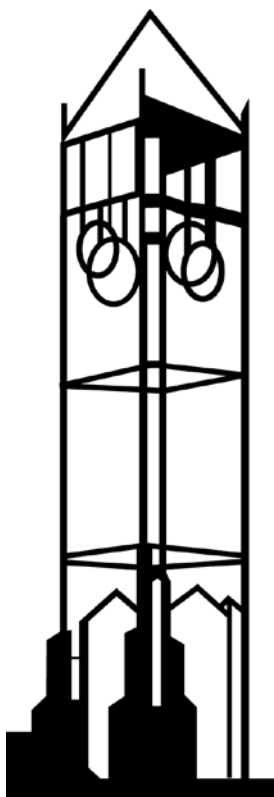


Entrepreneurship and Higher Education: An Overview of the Iowa State University Alumni Survey

Robert W. Jolly, Li Yu, Peter Orazem, Kevin Kimle



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Entrepreneurship is a hot topic both in academic and policy circles.¹ There is a growing recognition that entrepreneurship is a driving force in economic growth and development in both established and emerging economies. There is also an increasing body of evidence suggesting entrepreneurship that stems from a high level of human capital and creativity is the most likely to produce the goods, services and ultimately the jobs that fuel economic growth, development and competitiveness. If human capital and innovation are important for growth entrepreneurship, then higher education should have a significant role to play in fostering entrepreneurship.

In this report we present a descriptive overview of the entrepreneurial activities of graduates from Iowa State University – a medium-sized public university in the United States. The data were obtained from a random sample of 25,000 Iowa State University bachelor’s degree recipients between 1982 and 2006. The survey requested information on graduates’ employment history, further education, income, entrepreneurial activity and community involvement. The on-line survey was conducted in 2008 and produced 5,416 usable responses – a response rate of 21.6 percent. Survey details are presented in Appendix I.²

A QUICK LOOK AT IOWA STATE AND ITS GRADUATES

Iowa State University offers undergraduate and graduate degrees through its eight colleges: Agriculture and Life Sciences, Business, Design, Engineering, Human Sciences, Liberal Arts and Sciences, Veterinary Medicine plus the Graduate College. In the fall of 2007, Iowa State enrolled 26,160 students of whom 4,664 were graduate students. Nearly 76 percent of all undergraduates were Iowa residents. Only 3.6 percent of undergraduates were international students. Iowa State’s admission policies are not highly selective. Over the period of this study, high school students entering Iowa State needed to rank in the upper half of their graduating class and have met certain minimum requirements in English, Mathematics, Science and Social Studies. Students in the lower half of their graduating class needed to achieve a minimum test score on the ACT or SAT. In 2007, entering ISU freshman had a mean ACT score of 24.4 and an average class rank of 76 percent. In comparison, the average ACT scores in the U.S. and Iowa were 21.0 and 22.3 respectively. Test scores and class rank of entering freshman have been fairly stable over the period of the study.

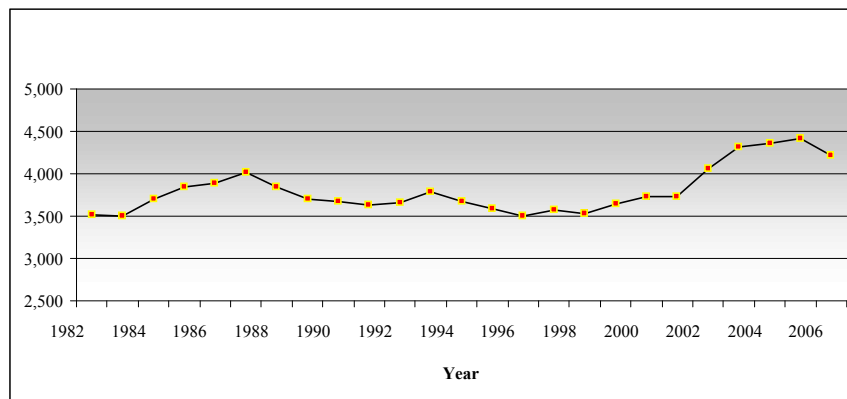
Figure 1 shows bachelor’s degrees awarded by Iowa State between 1982 and 2006. A total of 95,016 students received bachelor’s degrees – an average of 3,800 per year. The overall trend in graduates has been flat, however graduation rates increased recently beginning in 2003.

¹ See Schramm, Carl J. *The Entrepreneurial Imperative*. 2006. Harper Collins, New York.

² See “After They Graduate... for an Overview of the Iowa State University Alumni Survey. 2009. Iowa State University available at: http://www.econ.iastate.edu/research/webpapers/paper_13031_09002.pdf

Over most of this study, seven colleges awarded bachelor’s degrees.³ In 2005 the Colleges of Education and Family and Consumer Sciences merged into the College of Human Sciences. In this analysis we combine data from the two merged colleges and report results under the College of Human Sciences. Figure 2 provides information on total number of bachelor’s degrees awarded by college since 1982. The College of Liberal Arts and Sciences is by far the largest accounting for over 25 percent of graduates. Engineering, Business and Human Sciences are roughly equal in size followed by the College of Agriculture and Life Sciences and Design. The share of graduates by college over the same period is given in Figure 3. The College of Liberal Arts has grown fairly steady since 1970. The College of Business is relatively new – established in 1984 from the School of Business Administration. Following a period of rapid growth in the late 1980s, followed by falling enrollments in the 1990s, the College of Business is now tied with Engineering as the second largest producer of undergraduate alumni. Graduation trends in the College of Agriculture and Life Sciences have been cyclical over this period – to an extent following the fortunes of the agricultural economy. Human Sciences and Design exhibit little trend.

Figure 1. Annual number of Bachelor’s degree recipients from Iowa State University, 1982-2006

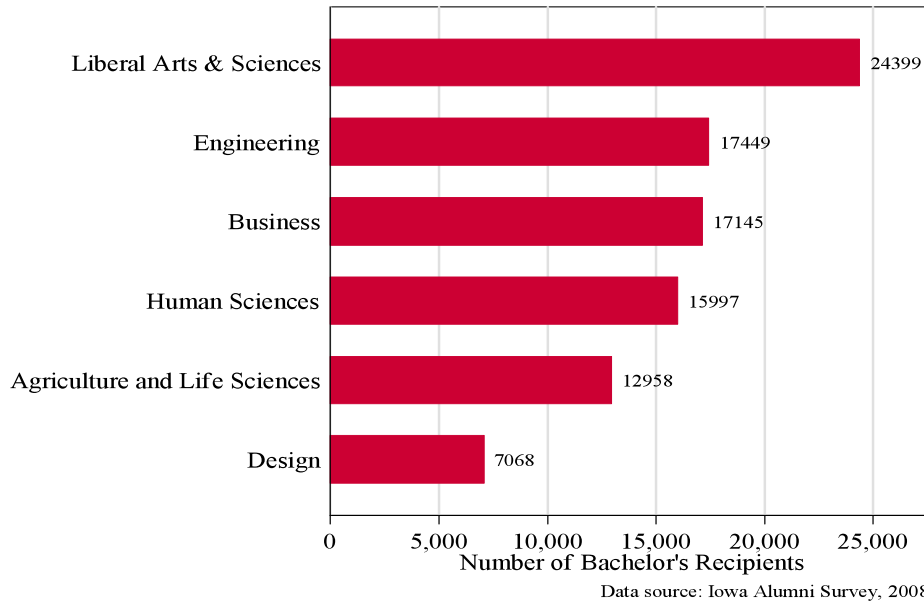


Although we can’t make a claim that ISU is fully representative of all universities in the U.S., it is reasonably representative of the public universities that enroll approximately 60 percent of all undergraduates.⁴ In that context, our analysis may provide useful insights into the role of higher education in fostering entrepreneurship.

³ Note the College of Veterinary Medicine and Graduate College are excluded from this study because they do not award bachelor’s degrees.

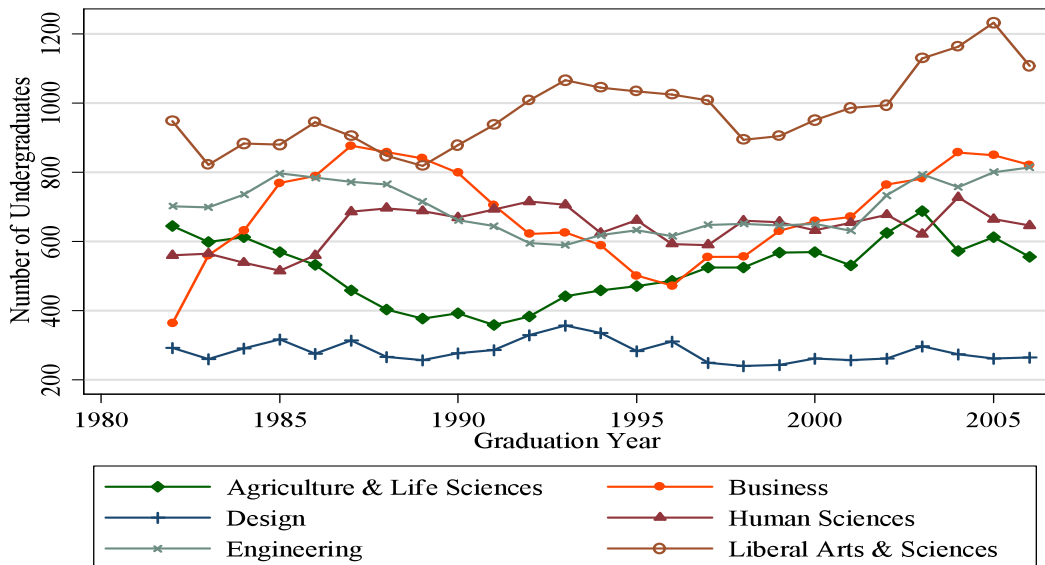
⁴ National Center for Education Statistics. 2008. The Condition of Education 2008. U.S. Department of Education. <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008031>

Figure 2. Total number of Iowa State University undergraduate alumni by college, 1982-2006



Note: Colleges of Human Science, Education and Family and Consumer Sciences are combined into College of Human Science.

