Should I Stay or Should I Go?

Entrepreneurial Ecosystems and the Relative Importance of Distance For Innovative New Ventures

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ABSTRACT

New ventures feed into ecosystems of investors, human capital, and other businesses. We ask: What is the impact of a having a variety of early stage funding options on growing new ventures, and how important is distance between the startup and the funding source in this relationship? We leverage differences in geographic reach of accelerators and angel groups using novel microdata on a matched sample of 737 startups. We find that having a diverse mixture of startups and funding sources impacts subsequent VC investment and hiring outcomes. Whether a startup hails from the same or distant region as the funder plays a large role in the early development of startups. This effect is amplified for startups in accelerators relative to those with angel group funding.

INTRODUCTION

Having a variety of sources to launch new ventures creates new avenues for entrepreneurs but also entails tradeoffs. For entrepreneurs, early-stage investors, and policy makers, long term success hinges on sustaining a environment that is conducive to launching new ventures and allowing them to grow through funding, hiring, and exit options that feed into the larger ecosystem (Glaeser *et al.*, 2010). A growing literature addresses the importance of agglomeration for venture capital performance (Chen *et al.*, 2010; Cumming *et al.*, 2010; Hochberg *et al.*, 2010; Wuebker *et al.*, 2015). This study instead focuses on the importance of relative distance from early funding sources for the growth potential of innovative new ventures. Specifically, this proposal asks: *What is the relative importance of geographic distance between the startup and different early funding sources in reaching subsequent growth milestones?* The answer to this question is salient to a deeper understanding the conditions that allow new ventures to flourish.

This proposal considers the relative impact of two different early stage funding options, angel groups and accelerators, on the growth potential of startups through follow-on VC investment and employment growth through new hires. The growth of accelerators that promise to "accelerate" the entrepreneurial process has become a global phenomenon that attracts ever-increasing attention in the popular imagination and the policy arena (Carr, 2012; Dempwolf *et al.*, 2014; Porat, 2014). An expanding body of scholarly work points to accelerators as a growing and significant part of the entrepreneurial ecosystem (Cohen *et al.*, 2018; Gonzalez-Uribe *et al.*, 2017; Winston Smith *et al.*, 2014). At the same time, although entrepreneurial accelerators represent an emerging paradigm in early stage entrepreneurship, our scholarly and practical understanding of the impact of these accelerators on broader economic outcomes is lacking.

The research leverages differences in the geographic reach two types of early funding sources for startups, accelerators and angel groups, using hand-collected data on the complete population of startups that were accepted into and received financing from 25 accelerator cohorts over the period 2005-2011 and

a matched sample of startups that instead receive their first round of formal outside equity finance from established angel groups over this period. Startups are matched on geographic footprint and industry representation over this period. Outcomes are tracked through December 2016.

Taken together, the results suggest that whether a startup hails from the same or distant region as the funding source plays a large role in the early growth of startups in terms of follow-on funding and hiring outcomes. This effect is amplified for startups in accelerators relative to those with angel group funding. This impact is evident in reaching an important startup milestone, the receipt of follow-on VC financing, and in attaining growth metrics (amount of follow-on VC financing and number of employees hired).

THEORETICAL BACKGROUND & HYPOTHESES DEVELOPMENT

As innovative new ventures launch, their need for increasing amounts of financial capital typically expands from largely informal, inside sources of growth capital—e.g., founders, family, and friends—to increasingly formal providers of outside financing, e.g., angel investors and then venture capitalists as equity investors (Cassar, 2004; Robb *et al.*, 2012; Winston Smith, 2012). Angel investors provide early, arm's length funding to startups (Freear *et al.*, 1994; Freear *et al.*, 1990; Goldfarb *et al.*, 2009; Wetzel, 1983; Wong, 2002). Angel groups consist of high net worth individuals who co-invest in early stage ventures (DeGennaro *et al.*, 2013; Kerr *et al.*, 2014; Wiltbank *et al.*, 2007). Kerr et al. (2014) find that financing by top angel groups increases survival and growth relative to new firms that do not receive angel group financing.

Accelerators are a growing form of early stage funding that are distinct from other types of early equity investors. Accelerators are formal programs that are focused explicitly on accelerating the process of launching a new venture (startup) at a very early stage. In general, accelerators are characterized by several distinct features that make them a novel organizational form: formal application and selection mechanisms for entry; pre-determined cohorts with a fixed length of time (typically 3-4 months); and a formal ending point typically marked by a "Demo Day" event in which startups in a given cohort pitch to investors (Clarysse *et al.*, 2015; Cohen *et al.*, 2014; Miller *et al.*, 2011; Solomon, 2015). Most

accelerators also take a small equity stake in the startup. To date, several studies consider the relationship between accelerators and the regional economy. Fehder (2015) studies one accelerator, MassChallenge, and finds that entrepreneurs from regions with richer entrepreneurial ecosystems benefit the most from the program. Gonzalez-Uribe *et al.* (2017) find that startups benefit from the mentoring provided in accelerators and that these benefits spread to the local region. Also studying Startup Chile, Mejia and Gopal (2015) find that mentorship increases the likelihood of raising financing and longer term survival.

Early Funding Sources And Location Effects On VC Investment

One difference between accelerators and angel groups is the relative role of distance. Most accelerator programs include physical colocation of the startups during a given cohort period, while angel group backed startups have no colocation conditions. On the other hand, accelerators attract startups from greater distances than do angel groups. The literature suggests that new ventures are shaped by colocation and direct peer interaction. For example, an individual is more likely to take up entrepreneurial activity with greater spatial and social proximity to his or her referent peers (Wright and Mischel, 1987) and living in an entrepreneurial region is associated with a greater propensity to enter into entrepreneurship (Nikolaev *et al.*, 2018) . Moreover, entrepreneurs have a strong tendency to remain in geographically concentrated regions (Michelacci *et al.*, 2007).

A growing literature considers the agglomeration effects of venture capital investors and associated performance implication for these investors (Chen *et al.*, 2010; Cumming *et al.*, 2010; Hochberg *et al.*, 2010; Wuebker *et al.*, 2015). Overall, the literature suggests that VCs tend to invest in relatively local startups. Why should the distance between funding sources and startup make a difference in attracting subsequent VC investors? Investing in a local area provides multiple benefits for the investor, including decreased search costs, relative ease of communication, and greater ability to monitor portfolio companies (Mejia *et al.*, 2015). As a counterweight, when VCs invest in non-local startups they have a higher "hurdle rate" (Chen *et al.*, 2010).

