Taking the Leap: The Determinants of Entrepreneurs Hiring Their First Employee

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Job creation is one of the most important aspects of entrepreneurship, but we know relatively little about the hiring patterns and decisions of start-ups. Longitudinal data from the Integrated Longitudinal Business Database (iLBD), Kauffman Firm Survey (KFS), and the Growing America through Entrepreneurship (GATE) experiment are used to provide some of the first evidence in the literature on the determinants of taking the leap from a nonemployer to employer firm among start-ups. Several interesting patterns emerge regarding the dynamics of nonemployer start-ups hiring their first employee. Hiring rates among the universe of nonemployer start-ups are very low, but increase when the population of nonemployers is focused on more growth-oriented businesses such as incorporated and employer identification number businesses. If nonemployer start-ups hire, the bulk of hiring occurs in the first few years of existence. After this point in time, relatively few nonemployer start-ups hire an employee. Focusing on more growth- and employment-oriented start-ups in the KFS, we find that Asian-owned and Hispanic-owned start-ups have higher rates of hiring their first employee than white-owned start-ups. Female-owned start-ups are roughly 10 percentage points less likely to hire their first employee by the first, second, and seventh years after start-up. The education level of the owner, however, is not found to be associated with the probability of hiring an employee. Among business characteristics, we find evidence that business assets and intellectual property are associated with hiring the first employee. Using data from the largest random experiment providing entrepreneurship training in the United States ever conducted, we do not find evidence that entrepreneurship training increases the likelihood that nonemployers hire their first employee.

1. Introduction

Many policymakers and organizations have called upon entrepreneurs to create new jobs. For example, President Obama has repeatedly emphasized the importance of

start-ups and small businesses in creating jobs, and has signed laws such as the Small Business Jobs Act of 2010 and the Jumpstart Our Business Start-ups (JOBS) Act of 2012, which aim to create jobs through promoting small businesses. The focus on the job creation potential of entrepreneurs also exists in Europe and other countries around the world (OECD, 2014).

Several previous studies examine the impact of small businesses on employment. Starting with the seminal study by Birch (1979) showing that small businesses were the principal driver of job creation in the U.S. economy and recent refinements of this argument to focus on young and high-impact firms, there has been considerable interest in what types of firms generate jobs. Recent evidence indicates that young and high-impact businesses (defined as having high rates of growth in sales and employment) account for essentially all net jobs in the economy (Tracy, 2011; Haltiwanger et al., 2013). Often overlooked is that self-employed business owners also create jobs for themselves, representing more than 10% of total employment in the United States and that many employer businesses start as nonemployers (Davis et al., 2007).

But, hiring employees represents one of the major thresholds that entrepreneurs encounter when growing their businesses. The step from nonemployer to employer entails additional registration and legal requirements; health insurance, workers compensation and unemployment insurance issues, and the ongoing burden of making payroll. Navigating through filing for an employer identification number (EIN), federal wage and tax statement (Form W-2), employee eligibility verification (Form I-9), state new hire reporting program, workers' compensation insurance program, unemployment insurance tax registration program, and disability insurance in some states may be especially daunting to small business owners considering hiring their first employee. But, perhaps, the most important consideration for the owner is whether current and future revenues are large enough to cover the extra expenses of having employees. Surprisingly, given its importance, there is very little research on the topic.

This paper examines four main questions related to the decision by entrepreneurs to hire their first employee that have not been examined in detail in the previous literature. First, what are the dynamic patterns of hiring employees among start-ups in their first few years of existence? Second, what are the demographic and human capital characteristics of entrepreneurs that are associated with making the decision to hire their first employee in the first several years of operation? Are female, minority, and immigrant owners less likely to cross the employer threshold? Are more educated entrepreneurs more likely to hire their first employee in the first years of existence? Third, can an alternative form of human capital, entrepreneurship training, help overcome some of the barriers to hiring employees? Entrepreneurship training often specifically teaches self-employed business owners strategies for hiring and managing employees, and provides training on registering for EINs, tax and insurance compliance, and legal issues, but does it increase the likelihood of hiring the first employee? Finally, what dynamic business conditions are associated with hiring the first employee? Is there a sales or business asset milestone that firms often reach before hiring their first employee? Do nonemployer firms typically have intellectual property, such as patents, copyrights, and trademarks, before hiring their first employee?

In addition to the previous research on the impact of small businesses on employment in the United States, a few recent studies examine the relationship and growth patterns between nonemployer to employer businesses. Acs et al. (2009), for example, find that nonemployers have a start-up rate of 35%, which is nearly three times the start-up rate of employer firms. Using matched data from the Census Bureau, Davis

et al. (2007) find that a significant number of new employer firms start as nonemployer firms. The link between nonemployer and employer status and how it is related to reaching business milestones and owner characteristics, however, has not been previously examined in detail.

Another strand of research indicates variation in employment rates and average number of employees by demographic and human capital characteristics of the business owner. Parker (2009) reviews the literature and reports evidence of positive effects from education, age, experience, male, parental self-employment, wealth, and industry.[1] Three factors that especially stand out are minority, female ownership, and education. In the United States, for example, substantial disparities exist between minority versus nonminority owned firms and female versus male owned firms, for example: 13.3% of minority-owned firms hire employees compared with 21.6% of nonminority owned firms, and 11.7% of female-owned business hire employees compared with 23.2% of male-owned businesses (U.S. Census Bureau, 2013).[2] The education level of the business owner is also associated with hiring employees, with 32% of owners with a university degree hiring employees compared with 28% of owners with a high school degree or lower level of education hiring employees.[3] These findings, however, are for all existing businesses and do not capture the relationship between owner characteristic and the employment decision when that decision is made. Previous research also does not focus on start-ups, and hiring patterns may differ substantially for all new businesses than for the subsample of businesses that survive up to the survey year.

In this paper, we use data from three sources: 1) the U.S. Census Bureau's Integrated Longitudinal Business Database (iLBD) that provides panel data on the universe of nonemployers matched to employers over time, 2) the Kauffman Firm Survey (KFS) that provides panel data on detailed owner and business characteristics and follows growth-oriented start-ups over the first several years of existence, and 3) the Growing America through Entrepreneurship (GATE) experiment that is the largest random experiment on the effects of entrepreneurship training ever conducted. Using these data, this paper provides one of the first detailed longitudinal studies of the owner, business, and training determinants of nonemployers hiring their first employee. The novel results from the iLBD provide the first evidence in the literature on hiring patterns among the universe of nonemployer start-ups.[4]

The limited previous research on the topic appears to be due to data limitations. Very few datasets provide information on the time at which a business hires its first employee, owner and business characteristics, and longitudinal information on business conditions or milestones. Additionally, no previous datasets have information allowing for a credible method of identifying whether entrepreneurship training helps business owners hire their first employee.

2. Data

Three datasets, the iLBD, the KFS, and the GATE Project, are used in this study. All three datasets provide difficult-to-find information on when a nonemployer

1. Also, see Burke et al. (2000, 2002), van Praag and Cramer (2001), Cowling et al. (2004), Henley (2005), and Fairlie and Robb (2007a).
2. See Fairlie and Robb (2007b, 2008) for a review of the literature on racial and ethnic patterns in business employment.
3. See van der Sluis et al. (2005) for evidence on the relationship between education and business outcomes.
4. These results from the new and revised iLBD complement earlier results reported in Davis et al. (2007). Two major differences in the current study are that we focus specifically on the population of start-ups and that we include all industries.

business hires its first employee. Each dataset has strengths to contribute to the over-all analysis of patterns and determinants of nonemployer businesses hiring their first employee. The confidential and restricted-access iLBD provides administrative information on the universe of nonemployer firms. These data provide a comprehensive view of patterns of nonemployer start-ups hiring employees over time. The KFS and GATE also provide detailed information on the characteristics of the owner and business prior to when the business hires its first employee. All three panels provide information at the point in time of hiring instead of less reliable retrospective information. All three datasets provide longitudinal data that follow businesses over several years.

To our knowledge, the iLBD and KFS are the only two nationally representative datasets that provide information on nonemployer start-ups making the transition to employer firms. Additionally, the only dataset providing information on nonemployers hiring employees at the point of time of hiring and providing an experiment in which entrepreneurship training is randomly allocated is the GATE data. Although GATE is not nationally representative, it does cover urban and rural populations across 14 different organizations in three different states.

2.1. iLBD

We use the U.S. Bureau of the Census confidential and restricted-access iLBD. The iLBD covers the universe of nonemployer and employer business units in the nonfarm private sector of the U.S. economy. It is constructed by linking employer and nonemployer businesses units by a variety of identifiers including the EIN, the Social Security Number (SSN), and the name and address of the business (for details on the construction of this dataset, see Davis et al., 2007). We focus our analysis on nonemployer businesses that transition to employer status. We include the full population of nonemployer business and impose no restrictions in terms of industry, revenue, age of the business owner, or number of hours spent in the business.[5] We define a nonemployer start-up as a business with no activity in the four years prior be it as a nonemployer or as an employer. We start from the population of nonemployer start-ups in 1997. We follow their transitions out of the nonemployer population either as a permanent exit or as a transition into employer status. A permanent exit requires that the EIN, SSN, or business name do not appear again in the iLBD either as an employer or as a nonemployer. To this end, we examine iLBD data through 2011. A transition to employment status takes place when we are able to identify a nonemployer business unit in the employer universe. We track transitions up to seven years after start-up.

The iLBD cover the universe of nonemployer start-ups. Every business that is registered is included. The iLBD contains information on the legal form of business (i.e. sole proprietorship, partnership or corporation), the type of tax identifier (EIN or SSN), revenue size, and industry. It does not contain any information on the owner. As discussed below, the iLBD contains a large number of business activities that have no intention of hiring employees and represent consulting or contracting activities. But these data provide a useful view of the universe of nonemployer business units, and we are able to identify more growth-oriented businesses by conditioning on a few of the administrative variables in the iLBD.

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5. We also do not limit ourselves to migrant transitions as defined by Davis el al (2007) and examine, instead, all transitions to employer status.

