# ENTREPRENEURIAL MIGRATION: THE LOCATION CHANGES OF HIGH GROWTH ENTREPRENEURS IN THE UNITED STATES

*Application Statement for the 2017-2018 NBER Entrepreneurship Post-Doc*

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Entrepreneurship creates economic growth (Schumpeter, 1942; Aghion and Howitt, 1992; Davis and Haltiwanger, 1992; Haltiwanger et al, 2013; Glaeser et al, 2014; Akcigit and Kerr, 2010; Klette and Kortum, 2004). Yet, not all firms contribute equally to this growth. The growth rate and outcomes of startups are skewed, with a small proportion of firms accounting for most economic production (Dunne, Roberts, and Samuelson, 1988; Hall, 1987; Kaplan and Lerner, 2010; Decker et al, 2014). While economics as a field has historically attributed this skewness to a process of "random growth" on a log-normal distribution (Gibrat, 1931; Cabral and Matta, 2003), the view amongst entrepreneurship researchers has consistently been that this variation is not random, but a reflection of differences in the underlying "quality" of firms. In recent work, Schoar (2010) and Hurst and Pugsley (2011) make a compelling case on the importance of accounting for this heterogeneity in ex-ante firm potential: when entrepreneurial quality is not accounted for, "many policy interventions may have unintended consequences and may even have an adverse impact on the economy" (Schoar, 2010). Notwithstanding this call to action, systematic strategies to account for firm quality appear, to date, elusive[1]. How can differences in startup potential be measured?

In my dissertation, I break through this impasse by developing a novel approach to measure entrepreneurial quality systematically, in an economy, through the use of predictive analytics and business registration records. Business registration records are a new source of business information that allow me to observe a quasi-population of firms with growth intention. The approach uses firm characteristics and growth outcomes to create estimates of the predicted likelihood of achieving growth given a firm's characteristics at founding. The estimates turn out to be highly informative: in multiple out of sample tests, we find that around 70% of the firms that eventually growth are in the top 5% of the predicted quality distribution, and over 40% of them in the top 1%. The estimates also document substantial skewness in entrepreneurial quality: for example, in our main model, a Delaware corporation with a patent and a trademark—which is at the high end (but not the highest) of our quality distribution—is 5287 times more likely to grow than a local LLC. The relationship of these estimates to other outcomes, such as

[1] For example, as recent as 2014, Hathaway and Litan responded to calls to account for this heterogeneity by stating that "The problem is that it is very difficult, if not impossible, to know at the time of founding whether or not firms are likely to survive and/or grow. This is true even with venture-capital backed firms" (Hathaway and Litan, 2014).

employment, and their precise relationship to "true" quality, are results I am in the process of developing.

Since this agenda on entrepreneurial quality started, there has been blossoming of high impact co-authored research projects of which I am part of. Two initial papers developed the methodology and are already published ("Where is Silicon Valley", with S. Stern, 2015; "Nowcasting and Placecasting Entrepreneurial Quality and Performance", with S. Stern, 2016a). Two more are complete working papers, and working through the review process. The first uses this data to measure entrepreneurship in the United States ("The State of American Entrepreneurship: Evidence from 15 US States. 1988-2014". with S. Stern, 2016b); the second documents the interplay between firm quality and gender to estimate the gender gap in VC financing ("Gender Gap in Entrepreneurship. with A. Kacpcerzyk, 2016). Three more are early stage projects with results at different stages of development, and which we expect to have soon as working papers. The first of these focuses on the quality of venture-backed firms ("Entrepreneurial Quality and Venture Capital". with C. Catalini, and S. Stern, 2016); the second on the shape of the entrepreneurial quality distribution ("Zipf's Law in Entrepreneurial Quality". with S. Stern, 2016); and the third on the quality and potential of U.S. regions ("The Entrepreneurial Quality and Quantity of U.S. Regions". with S. Stern, 2016).

