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Is there a startup wage premium? Evidence from MIT graduates

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ABSTRACT

While startups are the center of extensive policy discussion given their outsized role in job creation, it is not clear whether they create high quality jobs relative to incumbent firms. This paper investigates the wage differential between venture capital-backed startups and established firms, given that the two firm types compete for talent. Using data on MIT graduates, I find that non-founder employees at VC-backed startups earn roughly 10% higher wages than their counterparts at established firms. To account for unobserved heterogeneity across workers, I exploit the fact that many MIT graduates receive multiple job offers. I find that wage differentials are statistically insignificant from zero when individual fixed effects are included. This implies that much of the startup wage premium in the cross-section can be attributed to selection, and that VC-backed startups pay competitive wages for talent. To unpack the selection mechanism, I show that individual preferences for risk as well as challenging work strongly predict entry into VC-backed startups.

1. Introduction

Politicians and pundits routinely tout that startups are the engine of job creation in the US economy. True to popular belief, young businesses account for roughly 70% of gross job creation in the US (Haltiwanger et al., 2012). While startup companies play a vital role in creating jobs, it is not clear whether startups — relative to established firms — create high quality jobs. In light of the fact that startups employ a disproportionately high share of young workers (Ouimet and Zarutskie, 2014), a central question remains: do startups or large established firms create better paying jobs for young workers?

Although prior studies extensively document that large established firms generally pay higher wages than their smaller (Brown and Medoff, 1989; Oi and Idson, 1999) and younger counterparts (Davis and Haltiwanger, 1991; Brown and Medoff, 2003; Haltiwanger et al., 2012), the existing set of evidence is difficult to interpret for two reasons. First, the potential sorting of workers across employers limits the interpretation of cross-sectional wage comparisons. For instance, if large firms possess superior managerial talent as shown in the (Lucas, 1978) span of control theory, then high-ability workers may sort into large firms and thus command higher wages. Exploiting the fact that many graduates from Massachusetts Institute of Technology (MIT) receive multiple job offers, this study seeks to uncover the counterfactual wages that the first set of non-founder employees at startups ("early employees") would have earned if these young workers had instead joined large established companies.

Second, prior studies do not clearly distinguish high-growth startups from small businesses. While many policymakers broadly use the term entrepreneurship to refer to all new enterprises, small businesses and high-growth startups are fundamentally different types of firms (Schoar, 2010). High-growth startups are a small subset of new firms that grow rapidly and account for a disproportionately high share of wealth and job creation (Shane, 2009; Decker et al., 2014). In contrast, most small businesses (e.g. local restaurants) tend to remain small because they typically do not intend to grow large or innovate in a meaningful way (Hurst and Pugsley, 2011). Given their distinct growth intentions, high-growth startups — unlike small businesses — compete against incumbent firms for talent. Therefore, a suitable setting to compare wages between startups and established firms is one in which workers who join startups are much more likely to do so in the high-growth rather than the small business sector.

MIT is a particularly appropriate setting to study the allocation of top technical talent between high-growth startups and established corporations. While MIT selectively draws highly talented individuals that may not represent the average worker, the right tail of the talent distribution is precisely where the rich interplay between high-growth startups and established firms can be studied. This is because entrepreneurial growth is itself an extremely skewed outcome; a very small fraction of startups at the right tail of the quality distribution are responsible for much of the job creation and impactful innovation (Guzman and Stern, 2016). To quantify the skewness, Puri and Zarutskie (2012) estimate that only 0.10% of the US firms born between 1981 and 2005 ever receive venture capital financing. Given that a large portion of MIT graduates are prolific inventors, entrepreneurs,

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and early employees of high-growth ventures, MIT graduates are much more likely to select into both established firms and high-growth startups — rather than small businesses — where their skills are directly used.

This paper explores the wage differential between venture capital-financed startups and large established firms, and the role of selection as the channel through which these differences persist. Using data on graduating college students from MIT, I find that VC-backed startups on average pay 8% to 13% higher wages than their more established counterparts holding all observable individual-level covariates constant. Given that VC-backed firms are — by construction — young and small, this finding stands in contrast to the literature's well-documented wage premium associated with large and old firms. However, the observed startup wage premium for MIT graduates is consistent with the recent evidence that the relationship between firm age and wages becomes negative when controlling for employee age (Ouimet and Zarutskie, 2014) or focusing on rapidly growing startups (Sorenson et al., 2016). Nonetheless, relatively high wages associated with VC-backed startups are robust across several regression specifications. Given that venture capital investors typically concentrate their deals in a few select industries, I restrict the sample to the high-tech sector and find that the startup wage premium remains statistically significant albeit slightly attenuated in magnitude.

Next, I test for selection as the source of wage differentials between startups and established firms. Even with a rich set of control variables, cross-sectional wage comparisons can be biased due to selection based on unobservable characteristics such as ability. The two groups of workers appear to be systematically different along several observable dimensions, suggesting that there may also be unobserved differences that lead to non-random sorting of workers. For instance, early employees receive more job offers and less strongly prefer job security and firm reputation relative to workers at established firms. To account for unobserved heterogeneity across workers, I focus on MIT graduates who receive multiple job offers from both firm types. Originally employed by Stern (2004), this identification strategy allows for within-person comparison of wages.

Based on empirical specifications that use individual fixed effects, I find that the effect of startup employment on wages becomes negative and statistically indistinguishable from zero. At a minimum, these results reject the large, positive wage premium associated with entrepreneurial employment in the cross-section. More broadly, these findings suggest a positive selection of high-ability workers into startups; counterfactually, they would also command relatively high wages at established firms. Overall, much of the startup wage premium can be attributed to selection. This result highlights the substantial role that endogenous sorting of heterogeneous workers plays in determining key labor market outcomes such as wages. In addition, though they face more credit constraints than large firms, VC-backed startups appear to pay competitive wages for talent.

Empirical exploration of the dynamics of high-growth startups vis-à-vis established firms is important to both policymakers and researchers for several reasons. First, in terms of startup entry, the allocation of productive workers has significant implications for economic growth (Baumol, 1990; Murphy et al., 1991; Philippon, 2010). Given the recent surge in venture capital activity, hiring at venture capital-backed firms has risen.[1] As a result, talented young workers have increasingly joined early-stage companies financed by venture capital. For instance, the share of MIT graduates joining VC-backed startups rapidly grew from less than 2% to 14% between 2006 and 2014. In tandem with this rise, the portion joining the financial sector sharply fell from 30% to 5% in the same period. If workers' career paths are endogenous to the set of sector-specific skills and social ties developed during initial employment (Gompers et al., 2005; Elfenbein et al., 2010; Campbell, 2013), then this phenomenon has larger implications for the future supply of innovators and entrepreneurs.

Second, from a policy perspective, it is important to understand whether startups create high-paying jobs relative to those in other sectors of the economy. There are numerous policy efforts aimed to encourage entrepreneurship typically through tax breaks and funding (e.g. SBA loans). Burgeoning evidence shows that tax breaks and financing aid are effective levers in enhancing entrepreneurial activity (Gentry and Hubbard, 2000; Howell, 2017). However, Shane (2009) argues that simply encouraging more entrepreneurship is a flawed policy approach because the vast majority of new firms generate little economic impact. For instance, it is not clear whether the new jobs stemming from policy-induced entrepreneurial entries are low quality jobs. Since wages are a key indicator of job quality, wage determination between startups and established firms is an insightful empirical analysis.

Third, scholars in the fields of labor economics and entrepreneurship have not sufficiently unpacked the importance and the role of early employees. While founders are undoubtedly important, high-skilled employees play a critical role in the growth and success of nascent firms. Attracting and retaining high quality workers is a challenge for early-stage companies because they compete against established firms for talent. Yet, very little is known regarding the first set of non-founder employees that join startup companies (Stuart and Sorenson, 2005; Roach and Sauermann, 2015). Therefore, the lack of empirical and theoretical attention on early employees leaves the human capital piece of entrepreneurship under-explored. This study offers one of the first set of empirical evidence on the characteristics of high-skilled young workers who join VC-backed startups and the wages that they earn relative to their counterfactual wages at established companies.

The remainder of this paper is structured as follows: Section II reviews the relevant prior literature and the conceptual framework. Section III explains the identification strategy exploiting multiple job offers and the empirical setting. Section IV presents the empirical results on the startup wage differential, tests for selection effects, and investigates the mechanisms that determine workers' entry decision between VC-backed startups and established firms. Section V concludes with this study's main insights, limitations, and implications for future research.