2.2. The Kauffman Firm Survey

The KFS, conducted by the Kauffman Foundation, is a panel study of 4,928 businesses founded in 2004. See Robb et al. (2010) for a detailed description of the KFS. The business start-ups were surveyed in 2004 (baseline) and annually after that date. The most recent year of available data is the seventh follow-up survey conducted in 2011. These data were released in spring 2013 and are the final wave planned for the KFS. The sampling frame for the KFS is the Dun & Bradstreet database started in 2004. The definition of a start-up used in the KFS is whether at least one of several business indicators was present for the first time in 2004. The indicators include payment of unemployment insurance taxes, payment of FICA taxes, presence of a legal status for the business, presence of an EIN, and use of schedule C to report business income. Thus, the KFS definition of a business start is somewhat unique and include a disproportionate number of more "advanced," growth-oriented, or employment-oriented nonemployer start-ups.

The panel dataset provided in the KFS provides an unprecedented source of data on business start-ups in their early years of operation.[6] Detailed information on each firm includes employment, industry, physical location, sales, profits, and business assets at start-up and over time.[7] The KFS also includes detailed information on intellectual property, such as patents, copyrights, and trademarks. The detailed information on employment and other business activity provided annually in the KFS allows for an examination of the dynamic relationship between these factors and employment among new businesses. Most importantly, it allows for an analysis of business and owner characteristics at the time young businesses hire their first employee.

The KFS also provides detailed information on owner characteristics such as age, gender, race, ethnicity, education, and prior work experience.[8] This information is useful for identifying the characteristics of owners that hire employees within the first several years of operation. Panel data allow for measurement of these characteristics year by year, and thus immediately prior to when nonemployer start-ups make the decision to hire their first employee.

Robb et al. (2010) provide a detailed comparison of the KFS to several commonly used business-level datasets. These comparisons, however, include the full sample of businesses in the KFS. To examine the representativeness of the KFS sample of nonemployer start-ups used in this study, estimates are compared to estimates from the 2004 iLBD and the 2007 Survey of Business Owners microdata for a roughly similar population (defined as all nonemployer businesses started in the previous year). Online Appendix Table 1 reports estimates of the industry distribution from all three datasets (see ??? for all online appendix tables and figure). For most industries, the KFS, iLBD, and Survey of Business Owners (SBO) are roughly similar in representation. The main exceptions are that the KFS nonemployer start-up sample is overrepresented in

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6. For more information about the KFS survey design and methodology, see Ballou et al (2008).

7. The KFS also includes detailed financing information. These variables, however, are not included in the analysis because of endogeneity concerns. For example, if a firm needs to hire employees prior to production, then the only method of doing this is to obtain financing. In this case, however, the financing did not cause the business to hire the employee, but, instead, the need to hire employees caused the business to find financing. Similar concerns have been noted in the literature examining liquidity constraints for business creation. See Parker (2009), Kerr and Nanda (2011), and Fairlie and Krashinsky (2012) for recent discussions of the literature.

8. Owner characteristics are identified for the primary owner of the business. The primary owner of multiowner businesses is identified by the largest equity share in 2004 with ties being allocated by comparing hours worked and other variables (see Robb et al., 2010). Thanks to Alicia Robb and Joseph Farhat for providing the codes for primary owners.

manufacturing and wholesale trade, and underrepresented in health and educational services compared with the new nonemployer sample in the SBO.

2.3. Gate Experiment

Growing America through Entrepreneurship (Project GATE) is an evaluation designed and implemented by the U.S. Department of Labor and U.S. Small Business Administration. The GATE experiment is the largest ever randomized evaluation of entrepreneurship training and assistance involving more than 4,000 participants. It differs from earlier large-scale evaluations in the United States because its training was marketed to any individual interested in starting or growing a business, and was not limited to individuals receiving unemployment or welfare benefits. It also involved both individuals who wanted to start a business and individuals who already owned a business, but wanted to grow that business.

GATE was administered between September 2003 and July 2005 in cities of varying sizes: Philadelphia; Pittsburgh; Minneapolis/St. Paul; Duluth, Minnesota; Virginia, Minnesota; Portland, Maine; Lewiston, Maine; and Bangor, Maine (see Bellotti, 2006 for more details). Both urban and rural populations were served by the sites. Fourteen different organizations provided the GATE training, including SBA-funded Small Business Development Centers and nonprofit community-based organizations. All of the providers and their programs had been operating prior to the experiment, and thus collectively represent the existing market for entrepreneurship training in the United States.

Individuals interested in applying to receive entrepreneurship training through the program had to first attend an orientation meeting at a One-Stop Career Center. Applicants were informed that "GATE does not have space for everyone" and that a "lottery or random drawing will decide whether you will be able to enter the program." Applicants were then randomly assigned to the treatment or control group with equal probability. The treatment group was offered an array of free services. Program administrators informed the control group that the GATE program did not have the capacity to offer them services, and administrators offered no referrals to other (free) services either.

The array of GATE services offered to the treatment group began with a one-on-one assessment meeting to determine an individual's specific training needs. Then training was provided by experienced business consultants in classroom and/or one-on-one settings. Classroom offerings targeted a variety of general and specialized topics at different experience levels. Introductory courses cover subjects such as legal structure, business plans, and marketing. Intermediate and advanced courses cover subjects including managing growth, legal risks, and personnel issues. These classes would be especially important for entrepreneurs deciding whether to hire their first employee. The total cost of providing training to GATE recipients was estimated to be $1,321 per person.

Extensive data were collected on treatment and control group members on the application survey and from three follow-up surveys. Data are available at baseline (prior to entrepreneurship training) and at follow-up waves of 6 months, 18 months, and 60 months after baseline. Detailed information on employment, sales, profits, and other firm characteristics is available for each time period. Detailed information on owner characteristics such as age, education, gender, race, immigrant status, marital status, children, family income, health, family business experience, credit history,

unemployment insurance receipt, health insurance, and personality traits is also available from the baseline survey. The resulting dataset provides unprecedented longitudinal information on the employment of businesses after the owners of those businesses received training. The impact of entrepreneurship training on when and whether businesses hire their first employee has not been previously examined.

In the experiment, 4,197 individuals completed the application process and were randomly assigned to the treatment ($N = 2,094$) or control ($N = 2,103$) group. Among participants, 19% were self-employed business owners at the time of application ($N = 774$), and 44% of the businesses owned reported not ever having employees ($N = 343$). For this study, the focus is on these nonemployer business owners participating in the experiment. Previous research on the full sample of participants generally finds small or no effects of entrepreneurship training on outcomes (Benus et al., 2009; Fairlie et al., 2015), but these studies do not estimate the effects of entrepreneurship training on hiring the first employee among the group of nonemployer business owners participating in the experiment. This analysis provides the first evidence in the literature on this question.

3. Hiring Dynamics among Nonemployer Start-Ups

We first examine the dynamic patterns of hiring employees among start-ups. The panels of nonemployer start-ups included in the iLBD and KFS are important because all firms can be tracked even if they are not successful in the first few years after start-up. Cross-sectional data based on existing nonemployer and employer firms include only surviving firms up to that point in time and all nonsurviving firms when they hired their first employee. Also, retrospective information on when the first employee was hired instead of contemporaneous information is more subject to the possibility of recall bias.

We start by examining patterns of hiring among nonemployer start-ups in the universe of nonemployers provided in the iLBD. Our definition of a nonemployer start-up is any firm that has no record of existing for the previous four years. The first year observed is defined as the start-up year. We include the complete universe of nonemployer firms across all industries, revenues, and business types. When a business is identified in a subsequent year in the employer database, we define that year as the point when the first employee is hired. It is important to note that there can be slippage in the match from nonemployer to employer because the datasets are generated from different sources.[9] We view these results as a lower bound on the level of transitions from nonemployers to employers.

Table IA reports the distribution of all nonemployer start-ups hiring their first employee in up to seven follow-up years, not hiring their first employee by the end of the seven-year period, or exiting before hiring an employee during the seven year period. This provides detail on when nonemployer starts-ups hire their first employee. For example, it answers the question of what percentage of businesses hire their first employee in the first year after start-up versus the second year after start-up. Among all nonemployer start-ups, 2% hire their first employee in the first year after start-up. Very low percentages of nonemployer start-ups hire their first employee after that year.

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9. The linkage between the nonemployer and the employer universes makes use of the name of the business and the tax identifiers; the EIN and the SSN. If any of these change, then we might not be able to form a link. This is more likely when there is a change in legal form of organization at the time of the transition.

	Percent	Universe
Hired first employee at:		
One year after start-up	1.9%	84,500
Two years after start-up	0.2%	10,200
Three years after start-up	0.1%	4,900
Four years after start-up	0.1%	2,900
Five years after start-up	0.1%	2,500
Six years after start-up	0.0%	1,500
Seven years after start-up	0.0%	1,200
Has not hired employee by end of study period	12.7%	556,200
Exit before hiring employee by end of study period	84.8%	3,704,800
Total number of nonemployer start-ups:		4,368,700

Notes: (1) The data consist of the universe of nonemployer start-ups in 1997. (2) Nonemployer start-ups are defined as nonemployers appearing in the nonemployer data for the first time in at least three years. Numbers are rounded to comply with Census Bureau disclosure rules.

	Percent	Universe
Hired first employee at:		
One year after start-up	11.0%	63,900
Two years after start-up	1.5%	8,800
Three years after start-up	0.7%	4,100
Four years after start-up	0.4%	2,400
Five years after start-up	0.3%	1,800
Six years after start-up	0.2%	1,200
Seven years after start-up	0.2%	1,000
Has not hired employee by end of study period	13.0%	75,700
Exit before hiring employee by end of study period	72.7%	422,300
Total number of nonemployer start-ups:		581,200

Notes: (1) The data consist of the universe of nonemployer start-ups in 1997. (2) Nonemployer start-ups are defined as nonemployers appearing in the nonemployer data for the first time in at least three years. Numbers are rounded to comply with Census Bureau disclosure rules.

A large percentage of nonemployer start-ups (12.7%), however, do not hire their first employee by the end of the seven-year period. Finally, 84.8% of nonemployer start-ups exited over the sample period before ever hiring their first employee. But it is important to note here that exits are defined as nonemployers who do not report revenues by 2011 (and thus exit the nonemployer universe up until that year). These nonemployers could report revenues and be in the universe of nonemployers in later years, but this is out of our sample period. This could explain the extremely high exit rate as we have defined it here and this should not be interpreted as a business failure rate for nonemployer businesses.

A very large percentage of these nonemployer businesses are consulting, contracting, or small-scale business activities. When we focus on different types of nonemployer start-ups, we find much higher rates of hiring employees. For example, Table IB includes only EIN cases for nonemployer start-ups. These are businesses that are identified

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TABLE IC.

