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Stopping start-ups: how the business cycle affects entrepreneurship

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Keywords

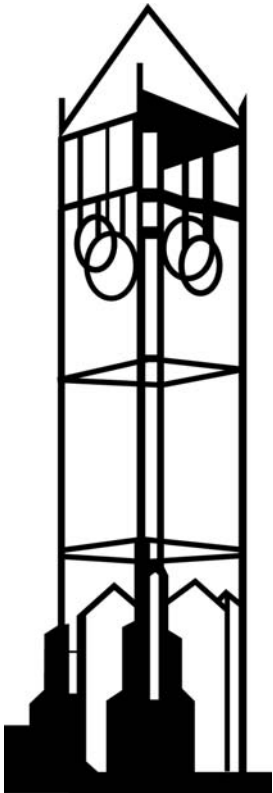
entrepreneurship, boom, bust, occupational choice, survivor analysis, business cycle, cohort

Disciplines

Economics

STOPPING START-UPS: HOW THE BUSINESS
CYCLE AFFECTS ENTREPRENEURSHIP

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STOPPING START-UPS: HOW THE BUSINESS CYCLE AFFECTS

ENTREPRENEURSHIP

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Abstract

This study analyzes whether economic conditions at the time of labor market entry affect entrepreneurship, using difference in business start-ups between cohorts of college students graduating in boom or bust economic conditions. Those graduating during an economic bust tend to delay their business start-ups relative to boom period graduates by about two years. Those results are consistent with additional findings that higher unemployment rates at time of graduation significantly delay the first business start-up across all college graduation cohorts over the 1982-2004 period. The adverse effect of a bust is temporary, delaying but not preventing self-employment over the life-cycle.

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I. Introduction

There are two competing views of the role of business cycles on self-employment¹. Some contend that during recessions, workers are pushed into self-employment because of weak labor market opportunities. However, the evidence for this is mainly that the unemployed are more apt than the employed to become self-employed. For example, Evans and Leighton (1989) find that the self-employment rate is positively correlated with being unemployed in a longitudinal sample of white men in the U.S.. Constant and Zimmermann (2004) find that unemployed people are twice more likely to enter self-employment than are wage earners in Germany. Of course, the unemployed are also more likely to transit into paid employment compared to those already in paid employment, and so these studies cannot be seen as strong support of the push theory.

Because recessions are unlikely to be ideal for starting a business, other researchers have suggested that recessions discourage entry into self-employment. For example, Blanchflower (2000) reports a negative relationship between the self-employment rate and the unemployment rate in most OECD countries. To round out all possible conclusions, Moore and Mueller (2002) found that self-employment decisions are uncorrelated with the unemployment rate.

There are several reasons to be suspicious of the recession-push story. Cagetti and De Nardi (2006) showed that constraints on borrowing would retard entrepreneurial activity, conditions that should be more prevalent in downturns. Access to credit does affect the decision to become an entrepreneur. Holtz-Eakin, Joulfaian and Rosen (1994) and Blanchflower and Oswald (1998) found that receipt of a bequest increases the

¹ Meager (1992) provides an early summary of the literature.

likelihood of self-employment, presumably because inherited wealth relaxes liquidity constraints. Fairlie (1999) shows that lower levels of wealth help to explain the lower level of self-employment for blacks. Additionally, people tend to be more risk averse in economic downturns. Rampini (2004) presents a theoretical argument that more agents become entrepreneurs during expansions because agents are more willing to bear risk.

The investigation of whether or not entrepreneurship varies with the business cycle has largely ignored the life-cycle perspective of occupational choice. That perspective suggests that individuals choose occupations with an eye toward expected future returns rather than transitory incomes (Orazem and Mattila, 1991). Empirical models of self-employment have generally focused on permanent or quasi-fixed factors such as demographic attributes, education, or industry- or location-specific human capital to explain variation in entrepreneurial entry (Fairlie and Meyer, 2000; Hout and Rosen, 2000; Lazear, 2005; Fairlie and Robb, 2007). That focus is natural in that entrepreneurial returns are only realized after a long delay (Hamilton, 2000). It is unlikely that individuals start businesses in reaction to short-term fluctuations in the business climate. It is more probable that the decision to open a business reflects lifetime comparisons of anticipated earnings from self-employment with wage or salaried employment. In the life-cycle context, the business cycle may accelerate or delay the age at which an individual enters self-employment, but recessions or expansions will not alter the probability that someone ever opens a business over a lifetime.

This study examines whether business cycles have a measurable temporary or permanent impact on life-cycle entrepreneurial decisions. We do so by examining the impact of the economic climate at the time of labor market entry on the probability of

opening a business in the first 15 years after entry. Our primary focus is on two cohorts of Iowa State University graduates. The first, labeled the bust generation, graduated in 1982, the worst recession in the postwar period. The second, labeled the boom generation, graduated in 1992, the start of the longest expansion in the history of the United States. If business cycles affect life-cycle entrepreneurship, the contrast between these two cohorts should reveal the impact.