2. Literature review and conceptual framework

2.1. Existing evidence

In theory, should startup salaries be meaningfully different from those at large established companies? If so, what is the equilibrium wage that a startup must pay in order to induce a worker into the young company who would otherwise sort into an established firm? As a useful starting point, the literature on the returns to entrepreneurship may offer relevant insights because in a sense, early employees are an extension of the founding team. Unfortunately, the financial returns to entrepreneurship appear to be a puzzle. While many studies show that entrepreneurs earn less than their salaried counterparts (Borjas and Bronars, 1989; Evans and Leighton, 1989; Hamilton, 2000; Hall and Woodward, 2010), more recent studies argue that the pecuniary returns to entrepreneurship are relatively high (Levine and Rubinstein, 2017; Kartashova, 2014; Sarada, 2014; Manso, 2016).

Results are seemingly inconsistent largely due to the broad definition of entrepreneurship. While many scholars and policy-makers generalize all small or young firms as startups, entrepreneurial firms are extremely heterogeneous in their growth outcomes (Decker et al., 2014). Broadly, there are two types of entrepreneurship that fundamentally differ in their economic intentions, skill composition, and rates of job creation (Schoar, 2010). On the one hand, small businesses

[1] Venture Capital Activity at 13-Year High" Ernst & Young Global Limited. 5 February 2015 < http://www.ey.com/GL/en/Newsroom/News-releases/News-EY-venture-capital-activity-at-13-yearhigh > .

typically do not intend to grow large or innovate in a meaningful way (Hurst and Pugsley, 2011). As a result, Hurst and Pugsley (2011) document that more than 85% of mature US firms (in operation for at least ten years) remain small. On the other hand, high-growth startups aim to grow large and thus make strategic decisions — such as incorporating in Delaware or applying for a patent — that are related to substantial growth outcomes (Guzman and Stern, 2016).

Naturally, the two types of entrepreneurship also exhibit different wage patterns. Studies that conflate small business owners and high-growth entrepreneurs generally find a wage penalty for entrepreneurs relative to employees of large firms. However, when selecting on entrepreneurial firms that intend to expand, Levine and Rubinstein (2017) find that entrepreneurs earn higher hourly wages than their salaried counterparts. Therefore, the results on entrepreneurial earnings are muddled by the inconsistent measurement of entrepreneurship, lending unclear guidance to the wage comparison between early employees at high growth ventures and workers at established firms.

Furthermore, the literature on the financial returns to entrepreneurship may be inapplicable to the wage differences between high-growth startups and established firms because joiners are considerably different from founders. In many ways, early employees resemble salaried workers in large firms (Chen, 2013; Roach and Sauermann, 2015). The main similarity is that early employees are hired workers who receive competitive salaries. In contrast, compared to joiners, founders of VC-backed startups typically take on lower cash compensation and greater equity ownership (Wasserman, 2006; Bengtsson and Hand, 2013). As a result, joiners and founders experience substantially different economic incentives and rewards. Therefore, the literature on the returns to entrepreneurship appears to bear little pertinence to the wages that startup joiners earn.

Another relevant set of insights comes from the rich literature in labor economics around wage differentials across firms. In particular, employer size and age appear to be salient drivers of a persistent gap in earnings. Extensive evidence documents that large firms tend to pay higher wages than their smaller counterparts (Brown and Medoff, 1989; Oi and Idson, 1999). Similarly, old firms generally pay higher wages relative to young firms (Davis and Haltiwanger, 1991; Brown and Medoff, 2003; Haltiwanger et al., 2012). Since high-growth startups are both young and small, the existing evidence appears to lend support to the hypothesis that startups pay lower wages compared to large established firms. However, the positive firm age-wage relationship becomes questionable after accounting for worker characteristics (Brown and Medoff, 2003), raising the concern for selection bias.

The literature on wage differentials by firm size and age does not adequately address the potential sorting of heterogeneous workers. Workers may endogenously sort into startups or established firms based on unobservable worker characteristics that are also related to wages. For instance, prior studies provide evidence of non-random sorting of workers between incumbent and new firms (Nystrom and Elvung, 2015), as well as between academic spin-offs and other technology-based startups (Dorner et al., 2017). Simple wage comparisons would be biased if workers who join established companies are systematically different from early employees at startups.

Prior literature show that early employees are intrinsically different from established firm employees along several important observable characteristics. With respect to age, Ouimet and Zarutskie (2014) document that young firms tend to hire younger workers. The authors also show evidence suggesting that, relative to young workers at older firms, young workers at young firms are more risk tolerant and technically skilled. In addition, Sauermann (2017) finds that academic scientists who join small firms place a lower value on job security but prioritize independence and challenging work. Therefore, the two groups of workers appear to be different not only in their demographic characteristics, but also in their technical capacity and individual preferences.

It is also likely that the two groups are dissimilar along unobservable dimensions. In early empirical examination of compensating differentials, Brown (1980) contends that cross-sectional evidence of wage differentials does not necessarily substantiate the theory because several key variables are omitted — most importantly, worker ability. Omission of worker ability is problematic because ability is typically positively correlated with the individual's earnings capacity. In addition, ability may be related to the worker's entry into startups. For instance, Dahl and Klepper (2015) theorize that high quality workers are matched to large — presumably more productive — firms, leaving low quality workers to be matched to new firms. Potential sorting of workers between entrepreneurial firms and established companies weakens the interpretation of the widely documented wage penalty associated with small and young firms.

2.2. Wage differentials

As a starting point, the well-documented employer-age wage premium informs the basic relationship between VC-financed startups and wages which can be organized into a simple econometric framework with worker *i*, firm *j*, and a vector of individual-level traits X_i:

$$\log(WAGES_{ij}) = \beta_0 + \beta_1 STARTUP_j + \boldsymbol{X}_i'\Theta + \varepsilon_{ij} \quad (1)$$

Eq. (1) is a cross-sectional relationship between startup employment and wages in which the unit of observation is the individual. Only the accepted job offer is observed for each individual. Previous literature provides a prior on the magnitude and direction of β_1. In particular, Haltiwanger et al. (2012) compute the real monthly earnings of US workers at both new and established firms.[2] The authors show that, in 2011, workers at young firms earned roughly 70% as much as their counterparts at mature firms. Therefore, prior evidence from the literature estimates β_1 at roughly -0.30. Since VC-backed startups are — by construction — young, the existing prior on the negative relationship between firm age and wages leads to the first hypothesis: VC-backed startups on average pay lower wages than do established companies.

2.3. Selection

Selection may explain the wage gap between entrepreneurial and established firms. As discussed, simple wage comparisons would be biased if workers who join established companies are systematically different from early employees at startups. Selection bias can be eliminated through conditional independence if such differences across workers are perfectly observable to the econometrician and thus included in the conditional expectation function (Angrist and Pischke, 2009). In this case, observable differences between startup joiners and established firm employees — such as worker age — can be included as control variables.

However, the key omitted variable in the wage comparison is worker ability. Omission of ability is problematic because it is typically positively correlated with the individual's earnings capacity. At the same time, worker quality may be associated with firm maturity (Dahl and Klepper, 2015). A possible explanation for the positive assortative matching is that since larger firms have better managerial talent and a greater span of control (Lucas, 1978), high quality workers are matched to large firms. The relationship between wages and startups conditional on worker ability is the following:

$$\log(WAGES_{ij}) = \pi_1 STARTUP_j + \pi_2 ABILITY_i + \boldsymbol{X}_i'\Theta + \eta_{ij} \quad (2)$$

The model in Dahl and Klepper (2015) predicts that startups are matched to lower quality workers, who generally command lower wages. In this case, β_1 in Eq. (1) would be downward biased because ability is negatively correlated with startups while positively linked to

[2] New firms are defined to be younger than two years old while established older than ten years old.

wages. Sorting of low quality workers into new firms would then be the mechanism through which startups appear to pay lower wages than established firms. In such scenario, entrepreneurial employment is expected to be unrelated to wages after accounting for individual ability. This leads to the second hypothesis: Holding worker ability constant, VC-backed startups and established firms pay statistically equal wages.