DISTRIBUTION ACROSS YEARS IN WHICH NONEMPLOYER START-UP
HIRED ITS FIRST EMPLOYEE—INCORPORATED CASES iLBD

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	Percent	Universe
Hired first employee at:		
One year after start-up	16.2%	52,700
Two years after start-up	2.3%	7,500
Three years after start-up	1.1%	3,500
Four years after start-up	0.6%	2,100
Five years after start-up	0.5%	1,500
Six years after start-up	0.3%	1,000
Seven years after start-up	0.2%	800
Has not hired employee by end of study period	8.8%	28,600
Exit before hiring employee by end of study period	70.0%	227,800
Total number of nonemployer start-ups:		325,500

Notes: (1) The data consist of the universe of nonemployer start-ups in 1997. (2) Nonemployer start-ups are defined as nonemployers appearing in the nonemployer data for the first time in at least three years. Numbers are rounded to comply with Census Bureau disclosure rules.

through filing for an EIN even though they do not have employees. Another example is Table IC that includes only incorporated nonemployer start-ups. In both cases, transition rates from nonemployer to employer are much higher although most of the transitions are occurring in the first few years and there continues to be a very high exit rate (or nonexistence rate by the end of the sample).

The iLBD contains a very large number of nonemployer businesses that have very low revenues. Focusing on higher revenue nonemployer start-ups, we find higher rates of transitions to employment. But focusing on revenues in the first year can be problematic as many potentially successful businesses take a few years to produce sales.

These aggregate measures of hiring employees in the first several years following start-up reveal interesting patterns. Many nonemployer start-ups hire their first employee in the first three years of existence. After that period of time and through seven years, only a few additional firms make the switch from nonemployer to employer.

3.1. HIRING PATTERNS IN THE KFS

We turn to the KFS for a similar analysis of patterns of hiring among nonemployer start-ups. The KFS, which is based on D&B data, is known to include businesses that are more growth and employment oriented than the universe of nonemployers. With this in mind, we also examine patterns of hiring in these data before turning to an analysis of the determinants of hiring. The KFS is crucial to examining determinants because it contains detailed information on owner and business characteristics. The iLBD, unfortunately, is limited to including only a few pieces of administrative information on businesses. Also, the KFS implicitly rules out the many nonemployer start-ups that are essentially consulting and small-scale business activities by individuals with no intention of growing a business and eventually hiring employees. Thus, the inclusion of this group is problematic for exploring the owner and business characteristics associated with hiring employees. With this in mind, we turn to a detailed analysis of the KFS data that include more growth- or employment-oriented nonemployer start-ups.

To better illustrate the KFS panel, Online Appendix Figure 1 displays the full sequence of hiring decisions over the first seven years using data from the KFS. The KFS

TABLE IIA.

DISTRIBUTION ACROSS YEARS IN WHICH NONEMPLOYER START-UP
HIRED ITS FIRST EMPLOYEE KAUFFMAN FIRM SURVEY (2004–2011)

	Percent	*N*
Hired first employee at:		
One year after start-up	36.6%	1,590
Two years after start-up	12.6%	1,590
Three years after start-up	4.0%	1,590
Four years after start-up	3.1%	1,590
Five years after start-up	1.4%	1,590
Six years after start-up	0.8%	1,590
Seven years after start-up	0.4%	1,590
Has not hired employee by end of study period	13.3%	1,590
Out of business before hiring employee by end of study period	27.9%	1,590

Notes: (1) The sample consists of businesses with no employees at start-up in 2004. (2) The sample includes only businesses with nonmissing information for all follow-up years.

TABLE IIB.

HIRING RATES OF FIRST EMPLOYEE BY YEAR AMONG NONEMPLOYER
START-UPS KAUFFMAN FIRM SURVEY (2004–2011)

	Percent	*N*
Hire first employee by:		
One year after start-up	38.0%	2,460
Two years after start-up	51.0%	2,214
Three years after start-up	54.0%	1,960
Four years after start-up	57.2%	1,810
Five years after start-up	58.4%	1,712
Six years after start-up	58.5%	1,626
Seven years after start-up	58.8%	1,590

Note: The sample consists of businesses with no employees at start-up in 2004. For each follow-up year, only observations with nonmissing information for all years up to that point are included.

includes information through seven years following start-up.[10] Starting with the first year, there were 2,460 nonemployer start-ups in the KFS with complete information on employment decisions that year. Of those nonemployer businesses, 38.0% hired their first employee and 7.4% went out of business that year. Of the 1,197 businesses remaining as nonemployers in the KFS in the second year, 26.0% hired their first employee and 9.5% went out of business in that year. In the following years, the probability of hiring the first employee drops as the remaining sample of nonemployer businesses becomes smaller. The percentage of nonemployer businesses going out of business each year, however, does not decline.

Table IIA reports the distribution of nonemployer start-ups across hiring their first employee in one of the seven follow-up years, not hiring their first employee by the end of the seven-year period, or going out of business before hiring an employee. This provides detail on when nonemployer start-ups hire their first employee, summarizing the information displayed in Online Appendix Figure 1. Firms that are known to go out of business before hiring an employee by the reported year are included in the

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10. The reported estimates are only for nonemployer start-ups. Start-ups with employees represent 40.9% of all start-ups captured in the KFS.

sample, implying that the estimates are not conditional on survival to that year. But only businesses with complete information on employment and survival through all seven years are included to avoid biasing estimates for earlier years. Among the more growth-oriented nonemployer start-ups captured in the KFS, 36.6% hire their first employee in the first year after start-up. A total of 12.6% of start-ups hire their first employee in the second follow-up year, 4.0% of startups hire in the third follow-up year, and 3.1% of startups hire in the fourth follow-up year. Only a small percentage of nonemployer start-ups hire their first employee in the fifth, sixth, or seventh years following start-up. A large percentage of nonemployer start-ups (13.3%), however, are still in business, but do not hire their first employee by the end of the study period. Finally, 27.9% of nonemployer start-ups went out of business over the sample period before ever hiring their first employee.

Another method of measuring when nonemployer start-ups make the switch to an employer firm is to examine the likelihood of hiring the first employee *by* each of the follow-up years. Table IIB reports estimates. Again, firms that are known to go out of business before hiring an employee are included in the sample, so the estimates are not conditional on survival. But in this case, we use the maximum number of observations available to calculate the probability for each year (which is why the sample size declines with more years available). One year after start-up, 38.0% of nonemployer start-ups in the KFS have hired their first employee. By two years after start-up, the majority of nonemployer firms have hired their first employee.[11] By seven years after start-up, 58.8% of initial nonemployer businesses have hired their first employee.[12] The increase in the likelihood of hiring a first employee rises quickly and then slows down as more businesses have already hired their first employee.

Although hiring rates among more growth- or employment-oriented nonemployer start-ups in the KFS are higher than hiring rates among the universe of nonemployer start-ups, the general patterns are similar. Most nonemployer start-ups that will eventually hire an employee hire their first employee in the first few years of existence (and especially in the first year). After that period of time and through seven years, only a small percentage of additional firms make the switch from nonemployer to employer.

4. Demographic and Human Capital Characteristics of Entrepreneurs

This section examines the demographic and human capital characteristics of the owners of nonemployer businesses that lead to hiring their first employee. As noted above, the KFS is the only large, nationally representative dataset with detailed demographic and human capital information on the owners of start-ups.

We first examine rates of hiring an employee in the first several years of operation among nonemployer start-ups by race, gender, and immigrant status. Table III reports estimates of the percentage of nonemployer start-ups hiring employees by one, two, and seven years after start-up. These years are chosen to represent a wide range of

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11. The sample size drops for two years after start-up and each subsequent year because some businesses have missing information on employment in those years. Estimates of hire rates by follow-up year conditioning on only businesses with nonmissing observations for all survey years are similar.
12. Annual sample attrition rates are 1–4.5% per year which contributes to losing observations over time, but another issue is that even if one missing value is found for employment in an intermediate year, it cannot be used to calculate the seven-year cumulative probability. Thus, some caution is needed in interpreting the seven-year outestimates.

Owner Characteristic	Hire First Employee by One Year after Start-Up		Hire First Employee by Two Years after Start-Up		Hire First Employee by Seven Years after Start-Up	
	Percent	N	Percent	N	Percent	N
Total	38.0%	2,460	51.0%	2,214	58.8%	1,590
White, non-Hispanic	36.3%	2,010	48.9%	1,823	57.9%	1,326
African-American	38.8%	197	49.9%	169	58.5%	110
Asian-American	53.7%	81	68.9%	70	70.2%	51
Other race	51.3%	131	65.6%	114	67.0%	77
Hispanic	48.1%	118	64.5%	104	67.0%	68
Native born	37.4%	2,220	50.3%	2,005	58.8%	1,452
Immigrant	44.8%	235	58.3%	204	58.6%	136
Male	41.0%	1,762	54.5%	1,592	62.2%	1,140
Female	31.9%	696	43.9%	620	51.8%	449
High school or less	35.7%	309	48.9%	271	58.5%	182
Some college	36.7%	898	49.9%	796	55.1%	553
College graduate	40.0%	1,243	52.7%	1,137	62.2%	848
Industry work experience < 10 years	35.2%	1,283	47.2%	1,133	54.5%	813
Industry work experience ≥ 10 years	41.7%	1,171	56.2%	1,075	64.6%	773

Note: The sample consists of businesses with no employees at start-up in 2004.

hiring points over the sample period. Estimates from the KFS indicate that nonemployer start-ups owned by African-Americans have similar rates of hiring their first employee by each year as do white, non-Hispanic start-ups. Asian-owned start-ups have higher rates of hiring their first employee by each of the follow-up years. Hiring rates by each follow-up year are also higher among nonemployer start-ups owned by Hispanics. Related to these racial and ethnic patterns, immigrants have higher rates of hiring their first employee by the first two follow-up years than the native-born, but the rates of hiring employees are similar by the seventh follow-up year.

Nonemployer start-ups owned by men and women differ substantially in their rate of hiring first employees by each of the reported follow-up years. Female-owned start-ups are roughly 10 percentage points less likely to hire their first employee by the first, second, and seventh years after start-up.