We do find that individuals graduating during economic busts are less likely to start a business than are those who graduate in economic booms, holding constant years since graduation. However, the impact is only temporary. While the economic bust slowed entrepreneurial entry by about 2 years, it did not permanently stop the bust cohort from opening a business.

Recessionary conditions also affect the success of the firm. Bust cohort ventures were more likely to fail when we standardize length of time since graduation. When we standardize year of startup, however, there is no significant difference between the boom and bust groups in business success, consistent with the presumption that the higher bust cohort failure rate is due to economic circumstance and not difference in entrepreneurial ability. We corroborate that conclusion by noting that bust cohort entrepreneurs were more than twice as likely to blame their exit to business failure. Boom cohort entrepreneurs were more able to self-finance their enterprises, suggesting that a stronger labor market supports stronger entrepreneurial ventures.

The next section introduces the methodology used to model the period of entrepreneurial incubation following graduation for our boom and bust cohorts. Section three describes the survey data, and section four reviews the results.

II. Methodology

We want to isolate the effect of the business cycle on the probability of becoming an entrepreneur. We assume that within t years of graduation, the probability that a member of cohort T has started a business is $E(B_{it} | x_i, T) = \hat{\gamma}_{Tt}$, where B_{it} is a dummy variable indicating individual i has started a business by the t^{th} year after graduation. x_i is a vector of individual attributes including demographics, family background, and academic and extracurricular experiences in high school and college. Importantly, we require that all of these individual attributes are known at the time of graduation, T . At the time of graduation, individuals have generated skills and attitudes that allow them to assess expected utility from business ownership versus being an employee or other uses of time. However, most will not open a business immediately upon graduation, and so subsequent choices regarding postgraduate schooling, occupation, location, and investments will endogenously reflect potential future planned entrepreneurial ventures.² There will also be unanticipated shocks to expected utility in either the business or other lifecycle time allocation decisions which will be the source of error in the model.

The conditional probability of starting a business, $\hat{\gamma}_{Tt}$ is assumed to vary with individual attributes, with the economic conditions that prevailed at the time of graduation, and with the length of time since graduation, t . We can estimate the conditional probability of entrepreneurship for any year T . In particular, using '82' to designate the advent of a 'bust' period and '92' to be the start of a 'boom', we can

² In our data set, individuals with postgraduate degrees are less likely to open a business, but some postgraduate training (e.g. veterinary medicine, MBA, clinical psychology) are clearly selected with the potential of self-employment or firm start-up in mind.

estimate the difference in the conditional probability of starting a business within t years of graduation in a ‘boom’ compared to a ‘bust’ as $\hat{\gamma}_{92t} - \hat{\gamma}_{82t}$. We are completely agnostic about the sign or magnitude of the difference. It could be positive, negative or zero, depending on whether boom periods atypically encourage business start-ups, encourage accepting job offers from existing businesses, or have no systematic effect on entrepreneurial versus other occupational decisions.

The incentive or funding necessary to start a business may depend on economic circumstances at the time of graduation, and these initial conditions may have persistent effects on business entry over time. We use a logit specification to identify the magnitude and persistence of the cumulative effect of good or bad economic conditions on entrepreneurship over the first 15 years after graduation,³ difference sufficiently long period to identify $\hat{\gamma}_{92t} - \hat{\gamma}_{82t}$. We choose three different time periods over which to examine if there is a positive or negative relationship between economic conditions upon graduation and entrepreneurship, $t = 5, 10$ or 15 . We use a logit model to measure the relative likelihood of starting a business over the different time periods. The results will show whether there are systematic and persistent differences in entrepreneurship between the boom and bust cohorts.

At first blush, it appears that graduating in the midst of a recession immediately retards incentives to start a business, and that the effect of recession on business start ups persists over at least the first fifteen years of the work career. Figure 1 displays the

³ An earlier version of the paper also used a waiting time model to describe entrepreneurial entry. However, many individuals have no intention of ever starting a business, the assumptions of the waiting time model are violated and the cumulated probability of starting a business will not converge to one by the end of an individual’s lifetime. This misspecification may lead to a biased estimation of the business cycle effect on waiting time to entry, even though in applications, our findings using the waiting time model were very similar to those found with the logit model.

cumulative proportion of alumni starting a business t years after graduation for the boom (1992) and bust (1982) cohorts. Fifteen years after graduation, nearly 17% of the boom cohort had started a business, about 3% higher than bust cohort. This finding is consistent with evidence elsewhere that graduating in a recession can have persistent effects on the earnings path (Kahn, 2008) and on job placement (Gallett *et al*, 2005; Oyer, 2006). Nevertheless, these differences also could reflect systematic differences in individual attributes between the boom and bust cohorts, and so our analysis will have to hold fixed these individual characteristics..

