

# The Economic Impact of Entrepreneurial Alumni

## A Case Study of the University of Virginia

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### IN BRIEF

The following report distills the results of a large survey investigating the entrepreneurial activities and related economic impact of the University of Virginia's alumni. While universities are undisputed hubs of economic activities that directly spur regional growth and prosperity, we have focused on building a picture of U.Va. alumni's impact on economic growth through their diverse post-graduation entrepreneurial activities.

Thomas Jefferson founded U.Va. in 1819 to educate future leaders in practical affairs. Of the more than 221,000 living graduates, our data suggests that almost 60,000 have founded, supported, invested in, and worked for new ventures. The collective impact of these entrepreneurs is impressive, and comparable with that of alumni from other prestigious research-based universities, including Stanford and MIT, which have conducted similar surveys in recent years.

Carefully extrapolated, the responses to our survey suggest that entrepreneurially active alumni have created approximately 65,000 companies. These efforts have generated positive impacts on the global economy—notably, 2.3 million people have worked at companies founded or directly supported by U.Va. alumni. The organizations that are active today generate global revenues worth \$1.6 trillion annually. The Commonwealth of Virginia has benefitted disproportionately well, receiving a high number of these jobs—upwards of 371,000—at companies operating in the Commonwealth. These Virginia-based companies have produced about \$395 billion in calculated annual revenues and spent \$279 billion per year.

Project website with interactive maps and charts can be found at:  
[www.batteninstitute.org/uva-alumni](http://www.batteninstitute.org/uva-alumni)

# Impact of Universities on Economic Growth

## DESCRIPTION OF THE SURVEY

At the beginning of 2013, the University of Virginia had more than 221,000 living alumni spread across the world and throughout North America. In the same year, Michael J. Lenox, Andrew C. King, and Charles E. Eesley developed a survey to take a snapshot of this diverse group's engagement in entrepreneurial activities.

An anonymous online and mail survey of 135,227 individuals who graduated from the University of Virginia and had agreed to be contacted by the University elicited 22,757 (16.8%) valid responses. This number represents 10.3% of the entire University alumni population. The survey asked respondents for information in three areas: their education and career development, details of their entrepreneurial experience at up to eight ventures, and basic demographics. With help from Research Associate Asif Mehedi, the authors analyzed the data and developed models to estimate the alumni impact through entrepreneurial action.

This survey was conducted in collaboration with the University of Virginia's Alumni Association, and the Center for Survey Research, and was funded by the Batten Institute.

Research suggests that universities can be a significant engine for economic growth in their local communities and beyond.<sup>1</sup> They are frequently large employers in their communities. They are large purchasers of goods and services. They often spend significantly on building and construction. They spend large amounts on research, attracting grants from the federal government and other sources. This research in turn can lead to intellectual property, such as patents, that is licensed to established companies and entrepreneurial spinouts. In some cases, this may encourage businesses to locate near the origin of that intellectual property. Last, but certainly not least, universities prepare and train students to participate in the workforce.

In this analysis, we focus on this last pathway by which universities help generate economic growth and create jobs. In particular, we examine the entrepreneurial efforts of university alumni. Entrepreneurial alumni start businesses and organizations that generate employment and economic growth. *We define entrepreneurial alumni as those who found new ventures, who are one of the first five employees of a new venture, who serve on the governing or advisory board of a new venture, or who provide capital to entrepreneurial ventures* (e.g., angel investors and venture capitalists). Ventures include for-profit businesses as well as non-profit organizations. We focus on the alumni from one university, our home institution, the University of Virginia. This study complements previous studies on Stanford and MIT conducted by Batten Fellow and report coauthor Charles Eesley. The numbers are impressive. As of 2012, Stanford alumni created an estimated 39,900 active firms generating annual worldwide revenues of \$2.7 trillion and employing 5.4 million people.<sup>2</sup> A survey in 2003 showed that MIT alumni had founded 25,800 active firms that employed an estimated 3.3 million people and generated annual worldwide revenues of \$2 trillion.<sup>3</sup> In both cases, these efforts created substantial local spillovers. 25% of Stanford entrepreneurs founded their companies within 20 miles of the university. 27% of MIT entrepreneurial ventures active in 2003 were headquartered in Massachusetts, creating nearly 1 million jobs.

This is one of the most comprehensive surveys that we are aware of concerning entrepreneurial alumni at a major public university. U.Va. is ranked among the top 25 universities in the United States and has been ranked the first or second public university since U.S. News began ranking public universities. As a public university, U.Va. receives funding in part from the Commonwealth of Virginia (\$154M in 2013 or 5.8% of the university's total budget<sup>4</sup>). One of the motivations of the state in investing in higher education is to help generate economic growth within the Commonwealth. This report provides evidence of the impact that alumni entrepreneurs have on economic growth and job creation both in the Commonwealth and beyond, and suggests the state is receiving a substantial return on investment from this avenue alone, even ignoring the numerous other ways the University creates value.

<sup>1</sup> Applesseed Inc. 2003. "Engines of Economic Growth: The Economic Impact of Boston's Eight Research Universities on the Metropolitan Boston Area." (<http://www.news.harvard.edu/gazette/2003/03.13/photos/EconomicReport-full.pdf>)

<sup>2</sup> Eesley, C. and W. Miller. October 2012. "Impact: Stanford University's Economic Impact via Innovation and Entrepreneurship."

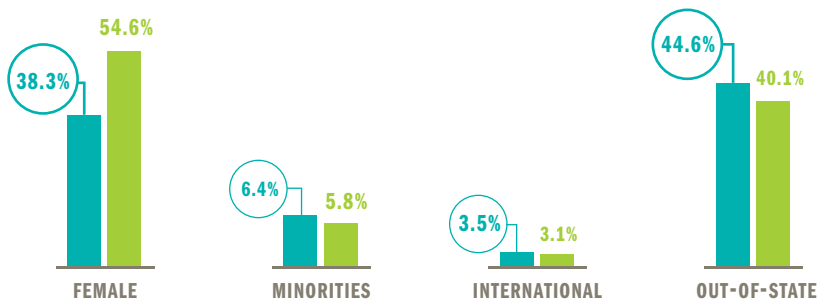
<sup>3</sup> Roberts, E. and C. Eesley. February 2009. "Entrepreneurial Impact: The Role of MIT."

<sup>4</sup> <http://www.virginia.edu/finance101/state.html>. Accessed on 7/23/2014.