This proposal—and the purpose of a post-doc at the NBER—is to focus on an independent, single-authored, agenda I have in this area: entrepreneurial migration. It is composed of three interrelated projects. The first paper ("Entrepreneurial Migration"), is the third chapter of my dissertation, a descriptive paper containing the basic facts on the migration of high growth entrepreneurs. The second ("Location Choice and Entrepreneurial Performance") is my (anticipated) job market paper, which focuses on the role of location as part of entrepreneurial strategy and its effect on firm performance. And the third ("Entrepreneurial Migration and Regional Dynamics") is early work on the role of migrating entrepreneurial firms on the evolution of regions. I describe this agenda, and the first two papers, in the next section.

***The Entrepreneurial Migration Agenda***

According to Marshall (1890) location benefits firms by reducing the transportation costs of employees, ideas, inputs, and customers. There exists convincing evidence that these location effects are real and improve firm productivity (Ellison et al (2011), Delgado et al (2014), and Combes et al (2014)). Much less is known about the process through which firms choose their location. The main theoretical models of agglomeration—such as Roback (1982), Krugman (1991), or Duranton and Puga (2004)—assume firm location is fixed and that it is the mobility of workers (with no migration costs) that leads to agglomeration in regions. Workers certainly migrate but assuming firms do not migrate requires one of two conditions: either entrepreneurs have perfect foresight in their location choices and always match the initial location and the ideal location—something workers do not do—, or the migration costs are orders of magnitude higher for entrepreneurs than for workers, making it impossible for them to move once a firm is founded.

Consider the case of Microsoft. Bill Gates and Paul Allen started their company in Cambridge, Massachusetts. They quickly moved to Albuquerque, New Mexico, to follow their first customer. However, a few years later, they realized they where having trouble hiring and moved to Redmond, Washington, which offered a better software engineering labor force and where they also grew up.

Location was important to Microsoft, but it was not fixed, it changed through time[2]. When and where to locate where strategic choices for Microsoft, which depended on the vision Bill Gates and Paul Allen had for their firm (later summed up as "a computer in every desk and in every home, running Microsoft software") and the importance of a talented engineering labor force to achieve it. Microsoft's migration also had an impact on its destination. After moving to Redmond, Microsoft hired engineers who relocated into the Seattle area, and invested in the computer science department at the University of Washington. In all likelihood, this was helpful in creating today's booming software cluster in the area.

To what extent is migration an important phenomenon in high growth entrepreneurship? What is the role of migration in entrepreneurship strategy and regional dynamics? Bridging the gap between the real-world phenomena of migration and its paucity in research is the focus this agenda.

In "Entrepreneurial Migration"—the third chapter of my dissertation—I do an initial exploration of migration in high growth entrepreneurship in the United States. To do so, I develop a new dataset using business registration records and entrepreneurial quality estimates that allows me to track the inter-state migration of firms that exhibit a simple signal of high growth intention—incorporating under Delaware jurisdiction. The dataset includes measures of the quality of the firms, and of the entrepreneurial quality, entrepreneurial quantity, and entrepreneurial potential (quality-adjusted quantity) of source and destination regions. It covers 30 US states, representing 70% of the U.S. by 2013 GDP, and represents all Delaware corporations, partnership, and limited liability companies founded between 1988 and 2012 in those states.

This paper documents several interrelated facts. First, migration is common amongst high growth firms (registered in Delaware). Over their first 15 years, 14% of firms eventually migrate. Second, most of this migration is entrepreneurial, and the risk of migration decreases monotonically over time. Third, controlling for differences between region of birth, firms of higher entrepreneurial quality are more likely to migrate. And fourth, including region and year fixed effects, increases in the entrepreneurial potential (quality-adjusted quantity) of destination regions predicts higher migration to that region in the subsequent year, while increases of only the quantity of firms does not. Figure 1 of this proposal shows the distribution of migrants and their average quality for the largest MSAs in my sample. Table 1 shows one of the main relationships in the paper—that between the entrepreneurial ecosystem of a region (its quality and quantity) and the rate of migration into that ecosystem (Fact 4).