III. Data

This study uses a survey given to the universe of Iowa State University (ISU) Bachelor's degree recipients graduating in 1982 and in 1992 for whom the ISU Alumni Association had a home address. These years were picked deliberately to maximize the difference in business climate that college graduates could face. The bust cohort graduated in 1982, the deepest recession in the postwar period, and a recession which dragged on for almost three years in Iowa. The boom cohort graduated in 1992, the start of the longest economic expansion in the history of the United States.⁴

This data is supplemented by a 20% random sample of ISU graduates of all the other years between 1983 and 2002. The expanded data set will enable us to test more generally if receiving a Bachelor's degree in a weak labor market will retard entrepreneurship.

⁴ 3510 undergraduates received a Bachelor's degree from ISU in 1982 and 731 responded to the survey. 3651 undergraduates received a Bachelor's degree from ISU in 1992 and 587 responded to the survey.

Sample weights are used to correct for differences in probability of response between survey years and between alumni within survey years. Weights are constructed so as to relate the number of respondents in each college-cohort cell to the number in the universe⁵. The weighted data are used to obtain consistent estimators of population means.

The key dependent variable is whether an alumnus had ever started a for-profit-business. These individuals are defined as entrepreneurs in our paper. For our main results, we focus on a 15 year time horizon. Over that time frame, 14.2% of the 1982 cohort started at least one business between 1982 and 1996. Taking the same 15-year exposure since graduation, 16.8% of the 1992 cohort had started at least one business between 1992 and 2006. Three-quarters of the entrepreneurs had started only one business and the rest started two or more. For entrepreneurs with multiple businesses, our analysis will focus on the most successful enterprise.⁶

The data structure will allow us to test whether there are differences in starting a business in a time frame that are related to the state of the business cycle at the time of graduation. The dataset includes additional information on demographics, family

⁵ Let N_t be the total number of alumni who graduated from Iowa State University with a Bachelor's degree in year t . There are six colleges at ISU: Agricultural & Life Sciences, Business, Design, Engineering, Human Sciences and Liberal Arts & Sciences. Let n_{jt} be the number of alumni who graduated from college j in year t . The proportion of these alumni out of the graduates from ISU in year t is n_{jt} / N_t . The corresponding number of alumni in our sample who graduated from college j in year t is s_{jt} . Each individual in our sample is then assigned with a sampling weight n_{jt} / s_{jt} such that the weight will represent the number of total alumni from college j in year t .

⁶ Our key parameter estimates retain signs and magnitudes when we focus only on one-time entrepreneurs, although we lose precision with the smaller samples.

background, extra-curricular activities, and college major. Statistical summaries of variables of interest are shown in Table 1.

IV. Empirical Findings

Comparative static tests of the difference in entrepreneurial entry across boom and bust cohorts

Figure 1 shows that a gap in the unconditional likelihood of starting a business opens up between the two cohorts early in the years after graduation and widens slowly over time. Fifteen years after graduation, the percentage of the boom cohort that had started at least one business was 3 percentage points larger than for the bust cohort.

The apparent difference in entrepreneurial entry between the ‘boom’ and ‘bust’ groups may be due to other cohort-specific differentials, x_{iT} . The regression results from the logit models of entrepreneurship are shown in Table 2. We report two sets of results: one comparing the 1992 and 1982 cohorts; and a second that adds additional precision to our estimates by adding the 1983 cohort to our ‘bust’ graduate group and the 1993 cohort to our ‘boom’ graduate group.⁷

Controlling for the observed characteristics at time of graduation, ten years after graduating, the 1992 cohort is significantly more likely to have started a business compared to the 1982 cohort. By the close of the period, the boom cohort is 3.5% more likely to have started a new business within fifteen years of graduation from ISU. The

⁷ As can be seen in Figure 2, the weak economic conditions of the 1982 recession persisted through 1985 in Iowa, longer than the national recession. Unemployment rates in 1993 were similar to those in 1992.

boom-bust effect becomes more significant as time elapses. The initial weak effect apparently reflects a common result that entrepreneurship most commonly occurs after some work experience (Evans and Leighton, 1989; Fairlie and Robb, 2007). Adding degrees of freedom by including the 1983 and 1993 graduates into the sample adds to the significance without appreciably changing the numerical result. Although not our primary interest, it is worthwhile to examine what other covariates are linked to entrepreneurship. Married graduates are more likely to start a business than are singles, and indeed, 69% of the entrepreneurs in our survey list support from family members and close friends as very important for business success. Members of minority groups are more likely to start new businesses despite the assessment that customer discrimination (Borjas and Bronars, 1989) or discrimination in credit access (Coate and Tennyson, 1992) may lower returns to self-employment. Perhaps college educated minorities do not face the same barriers that limit minority businesses more generally (Fairlie, 1999), perhaps because they find it easier to pool resources from ethnic enclaves that facilitate new start-ups or partnerships (Lee, *et al.*, 2004, Kandel and Lazear, 1992).

Having entrepreneurial parents also increases entrepreneurial entry, consistent with research that views entrepreneurship as a “transmission of parental self-employment” . Entrepreneurial parents presumably impart to their offspring entrepreneurial skills and they may be willing and able to transfer financial wealth to their offspring, thus relaxing credit market constraints (Dunn and Holtz-Eakin, 2000; Matthew and Human, 2004; Fairlie and Robb, 2007).

