



Paper to be presented at
DRUID15, Rome, June 15-17, 2015
(Coorganized with LUISS)

Do Entrepreneurship Incubators Lead to Entrepreneurship?

Elizabeth Lyons

University of California, San Diego
IR/PS
lizlyons@ucsd.edu

Laurina Zhang

Western University
Ivey Business School
lzhang@ivey.uwo.ca

Abstract

Interest in entrepreneurship incubator programs has increased significantly over the past decade. However, evaluating the success of entrepreneurship incubator programs has been limited in part due to data scarcity and empirical challenges associated with disentangling program effects from selection effects. In this paper, we provide one of the first empirical evaluations of an entrepreneurship incubator program provided to students in North America. Given that the goal of many of these programs is to encourage subsequent entrepreneurial activities, we compare career decisions among the set of applicants who are accepted into the program with the set of applicants who are program finalists but not accepted. We find that being accepted into the program is positively related to the likelihood that applicants engage in subsequent entrepreneurship. We find that this relationship remains for applicants of above and below-median quality. Interestingly, we also find evidence that the effect of the program may be stronger for females and applicants with non-European surnames suggesting the program is most effective for people that may otherwise have more limited access to entrepreneurial opportunities. We discuss implications for incubator strategy and entrepreneurship policy.

Do Entrepreneurship Incubators Lead to Entrepreneurship?

Preliminary and Incomplete - Please Do Not Cite

Elizabeth Lyons[†] and Laurina Zhang[‡]

May 20, 2015

Abstract

Interest in entrepreneurship incubator programs has increased significantly over the past decade. However, evaluating the success of entrepreneurship incubator programs has been limited in part due to data scarcity and empirical challenges associated with disentangling program effects from selection effects. In this paper, we provide one of the first empirical evaluations of an entrepreneurship incubator program provided to students in North America. Given that the goal of many of these programs is to encourage subsequent entrepreneurial activities, we compare career decisions among the set of applicants who are accepted into the program with the set of applicants who are program finalists but not accepted. We find that being accepted into the program is positively related to the likelihood that applicants engage in subsequent entrepreneurship. We find that this relationship remains for applicants of above and below-median quality. Interestingly, we also find evidence that the effect of the program may be stronger for minorities suggesting the program is most effective for people that may otherwise have more limited access to entrepreneurial opportunities. We discuss implications for incubator strategy and entrepreneurship policy.

[†]School of Global Policy and Strategy, University of California, San Diego, 9500 Gilman Drive, MC 0519 La Jolla, CA 92093-0519. lizlyons@ucsd.edu.

[‡]Ivey School of Business, Western University, 1255 Western Road, London, ON, Canada N6C 0N1. lzhang@ivey.uwo.ca

Acknowledgments: We thank participants of the Ivey iSTOR brownbag for helpful comments. We gratefully acknowledge funding support from SSHRC and the Centre for Innovation and Entrepreneurship at the Rotman School of Management, University of Toronto.

1 Introduction

Interest in entrepreneurship incubator programs has increased significantly over the past decade. The number of incubators and accelerators around the world have grown rapidly from roughly 25 in 2006 to over 170 in 2013 and the number of startups funded by entrepreneurship training programs have increased by roughly twenty times in less than ten years (CrunchBase, 2013). At the same time, the U.S. Small Business Bureau spent \$127 million (SBA, 2012) on mentoring and coaching of entrepreneurs in 2012 and the Canada Job Grant initiative dedicated \$60 million¹ to the development of incubators and accelerators in 2013. For-credit courses, business incubators and extracurricular activities in entrepreneurship are also proliferating and expected to surge further.²

Entrepreneurial ability is increasingly regarded as a key factor for success in business and consequently innovation policy (Rigby and Ramlogan, 2013). Public and private resources directed toward entrepreneurship incubator programs are based on the belief that they develop entrepreneurial ability and subsequently drive innovation and economic growth. Yet, the evaluation of entrepreneurship programs on subsequent entrepreneurial activity has been relatively limited for a variety of reasons. Data on applicants and participants of entrepreneurship programs is often scarce and incomplete. Furthermore, disentangling the impact of training programs on career outcomes faces a fundamental selection problem in that people with a predisposition to entrepreneurship are more likely to apply and programs tend to select top quality applicants. Thus, it is difficult to discern whether entrepreneurship training programs facilitate subsequent entrepreneurial activities or whether program applicants would have pursued an entrepreneurial career even in the absence of the training program.

¹<http://www.ey.com/CA/en/Services/Strategic-Growth-Markets/G20-Entrepreneurship-Barometer-2013-Education-and-training> [accessed August 1, 2014]

²<http://www.theglobeandmail.com/report-on-business/careers/business-education/entrepreneur-courses-booming-but-are-they-effective/article19803868/> [accessed August 1, 2014]

In this paper, we provide one of the first empirical evaluations of an entrepreneurship incubator program provided to undergraduate students in North America. This program was founded in 2010 and has ran a single nine month session each year since 2011. The goal of the program is to create the next generation of innovators through a combination of classwork, mentorship, and financial capital as participants explore starting their own ventures. We compiled a unique dataset in partnership with the program on finalists from 2011 to 2014. Notably, we are able to measure the “quality” of both finalists accepted into the program and finalists who were not accepted into the program through factors such as finalist interview scores, survey responses, prior entrepreneurship experience, and undergraduate colleges.³ We also have demographic information such as age, gender, and ethnicity.

We compare subsequent career decisions among the set of applicants who are accepted into the program with the set of applicants who are program finalists but not accepted. Using finalists who are not accepted into the program as a control group allows us to control for selection into the program, as well as a meaningful proportion of any ability bias that may threaten the validity of our findings. We find that being accepted into the program is significantly and positively correlated with the likelihood that applicants engage in subsequent entrepreneurial activities. We find this relationship remains for applicants of above and below-median quality. In contrast, we find that acceptance into the program is negatively correlated to the likelihood that finalist pursue in traditional career paths, such as professional services. Interestingly, we also find some evidence that this positive relationship is more pronounced for minorities (females and non-Caucasians) suggesting the program may be most effective at offering opportunities to people who may otherwise have more difficulty securing them. In a preliminary exploration of the mechanism behind the effect of the program on participants, we do not find evidence that access to mentorship or capital through the program are driving our findings.