[2] A few other examples of entrepreneurial migrants include Amazon.com, Netscape, Facebook, Wal-Mart, Shockley Semiconductor, and Dropbox.

My (expected) job market paper "Location Choice and Entrepreneurial Performance" builds on this agenda to study the role of migration on the performance of firms. Firms can choose and change location, with inherent costs and benefits in doing so—such as the loss of local relationships or the gain of a more useful ecosystem. The role of this choice as part of entrepreneurial strategy is yet to be explored.

In Figures 2 and 3 of this proposal, I present results using matched pairs of migrants and non-migrants born in the same year and region, and with similar quality. These results are simply an early exploration, and I expect soon to have a compelling identification strategy.

In Figure 2 I compare for each group the incidence of two outcome measures—achieving an equity growth outcome (IPO or acquisition), and raising venture capital financing. Migrants are more likely to achieve both outcomes than non-migrants. 2% of the non-migrant firms achieve equity growth, and 3.5% of them get venture capital financing. However, almost 6% of migrant firms achieve equity growth, and 6% receive venture capital. In Figure 3 I focus on the ability of firms to develop two types of intellectual property assets: patents, a proxy for the development of "new to the world" technologies, and trademarks, a proxy for new products or services with consumer value. Once again, the outcomes are much higher for migrants than non-migrants. 3% of non-migrants file a patent and 9% file a trademark, while 6% of migrants file a patent and 16% a trademark.

Though these results are exploratory, the relationships are intriguing. I soon intend to complement my dataset with employment, revenue, and productivity outcomes from the US Census Longitudinal Business Dataset (LBD), to which I will gain access over the next couple of months[3].

My goal for an NBER post-doc is to allow me to push this agenda forward. I believe this post-doc will be beneficial in allowing me the time and focus to do so independently in a strong community of research scholars, while also allowing me to develop a better sense of the place of my research within the community, and would be an important step in my career, before I move into an assistant professor position.

Thank you for considering my application.

[3] Specifically, I am part of a project with Mercedes Delgado which was approved in September of this year. I have already submitted my US Census Sworn Status paperwork, and we are expecting IRS approval soon.

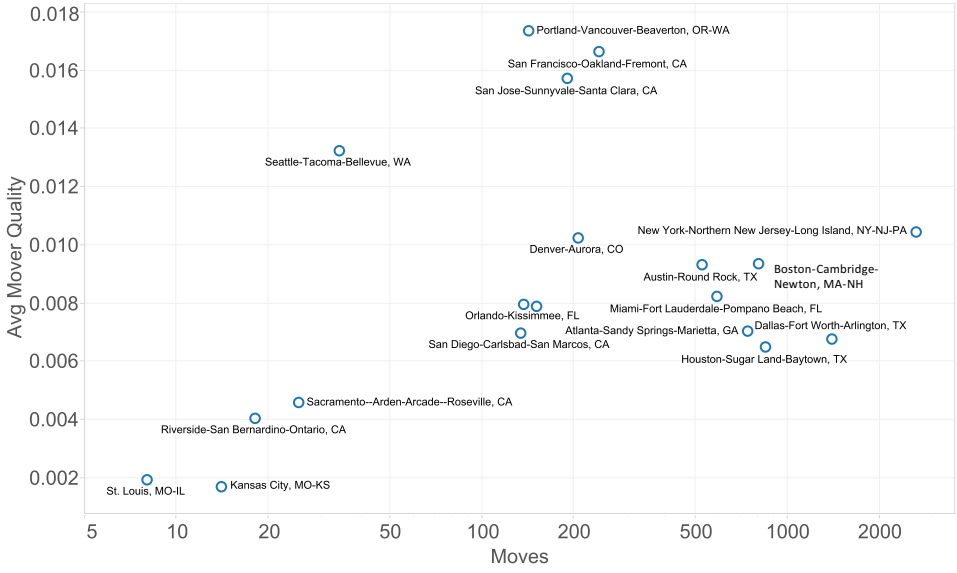
## TABLE 1

The Effect of Entrepreneurial Quality and Quantity on Migration Rates.
Quasi-Maximum Likelihood Poisson
Dependent Variable: Number of Migrant Firms to MSA in t+1
Strongly balanced panel of 165 MSAs 1988-2012