# Which Alumni Become Entrepreneurs?

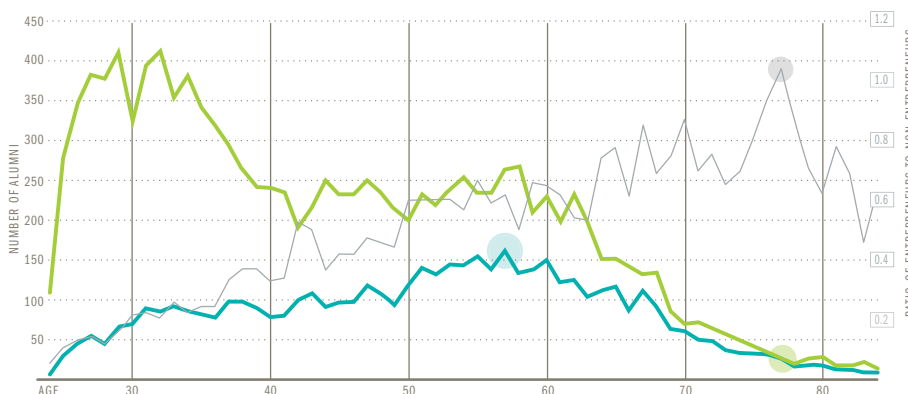
According to our survey, 29% of alumni self-identify as entrepreneurial. This includes founders (19%)<sup>5</sup>, early employees (11%), board members (12%), or investors (7%). Of those entrepreneurial alumni, 38.3% were female, 6.4% were underrepresented minorities, and 3.5% were international students. 44.6% of U.S. alumni entrepreneurs had been out-of-state students—i.e., students who applied to U.Va. while residing outside the state.

## DEMOGRAPHICS:<sup>6</sup> Entrepreneurs v. Non-Entrepreneurs



Consistent with recent analyses, including the Kauffman Foundation’s investigation of MIT graduates,<sup>7</sup> many alumni pursue entrepreneurship at mid to late stages of their careers. The highest number of entrepreneurs in the survey were born in the mid-1950s suggesting an average age of approximately 60 at the time of the survey. This is despite a massive increase in the number of students and alumni starting in the early 1970s. Of course, entrepreneurial experience is cumulative and therefore will increase with age. However, if we look at the ratio of entrepreneurs to non-entrepreneurs by age, we see an increasing percentage of entrepreneurs as age increases, lending support to the notion that alumni are pursuing entrepreneurship later in their careers.

## AGE: Entrepreneurs v. Non-Entrepreneurs



### ALUMNI PROFILE Henry Termeer

Henry Termeer, graduating from U.Va. Darden School of Business in 1973, helped transition Genzyme from a long-shot start-up into one of the world’s leading biotechnology companies. It employed over 11,000 people when it was acquired by Sanofi in 2011.



### ALUMNI PROFILE Rangina Hamidi

Rangina Hamidi, a dual citizen of Afghanistan and the United States, founded the non-profit Kandahar Treasure after earning her BA in Religious Studies and Gender Studies from U.Va. Since its inception in 2003, Kandahar Treasure has been employing women artisans in Afghanistan as a conduit for building regional economic and social stability. The organization’s success has set it on a pathway towards becoming a for-profit entity.

<sup>5</sup> This ratio is similar to the national average in the US, as mentioned in the “Global Entrepreneurship Monitor: 2013 United States Report,” jointly produced by Babson College and Baruch College.

<sup>6</sup> About 45% of the living U.Va. alumni are women, but in our survey men and women are almost equally represented. The minority races/ethnicities are slightly underrepresented among the respondents. Asian, Black, and Hispanic alumni are respectively 4.1%, 4.1%, and 1.6% of the survey respondents; the numbers are respectively 6.5%, 5.4%, and 1.6% for all the living alumni who have reported race/ethnicity. Data for the overall alumni population can be found at [www.virginia.edu/Facts/Glance\\_Alumni.html](http://www.virginia.edu/Facts/Glance_Alumni.html).

<sup>7</sup> Roberts, Edward B., and Charles E. Eesley. *Entrepreneurial impact: The role of MIT*. Vol. 7, no. 1-2. Now Publishers Inc., 2011.

# Which Alumni Become Entrepreneurs? [CONTINUED]



## ALUMNI PROFILE Gregory Olsen

Gregory Olsen earned his PhD in material science from the University of Virginia. He used his technical knowledge to found several optics firms, most famously Sensors Unlimited Inc., which was acquired in 2005 for \$60M. Olsen's company is now a leading supplier of infrared optical gear for the US military.



## ALUMNI PROFILE Betty Shotton

Betty Shotton graduated with U.Va.'s first class of women. She has gone on to lead six companies in the vacation and airlines industries. Her most well-known venture is ResortQuest International, which is currently a publicly traded company on the New York Stock Exchange.

The alumni profiles in this briefing are based on publicly available information. The profiled alumni did not necessarily participate in the survey.

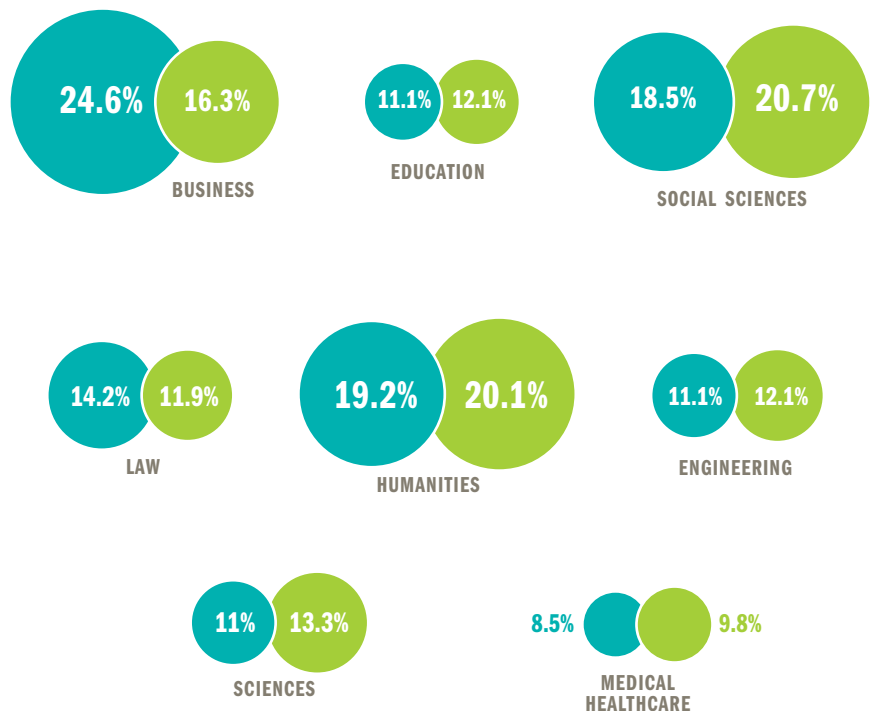
<sup>8</sup> Krueger, Norris F. "The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability." *Entrepreneurship theory and practice*. Vol. 18, no. 1 (1993): 5-21.