³We also have GPA data for three of the four years in our sample.

Our paper adds to the growing literature that evaluates the impact of entrepreneurship training on organizational and entrepreneur outcomes, including the impact of training on organizational processes (Ding, 2011), the knowledge and revenues of startups (Karlan and Valdivia, 2006), entrepreneurial skills and intent (Oosterbeek, van Praag, and Ijsselstein, 2010), and human capital investments (Martin, McNally, and Kay, 2013). While a rich literature has examined the impact of schooling on labor market outcomes (e.g. Angrist and Krueger, 1991; Duflo, 2004), our study provides (to our knowledge) one of the first instances of empirical evidence of incubator-training programs on the subsequent career decisions of participants.

We also contribute to the literature that has examined factors that lead people to pursue entrepreneurship, such as pre-founding work experience (e.g. Burton, Sorensen, and Beckman, 2002; Sorensen, 2007; Elfenbein, Hamilton, and Zenger, 2010), educational background (e.g. Lazear, 2005; Kim, Aldrich, and Keister, 2006), labor market frictions (Astebro, Chen, and Thompson, 2011), and genetics (Nicolaou, Shane, Cherkas, Hunkins, and Spector, 2008). Our study adds nuance to this story by suggesting that not only does entrepreneurship training increase the likelihood of entrepreneurship for applicants of both high *and* low ability, the effect is more pronounced for subgroups that may otherwise not have access to entrepreneurial opportunities. More broadly, our study also adds to the vibrant literature on the impact of policy interventions direct towards entrepreneurs on labor market outcomes (Ghani, Kerr, and O’Connell, 2014). However, most studies in this area have focused on developing economies (Field, Jayachandran, and Pande, 2010), where barriers to entrepreneurship such as access to capital, are arguably more severe than those faced by entrepreneurs in developed nations. Our results suggest that even in a setting where we expect barriers to entrepreneurship to be less severe, entrepreneurship-training programs have the largest impact on socially disadvantaged groups. In particular, our results add to the literature that considers obstacles to female entrepreneurship (Ghani, Kerr, and O’Connell,

2013; Rosenthal and Strange, 2012).

In the next section, we provide details on applicant selection and components of the training program. Section 3 describes the data and empirical strategy. Sections 4 and 5 discuss the results and conclude with next steps, respectively.

2 Institutional Background

To analyze the relationship between entrepreneurship education on subsequent entrepreneurial activities, we use data from an entrepreneurship education program for undergraduate students in North America. This program was founded in 2010 and accepted its first round of students in 2011. It runs one session per year. The goal of the program is to create the next generation of innovators in the country through a combination of coursework, mentorship, and financial capital while participants explore setting up their own ventures. There are several aspects of the program that are particularly relevant for our study. We discuss these features here.⁴

2.1 Program Participant Selection

The program has a limited number of spaces each year and participants are chosen through a careful selection process. The first round of applications consists of a detailed online application form that includes questions related to demographics, and start-up and life experience. The application also requires students to submit reference letters. Each online application is carefully reviewed by multiple people associated with the program, including experienced entrepreneurs, educators, and program donors. From this initial applicant pool, a set of finalists are chosen. On average, about 300 people apply and 70 finalists are selected each year.

⁴We do not go into extensive detail on the program features to protect the privacy of the program and of the participants.

Finalists then goes through a second round of the application process where they are interviewed in person by eight to ten interviewers. These interviewers are primarily experienced entrepreneurs and program founders. Finalists receive a score from each interview, and these scores are averaged to produce an overall finalist interview score. Program participants are then selected from this pool of finalists.

One of the authors sat in on the final deliberations following the finalist interviews in January, 2015. From this experience, we learned that program finalists are scored on a number of dimensions, including passion for entrepreneurship, academic performance, past entrepreneurial experience, and the ability to get along with others. These dimensions formulate the composite interview score. While the interview score informs a large part of the selection process, selection of program participants from the finalist pool is less systematic at the margin. For instance, gender and educational background diversity among participants is a goal of the program, and these factors play a larger role in the evaluation of finalists who are at the margin of being selected to participate in the program. Based on our first-hand experience with the selection process, we believe that, while they are imperfect, our controls of interview score, gender, educational and entrepreneurial background, etc., capture a significant portion of the selection process. Perhaps more importantly, we are confident that the pool of finalists who are not accepted into the program are a reasonable control group for those who are accepted into the program.

2.2 Program Components

The program offers participants a combination of academic and real-world training. Applicants who are accepted into the program receive in-class training, mentorship, and access to financial capital for ventures they found while participating in the program. Participants are required to attend courses on topics related to entrepreneurship, including entrepreneurial finance, entrepreneurial strategy, and international business. Participants also explore start-

ing their own venture during the program, and are assigned one or two mentors to guide the process. Mentors are typically shared by multiple participants. The majority of ventures founded during the program do not survive for more than 6 months after the program ends. Each venture is also eligible to receive financial capital from the program depending on their progress.⁵

In addition to these primary components, the program also gives participants an opportunity to develop a significant network of people in the country's entrepreneurship sector. Participants are introduced to people ranging from venture capitalists (VCs) and legal experts to academics and other entrepreneurs. While this program is unique relative to some other programs in its scope and rigor, the overall aim of the program and many of its components are consistent with many entrepreneurship training programs and incubators.

3 Data and Empirical Strategy

3.1 Overview of Data

We use data on program finalists for the 2011, 2012, 2013, and 2014 sessions of the program. In total, our data include 128 finalists who were not accepted into the program, and 147 finalists who were accepted. We have data on each finalist's application, which includes information on how they were rated during the finalist interviews. We also administered surveys to finalists before the program began each year, and to program participants after they had completed the program to supplement the data we were able to collect through the online applications and finalist interviews. In order to track post-program activity, we manually collected data from finalists' LinkedIn profile pages in June and July of 2014, and again in May 2015. We used information collected through Google searches to fill in data for finalists who did not have publicly available LinkedIn pages.

