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WP 22-19

PUBLISHED
August 2022

ISSN: 1962-5361

DOI: https://doi.org/10.21799/frbp.wp.2022.19

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The Role of Universities in Attracting Immigrant Entrepreneurs

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June 1, 2022

We study immigrant founders of venture-capital backed firms using a new and detailed data set that we assemble on the backgrounds of founders. Immigrant founders have been critical to the entrepreneurial ecosystem, accounting for roughly 20% of all venture capital-backed founders over the past 30 years. We document the channels through which immigrant founders arrive in the United States and how those channels have changed over time. Higher education has served as the primary entry channel for immigrant founders. The share of foreign-educated immigrant founders who initially arrive for work has decreased over time, while the share of immigrant founders with undergraduate education in the United States has increased over time. Immigrant founders are likely to start their companies in the state in which they were educated, leading to potentially large local economic benefits associated with attracting foreign students. The results of this paper have important policy implications for the supply of entrepreneurial talent and efforts to promote entrepreneurial ecosystems.

Keywords: entrepreneurship, venture capital, immigration, education

JEL Code: G24, J0, J15, J24, L26

*Support for this research was provided by the Division of Research at the Harvard Business School. Patrick Sweeney provided excellent research assistance. Paul Gompers has invested in and consulted for venture capital firms. The contents of this paper do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System and should not be interpreted as investment or legal advice.

1. Introduction

Immigrants play a vital role in innovation activities (Hunt and Gauthier-Loiselle, 2010; Bernstein, Diamond, McQuade, and Pousada, 2020) and entrepreneurship (Kerr and Kerr, 2016; Azoulay, Jones, Kim, and Miranda, 2020; Kerr and Kerr, 2020). Given the substantial contribution of immigrants in these areas, a set of natural questions arises: What pathways do high-skilled immigrants take to arrive in the United States, and how has the importance of these pathways changed over time? What institutions serve as gatekeepers for highly skilled immigrants, and do they affect the types of immigrant founders who come to the United States? Do certain parts of the United States benefit disproportionately from highly skilled immigration, and if so, what are some factors that contribute to these benefits?

The answers to these questions have important implications for designing immigration policy and regulation, which have become increasingly acrimonious topics in public discourse. They also have important implications for firms and universities that recruit talent from abroad, as well as for communities that hope to promote vibrant entrepreneurial ecosystems.

To investigate these questions, we study venture capital (VC)-backed immigrant entrepreneurs. The VC ecosystem plays a crucial role in the macroeconomy (Gornall and Strebulaev, 2015; Gompers and Lerner, 2000), as VC-backed firms contribute disproportionately to the right tail of the firm size and innovation distributions in the U.S. economy (Akcigit, Dinlersoz, Greenwood, and Penciakova, 2019). VC-backed firms are also substantial job creators in the U.S. economy. Focusing on the contribution of immigrant founders of venture-backed firms highlights the job *creating* role that immigrants play in the economy, thereby addressing concerns that immigrants primarily take jobs away from natives (Azoulay, Jones, Kim, and Miranda, 2020). Finally, various policymakers have endeavored to promote and foster high growth-potential entrepreneurship. Accordingly, understanding the contribution of immigrants to this important part of the economy is of interest *per se*. Additionally, as we discuss further, while entrepreneurs who start venture-backed firms may be a selected sample, the detailed data set we assemble on immigrant entrepreneurs yields insights that are likely generalizable to highly skilled immigrants at large.

Focusing on VC-backed immigrant entrepreneurs, we use a combination of unique data sets that allow us to identify immigrant founders of VC-backed companies and to more closely study their backgrounds. Particularly, we combine a data set from Infutor, which enables us to proxy for the immigration status of individuals in the United States, with VentureSource, which contains detailed information on the near universe of VC-backed start-ups in the United States, including the identities of the individual founder and VC investors. We supplement these with resume data from Emsi, a labor analytics firm, which allows us to observe details of the education and prior work experience for the entrepreneurs in our sample, and PatentsView, which enables us to link U.S. patent applications to VC-backed start-ups. These data together provide a rich and comprehensive source of background information on entrepreneurs that we leverage to understand the pathways that highly skilled immigrants take toward entrepreneurship.

We begin our empirical analysis by documenting several facts about immigrant entrepreneurs in our sample. We estimate that approximately 20% of the VC-backed founders in our sample are immigrants, broadly in line with previous research that estimates a similar immigrant share in entrepreneurial and innovation activities. Consistent with overall immigration trends, we find that the proportion of East Asian and South Asian founders has increased substantially over time in our sample. We also find that immigrant founders are just as likely as native-born founders to start firms that have initial public offerings (IPOs) or are acquired at valuations greater than $100 million, markers of success for VC-backed firms. Moreover, relative to natives, immigrants disproportionately tend to start information technology (IT) firms. On a relative basis, venture-backed firms founded by immigrants also tend to be founded in coastal states, most notably California, Massachusetts, and New York, as opposed to smaller states in the southern and middle parts of the country. Even relative to their overall greater share of VC-backed companies, these coastal states have higher proportions of founders who are immigrants, indicating that the benefits associated with high-growth potential, immigrant-founded firms have been geographically concentrated in certain parts of the country.

Having established these broad facts about immigrant entrepreneurs and their firms, we further use our unique data on immigrant entrepreneurs' education and work histories to better understand immigrant pathways toward entrepreneurship. We categorize each immigrant entrepreneur in our sample into one of three categories: those who first came to the U.S. for undergraduate study, those who first came for postgraduate education, and those who first came after receiving their education elsewhere. This classification allows us to more closely explore how the different pathways of highly skilled immigration to the United States contribute to the pool of entrepreneurial talent. Such classification also reveals a striking fact: More than 75% of immigrant entrepreneurs for whom we have education information received some form of education in the United States. Of this 75%, roughly half received an undergraduate degree in the United States. The critical role of higher education, and increasingly undergraduate education, as a path to the U.S. and high potential entrepreneurship for immigrants provides new insights about the role of research universities in attracting highly skilled talent from abroad.