3. Methodology and data

3.1. Identification strategy

The true startup-wage relationship in Eq. (2) cannot be directly tested because $ABILITY_i$ is unobserved. In order to estimate the startup-wage relationship while accounting for selection, I exploit bundles of job offers — both accepted and rejected — that MIT graduates receive before entering the labor market. This framework allows for the comparison of wage offers across firms while holding the individual constant. Since multiple price points are observed for the same labor service, the demand curve for startup employment can be traced out while holding the supply curve fixed (Hsu, 2004). As a result, the effect of startup employment on wages can be cleanly identified. Econometrically, individual fixed effects are employed to essentially difference out the unobservable individual-level factors that may be systematically correlated with wages:

$$\log(WAGES_{ij}) = \beta_0 + \beta_1 STARTUP_j + \delta_i + \boldsymbol{X}_i^{'}\Theta + \varepsilon_{ij} \quad (3)$$

Contrary to the previous empirical relationship, the unit of observation in Eq. (3) is the job offer such that the individual is separately observed for each of her job offer. As a result, individual fixed effects account for the effects of unobserved factors that are individual-specific but fixed over time — most notably, worker ability or attractiveness to employers. The β1 in Eq. (3) is the estimated effect of entrepreneurial employment on wages. If the second hypothesis is true, meaning that VC-backed startups and established firms pay similar wages conditional on worker ability, then β1 will be statistically insignificant from zero.

A key identification assumption behind the multiple job offers methodology is that those who receive one job offer are not fundamentally different from workers with multiple offers. This methodology requires narrowing the sample to only the individuals with multiple offers in order to employ individual fixed effects. Selection issues may weaken the internal validity of the following analysis if, for instance, multiple offers are systematically drawn from a different part of the worker ability distribution. It is possible that workers with higher ability attain more job offers because they are presumably more attractive to employers. However, many top MIT graduates have a single job offer because they receive and accept a full-time job offer from their summer internship prior to their senior year and thus do not participate in the ensuing full-time job recruiting. I revisit this assumption in Section IV by testing for differences in observable individual traits between the two groups.

3.2. Empirical setting

MIT serves as the empirical setting in which I study wage differentials between VC-backed startups and established firms. Although MIT is a highly selected sample of talented workers and therefore may not be representative of the broader labor market, it serves as a favorable setting for three reasons.

First, as noted earlier, MIT is a major technology-based university whose alumni include productive inventors responsible for nearly 25,000 patents (Shu, 2012) as well as entrepreneurs estimated to have founded more than 30,000 actively operating companies as of 2015 (Roberts et al., 2015). Given the roots of a research university, MIT alumni-founded companies are largely technology-based (Hsu, 2008). Such active participation in innovative activities among MIT graduates is important for this study because there are fundamental differences between high-growth ventures and small businesses (Schoar, 2010; Levine and Rubinstein, 2017); the latter type of entrepreneurship does not provide an appropriate basis for wage comparisons since small businesses do not directly compete against established firms for talent. Since MIT attracts highly skilled individuals, its graduates are much more likely to select into high-growth startups and established companies rather than small businesses.

Second, a significant portion of graduating students from MIT receive job offers from both established firms and high-growth startups, generating rich variation in the comparable job offers that these graduates receive. While roughly 550 of the 1100 graduating class seek full-time employment in a typical year, more than 400 companies actively recruit at MIT.[3] As a result, the average student on the job market receives two competing job offers. This is an important feature not only for the interpretation of the wage differential, but also for the multiple offers methodology's identifying assumption that some workers receive offers from both VC-backed startups and established firms. This study's empirical strategy rests on the fact that the average MIT undergraduate on the job market receives two competing offers.

Third, while job offers from startups are relatively rare and often difficult to observe, many MIT graduates join early-stage firms whose salary offers are observable. In fact, the portion of MIT graduates joining startups as non-founder employees has substantially increased especially following the financial crisis in 2008. In 2014, roughly 14% of the graduating class chose employment at VC-backed startups compared to less than 2% in 2006 (see Fig. 1). Interestingly, the share of MIT graduates joining the financial sector fell from 30% to 5% during the same period (see Fig. 2). Thus, MIT provides a setting to study and compare offers from entrepreneurial companies and established firms distributed among a pool of highly talented labor market entrants.

3.3. Data

The data come from the two following surveys on full-time recruiting outcomes for graduating college students at MIT: (1) Graduating Student Survey and (2) MIT Early Careers Survey. The Graduating Student Survey, which is annually administered by MIT Career Services, collects information regarding each student's post-graduation plans, job offers that the individual receives, and motivations for accepting a particular offer. The survey data coverage extends from 2006 to 2014 with response rates consistently around 80% and includes 18,789 total respondents from undergraduate, and master's, and doctoral programs.[4] The sample is reduced to undergraduate seniors who indicate plans to be employed full-time during the year following graduation; immediately following graduation, approximately half of MIT college graduates enter graduate school. Furthermore, those entering into non-private sector employment are removed from the sample. The final sample includes 2,064 individuals. Table 1 shows the summary statistics.

In addition, the MIT Early Careers Survey, launched in 2014, is an online follow-up survey of recent MIT alumni and the set of offers they received upon graduation. Respondents were asked to provide information on various job characteristics (e.g. salary, title, industry) and motives for choosing the accepted offer. Respondents with job offers from startups were additionally asked about stock options (e.g. number and percentage of shares, then-current company valuation, vesting schedule). Since the survey was motivated by the initial results from the

[3] Data from the MIT Global Education and Career Development Office show that, between 2006 and 2014, approximately 50% of MIT undergraduates enter into full-time employ upon graduation, 40% into graduate school, and 10% into other plans including fellowships, continuing education, traveling, volunteering, and part-time work.

[4] When this study was initially launched, the MIT Graduating Student Survey covered from 2006 to 2014. Summarized results from future waves of this survey are available here: https://gecd.mit.edu/resources/survey-data.

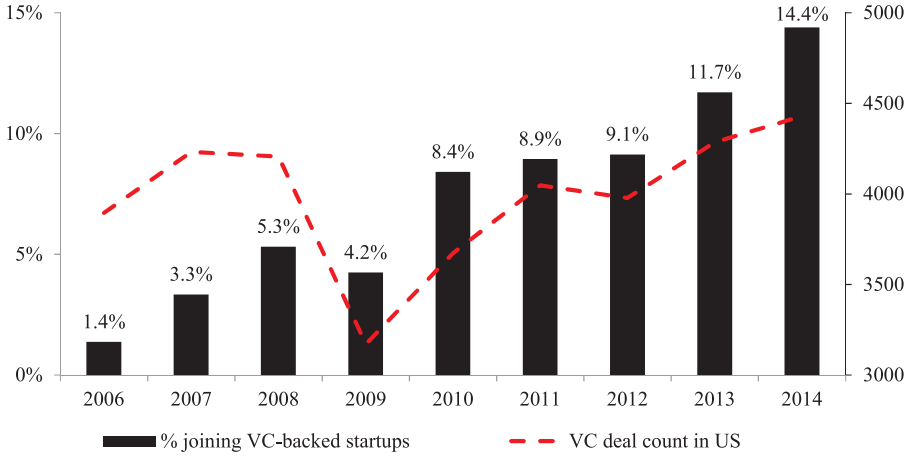

Fig. 1. Allocation of MIT Graduates into VC-Backed Startups Relative to Total VC Investments.
Notes: Join percentage is calculated based on the subset of graduating seniors at MIT who select into full-time employment.
Source: MIT Graduating Student Survey; PricewaterhouseCoopers and National Venture Capital Association.

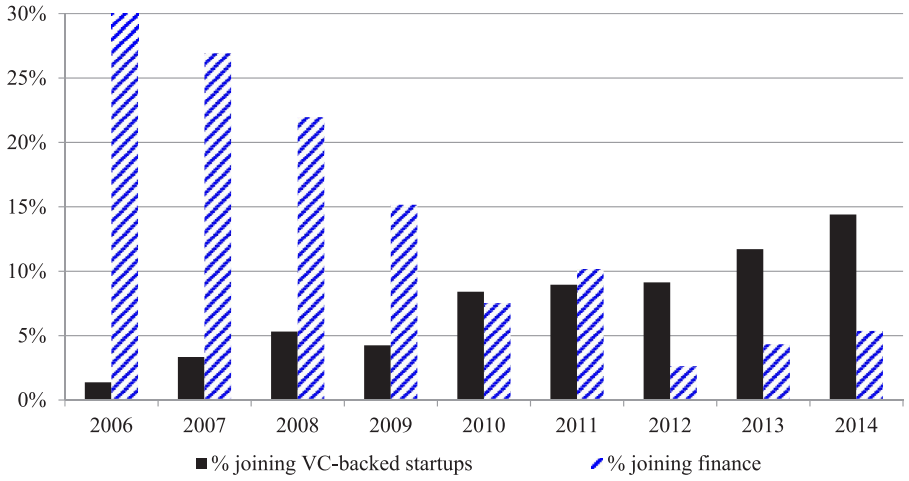

Fig. 2. Allocation of MIT Graduates into VC-Backed Startups vs. Finance, 2006–2014.
Notes: Join percentages are calculated based on the subset of graduating seniors at MIT who select into full-time employment. Finance includes financial services (commercial banking and insurance), investment banking, and money management.
Source: MIT Graduating Student Survey.