Both angel groups and accelerators develop ongoing ties with local VC investors. Angel groups

invest multiple rounds in a startup over a period time, often with interim updates (Ibrahim, 2008; Rose, 2014). Startups in a local region are more easily in contact with the angel groups on a regular basis. Moreover, angel groups rely on repeated relationships with local VCs for exit opportunities (Hellmann *et al.*, 2015; Kerr *et al.*, 2014). On the other hand, accelerators work with startups in a concentrated period of time during the cohort. While connections are maintained after the end of the cohort, startups coming from a greater geographic distance might not benefit from strong local ties in the same manner as startups that are relatively closer.

Taken together, these arguments suggest Hypotheses 1 and 2:

Hypothesis 1 (H1): The impact of geographic distance between the startup and the accelerator on the likelihood of receiving VC funding is greater than the impact of geographic distance between the startup and the angel group on the ***likelihood*** *of receiving VC funding.*

Hypothesis 2 (H2): The impact of geographic distance between the startup and the accelerator on the likelihood of receiving VC funding is greater than the impact of geographic distance between the startup and the angel group on the ***amount*** *of VC funding.*

Early Funding Sources And Location Effects On Early Hiring

Hiring new employees is a key growth milestone for startups and is a key marker of startup growth potential (Haltiwanger *et al.*, 2013). Angel groups provide should facilitate access to local hires with the requisite skills through informal networks as well as formal mechanisms such as hosting employment pages for startups in their portfolio (Rose, 2014). In contrast, the accelerator model expands the reach beyond the local region. The network of companies comes from a broader geographic range and the founders interact extensively with one another. Thus, the more national reach of accelerators might facilitate hiring from a larger potential pool.

Second, the cohort model requires direct engagement for several months, which enhances tacit benefits such as networking and mentoring amongst founders from varied locations. A sentinel feature of accelerators is the explicit design of cohorts. These short "boot camp" periods allow portfolio firms to interact extensively with other founders. The peer effects literature shows that spatial and social

proximity to peers increase the likelihood of a given activity (Marmaros & Sacerdote, 2006; Sacerdote, 2001; Wright & Mischel, 1987). A growing literature suggests that such peer effects are particularly important in entrepreneurship, for example, in the decision to enter into entrepreneurship (Kacperczyk, 2013; Nanda & Sørensen, 2010) and the evaluation of the viability of entrepreneurial ideas (Lerner & Malmendier, 2013). Accelerator cohorts provide an intense experience that mimics the university experience, leading to cultural capital derived from social bonding and resulting strong connections between people (Bourdieu, 1986).

Taken together, these arguments suggest Hypothesis 3:

> *Hypothesis 3 (H3): The impact of geographic distance between the startup and the accelerator on the likelihood of receiving VC funding is greater than the impact of geographic distance between the startup and the angel group on hiring new employees.*

SAMPLE SELECTION AND DATA

The analysis is based on hand-collected data on the complete population of startups that were accepted into and received financing from the two longest running accelerators in the U.S. over the period 2005-2011 and a comparable sample of startups that instead receive their first round of formal outside equity finance from major angel groups over this period. Outcomes are tracked through 2016.

The accelerator sample is drawn from the two archetypical accelerators, Y Combinator, founded in 2005, and Techstars, founded in 2006 (Geron, 2012; Gruber, 2011; Lennon, 2013). All cohorts of these two accelerators over the time period are included. The comparable sample of startups that instead received their first round of outside equity finance from angel groups is matched on geographic footprint and industry representation to those included in accelerator cohorts over the same time period. These angel groups are chosen based on similar levels of selectivity as the accelerators and are matched on geographic location and industries in which they invest. There is no comprehensive ranking of angel groups, thus we ranked the angel groups by the number of deals each made over time using ThomsonOne's *VentureXpert* database. The final angel investor sample consists of startups in which the

19 most active professional angel groups invested over a similar range of industries and geographic locations as the accelerator sample over this time period. This list is broadly consistent with angel groups featured in the literature as "top" groups (Kerr *et al.*, 2014). This data is augmented with data from angel group websites.

Data is triangulated from *LinkedIn*, *Crunchbase,* and *CB Insights,* supplemented with technology blogs and press articles, to trace the trajectory of start-ups from inception. Startup data includes the date of founding and entry into either the accelerator or angel group for first round of funding, the amounts of subsequent rounds, participants in each round of funding, geographic location at time of founding, industry, and attributes of all members of the founding team, such as education and other details. The performance variables are follow-on financing and hiring outcomes. The final sample consists of n=736 startups.

It is worth commenting on the choice of sample. The accelerator sample is drawn from two archetypal accelerators, Y Combinator (founded in 2005) and Techstars (founded in 2006). The analytical lens focuses on this sample of accelerators for several reasons. First, these accelerators represent the industry standard in a still emerging paradigm. As the longest established accelerators in the U.S. they have implemented organizational models that are well-documented and can be replicated by other accelerators. They also are consistently ranked as the top accelerators, allowing isolation of these effects across regions and in circumstances that represent the industry standard (CBInsights, 2014; Kerr *et al.*, 2014). Second, these accelerators have been established for a long enough period to follow the longer-lasting economic impact in the region. Third, there is substantial regional variation in where these accelerators are located and in the regions from which the startups originate.

Regional Characteristics of the Sample

The regional distribution of the accelerator cohorts, angel groups and associated startups are evident in Figures 1-4. Figure 1and Figure 2 show the geographic location of the accelerator cohorts and the associated startups in the sample, respectively. These figures show that startups come from a wide range

of geographic locations to be in a specific accelerator cohort. Figure 3 and Figure 4 show comparable mapping of the geographic location of the angel groups and associated startups, respectively. The greater geographic draw of the accelerators, relative to the angel groups, is evident in]Figure 2 relative to Figure 4.