To investigate these patterns further and control for potential correlations with other entrepreneur characteristics, we estimate regressions for the probability of hiring employees by each survey wave. The regression equation is:

$$y_i = \alpha + \beta X_i + \varepsilon_i, \tag{1}$$

where y_i is the probability that the nonemployer start-up hires its first employee by the first, second, or seventh follow-up year. X_i includes demographic and human capital characteristics of the entrepreneur, and ε_i is an error term. All specifications are estimated using OLS and heteroskadasticity-consistent standard errors are reported. Marginal effects estimates are similar from probit and logit models, and are thus not reported.

Table IV reports estimates. Nonemployer businesses owned by Asians, other race, and Hispanics have higher probabilities of hiring their first employee than non-Hispanic, white-owned businesses, all else equal. Nonemployer firms owned by African-Americans have similar likelihoods of hiring their first employee as non-Hispanic whites. Immigrant status also does not appear to have an effect on hiring probabilities after controlling for other entrepreneur characteristics. Female-owned nonemployer firms have lower annual probabilities of hiring their first employee than male-owned firms.

Turning to the human capital of the entrepreneur, we include the owner's level of education as a set of dummy variables for thresholds in the regressions. As noted above, owner's education has been found to be a positive predictor of hiring employees, but the relationship with early-stage hiring patterns is unknown. Surprisingly, estimates from the KFS do not provide evidence that among nonemployer start-ups, owner's education has a strong positive predictive power on whether the first employee is hired in the first several years of operation. The point estimates are generally small and statistically insignificant and in a couple of cases negative.

Another measure of human capital—having more industry work experience before start-up—is found to have a positive, but weak relationship with hiring an employee in the first several years of operation. Previous industry work experience has been found to be an important determinant of business success in previous work (e.g., see Fairlie and Robb, 2007a). Unfortunately, the KFS does not include contemporaneous information on wage and salary work of owners that has also been found to be important (Garcia-Perez et al., 2013).

Although human capital, such as owner's education and prior industry work experience, has been identified as an important determinant of business success in previous research, it appears to be less important in determining which nonemployer start-ups hire their first employee in the first several years of operation.

In contrast to the human capital measures, we find that industry differences are important in determining which nonemployer start-ups are likely to hire employees.[13] Nonemployer start-ups in wholesale trade have the highest rate of hiring employees, followed by the transportation, manufacturing, and professional industries. In these industries, hiring employees may be important for capturing returns-to-scale for growth of businesses.

4.1. LEGAL FORM OF ORGANIZATION

The KFS also includes information on the legal form of organization of the business. Does the legal form of organization affect the probability of hiring an employee among nonemployer start-ups? This question is examined by estimating the same set of regressions including dummy variables for the legal form of organization. Dummy variables are included for incorporated businesses (58.6%) and partnerships (5.5%). Estimates are reported in Table V. Nonemployer start-ups that are incorporated are more likely to hire their first employee by each of the reported follow-up years relative to nonemployer start-ups that are sole proprietorships. The evidence is less clear for partnerships. The interpretation of these results is difficult because decisions about employment might cause businesses to choose their legal status. For example, a nonemployer start-up that plans on hiring employees in the first few years might choose to become incorporated

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13. Hiring rates by industry are reported in Online Appendix Table 2.

TABLE IV.

REGRESSIONS FOR PROBABILITY OF HIRING FIRST EMPLOYEE
NONEMPLOYER START-UPS—KAUFFMAN FIRM SURVEY (2004–2011)

Explanatory Variables	By One Year after Start-Up (1)	By Two Years after Start-Up (2)	By Seven Years after Start-Up (3)
African-American	0.00838	−0.00565	0.05406
	(0.04258)	(0.04910)	(0.06387)
Asian-American	0.17478**	0.23409***	0.17472**
	(0.06897)	(0.07674)	(0.07932)
Other race	0.12570**	0.13483**	0.15197**
	(0.05140)	(0.05403)	(0.06377)
Hispanic	0.07071	0.13196**	0.12730
	(0.05468)	(0.06050)	(0.07875)
Immigrant	−0.01565	−0.02637	−0.06087
	(0.04415)	(0.05123)	(0.06658)
Female	−0.08755***	−0.09266***	−0.03513
	(0.02474)	(0.02898)	(0.03788)
Some college	0.01975	0.01476	−0.09452*
	(0.03478)	(0.04234)	(0.05039)
College graduate	0.04388	0.02914	−0.08744*
	(0.03527)	(0.04271)	(0.04743)
Industry work exp. > 10 years	0.03302	0.05531**	0.02439
	(0.02298)	(0.02609)	(0.03433)
Other industry	−0.01589	−0.08660	−0.24204
	(0.09890)	(0.10919)	(0.16904)
Construction	0.07575	0.04544	0.09997
	(0.04964)	(0.05699)	(0.07534)
Manufacturing	0.14575***	0.12237*	0.09981
	(0.05570)	(0.06538)	(0.08850)
Wholesale trade	0.25716***	0.17615**	0.21710***
	(0.06048)	(0.06953)	(0.08295)
Retail trade	0.08518*	0.05171	0.07725
	(0.04684)	(0.05404)	(0.07745)
Transportation and warehousing	0.12147	0.19142**	0.21907**
	(0.07555)	(0.08966)	(0.09122)
Information	−0.03328	−0.01662	−0.06866
	(0.06582)	(0.07588)	(0.10955)
Finance, insurance, and real estate	−0.05926	−0.08031	−0.04966
	(0.04934)	(0.05928)	(0.08550)
Professional services	0.12143***	0.06974	0.12723*
	(0.04231)	(0.04889)	(0.06607)
Management	0.07932	0.12508**	0.14899*
	(0.04891)	(0.05734)	(0.07638)
Health and educational services	0.08719	0.05560	0.15946
	(0.07186)	(0.08357)	(0.11404)
Entertainment, accommodation, and food services	0.01381	0.01163	−0.04673
	(0.06352)	(0.08011)	(0.11191)
	0.37991	0.56187	0.73760
Sample size	2,419	1,982	931

Notes: (1) The sample consists of businesses with no employees at start-up in 2004. (2) Regional controls are included in all specifications. (3) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

TABLE V.
REGRESSIONS FOR PROBABILITY OF HIRING FIRST EMPLOYEE
INCLUDING LEGAL FORM OF ORGANIZATION NONEMPLOYER
START-UPS—KAUFFMAN FIRM SURVEY (2004–2011)

Explanatory Variables	By One Year after Start-Up (1)	By Two Years after Start-Up (2)	By Seven Years after Start-Up (3)
African-American	0.01034	−0.00366	0.06132
	(0.04274)	(0.04959)	(0.06620)
Asian-American	0.17392**	0.24039***	0.17309**
	(0.06891)	(0.07826)	(0.08546)
Other race	0.12539**	0.13259**	0.14550**
	(0.05111)	(0.05337)	(0.06643)
Hispanic	0.07476	0.13187**	0.12716
	(0.05448)	(0.06014)	(0.08069)
Immigrant	−0.02032	−0.02839	−0.06111
	(0.04395)	(0.05112)	(0.07029)
Female	−0.08134***	−0.08636***	−0.02430
	(0.02475)	(0.02905)	(0.03783)
Some college	0.01558	0.00931	−0.10647**
	(0.03457)	(0.04232)	(0.05096)
College graduate	0.03296	0.01626	−0.11064**
	(0.03528)	(0.04299)	(0.04882)
Industry work exp. > 10 years	0.03072	0.05432**	0.02239
	(0.02293)	(0.02607)	(0.03439)
Other industry	−0.03129	−0.10504	−0.26844
	(0.09977)	(0.10849)	(0.16663)
Construction	0.06745	0.03233	0.08164
	(0.04986)	(0.05691)	(0.07519)
Manufacturing	0.13623**	0.11074*	0.08227
	(0.05522)	(0.06557)	(0.08912)
Wholesale trade	0.24504***	0.15788**	0.18410**
	(0.06022)	(0.06968)	(0.08441)
Retail trade	0.07800*	0.03926	0.06719
	(0.04683)	(0.05429)	(0.07661)
Transportation and warehousing	0.10656	0.17467**	0.19072**
	(0.07640)	(0.08910)	(0.09246)
Information	−0.03497	−0.02492	−0.05656
	(0.06661)	(0.07559)	(0.10771)
Finance, insurance, and real estate	−0.08099	−0.09314	−0.07188
	(0.05049)	(0.05941)	(0.08645)
Professional services	0.11198***	0.05687	0.10927*
	(0.04241)	(0.04913)	(0.06635)
Management	0.07356	0.11384**	0.13076*
	(0.04866)	(0.05771)	(0.07668)
Health and educational services	0.08124	0.03695	0.14838
	(0.07128)	(0.08375)	(0.11582)
Entertainment, accommodation, and food services	0.00350	0.00017	−0.04575
	(0.06360)	(0.08032)	(0.11238)
Incorporated	0.06045**	0.04264	0.08700**
	(0.02612)	(0.02934)	(0.03799)
Partnership	0.04194	−0.08990	−0.05928
	(0.05408)	(0.06198)	(0.10680)
Mean of Dep. Variable	0.37991	0.56187	0.73760
Sample size	2419	1982	931

Notes: (1) The sample consists of businesses with no employees at start-up in 2004. (2) Regional controls are included in all specifications. (3) *, **, and ***denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

because of the employment decision. Additionally, a relatively small percentage of firms change legal form status, suggesting that becoming incorporated is not a potentially important milestone such as revenues or assets (Cole, 2011). The estimates for the demographic and human capital characteristics are not sensitive to the inclusion of the legal form of organization variables.

5. Dynamic Business Milestones Associated with Hiring the First Employee

Continuing to use the KFS, we switch the focus to exploring the dynamic business factors associated with hiring decisions. An important question is whether there are milestones that nonemployer start-ups often reach before hiring their first employee. For example, nonemployer firms might often wait until they have large enough annual revenues to take on the extra expenses of hiring employees. Do start-ups wait to build up assets or obtain intellectual property before hiring their first employee?

The examination of these questions requires longitudinal data on start-ups with measures of both employment and milestone variables year by year instead of a single point in time. By combining follow-up years to create a panel, it is possible to measure the annual probability that nonemployer firms hire their first employee over the entire sample period. It is also possible to measure levels of revenues and business assets of nonemployer firms prior to the timing of the employment decision. Table VI reports an estimate of the annual probability of hiring the first employee among nonemployer firms.