Graduating Student Survey, it was designed to cover the exact same time frame and population (i.e. college graduates who select into full-time employment). Given the administrative concern that MIT graduates are too frequently solicited to fill out surveys, the MIT Early Careers Survey's outreach was limited to 2,500 people. Consequently, the random sampling of 2,500 potential respondents was slightly weighted towards (1) the Engineering school and (2) graduation years closer to the implementation year to reduce recall bias. The final sample contains 1,014 private sector job offers among 626 individuals.

The MIT Graduating Student Survey measures compensation from the three following variables: (1) yearly salary in US dollars; (2) sign-on bonus; and (3) additional compensation (e.g. allowance for moving expenses). All of the analyses in this study are based on the first component, the yearly salary, as the main dependent variable. Nonetheless, as shown in Appendix Tables A3 and A4 in Supplementary materials, the main results are consistent with using the total compensation package. Ex-post compensation (e.g. performance bonus) are not observed because individuals are surveyed before they begin their jobs.

Moreover, equity compensation is not included in this study. Although the MIT Early Careers Survey collects some information regarding stock options, the data are difficult to interpret. The real value of a share in an early-stage company is almost impossible to assess ex-ante considering the uncertainty around the company's underlying idea or business model (Kerr et al., 2014); even with information on the most recent company valuation, the actual value of the employee's shares is not realized until the company eventually exits via an acquisition or initial public offering. Therefore, it is not clear how the job candidates perceive and value the proposed stock options at young private firms during the time of the job offer. Due to issues around both measurement and interpretation, equity compensation is not captured in this study.[5]

A potential concern for the MIT Early Careers Survey is the non-response bias. The MIT Early Careers Survey has a response rate of 25%. The low response rate is problematic if the 25% who responded to the survey are qualitatively different from those who did not. In this case, the multiple offers analysis based on this survey data may not be generalizable to the full labor market of MIT graduates. For instance, MIT alumni with "less successful" early careers may be less inclined to participate in the survey which would upward bias the observed earnings distribution.

Fortunately, non-response bias can be rigorously assessed since MIT contains administrative data on both the survey respondents and non-respondents. Appendix Table A1 in the Supplementary materials shows difference in means tests of observable individual characteristics between respondents and non-respondents. By design, the respondents are more likely to be from the Engineering school and recent graduation years relative to the non-respondents. Consistent with the sectoral trends in Fig. 2, and given their more recent graduation years, respondents are much more likely to have chosen jobs in the high-tech sector (e.g. software) and less so in the financial services sector. Therefore, these industry differences are rather expected and are controlled for in the inclusion of year fixed effects.

[5] Typically, college graduates entering into entry-level positions are not offered significant stock options at large established companies. In contrast, VC-backed startups typically offer equity to their early employees to attract talent without offering more cash (Booth, 2006). Given the assumption that VC-backed startups tend to pay equity more frequently than large established companies, it is likely that the startup wages estimated in this study are downward biased since equity compensation is omitted in the analysis.

Table 1
Summary Statistics (N = 2,064 workers).

Individual Characteristics	Mean	Median	SD	Min	Max
Male	0.43	0	0.49	0	1
US Citizen	0.87	1	0.33	0	1
Graduation year	2010.27	2011.00	2.63	2006	2014
Number of offers received	1.94	1	1.34	1	12
MIT School					
Architecture and Planning	0.01	0	0.08	0	1
Engineering	0.63	1	0.48	0	1
Humanities, Arts, & Social Sciences	0.06	0	0.25	0	1
Management	0.10	0	0.30	0	1
Science	0.20	0	0.40	0	1

Employer Characteristics (Accepted Offer)	Mean	Median	SD	Min	Max
Firm Type					
Established Firm	0.89	1	0.31	0	1
VC-Backed Startup	0.08	0	0.27	0	1
Non-VC backed Startup	0.03	0	0.16	0	1
Salary ($2006)	61,614	60,094	19,033	10,537	187,271
Firm age (at graduation year)	54.06	34	52.94	1	348
Industry					
Aerospace and Defense	0.07	0	0.25	0	1
Automotive and Transportation	0.01	0	0.12	0	1
Business Services (Advertising, Real Estate, Retail)	0.02	0	0.15	0	1
Chemicals and Materials	0.02	0	0.14	0	1
Computer Hardware/Electrical Engineering	0.03	0	0.18	0	1
Computer Software	0.17	0	0.37	0	1
Consulting	0.15	0	0.36	0	1
Education	0.02	0	0.16	0	1
Energy and Utilities	0.04	0	0.19	0	1
Engineering	0.09	0	0.28	0	1
Financial Services	0.06	0	0.23	0	1
Health/Medicine	0.04	0	0.19	0	1
Industrial and Consumer Manufacturing	0.02	0	0.13	0	1
Money Management	0.13	0	0.34	0	1
Pharmaceutics (Biotech, Medical Device)	0.03	0	0.17	0	1
Other	0.06	0	0.23	0	1

Overall, the two groups appear to be similar in their individual traits (e.g. gender, number of offers received, citizenship status). More importantly, respondents and non-respondents are similar in terms of their job outcomes (e.g. number of offers, accepted salary), suggesting that non-response bias is not a credible alternative explanation to this study's results on wages. As a result, the interpretation of the results from the MIT Early Careers Survey does not seem to be threatened by non-response bias.

Firms are categorized as one of the three following types based on firm age and venture capital financing: Established Firm, VC-Backed Startup, or Non-VC-backed Startup. Firm categorization is based on firm age – not size – in light of the fact that young firms play a salient role in job creation (Haltiwanger et al., 2013). Mechanically, I define a VC-backed startup as any for-profit company that receives early-stage institutional capital — either venture capital or angel financing — within five years of the employee's join date. All results are robust to narrowing the venture capital financing window to three years. Venture-backed companies that successfully exit via an IPO or M&A before the student's graduation year are categorized as established firms. Moreover, non-VC startups are companies that are five years old or younger and that do not receive VC-financing prior to the student's join date. Lastly, established firms are companies that are older than five years old and do not receive venture capital financing within the narrow window preceding the worker's graduation year.

It is important to discuss why venture capital financing is salient to this study's categorization of firm types. While many studies in the entrepreneurship literature generalize all small or young firms as startups, many small businesses are not viable employment alternatives to large established corporations. Most small businesses never intend to grow large or innovate in a meaningful way (Hurst and Pugsley, 2011), implying that they do not typically recruit for the type of human capital that large corporations seek. Since firm intentions are unobservable, VC financing is used to distinguish lifestyle businesses from young high-growth firms, which presumably compete against established firms for talent.[6]

In addition, VC financing is relevant to high-growth entrepreneurship because venture investors commonly professionalize their portfolio companies by implementing formal human resource policies (Hellmann and Puri, 2002). This allows the nascent companies to appropriately compensate their employees. Also, venture capital financing enables early-stage companies to attract new talent as evidenced by the hiring spree that typically follows each additional round of venture financing (Davila et al., 2003). Therefore, VC activity forms an important dimension to how firms are categorized in this study.

4. Empirical results

4.1. Simple wage comparisons

This section examines the cross-sectional relationship between offered salaries and startup employment for MIT graduates from 2006 to 2014. The analysis is at the individual-level and wages are those of the accepted job offer. The following regression specifications in Table 2 closely follow Eq. (1). All specifications include graduation year fixed effects to account for idiosyncratic time trends in the labor market.