<sup>9</sup> 51% of respondents had earned more than one post-secondary degree. Of all the degrees awarded at U.Va., less than 14% were in the field of business. Among the survey respondents, 18.7% had at least one degree in business (whether from U.Va. or elsewhere). While these two numbers are not directly comparable, it indicates the possibility that the alumni with business education are over-represented in the survey sample. Of all the degrees awarded at U.Va. since 1940, 79% were awarded in the period after 1980. For the survey respondents, 78% of the degrees were awarded during this period.

Over half of the entrepreneurial alumni had either business degrees or technical degrees (sciences, engineering, or medicine). As expected, more entrepreneurs had business degrees (24.6%) than non-entrepreneurs (16.3%). Surprisingly, while 27.1% of entrepreneurial alumni had technical degrees, 31.8% of non-entrepreneurial alumni had such degrees. However, 35.6% of entrepreneurial alumni had work experience in professional, scientific or technical fields, compared with 28.2% among non-entrepreneurs. Similarly, 51.2% of entrepreneurial alumni indicated having innovation experience, compared with 35.3% of non-entrepreneurs. Humanities degrees were represented nearly equally between entrepreneurial and non-entrepreneurial alumni (19.2% and 20.1%, respectively). 64% of entrepreneurs and 59% of non-entrepreneurs had advanced degrees.

Consistent with previous studies,<sup>8</sup> entrepreneurial alumni were more likely to have had experience working for a business with fewer than 100 employees (67.2% of entrepreneurs vs. 53.1% of non-entrepreneurs) or had close family members who were entrepreneurs (72.3% of entrepreneurs vs. 53.8% of non-entrepreneurs). Interestingly, 16.2% of alumni entrepreneurs indicated having some involvement with entrepreneurship classes and programs while at the University (compared with 8%

## DEGREES:<sup>9</sup> Entrepreneurs v. Non-Entrepreneurs

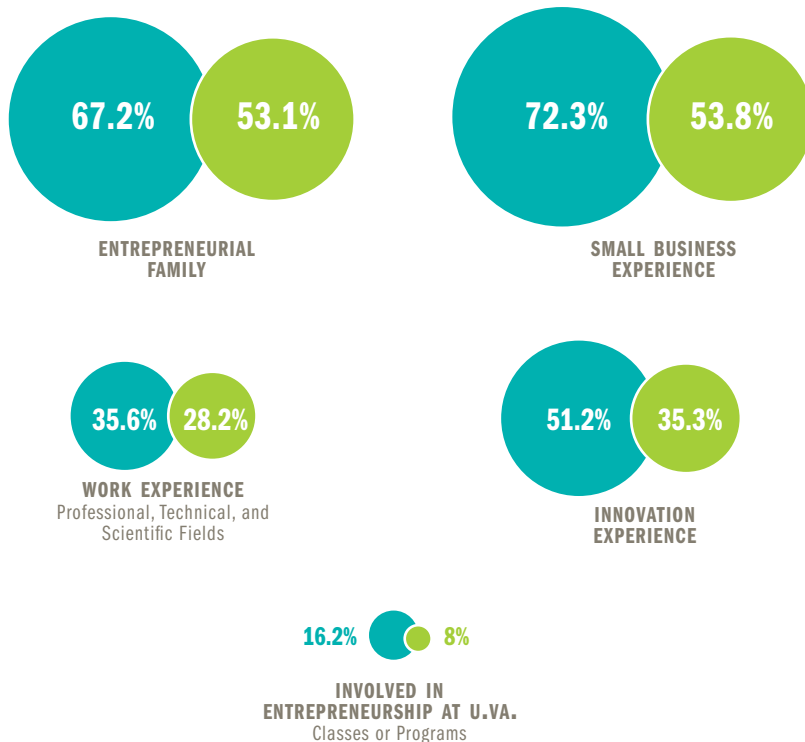




among non-entrepreneur respondents). While there is likely self-selection into such activities by those who are inclined to be entrepreneurs, the number is surprisingly high considering that entrepreneurship offerings at the University are a relatively recent phenomenon and that many alumni entrepreneurs graduated before any entrepreneurial courses were available.

A simple multivariate analysis provides insight into the relative sensitivity of entrepreneurial activity to demographic characteristics and experience.<sup>10</sup> We find that females are 32% less likely than their male counterparts to be entrepreneurial while minorities are 61% more likely to be entrepreneurial. We find no statistical evidence that out-of-state students or international students are more likely to be entrepreneurial. Consistent with our summary statistics, those with business degrees (43%), professional, technical or scientific job experience (19%), innovation experience (77%), exposure to family entrepreneurs (62%), small business experience (125%), and those who were involved with U.Va. entrepreneurship programs (87%) are more likely to be entrepreneurial. Interestingly, again, we find that those with technical degrees (-18%) and doctorate degrees (-26%) are less likely to be entrepreneurial.

## EXPERIENCE: Entrepreneurs v. Non-Entrepreneurs



### ALUMNI PROFILE Tim Koogle

**Tim Koogle** became the first CEO of fledgling web company Yahoo! Inc. in 1995, after receiving a BS in mechanical engineering from the University of Virginia. Koogle led Yahoo! during its transformation into the leading search engine. As of December 2013, Yahoo! employed just over 12,000 people and generated approximately \$4.5B in annual revenues.



### ALUMNI PROFILE Steve Huffman and Alexis Ohanian

**Steve Huffman** and **Alexis Ohanian** met at the University of Virginia and attended the McIntire School of Commerce during their undergraduate studies. They went on to found Reddit, a social networking and news portal, in 2005 with help from the seed accelerator Y-Combinator.

<sup>10</sup> We analyzed the data using logistic regression to test for relationships between the dependent variable (whether an alumnus is entrepreneurial or not) and fourteen independent variables. Of these, eleven were statistically significant ( $p < 0.05$ ): female (coefficient -0.3880), under-represented minority (0.4762), birth year (-0.0342), doctorate degree (-0.3064), technical degree (-0.2002), business degree (0.3606), entrepreneurship in family (0.4835), small business job experience (0.8128), involvement in entrepreneurship activities at U.Va. (0.6285), innovation experience (0.5724), professional, scientific or technical job experience (0.1705); and three were statistically non-significant ( $p > 0.05$ ): out-of-state student, international student, and humanities degree. The pseudo-R<sup>2</sup> is 11.5%. The full analysis is available upon request.