Activities while at Iowa State had less of an impact on entrepreneurial entry. Alumni who were active in sports while at Iowa State were more likely to start a business,

but other extra-curricular activities did not affect the choice. Students from Colleges of Design and of Agricultural and Life Sciences were also more likely to become entrepreneurs.

Measuring the delay in entrepreneurial entry due to the business cycle

Given that bust conditions significantly delay entrepreneurial entry, it is useful to derive an estimate of the length of the delay. Our strategy is to add time to start a business for the bust sample until the probability of business start up equals that of the boom sample. In other words, we allow the bust sample successively longer periods of time for entrepreneurial entry $\Psi + \tau$; $\tau = 1, 2, \dots$ for $\Psi = 5, 10, 15$; while holding the boom sample's exposure to entrepreneurship at t periods. We then reestimate the logit models at $t = \Psi$ for the boom cohort and $t = \Psi + \tau$ for the bust cohort. In a logit regression where we set Ψ successively at 5, 10, and 15, the value of τ at which we eliminate the difference in waiting time between the boom and bust entrepreneurs is our measure of the entrepreneurial delay due to graduating in a bust period. Table 3 shows that artificially extending the bust cohort sample by 2 years is sufficient to eliminate the difference in the timing of entrepreneurial entry. When we use the expanded sample, the difference is eliminated when we delay the boom cohort by 2-3 years⁸.

Do recessions cause entrepreneurial dreams to be deferred or denied?

While the bust conditions slowed business start-ups by about two years compared to the boom cohort, they may not permanently prevent the 1982 cohort from entering self-employment. To investigate that question, we use an ordered logit models to predict

⁸ Alternatively, we held the bust cohort duration at $t = \Psi$ while shrinking the entrepreneurial window for the boom cohort at $t = \Psi - \tau$, $\tau = 1, 2, 3, \dots$. We get similar results that recessionary economic conditions retarded business entry by 2-3 years.

the probability of a business startup for every five year period after graduation. As shown in Table 4, a quarter of the bust cohort alumni had started a business by 25 years after graduation. As noted before, the probability of business startups is lower for the bust than the boom cohort through the first 15 years after graduation, but the timing of startups differs. For the boom cohort, the marginal probability of starting a business levels off after 10 years, while the marginal probability of startup rises through the first twenty years for the bust cohort. While the poorer economic conditions at graduation retarded bust cohort entrepreneurial entry relative to the boom cohort, it appears that the bust cohort makes up for the delay with rising entrepreneurial entry later in the life cycle. Recessions cause entrepreneurial dreams to be deferred but not denied.

Extension to a continuous measure of the business cycle

It is possible that the differences in the timing of entrepreneurial entry between the ‘bust’ and ‘boom’ cohorts is due to confounding differences between the cohorts in other unmeasured factors. To test this, we use an alternative measure of business cycle conditions at the time of graduation, namely the national unemployment rate prevailing at the time of graduation. As shown in Figure 2, the sample period between 1982 and 2007 includes three periods of rising unemployment rates. If our previous conclusion holds that it is the good economic conditions at graduation that led to earlier entrepreneurial entry for the 1992 boom cohort, then we should also find a systematic negative relationship between entrepreneurship and the national unemployment rate at the time of graduation. We test this relationship over all respondents graduating between 1982 and 1997. The constraint is that we have to shorten the time elapsed between graduation and business start-up to add additional graduation cohorts after 1992, censoring at ten years,

⁹and so our test will focus on entrepreneurial relatively early in the life cycle. The coefficient on the national unemployment rate in the first model of Table 5 suggests that cohorts graduating in periods with atypically high unemployment rates significantly delay the timing of their business start-ups.

Because 33% of ISU alumni live in Iowa and 31.7% of the businesses started by alumni are located in the state, the Iowa unemployment rate may be the more appropriate business cycle measure. As seen from Figure 2, the Iowa unemployment rate was comparable or worse than the U.S. average during much of the 1980s, but dominated the U.S. average thereafter. Results in the second column of Table 5 show that the negative marginal effect of the Iowa unemployment rate on business startups is even bigger and more significant than that of the national unemployment rate.

Nevertheless, the time paths of both the Iowa and the U.S. unemployment rates are strongly correlated with a simple linear trend, and we cannot reject that the unemployment rate effect is instead attributable to another unmeasured variable that is trending consistently over that period. Citing one famous example, Katz and Murphy (1992) found that the systematic increase in returns to human capital over the 1963-1987 period was consistent with a simple linear trend in unmeasured factors shifting demand toward skilled workers. Indeed, information technologies that have increased demand for educated labor in the 1980s and 1990s may be altering incentives to start businesses. Only 3.1% of the businesses established by ISU alums before 1994 were web-based, while 10.5% of the businesses established after 1994 were web-based. Consequently,

⁹ The latest businesses in our sample were started in 2007, so the ten year elapsed time causes us to end the sample with the 1997 graduation cohort. We obtained similar results using a nine or eleven year elapsed time and stopping the sample with the 1998 and 1996 cohort respectively.

while the retarding effect of bust economic conditions on business start-ups seems plausible, other persistent trending factors could be at work as well.