Several broad characterizations emerge from the statistics on the regional breakdown of the sample. First, the sample includes a regionally diverse sample of accelerators and angel groups and regionally diverse set of startups. The regional distribution of startups in both the accelerator backed and angel group backed samples are summarized in (unweighted) and Table 2 (IPTW weighted). Second, as evident in Figure 2 and Figure 4 startups vary in the propensity to relocate for accelerators and angel groups. In the whole sample, approximately 67% of the startups come from the same region as the accelerator, and approximately 79% of the startups come from the same region as the angel group.

Matching Methodology

In order to account for potential self-selection, inverse probability of treatment weights (IPTW) methodology is used to match to observations in the accelerator and angel sample groups based on observable characteristics of each (Guzman *et al.*, 2015; Imbens, 2004). IPTW balances observations along observable dimensions that should influence the decision by the founders to enter an accelerator rather than an angel group. Observations without common observable characteristics are given zero weights (Wooldridge, 2007). IPTW matching allows for causal inference based on matching observable characteristics in a "treated" and "untreated" or baseline sample (Hirano & Imbens, 2001; Imbens & Wooldridge, 2009; Robins *et al.*, 2000). In this paper, the treated and control groups correspond to the accelerator and angel-group samples, respectively. The sample selection criteria explicitly match startups on key observable characteristics.

Econometrically, IPTW consists of a two-step process with a first-stage logit predicting selection into the treatment group and the second stage incorporating these predictive weights to create a matched sample. Matching criteria include startup age, location, and industry, and educational background of the

founders. The rich granularity of this dataset allows for matching of the startups using startup and founder specific characteristics that may drive selection between these alternative sources of financing.

The IPTW matching process results in 391 accelerator startups and 325 angel group startups for a total sample of n=716. Summary statistics for the full sample and the IPTW-weighted sample are given in Table 1 and Table 2, respectively.

METHODOLOGY: VARIABLES AND ECONOMETRIC APPROACH

Dependent Variables

Follow-on Funding

VCRound1. The first round of VC investment may be hardest for startups to receive (Geron, 2012; Gruber, 2011; Lennon, 2013) and thus this represents a distinct milestone for a startup. I focus on receipt of the first round of formal VC investment for this reason. *VCRound1* is a dummy variable equal to 1 when the startup receives the first round of formal VC investment and 0 otherwise.

Amount of VC funding. The total amount of follow-on funding raised after the initial investment round aby the accelerator or angel group is an important measure of performance. The natural log is used to account for skewness.

Hiring Employees

Employment measures the number of employees beyond the initial founding team that have been hired by early 2016. This variable captures some of the broader impact of startups in terms of demonstrable economic measures.

Independent Variables

The focal independent variables include dummy variables for accelerator or angel group financing, startup locations, and proximity between the startup and either the accelerator or angel group. These are described below.

Accelerator is a dummy variable equal to 1 if the startup receives financing from an accelerator and

equal to 0 if the startup received its initial financing from a top angel group. This is the focal independent variable beyond the regional variables above.

LocationMatch measures the proximity between the accelerator and the startup headquarters location as a dummy variable equal to 1 if the startup and the accelerator or angel group are in the same geographic region. The literature on the geography of innovation suggests that the organization of firms within a region plays an important role in the output of that region (Preston, 2004; Wiltbank *et al.*, 2007).

StartupHQ are dummy variables for each of the startup headquarter locations. The control variables tied to map the founding location of each startup. Startup locations are grouped into six regions: California, West (excluding California), Northeast, Southeast, Midwest, and Foreign.

LocSV and *LocBos* are dummy variables equal to 1 if the accelerator or angel group is in Silicon Valley or Boston, respectively. These variables are included to control for any specific "locational entrepreneurship premiums" that these entrepreneurial hotbeds may have (Saxenian, 1994).

Control Variables

Several control variables capture additional factors at the founder and startup level that can be expected to influence timing of the various outcomes. Founder level controls include founder experience and size of the founding team. Startup level controls include age of the startup at the time of entry into the accelerator or angel group and the cohort size of the accelerator or portfolio size of the angel group. Dummy variables for industry effects and year of entry are also included.

Econometric Approach

The analysis addressees two types of questions: 1) the relative likelihood of receiving follow-on funding and, 2) growth metrics such as the amount of follow-on funding raised and the number of employees hired. To address these distinct questions, the econometric analysis applies discrete choice models to estimate likelihood of reaching venture capital milestones, feasible generalized least squares (FGLS) to estimate the amount of follow-on funding raised, and the Poisson model to estimate the

number of new hires. All models are estimated using standard errors clustered on cohort to take into account effects common to a given cohort in time and location (Wooldridge, 2007).

Venture Capital Funding

Achieving a given milestone is a dichotomous outcome, making a discrete choice model the most appropriate estimation approach (Wooldridge, 2002, Ch. 15). Logit analysis is used to estimate the probability of a startup receiving follow-on VC investment. Each startup is characterized by a vector of covariates, X, and the coefficient vector β. The following logit equation is estimated:

$$\Pr\left(Y = 1 \middle| x\right) = \frac{\exp\left(x\beta\right)}{1 + \exp(x\beta)}$$

Amount of Funding Raised

Feasible generalized least squares (FGLS) estimation is used to estimate the amount of follow-on funding raised after the initial investment round. FGLS takes into account the heteroskedastic error structure across a given investor (i.e., angel group or accelerator) (Greene, 2008; Wooldridge, 2002).

Number of Employees

The Poisson model is used to analyze the number of employees associated with each startup. This is appropriate for counting nonnegative integers (Hausman et al., 1984; Wooldridge, 2002, Ch. 25). Maximum likelihood estimation is used to estimate this model. The Poisson model is specified as:

$$\Pr\left(Y = y_i \middle| x_i\right) = \frac{\exp^{-\lambda_i} \lambda_i^{y_i}}{y_i!}$$

In this case, λ_i is the average number of times an event occurs within a specified interval and y_i is a non-negative integer. The Poisson model can be rewritten in log-linear form as:

$$\ln \lambda_i = x_i \beta$$

RESULTS

Taken together, the results suggest that whether a given startup hails from the same or distant region plays a large role in the early development of startups. This effect is amplified for startups in accelerators relative to those with angel group funding along multiple dimensions. This impact is evident in reaching startup milestones (follow-on VC financing) and in attaining growth metrics (amount of follow-on VC financing and number of employees hired). Details are given below.

Results are presented in Table 3-Table 6. For ease of interpretation, marginal effects are calculated for each regression and are presented in the Appendix.

