned with core conceptions of entrepreneurship than strong eye-hand coordination, these results advertise the value of using incorporation is a proxy for entrepreneurship.

Using the National Longitudinal Survey of Youths 1979, we document that the incorporated and unincorporated are notably different with respect to human capital, starting

capital, and the sources of starting capital. As teenagers, incorporated business owners have stronger analytical skills, greater self-esteem, and a stronger sense of controlling their futures than those who become unincorporated self-employed. Furthermore, when comparing the salaried wages of people when they were in their 20s, those who become incorporated self-employed earned more as salaried workers early in their careers than those who either remained salaried workers or switched into unincorporated self-employment. There are also startling differences in starting capital. The typical incorporated business starts with almost ten-times as much capital as the typical unincorporated business, and 21% of the unincorporated report needing no capital to start their businesses. In terms of the sources of starting capital, the incorporated are much more likely to receive financing through the financial system. For example, the incorporated are more than three times more likely to receive a bank loan, four times more likely to receive external financing from a non-bank (non-governmental) entity, and six-times more likely to use a home equity loan to start their businesses.

We begin by evaluating the model's predictions concerning the differential selection of individuals into incorporated and unincorporated self-employment on (1) salaried wages and associated human capital and (2) collateral. We first discover that entrepreneurs—as proxied by the incorporated self-employed—are positively selected on salaried wages, while the unincorporated are negatively selected on wages. Second, we find that entrepreneurs are positively selected on collateral—as measured by home wealth, while the unincorporated are not. Besides being consistent with the model's predictions, these results offer a resolution of the human capital and liquidity puzzles: When researchers combine entrepreneurs with the other self-employed, this aggregates away the unique human capital traits of entrepreneurs and obfuscates the connection between entrepreneurship and liquidity constraints.

Next, we exploit natural variation in home equity values across regions and time and the cross-sectional variation in home ownership to identify the impact of collateral, and hence liquidity constraints, on entry into entrepreneurship and other businesses. We discover economically large and statistically significant effects of collateral on entry into entrepreneurship,

but no effect on entry into other forms of self-employment. Therefore, aggregating entrepreneurs and other self-employed into one homogeneous business category dilutes the estimated impact of liquidity constraints on entrepreneurship. This helps explain the liquidity puzzle.

Finally, we use cross-state, cross-year variation in state unemployment rates to assess the cyclicality of entrepreneurship and the other self-employed. Consistent with our model's predictions, we find that incorporated self-employment is procyclical, unincorporated self-employment is countercyclical, and aggregate self-employment is countercyclical. During periods of high unemployment, entrepreneurship falls, but there is a sharp increase in unincorporated self-employment that reverses when the economy recovers. This suggests that some people use unincorporated self-employment as a temporary cushion against adverse labor market shocks. Since the cyclical fluctuations in unincorporated self-employment are larger than those in incorporated self-employment, our findings confirm and account for past findings that aggregate self-employment is countercyclical, while uncovering the procyclicality of entrepreneurship.

The remainder of the paper is organized as follows. Section II documents the human capital, liquidity, and business cycle puzzles. Section III presents the theoretical model, and Section IV develops the statistical model, so that we can move from the theory to estimable equations. Section V provides the empirical evaluation of the model's predictions and Section VI concludes.

II. THE HUMAN CAPITAL AND LIQUIDITY PUZZLES

In this section, we document puzzles concerning the human capital and liquidity constraints of entrepreneurs. We first show that salaried employees and the self-employed have similar human capital traits despite an abundance of theoretical models emphasizing the distinct features of entrepreneurs. Second, we show that most businesses start with less than $3,500 of capital. This is consistent with the findings in Hurst and Lusardi (2004), who stress that liquidity constraints bind for very few. To illustrate these puzzles—and foreshadow our strategy for resolving them, we use data from the NLSY79. We do not document the earnings puzzle here since many researchers, e.g., Hamilton (2000), show that the median self-employed and salaried workers earn about the same per hour despite models emphasizing the unique talents and risk-taking attributes of successful entrepreneurs.

II.A. Data[3]

The NLSY79 is a representative survey of 12,686 individuals who were 15-22 years old when they were first surveyed in 1979. Individuals were surveyed annually through 1994 and biennially since then. Thus, we use year *t-2* when referring to a lagged value. We examine individuals who are 30 years of age or older, for whom the NLSY79 has information on assets, standard demographic information, and the human capital traits described below.

The NLSY79 reports information on human capital. It provides basic demographics, such as age, gender, race, and state of residence. It provides information on educational attainment, including the number of years of education and whether the person graduated from college.

The NLSY79 also contains measures of cognitive ability, illicit activities, and personality traits. From the 1980 survey, AFQT (Armed Forces Qualifications Test) measures the aptitude and trainability of each individual and is often used as an indicator of cognitive skills. The AFQT indicates the individual's percentile within the entire sample and has a median of 50. Furthermore, we construct the index *Illicit* that measures the aggressive, risk-taking, disruptive, "break-the-rules" behaviors of individuals before they reach prime working-age. *Illicit* is based on 20 survey questions from the 1980 NLSY79 that cover actions associated with damaging

[3] Appendix Table I provides detailed variable definitions and sources.

property, fighting, shoplifting, robbery, assault, drug use and dealing, etc., and whether the individual was stopped by the policy, charged with an illegal activity, or convicted of non-minor traffic violations. We construct this index to have a mean of zero and standard deviation of one. In addition, following Levine and Rubinstein (2017), we construct *Smart & Illicit*, which equals one for an individual if (a) *AFQT* is 50 or above and (b) *Illicit* is zero or above; otherwise *Smart & Illicit* equals zero. With respect to personality traits, the *Rosenberg Self-Esteem* index, which is based on ten questions in the 1980 survey, measures the degree of approval or disapproval of one's self and has been widely used in psychology and economics. *Rotter Locus of Control* is from the 1979 survey and measures the degree to which individuals believe they have internal control of their lives through self-determination relative to the degree that external factors, such as chance, fate, and luck, shape their lives. Smaller values indicate a greater sense of self-determination. Both *Rosenberg Self-esteem* and *Rotter Locus of control* are standardized across all individuals in the survey, so that each has a mean of zero and standard deviation of one.

The NLSY79 also contains information on wealth and earnings. We compute Home Wealth as the market value of the individual's home minus any mortgages on it and Wealth as the value of all assets minus all liabilities. To compute real earnings, the NLSY79 provides nominal earnings, and we use the Consumer Price Index to convert these values into 2010 dollars. Furthermore, we construct Wages (25-29), which equals an individual's average real log hourly earnings as a salaried employee during the ages of 25 through 29 if the person is 31 years of age or older and equals the individual's average real log hourly earnings as a salaried employee at the at the age of *t-2* if the person is between the ages of 27 and 30. When people are less than 27 year old, we set Wages (25-29) equal to missing. Wages (25-29) is available for almost all individuals, since people typically start their working lives as salaried workers.

Starting with the 2010 survey, the NLSY79 began asking more detailed questions about businesses, including the amount of capital used to start the business, the source of that capital, and the number of employees. In terms of the sources of starting capital, owners might use family savings, external finance (such as home equity loans, bank loans, loans from businesses, etc.), or other sources (such as credit card debt, or government loans).

With respect to employment types, the NLSY79 classifies all workers in each year as either salaried or self-employed, and among the self-employed, indicates whether individuals are incorporated or unincorporated. Specifically, individuals are asked about the employment class for their main job: "Were you employed by a government, by a private company, a nonprofit organization, or were you self-employed (or working in a family business)?" Those responding that they are self-employed are further asked, "Is this business incorporated?" While incorporation offers the benefits of limited liability and a separate legal identify, there are direct costs of incorporation, such as annual fees and the preparation of more elaborate financial statements, and indirect costs associated with the separation of ownership and control.

We use the incorporated as a proxy for entrepreneurs and the unincorporated as a proxy for the other self-employed in our model. Levine and Rubinstein (2017) show that the incorporated and their businesses engage in activities that demand a relatively high degree of creativity, complex problem-solving, and communication skills, including the ability to persuade, motivate, and manage others. In contrast, the unincorporated perform activities that require relatively low levels of these analytical skills but instead require strong manual skills. Under the assumption that stronger cognitive skills are more closely aligned with core conceptions of entrepreneurship than manual dexterity, these observations motivate our use of incorporation as a better proxy for entrepreneurship than aggregate self-employment.

II.B. Patterns: Human capital

Table I provides summary statistics on individuals and their businesses. Focusing on those who work full-time, full year, the table differentiates individuals by whether they are salaried employees (Employed) or self-employed. For the self-employed, the table provides summary statistics on all self-employed (Total) and also by the legal form of the business (Unincorporated or Incorporated). The data are from the business ownership part of the 2010 and 2012 NLSY79 surveys.[4] For the business ownership part of the surveys, the observation is at the

[4] There are some differences between the responses that individuals give regarding their employment type in the business ownership and employment parts of the NLSY79. In Table 1, we classify an individual as an incorporated or unincorporated business owner only if the individual provides consistent responses in both parts of the survey. The results, however, are very similar if we classify employment type based either the business ownership or employment part of the survey.

person-business level. Specifically, individuals are classified as business owners based on the 2010-2012 waves. Individuals who are not business owners enter the sample only once. Individuals who are business owners have an entry per business reported. If a person reports one business – she enters once. If a person reports two businesses, she enters twice. Data on starting capital etc. is per entry. So if a person reports two businesses one incorporated and another unincorporated, we use the relevant details for each business separately.

Table I shows that the human capital traits of employees and the self-employed are similar. Employees and the self-employed in 2010 and 2012 have, on average, virtually the same number of years of education (13.8 v. 13.7), and the same proportion of college graduates (29% v. 28%). Since wages reflect human capital, we consider people who are employees and self-employed in 2010 and 2012 and compare their salaried earnings when they were 25-29 year old. As shown, employees and the self-employed had almost identical salaried wages, on average, when they were 25-29 years old: 2.35 for employees and 2.39 for the self-employed. We also compare measures of the cognitive abilities and personality traits of individuals before they entered the prime age workforce. We find that the differences between employees and the self-employed are small, though the self-employed have slightly higher AFQT scores and self-esteem values, and slightly lower Locus of control measures. For example, there is only a 2.2 percentile point difference in average AFQT scores between employees (49.2) and the self-employed (51.4). Thus, although influential models of entrepreneurship emphasize the unique human capital of entrepreneurs, the self-employed and salaried employees have remarkably similar attributes.

Table I also hints at an explanation of this human capital puzzle: There are two distinct types of self-employed individuals, those who tend to engage in entrepreneurial activities (Incorporated) and those who do not (Unincorporated), and these two types of self-employed have very distinct human capital characteristics. The incorporated have, on average, more years of education, a much greater likelihood of graduating from college, and earn much more per hour than both the unincorporated self-employed and salaried employees. In contrast, the unincorporated have lower levels of each of these human capital indicators than salaried

employees and incorporated business owners. There are also large differences in AFQT, Self-esteem, and Locus of control. For example, the incorporated have AFQT scores that are, on average, 11.5 percentile points greater than the unincorporated and 10.6 percentile point greater than salaried workers, while the unincorporated have the lowest AFQT scores across employment types. Thus, while salaried employees have similar human capital to the aggregate group of self-employed, entrepreneurs have much greater human capital, on average, than salaried workers, while other self-employed have much less. Aggregation may account for the human capital puzzle.

II.C. Patterns: Starting capital

Table I also documents that the median self-employed individual (a) starts the business with less than $3,5000 and (b) has no employees. This is consistent with the findings of Evans and Leighton (1989), Hurst and Lusardi (2004), Hurst and Pugsley (2011), and Levine and Rubinstein (2017): most businesses are one-person, retail operations that provide routine, manual services, such as landscaping, house cleaning, handyman services, etc. Indeed 17% of the self-employed indicate that no capital was needed to start their businesses. These observations on starting capital further motivate the question raised by the findings in Hurst and Lusardi (2004): Do liquidity constraints represent a high entry barrier for many potential entrepreneurs?