# What Type of Ventures Do U.Va. Alumni Create?

## VENTURES WITH ALUMNI INVOLVEMENT <sup>11</sup>

**58%**

of ventures had an alumnus as **FOUNDER**

**34%**

of ventures had an alumnus as **BOARD MEMBER**

**33.8%**

of ventures had an alumnus as **EARLY EMPLOYEE**

**23.2%**

of ventures had an alumnus as **INVESTOR**



### ALUMNI PROFILE Frank Batten, Sr.

Frank Batten, Sr. graduated from the University of Virginia in 1950. In 1967 he became chairman of Landmark Communications, Inc., which he transformed into one of the leading media companies in the nation. His most memorable innovation was the introduction of The Weather Channel, which grew to be worth more than \$5 billion.

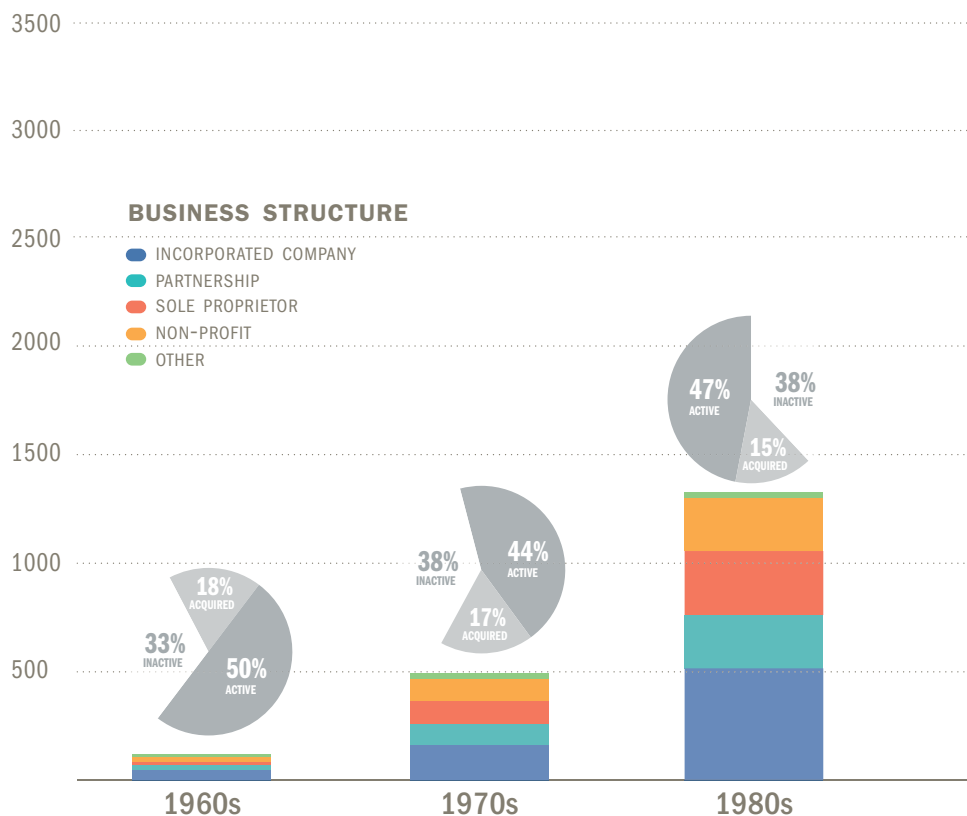
<sup>11</sup> Note that the same alumnus may assume multiple roles within the venture.

<sup>12</sup> Bureau of Labor Statistics, Business Employment Dynamics, [http://www.bls.gov/bdm/entrepreneurship/bdm\\_chart3.htm](http://www.bls.gov/bdm/entrepreneurship/bdm_chart3.htm)

Out of the 22,757 respondents to the survey, 6,564 indicated that they were entrepreneurial. These entrepreneurial alumni provided details on 8,979 ventures that they were involved in, suggesting an average of 1.37 ventures per alumni. Most alumni were involved in one venture. However, over 13% were involved in multiple ventures. 3,022 indicated involvement in more than one venture, with 383 indicating involvement with five or more ventures.

The average year of founding of the ventures in our sample was 1997, with an increasing number of ventures founded in recent years. The single largest year for founding ventures was 2010. At the time of the survey, 9.6% of alumni ventures had been acquired and 25.3% were out of operation. The survival rate of U.Va. alumni ventures compares favorably to national averages, where approximately half of new firms survive more than five years and less than one-third survive more than ten years.<sup>12</sup> 39.6% (3,517) of alumni ventures were operating as private for-profit

## VENTURES BY FOUNDING DECADE Number of Ventures and Current Stage



businesses, 18.6% (1,652 ventures) were operating as non-profits, and 1.7% (151 ventures) were publicly traded corporations. Consistent with this last number, 1% of the ventures had experienced an initial public offering (IPO). As for the legal form of ownership, 18.8% were sole proprietorships, 18.5% were partnerships, 35.5% were incorporated companies, and less than 1% were franchisees. Among all the in-operation businesses, 9.9% were pre-revenue, 19.7% were early revenue, 29.9% were in growth phase, and 31.5% indicated that they were mature businesses (about 9% of respondents indicated “not sure”).

The ventures were distributed across a wide number of industry sectors. 19% classified themselves as professional, scientific or technical services—which could include businesses in information technology and life sciences. 10.9% classified themselves as non-profit, 9.4% in healthcare, 6.3% in educational services, 6% in retail trade, 5.9% in information services, 5.7% in arts and entertainment, 5.4% in finance and insurance, and 5.0% in real estate.