Relative Distance of Startups

Characterizing the extent to which startups outside of the region are drawn to accelerators and angel groups within a region is important. The literature points to a strong geographic component to angel group investing: approximately 75% to 80% of angel investments are within the same region according to the Halo Report (Greene, 2008). One notable feature of accelerators is that they stand to potentially broaden the geographic scope of funding for startups. The results bear this out. *Primo facie*, accelerators invest in startups that come from a greater distance than those receiving angel group investment. As shown in, the share of startups from the same region is smaller for accelerators than for angel groups (difference of means: 0.11, $p<0.002$). In line with this, startups in accelerators come from a further geographic distance than those receiving angel group funding. The average distance for the accelerator sample is 738.5 miles, compared to 478.3 miles average distance between startups and angel groups (difference of means: 260.17 miles, $p<0.01$). Thus, the evidence suggests that accelerators invest in startups coming from a comparably larger geographic swath than do angel groups.

Relative Distance and Follow-on Funding

Results of the logit regressions on the probability of getting follow-on VC funding are presented in Table 3. These results suggest that all else equal, startups in an accelerator are less likely to receive follow-on funding than those with angel group backing. Marginal effects are provided in the Appendix.

The average marginal effect on follow-on funding is -0.25 ($p<0.01$); in other words, the probability of receiving follow-on VC financing is 25 percentage points lower for a startup in an accelerator relative to a startup in an angel group. For all startups, the average marginal effect of being in the same region (LocationMatch), rather than a different region, as the accelerator or angel group is 0.11 ($p<0.01$), or an 11 percentage point increase in the likelihood of getting VC funding.

The results provide support for Hypothesis 1. All else equal, the average marginal effect of being in the same region for startups going through an accelerator is a 24 percentage points greater likelihood of getting follow-on VC funding ($p<0.01$) than if the startup is from a different region. In contrast, the average marginal effect of being in same region is not statistically significant for startups with angel group funding. An alternative way of looking at this is that a startup in an accelerator in the same geographic region is only 12 percentage points ($p<0.01$) less likely to receive follow-on funding compared to a similar startup in an angel group if the startup is in the same region as the accelerator, whereas a startup in an accelerator in a different region is 42 percentage points ($p<0.01$) less likely to get VC funding than a similar startup in an angel group.

Relative Distance and Growth Metrics

Amount of Funding Raised

Venture capital investment allows a startup to grow. The results of the FGLS regressions on the amount of follow on funding (ln_FollowOnVCFunding) in Table 4 show that else equal, the average marginal effect of being in accelerator is -0.67 ($p<0.01$); in other words, the amount of follow-on VC financing is decreased by 67 percent relative to a startup in angel group. For all startups, the average marginal effect of being in the same region (LocationMatch) is 0.20 ($p<0.01$), or a 20 percent increase in the amount of VC funding received.

The results provide support for Hypothesis 2. The average marginal effect of being in the same region on the amount of follow-on funding also is amplified for startups in accelerators. A startup in an accelerator in the same geographic region receives 33 percent greater follow-on funding ($p<0.01$)

compared to a startup in a different region; the impact for a startup in an angel group in the same or different region is statistically insignificant.

Employment

The results suggest that accelerators are associated with employment growth. In Table 5, the results of the Poisson regressions on numbers of employees show that all else equal, the average marginal effect of being in accelerator is 0.381 ($p<0.01$); in other words, startups in an accelerator hire 46% more employees than similar startups in angel groups. Locational effects also matter for employment: all else equal, the marginal effect of being in the same region as the accelerator or angel group is 0.372 ($p<0.01$); in other words, startups located in the same region hire 45% more employees.

Hypothesis 3 posited that geographic distance has a greater impact on startups in accelerators than those that are angel group backed. On average, startups in accelerators and startups in angel groups *both* hire more employees when they are in the same region as the accelerator or angel group, respectively. For startups in accelerators, being in the same region translates into an average of 8.5 more employees than if it was in a different region, while startups with angel group backing hire an average of 9.5 more employees relative to being in a different region.

This begs the question, what is the *relative* impact on hiring of being in the same location for a startup in an accelerator compared to a similar startup in an angel group? The average marginal effect of being in the *same* region is 34% more employees for startups in an accelerator relative to those in angel group ($p<0.01$), while the average marginal effect for startups in a *different* region is 62% more employees than a similar startup in an angel group in a distant region. Put differently, the results suggest that accelerators might have the largest impact on hiring for startups from distant regions.

Robustness

Alternative Geographic Distance Measure

The results above summarize the impact of startups coming from the same or different region as the accelerator or angel group. Alternatively, we can measure the geographic distance between the startup

and the respective accelerator or angel group based on the latitude and longitude of each using the great circle distance equation:

$$\text{distance} = 2\arcsin\left(\sqrt{\sin^2\left(\frac{\Delta lat}{2}\right) + \cos\left(lat_1\right)\cos\left(lat_2\right)\sin^2\left(\frac{\Delta long}{2}\right)}\right)$$

Latitude and longitude data for each dyad (startup-angel investor or startup-accelerator) are computed from location data using Google Maps GeoCoding API supported through the Google cloud platform (Google, 2016). Results using log of Geographic Distance instead of Location Match are consistent with the previous results.

Acquisition

A successful exit through acquisition allows entrepreneurs and investors to realize financial returns and thus represents an important outcome for a startup (Preston, 2004; Wiltbank & Boeker, 2007). *Acquisition* is a dummy variable equal to 1 when the startup exits through a viable acquisition offer and 0 otherwise. Logit analysis is used to estimate the probability of an exit through acquisition. The results of these regressions are presented in Table 6.

DISCUSSION AND CONCLUSION

The findings above suggest that the relative location of startups and different funding sources plays a substantial role in the early development of startups. To the extent that startups seek follow-on financing, the results suggest that location in the same region has a greater impact in terms of both the likelihood of receiving VC following and the amount of follow-on funding for startups in accelerators than those with angel group backing. With respect to subsequent employment, the effect of geographic distance is amplified for startups in accelerators compared to those with angel group backing.