The notable differences between entrepreneurs and other self-employed may also account for this liquidity puzzle. Table I indicates that the median starting capital for an unincorporated business is about $2,000, but it is almost $20,000 for incorporated businesses. While 21% of individuals report needing no capital to start an unincorporated business, only 5% of incorporated business owners respond similarly. Also note, that the average incorporated business has more than ten-times the number of employees as an average unincorporated business. There are also pronounced differences in wealth. The total wealth of the unincorporated self-employed is, on average, about $70,000, of which $19,500 is home wealth. In contrast, the overall wealth of incorporated business owners is almost $160,000, of which

$32,000 is home wealth. These notable differences in collateral and starting capital suggest that aggregating the incorporated and unincorporated self-employed might yield misleading information on the degree to which liquidity constraints limit entry into entrepreneurship.

The differences between entrepreneurs and other self-employed with respect to starting capital are even more pronounced when analyzing quartiles. Figure I depicts the amount of starting capital at each quartile of the starting capital distribution. This is done separately for the aggregate group of self-employed, the incorporated, and the unincorporated. Thus, the starting capital of the fourth quartile of the incorporated self-employment distribution is almost $275,000. The figure shows that for three-quarters of the distribution of unincorporated businesses owners, exceedingly little capital was used to start their businesses. This further emphasizes the potential pitfalls of aggregating the incorporated and unincorporated.

II.D. Discussion

Table I and Figure I document that contrary to influential theories, salaried employees and self-employed individuals have similar human capital characteristics and most businesses start with little or no capital. The data also suggest a strategy for resolving these puzzles: There are material differences between incorporated and unincorporated self-employed and their businesses. Thus, we now develop a three-sector Roy model to explore the selection of individuals on human capital and liquidity into entrepreneurship and other forms of self-employment. Below, we empirically evaluate the predictions emerging from the model.

III. MODEL

III.A. Framework

Each individual chooses one of three employment types: Self-employment (*U*), salaried employment (*S*), or entrepreneurship (*E*). Individual *i* then receives income I_{Ji} from working in employment type *J*, where *J* is *U*, *S*, or *E*. Individuals sort into employment types to maximize utility, where the utility of individual *i* in employment type *J* is a function of income and non-pecuniary benefits (δ_{Ji}):[5]

$$V_{Ji} = I_{Ji} * e^{\delta_{Ji}}, \tag{1}$$

where non-pecuniary benefits are defined relative to salaried employment, so that $\delta_{Si} = 0$. We first derive the model with risk neutral individuals, as in EJ, and then extend the model to allow for risk aversion.

Individuals are endowed with human capital, consisting of (1) entrepreneurial ability (θ_i) and (2) other employment specific skills (ε_{Ji}) that are uncorrelated with entrepreneurial ability. Without loss of generality, we assume that $\varepsilon_{Ei} = 0$ and $\bar{\varepsilon}_J > 0$, for *J*=*S* or *U*.

Human capital skills are not equally productive across employment types. Specifically, the effective human capital of individual *i* in employment type *J* (H_{Ji}) is

$$H_{Ji} = \theta_i^{\rho_J} * e^{\varepsilon_{Ji}}, \tag{2}$$

where the effective human capital of entrepreneurial ability in employment type *J* is represented by ρ_J, so that it is natural to set $\rho_E = 1$. While EJ assume that $\rho_S = 0$, we relax this assumption and allow abilities that are useful for entrepreneurship to also be productive in salaried employment. Thus, we assume that $\rho_U < \rho_S \leq 1$, and without further loss of generality, set $\rho_U = 0$.[6] We evaluate these assumptions empirically below. Thus, the effective human capital of

[5] For example, the non-pecuniary benefits of self-employment could reflect preferences to be one's "own boss," as emphasized by Hurst and Pugsley (2011).

[6] This assumption is consistent with the findings in Levine and Rubinstein (2017). They show that the pecuniary returns to human capital skills that are crucial for entrepreneurial success (e.g., learning aptitude scores) are greater in salaried employment than in other forms of self-employment activities, suggesting that $\rho_S > \rho_U$. Given this assumption, setting $\rho_U = 0$ is just a simplifying normalization that does not affect the analyses. In the model, if

individual *i* in salaried employment is increasing in (a) the person's job-specific skills in salaried work (ε_{Si}), (b) the persons entrepreneurial ability (θ_i), and (c) the degree to which entrepreneurial ability is productive in salaried employment (ρ_S).

An individual choosing employment type *U* or *S* earns

$$I_{Ji} = H_{Ji}, \tag{3}$$

which expressed as log earnings is

$$LnI_{Ji} = \rho_J ln\theta_i + \varepsilon_{Ji}. \tag{4}$$

Individuals engaged in entrepreneurship combine entrepreneurial ability and physical capital (*K*) to produce output (*Y*) using a similar production function as in EJ:

$$Y_i = H_{Ei}K_i^{\alpha}\nu_i = \theta_i K_i^{\alpha}\nu_i, \tag{5}$$

where $0 < \alpha < 1$ and ν_i is a lognormal disturbance that reflects an independent and identically distributed productivity shock, where $E[\nu_i] = 1$. As in Lucas (1978), Jovanovic (1982), EJ, and many others, entrepreneurs with more entrepreneurial ability have, ceteris paribus, larger average and marginal products of capital at each level of capital.

Net returns from entrepreneurship, i.e., entrepreneurial earnings (I_{Ei}), equal

$$I_{Ei} = \theta_i K_i^{\alpha}\nu_i - r_i K_i, \tag{6}$$

where the price of output is one and the gross cost of capital (r_i)—one plus the interest rate—is heterogeneous across individuals and greater than one. For now, we simply take r_i as given. In particular, we assume individuals are endowed with exogenously given assets and when these assets are used as collateral to finance *K*, they reduce the cost of capital. This is a bit different from EJ, where collateral determines how much an individual can borrow. In our model, collateral influences the cost of capital and endogenously influences the optimal capital stock and hence borrowing.

$\rho_S = 0$, then there is no unique level of entrepreneurial skill at which individuals are indifferent between self-employment and salaried work.

The K_i that maximizes expected entrepreneurial earnings (K_i^*), given θ_i and r_i, is

$$K_i^* = (\theta_i \alpha / r_i)^{1/(1-\alpha)}, \tag{7}$$

and the log of expected entrepreneurial earnings at this maximum is therefore:

$$lnI_{Ei}^* = \rho_E' ln\theta_i + \alpha\rho_E' \ln\left(\frac{\alpha}{r_i}\right) + \ln(1-\alpha), \tag{8}$$

where $\rho_E' = \left(\frac{1}{1-\alpha}\right)$.

Notice the following about entrepreneurial earnings. First, entrepreneurial earnings (and the optimal capital stock) are increasing in entrepreneurial ability (θ_i) and decreasing in the cost of capital (r_i). Second, the elasticity of entrepreneurial earnings with respect to entrepreneurial ability is greater than one, i.e., $\rho_E' > 1$. This reflects the endogeneity of capital to entrepreneurial ability: Higher θ_i not only increases the returns to entrepreneurship at each level of capital, it increases the returns to increasing the capital stock. Third, comparing equations (4) and (8), the returns to entrepreneurial ability in entrepreneurship are larger than the returns to entrepreneurial ability in salaried employment even when $\rho_S = 1$ because of the complementarity between entrepreneurial ability and physical capital.

III.B. Selection into employment types

Individuals select into employment types by comparing expected utility levels. For other self-employment and salaried work, the log of expected utility is:

$$lnV_{Ji} = \rho_J ln\theta_i + \varepsilon_{Ji} + \delta_{Ji}, \text{ for } J = U \text{ or } S, \tag{10.1}$$

and for entrepreneurship, the log of expected utility is:

$$lnV_{Ei} = \rho_E' ln\theta_i + \alpha\rho_E' \ln\left(\frac{\alpha}{r_i}\right) + \ln(1-\alpha) + \delta_{Ei}. \tag{10.2}$$

In comparing the logs of expected utilities across employment types, first consider human capital. Utility in entrepreneurship rises faster in θ_i than utility rises in either other self-employment or salaried work. This holds even when $\rho_S = \rho_E = 1$ because of the

complementarity between entrepreneurial ability and physical capital. Furthermore, note that the log of expected utility in salaried employment (lnV_{Si}) reflects both human capital that is specific to salaried employment (ε_{Si}) and entrepreneurial human capital ($\rho_S ln\theta_i$). Ceteris paribus, therefore, while increases in ε_{Si} boost the relative utility of salaried employment, increases in $ln\theta_i$, even when $\rho_S = 1$, increase the relative utility of entrepreneurship. Second, as shown in equations (10.1 – 10.2), the cost of capital influences the utility of entrepreneurs, but not the utility of those working in other employment types. Liquidity constraints have the biggest adverse effects on those with the most entrepreneurial human capital. Finally, other human capital endowments (ε_{Ji}) and preferences (δ_{Ji}) directly shape the relative utility of different employment types.

We now derive the cutoff levels of entrepreneurial ability that lead individuals to select into self-employment, salaried employment, or entrepreneurship. We derive these cutoff levels of $ln\theta_i$ as functions of the cost of capital (r_i), non-entrepreneurial human capital skills (ε_{Ui} and ε_{Si}), and preferences (δ_{Ji}). In particular, define $ln\theta_{Si}$ as the level of $ln\theta_i$ such that below $ln\theta_{Si}$, the individual selects into other self-employment and at $ln\theta_{Si}$, the individual is indifferent between other self-employment and salaried work. Setting lnV_{Ui}= lnV_{Si}, and solving for $ln\theta_{Si}$ yields:

$$ln\theta_{Si} = \frac{\delta_{Ui}+(\varepsilon_{Ui}-\varepsilon_{Si})}{\rho_S}. \quad (11.1)$$

Individuals with stronger preferences for self-employment (e.g., people who like being their own boss) will have higher $ln\theta_{Si}$ cutoff values than otherwise similar individuals. Furthermore, in economies with higher values of ρ_S, $ln\theta_{Si}$ is lower, indicating that fewer individuals sort into other self-employment (*U*). Finally, note that if there are insufficient pecuniary (ε_{Ui}) and nonpecuniary returns (δ_{Ui}) to *U*, individuals will not sort into *U*.

We also derive the cutoff level of entrepreneurial ability such that above this level ($ln\theta_{Ei}$), individuals select into entrepreneurship and at this level, individuals are indifferent between salaried employment and entrepreneurship:

$$ln\theta_{Ei} = -\frac{\alpha\rho_E' \ln(\alpha/r_i)+\ln(1-\alpha)+(\delta_{Ei}-\varepsilon_{Si})}{\rho_E'-\rho_S}. \quad (11.2)$$

Equation (11.2) indicates that individuals with higher r_i require more entrepreneurial ability to enter entrepreneurship than similar individuals with lower capital costs.[7] Thus, the cost of capital shapes selection into entrepreneurship, but it does not shape selection into other forms of self-employment as r_i does not appear in (11.1). Equation (11.2) also indicates that individuals with greater salaried-specific human capital (larger ε_{Si}) or those receiving less utility from entrepreneurship (smaller δ_{Ei}) will require greater entrepreneurial skills to select into entrepreneurship.

Figure II illustrates the relationship between the log utility in each employment type and $ln\theta$. The horizontal line represents the log utility of other self-employment (lnV_{Ui}) and equals $\varepsilon_{Ui} + \delta_{Ui}$. The dashed upward sloping line is the log utility of salaried employment (lnV_{Si}), where the slope is ρ_S. lnV_{Si} intersects lnV_{Ui} at the first cutoff level of entrepreneurial ability: $ln\theta_{Si}$. The solid upward sloping line is the log utility of entrepreneurship (lnV_{Ei}), where the slope is ρ_E' and where lnV_{Ei} intersects lnV_{Si} at the second cutoff level: $ln\theta_{Ei}$.

Figure II illustrates how human capital and liquidity constraints shape selection into different employment types. On human capital, entrepreneurs are positively selected on entrepreneurial ability, but the other self-employed are negatively selected on $ln\theta_i$. Consistent with this prediction, Levine and Rubinstein (2017) show that entrepreneurs (as proxied by the incorporated self-employed) score higher on learning aptitude tests as youths, attain higher education levels, and perform tasks (even when they were salaried employees) demanding more creative and analytically-challenging cognitive skills and less manual skills than salaried workers. The opposite holds for the other self-employed as proxied by the unincorporated self-employed).