Estimates of annual hire rates are also reported by revenue class in Table VI. Perhaps surprisingly, the likelihood of hiring the first employee is not strongly related to total business revenues. The probability of hiring an employee actually decreases by 8.1 percentage points from nonemployer firms with $0 in annual revenues to nonemployer firms with $1–$10,000 in annual revenues. The likelihood of becoming an employer firm remains steady as revenues increase until the $100,001 or more level. For revenues of $100,001 or more, the probability of hiring the first employee in the next year increases by 9 percentage points from nonemployers with revenues of $25,001–$100,000.[14] Even this change is not large considering the potential importance of higher revenues to offset the increased costs of hiring employees.

Table VI also reports estimates by business asset levels. Assets include cash, accounts receivable, equipment, machinery, product inventory, and vehicles. Nonemployer start-ups may wait until their business assets hit a certain level to offer financing or collateral for raising money to hire employees. Similar to revenue levels, however, there is no clear evidence that the probability of a nonemployer firm hiring its first employee over the following year increases substantially with business asset levels. The probability that a nonemployer business with $0 in total business assets hires its first employee over the following year is 22.0%. For nonemployers with $100,001 or more in total business assets, the probability is not much higher. Nonemployers with $25,001–$100,000 in total business assets have a probability that is 4 percentage points higher.

Both business revenues and assets measure the current resources of the firm, but future potential resources of the firm may be the most important in making the decision to become an employer firm. In particular, a milestone for many nonemployer

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14. Only categorical information on revenues is available in the KFS.

Milestone	Hire First Employee	
	Percent	N
All Nonemployer Observations	23.4%	6,092
Total Revenues (Annual)		
Zero	26.7%	1,750
$1–$10,000	18.6%	1,313
$10,000–$25,000	19.8%	710
$25,000–$100,000	21.4%	1,369
$100,000 or more	30.4%	777
Total Business Assets		
Zero	22.0%	667
$1–$10,000	19.7%	2,130
$10,000–$25,000	24.6%	1,013
$25,000–$100,000	28.2%	1,342
$100,000 or more	24.2%	920
Patents		
No	23.3%	5,867
Yes	31.9%	168
Copyrights		
No	23.2%	5,447
Yes	28.1%	535
Trademarks		
No	22.4%	5,382
Yes	35.6%	586
Any intellectual property		
No	22.4%	4,951
Yes	31.2%	940

Note: The sample consists of all nonemployer observations over sample period, 2004–2011.

start-ups might be when they obtain intellectual property, such as a patent, trademark, or copyright. Patents, trademarks, and copyrights might be useful for nonemployer firms considering hiring employees because they provide a potential source of future revenues even if the firm is experiencing low current revenues. For nonemployer firms with patents, the probability of hiring the first employee increases by 8.6 percentage points (see Table VI). Obtaining copyrights and trademarks is also associated with an increase in the likelihood of becoming an employer firm: for copyrights, the increase is roughly 5 percentage points; and for trademarks, 13 percentage points. Combining all types of measurable intellectual property, the estimates indicate that having at least one type is associated with roughly a 9 percentage point higher rate of hiring the first employee.

To identify the independent associations between these milestones and the decision to hire the first employee, we estimate several regressions for the probability of hiring employees. The regression equation is:

$$y_{it} = \alpha + \beta X_i + \gamma Z_{it-1} + u_i + \varepsilon_{it}, \tag{2}$$

where y_{it} is whether the entrepreneur hires in year t, X_i includes entrepreneur characteristics that do not change over time, Z_{it-1} include business characteristics that change

over time (measured prior to the employment decision), and $u_i + \varepsilon_{it}$ is the composite error term. The observational unit in the regressions is the business year, and only start-ups that have not previously hired an employee up to that year are included in the sample. All specifications are estimated using OLS and robust standard errors are reported with adjustments for multiple observations per entrepreneur (i.e., clustered by entrepreneur). Marginal effects estimates are similar from probit and logit models, and are thus not reported.

Table VII reports estimates. Specification 1 focuses on the independent effects of owner characteristics and industries on the annual probability of hiring the first employee. The estimates reveal similar patterns as those for the regressions predicting hiring the first employee by one, two, and seven years following start-up. Asians, other race, and Latino nonemployers have higher rates of making the transition to an employer firm than do non-Hispanic, white and black nonemployers. Female-owned businesses have a lower annual probability of hiring the first employee over the sample period than male-owned businesses. The education level of the entrepreneur has no effect on the hiring probability, but entrepreneurs with more prior work experience have a higher annual probability of hiring the first employee.

Specification 2 adds the dynamic business milestone variables reported in Table VII to the regression specification. In addition to these milestone variables, the regression includes all of the previous owner characteristics, industry, and regional controls. After controlling for other factors, there does not appear to be a strong, clear relationship between revenues and the probability of hiring the first employee. Most of the coefficients on revenue levels are negative, indicating that nonemployer businesses with zero revenues have relatively high probabilities of hiring their first employee in the sample period (the left out or comparison category is zero revenues). There is some evidence, however, that the largest revenue class has a higher probability of hiring the first employee than the previous revenue classes, indicating a somewhat U-shaped relationship.

The estimates for business assets, however, indicate a positive relationship with the annual employment probability. An increase in the probability of hiring the first employee occurs when firms have business assets of $10,001–$25,000. After that level, there is no further increase, but firms with at least $10,001 in business assets have a 6–9 percentage point higher probability of hiring the first employee over the sample period, all else equal.

Having intellectual property also has a positive association with making the nonemployer to employer transition during the sample period. Intellectual property, which includes patents, copyrights, and trademarks, is associated with a 7 percentage point increase in the annual probability of hiring the first employee.

Although not reported, regression specifications are estimated that include all three types separately. Including all three types of intellectual property separately in the regression, estimates indicate that the strongest relationship is between trademarks and the annual probability of hiring the first employee.

Revenues and business assets are positively correlated, which might weaken their estimated relationships with the employment probability. Specifications 3 and 4 include revenues and assets alone with the other controls, respectively. The estimates confirm the conclusion from the previous regressions—business assets have a positive association with the probability of hiring the first employee, but revenues do not have a clear relationship. It may be more important for nonemployer firms to build up assets to

TABLE VII.
REGRESSIONS FOR ANNUAL PROBABILITY OF HIRING FIRST EMPLOYEE NONEMPLOYER PANEL DATA—KAUFFMAN FIRM SURVEY (2004–2011)

Explanatory Variables	In Following Year (1)	In Following Year (2)	In Following Year (3)	In Following Year (4)
African-American	0.01613	0.00594	−0.00150	0.02098
	(0.03221)	(0.03209)	(0.03203)	(0.03240)
Asian-American	0.15645**	0.18576***	0.18753***	0.18813***
	(0.06803)	(0.06900)	(0.06930)	(0.06850)
Other race	0.13127***	0.11198**	0.11485**	0.11975***
	(0.04513)	(0.04809)	(0.04732)	(0.04635)
Hispanic	0.11114**	0.11271**	0.11263**	0.11206**
	(0.05336)	(0.05503)	(0.05445)	(0.05411)
Immigrant	0.01809	0.01743	0.01828	0.01720
	(0.03663)	(0.03877)	(0.03855)	(0.03756)
Female	−0.05342***	−0.04123**	−0.04524***	−0.04228**
	(0.01666)	(0.01704)	(0.01705)	(0.01688)
Some college	−0.01868	−0.01937	−0.02212	−0.02015
	(0.02579)	(0.02582)	(0.02595)	(0.02579)
College graduate	0.00106	−0.00504	−0.00745	−0.00045
	(0.02580)	(0.02597)	(0.02617)	(0.02596)
Industry work exp. > 10 years	0.03943**	0.03625**	0.03511**	0.03836**
	(0.01634)	(0.01665)	(0.01668)	(0.01652)
Revenues: $1–$10,000		−0.06380***	−0.06557***	
		(0.02028)	(0.02002)	
Revenues: $10,001–$25,000		−0.07024***	−0.06052***	
		(0.02321)	(0.02308)	
Revenues: $25,001–$100,000		−0.06149***	−0.04157**	
		(0.01969)	(0.01929)	
Revenues: $100,000 or more		−0.00204	0.02897	
		(0.02860)	(0.02765)	
Business assets: $1–$10,000		0.02041		−0.00814
		(0.02323)		(0.02279)
Business assets: $10,001–$25,000		0.06255**		0.03479
		(0.02760)		(0.02700)
Business assets: $25,001–$100,000		0.08812***		0.06469**
		(0.02681)		(0.02603)
Business assets: $100,000 or more		0.07367**		0.05923**
		(0.02903)		(0.02818)
Intellectual property		0.07379***	0.07598***	0.07995***
		(0.02321)	(0.02321)	(0.02333)
Mean of Dep. Variable	0.23364	0.23531	0.23526	0.23538
Sample size	5,793	5,452	5,455	5,593

Notes: (1) The sample consists of all nonemployer observations over sample period, 2004–2011. The unit observation is a business-year. (2) Industry and regional controls are included in all specifications. (3) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

use or borrow against to hire their first employee than to rely on large revenues in the previous year.

Although all of these dynamic business milestones are measured when the business has no current employees, there remains the concern that the estimated effects are not causal. This is an important concern with the regression results. The positive relationship between business assets and hiring the first employee might simply represent the unobserved growth plan of the business and not that higher assets cause

nonemployer firms to take the leap to being an employer firm. The same concern arises for intellectual property. Although it is measured for the business prior to hiring their first employee, estimates of the relationship might capture other unobserved factors. The finding that revenues do not have a clear positive relationship with the annual employment probability is less a concern, however, because the likely bias is toward finding a positive relationship. Without an instrument for revenues, these results do not provide definitive estimates on the causal effects of reaching milestones on hiring the first employee.[15]

5.1. BUSINESSES WITH POSITIVE REVENUES

There is often concern that the behavior of businesses that have no revenues might differ substantially from businesses with positive revenues. To examine this potential concern, we first compare the characteristics of zero-revenue observations to positive-revenue observations among nonemployer start-ups. Online Appendix Table III reports estimates. The owner and firm characteristics of zero-revenue observations for start-ups do not appear that different from positive-revenue observations. Demographic, education, and work experience characteristics of the owner do not look that different (except along a few expected characteristics such as black firms having lower revenues). The industry distributions for zero and positive revenue start-ups also look relatively similar. There are lots of zero-revenue start-up observations that hire employees the next year (27% compared with 22% of positive-revenue observations), and that have intellectual property (15% compared with 14%).[16]

Although there do not appear to be major differences by zero versus positive revenue observations, we, nevertheless, estimate regressions excluding those observations as a robustness check. Table VIII reports estimates of the same set of regressions excluding all business observations with zero revenues. Including only positive revenue nonemployer start-up observations reduces the sample size by roughly one-third. The estimates for the owner characteristics, such as Asian, Hispanic, female, and industry work experience, are similar. The estimates for intellectual property are also generally similar.