Receipt of follow-on financing from VC investors is one key area where location plays a significant role. To the extent that startups seek follow-on financing, the results suggest that entering a distant accelerator might make it harder to attract follow-on VC funding. Specifically, the results indicate that

location in the same region has a greater impact in terms of both the likelihood of receiving VC following and the amount of follow-on funding received for startups in accelerators than those with angel group backing.

There are several reasons why follow-on funding from VC investors may be particularly sensitive to startups coming to accelerators from a more distant location. First, VC investors rely on ongoing connections with their portfolio companies to monitor performance (Gompers, 1995; Kaplan & Strömberg, 2001). If startups come from a more distant region these ties may be harder to maintain after the cohort ends. Moreover, for startups in accelerators, VC investment occurs after Demo Day, when startups are more likely to be leaving the region. Finally, investors in angel groups have an incentive to provide some monitoring and oversight until an exit is achieved (Ibrahim, 2008), whereas accelerators provide intensive mentoring during the cohort but do not actively monitor startups post-graduation. VCs recognize that angel investors provide some of these monitoring benefits (Hellmann & Thiele, 2015). For more distant startups, VCs may rely more keenly on the assurance of monitoring by angel investors. Taken together, the results suggest that accelerators might look to ways to increase ties with a geographically diverse group of VCs. Indeed, some accelerators have taken steps in this direction, such as introducing "road show" demo days to develop exposure to a greater group of potential investors and loosening or eliminating residency requirements during the cohort period (Dreamit Ventures, 2016).

With respect to subsequent employment, the effect of geographic distance is amplified for startups in accelerators compared to those with angel group backing. Overall, the results suggest that being in the same region as either the accelerator or the angel group is associated with greater subsequent hiring than more distant startups. However, for startups that are in a different region, being in an accelerator facilitates hiring to a much greater extent than an angel group. Accelerators might increase distant hiring for several reasons. The literature on entrepreneurial hiring points to early hiring as an important predictor of growth (Fairlie & Miranda, 2017).

Entrepreneurial hiring draws heavily on the extended network available to founders (Forbes *et al.*, 2006). Most accelerators require startups to relocate for the period of the cohort. When startups come to an accelerator from a different region they have access to a larger network of potential hires because they can draw from both the new region where the accelerator is located and their home region. In contrast, a startup working with a distant angel group is unlikely to spend substantial time in that region and is less likely to build an extensive network there. Moreover, the cohort experience in an accelerator builds strong relationships amongst the founding teams and with accelerator partners and mentors. The social and cultural capital developed through a common selective experience is an important foundation for subsequent relationships such as in the labor market (Bourdieu, 1986). To the extent that successful startups can scale and create additional jobs, this finding has important implications. This finding suggests that accelerators might take this into account more explicitly. In separate analysis (available from author) the results also suggest that location in the same region increases the likelihood of an acquisition for startups in accelerators to a greater extent than those with angel group backing. Acquisition requires synergy and fit along strategic, product market, or technological dimensions for the acquiring company. Several factors might contribute to the larger importance of being in the same region for startups in accelerators. The literature shows that the difficulties companies face in acquiring distant targets can be ameliorated through vicarious learning and soft information (Chakrabarti & Mitchell, 2013, 2016). Being located in the same region as the accelerator allows the accelerator to become more familiar with the startup and facilitates sharing of soft information of use to potential acquirers. Second, startups are an attractive target as "acqui-hires," i.e., acquisitions of a company for the purpose of acquiring the human talent (CBInsights, 2014b; Paka, 2015). Accelerators exhibit a strong preference for solid founding teams; they often focus on the team in the acceptance decision and the intensive mentoring in the cohort involves deepening of relationships between the team and the accelerator. Accelerators should be able to provide greater insights about the founding team and early hires for startups that are in the same region and have greater ongoing contact beyond the cohort period. Finally, the regions where accelerators

are located may provide a larger playing field of potential acquirers, and the Demo Day pitch experience typically attracts both investors and acquirers.

The results in this paper speak to the extent to which accelerators draw startups from a larger geographic footprint than angel groups on average. This has several important implications for further consideration. Given that startups participate in an accelerator for a short duration, the extent to which they remain in the accelerator region varies. As noted above, startups coming from further distance have the potential to draw upon multiple regional networks. At the same time, the larger distance makes it harder for investors from other regions to closely monitor these young ventures. These tradeoffs are evidenced in the results. More broadly, recent research suggests that higher quality startups may "migrate" more often, but they are of similar quality to startups in the region to which they move (Guzman, 2017). Given the greater geographic draw of accelerators, regional ecosystems may be able to encourage high quality startups to remain.

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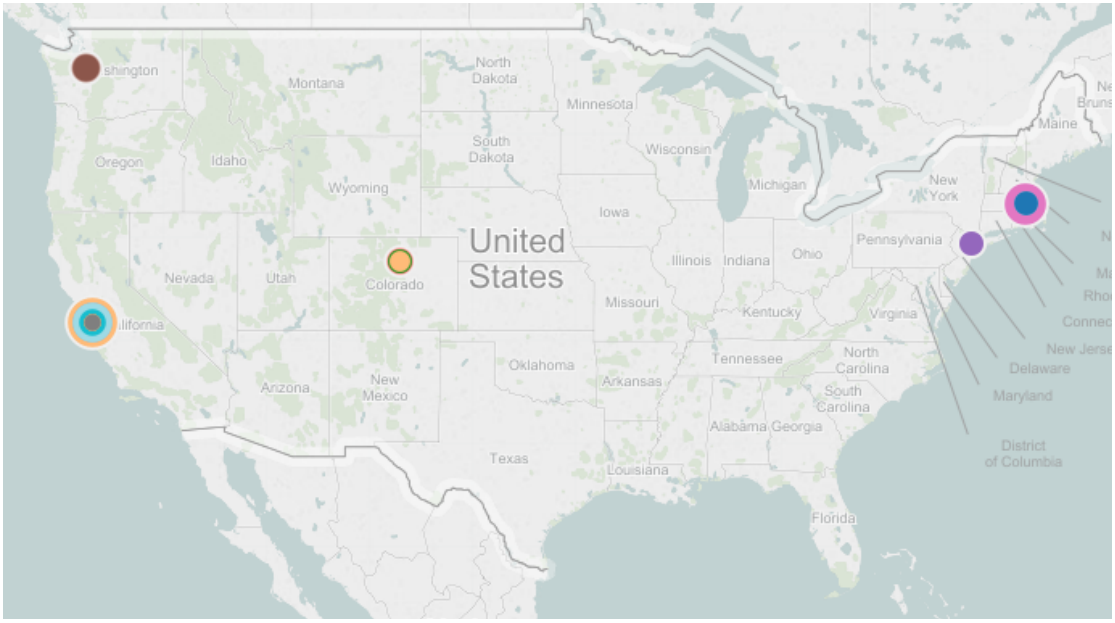

Figure 1. Accelerator Locations (By Cohort). Location of accelerator cohorts. Size of circle is proportional to number of startups in cohorts.