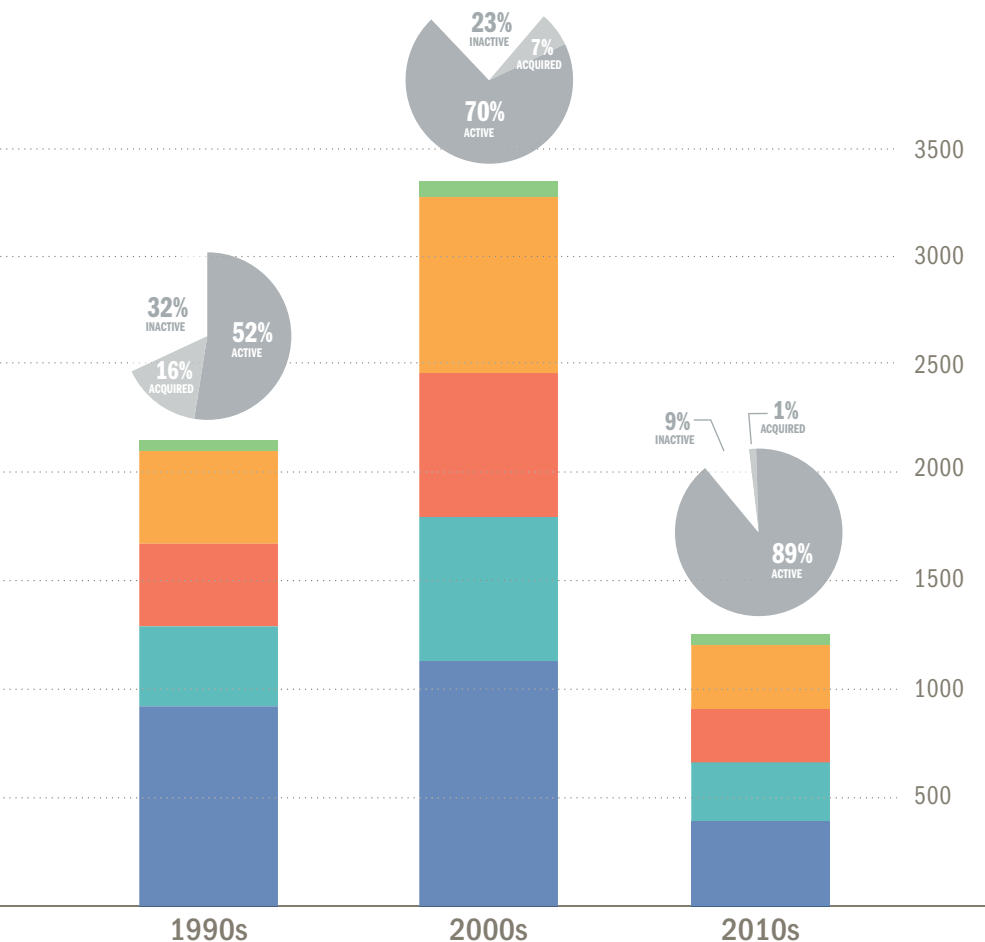
**ALUMNI PROFILE**  
**James B. Murray, Jr.**

James B. Murray, Jr. earned his undergraduate degree from the University of Virginia and has gone on to found investment companies focused on growing telecom and information technology firms. He has held directorships at more than two dozen firms, seven of which went public. He co-founded Columbia Capital with Virginia Senator Mark Warner and has invested in successful companies including Nextel, which Sprint eventually acquired.

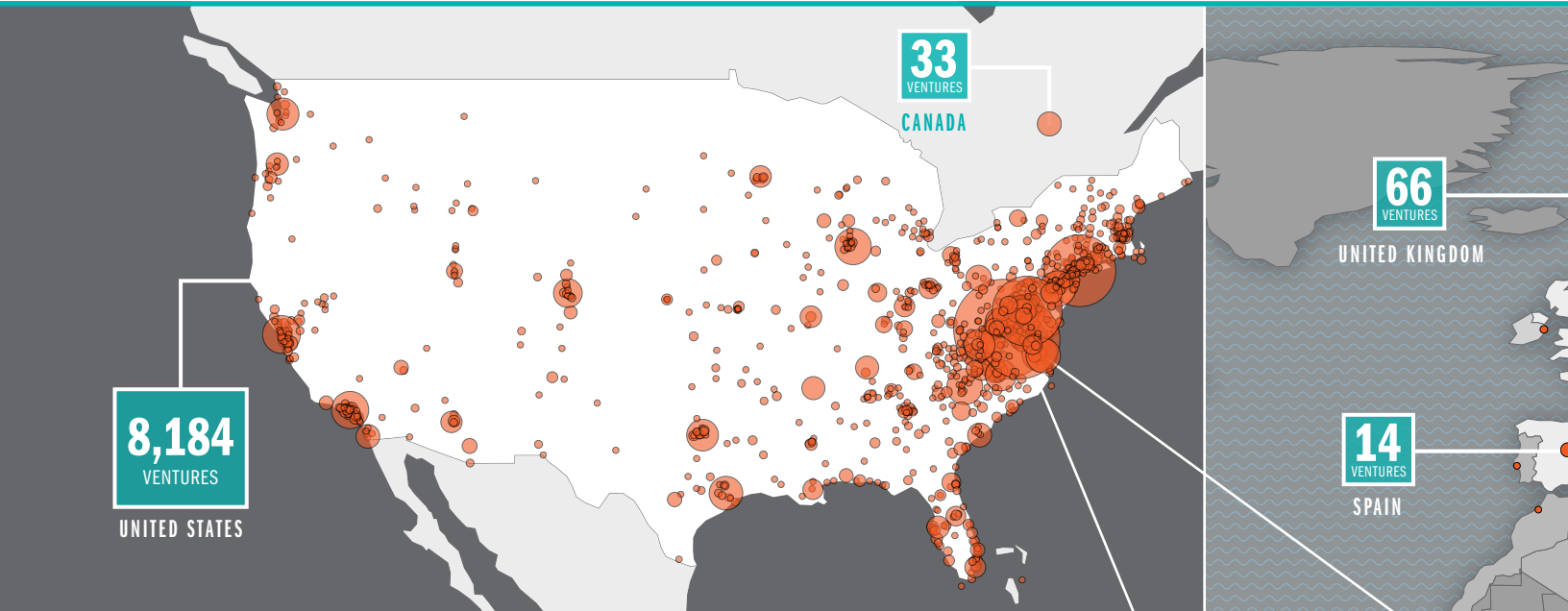


**ALUMNI PROFILE**  
**Doug Lebda**

Doug Lebda founded LendingTree and managed its successful national launch in 1998. LendingTree became a public company in 2000, and was acquired by IAC/ InterActiveCorp, where Lebda served as President and Chief Operating Officer. Tree.com subsequently spun off from IAC, and Lebda assumed the leadership position in the newly formed public company.



# Where Do U.Va. Alumni Create Ventures?



The ventures were geographically dispersed. Alumni were involved with entrepreneurial ventures headquartered in 95 countries, from Poland to Pakistan to the Philippines. Outside the U.S., the United Kingdom, Canada, China, India, and France were the most common locations. Not surprisingly, the vast majority of ventures were headquartered in the United States. Forty-nine states and the District of Columbia were represented.

While we do see quite a bit of activity in entrepreneurial hotbeds such as San Francisco, Boston, and New York, it is interesting to note that, consistent with previous analyses of MIT and Stanford, venture formation is tied very closely to the home of the University of Virginia in Charlottesville, VA. This is especially remarkable given that Charlottesville is not central to a large entrepreneurial ecosystem such as Silicon Valley (Stanford) and Boston (MIT).