More closely focusing on entrepreneurs within and across the different groups, we find that immigrant entrepreneurs who come to the U.S. for college tend to have similar educational backgrounds to native-born entrepreneurs. In contrast, entrepreneurs who come to the U.S. for graduate education or come first for work (having completed their education abroad) are substantially more likely to have studied a science, technology, engineering, and mathematics (STEM) discipline. Consistent with this fact, these entrepreneurs are also responsible for the disproportionate representation of immigrants among IT firm founders in our sample. Interestingly, while the share of immigrant entrepreneurs has stayed relatively constant over our sample, we find that the relative share of U.S. college-educated immigrant entrepreneurs has been rising, while the share of immigrant entrepreneurs who came to the U.S. for graduate school and work has generally been declining.

Next, we explore the locations within the U.S. in which immigrant founders from the different groups start their companies to ascertain which geographic areas benefit from immigrant entrepreneurs. We find that approximately 40% of founders in our sample found firms in the same state where they were

educated. This fact is not simply driven by the University of California, Berkeley- and Stanford University-educated entrepreneurs founding companies in the Bay Area, and Harvard University- and MIT-educated entrepreneurs founding companies in Massachusetts. Instead, it captures a more general phenomenon that applies to non-VC-hubs as well. The evidence suggests that the presence of top universities has likely been an important determinant of which areas have benefited the most from the immigration of highly skilled founders. More generally, this result provides additional evidence for the role that universities play in local agglomeration economies. Universities are known to contribute to local economies in a variety of ways, for example, by training a skilled labor force or by knowledge diffusion from innovation activities (e.g., Hausman, 2020). Our results suggest that this agglomeration benefit extends to attracting skilled immigrants, some of whom start high-growth potential firms.

Last, we explore the productivity and innovation activities of immigrant-founded companies. We find that: 1) immigrant-founded companies are equally as likely to achieve an initial public offering or be acquired at a high valuation as native-founded firms, and 2) immigrant-founded companies produce more patents than native-founded firms. The first result highlights that immigrant-founded firms are just as likely to *succeed* in financial terms by achieving exits for themselves and their investors that are as attractive as native-founded firms. The second result points to a performance dimension along which immigrant founded firms outperform native-founded firms: innovation activities. The higher patenting productivity of immigrant-founded firms is primarily driven by firms started by founders who arrived in the United States for their graduate education, again suggesting the importance of the higher-education system in attracting productive talent to the United States.

From a policy perspective, our results emphasize the importance of immigrant entrepreneurs as founders of high-growth potential start-ups. While a substantial focus in the current public discourse revolves around work visas, such as the H-1B visa, our evidence suggests that student visas may deserve even more attention, given the role of universities in bringing talented, high-potential foreign students into the country. Policy proposals in the past few years have sought to place restrictions on student visas for

foreigners. Given the substantial contribution of immigrant entrepreneurs educated in the United States, our results suggest that such policies would likely carry significant costs for the country by restricting the supply of talented potential entrepreneurs. Our results also suggest that there is a substantial temporal lag between immigrant entrepreneurs' entry into the U.S. and the founding of their firms. Accordingly, the effects of policies that increase or decrease the flow of immigrants may have very persistent effects on immigrant entrepreneurship, which only show up decades after implementation and which would be hard to reverse in a short period of time.

Our work closely relates to previous work on immigrant entrepreneurship.[1] Kerr and Kerr (2016) merge the Longitudinal Employment-Household Dynamics (LEHD), Longitudinal Business Database (LBD), and venture data to document key facts about immigrant entrepreneurship. An unanswered question of significant policy importance is how immigrant entrepreneurs come to the United States. We fill this gap by assembling a detailed data set that captures founders' work and educational history. Our data set allows us to identify immigrant founders, summarize their educational background, and classify them according to their path of immigration.[2] We paint a detailed picture of how immigrant entrepreneurs came to the United States and the path that led them to high-growth entrepreneurship. Accordingly, this paper highlights how American universities represent a key source of foreign entrepreneurial talent for the country, a fact that possesses broad policy implications.

Our paper also adds to a strand of literature that is concerned with the contribution that immigrant entrepreneurs make to innovation and technological advances in the United States (Kerr and Fu, 2008; Balasubramanian and Sivadasan, 2011; Akcigit and Kerr, 2010). In this paper, we document that immigrant founders are more likely to hold STEM degrees, start IT companies, and patent inventions through their

[1] See Fairlie and Lofstrom (2015) for a recent literature review.

[2] Other works in the literature use surveys to study immigrant founders' education background (Wadhwa et al., 2007b; Wadhwa et al., 2010). However, these works survey only a few hundred VC-backed start-up founders. The Dow Jones VentureSource data set allows us to study the near universe of VC-backed companies that were started by native-born and immigrant entrepreneurs.

start-ups. These results suggest that immigrant entrepreneurship is a channel through which American universities contribute to the commercialization of innovation and technology in the United States. Additionally, our paper contributes to the literature that studies the impact of immigrant entrepreneurship on local job growth and economic development (Kerr, 2020). We show that, for both native-born and immigrant founders, education location is an important determinant of start-up location. In other words, founders are more likely to start their companies in the state where they received their postsecondary education. This result suggests that establishing high-quality universities to attract both talented native-born and foreign students may be a viable strategy to promote local high-growth firm creation.

Last, our paper sheds light on the role of universities in bringing immigrants into the United States' entrepreneurial ecosystem. Our work thus contributes to a broader literature that focuses on immigration, education, and entrepreneurship (Etzkowitz, 1998; Di Gregorio and Shane, 2003; Bound et al., 2015; Åstebro et al., 2012; Grogger and Hanson, 2015; Guerrero et al., 2015; Hanson and Slaughter, 2017; Lee and Easley, 2018; Kerr, 2020; Uhlbach et al., 2022). Prior work has demonstrated that universities, through different levers (e.g., creating entrepreneurship-focused academic programs or making equity investments in spinoffs), can contribute to local economies by producing individuals, both students and faculty, who start high-growth companies. A key takeaway from our work is that the majority of VC-backed entrepreneurs are educated in the United States; in fact, many are educated at top U.S. universities and choose to start firms in close proximity to their place of education. The role of universities in bringing highly skilled immigrants to the United States complements the results of the literature and suggests that student visas, as well as immigration policies surrounding foreign students more broadly, are a critical area for policy focus.