In the simple case shown in Specification (2-1), the association between VC-backed startup employment and log wages is positive and statistically significant at the 1% level. The economic significance is also large; relative to established firms, VC-backed startups on average pay 13% higher salaries. This is a surprising finding because while VC-backed startups are typically young and small, the labor economics literature widely supports firm size- and age-wage premium as an empirical regularity. This suggests that, contrary to the general population, workers selected from the right tail of the human capital distribution experience a fundamentally different dynamic between firm age and wages when choosing among job offers from startups and established firms in the US.

Specifications (2–2), (2–3), and (2–4) control for individual characteristics that are potentially linked to the worker's earnings capacity. These characteristics include gender, US citizenship, number of offers received, and the MIT school in which the graduate was academically trained. The estimated effect of startup employment on wages is attenuated after accounting for individual traits related to earnings. This is consistent with Brown and Medoff (2003) who find that the empirical relationship between firm age and wage is highly sensitive to controlling for worker characteristics. More importantly, controlling for the number of offers received in Specification (2–4) noticeably attenuates the wage premium attributed to VC-backed startups. Given that the number of job offers can be a proxy for the individual's unobserved ability, it is reasonable that the estimated wages shrink after indirectly accounting for ability. Overall, even after controlling for worker characteristics that are related to wages, specifications (2)–(4) indicate a robust effect of a VC-backed startup wage premium. Therefore, I reject Hypothesis 1 at the 1% statistical significance level and find that VC-backed startups on average pay 8–13% higher wages than their mature

[6] Aulet and Murray (2013) similarly categorize young firms into two distinct types: small and medium-sized enterprises (SMEs) and innovation-driven enterprises. They explain that firms in the latter category are typically supported by external financing because they require investment capital in order to develop novel products and scale their businesses.

Table 2
OLS Cross-Sectional Wage Regression.

	Dependent Variable: Log Salary of Accepted Offer						
Omitted: Established Firm	All (1)	All (2)	All (3)	All (4)	All (5)	High-Tech only (6)	Non-Finance (7)
VC-Backed Startup	0.130***	0.110***	0.0935***	0.0791***	0.0693***	0.0550*	0.106***
	(0.0261)	(0.0259)	(0.0249)	(0.0258)	(0.0235)	(0.0313)	(0.0273)
Non-VC Startup	−0.0723	−0.0833	−0.0931*	−0.0642	−0.0250	−0.116*	−0.0963**
	(0.0557)	(0.0550)	(0.0498)	(0.0512)	(0.0537)	(0.0607)	(0.0473)
Male		0.122***	0.123***	0.114***	0.0919***	0.0633***	0.0875***
		(0.0170)	(0.0166)	(0.0163)	(0.0152)	(0.0240)	(0.0177)
US Citizen		−0.0696***	−0.0665***	−0.0585***	−0.0685***	−0.0626	−0.0507*
		(0.0227)	(0.0220)	(0.0222)	(0.0198)	(0.0399)	(0.0263)
Number of offers received			0.0552***	0.0555***	0.0464***	0.0374***	0.0469***
			(0.00603)	(0.00604)	(0.00554)	(0.00794)	(0.00624)
Constant	10.96***	11.02***	10.96***	10.76***	10.75***	10.95***	10.72***
	(0.0209)	(0.0291)	(0.0296)	(0.105)	(0.106)	(0.0814)	(0.109)
Location (State) Fixed Effects	No	No	No	No	Yes	No	No
MIT School Fixed Effects	No	No	No	Yes	Yes	Yes	Yes
Observations	2064	2064	2064	2052	2024	718	1667

Notes: This table reports OLS wage regressions on a sample of 2064 graduating seniors from MIT. The unit of observation is the individual with employment information based on his or her accepted job offer. All specifications include graduation year fixed effects. Robust standard errors are shown in parentheses.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

counterparts.

It is worth noting that non-VC startups generally pay lower wages than both established firms and VC-backed startups. While not always statistically significant, non-VC startups are generally associated with a 10% wage discount relative to established firms. In light of the wage premium consistently linked to VC-backed startups, these results corroborate the fundamental role that venture capital plays in financially enabling young firms to offer attractive compensation.

A key concern is that the observed wage differential may be driven by firm location. Given the venture-backed startups tend to be clustered in entrepreneurial regions (e.g. California, Massachusetts, and New York) that are also expensive, these firms may pay relatively high wages to simply offset the high cost of living. In other words, geographic differences are a plausible alternative explanation to the main result shown above.

Accordingly, Specification (2–5) tests whether and how the estimated wage differential changes after including location (state) fixed effects. For job offers outside the US, the locations are grouped by the continent. For example, jobs in Japan and South Korea are categorized as “Asia”. Over and above the location of the job offer, VC-backed startups are consistently associated with a wage premium relative to established firms. It is worth highlighting that the estimated effect is slightly smaller in magnitude. The attenuation is consistent with the intuition that the cost of living in the employer’s area is positively associated with regional wages. Nonetheless, geographic differences can be ruled out as the main mechanism that explains the higher wages at VC-backed startups.

As an additional robustness check, I split the analysis into subsamples to assess whether the effect is driven by a peculiar sector or industry. One potential concern is that since venture capital investments tend to be concentrated in a few select industries such as computer software, the estimated wage effect may be driven by wage differences in industry composition rather than those between startups and established firms. Specification (2–6) subsets on the high-tech sector which represents 73% of the VC-backed startups in the labor market for MIT graduates. This regression does not include state fixed effects because VC-backed firms are both concentrated in terms of industry and geography; compared to 65% of high-tech established firms in the sample, 95% of high-tech VC-backed startups are located in California, Massachusetts, or New York. Nonetheless, the effect of startup employment is attenuated to a wage premium of roughly 6%, which is statistically significant at the 10% level. This is not surprising given that inter-industry wage differentials tend to be large and persistent (Katz and Summers, 1989). Overall, even after conditioning on only the high-sector in which VC-backed startups are heavily concentrated, the startup wage premium is positive and significant.

Similarly, specification (2–7) explores the startup-wage relationship across only non-finance jobs. Finance jobs are an important aspect of the labor market outcomes for MIT graduates because it is a lucrative early career track that draws a large share of talent each year. Although Shu (2013) claims that MIT graduates who become financiers versus those enter into the innovation sector are not substitutable in their skill sets, Fig. 2 suggests that the allocation of talent has qualitatively shifted from the financial sector to entrepreneurial firms in the recent decade. Therefore, a comparison of the magnitude and sign of the startup wage premium from the full sample against those drawn from only the non-finance jobs is informative. Specification (2–7) shows that the estimated startup wage premium, which remains statistically significant at the 1% level, is larger than documented in the full sample (Specification 2–5). This is expected because finance jobs are generally the most lucrative early career tracks. Overall, these tests on subsamples show that the startup wage premium is not primarily driven by sectoral differences.

Another key concern is the 2008–09 Financial Crisis, which occurs in the middle of the sample. Business cycles may influence not only the graduating students’ initial career selection but also the wage dynamics within sectors. For instance, it is possible that the crisis more sharply affected jobs in the financial services sector, experiencing greater declines in wages relative to those in other sectors. Therefore, the startup wage “premium” effect could be an artifact of financial services firms (more) steeply reducing compensation during the financial crisis. In order to address this issue, I split the sample into three periods: before, during, and after the financial crisis. Given that MIT undergraduates typically search for full-time jobs almost a year before their graduation, I categorize the three time periods as graduation years 2006–2008 (pre), 2009–2010 (during), and 2011–2014 (after).

Overall, the results in Table 3 reflect the underlying business cycles. Venture-backed startup wage estimates noticeably vary across the three time periods centered on the financial crisis. In the years before and after the financial crisis, the VC-backed startups are consistently associated with a wage premium relative to established firms. These results

Table 3
Wage Regressions Before, During, and After the Financial Crisis.

	Dependent Variable: Log Salary of Accepted Offer			
	All (1)	All (2)	High-Tech (3)	Non-Finance (4)
Before the Financial Crisis				
VC-Backed Startup	0.118**	0.120**	0.165*	0.154**
	(0.0506)	(0.0567)	(0.0890)	(0.0658)
Observations	636	626	189	442
During the Financial Crisis				
VC-Backed Startup	−0.00156	−0.00137	−0.0974	−0.0254
	(0.0784)	(0.0737)	(0.0969)	(0.0836)
Observations	391	379	121	317
After the Financial Crisis				
VC-Backed Startup	0.161***	0.0953***	0.0626*	0.122***
	(0.0304)	(0.0284)	(0.0334)	(0.0311)
Observations	1037	1019	408	908
Control Variables	No	Yes	Yes	Yes
Graduation Year Fixed Effects	Yes	Yes	Yes	Yes
Location (State) Fixed Effects	No	Yes	No	No
MIT School Fixed Effects	No	Yes	Yes	Yes

Notes: This table reports OLS wage regressions on a sample of 2064 graduating seniors from MIT. The unit of observation is the individual with employment information based on his or her accepted job offer. From the three-categorization of firm types, Established Firms are the omitted category. Control Variables include binary indicators for whether the accepted offer was associated with Non-VC startup, Male, and US Citizenship. Robust standard errors are shown in parentheses.