[7] Given the modeling assumptions, $ln\theta_{Ei} > 0$ unless δ_{Ei} is exceptionally large. We already defined the conditions under which $ln\theta_{Si} > 0$. The additional conditions under which $ln\theta_{Ei} > ln\theta_{Si}$ are that (i) individuals do not have preferences for self-employment or entrepreneurship that are so strong that they dominate the increasing pecuniary returns to salaried work and entrepreneurship associated with entrepreneurial ability or that (ii) self-employment skills are not so valuable that they overwhelm the increasing returns to entrepreneurial ability in entrepreneurship.

On liquidity constraints, Figure III indicates that r_i shapes entry into entrepreneurship, but not into self-employment. In particular, increases in r_i shift downward the intercept of the line for the log utility of entrepreneurship, constraining entry into entrepreneurship. Changes in r_i, however, do not alter the intercepts or slopes of the other lines and therefore liquidity constraints do not affect entry into self-employment.

III.C. Testable implications and discussion

The model yields testable implications with respect to the impact of human capital, liquidity, and the business cycle on entrepreneurship and self-employment.

First, there is negative selection on salaried wages and entrepreneurial ability into the U-form of self-employment, but positive selection into entrepreneurship on entrepreneurial ability—and possibly on salaried wages when there is a sufficiently strong connection between ability as a salaried worker and an entrepreneur.

This is illustrated in Figure II: individuals with entrepreneurial abilities above $ln\theta_{Ei}$ have better salaried job opportunities and even better entrepreneurial opportunities than otherwise similar people with lower entrepreneurial abilities. The opposite is true of people who sort into the U-form of self-employment. Ceteris paribus, it is people with lower entrepreneurial abilities and hence people with comparatively low-paying salaried options, who choose the U-employment type. As for selection into entrepreneurship on salaried wages, this depends on the importance of entrepreneurial abilities in paid-employment. For example, in an economy where only one skill determines people's productivity in both salaried employment and entrepreneurship, people with the best salaried job opportunities become entrepreneurs. As illustrated in Figure II, for $\rho_S = 1$ and $\varepsilon_s = 0$, all other things equal, the most productive salaried workers become entrepreneurs. Yet, when entrepreneurial abilities are not very useful in paid-employment (low ρ_S), then there can be negative selection on salaried wages.

The second testable implication is that entrepreneurs are negatively selected on the cost of capital, but the other self-employed are not. As illustrated in Figure III, an increase in the cost

of capital implies a parallel drop in the line representing the log utility of entrepreneurship (lnV_{Ei}). This implies a reduction in selection into entrepreneurship but has no effect on selection into other forms of self-employment.

A third testable implication involves the cyclicality of entrepreneurship and self-employment. In the context of our model, we characterize the manifestation of aggregate fluctuations as changes in both the demand for salaried employees and the severity of liquidity constraints. For example, we characterize recessions as a simultaneous reduction in labor demand and a tightening of credit constraints. This is illustrated in Figure IV. As just discussed, the tightening of liquidity constraints involves a parallel fall in the log utility of entrepreneurship line. As shown, this tightening reduces selection into entrepreneurship but has no effect on entry into other forms of self-employment, i.e., the liquidity effect exerts a procyclical influence on entrepreneurship, but not on other self-employment. With respect to labor demand, a reduction in the demand for salaried employees implies a parallel drop in the line depicting the log utility of salaried employment (lnV_{Si}). The labor demand effect is countercyclical for both types of self-employment. Thus, the model (a) yields ambiguous predictions about the cyclicality of entrepreneurship but (b) unambiguously predicts that entry into other form of self-employment is countercyclical.

These three implications of the model are unique in that other models of entrepreneurship do not distinguish between entrepreneurs and other self-employed individuals and therefore do not derive predictions regarding the contrasting selection of individuals into entrepreneurship and other forms of self-employment. The model explains why aggregating these two groups and calling the combined group “entrepreneurs” can lead to mis-leading perspectives on entrepreneurship. Finally, the model’s prediction that entrepreneurs have higher salaried employment options than salaried workers (holding everything except entrepreneurial ability constant) is different from EJ, where wages are uncorrelated with entrepreneurial earnings.

III. D. Extension: Risk aversion

We now modify the model to allow for risk averse individuals. In particular, consider the constant relative risk aversion utility function:

$$V_{Ji} = -\exp\{-\tau_i I_{Ji} * e^{\delta_{Ji}}\}, \tag{1'}$$

where τ_i represents individual *i*'s risk aversion, as defined by $-V_i''/V_i'$. Equation (1') converges to the risk neutral utility function defined by equation (1) as $\tau_i \to 0$. Furthermore, we slightly modify the specification of the shock to productivity, so that

$$Y_i = \theta_i K_i^{\alpha}(1 + \nu_i'), \tag{5'}$$

where ν_i' is a zero mean, normally distributed shock to productivity. Assuming that the variance of output is $\sigma_Y^2 = \sigma^2 \theta K^{\alpha}$– so that, the variance of aggregate output does not change if a firm is split into two or more firms, then the variance of ν_i' equals $\sigma_Y^2/\theta K^{\alpha}$.

Thus, expected utility in entrepreneurship is:

$$E\{V_{Ei}\} = -\exp\{-\tau_i[\theta_i K_i^{\alpha} - r_i K_i - \theta_i K_i^{\alpha}\,(\sigma^2/2)]\},$$

where, for simplicity, we have set $\delta_{Ei} = 0$. Exploiting the observation that the certainty equivalent earnings from entrepreneurship is $I_{Ei}' = \theta_i K_i^{\alpha}(1 - \tau_i\,(\sigma^2/2)) - r_i K_i$, the optimal capital stock for entrepreneur *i* is:

$$K_i^* = (\theta_i \gamma_i \alpha / r_i)^{1/(1-\alpha)}, \tag{7'}$$

where $\gamma_i = (1 - \tau_i\,(\sigma^2/2))$, so that γ_i is increasing in risk tolerance and decreasing with risk.

The log of the certainty equivalent earnings from entrepreneurship, $ln\{I_{Ei}'\}$, evaluated at the optimal capital stock is then given by:

$$ln\{I_{Ei}'\} = \rho_E' ln\theta_i + \rho_E' Ln(\gamma_i) + \alpha\rho_E' \, Ln\left(\frac{\alpha}{r_i}\right) + Ln(1-\alpha). \tag{10.2'}$$

Furthermore, it is important to note since there is no income uncertainty associated with salaried employment or (non-entrepreneurial) self-employment, expected utilities from these employment types are the same as specified above.

Allowing for risk aversion, therefore, yields the following insights. First, the core predictions from the risk neutral specification hold: (1) entrepreneurs are positively selected on entrepreneurial ability ($ln\theta_i$) and on salaried wages (as salaried wages vary positively with $ln\theta_i$), but other self-employed individuals are negatively selected on salaried wages and (2) entrepreneurs are negatively selected on the cost of capital but other self-employed individuals are not. Second, risk aversion reduces the optimal capital stock—and hence the efficiency of entrepreneurial activity. In particular, the optimal capital stock reflects the interaction between ability (θ_i) and noncognitive attitudes toward risk (γ_i). This interaction suggests that effective entrepreneurial human capital is a mixture of narrowly defined entrepreneurial ability and the noncognitive traits that allow individuals to exercises those skills. Thus, the most successful entrepreneurs might not be those with the most entrepreneurial ability, e.g., if risk tolerance (τ) and entrepreneurial ability (θ) are negatively correlated.[8] This is akin to the combination of "smart and illicit" traits emphasized by Levine and Rubinstein (2017), where illicit capture attitudes toward breaking from the norm, undertaking novel endeavors, and investing in risky ventures. In the remainder of this paper, we focus on the risk neutral case and evaluating its predictions and show that the results are robust to controlling for other preferences and characteristics associated entrepreneurship.

IV. STATISTICAL MODEL

As discussed above, it is puzzling that existing theoretical models emphasize the crucial roles of both human capital and liquidity constraints in shaping selection into entrepreneurship, but existing empirical research finds that (1) it takes very little capital to start most U.S. businesses and (2) the aggregate group of self-employed and business owners have very similar human capital traits and earnings as their salaried counterparts. Our model suggests that these findings might reflect the aggregation of entrepreneurs and other self-employed into one

[8] Note that selection on entrepreneurial ability might vary across industries if σ^2 differs across industries.

category when selection into these employment types differs systematically on human capital traits, labor market skills, and liquidity constraints.

In this section, we take the theoretical model from section III and derive estimable equations that will allow us to identify statistically and quantify empirically the roles of human capital traits, paid-employment prospects, and liquidity in shaping selection across employment types and entry into entrepreneurship. In moving from the model toward an estimable equation we need proxies for entrepreneurial traits, paid-employment prospects and liquidity constraints. First, with respect entrepreneurial traits, we follow Levine and Rubinstein (2017) and use measures of cognitive and non-cognitive traits that are collected early in life. They show empirically that the interaction between cognitive and non-cognitive traits ("smart and illicit") shapes selection into entrepreneurship and success as an entrepreneur. Consistent with these findings, our model highlights the non-separability of abilities and attitudes in selection into entrepreneurship. Thus, we use the Levine and Rubinstein (2017) measures in our empirical analyses below. Second, we further exploit the observation that almost all individuals work as paid-employees before becoming business owners and use these early career wages to proxy for potential wages later in life. Third, on liquidity constraints, we note that home equity is frequently used as collateral to obtain loans. Thus, we use home equity as a proxy for collateral and hence the cost of capital facing an individual.

Assuming that the cost of capital for individual *i* diminishes with the person's collateral (C_{it}) in the following form $\alpha/r_{it} = \exp(\kappa C_{it})$, then the probability that individual *i* prefers entrepreneurship or other forms of self-employment to salaried employment is:

$$P(V_{Jit} > V_{Sit}) = P(\beta_{JW} W_i + \beta_{JSI} SIL_i + \beta_{JC} C_{it} + \beta_{JX} X_{it} > \eta_{Sit} - \eta_{Jit}). \quad (11)$$

W_i represents person *i's* potential salaried wages. As discussed further below, we proxy for W_i using person *i*'s early career wages, i.e., wages between the ages of 25 and 29. SIL_i represents the interaction between the cognitive ability ("smart") and non-cognitive attitudes ("illicit") of

individual *i*.[9] C_{it} represents the collateral of person *i* at time *t*, which we proxy with the equity value of the person's home, which we describe in greater detail below. X_{it} is a vector of observable characteristics, including demographics, schooling and early measures of cognitive and non-cognitive traits, that might influence choices via other reason. The error term (η_{Jit}) combines person-specific shocks to productivity in employment type *J* in period *t* and taste, $\eta_{Jit} = \varepsilon_{Jit} + \delta_{Jit}$. This directly motivates an estimable multinomial logit regression:

$$Ln(P_{Jit}/P_{Sit}) = \beta_{JW}W_i + \beta_{JSI}SIL_i + \beta_{JC}C_{it} + \beta_{JX}X_{it}, \quad (12)$$

where the dependent variable is the log-odds ratio of the probability of person *i* being an entrepreneur (*J=E*) or other self-employed (*J=U*), that is (P_{Jit}), rather than a salaried worker (P_{Sit}) at time *t*.

There are three reduced form parameters of interest: selection on (i) "smart and illicit" (β_{JSI}), on (ii) salaried wages (β_{JW}) and on (iii) collateral (β_{JC}). The model yields unambiguous predictions about collateral: $\beta_{UC} = 0$ and $\beta_{EC} > 0$; that is, collateral does not shape directly barriers associated with becoming a salaried worker or other self-employed individual, but collateral lowers the costs of becoming an entrepreneur. The model yields unambiguous predictions about the mixture of cognitive and non-cognitive traits: $\beta_{USIL} < 0$ and $\beta_{ESIL} > 0$; that is, the model predicts that smart and illicit traits are negatively associated with entry into other self-employment (the U-employment type) and positively associated with selection into entrepreneurship. With respect to wages, the model unambiguously predicts that $\beta_{UW} < 0$; increases in wages increase the utility of salaried employment relative to other self-employment. The model, however, generates ambiguous predictions with respect to β_{EW}. To the extent that wages are higher because the individual has higher salaried-specific skills, then $\beta_{EW} < 0$, as wages rise but entrepreneurial earnings do not. Yet, *Smart & Illicit* might not fully capture a person's entrepreneurial effective abilities. In this case we should expect to find positive

[9] Levine and Rubinstein (2017) discover that the combination of "smart" (AFQT) and "illicit" tendencies (aggressive, risk-taking, disruptive, "break-the-rules" behaviors) helps explain who becomes a successful entrepreneur.

selection into entrepreneurship on wages ($\beta_{EW} > 0$) if entrepreneurial skills are also useful in paid employment (high ρ_S).[10]

V. EMPIRICAL RESULTS: TALENT, WEALTH, AND ENTREPRENEURSHIP

In this section, we empirically evaluate the effect of human-traits, early career wages and collateral on selection into entrepreneurship, salaried employment, and other self-employment.