The estimates for revenues and business assets reveal some interesting patterns. First, there is some evidence of a positive relationship for the largest revenue class relative to the $1–$10,000 revenue class. This finding is similar to previous findings, but highlighted somewhat by the change in the reference from the $0 revenue class in Table VII to the $1–$10,000 revenue class in Table VIII.[17] There is no evidence of a positive relationship across the other revenue classes. Second, the estimates indicate a stronger positive relationship between business assets and hiring first employees. The removal of zero revenue observations has increased all of the coefficient estimates. Finally, similar

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15. In this application, it is extremely difficult to find an instrumental variable that has an effect on the sales of the business, but does have an effect on the unobserved component of the decision to hire the first employee. Similarly, an experiment that randomly varies revenues, assets, and intellectual property would be infeasible.

16. Another interesting finding is that slightly more than 50% of nonemployer start-ups with zero revenues in one year have positive revenues the following year. Roughly 15% of nonemployer start-ups with positive revenues follow that year with zero revenues. There appears to be some transitioning back and forth between not having revenues and having revenues among nonemployer start-ups.

17. The change in left-out category from Table VII to Table VIII essentially removes the left part of the U-shaped relationship.

TABLE VIII.
REGRESSIONS FOR ANNUAL PROBABILITY OF HIRING FIRST EMPLOYEE
INCLUDING ONLY BUSINESSES WITH POSITIVE REVENUES
NONEMPLOYER PANEL DATA—KAUFFMAN FIRM SURVEY (2004–2011)

Explanatory Variables	In Following Year (1)	In Following Year (2)	In Following Year (3)	In Following Year (4)
African-American	−0.01531 (0.04044)	−0.00914 (0.04102)	−0.01404 (0.04053)	−0.01261 (0.04100)
Asian-American	0.11369 (0.08564)	0.15396* (0.08592)	0.15597* (0.08580)	0.14705* (0.08621)
Other race	0.18526*** (0.06469)	0.16512** (0.06775)	0.17400*** (0.06640)	0.16612** (0.06668)
Hispanic	0.10238 (0.07062)	0.11102 (0.07244)	0.10927 (0.07141)	0.10679 (0.07167)
Immigrant	0.03152 (0.04573)	0.02764 (0.04796)	0.02850 (0.04809)	0.02991 (0.04655)
Female	−0.06438*** (0.01902)	−0.05118*** (0.01932)	−0.05417*** (0.01944)	−0.05362*** (0.01927)
Some college	0.01075 (0.02860)	0.01347 (0.02840)	0.00966 (0.02860)	0.01468 (0.02854)
College graduate	0.01511 (0.02892)	0.01293 (0.02879)	0.00918 (0.02913)	0.01567 (0.02894)
Industry work exp. > 10 years	0.04201** (0.01849)	0.03649* (0.01879)	0.03503* (0.01882)	0.03934** (0.01868)
Revenues: $1–$10,000				
Revenues: $10,001–$25,000		−0.01267 (0.02307)	0.00080 (0.02291)	
Revenues: $25,001–$100,000		−0.00588 (0.02222)	0.01882 (0.02102)	
Revenues: $100,000 or more		0.05509* (0.03084)	0.09175*** (0.02883)	
Business assets: $1-$10,000		0.07753*** (0.02664)		0.07404*** (0.02680)
Business assets: $10,001–$25,000		0.11764*** (0.03108)		0.11617*** (0.03095)
Business assets: $25,001–$100,000		0.14693*** (0.03040)		0.15522*** (0.03020)
Business assets: $100,000 or more		0.13240*** (0.03440)		0.14923*** (0.03370)
Intellectual property		0.05170** (0.02577)	0.05662** (0.02590)	0.05426** (0.02573)
Mean of Dep. Variable	0.21876	0.22045	0.22042	0.22045
Sample size	3,975	3,841	3,842	3,841

Notes: (1) The sample consists of all nonemployer observations with positive revenues over sample period, 2004–2011. The unit observation is a business-year. (2) Industry and regional controls are included in all specifications. (3) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

to previous findings, estimates of the relationship between business assets and hiring probabilities are not sensitive to the inclusion or exclusion of the revenue variables. Overall, the results excluding zero-revenue observations do not change the general conclusions.

TABLE IX.

REGRESSIONS FOR ANNUAL PROBABILITY OF HIRING FIRST EMPLOYEE
IN SERVICES INDUSTRIES NONEMPLOYER PANEL DATA—KAUFFMAN
FIRM SURVEY (2004–2011)

Explanatory Variables	In Following Year (1)	In Following Year (2)	In Following Year (3)	In Following Year (4)
African-American	0.03894	0.02898	0.02396	0.03741
	(0.03626)	(0.03571)	(0.03557)	(0.03616)
Asian-American	0.14699*	0.17646**	0.17721**	0.17809**
	(0.08018)	(0.07971)	(0.08102)	(0.07991)
Other race	0.07472	0.05551	0.05774	0.06479
	(0.04577)	(0.04954)	(0.04868)	(0.04682)
Hispanic	0.16409***	0.17559***	0.17230***	0.16894***
	(0.05809)	(0.06069)	(0.06017)	(0.05917)
Immigrant	0.00959	0.01106	0.01203	0.00309
	(0.04238)	(0.04526)	(0.04542)	(0.04319)
Female	−0.06331***	−0.05483***	−0.05621***	−0.05773***
	(0.01890)	(0.01918)	(0.01930)	(0.01906)
Some college	0.00085	−0.00500	−0.00987	−0.00010
	(0.03252)	(0.03339)	(0.03360)	(0.03275)
College graduate	−0.00602	−0.01526	−0.01974	−0.00837
	(0.03199)	(0.03296)	(0.03325)	(0.03234)
Industry work exp. > 10 years	0.03300*	0.02418	0.02488	0.02854
	(0.01880)	(0.01911)	(0.01916)	(0.01900)
Revenues: $1–$10,000		−0.03554	−0.03275	
		(0.02421)	(0.02406)	
Revenues: $10,001–$25,000		−0.01943	−0.00957	
		(0.02797)	(0.02783)	
Revenues: $25,001–$100,000		−0.05796***	−0.04213*	
		(0.02247)	(0.02206)	
Revenues: $100,000 or more		0.04599	0.05773*	
		(0.03468)	(0.03438)	
Business assets: $1–$10,000		0.02405		0.01376
		(0.02680)		(0.02571)
Business assets: $10,001–$25,000		0.09125***		0.07803**
		(0.03235)		(0.03144)
Business assets: $25,001–$100,000		0.05284*		0.04867
		(0.03121)		(0.02992)
Business assets: $100,000 or more		0.03040		0.03725
		(0.03268)		(0.03202)
Intellectual property		0.05320**	0.05464**	0.05574**
		(0.02617)	(0.02620)	(0.02612)
Mean of Dep. Variable	0.21624	0.21826	0.21818	0.21736
Sample size	3,716	3,497	3,499	3,587

Notes: (1) The sample consists of all nonemployer observations in the services industries over sample period, 2004–2011. The unit observation is a business-year. (2) Industry and regional controls are included in all specifications. (3) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

5.2. SERVICES AND OTHER INDUSTRIES

The relationships between revenues and business assets might differ across industries. The KFS sample is not large enough to run separate analyses by detailed industry, but it is large enough to run separate regressions for broad industry groupings. Table IX

TABLE X.
REGRESSIONS FOR ANNUAL PROBABILITY OF HIRING FIRST EMPLOYEE IN CONSTRUCTION, TRADE, MANUFACTURING, AND OTHER INDUSTRIES NONEMPLOYER PANEL DATA—KAUFFMAN FIRM SURVEY (2004–2011)

Explanatory Variables	In Following Year (1)	In Following Year (2)	In Following Year (3)	In Following Year (4)
African-American	−0.03484	−0.04780	−0.05602	−0.02316
	(0.05637)	(0.05927)	(0.05912)	(0.05934)
Asian-American	0.19793*	0.25723***	0.25749**	0.24691**
	(0.11080)	(0.09885)	(0.10667)	(0.10188)
Other race	0.23075***	0.19378**	0.21335**	0.20403**
	(0.08747)	(0.09173)	(0.08937)	(0.08994)
Hispanic	0.03478	0.03300	0.03479	0.03585
	(0.08394)	(0.07932)	(0.08121)	(0.08065)
Immigrant	0.02244	0.01363	0.01496	0.02534
	(0.06389)	(0.06578)	(0.06441)	(0.06662)
Female	−0.02926	0.00097	−0.01004	−0.00195
	(0.03135)	(0.03182)	(0.03204)	(0.03122)
Some college	−0.03824	−0.02776	−0.03390	−0.03336
	(0.03881)	(0.03749)	(0.03778)	(0.03774)
College graduate	0.03947	0.03275	0.03417	0.03898
	(0.04166)	(0.04101)	(0.04134)	(0.04129)
Industry work exp. > 10 years	0.06054**	0.07212**	0.06709**	0.07133**
	(0.02998)	(0.03050)	(0.03023)	(0.03019)
Revenues: $1–$10,000		−0.11233***	−0.12286***	
		(0.03512)	(0.03478)	
Revenues: $10,001–$25,000		−0.16260***	−0.16098***	
		(0.03960)	(0.03915)	
Revenues: $25,001–$100,000		−0.06566*	−0.03727	
		(0.03636)	(0.03526)	
Revenues: $100,000 or more		−0.06664	−0.00680	
		(0.04792)	(0.04435)	
Business assets: $1–$10,000		0.00669		−0.05468
		(0.04470)		(0.04473)
Business assets: $10,001–$25,000		0.02643		−0.03355
		(0.05019)		(0.04936)
Business assets: $25,001–$100,000		0.12735**		0.06840
		(0.04961)		(0.04809)
Business assets: $100,000 or more		0.13181**		0.07935
		(0.05703)		(0.05426)
Intellectual property		0.09773**	0.10088**	0.11985***
		(0.04302)	(0.04369)	(0.04356)
Mean of Dep. Variable	0.26185	0.26283	0.26282	0.26441
Sample size	2,077	1,955	1,956	2,006

Notes: (1) The sample consists of all nonemployer observations in the construction, manufacturing, trade, and other industries over sample period, 2004–2011. The unit observation is a business-year. (2) Industry and regional controls are included in all specifications. (3) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

reports estimates for regressions including only nonemployer start-ups in the services industry (where many start-ups are found). Table X reports estimates for regressions including only nonemployer start-ups in the construction, manufacturing, trade, and other industries. In the services industries, the relationship between sales and hiring is not clear. The relationship between business assets and hiring is also not clear, although

there are some positive coefficients relative to the lowest level. Only a few of the coefficient estimates are statistically significant, which is, in part, due to smaller sample sizes.