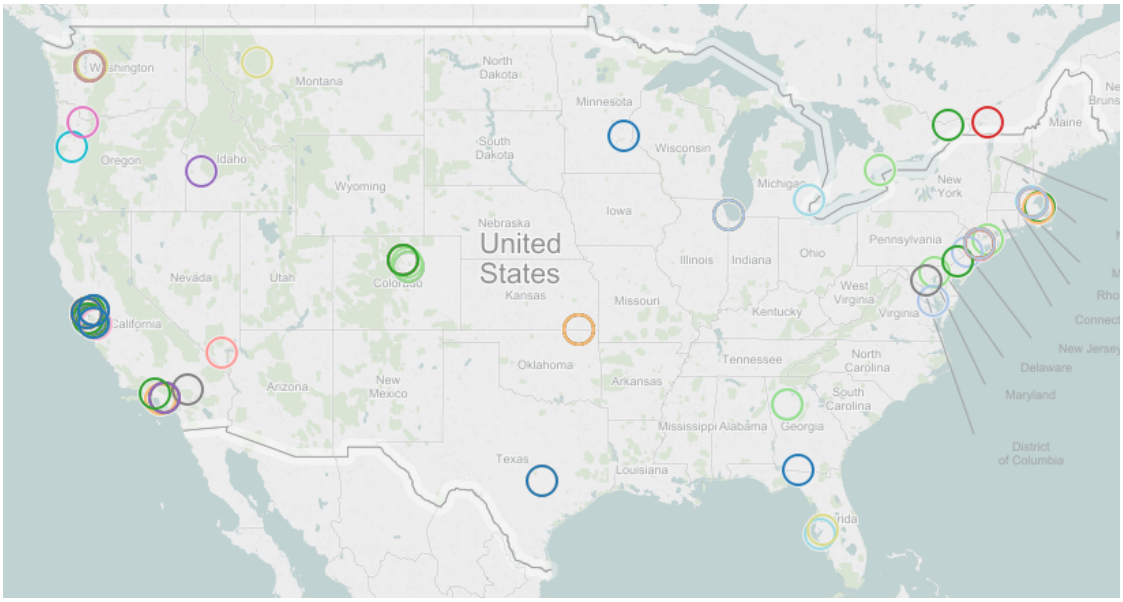

Figure 2. Startup Locations (By Cohort). Location of startup headquarters. Color of circle indicates accelerator cohort in which startup participated.

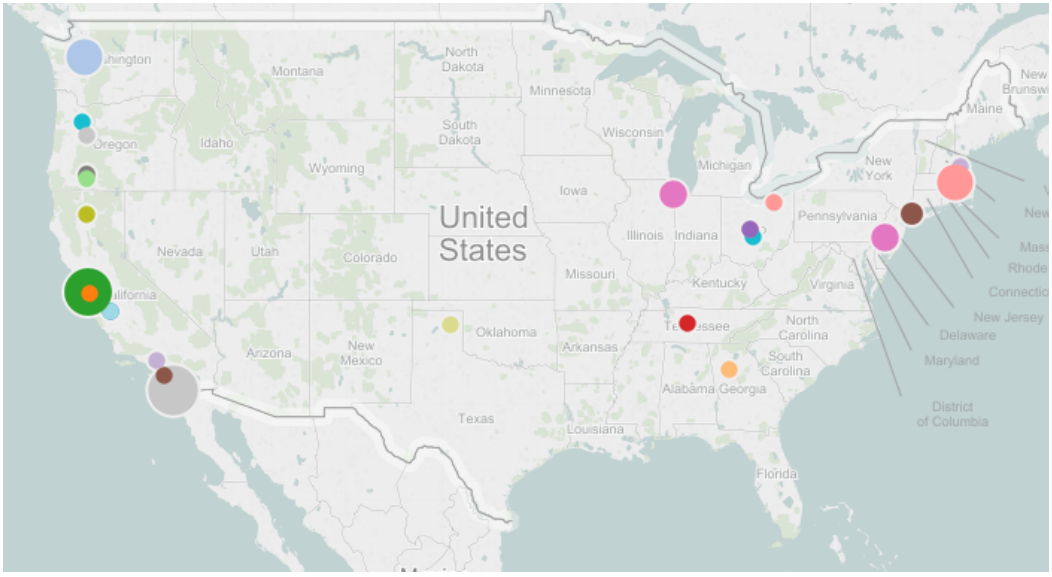

Figure 3. Angel Group Locations. Size of circle proportional to number of startups in angel group portfolio.