Figure 3. Annual number of Bachelor's degree recipients by college, 1982-2006.



Data source: Iowa State Alumni Survey, 2008

ENTREPRENEURSHIP

A standard textbook definition of an entrepreneur would read like this.

“An entrepreneur is a person who discovers an opportunity and creates an organization to exploit it.”

Entrepreneurship is the process, admittedly chaotic, that the entrepreneur moves through to develop needed products or services, acquire resources, accept risks and establish an appropriate organization.

Every person has the capacity and choice to pursue an entrepreneurial opportunity. Exactly what motivates an individual to choose entrepreneurship as their career or part of their career has not been identified, at least not as a single character trait. Our concern is more with the results of entrepreneurial activity than the motivation.

We use a simple operational definition of entrepreneurship. Undergraduate alumni were asked in the survey whether they had created a for-profit business.⁵ If they answered yes, we consider them an entrepreneur. One of the advantages of our data set is that it includes information on both graduates who became entrepreneurs and those who pursued other career paths.

In this report we examine the following issues using descriptive data from the survey.

- How common is entrepreneurship?
- What do we know about the businesses alumni entrepreneur created – location, sector, size, employees?
- Do entrepreneurs make more money?
- Are entrepreneurs different in terms of their background or training?
- Are entrepreneurs community-minded?

As stated, this is a descriptive overview. A more complete analysis of higher education, human capital and higher education will be presented in a later publication.

How Common is Entrepreneurship?

Conventional wisdom would suggest that entrepreneurship is rare – the product of highly talented and exceptional individuals. We tend to think of Bill Gates, Michael Dell, Sergey Brin, Jeff Bezos, Ted Turner or Fred Smith. This pantheon of superstars is somewhat misleading.

Robert Fairlie,⁶ in a series of reports for the Kauffman Foundation, estimates that in 2008 entrepreneurs in the United States founded approximately 530,000 new businesses each month –

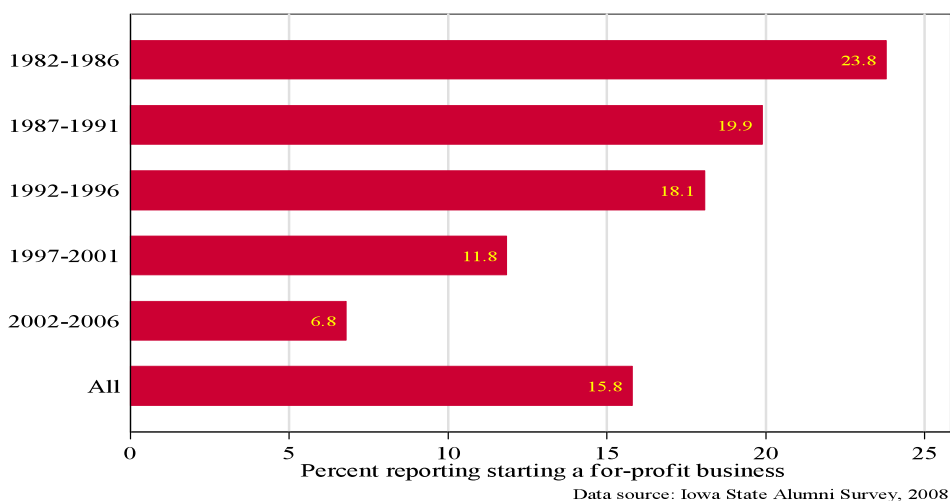
⁵ We also asked about non-profit businesses. Social entrepreneurship will be examined in a subsequent paper.

⁶ Fairlie, Robert W. 2009. Kauffman Index of Entrepreneurial Activity. Kauffman Foundation. Available at: http://www.kauffman.org/uploadedFiles/kiea_042709.pdf

320 entrepreneurs for every 100,000 adults. Fairlie also reports this entrepreneurship rate varies across states from a high in Georgia of 590/100,000 to a low in Pennsylvania of 140/100,000. Iowa, as it turns out, ranked near the bottom at 190/100,000. Fairlie’s estimates suggest entrepreneurship is uncommon, but not rare. And that it varies by location and a host of other factors.

In Figure 4, we report entrepreneurship rates of undergraduates for the entire sample and by graduation year cohort.⁷ Overall nearly 16 percent of all respondents report starting at least one business. As the cohort ages, the entrepreneurship rate increases from 6.8 percent for the most recent graduates to 23.8 percent for the oldest group – those who are 25 years into their careers.

Figure 4. Entrepreneurship rates by undergraduates by graduating year



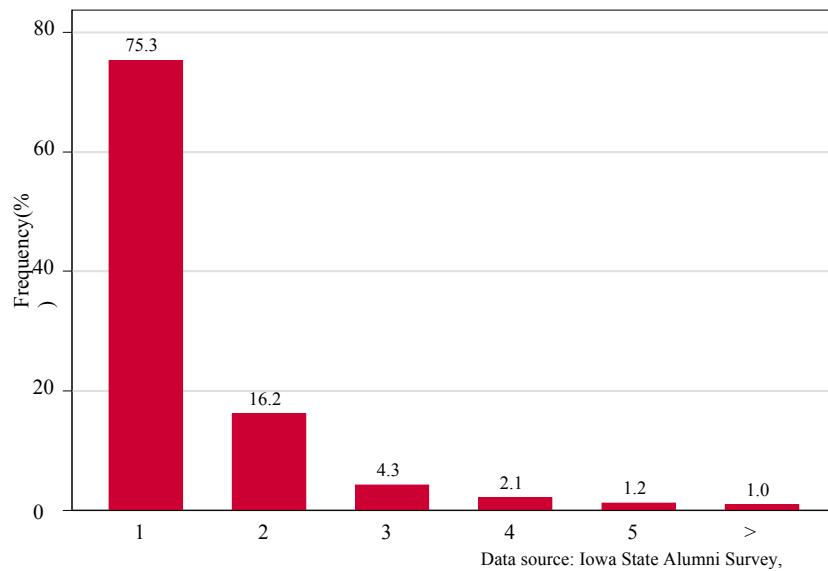
We don’t know if this trend continues as graduates age – our data doesn’t permit that analysis. A recent paper reports growing entrepreneurship among retiring baby boomers.⁸ From our data, we can conclude that at least a fourth of undergraduates will found a business at some point in their lives.

Most entrepreneurial episodes are one-off occurrences. Although some of the more famous entrepreneurs founded several successful businesses, the vast majority in our survey only created one. As shown in Figure 5, slightly more than 75 percent of all entrepreneurs founded a single business and 16 percent created two.

⁷ The survey data were used to make population estimates using weighting procedure described in Appendix I.

⁸ Stangler, Dane. 2009. The Coming Entrepreneurship Boom. Kauffman Foundation. Available at: <http://www.kauffman.org/uploadedFiles/the-coming-entrepreneurial-boom.pdf>

Figure 5. Distribution of number of businesses started by each entrepreneur



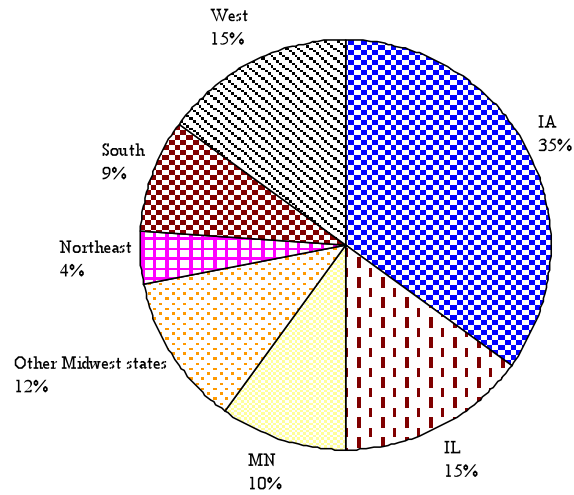
CHARACTERISTICS OF ENTREPRENEURIAL BUSINESSES

In the survey we asked respondents to describe their most successful business. Since most entrepreneurs (75 percent) only founded one business, reported information tends to represent all new businesses. In this section we present a number of descriptive characteristics of these businesses.