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Ln(MSA Entrepreneurial Quality) | 0.502** | 0.273** | | | | |
| | (0.126) | (0.0680) | | | | |
| Ln(MSA Entrepreneurial Quantity) | | | 0.956** | 0.398 | | |
| | | | (0.0808) | (0.250) | | |
| Ln(MSA Entrepreneurial Potential) | | | | | 0.406** | 0.368** |
| | | | | | (0.105) | (0.160) |
| MSA Fixed Effects | No | Yes | No | Yes | Yes | Yes |
| Other Ecosystem Measures as Controls | No | No | No | No | No | Yes |
| N | 4038 | 3988 | 4038 | 3988 | 3988 | 770 |
| Log-Likelihood | -26320.0 | -4778.0 | -10723.7 | -4766.6 | -4721.8 | -1150.7 |

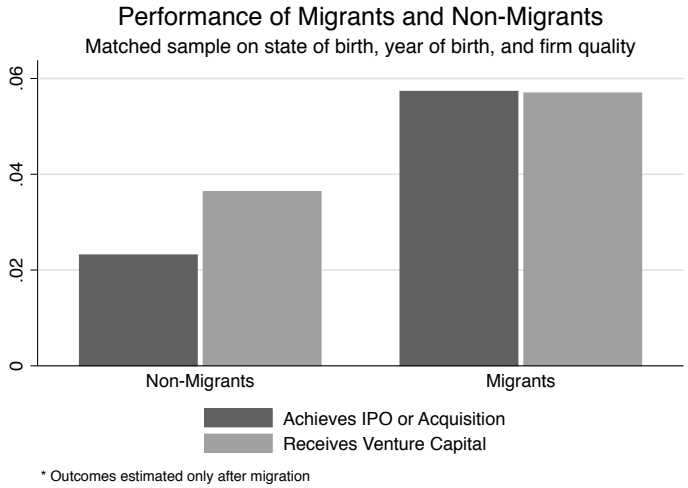
Panel of 165 MSAs developed through the use of business registration records and entrepreneurial quality measures. Entrepreneurial quality is the predicted probability of growth at firm birth. MSA Entrepreneurial Quality is the average for the MSA and year. MSA Entrepreneurial Quantity is the count of firms. MSA Entrepreneurial Potential is the quality-adjusted quantity; mathematically, the product of quality and quantity. Other ecosystem measures only exists after 2003, and include a measure of "Bohemia" (Florida, 2003), MSA GDP, venture capital, cost of living, and patenting. All regressions include year fixed effects. Standard errors clustered at the MSA level. * p < .1 ** p < .05.

