ENTREPRENEURSHIP & ACCELERATION

Questions from the Field

Photo by John-Michael Mass/Darby Communications

Intellectual Property | March 2017

"In our work, we see that science and technology-based startups face different challenges and need different resources than other ventures. In your data, how do teams with intellectual property differ from those without? We are specifically interested in the roles of geography, education, team size and gender composition."

—Thema Monroe-White
Director of Research and Evaluation, VentureWell

Thanks for the question, Thema.

The emergence of accelerators in the mid-2000s coincided with the "lean startup" era, as innovation in technology shifted from hardware-based companies toward software, which requires relatively less investment to bring to scale.[1] This leads us to wonder the extent to which accelerators are drawing in companies with intellectual property, and what types of science and technology-based startups they are attracting. In this data brief, we explore patterns among invention-based ventures using data from the Entrepreneurship Database Program.

[1] Miller, P. and Bound, K. (2011) The Startup Factories: The rise of accelerator programmes to support new technology ventures.

EMORY | GOIZUETA BUSINESS SCHOOL
SEG SOCIALENTERPRISEGOIZUETA
Aspen Network of Development Entrepreneurs | THE ASPEN INSTITUTE

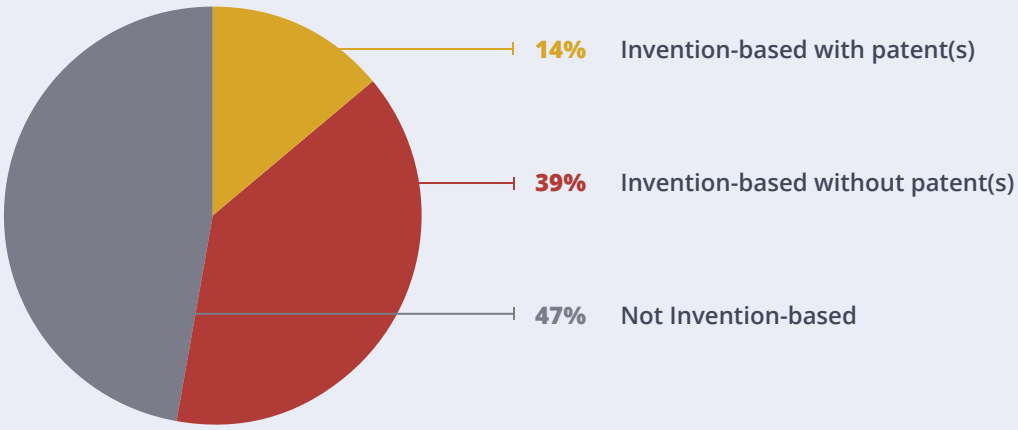
About the sample

Since 2013, the Entrepreneurship Database Program at Emory University has been systematically collecting data from entrepreneurs who apply to one of many participating accelerator programs. The data used in this analysis come from 4,125 ventures that applied to 55 programs run between 2013 and 2015.

In surveys administered to entrepreneurs when they apply to accelerator programs, we ask two questions related to intellectual property. First, we ask whether the venture is invention-based (i.e., a company that builds upon newly-created technology owned by the venture and/or its founders). Second, we ask whether the venture has any patents. Figure 1 shows that the majority of our current sample self-report as being "invention-based," while only 14% of those entrepreneurs report having any patents. In the following brief, we use these two categories—'invention-based with patent(s)' and 'invention-based without patent(s)'—to discern how ventures with varying degrees of intellectual property differ from the rest of the sample.