Location

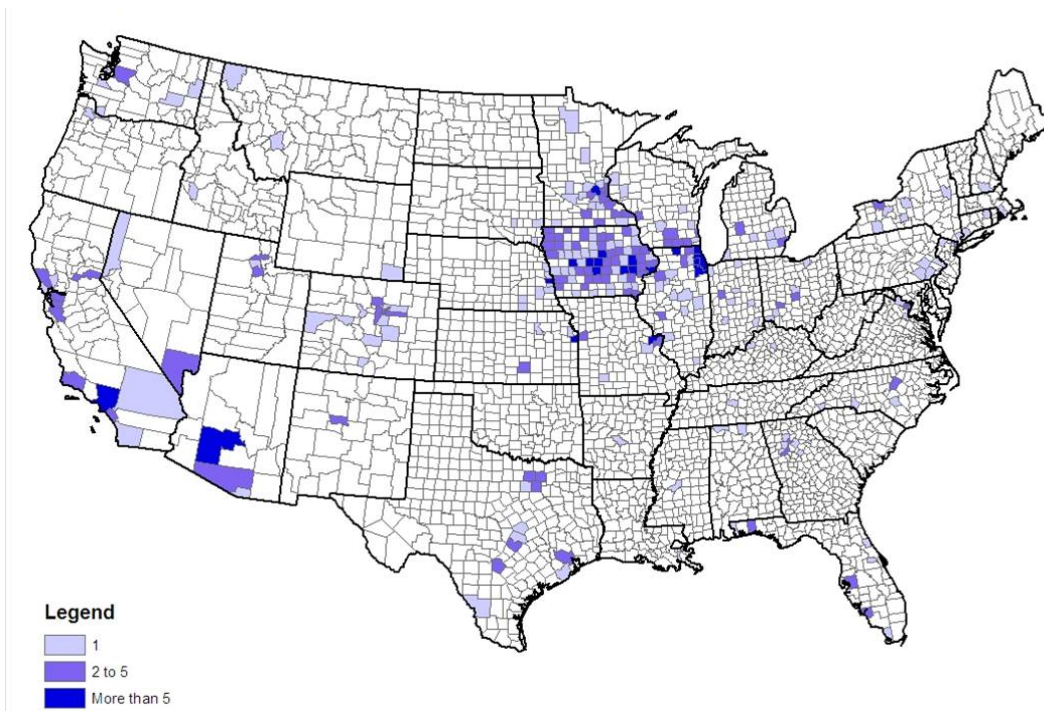
Most of ISU's entrepreneurial alumni left Iowa to create their businesses – but they didn't go far. As shown in Figure 6(a). Approximately 72 percent of these businesses were established in Iowa or nearby Midwestern states. States in the western U.S. accounted for 15 percent. The remaining 13 percent were located in either the northeast or the south. Figure 6(b) presents a map showing alumni business location. Outside the Iowa cluster, major metropolitan areas seem to offer the greatest attraction for ISU's entrepreneurs.

Figure 6(a). Location distribution of entrepreneur's most successful for profit businesses



Note: for-profit businesses located abroad are excluded from analysis. States in the US are divided into four regions: Northeast, Midwest, South, and West, according to the US Census Bureau. States included in Mid-west: IA, IL, IN, MN, MO, ND, NE, OH, SD, WI; in Northeast: CT, DC, DE, MA, MD, ME, MI, NH, NJ, NY, PA, RI, VT; in South: AL, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV; and in West: AK, AR, AZ, CA, CO, HI, ID, KS, MT, NM, NV, OK, OR, TX, UT, WA, WY.

Figure 6(b). Where are their businesses located?



In Table 1 we summarize the importance of various factors that influenced entrepreneurs' choice of business location. Businesses tend to be located in the entrepreneurs' home community – where they are aware of product or service needs, or to meet needs in their own families. Many of the community attributes identified by economic development professionals – infrastructure, business climate or natural amenities for example, were not ranked very highly.

Table 1. Importance of factors in choosing location of business

Factors	Not important	Neither	Important
Where I lived	9.40%	7.90%	82.80%
Local product or service needed	17.40%	16.80%	65.80%
Family needs	31.20%	18.00%	50.80%
Sufficient local infrastructure	42.30%	22.20%	35.40%
Business climate	41.60%	24.20%	34.10%
Local amenities and services	54.00%	19.60%	26.40%
Availability of skilled labor	56.80%	18.10%	25.10%
Availability of labor	57.10%	20.10%	22.70%
Local natural amenities	62.00%	17.70%	20.30%
Other	61.00%	19.70%	19.30%

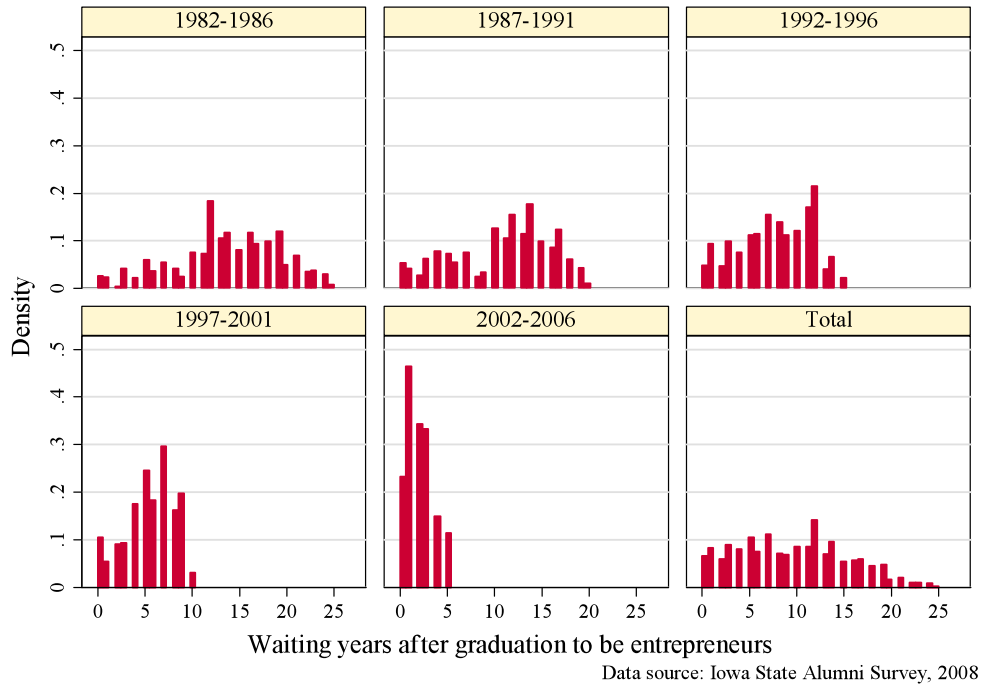
How Long Did They Wait?

The fame and fortune of Michael Dell and Bill Gates – with help from the media – has led to a belief that college entrepreneurs start their first business in their dorm rooms. Our data suggests that on average, however, there is a ten-year wait. Table 2 summarizes waiting time by graduation year. In Figure 7 we present histograms for each cohort showing the distribution in waiting times following graduation. The key insight here is that entrepreneurship is more likely to occur later in one's career – after college loans are paid off, with some job experience and the opportunity to discover unmet needs in the marketplace.

Table 2. Entrepreneurship wait times by graduation year

Graduation Year	Mean	Min	Max	Sd
1982-1986	13.61	0	25	5.66
1987-1991	10.86	0	20	5.19
1992-1996	7.78	0	15	3.89
1997-2001	5.51	0	10	2.63
2002-2006	2.03	0	5	1.44
Whole sample	9.56	0	25	5.84

Figure 7. Distribution of wait times for business creation by graduation year



Industry Markets and Business Size

We asked respondents to choose an industry designation or code that best described the sector within which their business operated. This information is reported in Table 3. Agricultural firms including farms, farm management services and supporting businesses are the most common followed by retail and information technology. Most of the remaining industries are represented as well. Note, however, that nearly 19 percent of respondents did not select a primary industry for their business, possibly due to the broad (2-digit) industry codes used in the survey.

We also asked alumni to describe the geographical reach of the markets their business served. Table 4 shows most businesses served local markets. However national and international markets are also well represented.

Finally, as shown in Table 5, most of the entrepreneurial businesses were small – nearly two-thirds had average annual sales less than \$250,000. Only 3.5 percent reported annual sales greater than \$10 million.

Table 3. Distribution of industries businesses belonging to

Industry	Proportion
Agriculture	13.7%
Retail	12.1%
Information Technology	11.3%
Construction	9.3%
Arts, Entertainment & Recreation	7.3%
Finance/Insurance	5.8%
Medicine/Health Care	5.8%
Communications	5.8%
Real Estate	5.6%
Manufacturing	4.7%
Transportation & Utilities	3.0%
Education	2.5%
Accommodation & Food Services	2.5%
Legal	2.5%
Hospitality	2.1%
Social Services	2.1%
Government/Military	0.9%
Non-profit	0.2%
Mining	0.1%
Other	18.7%

Table 4. Primary market served by entrepreneurial businesses

Demand	Percent reporting
Local market in the community	70.7%
Multiple counties surrounding the local community	42.8%
Near multi-state region	30.3%
National market	48.1%
International market	17.9%

Note: businesses located abroad are excluded from analysis.