2. Data

Our analysis of immigrant founders uses several data sources that help identify immigrant status, education, and work history of founders for VC-backed companies in the U.S. The first source is the Infutor database, which contains address history and information for U.S. residents. The Infutor database is especially useful

for our study because we use it to construct a reasonable proxy for the immigrant status of individuals in the database. The second main data source we use is Dow Jones VentureSource, which is one of the main databases used to study VC-backed firms. We also use resume data on founders in our sample from Emsi, a labor analytics firm; these data contain work history and education information for the founders in our sample. We supplement these data with additional, hand-collected data on the education of founders in our sample. Last, we obtain information on firm patenting from PatentsView, which provides a publicly available database covering patents granted by the U.S. Patent and Trademark Office (USPTO). We discuss these data sets and their uses within the final data set for our analysis in more detail below.

2.1 Infutor Database

The Infutor database provides a variety of information for more than 160 million U.S. residents. The data is aggregated from various sources including phone books, magazine subscriptions, and credit header files. For each individual, the database contains the individual's first and last names as well as complete address history with date and exact street address for each location. The data set also contains demographic information for many individuals in the sample, including birth year, gender, and Social Security number (SSN). Diamond et al. (2019) and Bernstein et al. (2018) have also used the Infutor data and have found that the data appear to be largely representative of the overall U.S. population. The address history appears to be reasonably comprehensive back to 1990, though some individuals have address information going back to the 1980s.

We follow the approach of Bernstein et al. (2018) to identify venture capital-backed founders who are immigrants using Infutor data. This identification exploits the fact that, from 1936 to 2011, SSNs were assigned using a specific formula. The first three digits of the SSN (the "area number") reflect the geographic region (state) where the SSN was assigned. The next two digits corresponded with a "group number," while the last four digits are an individual-specific serial number. Group numbers were assigned sequentially within a geographic region over the given time period, i.e., for a given area number, the same group number was used for all SSNs until all possible serial numbers (the last four digits), ranging from

0001 to 9999, were exhausted. Accordingly, any combination of the first five digits of the SSN was only assigned during a certain year(s) within a certain state. The mapping from the first five digits of the SSN to state and year in which the SSN was issued is readily available.[3]

Using this mapping and the data from Infutor, we are able to estimate individuals' ages at which they received their SSN using individuals' date of birth and the year they obtained their SSN. We classify immigrants as individuals who received their SSNs after age 18. We classify all individuals who received their SSN before age 18 as native born. Our results are not sensitive to the cutoff age we use to distinguish between immigrants and native-born Americans, although the choice of cutoff age does slightly influence the proportion of founders that we identify as immigrants.[4]

2.2 Dow Jones VentureSource

The Dow Jones VentureSource data set contains information on the near universe of VC-fund investments in start-ups from around the world and is one of the two main data sets used in academic research on the venture capital industry.[5] VentureSource has several distinct data files. First, VentureSource tabulates investment data that contain information at the portfolio company level on investments dates, investment amounts, and identity of VC firms participating in each round. From these data, we can trace a start-up's funding history. VentureSource also collects a variety of information on the portfolio company including company start date, company industry, business description, and office location. Additionally, VentureSource collects information about individuals associated with each start-up, including VC investors, founders, board members, and senior employees. For these individuals, VentureSource provides their first and last names as well as information on prior work experience, including names of their past

[3] We use data from the website www.ssn-verify.com to map from the first five digits of a Social Security number to state and year, once again following Bernstein et al. (2018).

[4] While Bernstein et al. (2018) use a cutoff age of 20, we use a cutoff age of 18 to better capture individuals who may have arrived in the United States for college. The number of foreign-born college students has increased dramatically over the past 30 years.

[5] The other is Thompson VentureXpert.

employers, past job titles, and employment dates. We focus our analyses on start-ups that are based in the United States. Following other work in the literature, we focus on firms that receive VC-backing funding from 1990 to 2019 because both Infutor and VentureSource data have substantially more comprehensive coverage after 1990 (Gompers, Lerner, and Scharfstein, 2005; Gompers, Kovner, Lerner, and Scharfstein, 2010).

2.3 Gender and Race/Ethnicity

Founders' genders are determined based on their first names. In the cases of unisex names, we determine gender by reading news articles and web pages mentioning or containing pictures of the individual founders. For race/ethnic background, we use the name-matching algorithm developed by Kerr and Lincoln (2010) to determine the most likely race/ethnicities of founders based on their last names. Individual founders are classified into nonoverlapping racial/ethnic groups: East Asians, Indian, Jewish, Hispanic, and White. The name-matching algorithm does not allow us to identify all possible ethnicities, including Black founders. Therefore, for all founders classified as White, we manually search for pictures on company websites and in news articles to determine if the founder is White or Black. As discussed in prior research, the percentage of Black founders in the VC-backed start-up space is very small.

2.4 Education and Employment Data

For each founder in the VentureSource data, we collect information on educational history and prior employment using both resume data from Emsi as well as hand-collected education and work experience information from LinkedIn, Bloomberg Businessweek, and company websites. We collect education data for 92% of the founders in our sample. For founders with complete background information, we observe their undergraduate institution, undergraduate major, graduate institution(s), graduate degree(s), and year(s) of graduation, as well as prior work history. We aggregate colleges, professional schools, and graduate schools up to the institution level. For example, Harvard College and Harvard Business School are coded as Harvard University. Using information on undergraduate and graduate majors, we classify degrees into

three categories: STEM, business, and other. We also collect information on the geographic location of universities using the Google Maps API.

2.5 Identification of Immigrant Founders

To determine immigrant status of VC-backed founders, we match individuals from VentureSource with Infutor. To identify founders in the Infutor data, we use an iterative procedure that matches observations using name, location, and age information. Infutor contains a list of an individual's residential address history and date of birth. We use this information to match with VentureSource, which contains information on the locations of the start-up firms. To further verify that our match is correct, we use information on individuals' graduation years to infer an approximate birth year, which we use to eliminate matches in Infutor whose ages do not match up with the ages of founders in the VentureSource data.