Other entrepreneurial differences between boom and bust cohorts

There are other differences between the entrepreneurial ventures of boom and bust cohorts that suggest the apparent business cycle effects are not due to other coincident trends in the economy. Boom cycle entrepreneurs relied more heavily on self-financing for their start-ups (88% vs. 73%, as shown in Table 6). Kahn (2008) showed that bust cohort college graduates face persistently lower wages than boom cohorts for the first 18 years after graduation, consistent with our finding that bust cohort entrepreneurs have less ability to self-finance their ventures.

Bust cohort entrepreneurs who started a business in the first 15 years after graduation were 14% less likely to have retained ownership than boom cohort entrepreneurs. Controlling for individual attributes, the difference in firm retention rate is significantly different from zero. However, the difference in firm retention rate does not appear to be attributable to differences in entrepreneurial ability. When we standardize the year of startup, there is no significant difference in the likelihood of firm retention between the boom and bust graduates.

There are distinctions between the groups in the reasons leading to firm exits, although we run into small samples which cloud the precision of our results. Bust cohort entrepreneurs were more likely to exit because the venture failed (29% versus 11%) although the difference fails standard significance tests. Boom cohort entrepreneurs were more likely to exit the business when it was still a going concern. It may well be easier for the boom cohort to walk away from a business because the relatively strong labor

market they faced over the fifteen years offered them a safer landing than the relatively slack labor market faced by the bust cohort.

V. Discussion and conclusion

We find evidence consistent with the hypothesis that adverse economic conditions at the time of labor market entry affect the timing of entrepreneurship in the life-cycle. Standardizing length of time since graduation, bust cohorts are less likely to start a business than boom cohorts. Inconsistent with recession-push theories of entrepreneurial activity, we find that graduating in a bust period delays entrepreneurial entry by about two years. However, bust conditions at labor market entry do not permanently reduce the incidence of self-employment over the life-cycle, and so entrepreneurial dreams are not dashed but only deferred. Bust cohort graduates were less likely to self-finance their ventures, consistent with evidence that graduating in a recession persistently lowers labor market earnings over a long time frame. Bust cohort ventures were also more likely to fail, apparently due to economic conditions and not to inferior entrepreneurial abilities of bust graduates.

This study provides a different perspective on the literature on the impact of business cycles on entrepreneurship. Our results do suggest that recessions will reduce firm start-ups, but the impact is temporary and not permanent. If an individual determines that self-employment maximizes expected life-time utility, our results suggest that the individual will eventually start a business. Even historically weak economic conditions at labor market entry will only delay the business start-up for a short period.

Figure 1: Proportion of alumni starting a business by years after graduation for the 1982 and 1992 graduation cohorts