⁵All the venture teams in our sample received at least some capital from the program.

Our data includes demographic information on the finalists, including their gender, age, college major, school ranking, and whether or not they have prior entrepreneurship experience. We also use finalists' surnames to develop a measure of ethnicity.⁶ Importantly, we have the scores that program interviewers assigned to each finalist. This allows us to compare accepted and non-accepted finalists who are scored similarly. A complete list of variables and variable definitions is provided in Table 1.

We coded several variables to measure finalists' subsequent career decisions. In particular, we examine three measures of entrepreneurial activity: 1) whether the finalist has worked with a startup in any capacity after the program (founding/co-founding, work for a startup, work for a VC firm); 2) whether the finalist worked with a start-up after the program but is no longer working with them; 3) whether the finalist is currently working with a start-up. These variables are intended to distinguish between short and longer run effects of the program. We also measure whether they attended graduate school, worked in professional services, or in the non-profit or public sectors. As described in Section 2, students accepted into the program are required to start their own companies. In some cases, these companies survived well beyond the period of the program, but in most, they survived for only a few months after the program. In our measures of post-program entrepreneurial activity, we are careful to exclude start-up activity directly linked to the program as this could lead to an overestimate of the impact of the program on entrepreneurship. To do this, we did not include work with a start-up founded in the program unless it extended beyond six months following the program. These career outcomes variables are described in more detail in Table 1.

⁶We use Ancestry.com (2014), and Database (2014) to determine the origins of finalists' last names.

3.2 Descriptive Statistics

Summary statistics of program finalists' characteristics are presented in Panel A of Table 2. The means show about 60% are classified as a minority (specifically, about one quarter of finalists are female and slightly less than half have a non-Caucasian surname). Roughly 15% are eligible for financial aid, about 45% have prior experience founding a start-up, and the average finalist is within a year of graduating from an undergraduate degree program when they apply for entry into the program. About three quarters of finalists either major in engineering/natural science, or in business/economics.

Summary statistics for finalists' post-program career outcomes are presented in Panel B of Table 2. First, as the means make clear, some finalists had more than one role following the program. These statistics also show that about half of finalists went on to work in a start-up as a founder, and nearly 60% of finalists subsequently worked in the start-up sector in some capacity. Over 40% of finalists are currently pursuing entrepreneurial activities. Almost 13% of finalists went on to graduate school, about 15% went on to work in professional services or the tech sector in companies other than start-ups, and about 6% went on to work in the public or non-profit sectors.

Panel A in Table 3 compares the characteristics of finalists who were accepted into the program to the characteristics of those who were not accepted. On the majority of dimensions, including GPA and prior entrepreneurship experience, the two groups of finalists look very similar to each other. The clear exception to this is the scores they receive from program interviewers. Not surprisingly, finalists who were accepted into the program have significantly higher average interview scores than those who were not accepted. Finalists who major in business and economics appear less likely to be accepted into the program on average.

Panel B in Table 3 compares career outcomes of finalists accepted into the program to those of finalists not accepted into the program. While all finalists look quite similar before

the program, including in their prior entrepreneurial experience, they seem to differ in the career decisions after the program. In particular, accepted finalists are significantly more likely to work as start-up founders after the completion of the program, and are much more likely to work in the start-up sector in any capacity. In particular, 70% of accepted finalists go on to work in the start-up sector compared to less than half of not accepted finalists. In contrast, finalists not accepted into the program appear to be more likely to enter into a career in professional services. Not surprisingly, all finalists appear more likely than the general population to pursue a career in entrepreneurship.

While these descriptive comparisons are compelling, finalist differences in career outcomes could be driven by differences in applicant quality rather than by the program itself. We explore these patterns more carefully using the empirical strategy described below.

3.3 Empirical Strategy

There are important challenges associated with identifying the effect of entrepreneurial training on labor market outcomes. As with most evaluations of human capital investment, there is the potential for ability bias (e.g. Card, 1999). In particular, it is likely that people who invest in entrepreneurial training would be relatively proficient at the skill even if they have not invested in it. This could occur, for instance, because people select into a particular training based on their underlying preferences. This selection effect could bias our estimates upward because people who plan to enter into careers as entrepreneurs are more likely to invest in entrepreneurial training than those who do not. Our estimates could also suffer from an ability bias if higher quality people who would be better at entrepreneurship even without the program are the ones who are accepted into the program.

Our research setting allows us to address a large part of the concerns associated with ability bias. In particular, we restrict our analysis to program finalists. This allows us to compare people who participated in the program to those who have invested a substantial

amount of effort to participate but were not able to do so. However, even conditioning on the sample of people who self-selected into the program, ability bias likely remains. For instance, the program tends to select applicants that are more likely to become entrepreneurs because of their passion for entrepreneurship. To address this empirical challenge, we control for how finalists were rated by the program using the program interviewer scores assigned to each finalist. Given that the program likely considered other factors when choosing who to invite to participate, we also control for other applicant characteristics.⁷ These controls include finalists' gender, program of study, prior entrepreneurship experience, college ranking in the country, ethnicity, number of years to graduation, and whether they live in the region within the country with the most active start-up culture.⁸

We include year fixed effects in our regressions to control for time-varying factors that impact all applicants, including economic conditions. We also include interviewer fixed effects because different interviewers likely score finalists differently.

The main estimating equation we use to examine the effect of entrepreneurship training on career outcomes is as follows:

$$Y_i = \alpha + \beta_1 \textit{Accepted}_i + \theta X_i + \delta \textit{Year}_i + \psi \textit{Interviewer}_i + \epsilon_i \quad (1)$$

where Y_i is a measure of finalist i 's career decisions. $\textit{Accepted}_i$ is an indicator variable for whether or not finalist i is accepted into the program, X_i is a vector of controls for the characteristics of finalist i , \textit{Year}_i is a fixed effect for the year applicant i applied to the program, and $\textit{Interviewer}_i$ is a fixed effect for the program interviewer that interviewed finalist i . We employ robust standard errors in all our specifications.