V.A. Section on wages and home wealth

We begin by examining differential selection into entrepreneurship and unincorporated self-employment on cognitive and non-cognitive skills, early careers wages and collateral. Based on equation (12), we focus on estimating the multinomial logit regression:

$$Ln(P_{Jit}/P_{Sit}) = \beta_{JW}W_i + \beta_{JSI}SIL_i + \beta_{JC}C_{it} + \beta_{JX}\boldsymbol{X}_{it}, \qquad (12')$$

where the dependent variable is the log-odds ratio of being incorporated (*J=E*) or unincorporated (*J=U*) rather than a salaried worker and the other terms are defined above. In Table II, we provide the multinomial logit results on unincorporated and incorporated self-employment (columns 2-3), where we do not report results on other self-employment categories such as unpaid family and nonprofit businesses. In column 1, we also provide the results from a logit regression in which the dependent variable is an indicator variable that equals one if the individual is self-employed (either incorporated or unincorporated) in year *t* and zero otherwise.

The key explanatory variables are as follows. For W_i, we use *Wages (25-29)*, which equals log hourly salaried earnings when the individual was 25-29 years. For SIL_i, we use *Smart & Illicit*, which equals one if an individual has both above the NLSY79 sample median of *AFQT*

[10] Appendix Table II evaluates and confirms this assumption. In particular, we regress log hourly wages of individual *i* in year *t* on the average log hourly salaried earnings of the individual between the ages of 25 and 29 (Wages (25-29)) while conditioning on Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), as well as race, gender, year, and state fixed effects. We run this regression separate for individuals by their employment type in year t. As shown, the results are consistent with the assumption used in out statistical model: Early career salary wages are positively related to later entrepreneurial earnings (and salaried wages) but not to the earnings of the unincorporated self-employed.

and *Illicit* and zero otherwise. For C_{it}, we use *Home Wealth(t-2),* which equals the market value of the individual's home (if any) minus mortgages on the house divided by $100,000 two year before period *t*. For ***X***, we use an assortment of controls that are not reported in the tables. Specifically, all regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories),[11] measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), as well as gender-year, race-year, and state fixed effects. Since the data on home wealth begins in sample year 1985 and we restrict the sample to individuals with data on home wealth in *t-4*, the sample starts in 1989. The sample also excludes individuals who were self-employed in either *t-2* or *t-4*. The table provides heteroskedasticity robust standard errors that are clustered at the individual level.

Consistent with the model's predictions, the results reported in Table II indicate positive selection into incorporated self-employment on early career wages and negative selection into unincorporated self-employment on those salaried earnings. *Wages (25-29)* enters positively and significantly when examining selection into incorporated self-employment but negatively and significantly when assessing entry into unincorporated self-employment. The economic magnitudes are substantial. Using the estimates from the multinomial logit regressions, consider two people: a high early-career wage earner, where *Wage (25-29)* is 25% above the sample median and a low early-career wage earner, where *Wage (25-29)* is 25% below the sample median. The coefficient estimates suggest that the odds of the high early-career wage earner switching from salaried work into incorporated business ownership next period are approximately 17% greater than the low early-career wage worker (1.17=exp(0.5*0.3139)). Similarly, the estimated coefficients indicate that the odds of the low early-career wage earner switching from salaried work into unincorporated self-employment next period are 20% greater than the high early-career wage worker (1.2=exp(0.5*0.3713)). Table II also highlights the

[11] The six educational attainment categories are: (i) high school dropouts: less than 12 years of schooling (ii) GED degree (iii) high school graduates: 12 years of schooling (iv) had some college education: 13-15 years of schooling (i) college education: 16 years of schooling (vi) advanced studies: 17+ years of schooling. Potential work experience (pwe) equals age minus years of schooling minus six (or zero if this computation is negative). The quartic includes pwe, pwe^2, pwe^3, and pwe^4.

pitfalls of using the aggregate group of self-employed business owners. As shown in column (1), there is negative selection into aggregate self-employment on early career wages, which masks the differential selection into entrepreneurship and unincorporated self-employment.

Also consistent with the model's predictions, we find positive selection into incorporated self-employment on collateral, but no link between collateral and entry into unincorporated self-employment. That is, *Home Wealth(t-2)* enters positively, significantly, and with an economically large coefficient when examining incorporated self-employment but enters with a small, insignificant coefficient when examining unincorporated self-employment. With respect to the economic size of the estimated coefficients, consider a high-collateral and low-collateral person, where the high-collateral person has $50,000 of additional home wealth in year *t-2* than the low-collateral person. The coefficient estimates suggest that the odds of the high-collateral person switching into incorporated business ownership next period from salaried employment this period) are 6.5% greater than the low-collateral person (=exp(0.5*(0.1607-0.0344)).

The findings on *Smart & Illicit* are also consistent with the model and the findings in Levine and Rubinstein (2017). Like *Wages (25-29), Smart & Illicit* is positively associated with entry into entrepreneurship but negatively associated with entry to unincorporated self-employment. To the extent that *Smart & Illicit* is an additional proxy for effective entrepreneurial abilities that is imperfectly correlated with *Wages (25-29),* these results are fully in line with the model's broad predictions. That is, the combination of strong analytical skills and break-from-the-norm, risk-tolerant preferences is positively associated with expected success and hence entry into entrepreneurship. However, these *Smart & Illicit* traits are not productive, even counterproductive, for undertaking the manual-skills-based self-employment activities associated with unincorporated self-employment.

V.B. Section on wages and home wealth: Individual fixed effects and a falsification test

We next address the concern that omitted time-invariant individual traits drive the results on home wealth. For example, individuals from rich families might have many characteristics that facilitate entry into entrepreneurship. If home wealth is positively correlated with these other characteristics, the Table II results might lead us to conclude inappropriately that collateral shapes entry into entrepreneurship.

To address this concern in Table III, we first include individual fixed effects. In this way, we focus on whether changes in collateral are associated with selection into different employment types. Below, we implement a strategy for identifying the impact of collateral on selection into employment types below. Of course, including individual fixed effects will essentially eliminate *Wages (25-29)*, as it varies little over time.[12] When conducting these analyses with individual fixed effects, we use OLS, because the multinomial logit regressions did not converge. For comparison purposes, therefore, we also present the key earlier analyses from Table II using a linear probability model. Table III shows that the results are robust to conditioning on individual fixed effects. We continue to find positive selection into entrepreneurship on *Home Wealth(t-2)* but little relation between selection into unincorporated self-employment and *Home Wealth(t-2)*.

We also provide a falsification test in Table III. Instead of examining selection into employment types in period *t* on home wealth in period *t-2*, we examine selection into employment types in period *t* on future home wealth in period *t+2* (i.e., on *Home Wealth(t+2)*). If *Home Wealth(t-2)* captures changes in wealth that can be used as collateral to finance entry into entrepreneurship in year *t*, then the model predicts that *Home Wealth(t-2)* will be positively associated with entry into incorporated self-employment. We would not, however, expect that a change in future household wealth would influence past entry into entrepreneurship unless *Home Wealth(t+2)* is capturing something else about the evolving characteristics of the individual. The

[12] As noted in Section II, there is slight time variation in Wages (25-29) when individuals are 27-30 years old.

results from this falsification test, which are reported in Table III, are consistent with the view that (a) home wealth is positively related to collateral and (b) collateral is important for entering entrepreneurship. Specifically, when controlling for individual effects, we find positive selection into entrepreneurship on *Home Wealth(t-2)* but not on *Home Wealth(t+2)*.

V.C. The impact of home wealth on entry into self-employment

Although the results reported in Tables II and III indicate strong positive selection into entrepreneurship on wages and collateral and strong negative selection into unincorporated self-employment on wages, the analyses do not identify the impact of collateral on entry into entrepreneurship. In particular, lagged housing wealth, even when including individual effects, might not represent an exogenous source of variation in collateral if other time-varying factors shape both home wealth and entry into self-employment.

In this section, we use a Bartik-type instrumental variable to evaluate the impact of collateral on entry into incorporated and unincorporated self-employment. Building on the work in Hurst and Lusardi (2004), Coradin and Popov (2015), and Schmalz, Sraer, and Thesmar (2017), we use $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$, which equals the net value of the home owned by individual *i* in year *t-4* ($Home\ Wealth_{it-4}$) times the growth rate of home prices in the state in which the home is located from year *t-4* to year *t-1* ($g_{(t-4,t-1)}$). If the individual does not own a home in year *t-4*, $Home\ Wealth_{it-4}$ equals zero. Our identifying assumptions are that the value of a person's home in *t-4* and the growth rate in state housing prices between *t-4* and *t-1* are exogenous to the individual's decision in year *t* about switching into incorporated or unincorporated self-employment.

Our identification strategy has two advantages over previous authors. Since we have panel data, we (a) use individual fixed effects as discussed above and (b) conduct the analyses based on a person's home wealth in *t-4* and changes in the state's home values through period *t-1* in examining self-sorting into self-employment in period *t*.

We estimate the following benchmark multinomial logit model and report the results in Table IV:

$$Ln(P_{Jit}/P_{Sit}) = \beta_{JW}W_i + \beta_{JSI}SIL_i + \beta_{JC}Home\ Wealth_{ist-4} * g_{(t-4,t-1)} + \beta_{JX}\boldsymbol{X}_{it}, \quad (13)$$

where $\boldsymbol{X}$ includes $Home\ Wealth_{it-4}$ and $g_{(t-4,t-1)}$, as well as Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), gender-year, race-year, and state fixed effects. The dependent variable is the log-odds ratio of entry into either incorporated or unincorporated self-employment relative to not switching into self-employment. The sample includes individuals who were not self-employed in either *t-2* or *t-4*.

Before turning to the multinomial logit regressions, we begin by assessing—and validating—the "first-stage." That is, we evaluate whether $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$ predicts $HomeWealth_{it}$ after controlling for $HomeWealth_{it-4}$, $g_{(t-4,t-1)}$, Wages(25-29), and $\boldsymbol{X}$. We conduct these analyses using OLS in columns (1) and (2) of Table IV, where the column (2) regression includes individual fixed effects. As shown, $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$ enters positively and significantly at the one percent level, when controlling for lagged values of the individual's home wealth, the recent growth rate of home prices in the state, early career wages, and the array of control variables and fixed effects listed above.

We next examine entry into the aggregate group of incorporated and unincorporated self-employed individuals. For these analyses, we use a logit estimator since the dependent variable is a simple one-zero indicator variable. As shown in column (3), $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$ does not help account for entry into aggregate self-employment. This is consistent with findings that, on average, liquidity constraints do not account for entry into self-employment.

When distinguishing between the incorporated and unincorporated, we discover that collateral impacts entry into entrepreneurship but not into unincorporated self-employment. As shown in columns (5) and (6), $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$ enters positively and significantly when examining entry into incorporated self-employment but not when considering the odds of switching into unincorporated self-employment. The economic magnitudes are material. For example, consider two similar individuals, where each has $100,000 of home wealth in *t-4*. Let one live in a state where housing prices rise by 25% from *t-4* to *t-1* while the other resides in a state where housing prices stagnate. The coefficient estimates indicate that the odds that the

individual receiving the positive housing price shocks switches from salaried employment to incorporated self-employment in year *t* are 4% higher than the otherwise similar individual who did not receive this housing price boost (1.04=exp(0.25*0.1566)).[13]

We also conducted a falsification test, similar to the one presented in Table III, to address the concern that *Home Wealth(t-4)*g(t-4, t-1)* is capturing something else about an individual besides a shock to home wealth. If *Home Wealth(t-4)*g(t-4, t-1)* captures shocks to a person's collateral between year *t-4* and *t-1*, then we expect that (a) *Home Wealth(t-4)*g(t-4, t-1)* will positively influence selection into incorporated self-employment analyses in year *t* and (b) *Home Wealth(t-4)*g(t+1, t+4)* will not explain entry into entrepreneurship. That is, we would not expect that a shock to *future* household wealth would influence entry into entrepreneurship unless these future shocks *are c*apturing something else about the evolving characteristics of the individual. In Appendix Table III, we show that *Home Wealth(t-4)*g(t+1, t+4)* does not explain entry into entrepreneurship in period *t*. While shocks to wealth before period *t* explain entry into entrepreneurship, shocks to wealth after period *t* do not.