We are able to identify a unique match within Infutor for approximately half of the founders in VentureSource. Some founders in the VentureSource have multiple potential matches in Infutor. In these instances, we classify founders as immigrants if more than 80% of potential matches in Infutor are immigrants, native born if less than 20% of potential matches are immigrants, and do not assign an immigrant classification otherwise. Our merged data set includes 65% of founders in VentureSource. In the Appendix, we discuss the procedure for matching our data in more detail and provide a comparison between the matched and unmatched observations in our sample.

2.6 Patent Data

To obtain information on start-up patenting activities, we link companies in VentureSource to patent assignees in PatentsView by matching company names within both data sets. We standardize company names in a manner based on Hall, Jaffe, and Trajtenberg (2001). Other research that matches patents with VC-backed firms employs a similar matching procedure (e.g., Bernstein, Giroud, and Townsend (2016), and Howell et al. (2020)).

3 Summary Statistics

3.1 Founder and Start-Up Characteristics by Immigration Status

Table 1A presents summary statistics on founder characteristics by immigration status. Approximately 20% of the founders in our sample are immigrants. As we discuss in Appendix B, due to data limitations, this number may slightly understate the proportion of immigrant founders in our sample. Kerr and Kerr (2016) find that 28% of VC-backed start-up founders are immigrants. Our results are broadly consistent with Kerr and Kerr (2016), though a notable difference is that, while they define immigrant founders by country of birth, we define immigrants according to the age at which the individual receives his or her SSN. Given this difference in definitions, we expect to see a slight difference in the proportion of founders reported as immigrants in the two samples, even if the true proportions are identical. Our choice reflects the notion that we identify individuals who chose to come to the U.S. as immigrants. Kerr and Kerr (2016) identify those born abroad but came to the U.S. as children; policy reforms targeting this type of immigration may be difficult. On the other hand, our definition of *immigrant* leads to directly relevant policy implications for education and work visa programs.

Table 1A highlights several differences between native-born and immigrant founders in our sample. First, the immigrant founder sample has a higher proportion of females than the native-born founder pool does. The second main difference is, not surprisingly, that the immigrant sample is more racially/ethnically diverse. Most significantly, the proportions of Indian and East Asian founders are much higher among immigrant founders than among native-born founders. The proportion of Indian founders in the immigrant sample is almost 10 times higher than that of the native-born sample. Similarly, the proportion of East Asian founders is more than three times higher. This difference is not surprising given that over the sample period, the United States has seen a significant number of immigrants from India and China who came for education and employment opportunities, particularly in high-tech sectors. The table also demonstrates a notable advantage to our approach of classifying immigrants using SSN information relative to using a name-based algorithm as a proxy for immigration status, as others have done. A substantial proportion of founders that

we classify as immigrants (36%) have names that are classified as White. These are founders who an ethnic-classification algorithm may not identify as immigrants. The high proportion of immigrant founders identified as White also suggests the potentially substantial contribution of immigrant entrepreneurs from Canada and Western European countries.

In line with previous literature on immigrants' productivity, conditional on being a VC-backed founder, immigrants start more VC-backed companies than native-born founders on average.[6] However, the average success rate of immigrant-founded start-ups is no higher than that of native-founded start-ups when success is measured by whether the firm achieved an IPO or was acquired at a valuation in excess of $100 million. This result suggests that VC funds appear to have similar screening abilities in evaluating immigrant- and native-founded firms.[7] Furthermore, we find that immigrants tend to be older than native-born founders at the time their firms obtain VC funding. The average founding age of immigrant founders is close to 45 years old, while the average age for native-born founders is about 40 years old.[8] Finally, consistent with Azoulay et al. (2020b), we find that immigrant founders tend to start more innovative firms as measured by patenting activity. On the extensive margin, immigrant founders are 3% more likely to start a company that produces at least one patent within the first two years of existence. On the intensive margin, immigrant founders start firms that produce 0.2 more patents within the first two years of existence than firms started by native-born founders. This result suggests that firms started by immigrant founders benefit the U.S. economy by producing more innovations.

In **Table 1B**, we present industry breakdowns for start-ups founded by native-born and immigrant entrepreneurs. Immigrants are significantly more likely to start a company in the IT sector than natives and significantly less likely to start companies in the Business and Finance or the Consumer Services sectors.

[6] Kerr and Kerr (2016) find that immigrants tend to start more companies than natives. Azoulay et al. (2020a) find that, at every point of the firm size distribution, immigrants start larger companies than natives. Bernstein et al. (2020) and Hunt and Gauthier-Loiselle (2010) find that immigrant inventors produce more patents than native-born inventors.

[7] We consider M&A deals where the start-up was valued at $100 million or more as high-valued acquisitions.

[8] These numbers for founding ages are broadly in-line with results found in other work. Azoulay et al. (2020b) find that the average founders' age of the fastest-growing companies in the United States is 45 years old.

The proportion of immigrant-founded companies that are in the IT sector (48.4%) is more than 30% higher than the proportion of native-founded companies in IT (35.5%). The differences in Business and Finance (4.7% of immigrant-founded companies versus 22.1% of native-founded companies) and Consumer Services (12.2% of immigrant-founded companies versus 18.0% of native-founded companies) are equally striking.[9] The result is in-line with immigrants tending to come to the United States to study in STEM fields and pursue STEM-related employment opportunities (Hanson and Slaughter, 2017).

Table 2 shows the top 10 and bottom 10 states by number and percentage of immigrant founder start-up pairs.[10] To construct the top panel, we use data on each start-up headquarters' office address and count the number of immigrant founder–start-up pairs. The top three states with the greatest number of VC-backed start-ups in the sample are California, Massachusetts, and New York, which are also the top three states with the highest number of immigrant founder–start-up pairs. In general, states that appear in the top 10 list tend to be coastal states and states that feature prominently in the U.S. VC ecosystem. On the other hand, states that appear in the bottom 10 list tend to be smaller states and states in the south or middle of the country.

The top panel of Table 2, which counts founder–start-up pairs, is highly influenced by a states' population size, economy size, and level of VC activity. The bottom panel of Table 2 controls for size by tabulating the top 10 and bottom 10 states with the highest fraction of start-ups that are founded by immigrants. Within the top 10, California, Massachusetts, and New York remain on the list, indicating that the largest VC hubs not only have a high number of immigrant-founded companies, but also a have high share of immigrant founders relative to the total number of start-ups.[11] Furthermore, similar to the results

[9] Wadhwa et al. (2010) present proportions of technology and engineering-types among immigrant-founded companies.