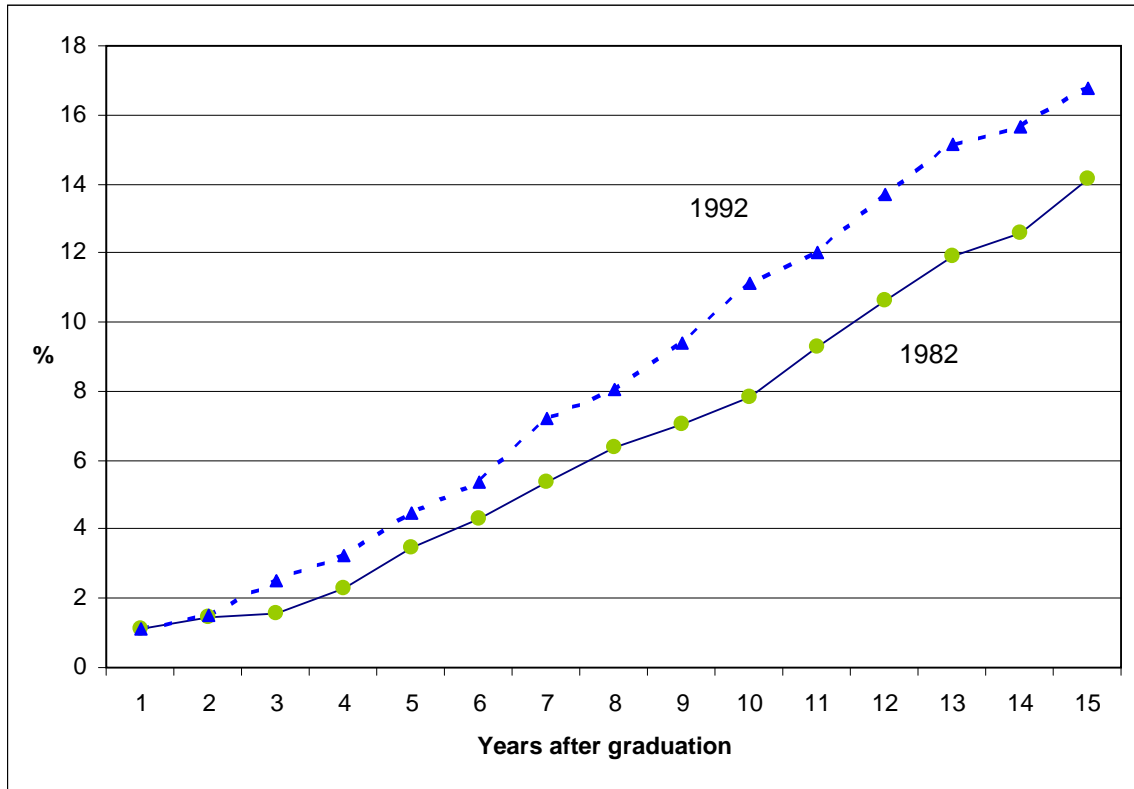
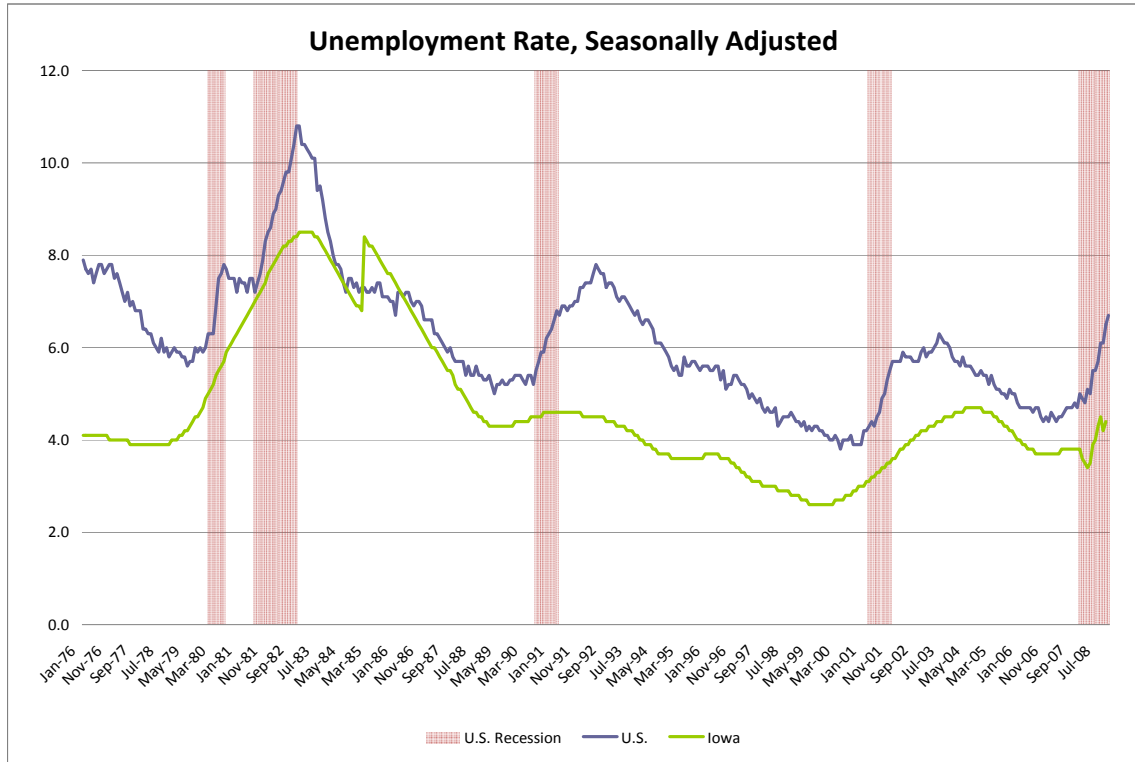


Figure 2: Time path of U.S. and Iowa Unemployment Rates, 1969-2006 with recessions shaded