In the regressions that include the construction, manufacturing, trade, and other industries, the positive relationship between business assets and hiring probabilities is clear. Hiring increases generally with each level of business assets. The relationship with revenues is less clear, with hiring first decreasing with higher sales and then increasing for these industries. The separate industry analyses, in general, do not reveal different patterns for the revenues and business asset results than for the main results.

Estimates for the other variables indicate that intellectual property has a similar association with hiring in the two broad industry groups. The industry groups also have similar demographic characteristics predicting which nonemployer start-ups hire. Although it would be useful to conduct separate analyses with more detailed industries, the results for these broad groupings do not indicate substantially different results and the sample sizes are not large enough in the KFS to investigate the question further.

6. Does Entrepreneurship Training Help Owners Hire Their First Employee?

Returning to the question of whether the human capital of the entrepreneur is important for hiring decisions, we examine whether entrepreneurship training can help overcome some of the barriers to hiring employees. Entrepreneurship training often specifically teaches self-employed business owners strategies for hiring and managing employees, and provides training on registering for EINs, tax and insurance compliance, and legal issues, but does it increase the likelihood of hiring the first employee? Data from the largest random experiment providing entrepreneurship training—the GATE experiment—are used to examine this question.

As noted above, the analysis focuses on the participants in the GATE experiment who were self-employed business owners at the time of application and reported not ever having employees for their businesses. Thus, the experiment is used to estimate the effects of entrepreneurship training on nonemployer entrepreneurs hiring their first employee.

Table XI starts by comparing mean baseline characteristics between the treatment and control groups to check the randomization. The groups appear to be similar. Among the numerous baseline characteristics measured in the application, none are statistically different between the treatment and control groups. Even though we do not detect any differences, in the estimates of treatment effects, results are presented both without controls and with controls for a large set of detailed baseline characteristics.

With any random experiment, the control group cannot be restricted from obtaining training elsewhere. They cannot receive free services through the GATE program, but they can seek assistance through the existing market for training services. Given this limitation with any training experiment, it is important to examine whether and how the GATE treatment actually changed the use of training services. Table XII reports the percentage of participants receiving entrepreneurship training and the mean hours of training separately for the two main types of training: classroom, workshops, and

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TABLE XI.
TREATMENT/CONTROL COMPARISON OF BASELINE CHARACTERISTICS
FOR GATE EXPERIMENT

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	Treatment Group (1)	Control Group (2)	*P*-Value for Treat-Control (3)
Philadelphia	19.0%	16.0%	0.47
Pittsburgh	10.3%	14.8%	0.22
Minneapolis-St. Paul	52.3%	49.1%	0.56
Duluth	3.5%	5.3%	0.40
Maine	14.9%	14.8%	0.97
Female	46.0%	45.0%	0.85
Black	25.3%	23.8%	0.75
Latino	8.6%	4.8%	0.15
Asian	2.9%	4.2%	0.52
Other	6.9%	8.3%	0.62
Not U.S. born	9.2%	9.5%	0.93
Age	44.19	43.70	0.66
Married	46.6%	55.1%	0.12
Has children	46.0%	47.3%	0.80
Highest grade completed	15.07	15.21	0.56
HH Income $25,000–$49,999	28.3%	29.2%	0.86
HH Income $50,000–$74,999	19.7%	20.8%	0.79
HH Income $75,000–$99,999	5.2%	5.4%	0.95
HH Income $100,000+	5.2%	6.6%	0.60
Has a health problem	7.5%	5.9%	0.57
Has relatives or friends who have been previously S.E.	75.3%	74.6%	0.88
Ever worked for relatives or friends who are S.E.	30.5%	26.6%	0.43
Has a bad credit history	41.4%	37.3%	0.44
Currently receiving UI benefits	31.6%	25.6%	0.22
Sample size	174	169	

Notes: (1) All reported characteristics are measured at time of application, prior to random assignment. (2) Sample includes only nonemployer business owners at time of application.

seminars, and one-on-one counseling or technical assistance. The treatment group was an estimated 32 percentage points more likely to receive any training in the six months following random assignment than the control group. The first six months after random assignment was the most intensive period for receiving training, with less training received during the subsequent 12-month period (i.e., between wave 1 and wave 2) and the last 12-month period (i.e., before wave 3).

The treatment group also received more than twice the number of hours of training by the first follow-up wave. The difference in training received is 9 hours at wave 1 and summing across waves. The extra hours of instructional time are likely to result in substantially more "homework" time. Although students learn or receive guidance in the classroom or one-on-one counseling, research and calculations for planning and strategies for business growth are done elsewhere, and thus not reported as "training" hours. Among those who received any training, the treatment group received on average 21.0 hours of training in the first six months, which is roughly two-thirds the instructional time for a five-unit college course over a quarter.

Follow-up survey responses also indicate that GATE participants were satisfied with services. Table XIII reports estimates for the treatment and control groups who received services. And 48.6% of GATE recipients reported that "the overall usefulness"

TABLE XII.
TREATMENT AND CONTROL GROUPS RECEIPT OF ENTREPRENEURSHIP TRAINING

	R.A. to Wave 1 (6 month period)		Wave 1 to Wave 2 (12 month period)		Year Prior to Wave 3 (12 month period)		Cumulative to Wave 2		Cumulative to Wave 3	
	Percent Receiving (1)	Mean Hours (2)	Percent Receiving (3)	Mean Hours (4)	Percent Receiving (5)	Mean Hours (6)	Percent Receiving (7)	Mean Hours (8)	Percent Receiving (9)	Mean Hours (10)
Treatment group										
Any entrepreneurship training	86.0%	18.0	50.0%	9.7	31.7%	6.8	86.4%	27.8	88.7%	34.5
Attended classes, workshops, or seminars	72.0%	15.9	45.8%	8.9	28.5%	5.9	74.1%	24.8	77.0%	30.7
Received one-on-one counseling or technical assistance	57.3%	2.1	18.1%	1.1	17.1%	0.7	58.8%	3.2	63.7%	3.9
Control group										
Any entrepreneurship training	53.7%	9.1	47.8%	8.7	40.2%	7.9	57.3%	17.8	65.4%	25.7
Attended classes, workshops, or seminars	46.3%	8.2	44.0%	7.3	37.4%	7.3	50.6%	15.5	58.7%	22.8
Received one-on-one counseling or technical assistance	22.4%	0.9	20.1%	1.5	11.2%	0.6	27.9%	2.5	34.4%	3.1

Note: The wave 1, wave 2, and wave 3 surveys are conducted at 6, 18, and 60 months after time of application.

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TABLE XIII.
**SELF-REPORTED AMOUNT THAT ENTREPRENEURSHIP TRAINING
HELPED RECIPIENTS IN VARIOUS WAYS**

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	Very Useful	Somewhat Useful	Not Very Useful	Not at All Useful
How would you rate the overall usefulness of the services you have received?				
Treatment group	48.6%	31.3%	12.5%	7.6%
Control group	35.6%	45.5%	6.9%	11.9%

	Treatment Group			Control Group		
GATE Services	A Lot	Somewhat	Not at All	A Lot	Somewhat	Not at All
Helped with applying for loans	9.4%	23.2%	67.4%	0.0%	11.0%	89.0%
Helped with deciding whether to pursue self. emp.	37.1%	20.3%	42.7%	23.3%	24.3%	52.4%
Helped with refining the business idea	32.9%	37.1%	30.1%	25.2%	33.0%	41.7%
Helped with credit issues	18.2%	27.3%	54.5%	6.9%	18.8%	74.3%
Helped with developing a marketing strategy	34.3%	35.0%	30.8%	22.3%	31.1%	46.6%
Helped with legal issues	13.3%	32.9%	53.8%	10.7%	24.3%	65.0%
Helped with accounting issues	22.9%	34.0%	43.1%	8.7%	31.1%	60.2%
Helped with hiring and dealing with employees	9.2%	18.3%	72.5%	5.8%	17.5%	76.7%
Helped with networking	31.3%	32.6%	36.1%	23.3%	29.1%	47.6%
Helped with using computers and technology	8.3%	29.2%	62.5%	5.8%	23.3%	70.9%
Helped with dealing with clients	19.4%	36.1%	44.4%	13.6%	31.1%	55.3%
Helped with providing psychological support	19.0%	28.2%	52.8%	15.7%	21.6%	62.7%

Notes: (1) Sample includes treatment and control group participants who received any entrepreneurship training by wave 1 follow-up survey (6 months). (2) Evaluation of services was asked at W1.

of the services received was "very useful," with 31.3% responding "somewhat useful." Most recipients of GATE training responded that services helped "a lot" or "somewhat" with at least one specific aspect of the business or business planning (e.g., marketing strategy, accounting, networking, and information technology). The treatment group reported greater satisfaction overall, and for each of the training aspects, than control group trainees (who obtained non-GATE training of their own accord). One interesting finding is that a low percentage of the treatment group (and control group) reported that the entrepreneurship training they received helped "a lot" with "hiring and dealing with employees" relative to other areas in which it helped. Of course, this may mean they were not looking for this kind of help, rather than that the training was not useful for hiring employees. Furthermore, these results must be interpreted with caution because they are only suggestive self-reports of how areas of training helped participants.

| | Treatment-Control ITT Estimates | | |
| | No Covars | Covariates | N |
Dependent Variable	(1)	(2)	(3)
Has any employees by W1 survey date	0.0277	0.0319	302
	(0.0349)	(0.0357)	
Has any employees by W2 survey date	0.0303	0.0532	275
	(0.0450)	(0.0438)	
Has any employees by W3 survey date	0.0418	0.0349	225
	(0.0529)	(0.0533)	
Has any employees at W1 survey date	0.0277	0.0319	302
	(0.0349)	(0.0357)	
Has any employees at W2 survey date	−0.0025	0.0098	276
	(0.0382)	(0.0375)	
Has any employees at W3 survey date	−0.0325	−0.0459	228
	(0.0413)	(0.0413)	
Number of employees at W1	−0.1011	−0.1152	302
	(0.1544)	(0.1637)	
Number of employees at W2	−0.2292	−0.1944	276
	(0.1753)	(0.1649)	
Number of employees at W3	−0.1110	−0.1338	228
	(0.2169)	(0.2376)	