⁷Although the mean comparisons indicate that finalists who were scored higher by interviewers were more likely to be accepted into the program, some finalists who scored quite low were accepted into the program, and some who scored very high were not. This suggests that the program did take other factors into consideration when deciding who to accept, which also works against the selection problem.

⁸We have data on finalist GPA for three of the four years of observation. We check the robustness of our findings to including these variables as controls in Tables A3 and results are largely consistent.

Despite our ability to control for much of the expected ability bias, our estimates may still suffer from bias if there remains unobservable differences between finalists who are accepted and those who are not. Therefore, we interpret our coefficient estimates as correlations rather than causal effects. We present these estimates in the following section.

4 Results

We begin this section by discussing the average relationship between entrepreneurship training and subsequent career decisions. We focus primarily on entrepreneurial careers, but we also explore other career outcomes. We then investigate whether there is heterogeneity in the relationship between program participation and finalists' career decisions by interacting whether a finalist was accepted into the program with finalist quality, and whether a finalist is a minority or not.

4.1 Main Results

Results from the main estimating equation are presented in Tables 4, and 5. The dependent variable in the first two columns of Table 4 is an indicator variable for whether or not finalists worked with a start-up following the program. Column 1 is our baseline regression and we find that program acceptance increases the likelihood of start-up activity after the program by 27 percentage points. Column 2 includes year and interviewer fixed effects, as well as controls for finalist characteristics. Including the full set of controls reduces the size of the acceptance coefficient by only about 6% relative to the coefficient in column 1, suggesting that there may be little omitted variables bias from unobservables (e.g. Altonji, Elder, and Taber, 2005). These results suggest that participating in the program significantly increases a finalist's subsequent likelihood of working in the start-up industry. The magnitude of the estimated coefficient is economically large. In particular, finalists who participate in the

program are about 25 percentage points, or over 50% more likely to work with start-ups following the program than finalists who do not.

The dependent variable in column 3 of Table 4 is equal to one if a finalist was working with a start-up following the program, but is no longer working with one. The dependent variable in column 5 is equal to one if a finalist is working with a start-up as of May 2015 and zero otherwise. The coefficients on the program acceptance indicator in these columns suggests that the effect of being accepted into the program is larger in the longer run than in the period immediately following the program, though the difference between the coefficients is not statistically significant.

In Table 5 we explore the relationship between entrepreneurship training and other career outcomes. First, to verify the robustness of our findings in Table 4, column 1 in Table 5 tests whether those finalists accepted into the program are more or less likely to work as a start-up founder following the program. This is a subset of finalists who work with start-ups, and arguably an important one. We find that those accepted into the program are more likely to go on to work as a start-up founder, and that the coefficient is very similar to the one presented in column 2 of Table 4. We also consider whether being accepted into the training program impacts whether the participant pursues a career in sectors other than entrepreneurship after the program ends. We find that being accepted into the program is correlated with a 9 percentage point reduction in the likelihood that the applicant will pursue a subsequent career in professional services, such as consulting, finance, or law. We also find that being accepted in the program is correlated with a 5 percentage point reduction in the likelihood an applicant pursues a subsequent career in the public or non-profit sectors. Meanwhile, we do not find evidence that acceptance into the program is significantly correlated to working in the tech sector in a non-start-up, or pursuing graduate school. Taken together, this is suggestive that entrepreneurship training may be correlated with applicants substituting away from mainstream career options.

4.2 Robustness of Main Results

In the results presented thus far, we have attempted to address concerns related to ability bias. In particular, we have restricted our analysis to individuals who complete the final stages of the program application but differ in whether they participate in the program. We have also addressed some concerns associated with who gets accepted into the program by restricting our analysis to program finalists who have relatively comparable abilities, and by controlling for a number of finalist characteristics. However, bias may remain if participants are being accepted into the program based on unobservable characteristics that also correlate with their subsequent career decisions. To address this possibility, we employ a coarsened exact matching procedure (CEM) (Iacus, King, and Porro, 2008), and run regressions that include additional controls that we collect for a subset of our sample.

We employ CEM procedure whereby we match accepted and not accepted finalists on their gender, interview scores, college majors, whether they have prior entrepreneurship experience, and their college's national ranking.⁹ This method helps to mitigate concerns that accepted and not accepted finalists are different by restricting analysis to observationally more similar finalists without losing too many observations. The results of this analysis are presented in Table 6. The estimated correlations between being accepted into the program and the likelihood that finalists engage in subsequent entrepreneurial activities at any time, whether they are currently working with start-up, and whether they were working with start-ups but are no longer doing so are similar in size to those presented in Tables 4. Statistical significance is lost, however, in column 3. This may be at least partially due to the smaller sample sizes.

As additional robustness checks, we include the data we collected on finalists' college GPAs from the program for the 2012, 2013, and 2014 finalists as controls in our main re-

⁹Including the non-Caucasian surname, years to graduation, and lives in active start-up region covariates in the matching led to a very small sample size. Thus, we excluded them from our main specification although the matching procedure is robust to different subsets of covariates.

gressions. College GPA is likely to be a strong determinant of whether finalists are accepted into the program, and potentially correlated with their entrepreneurial abilities. We include GPA as a control in Table A3. We also test whether our results are robust to dropping the control for prior entrepreneurship experience. This coefficient may be highly correlated with whether finalists engage in post-program entrepreneurship in a way that could be concerning because finalists could be continuing on with their pre-program entrepreneurial activities following the program. The results of this estimation are presented in Table A4. The estimated relationship between the training program and subsequent entrepreneurial activity in these regressions is consistent with those presented in Tables 4, though controlling for GPA eliminates the significant correlation between program acceptance and short-term entrepreneurial activity.

4.3 Heterogeneity in Applicant Quality and Characteristics

Table 7 investigates whether heterogenous ex-ante applicant “quality” measured by interview score impacts the likelihood of pursuing an entrepreneurship career after the program. If the program selects applicants based on their predisposition to entrepreneurship and ability, then we may expect that these “higher quality” applicants are more likely to pursue entrepreneurship regardless of the program, and consequently that the program may have a disproportionate effect on these types of applicants. Interestingly, we do not find this to be the case. Table 7 demonstrates that, while being accepted into the program is correlated with a 29 percentage point increase in the likelihood that participants will pursue entrepreneurship, applicants with above median interview scores are not significantly more likely to pursue entrepreneurship. This suggests that interview scores are not perfect controls for finalist ability, however, it is also suggestive that the selection problem is perhaps less severe in our setting and that entrepreneurship training does not appear to disproportionately benefit applicants based on their ex-ante ability. Moreover, consistent with existing

evidence on the difficulty associated with identifying successful entrepreneurs ex-ante (e.g. Howell, 2015) it suggests that interviewers may not be very good at identifying successful entrepreneurs.