## TOP COUNTRIES

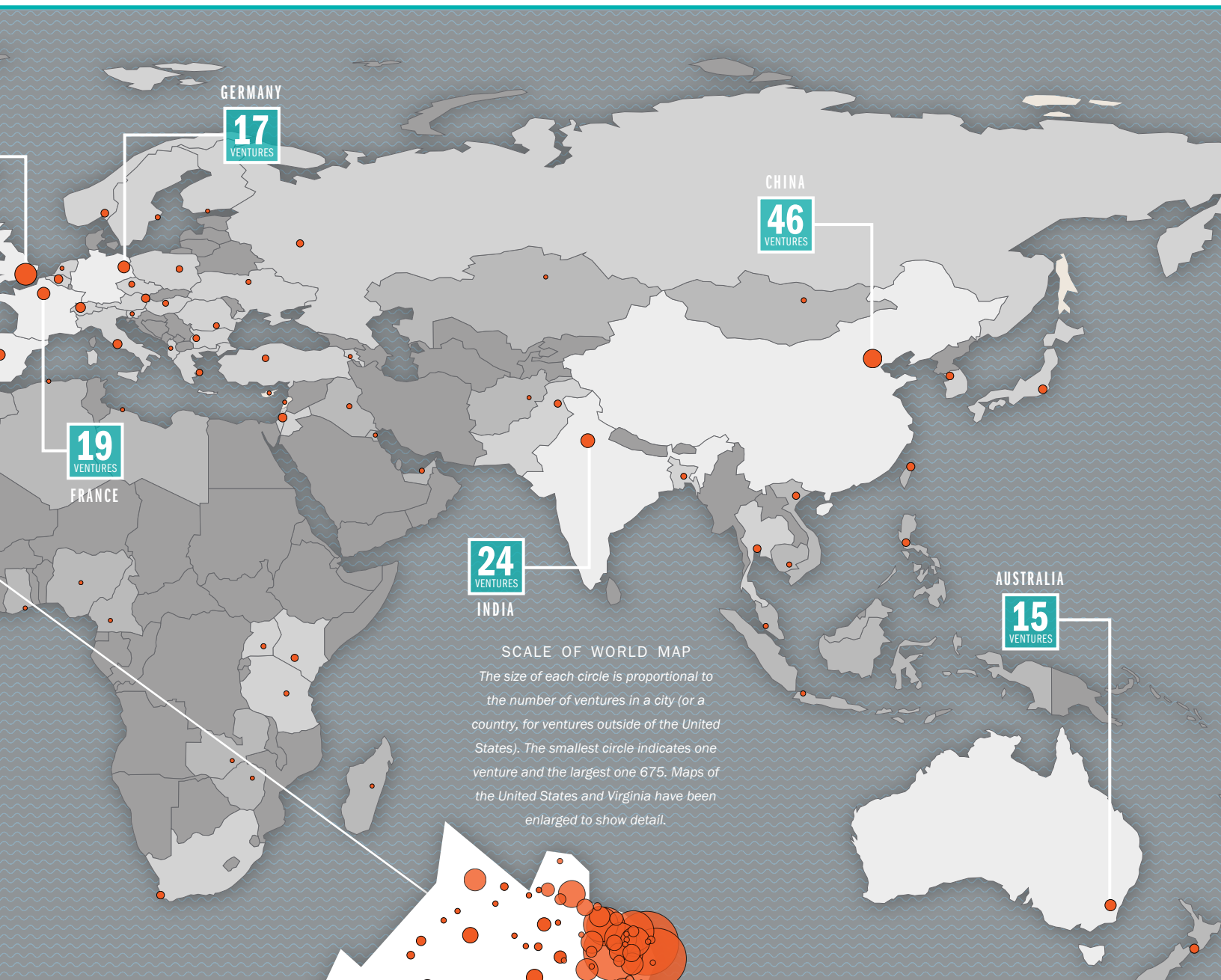
United States	8,184
United Kingdom	66
China	46
Canada	33
India	24
France	19
Germany	17
Australia	15

## TOP STATES

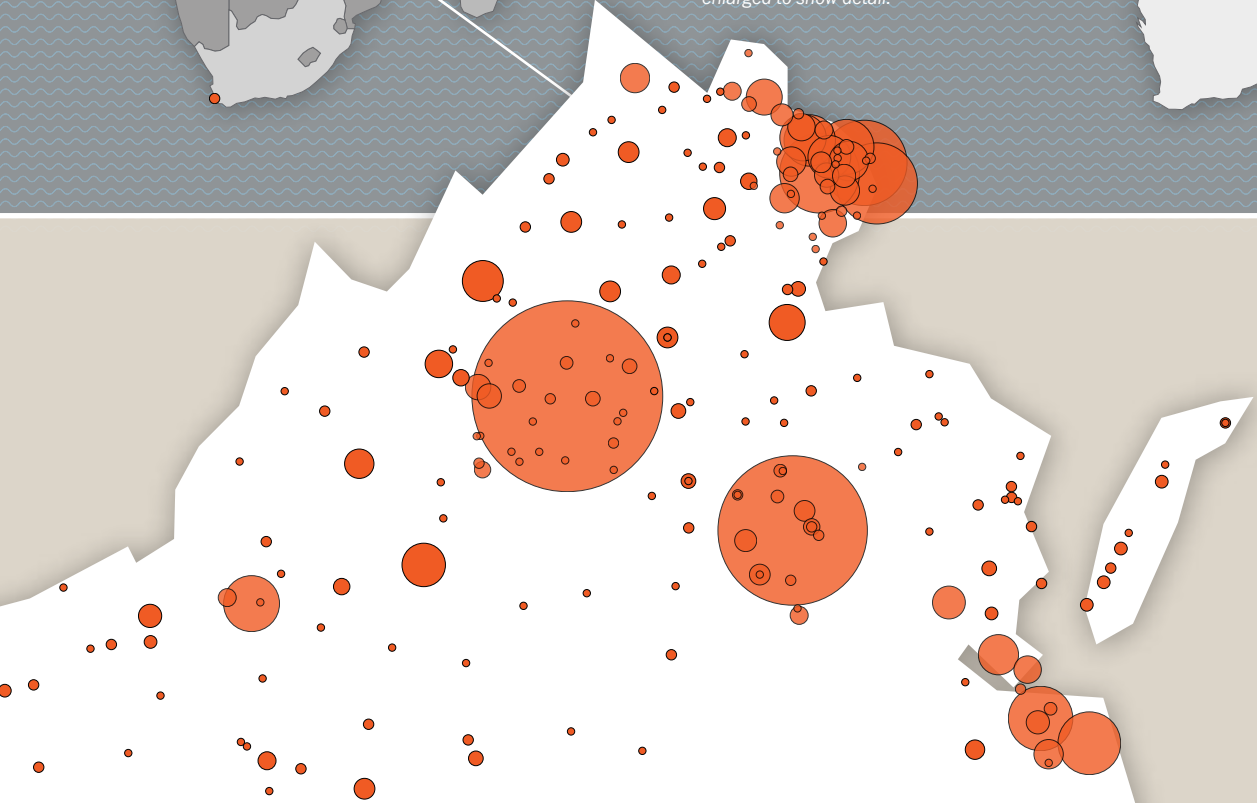
Virginia	2,944
California	520
New York	511
North Carolina	357
Maryland	336
Georgia	309
Texas	279
Pennsylvania	268