* p < 0.10.
** p < 0.05.
*** p < 0.01.

are consistent with the original finding that VC-backed startups are associated with higher salary offers than established firms.

However, the wage relationship is strikingly different during the financial crisis. Although statistically insignificant, VC-startup wages are qualitatively lower than those at established firms. This suggests that the financial crisis exerted a more severe liquidity shock on small and young firms, limiting their ability to pay attractive salaries. Soon after, startup wages appear to recover back to their pre-recession levels by the early 2010s.

While VC-startup wage effects are quite different during the financial crisis, the results clearly confirm that the documented VC-startup wage premium in the cross-section is not driven by the financial crisis. During the financial crisis, there is no wage premium associated with VC-backed startups. In this regard, the inclusion of the financial crisis period in the sample only attenuates the VC-startup wage estimates towards zero. Therefore, business cycles do not appear to be a credible alternative explanation to the startup wage premium documented in the cross-section.

Lastly, I explore the startup-wage relationship at other points in the distribution in order to check that the mean effect is not predominantly driven by outliers. Appendix Table A5 in Supplementary materilas presents the quantile regression points estimates at each decile of the conditional wage distribution. I find that the startup wage premium is highest for workers at middle to high range of the conditional earnings distributions while much lower for those at either tail of the distribution. Overall, the effect of entrepreneurial employment on wages is qualitatively similar given the positive, albeit not always statistically significant, startup-wage relationship at every point in the conditional earnings distribution.

4.2. Testing for selection

I assess selection as the main channel that may explain the startup wage premium. First, I compare MIT graduates who join VC-backed startups with those who work at established companies with respect to observable characteristics. Large observable differences would suggest that the two types of workers are systematically different and that there may also be unobserved heterogeneity that results in the sorting of workers across employers.

Table 4
Univariate Difference in Means Test: Workers at Established Firms vs. Early Employees.

	Est. Firm Employees (n = 1,848)	VC-Backed Startup Emps. (n = 163)	t-Stat: Equal Means	Normalized Differences
Individual Characteristics				
MIT School				
Architecture and Planning	0.01	0.01	0.04	0.00
Engineering	0.62	0.81	4.68	−0.18
Humanities, Arts, & Social Sciences	0.07	0.02	2.44	0.05
Management	0.10	0.01	3.79	0.09
Science	0.20	0.16	1.32	0.04
Male	0.40	0.64	5.92	−0.24
US Citizen	0.87	0.87	0.14	0.00
Number of Offers Received	1.91	2.28	3.38	−0.37

Notes: This table reports a series of *t*-tests of equality of means between MIT graduates who join established companies and those who join VC-backed startups; students who join non-VC startups are omitted for brevity. Differences are normalized based on Imbens and Wooldridge (2009).

Table 4 shows a series of *t*-tests of equality of means comparing MIT graduates who join VC-backed startups and those who work at established companies.[7] In terms of academic training, MIT graduates who join VC-backed startups appear to be based more in the Engineering school and less in the Management school. To extent that the choice of major at MIT directly shapes the development of skills relevant to future employment, this suggests that the type of human capital that sort into venture-backed startups is qualitatively different.

Moreover, individual characteristics widely vary between employees at established firms and those at VC-backed startups. VC startup joiners are much more likely to be male. More importantly, they tend to receive more job offers. This difference is statistically significant and hints that the students who join VC-backed startups exhibit higher ability or other qualities that are valued by employers.

Taken together, Table 4 illustrates that the two types of workers are systematically different along many observables characteristics including MIT school, gender, and number of offers received. Given these considerable differences, it is plausible that there also exist unobservable qualities by which employees at venture-backed startups and workers at established firms differ. Estimated wage premia in Table 2 are especially concerning if these unobservable differences are linked to wages. As explained in Section II, the primary concern for selection is found in Dahl and Klepper (2015). The model shows that high quality workers are matched to large productive firms, leaving low quality workers to be allocated to startups.

Although Eq. (2) cannot be directly tested because worker ability is unobservable, I use bundles of offers for each individual to account for both observed and unobserved individual characteristics. Before the analysis of wages at the offer-level rather than at the individual level, I revisit the key identification assumption that individuals who receive a single job offer are not systematically different from those who receive multiple. Table 5 presents a series of *t*-tests of equality of means for both individual and employer characteristics associated with the job offer.

[7] Formula for normalized differences is adopted from Imbens and Wooldridge (2009).

Table 5
Univariate Difference in Means Test: Single vs. Multiple Job Offers.

	Single offers (n = 328)	Multiple offers (n = 658)	*t*-Stat: Equal Means	Norm. Diff.
Individual Characteristics				
Male	0.42	0.42	0.11	0.01
US Citizen	0.89	0.86	1.06	0.05
Graduation Year	2011.41	2011.59	0.88	0.04
MIT School				
Architecture and Planning	0.01	0.00	1.29	0.06
Engineering	0.66	0.72	1.97	0.10
Humanities, Arts, & Social Sciences	0.06	0.05	0.82	0.04
Management	0.07	0.06	0.74	0.04
Science	0.20	0.17	1.16	0.06
Job Preferences				
Firm Reputation	0.65	0.64	0.24	0.01
Job Security	0.40	0.38	0.32	0.02
Opportunity for Impactful Work	0.70	0.72	0.61	0.03
Employer Characteristics				
Offer Salary ($2006)	58,752	67,482	6.70	9,833
VC-Backed Startup	0.08	0.13	1.90	0.10
Firm Age	56.79	47.56	2.67	8.8
Industry				
Aerospace and Defense	0.09	0.08	0.85	0.04
Automotive and Transportation	0.03	0.02	1.64	0.08
Business Services (Advertising, Real Estate, Retail)	0.01	0.01	0.24	0.01
Chemicals and Materials	0.01	0.02	0.17	0.01
Computer Hardware/ Electrical Engineering	0.02	0.03	0.12	0.01
Computer Software	0.15	0.23	2.80	0.15
Consulting	0.16	0.18	0.79	0.04
Education	0.03	0.01	2.25	0.10
Energy and Utilities	0.06	0.10	1.95	0.10
Engineering	0.06	0.05	0.59	0.03
Financial Services	0.07	0.09	0.72	0.04
Health/Medicine	0.06	0.02	3.00	0.14
Industrial and Consumer Manufacturing	0.04	0.02	1.45	0.07
Money Management	0.07	0.08	0.40	0.02
Pharmaceutical (Biotech, Medical Device)	0.05	0.03	1.86	0.09

Notes: This table reports a series of *t*-tests of equality of means between job offers among MIT graduates who receive one offer and job offers among MIT graduates who receive multiple offers. Differences are normalized based on Imbens and Wooldridge (2009). Variables of comparison are observable individual characteristics and preferences for job attributes. Each job preference is a dummy equaling one if the respondent indicated that the particular job attribute was considered "essential" or "very important" in choosing the ultimate job offer.

Administratively observable individual traits such as gender, citizenship, graduation year, MIT school of affiliation are statically equal between the two groups. Moreover, individuals with a single offer relative to those with multiple offers express similar preferences for the three job attributes (firm reputation, job security, and impactful work) that are related to startup entry. Overall, single and multiple offers appear to be drawn from two demographically similar groups of workers.

For employer characteristics, the share of offers from VC-backed startups is statistically similar although the percentage is slightly higher for multiple offers (8% vs. 13%). However, offered salary and firm age show a sharp contrast between the two groups. It may simply be the case that individuals who are more attractive to employers receive higher salaries and more job offers. While it is possible that the individuals with multiple offers are drawn from higher points in the ability distribution compared to single-offer individuals, offer salaries are likely inflated due to ex-post bargaining process between the workers and firms. Furthermore, many top MIT graduates have a single job offer because they receive and accept a full-time job offer from their summer internship prior to their senior year and thus do not participate in the ensuing full-time job recruiting. Nonetheless, while selection is a potential issue, the balanced individual-level covariates as well as the subsequent results consistent with the startup wage premium documented in Table 2 are reassuring.