In Table 8, we examine the heterogeneous effect of the program across applicant characteristics. In particular, we examine whether the program differentially impacts minorities, defined as females and non-Caucasians. Research has shown that females face different barriers to entrepreneurship compared to males in developing nations due to religious and caste constraints, and business training leads to higher rates of business growth and profitability (Field, Jayachandran, and Pande, 2010). Non-Caucasians may also have barriers to entrepreneurship not faced by Caucasians in Canada, for instance due to discrimination (Teixeira, Lo, and Truelove, 2007), and poorer access to resources (Aldrich and Waldinger, 1990). Several findings stand out. First, acceptance into the program increases the likelihood of short-term entrepreneurial activity for all applicants by about 15 percentage points. Second, while minority finalists are more likely to engage in short-term entrepreneurial activities, we find that they appear to be less likely to engage in entrepreneurial activity in the longer term than non-minorities. However, column 3 demonstrates that the program disproportionately increases the likelihood that minorities pursue longer-term entrepreneurial activities. In fact, the program almost eliminates any negative correlation between being a minority and pursuing on-going entrepreneurial activities. Moreover, the effect of program acceptance for non-minorities' efforts in ongoing entrepreneurial activities is statistically zero in column 3, which suggests that the impact of the program is less persistent for non-minority finalists in the long run.

One concern is that if minorities have fewer opportunities to enter into professional service jobs (e.g., investment-banking or consulting) than non-minorities, then they are more likely to pursue alternative career options like entrepreneurship. To examine whether these results are being influenced by differences in the characteristics of minorities and non-

minorities, Tables A1 report summary statistics across these two groups. These descriptive statistics suggest that minority and non-minority applicants are relatively comparable in observable characteristics, such as their average interview score and prior entrepreneurship experience. The main differences between minorities and non-minorities are that minorities have a higher mean GPA, are less likely to live in the country’s most active start-up region, and are attend higher ranked schools on average. In addition, as suggested by the estimation results in Table 8, non-minorities are more likely to engage in entrepreneurial activities, including working as a start-up founder. They are not, however, differentially likely to be engaged in any of the other career opportunities we consider (non-startup tech, professional services, graduate school, government/non-profit). While these differences in characteristics may be affecting the relationship between program participation and subsequent employment decisions, there is no clear evidence that employment opportunities differ by minority status.¹⁰

5 Conclusion

How do we evaluate the success of entrepreneurship incubator programs? In this paper we consider a performance metric that is arguably consistent with the mission of most programs: whether the participant continues with entrepreneurial endeavors after the program ends. Using unique data on a sample of applicants to an entrepreneurship incubator program that includes both accepted and non-accepted applicants of similar quality, we take a step towards disentangling the effect of entrepreneurship education on subsequent career outcomes.

We find evidence that suggests entrepreneurship training significantly increases the likelihood that participants pursue subsequent entrepreneurship. Applicants of higher “ability”, measured by interview scores, do not appear to be differentially effected by training. In-

¹⁰To verify that GPA is not biasing our results, we re-estimate the results in Table 8 including a control for GPA. These results are presented in Table A5 and are consistent with those presented in Table 8.

terestingly, this relationship appears to be most pronounced for minorities, suggesting that entrepreneurship training may alleviate social barriers to entrepreneurship even in developed nations where traditional labor market barriers may be less severe.

Our study is of course subject to limitations. Despite our ability to control for much of the expected ability bias, our estimates may still suffer from bias if there remains unobservable differences between finalists who are accepted and those who are not. Our data does not currently allow us to pinpoint the mechanism in which the program facilitates subsequent entrepreneurship, such as through VC network, access to capital, etc. We are in the process of collecting additional data to shed light on potential mechanisms through survey instruments. Table A2 presents a preliminary exploration of the mechanism behind the effect of the program on participants. We find no evidence that access to mentorship or access to capital through the program are driving our findings. Preliminary qualitative evidence suggests that the primary mechanism through which the program facilitates subsequent entrepreneurship is through networking benefits.

Our results should also be interpreted with caution. While we find that incubators are associated with an increase in subsequent entrepreneurship we are not able to evaluate whether this is socially optimal. For example, if incubators increase subsequent entrepreneurship from applicants that would have pursued a career in professional services (given that unaccepted finalists appear more likely to pursue professional service careers), it is unclear whether the increase in entrepreneurial activities is socially beneficial.

Nevertheless, our study provides one of the first empirical investigation of an important performance metric of entrepreneurship incubator programs in North America. Our results suggest that entrepreneurial training programs are effective in promoting entrepreneurship. Perhaps more importantly, our study suggests that thinking about who benefits the most from such programs is likely to be informative for both incubator strategy and for the allocation of public and private resources to these programs in the future.