## TOP CITIES

Charlottesville, VA	675	Boston, MA	97
Richmond, VA	415	San Francisco, CA	91
Washington, DC	356	Los Angeles, CA	87
New York, NY	344	Chicago, IL	82
Atlanta, GA	203		
Arlington, VA	135		
Fairfax, VA	129		
Alexandria, VA	122		



**SCALE OF WORLD MAP**  
*The size of each circle is proportional to the number of ventures in a city (or a country, for ventures outside of the United States). The smallest circle indicates one venture and the largest one 675. Maps of the United States and Virginia have been enlarged to show detail.*



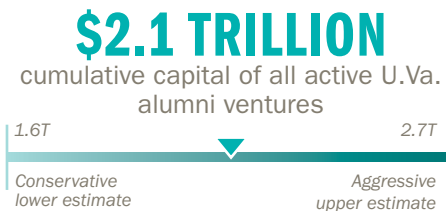
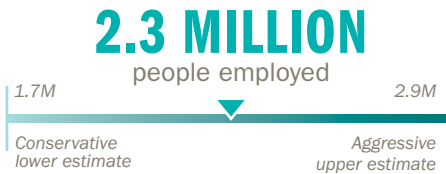
**VIRGINIA CITIES**

Charlottesville	675
Richmond	415
Arlington	135
Fairfax	129
Alexandria	122
Norfolk	77
Virginia Beach	73
McLean	60



# What Is the Economic Impact of those Ventures?

## WORLDWIDE IMPACT OF ACTIVE ALUMNI VENTURES



If our survey is a representative sample of all alumni, a simple extrapolation would suggest that entrepreneurial U.Va. alumni have been directly involved, in the four different roles, with the creation of close to 65,000 ventures, approximately 38,000 of which are still active. If we consider only founders and exclude investors, board members, and early employees, U.Va. alumni have started 21,000 currently active firms, which is respectable compared with Stanford (39,900 active firms) and MIT (25,800 active firms). In Virginia, U.Va. alumni have created, in different roles, about 21,000 ventures (out of the 65,000 worldwide), and 13,000 of those are estimated to be currently in operation. 22% of these Virginia ventures were started by alumni who had been out-of-state students at matriculation.

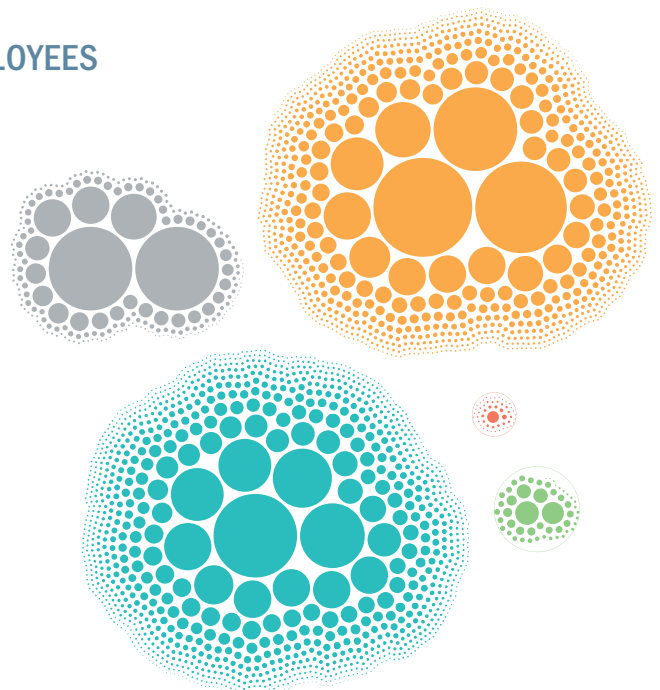
Across the 8,979 ventures for which alumni provided data, ventures employed 75 people on average during the period of their greatest employment.<sup>13</sup> At the top end of the distribution were five businesses employing 10,000 or more employees each. The vast majority of ventures employed less than ten people. In total, active ventures started by entrepreneurial alumni in our survey employed over 232,000 people. Extrapolating out to the entire population of U.Va. alumni suggests that close to 2.3 million people have been employed worldwide by ventures in which U.Va. alumni are involved.

Examining the localized effects of these efforts, alumni-started ventures employed 50 people on average in the state of Virginia during the period of their greatest employment, with the largest employer providing jobs to 6,000 people. Total Virginia employees reported in the survey equaled 52,000, and extrapolation indicates that almost 371,000 Virginians work in alumni ventures.

## NUMBER OF EMPLOYEES by Venture Type

The size of a circle represents the number of employees in a venture. The smallest circle indicates one employee and the largest one 12,000.

- INCORPORATED COMPANY
- PARTNERSHIP
- INFORMAL
- NON-PROFIT
- FRANCHISEE
- NOT REPORTED



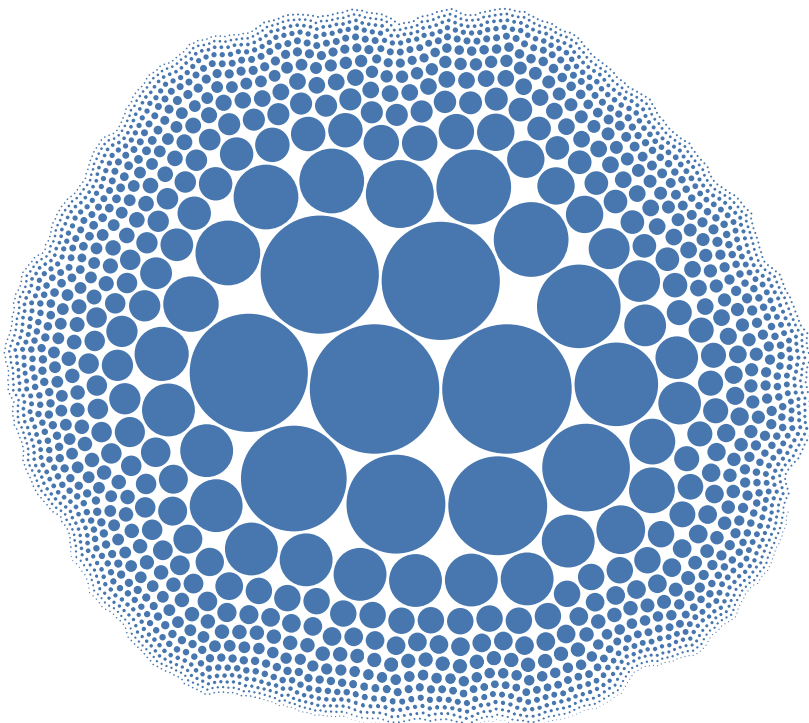
<sup>13</sup> The period of greatest employment for the vast majority of ventures was the year they were surveyed.