V.D. Entry into entrepreneurship: Entrepreneurial ability, capacity, and liquidity

Although we have focused on how entrepreneurial ability and wealth shape selection into different employment types, we now expand the notion of entrepreneurial talent to include the capacity to use narrow entrepreneurial skills to undertake entrepreneurial ventures. The theoretical model with risk aversion developed in Section III.D motivates this extension. In particular, the model with risk aversion predicts positive selection into entrepreneurship on the

[13] We were concerned that (a) state housing price growth might be correlated with changes in the state's overall economic conditions, (b) home wealth is correlated with other individual traits that independently shape entry into entrepreneurship, and (c) these other individual traits are sensitive to overall economic conditions. Under these conditions, $Home\ Wealth_{it-4} * g_{(t-4,t-1)}$ might proxy for the interactive impact of (non-home wealth) individual traits and changes in overall economic conditions on entry into entrepreneurship, so that the results in column (6) cannot be interpreted as the impact of collateral on the odds of switching into entrepreneurship. To address this concern, we controlled for shocks to overall economic conditions by including changes in the state unemployment rate (individual *i*'s state) between t-1 and t (Δ*Unemployment*), and its interaction with housing wealth in period *t-4* ($Home\ Wealth_{it-4}$*Δ*Unemployment*. The results hold.

interaction between entrepreneurial ability (θ_i) and noncognitive attitudes toward risk (γ_i). This interaction term represents effective entrepreneurial human capital—talent—as a mixture of narrowly defined entrepreneurial ability and the noncognitive traits that that give individuals the capacity to exercise those skills. In Levine and Rubinstein (2017), this conception of entrepreneurial talent was captured by the interaction of "smart" (*AFQT*) and "illicit" (aggressive, risk-taking, disruptive, "break-the-rules" behaviors). They found that the mixture of strong analytical skills and break-from-the-norm, risk-tolerant preferences was positively related to entry into entrepreneurship and success as an entrepreneur.

Our model suggests that early career wages—which we use as a proxy for entrepreneurial ability—should be most positively associated with selection into entrepreneurship among people with the capacity to use those entrepreneurial skills in entrepreneurial ventures. Our model, therefore, predicts that we should examine the *interaction* between *Wages (25-29)* and *Illicit* and that it should be this interaction term—and not *Wages (25-29)* or *Illicit*—that explains selection into entrepreneurship. The model also predicts that *Wages (25-29)*Illicit* will not account for selection into other forms of self-employment.

As shown in Table V, the results confirm these predictions. The analyses in Table V are the same as those in Table IV except that we also include *Wages (25-29)*Illicit*, where *Wages (25-29)* and *Illicit* were independently included in Table IV and are also included in Table V. There are two key findings. First, we confirm the results from Table IV: (a) shocks to collateral ($Home\ Wealth_{it-4} * g_{(t-4,t-1)}$) are positively associated with selection into incorporated self-employment but not into unincorporated self-employment. Second, and consistent with the extended theoretical model, we find that *Wages (25-29)* is positively associated with selection into incorporated self-employment only among individuals with above the median Illicit scores (i.e., *Illicit* = 1). Apparently, entrepreneurial ability is most strongly associated with selection into entrepreneurship among people with the noncognitive capacity to use those skills in entrepreneurial ventures.

VI. EMPIRICAL RESULTS: CYCLICALITY OF ENTREPRENEURSHIP

The model yields distinct predictions about the cyclicality of entrepreneurship and other forms of self-employment because the differential influences of the liquidity constraint and labor market components of business cycles. Specifically, the model indicates that as labor market opportunities worsen this will have a countercyclical effect on both types of self-employment: A deterioration of labor market opportunities induces more people to sort into both types of self-employment; and a boom in labor market opportunities attracts people out of both forms of self-employment and into salaried jobs. The liquidity constraint effect is different. A tightening of liquidity constraints in a recession discourages entry into entrepreneurship but has no effect on other forms of self-employment that require no capital. Thus, the model predicts (1) that other forms of self-employment are countercyclical and (2) entrepreneurship is procyclical when the liquidity constraint effect dominates the labor market effect. Under this condition, aggregating entrepreneurs and other self-employed individuals will hide the distinctive cyclical patterns of entrepreneurs.

VI.A. The cyclicality of entrepreneurship: Levels

To assess empirically the model's predictions, we document the basic cyclical patterns of salaried workers, the aggregate group of self-employed, the incorporated self-employed, and the unincorporated self-employed. To document these patterns, we use state unemployment rates to measure local economic conditions. The Bureau of Labor Statistics produces data on state unemployment for each month. We compute *Unemployment* as the average unemployment rate in an individual's state over the twelve months prior to the individual's interview with the NLSY79.

We estimate the following set of regression models using OLS:

$$E_{Jist} = \beta_J + \beta_{JU} Unemployment_{st} + \beta_{JX} \boldsymbol{X}_{it} + \varepsilon_{Jist}. \quad (14)$$

E_{Jist} is a binary indicator that equals one if person *i* from state *s* is observed in employment type *J* in time *t* and zero otherwise, where an individual's employment type can either be salaried, self-employed (and incorporated or unincorporated self-employed), not working, an unpaid family employee, or the owner of a non-profit organization.[14] $Unemployment_{st}$ is the unemployment rate of state *s* in year *t*. $\boldsymbol{X}_{it}$ is a vector of time-varying demographic and Mincerian traits that all regressions control for schooling (measured in six categories), potential work experience (quartic), gender-year, race-year, and state fixed effects. We also provide the results without (Panel A) and with (Panel B) individual fixed effects.

Table VI reports the coefficient estimates on state unemployment and also gives the mean of the dependent variables. For brevity, we provide the coefficient estimates for salaried workers, the aggregate group of self-employed, the unincorporated self-employed, and the incorporated self-employed. We do not report results on the other employment type categories. As shown in the column reporting the means of the dependent variables, the proportion of salaried workers, unincorporated self-employed, and incorporated self-employed in our sample are 80.7%, 6.8% and 1.5% respectively.

There are three key findings from Table VI: (1) entrepreneurship is procyclical, (2) unincorporated self-employment is countercyclical, and (3) aggregate self-employment is countercyclical when including individual fixed effects. As shown in Panel B, the state unemployment rate enters negatively and significantly when the dependent variable is incorporated self-employment, but enters positively and significantly when the dependent variable is either unincorporated self-employment or the aggregate group of self-employed. Thus, we both confirm the common finding that aggregate self-employment is countercyclical and document that entrepreneurship is procyclical.

The estimated magnitudes are economically large. Consider, for example, the estimates from the analyses controlling for individual fixed effects. The coefficient estimates indicate that

[14] The patterns also hold if we examine the extensive margin by using the number of hours that individual *i* from state *s* in year *t* works in each employment type *J* as the regressand.

a one-percentage point increase in the state unemployment rate (i.e., an increase of 0.01) is associated with a 1.10% drop in salaried employment relative to the average number of salaried workers (1.10%=[100*0.01*0.89]/0.807). The "elasticity" is much larger for incorporated and unincorporated self-employment. Relative to the average number of incorporated and unincorporated self-employed respectively, a one-percentage point increase in the state unemployment rate is associated with 4.16% increase in unincorporated self-employed and a 6.07% decrease in incorporated self-employment.[15]

VI.B. The cyclicality of entrepreneurship: First differences

In this subsection, we further exploit the longitudinal nature of the NLSY79 to account for omitted local-market year factors that might confound our ability to draw confident inferences about the reduced form relationship between business cycles and selection into entrepreneurship and other employment types.

In light of these concerns, we estimate the following net entry regressions and report the results in Table VII:

$$\Delta E_{Jist} = \gamma_J + \gamma_{J\Delta U}\Delta Unemployment_{st} + \gamma_{JX}\Delta \boldsymbol{X}_{it} + \upsilon_{Jist}, \quad (15)$$

where ΔE_{Jist} is the change into employment type *J* of individual *i* between periods *t-2* and *t*, so that ΔE_{Jist} equals +1 if the individual moves into employment type *J*; -1 if the person leaves type *J*; and 0 if the individual does not change designation with respect to employment type *J*. $\Delta Unemployment_{st}$ is the change in the state unemployment rate between year *t* and *t-1*. Thus, $\gamma_{J\Delta U}$ is the coefficient estimate on the relationship between a *change* in the state's unemployment rate and switches into and out of each employment type. As above, the regressions control for schooling, potential work experience, gender-year, race-year, and state fixed effects. We also provide the results without (Panel A) and with (Panel B) individual fixed effects.

[15] For the unincorporated, there is an increase of 4.16= (100*0.01*0.283)/0.068; and for the incorporated, there is a decrease of 6.07 = (100*0.01*0.091)/0.015.

Including state and individual fixed effects in these first differences regressions conditions out many potentially confounding factors. By controlling for state fixed effects, we control for state-specific trends in the probability that individuals select into or out of particular employment types. By controlling for individual fixed effects in these first differences regressions, we not only difference out individual effects, we control for individual trends in employment types.

As shown in Table VII, the results from the first differences analyses are consistent with the theoretical model's predictions and confirm the earlier findings on the cyclicality of entrepreneurship. Entrepreneurship is procyclical and unincorporated self-employment is countercyclical. The results highlight the importance of distinguishing between entrepreneurs and other types of self-employed individuals.

VII. CONCLUSIONS

In this paper, we addressed several gaps that have emerged between theories and empirical analyses of entrepreneurship. We begin by offering a new three-sector Roy model of selection into entrepreneurship, other businesses, and salaried employment on human capital and liquidity constraints. The model predicts that (1) entrepreneurs are positively selected on entrepreneurial talent, but the other self-employed are negatively selected on those same skills and traits, (2) entrepreneurs are positively selected on collateral, but entry into other forms of self-employment is unrelated to liquidity constraints., and (3) entrepreneurship is procyclical when business cycles exert a large effect on liquidity constraints, but other forms of self-employment are unambiguously countercyclical. Thus, the model suggests that existing puzzles concerning human capital, liquidity constraints, and the cyclicality of business starts might reflect the failure to distinguish between entrepreneurs and other self-employed individuals.

Consistent with the theoretical model, we discover that (1) the incorporated are positively selected on proxies for entrepreneurial talent, but the unincorporated are negatively selected on entrepreneurial talent, (2) collateral exerts a large, positive impact on entry into incorporated

self-employment, but collateral does not influence entry into unincorporated self-employment., and (3) entrepreneurship is procyclical, suggesting that business cycles have large liquidity effects, but other forms of self-employment are countercyclical. The results highlight the conceptual and empirical shortcoming of using the aggregate group of self-employed to assess selection into entrepreneurship as human capital and liquidity constraints shape entry into entrepreneurship very differently from entry into unincorporated self-employment.

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TABLE I
SUMMARY STATISTICS

		Legal Form of Business		
	Employed	Total	Unincorporated	Incorporated
Human capital				
AFQT	49.2	51.4	48.3	59.8
Self-esteem	0.05	0.09	-0.02	0.35
Locus of control	-0.05	-0.21	-0.13	-0.43
Illicit	-0.02	0.17	0.21	0.07
Smart & Illicit	0.18	0.20	0.16	0.28
Years of schooling	13.8	13.7	13.5	14.4
College graduate	29%	28%	24%	39%
Demogpraphics				
Female	49%	33%	37%	24%
Black	14%	11%	14%	5%
Hispanic	7%	5%	6%	4%
Wages:				
Wages (25-29)	2.35	2.39	2.32	2.57
Wealth				
Wealth	$49,939	$94,018	$69,017	$159,763
Home Wealth	$13,722	$22,982	$19,537	$32,007
Starting Capital				
Starting Capital (Mean)		$50,508	$35,715	$90,555
Starting Capital (Median)		$3,463	$2,033	$19,633
None needed		17%	21%	5%
Employees				
Employees (Mean)		2.7	0.7	8.2
Employees (Median)		0.0	0.0	2.0

Note: The table provides summary statistics on individuals and their businesses while differentiating by whether the person is not a business owners (Employed), a business owners (Total), and if the person is a business owners, the legal form of the business (Unincorporated or Incorporated). The data are from the 2010 and 2012 business ownership part of the NLSY79 survey. Individuals are classified as incorporated or unincorporated only if the legal form of the business from the business ownership part of the NLSY79 survey is confirmed by the individual employment type part of the survey. For the Sources of starting capital, the respondents indicate with each category was an actual component of the capital used to start the business. We examine full-time, full-year individuals. Appendix Table 1 provides variable definitions.