6 References

- ALDRICH, H. E., AND R. WALDINGER (1990): “Ethnicity and entrepreneurship,” *Annual review of sociology*, pp. 111–135.
- ALTONJI, J. G., T. E. ELDER, AND C. R. TABER (2005): “An evaluation of instrumental variable strategies for estimating the effects of catholic schooling,” *Journal of Human Resources*, 40(4), 791–821.
- ANCESTRY.COM (2014): <http://www.ancestry.com/>.
- ANGRIST, J. D., AND A. B. KRUEGER (1991): “Does Compulsory School Attendance Affect Schooling and Earnings?,” *Quarterly Journal of Economics*, 106(4), 979–1014.
- ASTEBRO, T., J. CHEN, AND P. THOMPSON (2011): “Stars and Misfits: Self-Employment and Labor Market Frictions.,” *Management Science*, 57, 1999–2017.
- BURTON, M. D., J. B. SORENSEN, AND C. M. BECKMAN (2002): “Coming from good stock: Career histories and new venture formation,” in *Research in the Sociology of Organizations*, ed. by M. Lounsbury, and M. J. Ventresca. JAI Press, Oxford, UK.
- CARD, D. (1999): “The causal effect of education on earnings,” *Handbook of labor economics*, 3, 1801–1863.
- CrunchBase (2013): “The Startup Accelerator Trend Is Finally Slowing Down,” Accessed: 2015-05-15.
- DATABASE, S. (2014): <http://www.surnamedb.com/>.
- DING, W. W. (2011): “The Impact of Founders’ Professional-Education Background on the Adoption of Open Science by For-Profit Biotechnology Firms.,” *Management Science*, 57(2), 257–273.
- DUFLO, E. (2004): “The medium run effects of educational expansion: Evidence from a large school construction program in Indonesia,” *Journal of Development Economics*, 74(1), 163–197.
- ELFENBEIN, D. W., B. H. HAMILTON, AND T. R. ZENGER (2010): “The Small Firm Effect and the Entrepreneurial Spawning of Scientists and Engineers.,” *Management Science*, 56(4), 659–681.
- FIELD, E., S. JAYACHANDRAN, AND R. PANDE (2010): “Do Traditional Institutions Constrain Female Entrepreneurships? A Field Experiment on Business Training in India,” *American Economic Review*, 100, 125–129.

- GHANI, E., W. R. KERR, AND S. D. O'CONNELL (2013): "Local industrial structures and female entrepreneurship in India," *Journal of Economic Geography*, 13, 929–964.
- GHANI, E., W. R. KERR, AND S. D. O'CONNELL (2014): "Political Reservations and Women's Entrepreneurship in India," *Journal of Development Economics*, 108, 138–153.
- HOWELL, S. (2015): "Financing Constraints as Barriers to Innovation: Evidence from RD Grants to Energy Startups," Working paper.
- IACUS, S. M., G. KING, AND G. PORRO (2008): "cem: Software for coarsened exact matching," .
- KARLAN, D., AND M. VALDIVIA (2006): "Teaching Entrepreneurship: Impact of Business Training on Microfinance Clients and Institutions," *Center discussion paper // Economic Growth Center, No. 941*.
- KIM, P., H. E. ALDRICH, AND L. KEISTER (2006): "Access (not) denied: The impact of financial, human, and cultural capital on entrepreneurial entry in the United States.," *Small Business Economics*, 27(1), 5–22.
- LAZEAR, E. P. (2005): "Entrepreneurship," *Journal of Labor Economics*, 23(4), 649–680.
- MARTIN, B., J. MCNALLY, AND M. KAY (2013): "Examining the Formation of Human Capital in Entrepreneurship : A Meta-Analysis of Entrepreneurship Education Outcomes," *Journal of Business Venturing*, 28, 211–224.
- NICOLAOU, N., S. SHANE, L. CHERKAS, J. HUNKINS, AND T. SPECTOR (2008): "Is the Tendency to Engage in Entrepreneurship Genetic?," *Management Science*, 54(1), 167–179.
- OOSTERBEEK, H., M. VAN PRAAG, AND A. IJSSELSTEIN (2010): "The impact of entrepreneurship education on entrepreneurship skills and motivation," *European Economic Review*, 54, 442–454.
- RIGBY, J., AND R. RAMLOGAN (2013): "The Impact and Effectiveness of Entrepreneurship Policy," *Nesta Working Paper No. 13/01*.
- ROSENTHAL, S., AND W. STRANGE (2012): "Female Entrepreneurship, Agglomeration, and a new spatial mismatch.," *The Review of Economics and Statistics*, 94, 764–788.
- SBA (2012): http://www.sba.gov/about-sba/sba_newsroom/fiscal_year_2012_budget_summary.
- SORENSEN, J. B. (2007): "Bureaucracy and entrepreneurship: Work-place effects on entrepreneurial entry.," *Administrative Science Quarterly*, 52(3), 387412.
- TEIXEIRA, C., L. LO, AND M. TRUELOVE (2007): "Immigrant entrepreneurship, institutional discrimination, and implications for public policy: a case study in Toronto," *Environment and Planning C: Government and Policy*, 25(2), 176.

7 Tables and Figures

Table 1: Variable Definitions

<i>Applicant Characteristic Variables</i>	
Minority	Equal to one if finalist is female or is not Caucasian, zero otherwise
Average Interview Score	Average score given to finalist by program interviewers
Eligible for Financial Aid	Equal to one if finalist is eligible for program financial aid, zero otherwise
Years to Graduation	Number of years remaining until finalist graduates from undergraduate program
Prior Entrepreneurship Experience	Equal to one if finalist has entrepreneurship experience prior to program application, zero otherwise
Lives in Active Start-Up Region	Equal to one if finalist lives in a region with an active start-up culture, zero otherwise
Engineering/Science Major	Equal to one if finalist majors in engineering, computer science, or other natural science, zero otherwise
Business/Economics Major	Equal to one if finalist majors in business or economics, zero otherwise
Undergraduate College Ranking	Ranking of University within North America According to Shanghai Ranking
Accepted into Program	Equal to one if finalist is accepted into program, zero otherwise
<i>Career Outcome Variables</i>	
Any Entrepreneurial Activity	Equal to one if finalist worked with start-ups after program in any of the following capacity: founding, co-founding a start-up, working for a start-up, or working for a venture capital firm, zero otherwise
Short-term Entrepreneurial Activity	Equal to one if finalist worked with start-up after program but is no longer with them, zero otherwise
Current Entrepreneurial Activity	Equal to one if finalist is currently working with start-ups, zero otherwise
Start-Up Founder	Equal to one if finalist worked as start-up founder at least six months after program, zero otherwise
Non-Start-Up Tech Sector	Equal to one if finalist works in non-start-up tech sector at least six months after program, zero otherwise
Professional Services	Equal to one if finalist works in professional services, zero otherwise
Graduate School	Equal to one if finalist attended graduate school, zero otherwise
Government/Non-Profit Sector	Equal to one if finalist works in government or non-profit sector, zero otherwise