[10] Immigrant founder–start-up pairs are observations at the founder level, i.e., if a company has two founders, then there will be two founder–start-up pairs in these analyses. Similarly, if a founder starts two companies in our sample, they will be in the founder–start-up pair analysis for both companies.

[11] Delaware likely appears as a top 10 state in the bottom panel because the data contain some company registration addresses and opposed to physical company headquarters' addresses.

in the top panel, states with the lowest share of founders who are immigrants are in the south and middle of the U.S.[12] These results demonstrate that VC hubs on the coasts, especially in California, Massachusetts, and New York, benefit the most from high-growth immigrant-founded companies.

3.2 Immigrant Founder Share Time Trends

Figure 1 plots the share of immigrant founder–start-up pairs by five-year cohorts from 1990 to 2019. From 1990 to 2004, the share of immigrant founder–start-up pairs increased from around 20% to a peak of nearly 25%. This pattern is broadly consistent with the findings of Kerr and Kerr (2016), who find that the proportion of immigrant founders among VC-backed start-ups rose from 1995 and reached a peak during the tech bubble. After this period, we find that the share of immigrant founders dropped to around 17% and started to rise again through 2019.

While one might interpret these trends as suggesting that the H-1B Visa Reform Act of 2004 played a role in reducing the share of immigrant founders in the subsequent period, that is unlikely to be true.[13] The average age at which immigrant founders received their SSN is close to 26 years old, which is a rough proxy for the age at which these immigrants entered the United States. The average age at founding a VC-backed company for immigrants is greater than 40 years old, indicating that the majority of founders, even in the latter part of the sample, likely came to the United States before 2004. Therefore, it is unlikely that the H-1B Visa Reform Act of 2004 is the primary driver of the change in the immigrant founder share during our sample. As we discuss next, however, we would expect that any effects of the law would show up in the coming years.

Figure 2 plots the share of each ethnic group among immigrant founders by five-year cohorts from 1990 to 2019. Ethnic composition of immigrant entrepreneurs has changed substantially over time. First, the share of White immigrant founders decreased from close to 50% in the early cohorts to less than 40%.

[12] Results are similar if we use founders instead as the unit of observation.

[13] The H-1B Visa Reform Act of 2004 reduced the annual H-1B visa cap from 195,000 to 65,000.

Likewise, the share of ethnically Jewish immigrant founders decreased from close to 15% to slightly more than 10%. Ethnic groups that saw substantial expansion are Indian, East Asian, and Hispanic immigrant founders. The share of Indian immigrant founders increased from less than 20% to more than 30%. The share of East Asian immigrant founders rose from slightly more than 10% to more than 25%. The share of Hispanic immigrant founders increased from less than 5% to around 10%. The rise of Indian and East Asian entrepreneurs is in line with results from prior work on trends in immigrant entrepreneurship (Wadhwa et al., 2007). It also mirrors the trend in college and graduate school admissions in which the share of students from India, China, and South Korea coming to the United States for higher education rose substantially over the time period (Bound et al., 2021). The increasing share of Hispanic immigrant entrepreneurs, however, is a new result that is distinct from trends documented earlier.

4 Three Paths of Immigration for Entrepreneurs

In this section, we explore the channels by which immigrant founders come to the U.S. Understanding these different pathways is important not only for understanding policy implications of initiatives to promote entrepreneurial ecosystems, but also for understanding whether the benefits of immigration are regionalized, based on how and where immigrant founders enter the U.S. We divide entrepreneurs into three groups based on their path of migration to the U.S. to more closely examine the role that various institutions play in attracting immigrant entrepreneurs. We also explore whether there are differences across immigrant entrepreneur groups who arrive via different channels. We classify immigrant founders who first came to the United States for their undergraduate education as Group 1. Immigrant founders who first came to the United States for their postgraduate education after having received their undergraduate degree abroad are classified as Group 2. Group 2 founders have no undergraduate degrees from an American university but have at least one postgraduate degree from a university based in the United States. Finally, we classify immigrant founders who first came to the United States for work as Group 3. Group 3 immigrant founders do not have a degree from a university based in the United States. We drop immigrant founders with missing education information from this set of analyses.

4.1 Founder and Start-Up Characteristics by Immigration Path

Table 3A presents summary statistics of founder and start-up characteristics by immigration path. The majority of immigrant founders came to the United States first to pursue some type of university degree. Thirty-nine percent of immigrant founders came to the United States first for undergraduate studies and 38% came first for postgraduate studies. Only 24% of immigrant founders received all of their education abroad before coming to the U.S. for employment. These statistics show that universities serve as the primary gatekeepers for foreign entrepreneurial talent, relative to companies. In turn, statistics suggest that student visa policies and universities' admission policies likely play a more substantial role in determining the quality of entrepreneurial talent in the United States than does work visa policy.

Immigrant founders in Group 1 (i.e., those who came to the U.S. first for their undergraduate education) are 12% female, while both Group 2 and Group 3 immigrant founders are 9% female. We also summarize the ethnic shares within each group. Groups 2 and 3 have high proportions of Indian founders, 46% of Group 2 founders, and 28% of Group 3 founders are Indian. East Asian immigrant founders have higher representation among Group 1 (19%) and Group 2 (20%) founders as compared with Group 3 founders (12%). These statistics are consistent with trends in ethnic composition of foreign undergraduate and graduate students in the United States (Bound et al., 2021). We also find that ethnically White immigrant founders make up a large proportion of Group 1 (42%) and Group 3 (43%) founders (i.e., they either first enter the U.S. for undergraduate education or for work).

Using data on birth dates and the years in which founders received their SSNs, we calculate founders' ages when they received their SSNs. These ages should be close to the ages at which the founders immigrated. The average age at which immigrants received their SSN increases monotonically as we move from Group 1 to Group 3, as would be expected given the definition of the groups. Additionally, there is a large gap between average SSN age and average founding age across all three immigrant founder groups (between 22 and 29 years) indicating that immigrant founders generally stay and work in the United States for many years before starting their firms. This delay between immigrating and founding means that

changes in H-1B policies are unlikely to have an immediate effect on the rate of immigrant entrepreneurship or on the number of immigrant-founded companies. Over time, however, changes in H-1B quotas may have strong effects years later.