TABLE II
SELECTION ON WAGES AND HOME WEALTH: LOGIT AND M-LOGIT

	Logit	Multinomial Logit	
	Self Employed	Unincorporated	Incorporated
	(1)	(4)	(5)
Wages (25-29)	-0.1851***	-0.3713***	0.3139**
	(0.0587)	(0.0653)	(0.1491)
Smart & Illicit	-0.0861	-0.2683**	0.5198**
	(0.1198)	(0.1324)	(0.2628)
Home Wealth (*t-2*)	0.0654***	0.0344	0.1607***
	(0.0148)	(0.0246)	(0.0213)
Observations	93,755	93,755	93,755
R-Squared	0.0258	0.0912	0.0912

Notes: This table reports logit (columns 1) and multinomial logit (columns 2-3) analyses of selection into different employment types in year *t* on early career salaried wages (Wages (25-29)), Smart & Illicit (which is a zero-one indicator that equals one if the individual had above the median values of AFQT and Illicit in the initial years of the sample), and the net value of the individual's home in year *t-2* (Home Wealth (*t-2*)). In columns (1), the dependent variable is an indicator variable of whether the individual is self-employed (either unincorporated or incorporated) in year *t*. Columns (2-3) report the results of multinomial logit regressions, where we do not report the results on unpaid family and other business ownership categories. All regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), as well as gender-year, race-year, and state fixed effects. Since the data on home wealth begins in sample year 1985 and we restrict the sample to individuals with data on home wealth in *t-4*, the sample starts in 1989. The sample also excludes individuals who were self-employed in either *t-2* or *t-4*. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

TABLE III
SELECTION ON WAGES AND HOME WEALTH: OLS

	Self Employed			Unincorporated			Incorporated		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wages (25-29)	-0.0058***	-0.0036	-0.0039	-0.0074***	-0.0039	-0.0042	0.0015**	0.0003	0.0002
	(0.0020)	(0.0037)	(0.0037)	(0.0018)	(0.0035)	(0.0035)	(0.0008)	(0.0018)	(0.0018)
Smart & Illicit	-0.0027			-0.0074**			0.0046**		
	(0.0039)			(0.0034)			(0.0019)		
Home Wealth (t-2)	0.0025***	0.0018**		0.0003	0.0004		0.0022***	0.0013**	
	(0.0007)	(0.0008)		(0.0005)	(0.0006)		(0.0005)	(0.0005)	
Home Wealth (t+2)			0.0005			0.0001			0.0004
			(0.0008)			(0.0006)			(0.0005)
Individual FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	93755	93755	88448	93755	93755	88448	93755	93755	88448
R-square	0.0074	0.2545	0.2672	0.0073	0.2498	0.2623	0.0158	0.2454	0.2573

Notes: This table reports OLS analyses of selection into different employment types in year *t* on early career salaried wages (Wages (25-29)), Smart & Illicit (which is a zero-one indicator that equals one if the individual had above the median values of AFQT and Illicit in the initial years of the sample), and the net value of the individual's home in year *t-2* (Home Wealth (*t-2*)). As a falsification test, columns 3, 6, and 9, examine the net value of the individual's home in year *t+2 (Home Wealth (t+2)).* The dependent variable is a one-zero indicator variable of whether the individual is self-employed (columns 1-3), unincorporated self-employed (columns 4-6), or incorporated self-employed (columns 7-9) in year *t*. All regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), as well as gender-year, race-year, and state fixed effects. As indicated, all regressions, except those reported in columns 1, 4, and 7 include individual fixed effects. Since the data on home wealth begins in sample year 1985 and we require values of home wealth in t-4, the sample starts in sample year 1989. The sample also excludes individuals who were self-employed in either *t-2* or *t-4*. The sample if smaller in columns 3, 6, and 9 because the analyses require nonmissing values on Home Wealth in *t+2*. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

TABLE IV
SELECTION ON WAGES AND SHOCKS TO HOME WEALTH

	Home Wealth		Self-Employed	Unincorporated	Incorporated
	(OLS)	(OLS-FE)	(Logit)	(Multinomial Logit)	
	(1)	(2)	(3)	(5)	(6)
Wages (25-29)	0.1064***	0.0264	-0.1825***	-0.3637***	0.3143**
	(0.0138)	(0.0184)	(0.0585)	(0.0648)	(0.1496)
Smart & Illicit	-0.0371		-0.0853	-0.2718**	0.5244**
	(0.0310)		(0.1197)	(0.1322)	(0.2629)
Home Wealth(t-4)*g(t-4, t-1)	0.6265***	0.4883***	-0.0001	-0.0711	0.1566**
	(0.0748)	(0.0735)	(0.0482)	(0.0790)	(0.0769)
g(t-4, t-1))	0.3742***	0.3718***	0.2357	0.4295*	-0.8995*
	(0.0585)	(0.0595)	(0.2057)	(0.2231)	(0.5303)
Home Wealth (t-4)	0.7575***	0.4993***	0.0650***	0.0177	0.1679***
	(0.0246)	(0.0322)	(0.0163)	(0.0280)	(0.0228)
Observations	93755	93755	93755	93755	93755
R-Squared	0.5444	0.6475	0.0229	0.0867	0.0867

This table reports analyses of selection into different employment types in year t on Wages (25-29)), Smart & Illicit, and a Bartik instrument for changes in home wealth (Home Wealth(t-4)*g(t-4, t-1)), where Home Wealth(t-4) is the individual's net home wealth in year t-4, and g(t-4, t-1) is the growth rate in state housing prices between year t-4 and year t-1 for the state in which the individual lives. Columns (1-2) report OLS regressions in which the dependent variable is the individual's net home wealth in year t, were column (2) included individual fixed effects. In column (3), the dependent variable is a one-zero indicator variable of whether the individual is self-employed in year t. In columns (4-5), the dependent variable is a one-zero indicator of employment type, where the reported categories are unincorporated and incorporated respectively, and the unreported categories are salaried, unpaid family, and other business ownership. All regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Illicit, Rosenberg self-esteem, Rotter Locus of Control), as well as gender, race, year, and state fixed effects. Since the data on home wealth begins in sample year 1985 and we require values of home wealth in t-4, the sample starts in 1989. We exclude individuals who were self-employed in either t-2 or t-4. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively

TABLE V

SELECTION ON WAGES AND SHOCKS TO HOME WEALTH: DIFFERENTIATING BY ILLICIT

	Unincorporated (Multinomial Logit)	Unincorporated (Multinomial Logit)	Incorporated (Multinomial Logit)	Incorporated (Multinomial Logit)
	(1)	(2)	(3)	(4)
Wages (25-29)	-0.3637***	-0.3653***	0.3143**	0.0703
	(0.0648)	(0.0869)	(0.1496)	(0.1779)
Smart & Illicit	-0.2718**	-0.2729*	0.5244**	0.3998
	(0.1322)	(0.1393)	(0.2629)	(0.2739)
Home Wealth(t-4)*g(t-4, t-1)	-0.0711	-0.0711	0.1566**	0.1541**
	(0.0790)	(0.0790)	(0.0769)	(0.0781)
g(t-4, t-1))	0.4295*	0.4297*	-0.8995*	-0.8992*
	(0.2231)	(0.2231)	(0.5303)	(0.5295)
Home Wealth (t-4)	0.0177	0.0177	0.1679***	0.1684***
	(0.0280)	(0.0280)	(0.0228)	(0.0228)
Wages (25-29)*Illicit		0.0031		0.5479*
		(0.1181)		(0.2841)
Observations	93755	93755	93755	93755
R-Squared	0.0914	0.0915	0.0914	0.0915

This table reports analyses of selection into different employment types in year t on Wages (25-29)), Smart & Illicit, the interaction between early career salaried waged and Illicit (Wages (25-29)*Illicit), and a Bartik instrument for changes in home wealth (Home Wealth(t-4)*g(t-4, t-1)), where Home Wealth(t-4) is the individual's net home wealth in year t-4, and g(t-4, t-1) is the growth rate in state housing prices between year t-4 and year t-1 for the state in which the individual lives. The dependent variable is a one-zero indicator of employment type, where the reported categories are unincorporated and incorporated respectively, and the unreported categories are salaried, unpaid family, and other business ownership. All regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Illicit, Rosenberg self-esteem, Rotter Locus of Control), as well as gender, race, year, and state fixed effects. Since the data on home wealth begins in sample year 1985 and we require values of home wealth in t-4, the sample starts in 1989. We exclude individuals who were self-employed in either t-2 or t-4. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

TABLE VI
EMPLOYMENT TYPES VS. STATE UNEMPLOYMENT: NLSY79

	Worker	Salaried	Self-employed	Unincorporated	Incorporated	Unpaid Family
Panel A: Employment Type vs. State Unemployment						
State Unemployment	-0.782***	-0.962***	0.180	0.268***	-0.088*	0.059**
	(0.137)	(0.167)	(0.110)	(0.100)	(0.052)	(0.030)
Mean	0.892	0.807	0.085	0.068	0.015	0.006
Observations	161518	161518	161518	161518	161518	161518
R-square	0.068	0.041	0.020	0.013	0.015	0.006
Panel B: Employment Type vs. State Unemployment Including Individual Fixed Effects						
State Unemployment	-0.698***	-0.890***	0.193**	0.283***	-0.091**	0.054**
	(0.087)	(0.109)	(0.077)	(0.070)	(0.039)	(0.024)
R-square	0.422	0.438	0.418	0.387	0.367	0.295
Observations	161518	161518	161518	161518	161518	161518

Notes: This table reports OLS regression results of each employment type (Worker, Salaried, Self-employed, Unincorporated, Incorporated, and Unpaid Family worker) on state unemployment. Panels A - B each reports the results of six OLS regressions, one for each employment type, where the dependent variable equals 1 if the person has the designated employment type in period *t* and 0 otherwise. In Panel B, the regressions control for individual fixed effects. Though not shown, all regressions control for schooling (measured in six categories), potential work experience (quartic), gender, race, state, and year-gender fixed effects, and lagged values of the dependent variable. The table also provides the means of the dependent variables. The sample includes who are least 25 years old. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors clustered at the state-year level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

TABLE VII
EMPLOYMENT TYPES AND STATE UNEMPLOYMENT: FIRST DIFFERENCES

	Worker	Salaried	Self-employed	Unincorporated	Incorporated	Unpaid Family
Panel A: ΔEmployment Type vs. ΔState Unemployment						
ΔState Unemployment	-0.628***	-0.919***	0.291**	0.441***	-0.150**	0.076*
	(0.154)	(0.193)	(0.143)	(0.132)	(0.068)	(0.042)
Observations	160108	160108	160108	160108	160108	160108
R-square	0.409	0.311	0.195	0.209	0.156	0.185
Panel B: ΔEmployment Types vs. ΔState Unemployment: Individual Effects						
ΔState Unemployment	-0.615***	-0.912***	0.297**	0.456***	-0.159**	0.085**
	(0.146)	(0.180)	(0.132)	(0.122)	(0.065)	(0.041)
R-square	0.514	0.438	0.340	0.347	0.283	0.278

Notes: This table reports OLS regression results of the change in each employment type (Worker, Salaried, Self-employed, Unincorporated, Incorporated, and Unpaid Family worker) on the change in the state unemployment rate and a set of control variables. The dependent variable equals +1 if the individual moves into the indicated employment type between *t-2* and *t*; -1 if the person leaves the employment type; and 0 if the individual does not change designation with respect to the indicated employment type. Each panel reports the results of six OLS regressions, one for each employment type. Though not shown, all regressions control for schooling (measured in six categories), potential work experience (quartic), state, year-race, year-gender fixed effects, and lagged values of the dependent variable. The regressions in Panel B also control for individual fixed effects. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