Table 2: Summary Statistics

Panel A: Applicant Characteristics

Characteristics	Obs	Mean	Std. Dev.	Minimum	Maximum
Minority	282	0.613	0.488	0	1
Average Interview Score	278	6.196	2.053	0.714	10
Eligible for Financial Aid	219	0.146	0.354	0	1
Years to Graduation	281	0.406	0.792	-1	3
GPA	217	3.579	0.346	2.33	4
Prior Entrepreneurship Experience	275	0.440	0.497	0	1
Lives in Active Start-Up Region	282	0.443	0.498	0	1
Engineering/Science Major	282	0.337	0.473	0	1
Business/Economics Major	282	0.415	0.494	0	1
Undergraduate College Ranking	274	1.704	0.963	1	4
Accepted into Program	282	0.532	0.500	0	1

Panel B: Post-Program Applicant Career Outcomes

Career Outcomes	Obs	Mean	Std. Dev.	Minimum	Maximum
Any Entrepreneurial Activity	282	0.578	0.495	0	1
Short-term Entrepreneurial Activity	282	0.145	0.353	0	1
Current Entrepreneurial Activity	275	0.444	0.498	0	1
Start-Up Founder	275	0.528	0.500	0	1
Non-Start-Up Tech Sector	275	0.142	0.349	0	1
Professional Services	275	0.156	0.368	0	1
Graduate School	275	0.124	0.330	0	1
Government/Non-Profit Sector	282	0.057	0.232	0	1

Table 3: Summary Statistics By Program Acceptance

Panel A: Applicant Characteristics					
Characteristics	Not Accepted		Accepted		p-value of Difference
	Mean	Std. Dev.	Mean	Std. Dev.	
Minority	0.561	0.043	0.660	0.039	0.088
Average Interview Score	5.258	0.162	7.032	0.153	0.000***
Eligible for Financial Aid	0.174	0.037	0.118	0.031	0.242
Years to Graduation	0.386	0.066	0.423	0.067	0.701
GPA	3.552	0.037	3.607	0.029	0.2428
Prior Entrepreneurship Experience	0.438	0.044	0.442	0.041	0.938
Lives in Active Start-Up Region	0.402	0.043	0.480	0.041	0.187
Engineering/Science Major	0.303	0.040	0.367	0.039	0.261
Business/Economics Major	0.470	0.044	0.367	0.039	0.080*
Undergraduate College Ranking	1.714	0.081	1.700	0.083	0.876
N		128		147	
Panel B: Post-Program Applicant Career Outcomes					
Career Outcomes	Not Accepted		Accepted		p-value of Difference
	Mean	Std. Error	Mean	Std. Error	
Any Entrepreneurial Activity	0.439	0.043	0.700	0.098	0.000***
Short-term Entrepreneurial Activity	0.091	0.025	0.193	0.032	0.015**
Current Entrepreneurial Activity	0.359	0.043	0.517	0.041	0.009***
Start-Up Founder	0.394	0.043	0.647	0.039	0.000***
Non-Start-Up Tech Sector	0.148	0.032	0.136	0.028	0.770
Professional Services	0.195	0.035	0.122	0.027	0.098*
Graduate School	0.133	0.030	0.115	0.026	0.667
Government/Non-Profit Sector	0.076	0.023	0.04	0.016	0.197
N		128		147	

Table 4: The Effect of Program on Entrepreneurial Activity

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
		Any		Short-Term		On-going
Accepted	0.269*** (0.0591)	0.252*** (0.0638)	0.114*** (0.0428)	0.0862* (0.0452)	0.155** (0.0605)	0.166** (0.0650)
Minority		-0.147** (0.0572)		0.0459 (0.0451)		-0.193*** (0.0616)
Average Interview Score		0.0239 (0.0174)		0.00756 (0.0110)		0.0163 (0.0174)
Prior Entrepreneurship Experience		0.316*** (0.0566)		0.0602 (0.0467)		0.255*** (0.0591)
Startup region		0.00833 (0.0597)		0.00689 (0.0523)		0.00144 (0.0633)
Engineering/Science Major		-0.0176 (0.0755)		0.0367 (0.0572)		-0.0543 (0.0795)
Business Major		0.0413 (0.0676)		0.0424 (0.0556)		-0.00111 (0.0729)
Undergraduate College Ranking		-0.0284 (0.0363)		-0.00155 (0.0235)		-0.0269 (0.0379)
Year & Interviewer	No	Yes	No	Yes	No	Yes
Fixed Effects and Controls						
Observations	264	264	264	264	264	264
R-squared	0.074	0.259	0.025	0.095	0.024	0.203
Mean dep var	0.578	0.578	0.145	0.145	0.444	0.444

Notes: Robust standard errors are in parentheses. Any Entrepreneurial Activity is equal to one if a finalist engaged in any work with start-ups following the program. Short-term Entrepreneurial Activity is equal to one if a finalist was engaged in any work with start-ups following the program but is no longer involved with them. On-Going Entrepreneurial Activity is equal to one if a finalist is currently engaged in any work with start-ups.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Effect of Program on Other Career Outcomes

	Start-Up Founder	Non-Start-Up Tech Sector	Professional Services	Government/Non-Profit Sector	Graduate School
Dependent Variable	(1)	(2)	(3)	(4)	(5)
accepted	0.241*** (0.0637)	0.056 (0.081)	-0.091* (0.049)	-0.047* (0.028)	-0.007 (0.040)
Observations	264	264	264	264	264
R-squared	0.241	0.153	0.133	0.052	0.093
Mean dep var	0.528	0.369	0.156	0.0567	0.124

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, and year and interviewer fixed effects
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Effect of Program on Any Start-Up Activity, Matched Sample

	Any Entrepreneurial Activity	Short-term Entrepreneurial Activity	Ongoing Entrepreneurial Activity
Dependent Variable	(1)	(2)	(3)
Accepted into Program	0.260*** (0.088)	0.159** (0.067)	0.102 (0.091)
Observations	135	135	135
R-squared	0.187	0.149	0.174
Mean dep var	0.603	0.544	0.544