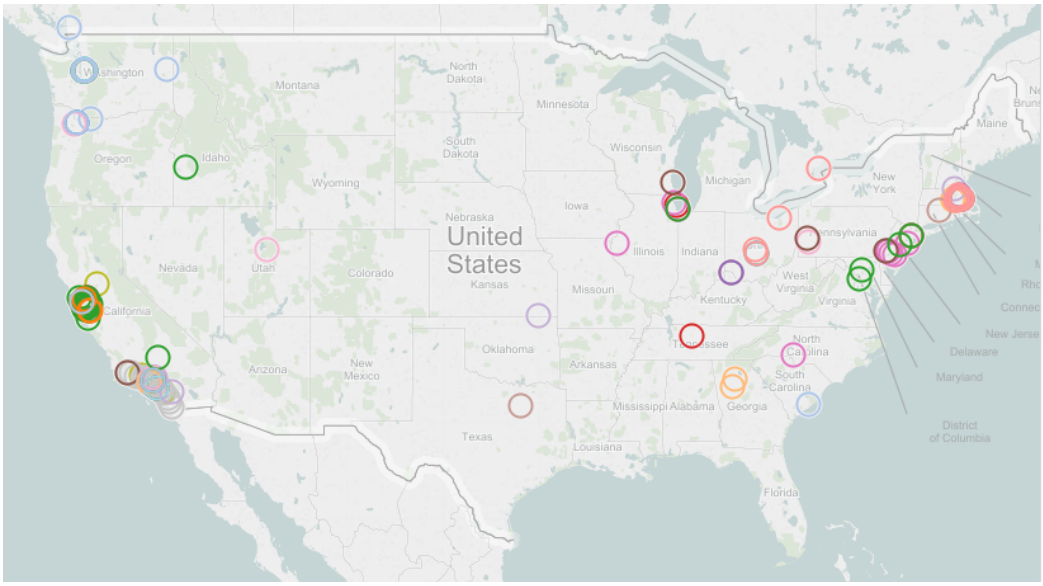

Figure 4. Startup Locations. Location of startup headquarters. Color of circle indicates angel group portfolio in which startup is included.

Table 1. Summary Statistics-Accelerator and Angel Groups (No Weights)

	Accelerator				***Angel Group***			
	mean	sd	min	max	mean	sd	min	max
Outcomes								
Acquisition_Dum	0.199	0.400	0	1	0.121	0.326	0	1
Quit_Dum	0.224	0.418	0	1	0.057	0.233	0	1
Alive_Dum	0.457	0.499	0	1	0.384	0.487	0	1
GetVC_Dum	0.158	0.365	0	1	0.444	0.498	0	1
Total Funding ($M)	9.938	42.690	0	706	13.375	41.702	0	628
LInumemp	23.7	55.6	0	522	31.1	62.7	0	606
Startup Location Variables								
StartupHQCalifornia	0.533	0.500	0	1	0.462	0.499	0	1
StartupHQWest	0.166	0.372	0	1	0.142	0.350	0	1
StartupHQNortheast	0.209	0.407	0	1	0.236	0.425	0	1
StartupHQMidwest	0.023	0.150	0	1	0.109	0.312	0	1
StartupHQSouth	0.020	0.142	0	1	0.039	0.195	0	1
StartupHQForeign	0.046	0.210	0	1	0.009	0.095	0	1
Location Match	0.680	0.467	0	1	0.782	0.413	0	1
LocSV	0.602	0.490	0	1	0.299	0.459	0	1
LocBos	0.166	0.372	0	1	0.172	0.378	0	1
GeoDistance (miles)	738.5	1295.5	0	8033	478.3	1430.6	0	7955
Startup and Cohort Controls								
IndustryMediaMusicGaming	0.135	0.342	0	1	0.121	0.326	0	1
IndustrySocialLocationMobile	0.298	0.458	0	1	0.239	0.427	0	1
IndustryPaymentCommerce	0.184	0.388	0	1	0.142	0.350	0	1
IndustryWebBusiness	0.168	0.375	0	1	0.172	0.378	0	1
IndustryUnderlyingTech	0.161	0.368	0	1	0.196	0.398	0	1
IndustryOther	0.054	0.225	0	1	0.127	0.333	0	1
StartupAgeEnter_Yr	0.471	0.711	0	4	2.293	1.875	0	12
HaveFemale	0.056	0.230	0	1	0.006	0.078	0	1
Total Number of Founders	2.230	0.756	1	5	1.559	0.669	1	4
CohortCount	21.765	12.161	8	42	0.000	0.000	0	0
Observations	405				331			

* *Summary statistics exclude 2 companies with valuations above $1Billion as of Jan. 2017*

Table 2. Summary Statistics-Accelerator and Angel Groups (IPTW weighted)

	Accelerator				Angel Group			
	mean	sd	min	max	mean	sd	min	max
Outcomes								
Acquisition_Dum	0.305	0.460	0	1	0.093	0.291	0	1
Quit_Dum	0.134	0.341	0	1	0.064	0.244	0	1
Alive_Dum	0.476	0.500	0	1	0.334	0.472	0	1
GetVC_Dum	0.310	0.463	0	1	0.509	0.500	0	1
Total Funding ($M)	5.900	29.668	0	706	12.346	35.503	0	628
LInumemp	21.9	43.2	0	522	29.0	59.8	0	606
Startup Location Variables	21.892	43.267	0	522	29.021	59.753	0	606
StartupHQCalifornia	0.328	0.470	0	1	0.428	0.495	0	1
StartupHQWest	0.098	0.297	0	1	0.230	0.421	0	1
StartupHQNortheast	0.223	0.416	0	1	0.213	0.409	0	1
StartupHQMidwest	0.294	0.456	0	1	0.061	0.240	0	1
StartupHQSouth	0.038	0.190	0	1	0.049	0.217	0	1
StartupHQForeign	0.019	0.138	0	1	0.014	0.117	0	1
Location Match	0.475	0.500	0	1	0.687	0.464	0	1
LocSV	0.642	0.480	0	1	0.314	0.464	0	1
LocBos	0.125	0.331	0	1	0.173	0.378	0	1
GeoDistance (miles)	606.4	1063.6	0	8033	590.1	1450.4	0	7955
Startup and Cohort Controls								
IndustryMediaMusicGaming	0.140	0.347	0	1	0.136	0.343	0	1
IndustrySocialLocationMobile	0.451	0.498	0	1	0.291	0.455	0	1
IndustryPaymentCommerce	0.130	0.337	0	1	0.141	0.348	0	1
IndustryWebBusiness	0.118	0.322	0	1	0.192	0.394	0	1
IndustryUnderlyingTech	0.116	0.320	0	1	0.157	0.364	0	1
IndustryOther	0.045	0.208	0	1	0.082	0.275	0	1
StartupAgeEnter_Yr	2.059	1.742	0	4	1.487	1.574	0	12
HaveFemale	0.078	0.269	0	1	0.006	0.077	0	1
Total Number of Founders	2.396	0.837	1	5	1.539	0.672	1	4
CohortCount	21.573	10.921	8	42	0.000	0.000	0	0
Observations	391				325			

** Summary statistics exclude 2 companies with valuations above $1Billion as of Jan. 2017*

Table 3. VC Funding Milestone (Logit Regression)