Table 5. Distribution of business sizes

Annual revenue range	Percentage (%)
Less than \$250,000	67.2
\$250,000 to \$1 million	18.6
\$1 million to \$10 million	10.6
\$10 million to \$50 million	2.4
\$50 million to \$100 million	0.5
\$100 million to \$500 million	0.3
More than \$500 million	0.3

Note: businesses located abroad are excluded from analysis.

Internet Businesses

The growth of the Internet has led to the creation (and destruction) of many businesses. In Figure 8, we report the proportion of Internet businesses among entrepreneurial firms. On average 9.5 percent of all businesses created were on-line operations. The rates are sharply higher for more recent graduates. In Table 6 we report the estimated number of Internet businesses founded by ISU alumni. In this case the total numbers of Internet businesses founded are similar for all except the most recent graduates. The higher rate of Internet business creation among recent graduates is offset by their lower overall rate of entrepreneurship. The survival rate of the Internet business is high, 85 percent on average.

Figure 8. Proportion of internet businesses by graduation year

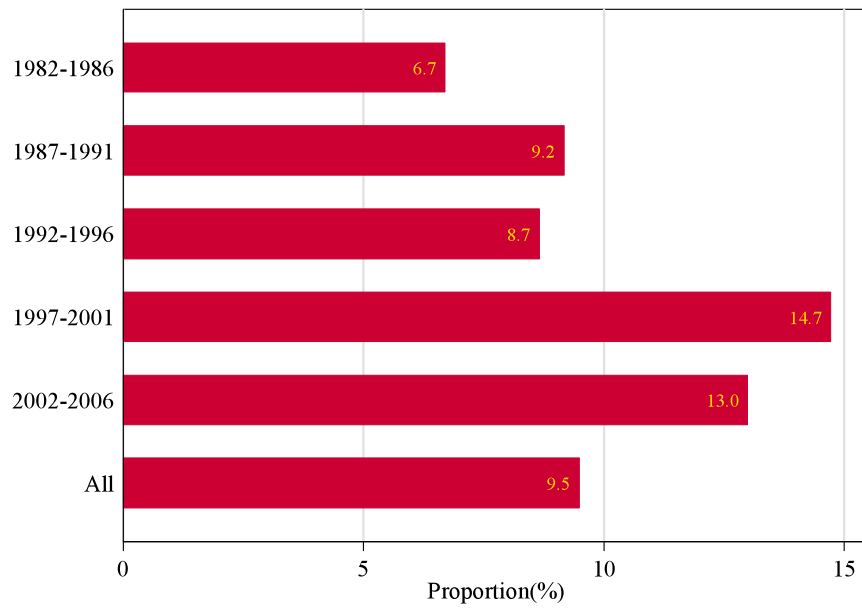


Table 6. Internet business creation

<i>Graduation Year</i>	<i>Number created</i>	<i>Proportion of still operational</i>
1982-1986	296	96.55%
1987-1991	351	81.86%
1992-1996	266	89.60%
1997-2001	316	80.18%
2002-2006	185	74.07%
Whole sample	1414	85.00%

Business, Job and Intellectual Property Creation

The economic consequence of alumni entrepreneurship can be assessed in part by the number of businesses and jobs that were created. In Table 7 we report estimated businesses and jobs created by all ISU entrepreneurs by graduation year. In total, we estimate nearly 20,000 businesses were created along with 223,000 jobs – 16 percent of these were in Iowa. Again most businesses were small. Average employment rates per business of two to eight employees are typical. The 1987-1991 cohort is rather unusual in terms of job creation. We don't have a ready explanation for their apparent success. Of all the businesses created, 71 percent were still in operation at the time the survey was conducted.

Table 7. Businesses and jobs created by alumni entrepreneurs by graduation year

<i>Graduation Year</i>	<i>Number of businesses started</i>	<i>Number of businesses in operation</i>	<i>Jobs created in the US</i>	<i>Jobs created in IA</i>	<i>Average jobs created/business started</i>
1982-1986	6,155	4,319	46,261	5,400	7.52
1987-1991	4,726	3,277	133,480	19,331	28.24
1992-1996	4,269	2,891	33,109	5,763	7.76
1997-2001	2,735	1,989	5,505	2,295	2.01
2002-2006	1,557	1,280	4,214	2,453	2.71
Whole sample	19,442	13,756	222,569	35,242	11.45

Financing Sources

It has been known for some time that most start-ups are self-financed (Table 8). The ISU alumni entrepreneurs are no exception. Self-financing, local bankers and family members are the primary sources of capital for new alumni ventures.

Table 8. Entrepreneur reported financing sources

Method	Proportion
Self financed	82.2%
Loan from a local bank	19.9%
Loan or gift from family members	10.6%
Finance from outside investors	6.5%
Loan from a non-local bank	4.8%
Other ways	4.6%
Government grants	2.3%

FATE AND SURVIVAL

Starting a business is risky. Knaup and Piazza⁹ report that for U.S. firms 66 percent survived past their second year in business. By the end of six years only 31 percent were still in existence. In Table 9 we report survival rates for businesses by year in which the business was founded. Overall, the survival rate is nearly 79 percent – markedly higher than the U.S. average. With the exception of businesses started between 1982 and 1986 the mean survival rate decreases by age of business. We suspect that the business cycle also plays a role in the observed survival rates as well. In the early 1980s the economy was in a severe recession. Beginning in 1992, the U.S. economy entered a sustained period of expansion. Respondents reported that most businesses were closed either because it was no longer viable or because the owner did not wish to continue with the business.

Business survival will certainly be influenced by the economic value created by the product or service, the skill of the entrepreneurs, market computation and economic conditions – among others. We asked alumni entrepreneurs to rank the importance of a number of economic, community and personal factors that might have influenced the success of their own business. Their responses are summarized in Table 10. The most commonly identified supporting factors were support from family members, customer base, financial resources and mentors. The most frequently identified hindrances were the demands of balancing family and business time and competition from established firms. In general more factors that helped were identifiable than those that hindered.

Entrepreneurial businesses are often seen as sources of new technologies, products or services. Intellectual property creation is an important indicator of innovation and entrepreneurial activity. Table 11 summarizes intellectual property creation by entrepreneurs and non-entrepreneurs. In general the differences between these two groups of respondents are mixed. The role of patenting is significantly greater for entrepreneurs, but the total number of patents is greater for non-entrepreneurs. This simply reflects the greater number of non-entrepreneurs in the population and the fact that employees can also obtain patents. Copyright rates for all covered products are generally much higher for entrepreneurs.

⁹ Knaup, Amy E. and Merissa C. Piazza. 2007. Business Employment Dynamics Data: Survival and Longevity, II. Monthly Labor Review, September. Available at: <http://www.bls.gov/opub/mlr/2007/09/art1full.pdf>

Table 9. Survival rates of selected most successful businesses and closure reasons

Items	Proportion
Survival Rate	78.7%
<i>Business starting period</i>	
1982-1986	78.6
1987-1991	52.5
1992-1996	65.2
1997-2001	74.6
2002-2006	86.3
<i>I closed it because</i>	
1. It was not successful	42.2%
2. I no longer wished to own the business	51.9%
3. I sold or passed it down to someone else and they closed it	5.9%

Table 10. Rating of factors affecting the success of business

Factors	Helped	Hindered	Neither
Support from family members and close friends	68.80%	9.80%	21.40%
Attracting customers	61.00%	16.30%	22.80%
Financial resources	47.00%	20.70%	32.30%
Availability of mentors	47.00%	14.90%	38.10%
Balancing time between business and personal or family life	46.20%	27.10%	26.70%
Availability of service providers	35.60%	6.10%	58.30%
Sufficient local infrastructure	32.60%	7.60%	59.80%
Community support for new businesses	26.90%	11.50%	61.60%
Finding employees	21.30%	14.70%	64.10%
Competition from other firms	20.60%	27.10%	52.30%
Access to suitable health insurance	17.30%	16.70%	66.00%
Requirements of local or state government regulations	13.80%	19.90%	66.20%
Availability of support from state or local government	13.40%	13.30%	73.30%
Tax rates	12.30%	24.60%	63.00%
Requirements of federal regulations	9.30%	16.60%	74.20%