Notes: Standard errors are in parentheses. Coarse and exact matching weights included. Covariates used for coarse and exact matching are female, average interview score, prior entrepreneurship experience, engineering/science major, business/economics major, and school ranking. Controls included in all columns are non-european surname, years to graduation, and lives in active start-up region. Year and interviewer fixed effects are also included in all columns
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Effects of Program Across Interview Scores

	Any Entrepreneurial Activity	Short-term Entrepreneurial Activity	Ongoing Entrepreneurial Activity
Dependent Variable	(1)	(2)	(3)
Accepted into Program	0.287*** (0.062)	0.132*** (0.050)	0.155** (0.063)
Above Median Interview Score	-0.010 (0.174)	-0.087 (0.061)	0.077 (0.172)
Accepted into Program*Above Median Interview Score	-0.010 (0.184)	-0.116 (0.073)	0.106 (0.193)
Observations	264	264	264
R-squared	0.244	0.116	0.206
Mean dep var	0.578	0.145	0.444

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, and year and interviewer fixed effects

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Effect of Program By Minorities

	Any Entrepreneurial Activity	Short-term Entrepreneurial Activity	Ongoing Entrepreneurial Activity
Dependent Variable	(1)	(2)	(3)
Accepted into Program	0.157 (0.096)	0.146** (0.068)	0.010 (0.101)
Minority	-0.228*** (0.082)	0.097* (0.050)	-0.325*** (0.082)
Minority * Accepted	0.155 (0.111)	-0.098 (0.087)	0.253** (0.116)
Observations	264	264	264
R-squared	0.264	0.099	0.218
Mean dep var	0.578	0.145	0.444

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, and year and interviewer fixed effects
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendices

Appendix A Additional Tables

Table A1: Summary Statistics By Minority Status

Panel A: Applicant Characteristics					
Characteristics	NonMinority		Minority		p-value of Difference
	Mean	Std. Error	Mean	Std. Error	
Average Interview Score	6.083	0.204	6.268	0.154	0.466
Eligible for Financial Aid	0.134	0.038	0.153	0.031	0.700
Years to Graduation	0.330	0.069	0.453	0.064	0.205
GPA	3.510	0.042	3.620	0.027	0.023**
Prior Entrepreneurship Experience	0.443	0.048	0.438	0.038	0.929
Lives in Active Start-Up Region	0.349	0.046	0.503	0.038	0.011**
Engineering/Science Major	0.339	0.046	0.335	0.036	0.943
Business/Economics Major	0.431	0.048	0.405	0.037	0.661
Undergraduate College Ranking	1.953	0.105	1.548	0.056	0.001***
N		108		170	
Panel B: Post-Program Applicant Career Outcomes					
Career Outcomes	Non-Minority		Minority		p-value of Difference
	Mean	Std. Error	Mean	Std. Error	
Any Entrepreneurial Activity	0.661	0.046	0.526	0.038	0.026**
Short-term Entrepreneurial Activity	0.119	0.031	0.168	0.028	0.325
Current Entrepreneurial Activity	0.556	0.048	0.373	0.037	0.003***
Start-Up Founder	0.606	0.047	0.480	0.038	0.040**
Non-Start-Up Tech Sector	0.132	0.033	0.147	0.027	0.715
Professional Services	0.132	0.033	0.172	0.029	0.382
Graduate School	0.104	0.030	0.136	0.026	0.4299
Government/Non-Profit Sector	0.055	0.022	0.048	0.018	0.923
N		106		169	

Table A2: Program Mechanisms: Some Descriptive Evidence

	Start-Up Founder	Any Work with Start-Ups	Start-Up Founder	Any Work with Start-Ups
Program Inputs	(1)	(2)	(3)	(4)
Mentor Hours	0.000 (0.005)	-0.004 (0.005)		
Investment During Program /\$10,000			0.031 (0.026)	0.026 (0.022)
Observations	37	37	83	83
R-squared	0.277	0.278	0.206	0.293
Mean dep var	0.676	0.718	0.687	0.783

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, and interviewer fixed effects. Sample restricted to accepted applicants. Mentor hours only available for 2011 cohort. Year fixed effects are included for regressions not including mentor hours.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A3: Effect of Program on Start-Up Activity, Controlling for GPA

	Any Entrepreneurial Activity	On-Going Entrepreneurial Activity	Short-term Entrepreneurial Activity
Accepted into Program	0.288*** (0.071)	0.225*** (0.070)	0.063 (0.046)
GPA	0.071 (0.106)	0.008 (0.104)	0.064 (0.051)
Observations	204	204	204
R-squared	0.247	0.231	0.118
Mean dep var	0.578	0.444	0.145

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, interviewer, and year fixed effects. Sample includes 2012, 2013, and 2014 finalists, GPA data is not available for the 2011 cohort.

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table A4: Effect of Program on Start-Up Activity,
Not Controlling for Prior Entrepreneurship Experience**

	Any Entrepreneurial Activity	On-Going Entrepreneurial Activity	Short-term Entrepreneurial Activity
Accepted into Program	0.232*** (0.066)	0.148** (0.066)	0.084* (0.045)
Observations	264	264	264
R-squared	0.156	0.141	0.098
Mean dep var	0.578	0.444	0.145

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, interviewer, and year fixed effects.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table A5: Effect of Program By Minorities Controlling for GPA

VARIABLES	(1)	(2)	(3)
	Controls Year FEs	Controls Year FEs	Controls Year FEs
Accepted into Program	0.151 (0.117)	0.060 (0.116)	0.092 (0.067)
Minority	-0.203** (0.097)	-0.290*** (0.095)	0.087* (0.051)
Minority * Accepted	0.224 (0.136)	0.275** (0.135)	-0.051 (0.090)
Observations	204	204	204
R-squared	0.261	0.245	0.112
Mean dep var	0.578	0.444	0.145

Notes: Robust standard errors are in parentheses. All regressions include controls for applicant characteristics, interviewer, and year fixed effects. Sample includes 2012, 2013, and 2014 finalists, GPA data is not available for the 2011 cohort.

* significant at 10%; ** significant at 5%; *** significant at 1%