Source: U.S. Department of Labor: Bureau of Labor Statistics

Table 1 Summary statistics of alumni characteristics

Variables	1982 Cohort		1992 Cohort		Cohorts 1982 & 1992		Cohort 1982, 1983, 1992, 1993	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Entrepreneurship rate ^a	0.127	0.333	0.156	0.363	0.141	0.349	0.165	0.372
Proportion of Cohort 1992					0.509	0.500		
Proportion of Cohort 1992 & 1993							0.516	0.500
Male	0.610	0.488	0.539	0.499	0.574	0.495	0.569	0.495
Married at graduation	0.200	0.400	0.151	0.358	0.175	0.380	0.169	0.375
Ethnicity	0.055	0.229	0.069	0.253	0.062	0.242	0.073	0.260
Number of siblings	3.002	1.948	2.434	2.005	2.713	1.997	2.585	1.905
Grow up with two parents in the household	0.946	0.227	0.894	0.308	0.919	0.272	0.899	0.302
Either of parents started their own business	0.522	0.500	0.518	0.500	0.520	0.500	0.469	0.499
Active in sports	0.709	0.455	0.721	0.449	0.715	0.452	0.707	0.455
Active in extra-curricular music/band	0.564	0.496	0.529	0.500	0.546	0.498	0.504	0.500
Active in extra-curricular drama	0.298	0.458	0.251	0.434	0.274	0.446	0.262	0.44
Active in extra-curricular academic clubs	0.272	0.445	0.264	0.441	0.268	0.443	0.279	0.449
<i>Graduation Colleges</i>								
Agriculture and Life Sciences	0.183	0.387	0.104	0.305	0.143	0.350	0.143	0.350
Business	0.105	0.306	0.173	0.378	0.139	0.346	0.152	0.359
Design	0.084	0.278	0.089	0.285	0.087	0.282	0.086	0.28
Engineering	0.200	0.401	0.164	0.371	0.182	0.386	0.179	0.383
Human Sciences	0.160	0.366	0.196	0.397	0.178	0.383	0.177	0.382
Observations	725		580		1305		1592	

Note: a: Entrepreneurship rate for Cohort 1982 and Cohort 1992 measures the proportion of individuals becoming entrepreneurs in fifteen years after their graduation. That is, the proportion of alumni starting businesses between 1982 and 1996 for Cohort 1982 and between 1992 and 2006 for Cohort 1992. Similarly, fifteen years criterion of entrepreneurship rate is for Cohort 1 and 2 (1: 1982, 1983 and 2: 1992, 1993). The last sample includes alumni graduating between 1982 and 2004 whose entrepreneurship rate is likelihood to start a business within four years after graduation.

Ethnicity is a dummy variable, equal to one if student is not white.

There is a series of college dummies, measuring the college where alumni achieved their first Bachelor's degrees from ISU, with the base of College of Liberal Arts and Sciences.

“Std” represents standard deviation.

Table 2 Logit models of entrepreneurial entry

Variable	Logit 1 ($t=5$)		Logit 2($t=10$)		Logit 3 ($t=15$)	
	Coef	t-value	Coef	t-value	Coef	t-value
<i>Panel A: 1982 & 1992 cohorts</i>						
Cohort 1992	0.580 [0.013]	1.58	0.415 [0.027]	1.77*	0.311 [0.035]	1.73*
Male	0.670	1.40	0.418	1.56	0.115	0.55
Married	0.725	1.79*	0.312	1.12	0.375	1.72*
Ethnicity	0.440	0.66	1.068	2.93***	0.655	2.04**
Number of siblings	0.038	0.52	0.062	1.21	0.031	0.73
Grow up with two parents in household			0.980	1.62	0.457	1.16
Parents started their own business	0.157	0.37	0.198	0.82	0.355	1.86*
Active in sports	0.251	0.55	0.465	1.69*	0.610	2.76***
Active in extra-curricular music/band	0.065	0.17	-0.012	-0.05	-0.012	-0.06
Active in extra-curricular drama	0.294	0.68	0.482	1.77*	0.218	1.01
Active in extra-curricular academic clubs	0.384	0.99	0.138	0.53	0.242	1.20
<i>Graduation Colleges</i>						
Agriculture and Life Sciences	0.828	1.82*	0.206	0.63	0.399	1.50
Business	0.221	0.37	0.254	0.71	0.454	1.62*
Design	0.374	0.51	0.888	2.03**	0.865	2.28**
Engineering	-0.867	-1.28	-0.301	-0.89	0.146	0.56
Human Sciences	-0.170	-0.22	0.044	0.11	-0.037	-0.11
Constant	-5.173	-7.15***	-4.922	-6.25	-3.696	-6.91***
Pseudo R ²	0.064		0.057		0.043	
Observations	1207		1305		1305	
Log pseudolikelihood	-151.2		-350.1		-509.2	
<i>Panel B: 1982, 1983 & 1992, 1993 cohorts</i>						
Cohort 1992 & 1993	0.707 [0.014]	1.68*	0.825 [0.055]	2.96***	0.454 [0.058]	2.14**
<i>Other variables included</i>						

Note: Number in the square bracket is the marginal effect on probability to be entrepreneurs. Dependant variable is a binary choice variable, indicating if individual has ever started a business in t years after their graduation from ISU. *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Table 3 Estimated delay in the timing of a first business start-up due to bust conditions at labor market entry

Cohort 1982 & 1992									
	5 year spell			10 year spell			15 year spell		
	Coefficient	t-value	Likelihood	Coefficient	t-value	Likelihood	Coefficient	t-value	Likelihood
<i>Baseline</i>	0.580	1.58	-151.2	0.415	1.77*	-350.1	0.311	1.73*	-509.2
<i>One</i>	0.122	0.35	-175.3	0.303	1.34	-362.0	0.182	1.05	-529.5
<i>Two</i>	-0.104	-0.31	-190.4	0.089	0.40	-378.4	0.072	0.42	-544.0
<i>Three</i>	-0.387	-1.16	-210.4	-0.074	-0.34	-399.0	-0.006	-0.04	-555.3