## FIGURE 1



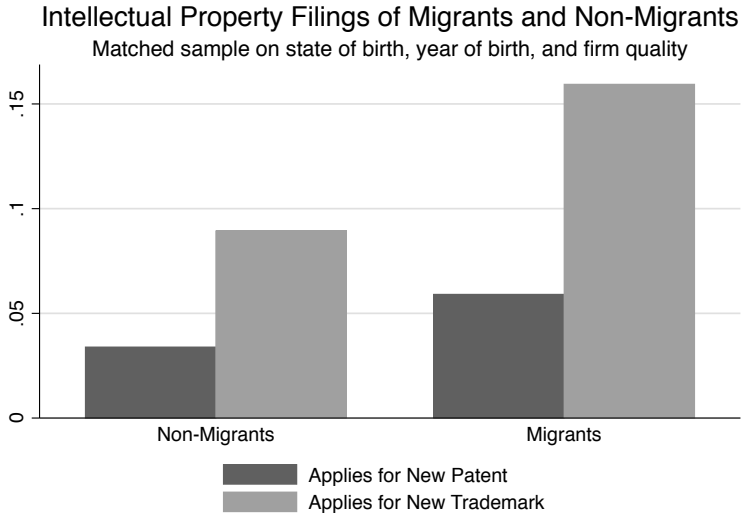

Note: Figure indicates the total number of movers into a region for the largest regions in the business registration sample. It is possible to appreciate size effects as well as quality effects. While the quality and number of migrants is correlated, there are multiple outliers. It is possible to appreciate the large number of high quality migrants to San Francisco Bay Area, including both the San Francisco-Oakland-Fremont, CA MSA, and the San Jose-Sunnyvale-Santa Clara, CA MSA.

## FIGURE 2




Note: This figure compares the outcomes of migrants and non-migrants in a matched sample. The matching approach finds, for each migrant, a non-migrant born in the same state and year, and in the same percentile of the quality distribution of Delaware firms. The outcomes IPO or acquisition are estimated through a matching procedure with SDC Capital and attained after migration. Venture capital data is downloaded from Thompson Reuters VentureXpert.

## FIGURE 3




Note: This figure compares the outcomes of migrants and non-migrants in a matched sample. The matching approach finds, for each migrant, a non-migrant born in the same state and year, and in the same percentile of the quality distribution of Delaware firms. The outcomes are downloaded from the USPTO Office of the Economist files.

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# JORGE A. GUZMAN

*Curriculum Vitae*

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## PERSONAL INFORMATION

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**MIT Sloan School Of Management** — Cambridge, MA
*Master of Business Administration (MBA)* — 2009 - 2011

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*B.S. Computer Engineering* — 2002 - 2006

## ACADEMIC PUBLICATIONS

*Published Papers*

Guzman, Jorge and Scott Stern. 2015. "Where is Silicon Valley?" *Science.* 347(6222): 606-609

Guzman, Jorge and Scott Stern. 2016. "Nowcasting and Placecasting Entrepreneurial Quality and Performance". *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*. Eds. John Haltiwanger, Erik Hurst, Javier Miranda, and Antoinette Schoar. University of Chicago Press. 1st Edition. *Forthcoming.*

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*Working Papers*

Guzman, Jorge. 2016. "Entrepreneurial Migration". MIT Working Paper.

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Guzman, Jorge and Aleksandra (Olenka) Kacperczyk. 2016. "Gender Gap in Entrepreneurship" MIT Working Paper.

*In-Process Papers*

Guzman, Jorge. 2016. "Locational Choice and Entrepreneurial Performance". Mimeo / Early Draft.

Catalini, Christian, Jorge Guzman and Scott Stern. "Venture Capital and Entrepreneurial Quality". Mimeo / Early Draft.

Guzman, Jorge and Scott Stern. "Zipf's Law in Entrepreneurial Quality". Mimeo.

Guzman, Jorge and Scott Stern. "The Entrepreneurial Quality and Quantity of Regions". Mimeo.

## OTHER PUBLICATIONS

Guzman, J. "Startups Mexicanas: A guide to software entrepreneurship in Mexico." (Master's Thesis)

## ACADEMIC PRESENTATIONS

*2016.* MIT Sloan TIES Seminar (Cambridge, MA). PhD Academic Defense (Cambridge, MA). Kauffman Emerging Scholars Conference (Kansas City, MO). Third International ZEW Conference on the Dynamics of Entrepreneurship (Mannheim, Germany). CCC Doctoral Conference (Milan, Italy).