INVENTION-BASED VENTURES AND PATENT STATUS

◀ *figure 01* ▶



Science and Technology-Based Startups

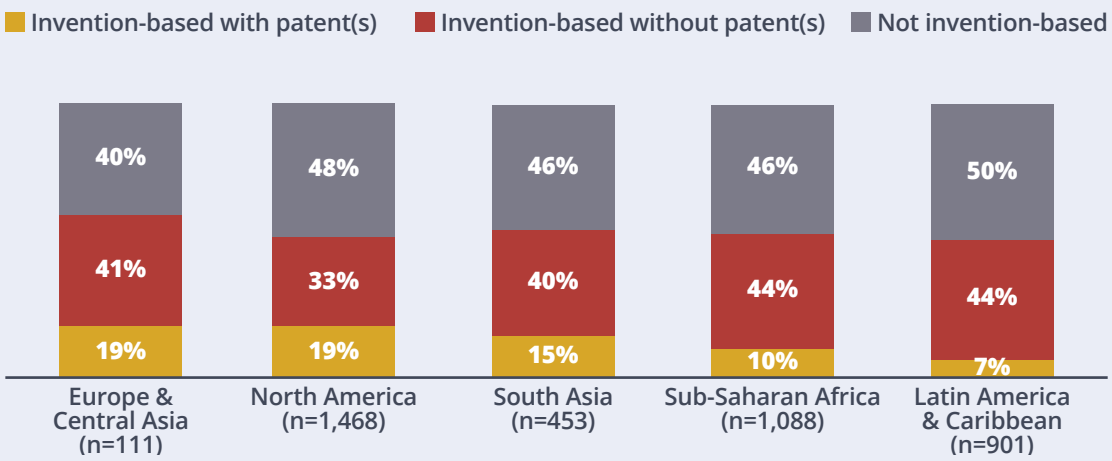
To determine how the 'invention-based' and 'has patents' variables serve as proxies for "science and technology-based startups," we drew a random sample of 25 ventures from each 'invention-based' group in Figure 1 and looked at their mission statements and operational models. Ventures that are invention-based and have patents mostly focus on production/manufacturing and slightly less on services. Many of their mission statements mention tangible products (examples being clean cookstoves, batteries or medical devices). Conversely, invention-based ventures without patents focus largely on services and refer to software-based products like online fundraising platforms, mobile education, and business intelligence. Within the sample of ventures that are not invention-based, 4% hold patents and have mission statements discussing a range of offerings such as skincare products, enterprise resource planning, and protection from urban pests. These ventures remain in the "Not invention-based" category for the analyses presented here.

Invention-Based Ventures and Patent Status by Region and Sector

Figure 2 displays the percent of ventures in different regions of the world that report to be invention-based, with and without holding patents. While the majority of ventures in each region claim to be "invention-based," North America and Europe & Central Asia have the largest proportions of patent holders. However, these contrasts likely mask differences in the sectors that are most prominent in our sample for each region (see Figure 3).

PERCENT OF VENTURES THAT ARE INVENTION-BASED AND HAVE PATENTS BY REGION[2]

◀ *figure 02* ▶

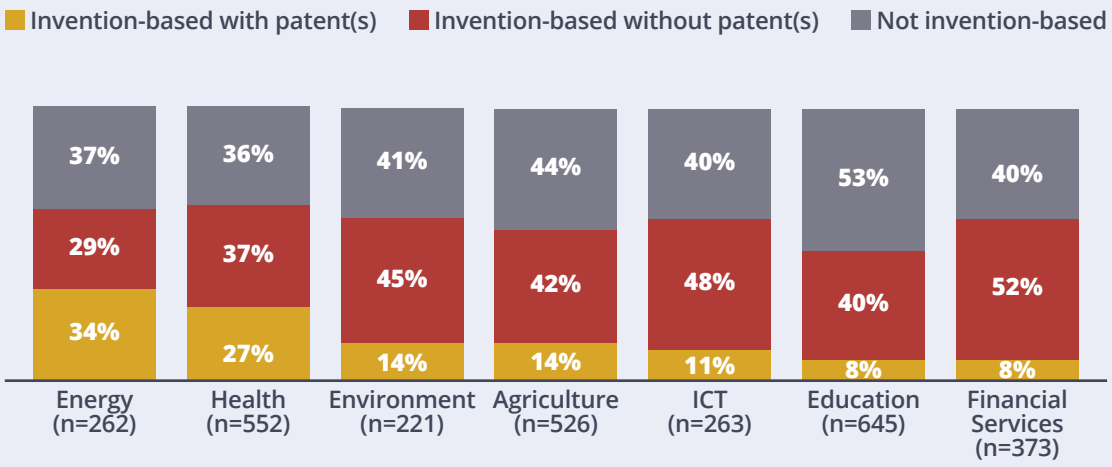


[2] Figure 2 includes World Bank regions that house at least 100 ventures in our sample.