Productivity, as measured by the average number of companies started and their success rate, is similar across immigrant founder groups, suggesting that entrepreneurial skill is similar across immigration paths. Innovation activities, as measured by patent rate and patent count associated with founded companies, is highest among Group 2 immigrant founders (i.e., those who came to the U.S. first for their postgraduate studies). This finding suggests that universities' graduate programs contribute to the U.S. innovation capacity by attracting individuals who are likely to start companies that produce patents.

We also examine differences in educational backgrounds for immigrant founders by path of entry. **Table 3B** summarizes founders' education information across immigration status and path. Immigrant founders are more likely to major in STEM fields and less likely to major in business-related fields compared with native-born founders. The largest difference appears when we compare Groups 2 and 3 immigrant founders to native-born founders. We find that 87.8% of Group 2 immigrant founders and 77.0% of Group 3 immigrant founders have an undergraduate STEM degree compared with 64.5% for native-born founders. Immigrant founders are also more likely to hold some type of graduate degree compared with native-born founders. Additionally, immigrant founders are more likely to hold technical postgraduate degrees than native-born founders. Group 1 immigrant founders, however, look similar to native-born founders for both measures (i.e., immigrant founders who come to the U.S. first for their undergraduate education look quite similar to native-born founders). More than 80% of Group 2 immigrant founders have a STEM master's degree or Ph.D. Native-born, Group 1, and Group 2 founders are roughly equally likely to earn an M.B.A. (approximately 20%), while M.B.A.s are relatively rare (8.3%) for Group 3 immigrant founders.

The bottom panel of Table 3B focuses on the likelihood that a founder received at least one degree (undergraduate or postgraduate) from a top school.[14] The unconditional probability that an immigrant founder holds a top school degree is 27%, while the unconditional probability that a native-born founder has a top school degree is 31%. This difference is statistically significant, indicating that on average immigrants are less likely to attend a top school. These averages, however, mask substantial heterogeneity across groups and for various types of degrees. For top undergraduate colleges, Group 1 immigrant founders are significantly more likely to have a degree from a top college than are native-born founders (30.9% versus 19.2%). For top graduate schools, Group 1 and Group 2 immigrant founders are significantly more likely to have a degree from a top university (26.4% and 37.9%, respectively) than are native-born founders (20.2%). This conclusion is true for both M.B.A. and non-M.B.A. postgraduate degrees. These findings demonstrate that conditional on receiving their degree from a university in the U.S., immigrant founders are more likely to attend a top university, consistent with the idea that the population of U.S.-educated immigrant founders is likely to be drawn from the right tail of their home country's academic talent distribution.

These summaries of educational attainment across our various founder groups provide several important takeaways. First, Group 1 immigrant founders tend to look similar to native-born founders in terms of educational backgrounds. Group 2 and Group 3 immigrant founders, however, are quite different from native-born founders. Second, immigrant founders are more likely to have advanced degrees compared with native-born founders. Finally, immigrant founders are more likely to major in STEM fields than are native-born founders. The educational backgrounds are consistent with the industry composition of founders by type. **Table 3C** presents the industry breakdowns for native-founded and immigrant-founded companies. First, native-born founders and Group 1 immigrant founders start companies in similar

[14] Following the definition in Gompers et al., (2016), we define *top universities* to include Ivy League schools; Amherst College; California Institute of Technology; Duke University; Massachusetts Institute of Technology; Northwestern University; Stanford University; University of California, Berkeley; University of Chicago; Williams College; Cambridge University; INSEAD; London School of Economics; London Business School; and Oxford University.

industries. IT companies represent 35%–40% of their start-ups,; Business and Finance, 22%; and Consumer Services, 18%. This observation is consistent with the fact that native-born founders and Group 1 immigrant founders have similar educational backgrounds. Second, Group 2 and Group 3 immigrant founders are more likely to start companies in the IT sector (55.5% and 50.7%, respectively) than native-born founders (35.5%) and are less likely to found Business and Finance (15.4% and 17.3%, respectively) or Consumer Services (7.8% and 10.5%, respectively) companies than are native-born founders (22.0% and 18.0%, respectively). This suggests that Group 2 and Group 3 immigrant founders, who are much more likely to have completed STEM undergraduate and postgraduate education, founded more technology-focused companies.

4.2 Important Institutions

In this section, we identify the educational institutions that provide the channel for immigrant founders to enter the U.S. For each immigrant founder group, **Table 4** presents the top 10 institutions that provided entry to the greatest number of immigrant founders. The first column lists the 10 universities that granted the highest number of college degrees to Group 1 immigrant founders. The second column lists the 10 universities that granted the highest number of graduate degrees to Group 2 immigrant founders.

The overlap of these two lists is quite striking. In fact, the top five universities are identical across the two lists. Second, these universities are also the same universities that educated the highest number of founders in our sample. This result suggests that these universities, either culturally or through the surrounding entrepreneurial ecosystem, attract and produce both native-born and immigrant founders via both undergraduate and graduate degree programs. Not surprisingly, these universities also have above-average shares of foreign students. College Scorecard's university database contains information on each university's annual share of foreign undergraduate student from 1996 to 2019. The average foreign student share among the universities listed in Table 4 is 9%, while the average foreign student share among all American universities is 4%. In this group, the University of Michigan has the lowest average foreign student share at 5%, while Columbia University has the highest average foreign student share at 11%. These

results suggest that universities that produce significant numbers of VC-backed founders are also among the most immigrant-friendly higher education institutions in the U.S.

We also compare the fraction of Group 1 immigrant founders educated at each of the top 10 undergraduate colleges to the fraction of students at those colleges who are immigrants. The bottom panel of Table 4 shows that, for all these colleges, while the share of immigrants in the undergraduate population is high (9% on average), the average share of immigrants among founders who were educated at those colleges is even higher (12%). This suggests that immigrant students at these colleges are more likely to become VC-backed start-up founders than their native-born peers.