Table 6 presents the offer-level relationship between entrepreneurial employment and wages. Consistent with the findings in Table 2, specification (6-1) shows that job offers from VC-backed startups are roughly 9% higher in compensation than those from established firms. This effect is positive and statistically significant at the 1% level. Results are consistent for job offers from both high-tech (6-3) and non-finance sectors (6-5). As similarly documented in Table 2, non-VC startups generally appear to pay relatively low wages when compared to both established and VC-backed startup firms.

Finally, I introduce individual fixed effects to account for both observed and unobserved individual traits including ability. All controls are omitted because they are time-invariant individual-level covariates whose effects are absorbed by the individual fixed effects. Specification (6-2) shows that the effect of startup employment on wages is statistically insignificant from zero. The sign flips to negative to roughly −6% although the point estimate is not statistically significant. Nonetheless, it is clear that accounting for heterogeneity across workers erases the relatively high wages associated with startup employment. In other words, conditional on worker quality, startups and established employers pay similar wages. This indicates that the cross-sectionally observed startup wage premium is primarily driven by selection. The results are consistent for both high-tech (6-4) and non-finance (6-6) job offers. Therefore, I accept the second hypothesis.

It is worth emphasizing that many high ability workers appear to select into entrepreneurial firms, which then pay high wages for superior talent. In a counterfactual world in which these workers are assigned to large corporations, these workers would also earn similarly high salaries. This implies that VC-backed startups pay competitive wages for talent. While not much is known regarding the personnel economics inside early-stage VC-financed companies, it is surprising that VC-backed startups tend to pay competitive salaries in spite of credit constraints.

4.3. Unpacking the selection mechanism

The main finding of this study is that while VC-backed startups seemingly pay higher wages compared to established firms, the "startup wage premium" is explained by high-ability workers sorting into VC-backed startups. Given that the allocation of talent among top graduates poses an important phenomenon, the natural follow-up question is: Why do better graduates end up in VC-backed startups? The following discussion offers some evidence regarding the mechanism that drives many high-ability students to select into entrepreneurial firms vis-à-vis established companies. Motivated by the existing literature, I test a few key predictions surrounding the individuals' ex-ante preferences for particular job attributes. The first half discusses the role of risk-appetite and impatience, and the second half highlights the importance of the job content.

Although ability is not directly measured, there are other proxies that can further clarify the relationship between ability and job selection among MIT graduates. Dohmen et al. (2010) offer experimental evidence that an individual's cognitive ability is systematically related to his preferences for risk and immediate satisfaction. In particular, the authors show that lower cognitive ability is linked to higher levels of

Table 6
OLS Offer-Level Wage Regression with Individual Fixed Effects.

	Dependent Variable: Log Offer Salary					
	All		High-Tech only		Non-Finance	
Omitted: Established Firm	(1)	(2)	(3)	(4)	(5)	(6)
VC-Backed Startup	0.0864***	−0.0652	0.0981**	−0.0693	0.0913**	−0.0613
	(0.0328)	(0.0554)	(0.0419)	(0.0868)	(0.0366)	(0.0508)
Non-VC Startup	−0.108	−0.0713	−0.0771	0.0671	−0.163**	−0.0979
	(0.0673)	(0.0565)	(0.0911)	(0.163)	(0.0702)	(0.0708)
Male	0.0907***		0.0502		0.0812***	
	(0.0240)		(0.0351)		(0.0257)	
US Citizen	−0.131***		−0.0904*		−0.118***	
	(0.0261)		(0.0473)		(0.0266)	
Number of Offers Received	0.0342***		0.0601***		0.0304***	
	(0.0106)		(0.0130)		(0.0108)	
Constant	11.45***	11.29***	11.17***	11.26***	11.39***	11.31***
	(0.197)	(0.0709)	(0.142)	(0.168)	(0.206)	(0.0915)
Individual fixed Effects	No	Yes	No	Yes	No	Yes
Observations (offers)	658	658	319	319	556	556

Notes: This table shows the result of individual fixed-effects OLS regressions on a sample of 658 job offers. The unit of observation is a job offer made to a graduating senior at MIT. All specifications include graduation year and MIT School fixed effects. Robust standard errors are shown in parentheses.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 7A
Risk Appetite, Impatience, and Job Selection.

Multinomial Logit	Main Independent Variable: Job Attributes		
DV: Type of Firm Chosen Omitted: Established Firm	**Job Security**	**Employer Reputation**	**First Job Offered**
VC-Backed Startup	0.525 [−0.645]*** (0.120)	0.503 [−0.686]*** (0.114)	0.765 [−0.268]** (0.117)
Non-VC Startup	0.478 [−0.738]*** (0.169)	0.338 [−1.084]*** (0.188)	0.932 [−0.0700] (0.171)
Controls	Yes	Yes	Yes
Graduation Year Fixed Effects	Yes	Yes	Yes
MIT School Fixed Effects	Yes	Yes	Yes
Observations	1811	1933	1746
… = odds ratio […] = coefficient on logit (…) = standard error on logit			

Notes: This table reports multinomial logit regressions estimating the likelihood of the type of firm chosen by the individual. The dependent variable is the firm type for which "Established Firm" is the omitted category. Independent variables are the individual's preference levels for particular job attributes on a scale of 1 ("not important") to 4 ("essential"). The unit of observation is the individual. Controls include indicator variables for male and US citizenship. Constants are undisplayed for brevity. Robust standard errors are shown in parentheses.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

risk-aversion and impatience. This leads to the following hypothesis that risk-averse and impatient MIT graduates are more likely to select into established firms than into startups.

To test this key prediction, I leverage a set of questions from the MIT Graduating Student Survey on the students' preferences for certain job attributes. On a 4-point Likert scale of "Not important" to "Essential", each student is asked to evaluate a set of factors (e.g. employer reputation) and their importance to her decision to accept the ultimate job offer. Among the twenty different job attributes included in the survey, the three following job attributes are most closely connected to Dohmen et al. (2010)'s results on risk aversion and impatience: "Job Security", "Employer Reputation", and "First Job Offered".

Table 7A shows a series of multinomial logit regressions estimating likelihood of students' job selection among established firms, VC-startups, and non-VC startups. The main independent variables are a set of preferences for a series of job attributes. Job security and employer reputation, as shown in Specifications 1 and 2, are proxies for the individual's risk appetite given that risk-averse are likely to prioritize job security and organizational reputation. Similarly, preferences for the first job offered is a proxy for the student's level of patience for labor market outcomes.

The results account for the students' initial selection of their area of study (MIT School) as well as for demographic characteristics and year-specific effects; only the specifications with the full set of controls are shown for brevity. First, results from Specifications 1 and 2 reflect a negative and statistically significant relationship between selecting into VC-startups and risk-aversion. A standard deviation increase in the preference for job security or firm reputation is each associated with a

Table 7B
Job Content and Job Selection.

Multinomial Logit	Main Independent Variable: Job Attributes		
DV: Type of Firm Chosen Omitted: Established Firm	**Job Content**	**Creative & Challenging Work**	**Opportunity for Impact**
VC-Backed Startup	1.479 [0.391]*** (0.149)	1.747 [0.558]*** (0.151)	1.376 [0.319]*** (0.114)
Non-VC Startup	0.918 [−0.0858] (0.195)	0.914 [−0.0899] (0.202)	0.876 [−0.132] (0.186)
Controls	Yes	Yes	Yes
Graduation Year Fixed Effects	Yes	Yes	Yes
MIT School Fixed Effects	Yes	Yes	Yes
Observations	1992	1949	1845

… = odds ratio
[…] = coefficient on logit
(…) = standard error on logit

Notes: This table reports multinomial logit regressions estimating the likelihood of the type of firm chosen by the individual. The dependent variable is the firm type for which "Established Firm" is the omitted category. Independent variables are the individual's preference levels for particular job attributes on a scale of 1 ("not important") to 4 ("essential"). The unit of observation is the individual. Controls include indicator variables for male and US citizenship. Constants are undisplayed for brevity. Robust standard errors are shown in parentheses.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

roughly 55% lower likelihood of joining a VC-startup compared to an established firm. This is consistent with Roach and Sauermann (2015) who find that startup joiners and founders express a stronger preference for risk than do joiners at established companies.