*2015.* MIT Innovation Initiative – Roundtable on Innovation Metrics (Fall, 2015. Cambridge, MA). West Coast Research Consortium (WCRS) (Seattle, WA)

*2014.* TIES PhD Reading Group (Spring, 2014; Winter, 2014) NBER/CRIW Conference on Measuring Entrepreneurial Businesses. (Winter, 2014. Washington, DC)

## REVIEWER FOR JOURNALS

Journal of Economic Geography, Academy of Management (Technology & Innovation Management Division), Academy of Management (Entrepreneurship Division), Strategic Management Conference, International Journal for Technology Management.

## FELLOWSHIPS AND GRANTS

Ewing Marion Kauffman Dissertation Fellowship (2016)

Jean Hammond (1986) and Michael Krasner (1974) Entrepreneurship Fund and the Edward B. Roberts (1957) Entrepreneurship Fund (2015) (w. Scott Stern)

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MIT Legatum Center for International Development Fellows Program (2011)

MIT Public Service Center Fellowship (2010)

## TEACHING

15.911 Entrepreneurial Strategy (April, 2017) (Scheduled)
- MIT Sloan MBA Class

Emprendedurismo Tecnológico – One Week Boot Camp (June, 2013)
- Universidad del Valle de México, Campus Puebla

Entrepreneurial Strategy for Engineers (Spring ,2013)
- 3 day class during MIT's independent activities period

## MEMBERSHIPS

Professional Interest Organizations: American Economics Association, American Finance Association, Academy of Management, Consortium for Co-operativeness and Competition (CCC).

Minority-Based Organizations: The PhD Project Management Doctoral Student Association (Minority U.S. citizens in management doctoral programs)

Civil Organizations: Cambridge-Ellis School (Board Member).

## TEACHING ASSITANTSHIPS

Teaching Assistant: 15.707 Global Strategy & Organization (Spring, 2016)
- Faculty: Don Lessard and Eleanor Westney
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## PUBLIC PRESENTATIONS

Measuring Growth Entrepreneurship (Summer, 2014)
- Consulado de Mexico.Visita de Innovación a Boston

MIT Regional Economic Acceleration Program (REAP) (Spring, 2014)
- MIT REAP Program

Emprendedurismo Tecnológico en México. (Summer, 2013. Puebla, Mexico)
- HUB Emprendedor

Emprendedurismo Tecnológico en México (Summer, 2013. Puebla, Mexico)
- Universidad Iberoamericana, Campus Puebla, Mexico. Instituto de Diseño e Inovación Tecnológica (IDIT).

## MEDIA COVERAGE

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- Fortune. July 14, 2016. "VCs May not be as Biased as You Think". By Jeremy Quittner.

*Spanish Media Coverage*

- El País. Feb 5, 2015. "Por qué Silicon Valley es tierra de startups". By Rosa Jimenez Cano.
- El Confidencial. Feb 5, 2015. "Tecnológicas de nombre corto, una combinación ganadora par alas startups". By Sergio Ferrer.

## RADIO AND VIDEO APPEARANCES

*Capital Emprendedor*
- Puebla FM. June 4, 2013.

*Univerpresarios*
- Puebla FM. June 4, 2013.

## RESEARCH ASSISTANTSHIPS

- Mercedes Delgado. Winter, 2014.
- Scott Stern. Regional Entrepreneurship Acceleration Program (REAP). Fall, 2013, Spring 2014, Spring, 2016.
- Pai-Ling Yin. Fall, 2012. Mobile Innovation Group. (http://mig.mit.edu)

## CORPORATE BOARD AND ADVISORY ROLES MEMBERSHIP

- BlazingDB (Advisor)
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## NON-ACADEMIC EMPLOYMENT

**Price Stats** Cambridge, MA
*Director of Data Engineering – first full-time employee* 2011-2012

**Unstructured Q – Business Analytics Consulting** Cambridge, MA

*Principal Consultant / Founder* 2010

**Microsoft Corporation** Redmond, WA
*Build and Release Engineer II (Microsoft IT – Relationship Experience Division)* 2007 - 2009