The Energy and Health sectors house the highest percentages of invention-based ventures with patents (Figure 3). At the other extreme is the Financial Services sector, where 60% of ventures report to be invention-based, but only 8% report holding patents. We can surmise that sectors with higher proportions of invention-based businesses with patents are more likely to be hardware-based (such as in the Energy sector), and sectors with lower proportions of patents may be software based, such as Fintech companies in the Financial Services sector.

PERCENT OF VENTURES THAT ARE INVENTION-BASED AND HAVE PATENTS BY SECTOR[3]

◀ *figure 03* ▶



The Implications of Founding Team Composition

Next, we examine how these groups of ventures differ based on founding team characteristics (Table 1). More than two-thirds of invention-based ventures are founded by multiple individuals, slightly more than non-invention-based ventures. Surprisingly, only (roughly) 20% of the teams in all three groups have at least one graduate degree holder on the team. The most salient pattern is in the gender composition of teams. The percentage of ventures with at least one woman on the founding team decreases with invention intensity, from 55% of non-invention-based ventures to only 37% of patent-holding enterprises.

INVENTION-BASED MODEL AND PATENT STATUS BY TEAM MAKEUP

◀ *table 01* ▶

	FOUNDED BY TEAM (VS. SOLO FOUNDER)	AT LEAST ONE GRADUATE DEGREE (VS. NONE)	WOMAN ON TEAM (VS. ALL-MALE TEAM)
Invention-based with patent(s)	75%	23%	37%
Invention-based without patent(s)	78%	20%	48%
Not invention-based	71%	22%	55%

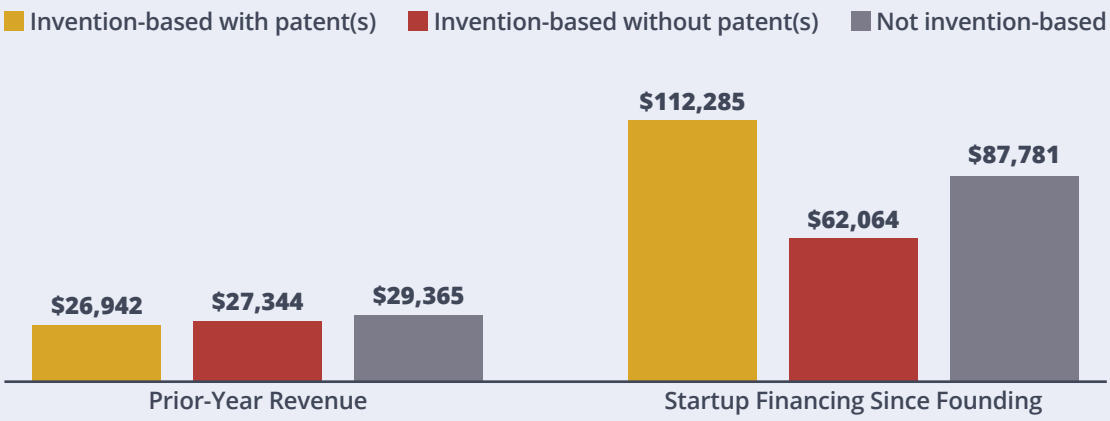
[3] Figure 3 includes sectors in which at least 200 ventures in our sample operate.