Table 11. Intellectual property produced by entrepreneurs and non-entrepreneurs

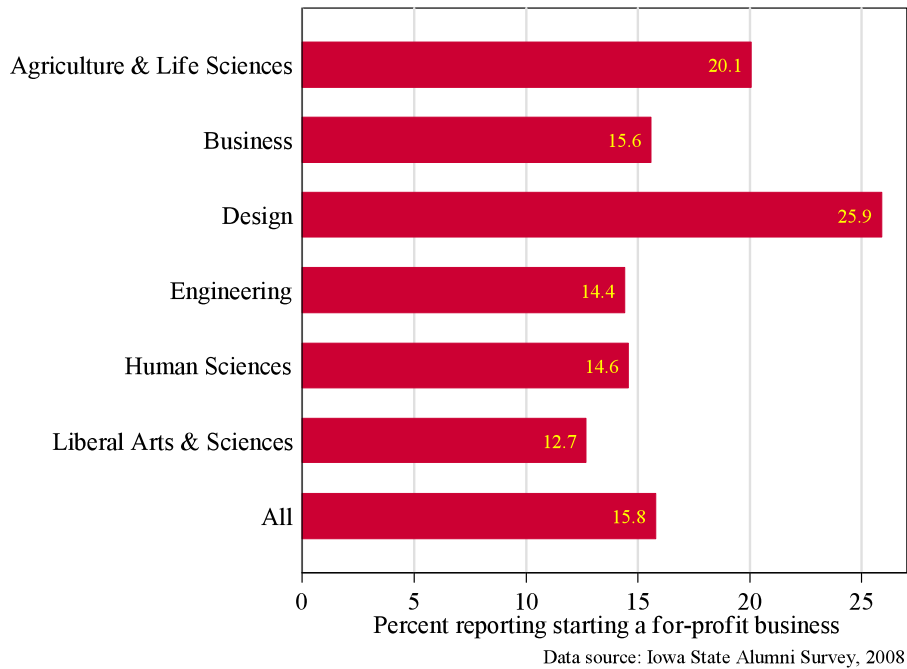
Proportion with	Alumni	Non-	Entrepreneurs
Patent	3.9%	3.9%	6.1%
Total number of patents	14,516	10,363	4,152
Average number of patents	0.153	0.130	0.277
<i>Copyrights</i>			
Music	0.5%	0.5%	0.5%
Literature	9.2%	9.2%	11.4%
Software	3.4%	3.4%	8.2%
Video/film	0.7%	0.7%	2.7%
Graphic arts/photography	1.7%	1.7%	5.7%
Others	1.4%	1.4%	6.1%

EDUCATION AND WORK EXPERIENCE

One of the frequently asked questions about entrepreneurs is whether they are made or born. This is a critical issue for educational institutions. If entrepreneurs can be made – or at least helped along their way, then it is essential to determine what role universities can play in developing needed skills. If, on the other hand, entrepreneurs are born, then universities primarily play a screening role, helping potential entrepreneurs identify their abilities and act on them. These are very distinct roles and would require different approaches to entrepreneurship education. In this report, we are not able to address this issue directly. But we can develop a few facts that suggest how universities might foster the entrepreneurship.

In Figure 9 we report entrepreneurship rates by college for the entire sample. Undergraduates from the Colleges of Design and Agriculture and Life Sciences have higher entrepreneurship rates than other areas of study. Although the higher rates, may suggest greater entrepreneurial spirit and training, it also reflects industry structure and potential earnings. Design for example offers degrees in architecture, graphic design, and community planning – industries that are characterized by smaller firms. To a lesser extent industry structure could also influence entrepreneurship rates among Agriculture and Life Science graduates. Liberal arts and sciences majors have the lowest entrepreneurship rates. Engineering, Human Sciences and Business are roughly equal.

Figure 9. Entrepreneurship rates by college



Further Education

Our survey included only individuals who received a bachelor's degree from Iowa State. However, we did ask them about further education. In Figure 10 we compare the rates of advanced degree attainment for entrepreneurs with non-entrepreneurs. Generally non-entrepreneurs were more likely to attain an master's or a Ph.D. degree prior to starting a business. Attainment rates for professional degrees – medicine, law, veterinary medicine were essentially the same for entrepreneurs and non-entrepreneurs.

In Figure 11 we look at entrepreneurship rates by terminal degree. Entrepreneurship rates for undergraduate alumni with only a bachelor's degree is the highest and slightly more than those who went on to obtain a professional degree. Alumni with a master's or Ph.D. had the lowest entrepreneurship rates.

In Table 12 we present estimates of the total number of entrepreneurs and non-entrepreneurs by their terminal advanced degree along with the estimated rate of entrepreneurship for each degree. Because master's degrees are more common generally, we see greater numbers of entrepreneurs with this degree. Among all advanced degree holders, those with MBA's were the most common entrepreneurs. Alumni with doctoral degrees were least likely to start businesses. Holders of doctorates in physical sciences had the highest entrepreneurship rates. Alumni with law degrees were the most common entrepreneurs among professional degree holders. Again, industry structure influences apparent entrepreneurship rates in this category.

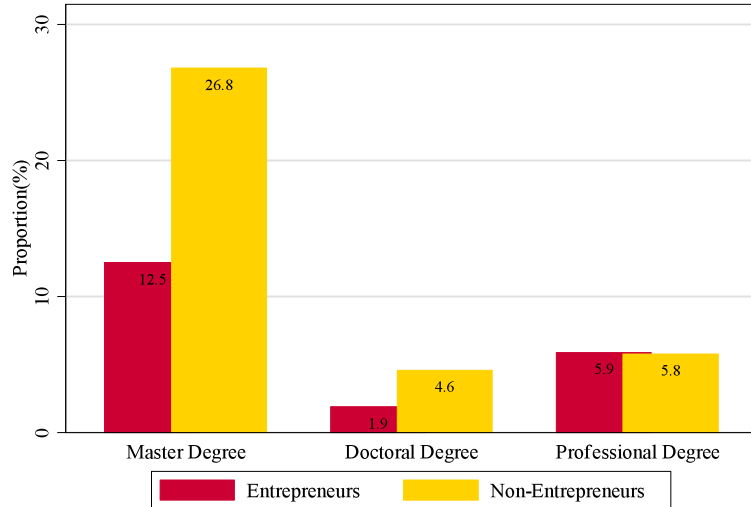
In Table 13 we present estimates of business and job creation by undergraduate college. The table expands the sample in the same way as Table 7. The difference between entrepreneurship rate and the absolute number of graduates, or College size is quite apparent. Design has the highest entrepreneurship rate, but the fewest number of businesses started – a reflection of the College’s small size. The College of Liberal Arts and Sciences created the most businesses, despite having the lowest rate of entrepreneurship. Total job creation was the greatest in Human Sciences and Agriculture and Life Sciences. Liberal Arts graduates, however, created the most jobs in Iowa.

Table 14 takes another look at further education to examine the economic impact of entrepreneurial activities. The top line in the table repeats the rate of entrepreneurship for undergraduate alumni by their terminal (or highest attained) degrees. As we have seen elsewhere in the report – numbers matter when it comes to economic impact. By far the largest number of new businesses and jobs are created by alumni with only a bachelor’s degree. The next largest group in terms of business creation were alumni with terminal master’s degrees, followed by professional degrees. Alumni who had obtained a doctoral degree have the lowest rates of entrepreneurship and created the fewest jobs in total and on a per business basis. This latter result is a little surprising given the belief that high-tech businesses are an important source of job growth. However, it may be that businesses founded by research scientists were acquired by existing businesses following a proof of concept stage in technology development.

Finally, from Lazear’s¹⁰ work on entrepreneurship, we would expect to see greater diversity in job experience among entrepreneurs than employees. Table 15 summarizes work experience for entrepreneurs and non-entrepreneurs for the five cohorts and the total sample. The simple result is that after graduating from ISU, entrepreneurs average more jobs, occupations, or job titles and have worked in more industries than their non-entrepreneur counterparts. Less certain is whether graduates intending to start businesses will seek out broader work experiences or if diverse work experience leads to entrepreneurship.

Figure 10. Advanced education of entrepreneurs and non-entrepreneurs

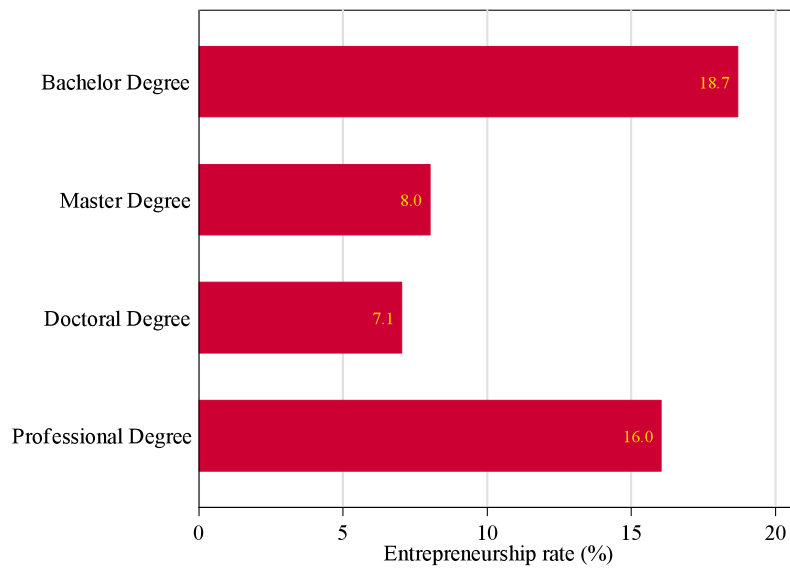
¹⁰ Lazear, Edward. 2005. Entrepreneurship. *Journal of Labor Economics*. 23(4):649-680.