Notes: (1) Intent-to-treat (ITT) estimates are reported for the listed outcome regressed on entrepreneurship training treatment. (2) The wave 1, wave 2, and wave 3 surveys are conducted at 6, 18, and 60 months after time of application. (3) Covariates include program sites, female, race, immigrant, age, married, children, education level, household income, self-employed at application, health problems, worked in family business, bad credit history, unemployment compensation, employer provided health insurance, autonomy, and risk tolerance. (4) [*], [**], and [***] denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

6.1. ESTIMATING THE EFFECTS OF ENTREPRENEURSHIP TRAINING ON HIRING THE FIRST EMPLOYEE

I next examine the effects of entrepreneurship training on nonemployer business owners hiring their first employee. The regression equation for the employment outcome, y_i, in the context of the random experiment is straightforward:

$$y_i = \alpha + \delta T_i + \gamma X_i + \varepsilon_i, \tag{3}$$

where T_i is the treatment indicator, X_i includes all of the baseline covariates reported in Table XI, and ε_i is an error term. The effect of becoming eligible for entrepreneurship training through the GATE program or the "intent-to-treat" (ITT) estimate of the training program is captured by δ. Measures of employment at three follow-up waves after random assignment are available: wave 1 at 6 months, wave 2 at 18 months, and wave 3 at 60 months. Employment at each of the waves is examined for the sample of nonemployer firms participating in the experiment.

Table XIV reports estimates from (3) of the effects of entrepreneurship training through the GATE program on employment. In the first panel, the treatment effects on the probability of hiring the first employee by each of the follow-up waves are reported. The sample includes only business owners with no employees at the time they applied to the GATE program. This is the time of random assignment. The first column does not include any controls, and thus essentially calculates the difference in employment rates between treatment and control groups in the experiment. At wave 1, 11.6% of

the treatment group and 8.8% of the control group hired an employee for a difference of 2.8 percentage points. The estimated treatment-control difference, however, is not statistically significant.

Table XIV also reports specifications that include controls and that are for additional follow-up waves. None of the point estimates for the entrepreneurship training treatment effects on hiring the first employee are statistically significant. These results are consistent for the 6-month, 18-month, and 60-month follow-up periods.

Table XIV also reports estimates of the effects of entrepreneurship training on current employment at the point in time of each follow-up survey. In the second panel, the effects on the probability of hiring an employee *at* each of the follow-up waves are reported. The six-month or wave 1 results are the same as those reported in Panel 1 because wave 1 is the first follow-up survey. At the 18-month and 60-month periods, the point estimates are no longer positive. They remain statistically insignificant. In both specifications and across follow-up waves, insignificant estimates and inconsistent signs on those estimates are found. Thus, there is no evidence of a positive effect of entrepreneurship training on increasing the likelihood that nonemployer business owners hired an employee at each of the follow-up surveys.

Although entrepreneurship training through the GATE program does not increase the likelihood a nonemployer firm hires an employee at each follow-up wave, it might increase overall employment levels. In the second panel, the entrepreneurship training treatment effects on number of employees for nonemployer business owners at each follow-up wave are investigated. Similarly, there is no evidence of positive effects of entrepreneurship training on the number of employees.

The lack of effects on the entrepreneurship training on hiring employees does not appear to be due to differential rates of nonemployer businesses ceasing operations over the study period. If a business stops operating, then technically, it cannot hire employees. The estimates do not condition on survival because that could introduce a bias in estimating the effects of entrepreneurship training through the experiment.

Table XV reports estimates of the effects of entrepreneurship training on whether the nonemployer business owner at baseline continues owning a business at each of the follow-up waves. There is some drop-off in business ownership, as roughly 20% are no longer business owners at wave 1, 28% at wave 2, and 33% at wave 3. The estimates, however, do not provide any clear and consistent evidence that entrepreneurship training increases the likelihood that nonemployer business owners remain in business.

These results are also consistent with lack of evidence of an effect of entrepreneurship training on the sales of businesses owned by initial nonemployer owners. Estimates are reported in Table XV. There is no evidence of a positive effect of entrepreneurship training on sales.

All of the experimental estimates reported thus far capture the "ITT" or the effects of the offer of entrepreneurship training through the GATE program. Another commonly reported estimate in an experimental setting is the local average treatment effect (LATE). LATE shifts the focus from estimating the effects of the *offer* of entrepreneurship training on hiring employees to estimating the effects of *receiving* entrepreneurship training on hiring employees. The estimation involves using instrumental variables, which is operationalized by using Two-stage least squares (2SLS). In the first stage, the probability of receiving any entrepreneurship training is regressed on treatment (the instrument). In the second stage, employment is regressed on the predicted value of receiving any entrepreneurship training from the first stage. The technique scales up the ITT estimate by dividing it by the difference between the percentage of the treatment group receiving

| | Treatment-Control ITT Estimates | | |
Dependent Variable	No Covars (1)	Covariates (2)	N (3)
Business owner at W1 survey date	−0.0296 (0.0454)	−0.0052 (0.0464)	302
Business owner at W2 survey date	−0.0017 (0.0539)	0.0046 (0.0551)	278
Business owner at W3 survey date	0.0555 (0.0627)	0.0213 (0.0666)	230
Monthly business sales at W1 survey date (000s)	−0.5808 (0.5336)	−0.5062 (0.5281)	252
Monthly business sales at W2 survey date (000s)	−1.3105 (0.7545)	−1.1815 (0.7225)	235
Monthly business sales at W3 survey date (000s)	−0.8671 (2.9767)	−0.8182 (2.8160)	214

Notes: (1) ITT estimates are reported for the listed outcome regressed on entrepreneurship training treatment. (2) The wave 1, wave 2, and wave 3 surveys are conducted at 6, 18, and 60 months after time of application. (3) Covariates include program sites, female, race, immigrant, age, married, children, education level, household income, self-employed at application, health problems, worked in family business, bad credit history, unemployment compensation, employer provided health insurance, autonomy, and risk tolerance. (4) *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

any training and the percentage of the control group receiving any training. It adjusts the treatment-control difference estimate upward to account for the fact that it was originally calculated with only part of the treatment group receiving training and part of the control group not receiving training.[18] As reported in Table XII, 86% of the treatment group did not receive any entrepreneurship training in the first six months after random assignment, and 54% of the control group received at least some entrepreneurship training (outside of GATE) in the six months after random assignment (e.g., 0.86−0.54 = 0.32 for the six-month survey).

Online Appendix Table IV reports LATE estimates for the three employment outcomes reported in Table XIV. The reported estimates are larger, but not statistically significant for any measure or any follow-up survey. The main conclusion does not change—we find no evidence that entrepreneurship training increases the likelihood of hiring employees among nonemployer entrepreneurs.

7. CONCLUSIONS

From the analysis of longitudinal data from the iLBD, several interesting patterns emerge regarding the dynamics of nonemployer start-ups hiring their first employee. Among business hiring employees, a large percentage of nonemployer start-ups hire their first

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18. LATE estimates, however, have two well-known drawbacks. First, LATE only provides an estimate of the effect of receipt of entrepreneurship training for those individuals complying with the experiment (i.e., the treatment group who received entrepreneurship training and the control group who did not receive entrepreneurship training). LATE estimates are then interpreted as "local" estimates of the effects of entrepreneurship training for compliers. Second, they rely on the key assumption that the receipt of any entrepreneurship training means the same thing for the treatment and control groups (otherwise the rescaling up of the ITT estimate would be invalid). This is problematic here if the control group is receiving a very different quality and level of services on average than the treatment group.

employee in the first three years of existence, with only a small percentage hiring their first employee in the few years after that period. Hiring patterns over time are roughly similar in the KFS sample of nonemployer start-ups, but higher because of the more growth- and employment-oriented businesses contained in the underlying D&B data.

The likelihood of making the transition from nonemployer to employer business within the first several years of operation differs by the race, ethnicity, and gender of the entrepreneur. Nonemployer businesses owned by Asians and Hispanics have higher probabilities of hiring their first employee than white-owned businesses, all else equal. Nonemployer firms owned by African-Americans have similar likelihoods of hiring their first employee as whites. Female-owned nonemployer firms have lower annual probabilities of hiring their first employee than male-owned firms.

The entrepreneur's human capital, measured as owner's education and prior industry work experience, does not strongly predict hiring the first employee, although there is some evidence of a positive relationship with prior industry work experience. Data from the GATE experiment are used to examine the question of whether entrepreneurship training increases the likelihood that nonemployer entrepreneurs hire an employee within the next several years. We do not find evidence of positive effects of entrepreneurship training on hiring the first employee by 6, 18, and 60 months. Furthermore, the estimates do not provide evidence that the probability of hiring an employee or the number of employees increases with entrepreneurship training. Entrepreneurship training, however, might be more effective for business owners in specific industries or with specific backgrounds. More research with larger samples of nonemployer business owners is needed to explore this question.

Using the longitudinal data from the KFS, another important question examined is whether there are milestones that nonemployer start-ups often reach before hiring their first employee. Surprisingly, we do not find clear evidence of a strong relationship between the revenues of nonemployer firms and the decision to hire their first employee in the KFS sample. The evidence, however, is less ambiguous that higher levels of business assets are associated with nonemployer businesses making the transition to employer firms. It may be important for nonemployer firms to build up assets to use or borrow against to hire their first employee. Having intellectual property also has a positive association with making the nonemployer to employer transition during the sample period. Intellectual property, which includes patents, copyrights, and trademarks, is associated with a 7 percentage point increase in the annual probability of hiring the first employee. Intellectual property may be valuable for securing future revenues for hiring employees.

The analysis of iLBD, KFS, and GATE experimental data represents one of the detailed studies on the topic of what predicts whether and when an entrepreneur hires the first employee. Although some caution is warranted in interpreting the estimates they represent an important first step toward better understanding the determinants of entrepreneurs making the decision to take the leap from nonemployer to employer firms. More research on the important topic of job creation by entrepreneurs is clearly needed.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Online Appendix

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