Implications for Early-Stage Revenues and Financing

The next step is to examine whether having an invention-based business model or patent correlates with observed differences in venture performance. Figure 4 shows that there are virtually no differences across the three groups when it comes to prior-year revenues. However, we see some variance in the amount of startup financing (the combination of equity, debt and philanthropy) raised to date. Here, invention-based ventures without patents raised the least outside investment (roughly $60,000 on average) while those with patents raised the most (over $110,000).[4]

AVERAGE OF PRIOR-YEAR REVENUES AND STARTUP FINANCING TO DATE

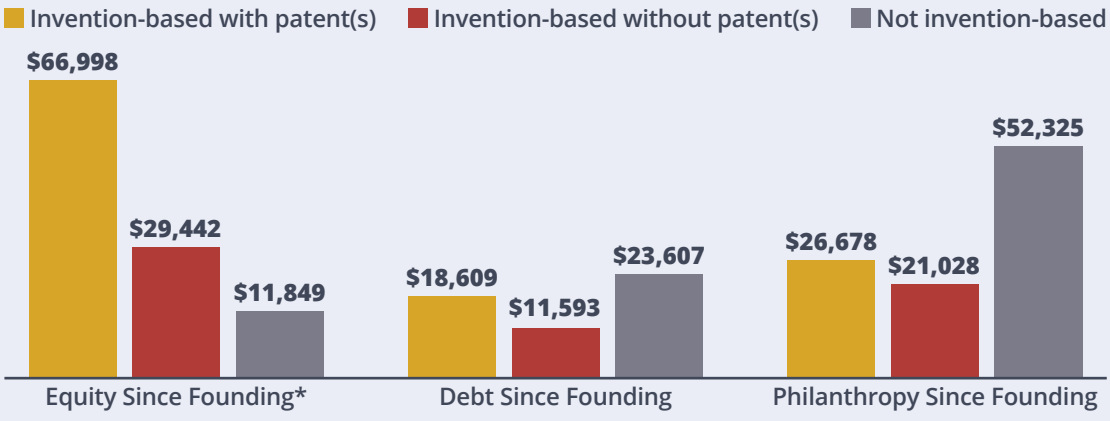
◀ *figure 04* ▶



Breaking down total start-up financing into its equity, debt, and philanthropy components, we see that patent-holders raised an average of over $65,000 in equity, twice as much as non-patent holders and over five times that of non-invention-based ventures (Figure 5). Patents and invention-based models seemed to decrease the likelihood of philanthropic capital and debt funding, though the differences are not statistically significant.

STARTUP FINANCING SINCE FOUNDING

◀ *figure 05* ▶



*Significant at the p<.05 level.

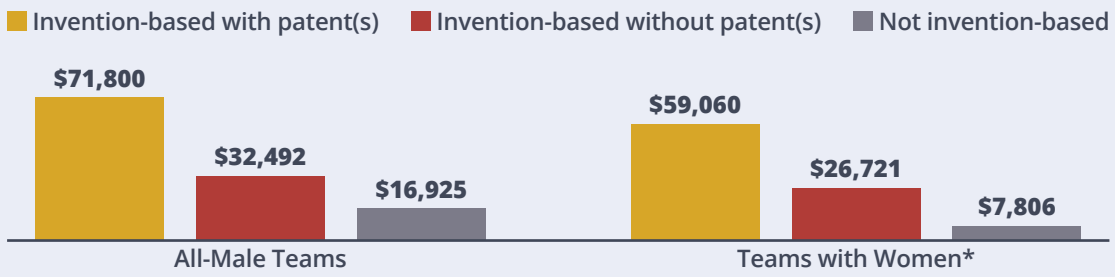
[4] More than 100 companies reported prior-year revenue or startup financing (philanthropy, debt, or equity) that were identified as outliers and excluded for the analysis of Figures 4-7.

Gender Equity Bias and Intellectual Property

We saw in a previous "Question from the Field" that founding teams with women raise less equity investment on average than teams comprised of all men.[5] Is this gender equity bias similar for teams with and without intellectual property? While in general patent-holding teams with at least one woman founder raised less than all-male teams, there is some evidence that intellectual property may narrow the gender gap (Figure 6). Among non-invention-based ventures, all male teams raised more than double the equity of their mixed-gender counterparts. However, among patent holders, the all-male teams raised an average of only 20% more.