	Pr(GetVCFunding=1)	
	(1)	(2)
VARIABLES	GetVC_Logit	GetVC_Logit
accelerator	-1.8854***	-3.4934***
	(-3.38)	(-3.35)
LocationMatch	0.7979*	-0.8957
	(1.80)	(-0.87)
accelerator#LocationMatch		2.4193**
		(2.37)
StartupAgeAtEnter	-0.0006***	-0.0003
	(-2.92)	(-1.44)
SingleFounder	-0.9109**	-1.0486***
	(-2.16)	(-2.93)
SerialDum	1.3382**	1.5499***
	(2.26)	(3.00)
LocSV	0.5371	0.4446
	(0.99)	(0.86)
LocBos	-0.5516	-0.5050
	(-0.96)	(-0.94)
ln_Amount1_CBI	0.6016	0.3694
	(0.75)	(0.53)
Constant	13.8652***	14.4960***
	(7.83)	(7.51)
Year FE	*Yes*	*Yes*
Industry FE	*Yes*	*Yes*
Observations	497	497
log pseudolikelihood	-489.8	-474.2

Robust z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.10

Table 4. Amount of VC Funding (FGLS Regressions)

VARIABLES	(1) FollowFund_FGLS ln_FollowOn	(2) FollowFund_FGLS ln_FollowOn
accelerator	-0.6593***	-0.8480***
	(-5.48)	(-4.78)
LocationMatch	0.2297**	-0.0026
	(2.09)	(-0.02)
accelerator#LocationMatch		0.3289
		(1.55)
StartupAgeAtEnter	-0.0001	-0.0001
	(-1.37)	(-1.02)
SingleFounder	-0.0977	-0.0939
	(-0.78)	(-0.75)
SerialDum	0.4670***	0.4997***
	(3.29)	(3.48)
LocSV	0.3291***	0.3007***
	(2.89)	(2.62)
LocBos	0.5872***	0.5636***
	(3.34)	(3.16)
Constant	3.3106**	3.3637**
	(2.25)	(2.35)
Year FE	*Yes*	*Yes*
Industry FE	*Yes*	*Yes*
Observations	497	497
Number of Investor	23	23
log pseudolikelihood	.	.

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.10

Table 5. Number of Employees (Poisson Regression)

Number of Employees		
	(1)	(2)
VARIABLES	NumEmp	NumEmp_
accelerator	0.3396***	0.4821***
	(3.14)	
	0.3905***	0.4901***
	(3.44)	(2.71)
accelerator#LocationMatch		-0.1908
		(-0.97)
StartupAgeAtEnter	0.0005***	0.0004***
	(6.02)	(4.82)
SingleFounder	-0.2647	-0.2515
	(-1.23)	(-1.17)
SerialDum	0.0977	0.0820
	(0.44)	(0.39)
ln_AmountPerRoundCBI	0.9553***	0.9580***
	(14.03)	(13.41)
ln_NumRounds_CBI	0.6449***	0.6557***
	(2.89)	(2.90)
LocSV	-0.0694	-0.0624
	(-0.51)	(-0.47)
LocBos	0.2185	0.2122
	(1.19)	(1.16)
Constant	1.3543***	1.3291***
	(2.97)	(2.95)
Year FE	*Yes*	*Yes*
Industry FE	*Yes*	*Yes*
Observations	548	548
log pseudolikelihood	-17299	-17279

Robust z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.10

Table 6. Likelihood of Acquisition (Logit Regressions)

	Pr(Acquired=1)	
VARIABLES	(3) GetAcq_Logitsep AcqDummy	(4) GetAcq_Logit AcqDummy
accelerator	1.3056**	0.8656
	(2.28)	(1.00)
LocationMatch	0.1425	-0.2934
	(0.39)	(-0.53)
accelerator#LocationMatch		0.7177
		(1.01)
StartupAgeAtEnter	-0.0011	-0.0010
	(-1.07)	(-0.97)
SingleFounder	-1.1158***	-1.0919***
	(-3.35)	(-3.18)
SerialDum	-0.1092	-0.0681
	(-0.32)	(-0.21)
LocSV	0.4098	0.3410
	(0.86)	(0.76)
LocBos	-0.0314	0.0090
	(-0.06)	(0.02)
ln_Amount1_CBI	1.3428**	1.3122**
	(2.52)	(2.39)
Constant	-7.8187***	-12.3568***
	(-4.24)	(-7.15)
Year FE	*Yes*	*Yes*
Industry FE	*Yes*	*Yes*
Observations	497	497
log pseudolikelihood	-271.2	-270.2

Robust z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.10

APPENDIX: MARGINAL EFFECTS

Funding and Acquisition Milestones (Logit)

	Pr(Get VC Funding=1)		*Pr(Acquired=1)*	
	(1)	(2)	(3)	(4)
	dydxLoc GetVC_Logit	dydxAcc GetVC_Logit	dydx LocAcq_Logit	dydxAcc Acq_Logit
VARIABLES	1.LocationMatch	1.accelerator	1.LocationMatch	1.accelerator
0.LocationMatch		-0.4218***		0.0468
		(-5.92)		(1.05)
1.LocationMatch		-0.1202**		0.0904***
		(-1.97)		(3.75)
0.accelerator	-0.0575		-0.0109	
	(-1.02)		(-0.48)	
1.accelerator	0.2441***		0.0327	
	(4.07)		(0.82)	
Observations	497	497	497	497

Amount of Funding (FGLS)

	(1)	(2)
	dydxAcc ln_FollowFund_FGLS	dydxLoc ln_FollowFund_FGLS
VARIABLES	1.accelerator	1.LocationMatch
0.LocationMatch	-0.848***	
	(-4.78)	
1.LocationMatch	-0.519***	
	(-3.56)	
0.accelerator		-0.003
		(-0.02)
1.accelerator		0.326**
		(2.35)
Observations	497	497

Number of Employees (Poisson)

	(1)	(2)	(3)
	eydxAccLoc NumEmp_P	eydxAcc NumEmp_P	eydxLoc NumEmp_P
VARIABLES	margins	1.accelerator	1.LocationMatch
1.accelerator	0.381***		0.299**
	(3.58)		(2.26)
0.accelerator			0.490***
			(2.71)
1.LocationMatch	0.372***	0.291**	
	(3.11)	(2.34)	
0.LocationMatch		0.482***	
		(2.93)	
Observations	548	548	548

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.10