Data source: Iowa State Alumni Survey, 2008

Note: numbers in the bar are the proportions of advanced degree holders among entrepreneurs or non-entrepreneurs. Entrepreneurs' education degree achievement is measured before their most successful businesses were started.

Figure 11. Entrepreneurship by their terminal education degrees



Data source: Iowa State Alumni Survey, 2008

Table 12. Fields of further education beyond bachelor's degree, entrepreneurs and non-entrepreneurs

Internal rate (entrepreneurship rate)	Field	Total number of entrepreneurs	Total number of non-entrepreneurs
<i>Master's degree (8.0%)</i>			
	Physical Sciences	20	928
	Social Sciences	141	2,223
	Agricultural or Life Sciences	148	1,375
	Business	832	5,885
	Engineering	243	2,554

Other	209	5,123
<i>Total</i>	1,593	18,088
<i>Doctoral level degree (7.1%)</i>		
Physical Sciences	73	430
Social Sciences	5	608
Agricultural or Life Sciences	23	1,082
Business	0	79
Engineering	43	531
Other	122	667
<i>Total</i>	266	3,397
<i>Professional degree (16.0%)</i>		
Medical (MD, DO, DDS, etc.)	119	1,532
Law	263	1,327
Veterinary Medicine (DVM)	35	295
<i>Total</i>	417	3,155

Table 13. Businesses and jobs created by alumni entrepreneurs by college

<i>College</i>	<i>Number of businesses started</i>	<i>Number of businesses in operation</i>	<i>Jobs created in the US</i>	<i>Jobs created in IA</i>	<i>Average jobs created/ business started</i>
Agriculture & Life Sciences	3,331	2,507	56,638	4,269	17.00
Business	3,485	2,478	36,452	6,201	10.46
Design	2,341	1,763	10,909	1,884	4.66
Engineering	3,439	2,555	24,170	4,464	7.03
Human Sciences	2,999	2,053	69,783	2,660	23.27
Liberal Arts & Sciences	3,847	2,400	24,617	15,764	6.40
Whole sample	19,442	13,756	222,569	35,242	11.45

Table 14. Does further education matter?

	Bachelor's Degree	Master's	Doctorate	Professional degree (MD, Law or Veterinary)
Entrepreneurship	16.20%	13.90%	14.30%	20.10%
Total number of businesses started	14,800	3,766	766	1,596
Total number of domestic businesses started	13,365	3,675	761	1,569
Total number of domestic jobs created	164,844	33,575	3,928	20,096
Average number of jobs created on a business	12.3	9.1	5.2	12.8

Note: education degrees are terminal by the end of year 2007.

Table 15. Mean of total number of jobs/occupations/industries alumni have worked in

Work Experience	Non-Entrepreneurs	Entrepreneurs	Difference
1982-1986 cohort			
Total number of jobs	4.54	5.67	1.13***
Total number of occupations	1.75	2.29	0.54***
Total number of industries	1.92	2.29	0.37***
1987-1991 cohort			
Total number of jobs	4.54	5.33	0.79***
Total number of occupations	1.74	2.44	0.70***
Total number of industries	1.84	2.32	0.48***
1992-1996 cohort			
Total number of jobs	3.81	4.39	0.58***
Total number of occupations	1.59	2.00	0.41***
Total number of industries	1.84	2.09	0.24**
1997-2001 cohort			
Total number of jobs	3.05	3.87	0.82***
Total number of occupations	1.45	2.05	0.60***
Total number of industries	1.76	2.06	0.31**
2002-2006 cohort			
Total number of jobs	2.01	2.49	0.48***
Total number of occupations	1.22	1.89	0.67***
Total number of industries	1.53	1.80	0.27**
Whole Sample			
Total number of jobs	3.47	4.74	1.26***
Total number of occupations	1.52	2.19	0.66***
Total number of industries	1.76	2.17	0.41***

Note: ***, ** and * indicates significance of difference in work experience between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level respectively.

FAMILY BACKGROUND AND PUBLIC SCHOOL EDUCATION

The relationship among family background, current family status and entrepreneurship is summarized in Table 16. Entrepreneurs, it seems, are more likely to grow up in larger families. They are also more likely to be married and have children – and more of them. This result, however, may reflect the gestation period for entrepreneurship. With an average ten-year waiting period to start their first business, entrepreneurs are older.

Early exposure to small business management or entrepreneurship at home may contribute to an entrepreneurial career. In Table 17 we report the frequency of alumni whose parents either operated an existing business or started a business. For the sample, a surprisingly high portion – 46.7 percent of alumni reported that their parents had small business or entrepreneurial experience. Entrepreneurs were more likely to have exposure to small or entrepreneurial businesses.

Of those alumni reporting a family background in small business, however, we see little difference in ownership or management patterns between entrepreneurs and non-entrepreneurs. Nearly half of alumni reporting small business exposure indicated the business was a farm. Again this is a rather high response rate – implying for the sample that approximately 22 percent of reporting alumni had a farm background. That said, a farm background does not appear to foster entrepreneurial behavior. Finally we note that having a close friend who started a business does not appear to be related to entrepreneurial behavior.

The impact of parents' education on entrepreneurship is shown in Table 18. Entrepreneurs seemed to be more influenced by their mother's education than their fathers. However, entrepreneurs tended to have parents with less than a 9th grade education or a mother with only a high school diploma. Entrepreneurs were less likely to have a mother with graduate training. The results seem a little murky, but it would seem that parents' education is inversely related to entrepreneurship.

We were also interested in learning whether activities in high school might have either encouraged or presaged entrepreneurs. In Table 19 we report several types of activities or experiences prior to entering college. Future entrepreneurs tended to be less involved in band or academic clubs and more likely to be working in the family business. Their high school rank was also significantly lower than those destined to be employees. Outside of these factors the high school activities of future entrepreneurs and employees seem to be similar.

Table 16. Childhood background & current marital status

Items	All	Non-Entrepreneurs	Entrepreneurs
Grow up with two parents (%)	89.7%	90.0%	87.9%
Average number of siblings	2.27	2.22	2.55***
Marriage Status			

Single, never married	21.4%	23.0%	12.7%***
Married/Partnered	74.1%	72.7%	81.4%***
Separated/Divorced	4.1%	4.0%	4.8%
Widowed	0.5%	0.3%	1.2%*
Average age when first married	25.85	25.84	25.90
Have kids (%)	56.6%	54.5%	67.9%***
Average number of kids if having	2.17	2.12	2.38***

Note: ***, ** and * indicates significance of difference in items between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level respectively.

Table 17. Exposure to small business management or entrepreneurial behavior

	All alumni	Non-entrepreneur	Entrepreneur
Parents started a business	46.7%	45.1%	55%***
Business operated or started by:			
Mother	8.6%	8.9%	7.2%
Father	60.6%	61.0%	58.8%
Both parents	<u>30.8%</u>	<u>30.1%</u>	<u>34.1%</u>
Total	100.0%	100.0%	100.0%
Parents' business is a farm	34.4%	34.6%	33.4%
Close friends started a business	46.5%	49.8%	29.2%***

Note: *** in the last column represents the significance in difference of statistics between entrepreneurs and non-entrepreneurs at 1% level.

Table 18. Parents' education and entrepreneurship

Education	Father's education		Mother's education	
	Non-	Entrepreneurs	Non-	Entrepreneurs
Less than 9 th grade	2.6%	3.8%*	1.2%	2.9%**
9 th -12 th grade, no diploma	2.1%	3.2%	1.4%	2.2%
High school graduate	22.7%	22.4%	25.9%	30.2%**
Some college	12.0%	12.3%	15.6%	16.6%
Associate's degree	5.8%	3.6%***	12.1%	10.2%
Bachelor's degree	31.9%	31.9%	30.2%	27.8%
Graduate / professional degree	23.0%	22.7%	13.7%	10.1%***

Note: ***, ** and * indicates significance of differences in education levels between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level.

Table 19. High school experience and entrepreneurship

	All alumni	Non-entrepreneurs	Entrepreneurs
Active in extra-curricular activities			

Sports	75.5%	75.6%	75.7%
Extra-curricular music/band	51.8%	52.7%	47.6%**
Extra-curricular drama	24.3%	24.7%	22.3%
Extra-curricular academic clubs	35.7%	36.4%	32.5%*
4-H, FFA and similar groups	21.3%	21.3%	21.6%
Boy or girl scouts	21.1%	20.9%	22.2%
Average size of high school graduating class	281.0	280.4	283.8
Average rank of high school ^a	69.52	71.50	59.06***
Work experience before the age of 18			
Work for family's business	28.6%	27.1%	36.5%***
Work for others at their place of residence	26.2%	26.6%	24.4%
Work for others at a place of business	78.4%	78.0%	80.3%

Note: ***, ** and * indicates significance of difference items between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level respectively. ^a: 100 is the top high school rank.

HOW MUCH DO ENTREPRENEURS EARN?