EQUITY RAISED SINCE FOUNDING BY INVENTION-BASED STATUS AND GENDER

◀ *figure 06* ▶



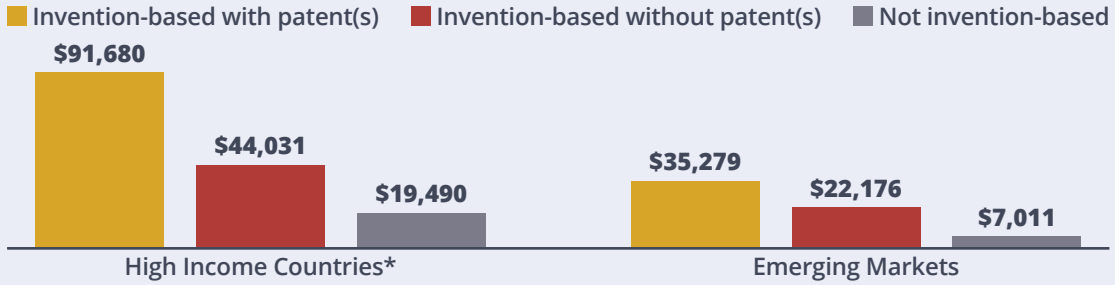
*Significant at the p<.05 level (for all-male teams, the difference between non-invention-based ventures and invention-based ventures without patents was not significant)

Equity Raised by Invention-based Ventures by Country Income Group

To address how geography plays a role in support for science and technology-based ventures, we examined whether the equity advantage experienced for invention-based ventures with patents (see Figure 5) holds when we divide our sample into ventures that operate in High Income countries versus Emerging Markets (Figure 7).[6] In both groups, invention-based ventures with patents raised more equity on average than other ventures. However, the gap between invention-based ventures with and without patents is considerably larger in High Income countries.

EQUITY RAISED SINCE FOUNDING BY INVENTION-BASED STATUS AND COUNTRY INCOME CATEGORY

◀ *figure 07* ▶



*Significant at the p<.05 level (in Emerging Markets, the difference between invention-based ventures with and without patents was not significant)

[5] Entrepreneurship and Acceleration: Questions from the Field (Gender & Entrepreneurship). August 2015.

[6] The categories in Figure 7 are based on 2013 World Bank country income classifications.

What does this mean?

Thema posed a question that is on the mind of many people who are interested in accelerating early-stage entrepreneurship around the world: To what extent does a focus on invention and intellectual property matter when it comes to supporting entrepreneurs and ventures? While the patterns in this brief are preliminary, they do raise important questions:

1. Invention-based ventures that have patents perform better than the rest of the sample when it comes to raising equity, but also raise less philanthropic capital. Since philanthropic capital has been found to be critical at the early stage,[7] does this suggest important gaps or differences for invention-based ventures?
2. The proportion of teams with at least one woman founder is smaller among ventures with invention-based models and patents. What are the deterrents from women engaging in science and technology-based startups, and what are the potential benefits of increasing gender diversity within these teams?
3. Ventures with patents in High Income countries raised more than 2.5 times the equity of their Emerging Market-based counterparts. Could this indicate a potential funding gap for science and technology-based ventures in Emerging Markets?

We hope these insights allow for a better understanding of early-stage science and technology-based ventures. As we continue to collect data, we will address more questions about trends in the field of entrepreneurship and acceleration.

Global Accelerator Learning Initiative

The Global Accelerator Learning Initiative (GALI), a collaboration between ANDE and Emory University, is designed to explore—and answer—key questions about enterprise acceleration such as: Do acceleration programs contribute to revenue growth? Do they help companies attract investment? GALI builds on the Entrepreneurship Database Program at Emory University, which works with accelerator programs around the world to collect and analyze data describing the entrepreneurs that they attract and support. These data also provide an opportunity to explore interesting questions around early-stage entrepreneurship, such as the topic discussed here.

GALI

To learn more about GALI, please visit www.galidata.org.

The Global Accelerator Learning Initiative has been made possible by its co-creators and founding sponsors, including the U.S. Global Development Lab at the U.S. Agency for International Development, Omidyar Network, The Lemelson Foundation and the Argidius Foundation. Additional support for GALI has been provided by the Kauffman Foundation, Stichting DOEN, and Citibanamex.

[7] Dichter S., Katz R., Koh H., & Karamchandani, A. Closing the Pioneer Gap. Stanford Social Innovation Review. Winter 2013.