<sup>14</sup> As with employment, the period of greatest revenue tends to be the most recent year.

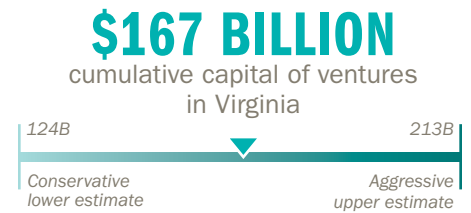
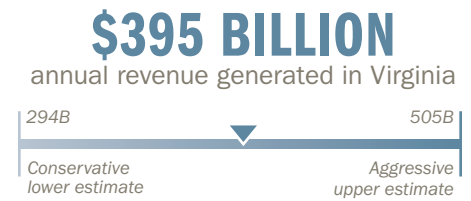
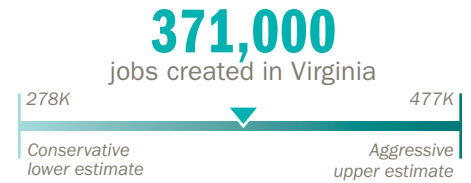
Turning our attention to revenues, alumni ventures in our survey generated \$36.8 million in annual worldwide revenues on average during their best year.<sup>14</sup> 37 ventures generated over a billion dollars of revenue, with five organizations generating more than \$8 billion in revenue. In total, survey respondents indicated that their active firms generated over \$133 billion in annual revenues. Extrapolation to the entire population of U.Va. alumni suggests closer to \$1.6 trillion of revenue generated. Focusing on the regional effects, active U.Va. alumni ventures headquartered in the Commonwealth generated an estimated \$395 billion in annual revenue.

Expenditures are another way that ventures contribute to their local and national economies. Spending on goods and services drives economic growth up the supply chain and has spillover effects in job creation. Active alumni ventures in our survey spent \$74 billion annually. Alumni-started ventures in the state of Virginia alone spent over \$25 billion. Extrapolating these data indicates that worldwide expenditures exceed \$898 billion and Virginia firms spent upwards of \$279 billion. While it is likely that not all of these monies were spent within the Commonwealth, it is a safe bet that many of the dollars flowed to other enterprises within the state.

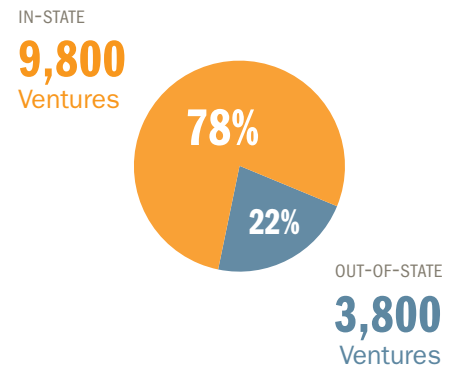
Finally, looking at capital, active businesses started by entrepreneurial alumni in our survey from U.Va. generated close to \$111 billion cumulatively. In addition, non-profit organizations raised donations of over \$8 billion. Many of these dollars flowed into the Commonwealth, given the location of their corporate headquarters.



## IMPACT OF ACTIVE ALUMNI VENTURES IN VIRGINIA



## VA VENTURES: Alumni Residency Status at Matriculation



# Conclusion

## EXTRAPOLATION METHODOLOGY

For aggregate statistics in the report, estimation methods were necessary to account for alumni without response data. Scaling factors yielded the estimates included in this report. The scaling factors hinge on the assumptions that, a) the levels of entrepreneurial activity and success are similar between survey respondents and non-respondents, and b) respondents included information about all of their entrepreneurial activities. All estimates are derivations of the survey data, and no external data (patent filings, high-profile company filings, etc.) were used. The survey did not force responses, and approximately one-third of respondents omitted employment, revenue, and expenditure data. We populated the missing data with the mean of the existing data based on organization type. Through analysis of the response data and comparison with high-profile alumni data, we concluded that a scaling factor of 7.2 is reasonably prudent to accommodate response bias and missing data. We have included aggressive (9.2) and more conservative (5.4) scaled extrapolations that put our estimations in context. Our estimates for economic impact are derived from the organizations that respondents indicated were still in operation.

Universities add value to their local community and broader region in a number of ways. The entrepreneurial efforts of university alumni are an important, yet often ignored, way in which universities help support the creation of jobs and economic growth. In some cases, alumni ventures grow directly out of the laboratories and research at the University and are reflected in reports on university licensing. In most cases, however, universities have no intellectual property claims on alumni ventures.

In this report, we analyze the impact of entrepreneurial alumni from the University of Virginia. They reported creating close to 9,000 ventures. Extrapolating from our survey sample to the population of U.Va. alumni as a whole suggests those numbers may be closer to 65,000 ventures, of which 38,000 are still active, employing 2.3 million people and generating \$1.6 trillion in annual worldwide revenues.

Within the Commonwealth of Virginia, entrepreneurial alumni reported creating nearly 3,000 ventures that employed over 90,000 people within the state. Extrapolated, Virginia ventures generated revenues of about \$395 billion and 371,000 jobs. When one considers the \$154 million annual expenditure by the Commonwealth on the University of Virginia, these numbers suggest a substantial return on investment from just entrepreneurial alumni of the University, even ignoring all other ways the University creates value.

Of course, these individuals may have started ventures regardless of where, or even if, they received a college education. It is beyond our current analysis to resolve this possibility. However, it is interesting to note that much of the entrepreneurial activity of U.Va. alumni is concentrated within the Commonwealth. Given that the University of Virginia enrolls a sizable number of out-of-state students (27% in 2013), the University may be acting as a talent attractor, bringing in high-performing students who are then more likely to remain and start ventures in the Commonwealth. It is further interesting to speculate how many Virginians would leave the state to attend college if they were not admitted to the University of Virginia. Once again, given the tendency for localization of ventures founded by entrepreneurial alumni, this retention may increase the overall number of start-ups within the state.

This research seeks to uncover one of the many ways that universities generate value for their students, their regional economic ecosystems, and the global business environment. Alumni have launched thousands of firms and created millions of jobs, which is only a fraction of the many ways that university students bring value to the world. Future research focused on understanding which attributes of the university experience help evolve students' entrepreneurial prowess could provide useful insights for all educational institutions' ability to cultivate new entrepreneurs.

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