Think of entrepreneurship and earnings and your mind usually drifts to thoughts of Bill Gates or Sergey Brin. Reality, it turns out, is a little more complicated. On average, as shown in Table 20, current entrepreneurs reported a higher income than did non-entrepreneurs. For that matter, so did former-entrepreneurs – alumni who started at least one business but who were currently working for someone else. We also see that there is greater income variability among entrepreneurs. Figure 12 shows a difference in income distribution between current entrepreneurs, and non-entrepreneurs. The personal income distribution for current entrepreneurs has “fat tails” compared to employees. In other words, we see a greater concentration of entrepreneurs’ income levels, at the extremes – very low or very high. This type of income distribution suggests “super star”¹¹ pay similar to professional athletes, coaches or rock stars. Entrepreneurs as they are getting started tend to earn less than their employed counterparts. But if they create successful businesses they appear to win big. The likelihood of superstar pay may be one of many factors that encourages new entrepreneurs to take the risk of starting a new business. Another reason for the concentration of low pay among entrepreneurs could be that the businesses are bridges between spells of employment. If someone loses their job and wants to remain in their home community, creating a business and becoming self-employed until something better comes along maybe an option.

In Figure 13 we compare the income distribution of current and former entrepreneurs. We still see evidence of the “super star” effect. Former entrepreneurs tend to have somewhat greater concentration in the upper income levels than do non-entrepreneurs.

We compare mean incomes from current and former entrepreneurs and employees by terminal degree in Table 21. Although differences are evident, the only statistically significant differences are between non-entrepreneurs and entrepreneurs. Interestingly average incomes increase for both groups between a bachelor’s degree and a masters and then decline with a doctorate.

¹¹ Rosen, Sherwin. 1981. The Economics of Superstars. *American Economic Review* 71(5): 845-858.

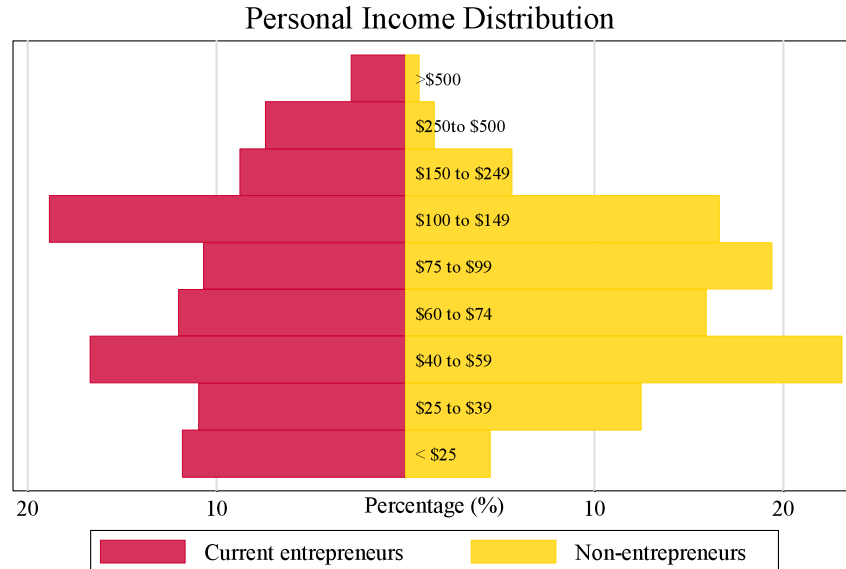
Finally in Table 22, we look at income, entrepreneurship and undergraduate field of study. The earning relationship across colleges is fairly consistent – engineers earn the most, human sciences tend to earn the least, independent of their employment status. Current and former entrepreneurs tend to earn more than employees. Apparently a spell of entrepreneurship makes you a more valuable employee.

Table 20. Average current income (\$1,000)

	Mean	75 th Percentile	90 th Percentile	Relative Dispersion (Coefficient of Variation)
Current entrepreneurs	119.6	125	375	1.11
Former entrepreneurs	104.5	125	200	0.91
Non-entrepreneurs	87.1	87.5	125	0.87

Note: Alumni who are students, retired, homemakers or unemployed are excluded. Median income is \$67,500

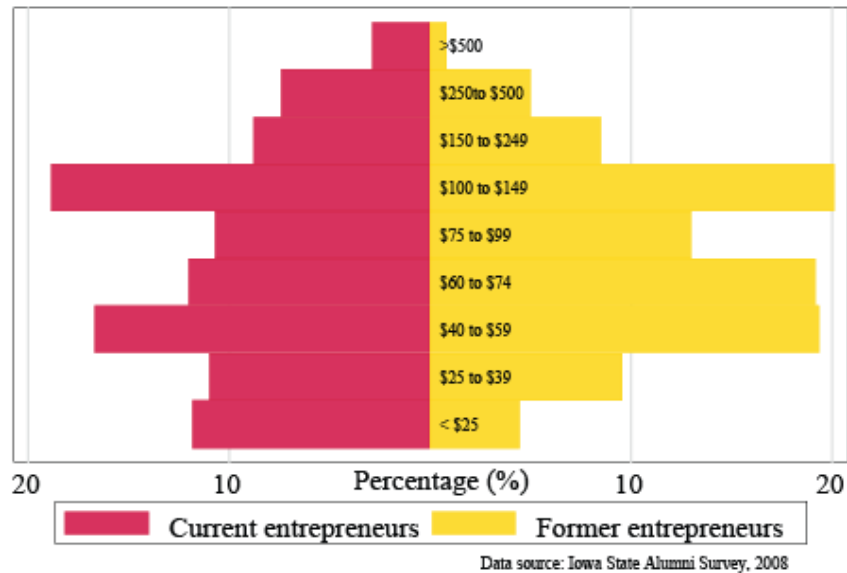
Figure 12. Current personal income distribution of current entrepreneurs and non-entrepreneurs



Data source: Iowa State Alumni Survey, 2008

Note: income unit: \$1,000. Graduates who are currently students, homemakers, retired, and unemployed are excluded from the analysis. Current entrepreneurs are those who still had ownership on their started business by the end of 2007.

Figure 13. Current personal income distribution of current entrepreneurs and former entrepreneurs



Note: income unit: \$1,000. Graduates who are currently students, homemakers, retired, and unemployed are excluded from the analysis.

Table 21. Average personal income by terminal education degrees (\$1,000)

	Non-	Entrepreneurs	Former	Current
Bachelor	79.58 (0.86)	102.44*** (1.15)	88.21 (0.93)	109.71 ^a (1.20)
Master	96.98 (0.78)	132.56*** (0.86)	134.13 (0.84)	130.99 (0.88)
Doctorate	89.12 (0.48)	124.03* (0.85)	117.66 (0.80)	127.12 (0.88)
Professional degree	135.75 (0.98)	155.96 (0.94)	116.79 (0.87)	169.22 (0.94)

Note: numbers in the parentheses are the Coefficients of Variation (CVs) measuring dispersion of income distribution. ***, ** and * indicates significance of differences in income levels between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level. ^a: * indicates significance of differences in income levels between current entrepreneurs and former-entrepreneurs at 10% level.

Table 22. Average current personal income (\$1,000) by graduation colleges

College	All	Non-	Current	Former
Agriculture and Life	78.5	74.0	92.6*	98.5
Business	102.3	97.7	141.5**	108.3
Design	79.4	73.4	94.5*	103.8
Engineering	118.5	111.2	170.9***	147.3***

Human Sciences	68.7	64.0	108.3*	65.2
Liberal Arts & Sciences	88.1	85.4	111.7	87.6
Average	91.6	87.1	119.6***	104.5**

Note: *, **, *** indicates the statistical significance at 10%, 5% and 1% level respectively. The significance in the last two columns is based on test of income equality between current entrepreneurs (or former entrepreneurs) and non-entrepreneurs.

COMMUNITY INVOLVEMENT

Entrepreneurs identified certain aspects of their community as keys to their success – as a market for their products and services or support during start up. We wanted to determine the extent to which entrepreneurs give back to their local communities. Table 23 reports several measures of community involvement for entrepreneurs and non-entrepreneurs. For all of the reported measures, entrepreneurs demonstrate a stronger bond and involvement in their home communities than do non-entrepreneurs. Table 24 lists representative types of services that entrepreneurs might provide. School and youth programs are the most common. Involvement in direct financial assistance or support of bond issues is somewhat mixed.

Table 23. Entrepreneurs’ contribution to communities

	All Alumni	Non-entrepreneurs	Entrepreneurs
Average residency length	9.46	8.94	12.26***
Community service projects participation	58.43%	57.00%	66.01%***
Organization membership	87.05%	86.42%	90.38%***
Being active in the community			
Very active	9.09%	8.03%	14.76%***
Somewhat active	38.51%	37.51%	43.64%***
Not very active	40.80%	42.48%	32.13%***
Not at all active	11.60%	11.97%	9.48%*

Note: ***, ** and * indicates significance in variables’ differences between entrepreneurs and non-entrepreneurs at 1%, 5% and 10% level.

Table 24. Frequency of entrepreneur’s provision of services to their communities

Services provided to the community	Never	Seldom	Occasionally	Often	Very often
Financial or technical assistance in community development and planning	50.0%	17.5%	18.9%	10.1%	3.5%
Donations to local schools or youth programs	18.2%	14.8%	32.5%	22.4%	12.2%

Support for local bond issues to finance community improvement projects	55.6%	17.4%	13.6%	9.3%	4.2%
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FINAL COMMENTS

This analysis provides a broad description of the entrepreneurial activity and economic impact of entrepreneurial ventures of university graduates. We know that institutions of higher learning like Iowa State University play an important economic role through education that builds human capital, research that leads to knowledge and technologies that result in productivity growth, and other spillovers. More specifically, however, this analysis shows that alumni entrepreneurship plays a role in economic growth and job creation.