APPENDIX TABLE I:
VARIABLE DEFINITIONS AND SOURCES

Variable	Definition
1. Human capital	
AFQT	Armed Forces Qualifications Test score measures the aptitude and trainability of the respondent. Collected during the 1980 NLSY79 survey, the AFQT score is based on arithmetic reasoning, world knowledge, paragraph comprehension, and numerical operations. It is frequently employed as a general indicator of cognitive skills. This AFQT score is measured as a percentile of the NLSY79 survey, with a median value of 50.
Illicit	Illicit measures the aggressive, risk-taking, disruptive, "break-the-rules," behavior of individuals based on the 1980 NLSY79 survey. Taken from Levine and Rubinstein (2017), this index is based on 20 questions, where 17 concern delinquency, e.g., damaging property, fighting at school, shoplifting, robbery, using force to obtain things, assault, threatening to assault, drug use, dealing drugs, gambling, and so forth, and three are about interactions with the police, e.g., stopped by the policy, charged with an illegal activity, or convicted for activities other than minor traffic violations. For each question, a value of one is assigned if the person responds in 1980 that they engaged in that activity and zero otherwise. The average of the answers is then computed for each individual. Finally, we construct a standardized version by subtracting the sample mean and dividing by the standard deviation to create a mean zero, standard deviation of one indicator of illicit activity.
Smart & Illicit	Smart & Illicit equals one if the individual's AFQT score is greater than or equal to 50 and Illicit is greater than or equal to zero and Smart & Illicit equals zero otherwise.
Rosenberg self-esteem (standardized)	Rosenberg Self-Esteem score is based on a ten-part questionnaire given to all NLSY79 participants in 1980. It measures the degree of approval or disapproval of one’s self. The values range from six to 30, where higher values signify greater self-approval. Rosenberg Self-Esteem (standardized) standardizes the score, so that it has a mean of zero and a standard deviation of one.
Rotter locus of control (standardized)	Rotter Locus of Control measures the degree to which respondents believe they have internal control of their lives through self-determination relative to the degree that external factors, such as chance, fate, and luck, shape their lives. It was collected as part of a psychometric test in the 1979 NLSY79 survey. The Rotter Locus of Control ranges from 4 to 16, where higher values signify less internal control and more external control. This is standardized, so that it has a mean of zero and a standard deviation of one.
Years of schooling	The respondent’s maximum number of years of schooling, so it does not vary over time for a respondent.

College graduate	Graduated from college or obtained an advanced degree.
Educational Attainment	The six educational attainment categories: (i) high school dropouts: less than 12 years of schooling (ii) GED degree (iii) high school graduates: 12 years of schooling (iv) had some college education: 13-15 years of schooling (i) college education: 16 years of schooling (vi) advanced studies: 17+ years of schooling. These are measured at the end of the respondent's educational experience, so that they do not vary over time for a respondent.
Potential Experience	Age of the respondent minus the years of schooling minus six, or, if this computation is less than zero, then potential experience set equal to zero.
Female	Equals one if the respondent reports being female and zero otherwise.
Black	Equals one if the respondent reports being Black and zero otherwise.
Hispanic	Equals one if the respondent reports being Hispanic and zero otherwise.

2. Collateral, Wealth, and Earnings

Home Wealth	The market value of the respondent's home net of any mortgages.
Wealth	Created by summing all asset values and subtracting all debts.
Wages (25-29)	When the respondent if 31 or more years old, Wages (25-20) equals the respondent's average log real wages (2010 prices) as a salaried employee when the respondent is 25-29 years old. When the respondent is 27-30 years old, Wages (25-29) equals the individual's average log real hourly earnings as a salaried employee at the age of *t-2*.
Earnings	Wages plus income from business. Deflated by the CPI corresponding to when those earnings were realized. Earnings are in 2010 prices.

3. Employment Types

Unincorporated	If a respondent is self-employed, the NLSY79 further asks whether the business is incorporated or not. If the respondent is self-employed and the business is unincorporated, then Unincorporated Self-employed equals one and it is zero otherwise.
Incorporated	If a respondent is self-employed, the NLSY79 further asks whether the business is incorporated or not. If the respondent is self-employed and the business is incorporated, then Incorporated Self-employed equals one and it is zero otherwise. See Levine and Rubinstein (2017) for additional coding
Self-employed	From the NLSY79's unified class of worker (R24455.10), there are four responses for working respondents: (1) Private company, including non-profit, (2) government, (3) self-employed, and (4) those working without pay, including in family businesses. We set Self-employed equal to one if the respondent's class of worker is "(3)" and zero otherwise.
Salaried	From the NLSY79's unified class of worker (R24455.10), there are four responses for working respondents: (1) Private company, including non-profit, (2) government, (3) self-employed, and (4) those working without pay, including in family businesses. We set Salaried equal to one if the respondent's class of worker is either "(1)" or "(2)"and zero otherwise.
Unpaid family business	Equals one if the respondent indicates that they are unpaid and work in a family business and zero otherwise.

4. Legal Form of Business

Unincorporated (B)	Equals one if the respondent indicates that the legal form of the business is a sole proprietorship and zero otherwise. This information is obtained from the business ownership part of the NLSY79 that was given in survey years 2010 and 2012.
Incorporated (B)	Equals one if the respondent indicates that the legal form of the business is either (a) a partnership or limited liability partnership, (b) a limited liability corporation, (c) a sub-chapter S corporation, or (d) a general corporation and zero otherwise. This information is obtained from the business ownership part of the NLSY79 that was given in survey years 2010 and 2012.
Other Business (B)	Equals one if the respondent indicates that the legal form of the business is either (a) a nonprofit organization or (b) other and zero otherwise. This information is obtained from the business ownership part of the NLSY79 that was given in survey years 2010 and 2012.

6. State-Year Characteristics

g(x,y)	The growth rate in state housing prices between years x and y. The Federal Housing Finance Agency provides house price indices by state and year.
ΔUnemployment	The change in the unemployment rate in the respondent's state over the preceding twelve months. In particular, the Bureau of Labor Statistics produces data on state unemployment for each month. The NLSY79 gives the date when each person was sampled. We compute change in the state's unemployment over the preceding twelve months from the date of the interview.

Notes:

(1) All data are from the NLSY79 unless otherwise indicated.

(2) The NLSY79 is a representative survey of 12,686 individuals who were 15-22 years old when they were first surveyed

(3) We use the sampling weights provided by the NLSY79.

(4) In Table 1, which covers the survey years 2010 and 2012, we classify an individual as incorporated if both Incorporated and Incorporated (B) indicate that the individual is an incorporated business owner for the 2010 (2012) survey. We get very similar results if we instead use only the business survey (Incorporated (B) to classify the legal form of the business. The same holds for unincorporated business owners.

APPENDIX TABLE II
EARNINGS BY EMPLOYMENT TYPE AND EARLY SALARIED WAGES

Panel A: Earnings vs. early salary wages, standard controls

	Log Hourly Earnings (31+)			
	Salaried	Self-Employed	Unincorporated	Incorporated
	(1)	(2)	(3)	(4)
Wages (25-29)	0.510***	0.2367*	0.067	0.936***
	(0.036)	(0.1369)	(0.147)	(0.322)
Observations	41015	3488	2568	920
R-square	0.101	0.0732	0.102	0.104

Panel B: Earnings vs. early salary wages, standard controls and state-year effects

	Log Hourly Earnings (31+)			
	Salaried	Self-Employed	Unincorporated	Incorporated
	(5)	(6)	(7)	(8)
Wages (25-29)	0.5105***	0.2198	0.0275	1.0058**
	(0.0364)	(0.1480)	(0.1675)	(0.4282)
Observations	41015	3488	2568	920
R-square	0.1138	0.2039	0.2698	0.3631

Notes: This table provides regression results of log hourly earnings in year t on an individual's average log wages as a salaried employee during the ages of 25 through 29 (Wages (25-29)). All regressions include "standard controls:" Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Rosenberg self-esteem, Rotter Locus of Control), as well as race, gender, year, and state fixed effects. In Panel B, the regressions also include state-year fixed effects. As indicated, each regression includes the subsample of individuals who are salaried (columns 1-5), self-employed (columns 2-6), unincorporated self-employed (columns 3-7), or incorporated self-employed (columns 4-8) in year t. The sample includes full-time, full-year workers who are 31 years of age or older. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

APPENDIX TABLE III

SELECTION ON WAGES AND SHOCKS TO HOME WEALTH: FALSIFICATION TEST

	Self-Employed (Logit)	Unincorporated (Multinomial Logit)	Incorporated (Multinomial Logit)
	(3)	(5)	(6)
Wages (25-29)	-0.1831***	-0.3670***	0.3162**
	(0.0587)	(0.0651)	(0.1497)
Smart & Illicit	-0.0865	-0.2705**	0.5254**
	(0.1197)	(0.1323)	(0.2625)
Home Wealth(t-4)*g(t, t+4)	0.0818	0.1660	0.0719
	(0.0773)	(0.1113)	(0.1248)
g(t, t+4))	0.0619	-0.1745	1.3717***
	(0.2437)	(0.2751)	(0.5323)
Home Wealth (t-4)	0.0618***	0.0069	0.1737***
	(0.0175)	(0.0301)	(0.0252)
Observations	93722	93755	93755
R-Squared	0.0258	0.0914	0.0914

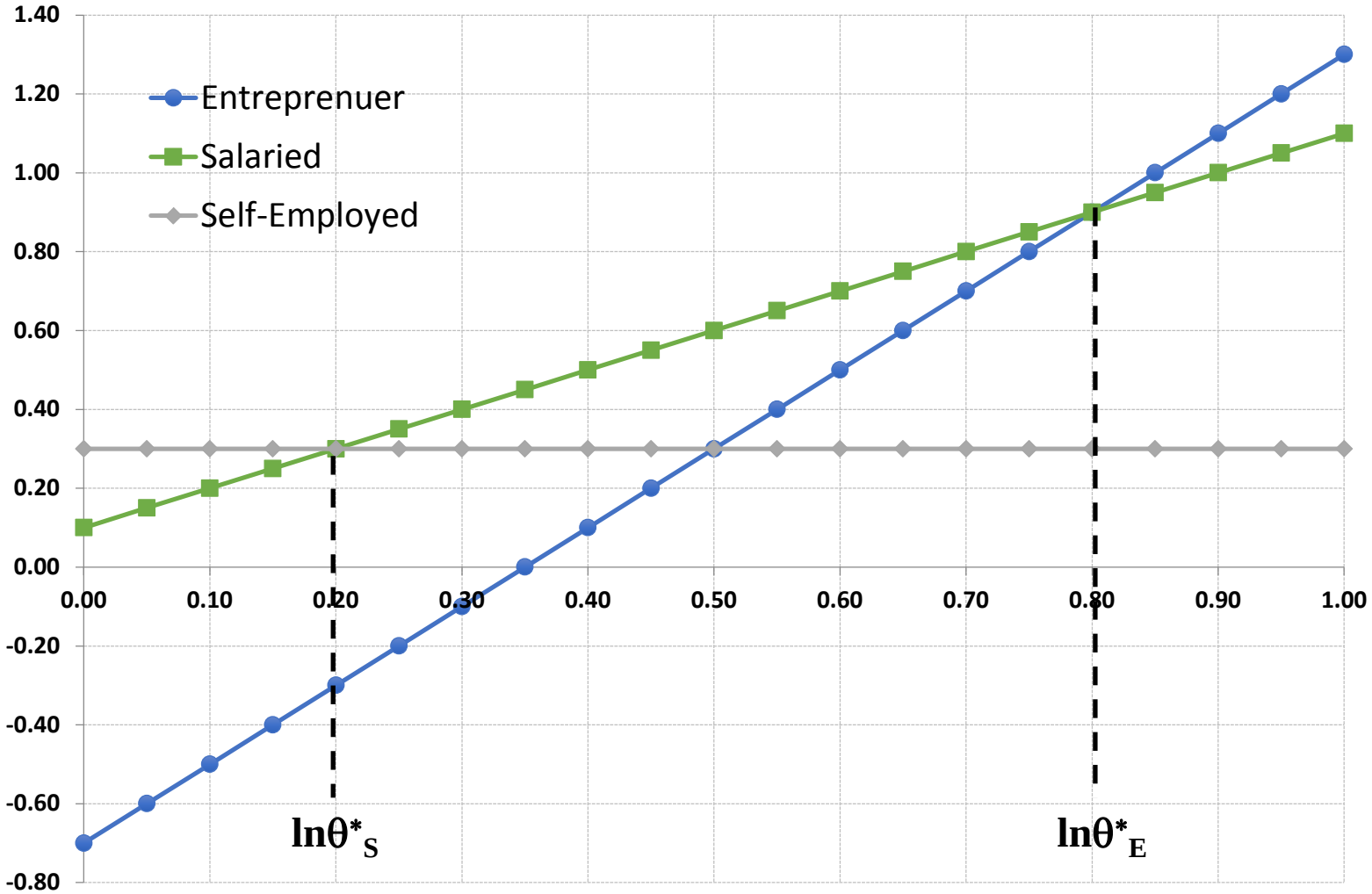
This table reports analyses of selection into different employment types in year t on Wages (25-29)), Smart & Illicit, and a Bartik instrument for changes in home wealth (Home Wealth(t-4)*g(t, t+4)), where Home Wealth(t-4) is the individual's net home wealth in year t-4, and g(t, t+4) is the growth rate in state housing prices between year t+1 and year t+4 for the state in which the individual lives. Columns (1-2) report OLS regressions in which the dependent variable is the individual's net home wealth in year t, were column (2) included individual fixed effects. In column (3), the dependent variable is a one-zero indicator variable of whether the individual is self-employed in year t. In columns (4-5), the dependent variable is a one-zero indicator of employment type, where the reported categories are unincorporated and incorporated respectively, and the unreported categories are salaried, unpaid family, and other business ownership. All regressions include Mincerian characteristics (a quartic expression for potential work experience and dummy variables for six education categories), measures of cognitive and non-cognitive traits (AFQT, Illicit, Rosenberg self-esteem, Rotter Locus of Control), as well as gender, race, year, and state fixed effects. Since the data on home wealth begins in sample year 1985 and we require values of home wealth in t-4, the sample starts in 1989. We exclude individuals who were self-employed in either t-2 or t-4. Appendix Table 1 provides variable definitions. Heteroskedasticity robust standard errors, clustered at the individual level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively

APPENDIX TABLE IV
EMPLOYMENT TYPES AND HOURS OVER THE BUSINESS CYCLE: CPS

	Worker	Salaried	Self-employed	Unincorporated	Incorporated
Panel A: Employment Type vs. State Unemployment: OLS					
State Unemployment	-0.530***	-0.610***	0.080***	0.113***	-0.032*
	(0.042)	(0.047)	(0.026)	(0.023)	(0.019)
Mean	0.843	0.756	0.087	0.059	0.028
Observations	2199569	2199569	2199569	2199569	2199569
R-square	0.076	0.034	0.030	0.016	0.020
Panel B: Employment Type vs State Unemployment: Multinomial Logit					
	Not Working	Salaried	Self-employed	Unincorporated	Incorporated
State Unemployment	4.418***			2.654***	-0.805
	(0.354)			(0.400)	(0.713)

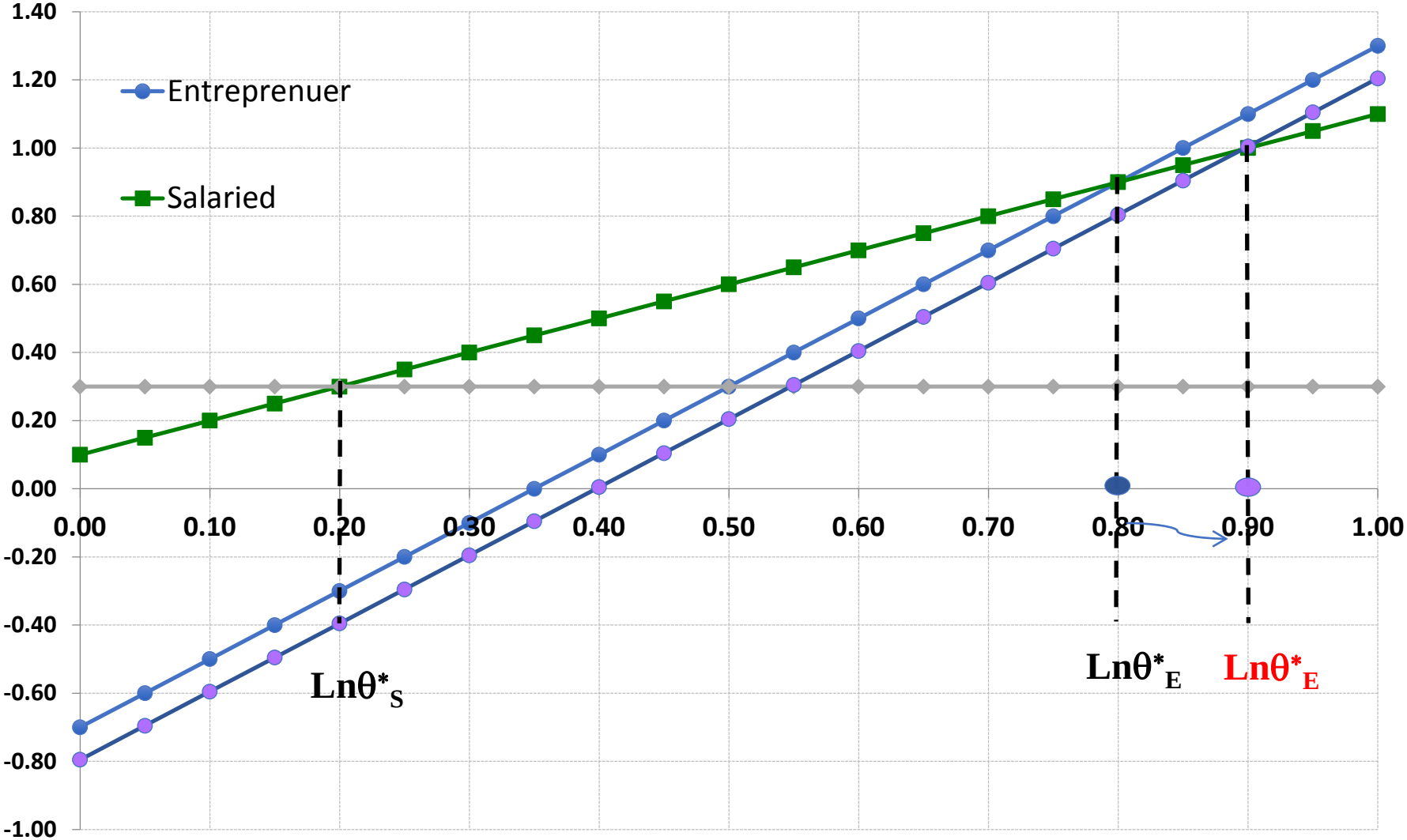
Notes: This table reports OLS and multinomial logit regression results of each employment type (Worker, Salaried, Self-employed, Unincorporated, and Incorporated,) on state unemployment using the CPS. Panel A reports the results of five OLS regressions, one for each employment type. The dependent variable is the proportion of individuals in the specified employment type. Panel C reports multinomial logit regression results, where the dependent variable is the log-odds of beingin the indicated employment type rather than a salaried worker. Though not shown, all regressions control for race, schooling (measured in six categories), potential work experience (quartic), state fixed effects, and year-gender fixed effects. Panel A also report the means of the dependent variables. Heteroskedasticity robust standard errors clustered at the state-year level are in parentheses, where *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Figure II: Selection into Employment Types by Entrepreneurial Ability



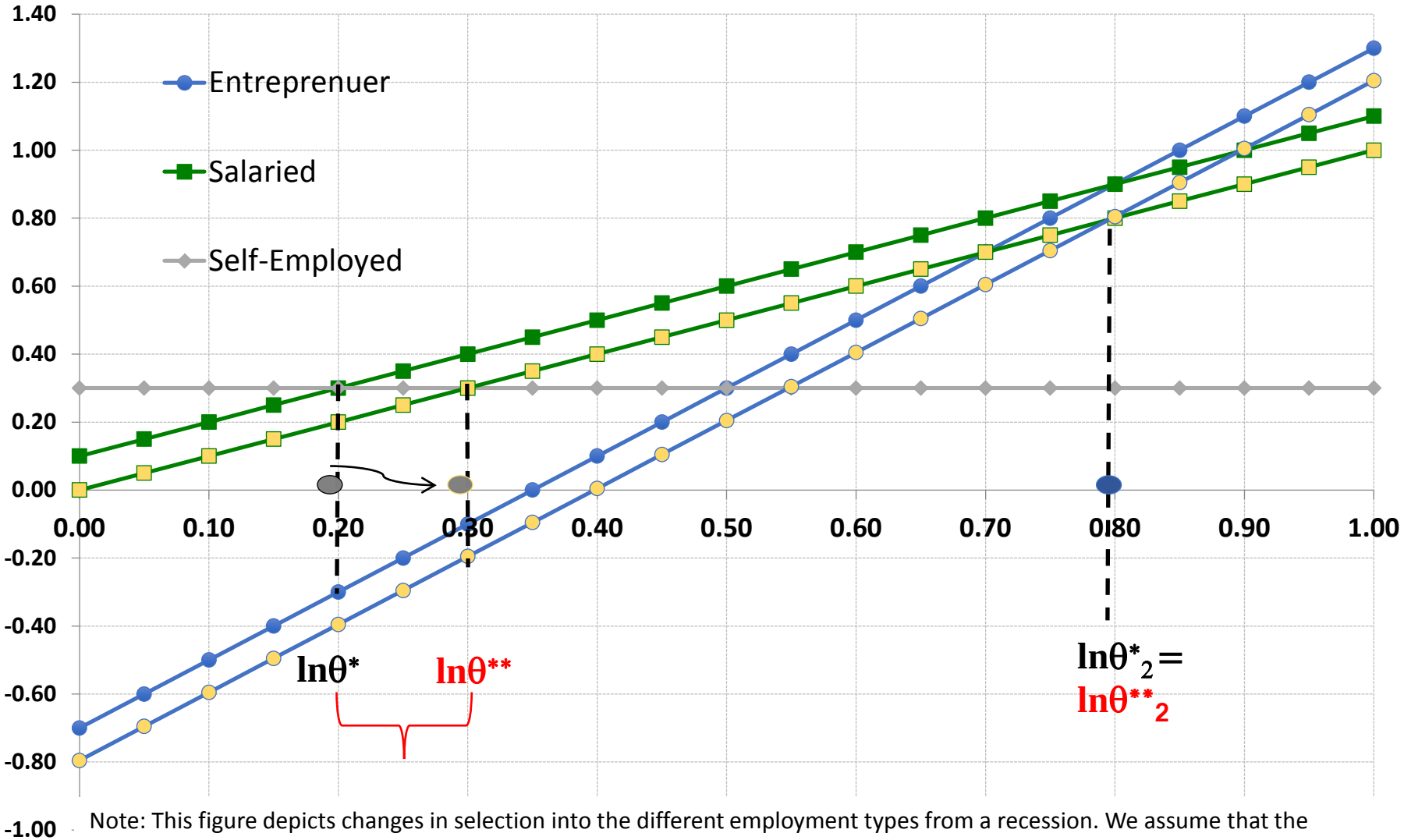
Note: This figures illustrates the relationship between the log utility in each employment type and the log of entrepreneurial ability.

Figure III: Selection into Employment Types and Liquidity Constraints



Note: This figure depicts the impact of an increase in the interest rate (r) on selection into different employment types. As shown, an increase in r shifts downward the line representing log utility in entrepreneurship at different entrepreneurial ability levels.

Figure IV: Selection and Business Cycles



Note: This figure depicts changes in selection into the different employment types from a recession. We assume that the business cycle downturn involves (1) a tightening of credit constraints: a parallel fall in the log utility of entrepreneurship line; and (2) a reduction in the demand for salaried employees: parallel drop in the line depicting the log utility of salaried employment. The figure depicts the special case when liquidity and labor demand effects exactly counterbalance each other with respect to entrepreneurship.