Cohort 1982, 1983 & 1992, 1993									
	5 year spell			10 year spell			15 year spell		
	Coefficient	t-value	Likelihood	Coefficient	t-value	Likelihood	Coefficient	t-value	Likelihood
<i>Baseline</i>	0.707	1.68*	-201.1	0.825	2.96***	-435.0	0.454	2.14**	-677.0
<i>One</i>	0.261	0.66	-232.1	0.682	2.58**	-456.5	0.391	1.89*	-688.8
<i>Two</i>	0.127	0.34	-242.5	0.460	1.77*	-476.8	0.273	1.33	-707.1
<i>Three</i>	-0.168	-0.47	-269.9	0.124	0.47	-514.2	0.086	0.42	-722.9

Note: *, **, and *** indicate significance at 10%, 5% and 1% respectively.

Table 4 Predicted business start probabilities from an ordered logit model

Predicted business start probabilities in different periods	1982	1992
1982-1986	0.023	-
1987-1991	0.048	-
1992-1996	0.055	0.031
1997-2001	0.059	0.062
2002-2006	0.051	0.062
Never start a business	0.764	0.845

Note: Dependent discrete variable is ordinal, representing different periods when business was started for each cohort with the based of never starting any business.

Table 5 Logit model of business start-up, a robust check

Variable	Logit 4		Logit 5	
	Coef	t-value	Coef	t-value
Male	0.175	0.95	0.181	0.98
Married	0.423	2.10**	0.434	2.15**
Ethnicity	0.103	0.38	0.075	0.27
Number of siblings	0.040	1.03	0.054	1.39
Grow up with two parents in the household	0.208	0.72	0.230	0.79
Parents started their own business	0.257	1.60	0.260	1.62
Active in sports	0.137	0.73	0.133	0.71
Active in extra-curricular music/band	-0.200	-1.21	-0.201	-1.22
Active in extra-curricular drama	0.095	0.48	0.121	0.61
Active in extra-curricular academic clubs	0.249	1.32	0.220	1.17
<i>Graduation Colleges</i>				
Agriculture and Life Sciences	0.710	2.62***	0.740	2.73***
Business	0.383	1.50	0.394	1.53
Design	0.713	2.33**	0.719	2.36**
Engineering	0.100	0.41	0.120	0.49
Human Sciences	0.406	1.37	0.402	1.35
National unemployment rate(in percent)	-0.028	-0.62		
Iowa unemployment rate(in percent)			-0.109	-2.59***
Constant	-3.307	-6.96***	-2.987	-7.11***
Pseudo R ²	0.022		0.026	
Observations	3370		3370	
Log pseudolikelihood	-916.9		-913.2	

Note: The dependent variable in Logit 4 and Logit 5 model is binary, equal to one if an individual started a business in ten years after graduation from ISU, zero otherwise.

The annual unemployment rate is based on Bureau of Labor Statistics. One star (*), two stars (**) and three stars (***) indicate significance at 10%, 5% and 1% respectively.

Table 6 Comparison of characteristics between the boom and bust cohorts

Variables	Cohort 1982 & 1983		Cohort 1992 & 1993		Difference	
	Mean ₁	Std Err ₁	Mean ₂	Std Err ₂	Mean ₂ - Mean ₁	t-value
<i>Financing business</i>						
Self financed	0.731	0.064	0.880	0.037	0.149	2.02**
Loan or gift from family members	0.113	0.037	0.068	0.020	-0.045	-1.07
Loan from a local bank	0.258	0.056	0.190	0.047	-0.068	-0.93
Loan from a non-local bank	0.019	0.010	0.018	0.009	-0.001	-0.10
Financed from outside investors	0.025	0.012	0.079	0.033	0.054	1.55
Government grants to finance	0.004	0.004	0.033	0.017	0.029	1.61*
Business is web based	0.000	0.000	0.066	0.032	0.066	2.10**
<i>Retained Ownership</i>						
RetentionRate ^a	0.603	0.069	0.742	0.058	0.442 ^c	2.08**
Retention Rate ^b	0.650	0.059	0.742	0.058	0.088 ^c	0.46
<i>Exit reasons</i>						
I sold it or passed it down	0.369	0.107	0.131	0.056	-0.238	-1.98**
It was not successful	0.288	0.088	0.114	0.068	-0.174	-1.56
I no longer wished to own the business	0.343	0.092	0.755	0.091	0.413	3.18***

Note: *, ** and *** indicate significance at 10%, 5% and 1% respectively. "Std Err" represents standard error of mean estimate.

a: The proportion of entrepreneurs who still have ownership of a business started during the first fifteen years after graduation.

b: The proportion of entrepreneurs who still have ownership of a business started between 1992 and 2007

c: Coefficient on the boom cohort dummy from a logit model predicting whether respondent still owns a firm, controlling for the regressors included in Table 5. Associated z-statistic is reported in the next column.

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