The education and experience received at Iowa State University appears to have had an impact on the entrepreneurship activity of graduates, though entrepreneurship rates do vary depending upon college of graduation. While formal classes and programs on entrepreneurship were not offered at Iowa State University until the latter 1990s, it appears that something in the university experience and the subsequent career path of graduates leads to relatively high rates of entrepreneurship. It also appears to lead to higher rates of firm survival for alumni entrepreneurs than for entrepreneurs generally.

While the state of Iowa has consistently lagged other states in various measures of entrepreneurial activity, Iowa State University graduates exhibit a higher rate of entrepreneurship compared to the population as a whole. Fairlie¹² reported an annual entrepreneurship rate for Iowa's population of 0.19 percent for 2008 and 0.26 percent for 2007. If we can extend these annual rates to the twenty five year span of the alumni survey, they imply an entrepreneurship rate for the population as a whole in Iowa of 4.8 to 6.5 percent as compared to 15.8 percent found among 1982 to 2006 graduates in this survey. The implication is an entrepreneurship rate among Iowa State University graduates about twice that of the general population of the state.

Iowa State University graduates also appear to exhibit higher entrepreneurship rates than other college graduates. For example, Fairlie also found that U.S. college graduates had an average annual entrepreneurship rate between 1996 and 2008 of 0.296 percent, implying a 7.4 percent entrepreneurship rate over a twenty-five year period as with the alumni survey. Interestingly, Fairlie found U.S. college graduates to have a slightly lower annual entrepreneurship rate than the population as a whole, which had an average annual entrepreneurship rate of 0.305 percent over the 1996 to 2008 time period.

Iowa State University graduates may have more comparable entrepreneurship rates with respect to other institutions of higher learning with a scientific and technical core, though there is not

¹² Fairlie, Robert W. 2009. Kauffman Index of Entrepreneurial Activity. Kauffman Foundation. Available at: http://www.kauffman.org/uploadedFiles/kiea_042709.pdf

extensive data available on this topic. In one example, The Massachusetts Institute of Technology (MIT) surveyed all of its living alumni and found an entrepreneurship rate of 23.5 percent¹³. Keep in mind that MIT has a very rich history of significant technology entrepreneurship, with alumni having created companies such as Hewlett Packard, Intel, and Digital Computer. Given that the entrepreneurship rate among the earliest cohorts in this survey was about 25 percent, we suspect that the rate for Iowa State University would have approached the MIT level if graduates pre-dating 1982 had been included as they were in the MIT study.

The 15.8 percent of Iowa State University graduates between 1982 and 2006 who had created at least one for-profit business, resulted in the creation of 222,569 jobs. These companies had 2007 revenues of approximately \$64 billion. For an indication of magnitude, note that Iowa gross domestic product was \$135.7 billion in 2008.

Entrepreneurship is vital to the growth and competitiveness of the U.S. economy.¹⁴ Entrepreneurial, small businesses provide much of the net new job growth in the U.S. economy¹⁵ Between 2004 and 2005, Census Bureau data showed that nearly 83 percent of all of the net new jobs in the U.S. economy stemmed from businesses with fewer than 20 employees.¹⁶

Iowa's report card for entrepreneurship is not stellar, with the state consistently ranking between fortieth and fiftieth in most measures of entrepreneurial activity such as venture capital investment, manufacturing investment, employment growth, and new business creation. This fact makes the entrepreneurial activity of Iowa State University alumni appear all the more impressive. It may also explain the disproportionate amount of entrepreneurial activity of alumni outside the state of Iowa.

Undergraduate enrollment at Iowa State is comprised historically of greater than 70 percent Iowa residents. For example undergraduate enrollment was 72 percent Iowa residents for Fall 2009. This compares to 78 percent of Iowa resident for Fall 1998. It seems reasonable to expect some propensity for an entrepreneur to locate their business in their state of residency and undergraduate attendance. However, that expectation isn't met by the data from the survey. While alumni entrepreneurs created 222,569 jobs in total, only 35,242 of those were created in the state of Iowa, 15.8 percent of the total. A higher proportion of total companies founded by alumni were located in Iowa (35 percent), but those businesses located outside Iowa had more jobs created per enterprise. Large metropolitan areas both in the Midwest (Minneapolis, Chicago, and St. Louis, Kansas City) and outside the Midwest (Phoenix, Los Angeles, Dallas, Seattle, San Francisco) recorded multiple alumni starting businesses.

¹³ Roberts, Edward B. and Charles Eesley. *Entrepreneurial Impact: The Role of MIT*. February 2009. MIT Sloan School of Management.

¹⁴ Baumol, William J. *The Free-Market Innovation Machine: Analyzing the Growth. Miracle of Capitalism*. Princeton University Press, 2002.

¹⁵ Acs, Zoltan J. and Catherine Armington. 2003. "The Geographic Concentration of New Firm Formation and Human Capital: Evidence from the Cities." Working Papers 03-05, Center for Economic Studies, U.S. Census Bureau.

¹⁶ Moutray, Chad. "Looking Ahead: Opportunities and Challenges for Entrepreneurship and Small Business Owners." SBA Office of Advocacy Working Paper #332. October 2008.

There are likely multiple explanations for this. The top response for business location in the survey was ‘where I lived’ (82 percent ranking it as very important) indicating that alumni had already moved away from Iowa to pursue their careers when they started their entrepreneurial ventures. Rather than move back to their native state of Iowa, they located their business where they lived currently and had built their post-undergraduate career and lives. Recall that the first business start for alumni was on average ten years after graduation.

The founding of entrepreneurial ventures by ISU alumni, over 70 percent of whom are Iowa natives, outside the state of Iowa likely signifies problems in the business climate in the state. A more robust business climate would lead to a higher proportion of undergraduates pursuing careers in their native state because of more numerous and better quality job opportunities. This, in and of itself, would increase the likelihood of alumni ventures being started in Iowa.

The consequences of what is commonly referred to as ‘brain drain’ are profound from an entrepreneurial as well as an economic perspective. Policies that have focused on keeping students in state to attend college miss the point that if they do not find a commensurate way to make a living in the state upon graduating they will leave.¹⁷

A more dynamic entrepreneurial ecosystem in the state would encourage more alumni to either start their ventures in Iowa sooner after graduation or to move back from another state after having pursued employment with another company for a time. It would also attract more entrepreneurs who are non-Iowa natives.

This survey reveals the economic impact of alumni entrepreneurs and the positive role that higher education plays in spurring entrepreneurship. Entrepreneurs tend to have higher incomes, their ventures create jobs for others, and they are more active in their local communities. This activity does not occur in a vacuum, however, and the business and entrepreneurial climate in the state seems to play an important role in the form and location of alumni’s entrepreneurial ventures. Research- and technology-intensive universities like Iowa State can have a dramatic impact on the economy via the entrepreneurial activities of its alumni. The economic activity this entrepreneurship can spur is part of a larger entrepreneurial ecosystem, however, that necessarily requires a vibrant economic environment to fully extend its potential impact.

Every indication is that entrepreneurial ventures will play a greater, not lesser, role in the U.S. economy in coming decades. The proportion of jobs in the U.S. with large companies continues to decrease while most net job growth has occurred among new and small businesses. Without startup companies, net job creation for the American economy would be negative in all but a handful of years since 1980.¹⁸

In light of this, it is important that universities like Iowa State University find ways to both continue and increase entrepreneurship among its students and alumni, and a number of new programs have been created in this vein to make entrepreneurship education widely accessible to

¹⁷ Artz, Georgeanne M. and Li Yu. How ya gonna keep ‘em down on the farm: Which Land Grant graduates live in rural areas? Working Paper No. 09016. Iowa State University Economics Department. July 2009.

¹⁸ Stangler, Dane and Robert E. Litan. Where Will The Jobs Come From? Kauffman Foundation Research Series. November 2009.

students in the last ten years. It is also important that the State of Iowa, and other low-growth states like it, to do more to improve its business climate such that entrepreneurial activity is encouraged, fostered, and rewarded.

APPENDIX I.

1. Sampling procedure.

Data for this study were drawn from a proportional random sample of all ISU alumni graduating between 1982 and 2006 with a Bachelor's degree. The sampling rate was approximately 24 percent. Two years, 1982 and 1992 were over sampled at 100 percent to permit a cohort analysis of career choice and business cycle. The sampling population consisted of 84,917 alumni. The total sample drawn was 25,025. We received 5,416 usable surveys for a response rate of 21.6 percent.

2. Weighting procedure.

The weights are computed as follows: Let N_t be the total number of alumni who graduated from Iowa State University with a Bachelor's degree in year t . 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 Iowa State University 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 a sampling weight $\frac{n_{jt}}{s_{jt}}$ such that the weight will represent the number of total alumni from college j in year t .