We also examine companies that provide a path for immigration among our Group 3 founders who were educated outside the U.S. and first came for employment. The last column in Table 4 lists the 10 companies that employed the highest number of Group 3 immigrant founders before they started their companies. First, these companies are among those that employed the highest number of founders, both native-born and immigrant founders. The list also represents two distinct types of spawning companies (Gompers, Lerner, and Scharfstein, 2005). First, six of the top 10 companies are VC-backed, highly successful IT companies. Gompers, Lerner, and Scharfstein (2005) show that these companies tend to spawn significant numbers of VC-backed entrepreneurs. Three of the six companies are large, old computer companies. These companies played an important role in providing entrepreneurs for the early waves of VC-backed companies in the 1990s. In addition, many of these companies are among the top H-1B sponsors in the U.S. (Kerr, 2020).

The evidence suggests that a specific of set of universities and companies play an especially vital role in fostering the careers of immigrant entrepreneurs in the U.S. VC-backed start-up ecosystem. While not surprising, these are the same institutions that foster entrepreneurs generally.

4.3 Immigration Paths Time Trends

In this section, we explore time series patterns in the path of entry for immigrant founders of VC-backed companies. **Figure 3** plots the breakdown of immigrant founder–start-up pairs by immigration path over time, from 1990 to 2019. The figure tabulates immigrant founders by the year they started their companies, not the year of entry into the U.S. The proportion of Group 1 immigrant founders was stable in the early part of the sample but increased over the past decade. On the other hand, the proportion of Group 2 and Group 3 immigrant founders peaked in the five-year period between 2000 and 2004 and has steadily declined since then. These dynamics are illustrative along several dimensions. First, the decline in the share of immigrant founders shown in Figure 1 is primarily driven by the decline in immigrant founders from Group 2 who initially arrived in the United States for graduate education. Compared with Group 3 immigrant founders, Group 2 immigrant founders make up a much larger proportion of the sample and their relative decline from the peak period has also been larger. This change drives the overall decline in immigrant founder shares. Second, the proportion of Group 1 immigrant founders who initially arrived in the U.S. for their undergraduate education has been increasing steadily over the sample period. The time trends point to the growing importance of undergraduate education as the primary channel of foreign entrepreneurial talent in the U.S. The share of foreign students in U.S. universities saw a dramatic jump in the late 1970s and again in the 2010s (Israel and Batalova, 2021). These trends have begun to reverse as the change in new foreign student enrollment in U.S. universities turned negative in 2016–2019. While this reversal is unlikely to affect immigrant founders in the short run, the long-term implications are cause for concern.[15]

[15] Given the differences in the industries that immigrants in each group start firms in, one alternative explanation is that changes in the industrial composition of firms funded by venture capitalists over time may account for the increasing share of Group 1 immigrants and decreasing share of Group 3 immigrants over time. Figure C.1 in the Appendix suggests this is likely not to be the case. The figure plots industry composition-implied immigrant founder group share over time. Per-period industry-implied founder group shares are calculated as the product of the full-sample industry-group shares (e.g., share of Group 1 founder–start-up pairs in the IT industry) and the per-period industry shares (share of IT founder–start-up pairs). The plot shows that industry-implied group shares are relatively constant over time.

5 Education and Start-Up Location

Given the significant role that universities play in bringing immigrant entrepreneurs to the United States, in this section, we explore the geographic spillover benefits from the supply of entrepreneurs produced by local universities. We assess and compare the propensity of immigrant university graduates to found companies near the place they were educated compared with native-born university graduates. Understanding these local spillovers is critical for cities and regions that seek to enhance their entrepreneurial ecosystems.

Table 5 presents the percentage of native-born, Group 1 immigrant, and Group 2 immigrant founders who started their companies in the states in which they were educated. The top panel presents these percentages for the whole sample by group. For all groups, the state in which founders received their university education is an important determinant of business formation state. Specifically, 40% of native-born founders started their companies in the same state in which they received their postsecondary education. This percentage is 43% for Group 1 immigrant founders and 36% for Group 2 immigrant founders. Second, founders are more likely to start their companies in the same state in which they received their graduate degrees as compared with the states in which they received their college degrees. This pattern is consistent with the perception that geographic mobility decreases with age (e.g., because of increased costs associated with moving a family).

One potential driver of these patterns is the geographic concentration of the VC ecosystem in three hub states: California, Massachusetts, and New York. These states are also homes to a number of top universities that produce a disproportionate share of VC-backed founders. A natural question is whether the pattern we document simply comes, for example, from Stanford- and Berkeley-educated immigrant entrepreneurs founding start-ups in the Bay Area, and Harvard- and MIT-educated immigrant entrepreneurs founding start-ups in the Boston area. To address this question, Table 5 splits the sample into VC hub states (California, Massachusetts, and New York) and the rest of the country, and then summarizes the percentage of founders educated in a particular state who found their companies in that state; 35% of founders educated

in nonventure capital hub states found their start-up in the same state. This number is generally moderately lower than in venture capital hubs (31% for New York, 39% for California, and 50% for Massachusetts), but the evidence suggests that the concentration of founders starting their company in the same state in which they were educated is a common feature across all states.

The geographic "stickiness" documented in Table 5 is important for several reasons. As a general feature that holds true both for native-born and immigrant founders, the evidence suggests that local talent may play a key role in giving rise to start-ups. Additionally, the presence of educational institutions plays a significant role in increasing the presence of local talent. Because immigrants, by definition, come from outside local communities, the results suggest that there is a geographically localized economic benefit stemming from the presence of universities that can import top talent from abroad. There is likely to be strong agglomeration effects in play wherever firm creation benefits from the presence of local universities. Combined with the fact that start-ups are the main drivers of job creation (Gornall and Strebulaev, 2015; Gompers and Lerner, 2000), the evidence suggests that the presence of high-quality universities, which attract talented native-born and foreign students, may be a potent contributor to local job growth via the creation of high-growth firms started by locally educated talent (Haltiwanger et al., 2013). While our focus is on immigrants who start high-growth firms, this conclusion is likely to be broader; the same universities that produce immigrant entrepreneurs may also educate the talent required to propel these firms forward.