In addition, Specification 3 indicates a negative and statistically significant association between a worker's ex-ante level of impatience and subsequent selection into VC-startups. A standard deviation increase in the preference for the first job offer is linked to a 29% decline in the likelihood of joining a VC-startup.

These findings confirm the hypothesis that risk-averse and impatient students are more likely to select into established firms. Given the previous implication that high-ability MIT students tend to select into VC-startups and therefore command relatively high wages, these results parallel Dohmen et al. (2010)'s finding that cognitive ability is positively related to risk-taking attitude and patience.

Beyond innate individual characteristics such as ability and risk-appetite, the nature of the job itself may play a vital role in attracting particular types of workers to startups versus established firms. Baron et al. (1996) highlight that employees of high-tech startups are fundamentally motivated by "a desire to work at the technological frontier." Moreover, entrepreneurial workers express a strong desire for autonomy (Roach and Sauermann, 2015). In response, Baron et al. (1996) explain that startup founders intentionally craft and offer "interesting and challenging work" to hire, motivate, and retain skilled employees.

Table 7B illustrates how the content of the job affects the type of firm that MIT graduates choose. More broadly, Specification 1 demonstrates that MIT graduates who express a strong preference for the job content are much more likely to join a VC-backed startup rather than an established firm. The next two specifications indicate a strong and statistically significant relationship between joining a VC-backed startup and preferences for "creative and challenging work" and "opportunity for impact." In other words, MIT students who seek meaningful and challenging work are much more likely to choose jobs at VC-backed startups rather than at established firms. Consistent with prior studies on startup employees (Baron et al., 1996; Sauermann, 2017), workers at VC-backed startups are appear to be distinctly influenced by the content of their job.

A limitation to this analysis is that there may be "ex-post rationalization" by the respondents; since the MIT Graduating Student Survey is administered during the spring of the student's final year – presumably *after* their job search – the students may be inclined to justify their job selection choices. However, albeit only suggestive, these results point to a strong link between individual preferences and job selection. Overall, innate individuals traits such as risk-appetite and patience – which are traits tightly linked to cognitive ability – play an important role in motivating certain types of MIT graduates and talent into entrepreneurial firms vs. established companies. Moreover, the nature of the job itself strongly influences the hiring process in which heterogeneous workers are matched to different firm types; MIT graduates who prefer challenging, creative, and impactful work tend to join VC-backed startups.

5. Conclusion

Human capital is undoubtedly a central component of entrepreneurship. In addition to the company founders, early employees are an indispensable force behind the growth and success of nascent companies. However, little is known regarding the type of workers who self-select into startups as well as the wages early employees earn relative to employees at large established firms. This study offers an empirical treatment of wage differentials between VC-backed startups and established firms — two firm types that compete for high talent.

Using data from graduating college students from MIT, I show that early employees earn roughly 10% higher salaries than their counterparts at established firms. It appears that selection is the primary channel through which startups appear to pay a wage premium in the cross-section. Holding worker ability constant in a framework of multiple job offers, I show that early employees earn statistically equal wages as employees at large established firms. In sum, these findings suggest that high-ability workers, who command high wages in both employment settings, tend to select into VC-backed startups, thereby creating an illusion of a cross-sectional wage premium associated with startups.

Wage parity between VC-backed startups and established firms stands in contrast to the existing evidence that small and young businesses tend to pay lower wages. This set of seemingly inconsistent results is likely driven by the fact small businesses and high-growth startups are systematically different (Schoar, 2010; Hurst and Pugsley, 2011; Guzman and Stern, 2016). From a policy perspective, this finding lends insight to Shane's (2009) claim that it is "bad policy" to simply

encourage more people to become entrepreneurs since the vast majority of new businesses create very small economic impact. In line with Shane (2009), this study documents that entry-level jobs created by high-growth startups are as well-paying as their counterparts at established companies. Therefore, policy efforts aimed to create "good jobs" should pay special attention to high-growth entrepreneurship rather than all young and new businesses.

Another interpretation of this study is that VC-backed startups pay competitive wages for talent. The wage parity between startups and established is surprising considering that nascent companies are typically credit constrained; it is commonly believed that startups offer equity compensation in order to justify a below-market salary (Booth, 2006). A complementary insight is that non-VC backed startups systematically pay relatively low wages compared to both established firms and venture-backed startups. Taken together, these findings clarify a fundamental role of venture capital: financially equipping young firms to be able to pay attractive salaries.

Moreover, this study concludes by offering some evidence regarding the selection mechanism. Consistent with prior evidence that lower cognitive ability is linked to greater risk-aversion and impatience (Dohmen et al., 2010), MIT graduates who strongly prefer job security (i.e. risk-averse) and first job offered (i.e. impatient) are significantly more likely to join established firms rather than startups. Moreover, job content strongly predicts the type of firm that the individual chooses to join; MIT graduates who desire creative, challenging, and impactful work are much more likely to join startups. These findings imply that managers at older companies can build and reinforce a culture of autonomy and impact – which startups generally embody (Baron et al., 1996) – to appeal to the "entrepreneurial talent" that would otherwise sort into their younger competitors.

A limitation of this study is that its findings may not be generalizable to the broader labor market since MIT represents a highly selected sample of workers at the right-tail of the ability distribution. However, the narrow nature of the sample is advantageous in many ways. MIT's distinctly high level of human capital generates a local labor market in which various types of firms vigorously compete for talent. Therefore, unlike many other labor markets, MIT students typically receive numerous job offers — some of which are from established firms and others from VC-backed startups. In addition, while many studies on the financial returns to entrepreneurship include both lifestyle businesses and high-growth startups in their comparison to large employers, the former is not an appropriate basis for comparison because small businesses often employ low-skilled workers who are not fit for high-productivity roles at large established firms. In contrast, MIT graduates generally possess the type of human capital that is sought after by both high-growth startups and mature firms. Lastly, this paper's multiple offers methodology turns on the fact that a sufficient number of workers receive offers from both firm types, making MIT an empirically advantageous setting to compare wages between VC-backed startups and established firms. Nevertheless, the insights drawn from MIT graduates and their labor market outcomes are generally limited to high-skilled young workers.

This study motivates numerous questions for future research. I discuss three promising follow-on questions. The first concerns the gender effect on VC-backed startup entry and wages. Although not explicitly addressed given the limited scope of this study, males are positively and significantly associated with a wage premium in almost all of the regression analyses in this study. Such a systematic gender inequity in pay is surprising: this sample is selected from a single elite research university, meaning that the men and women in this setting exhibit similar ex-ante characteristics (e.g. age) and experience identical training and career opportunities. While a vast literature surrounds the topic of gender discrimination, more research is needed to better understand the complex interplay between gender, endogenous job selection, and wages among the elite STEM-educated workforce. It would be promising to leverage multiple job offers – as done in this study – to empirically pin down the demand- vs. supply-side factors that govern gender pay inequity among STEM-educated workers.

Second, how does homphily (i.e. MIT graduates being drawn to MIT alumni-founded companies) impact the job offer that the worker ultimately chooses and the resulting wages? On the one hand, social ties may mitigate the "liability of newness" (Stinchcombe, 1965) that hampers new organizations' ability to attract top talent. On the other hand, homophily can positively bias employers' evaluation of socially connected job candidates (c.f., Gompers et al. (2016) for homophily in hiring among venture capital investors), leading firms to make poor hiring decisions. Given the high rates of entrepreneurship among MIT alumni, it would be insightful to better understand the real economic impact of homophily on hiring and wage outcomes.

Third, entry-level salaries for college graduates provide a setting for meaningful comparisons because these individuals possess almost identical pre-entry levels of education, social capital, and work experience. However, there are several open empirical questions regarding the real effects of entrepreneurial employment in the long-run. Do early employees develop a different set of skills as well as social ties that directly shape their follow-on productivity and earnings? If entrepreneurship is a skill that can be learned, does experience as an early employee directly affect the individual's future entry into business ownership and conditional on entry, the individual's performance (changes at the extensive and intensive margin, respectively)? Given that entrepreneurial success is extremely difficult to predict ex-ante (Kerr et al., 2014) and that most startups fail, how much of the real effects of entrepreneurial employment vary around the performance of the startup employer? In light of the many unexplored questions of interest, it is vital that scholars advance our understanding of the entrepreneurial organization by examining more deeply the role and impact of non-founding employees inside new enterprises.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.respol.2018.01.010.

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