6 Determinants of Start-Up Success

In this section, we explore the relation among immigrant status, channel of immigration, and start-up outcomes. Previous work suggests that there are certain observable founder characteristics that predict the success of VC-backed firms. For example, previous experience working at a venture-backed start-up, previous experience as a founder, and previous attendance at a top university are all correlated with likelihood of success (Gompers et al., 2010; Gompers et al., 2016). Given that there appear to be some differences between immigrant and native-born entrepreneurs, an important question is whether the same characteristics are correlated with success for both immigrant and native-born entrepreneurs.

Table 6 reports results for regressions of success (an indicator variable for whether a firm had an IPO or was acquired for more than $100 million) on founder characteristics, including previous work experience at a venture-backed start-up, previous founding experience, gender, and ethnicity. The first column of the table reports regression results for the sample that consists of firms founded by native-born entrepreneurs, and the second column of the table reports results for the sample consisting of firms founded by immigrants. Point estimates of coefficients are similar across the two regressions, indicating that similar founder characteristics are correlated with success for both immigrants and native-born founders. The strongest covariates with success are previous work experience at a VC-backed start-up and attendance at a top university. Previous experience at a venture-backed start-up corresponds with a 4%–5% higher success probability. The point estimate is statistically different from zero for native-born founders but not for immigrants. However, the economic magnitudes are very similar. Attendance at a top university corresponds with approximately 4% higher success probability. The success probability for female founders is a little more than 2% lower than for male founders and previous experience as a founder is associated with lower success probabilities of 3%.[16] The last three columns of the table report regression results for the same specification, but the sample for each consists of one of the three immigrant entrepreneur groups (e.g., Group 1, 2, or 3). The point estimates of coefficients are generally similar across the regressions though the estimates are noisier because of smaller sample sizes.

The coefficients reported in the table are correlations and do not necessarily admit a causal interpretation. Rather, they likely capture correlations with other features of the VC ecosystem that may be important determinants of success, such as social networks and connections to other resources. However, there does not appear to be any substantial difference in these relationships for immigrants and native-born entrepreneurs. The same covariates with success appear to be present for both immigrant and native-born

[16] A subtlety here is that previous experience as a founder of a successful venture-backed firm is positively correlated with success, while previous experience as a founder of an unsuccessful venture-backed firm is strongly negatively correlated with success. Founders of the latter variety are more represented than founders of the former in our sample. See Gompers et al. (2010) for more discussion.

founders. While we cannot determine the mechanism behind the correlation, the results suggest that the process of achieving a successful start-up outcome is similar for both immigrants and native-born founders.

7 Determinants of Innovation Activities

In the final section of the paper, we study the relationship among immigrant status, channel of immigration, and innovation activities, using patents as our primary measure of innovation. **Table 7** reports results from regressions of measures of patenting output onto the same set of founder characteristics that appear in Table 6. Columns 1–3 present OLS regression results in which the dependent variable is an indicator variable that equals one if the founder's company produced at least one patent during its first two years after founding, and zero otherwise. This exercise explores the extensive margin of patenting. The results in column 1 demonstrate that previous start-up work experience, immigrant status, attendance at a top university, having a non-M.B.A. graduate degree, having a STEM master's degree, and having a Ph.D. are all positively correlated with producing at least one patent. The positive coefficient on immigrant status indicates that immigrant founders are more likely to start companies that produce at least one patent in its early years. The economic magnitude of the coefficient on immigrant (approximately 1% to 1.6% for all immigrants) is large given that the approximately 14% of start-ups produce at least one patent within two years of being founded. The other statistically significant coefficients in the regression have intuitive signs. For example, it is not surprising that founders who hold STEM graduate degrees and Ph.D.s are more likely to start companies that produced at least one patent.

The summary statistics from the previous section showed that immigrant founders are more likely to start companies in the IT sector, which may tend to produce more patents than other sectors of the economy. Therefore, the results from column 1 might be driven by the systematic relationship between immigrant status and industry preferences. To account for this industry sorting, column 2 presents OLS regression results including industry fixed effects. We find that the results are qualitatively and quantitatively similar with and without industry fixed effects. This finding indicates that the higher patenting we find by companies started by immigrant founders does not stem from immigrants starting

companies in industries with higher patenting rates. It suggests that even when considering companies in the same industry, immigrant-founded companies are more innovative than native-founded firms. To further support interpretation, **Appendix Table D.1** summarizes within-industry patenting rates for immigrant-founded, native born-founded, and all start-ups. Strikingly, the table shows that immigrant-founded start-ups patent more than native born-founded start-ups across all industries, even as the share of immigrant-founded firms in industries that exhibit more patenting overall tends to be larger.

Column 3 of Table 7 presents results from a regression specification that allows us to study the relationship between immigration paths and patenting activity. To do so, we replace the immigrant status variable with indicator variables for Group 1, Group 2, and Group 3 immigrants. The results show that the positive coefficient on immigrant status is driven by Group 2 and Group 3 immigrant founders, for whom the regression coefficients are approximately 2.4% and 2.7%, respectively. Furthermore, the positive coefficients persist upon the inclusion of industry fixed effects and various educational controls. Taken together these results suggest that Group 2 and Group 3 immigrant-founded companies are more likely to patent than natives born-founded companies, even when holding start-up industry, demographics, and educational backgrounds fixed. One potential explanation for these findings may be intrinsic differences in strategies pursued by immigrant founders and in how they apply their university education to a professional setting. For example, immigrant entrepreneurs with technical degrees might be especially likely to apply STEM skills in patenting activities, whereas native-born entrepreneurs with a similar educational background might be more inclined to apply their STEM skills in other endeavors (e.g., nonpatented/classified product development).[17]

[17] Alternative explanations, such as cultural attitudes, social networks, and individual-level traits, may also help to explain the findings. Further investigation into the mechanisms that drive the column (3) results may be a fruitful avenue for future research.

Columns 4–6 of Table 7 present regression results for Poisson regressions in which patent count is regressed on the same set of founder characteristics.[18] These regressions capture not just whether founders' immigrant status is related to company patenting on the extensive margin, but whether immigrant-founded companies also patent more on the intensive margin. The results are qualitatively similar to those from columns 1–3. The key takeaways are that (1) immigrant founders tend to start companies that produce more patents, (2) this result is not driven by industry sorting, (3) Group 2 immigrants drive the patent production among immigrant founders, and (4) nonbusiness education backgrounds are associated with higher numbers of patents. The results from this section are largely consistent with findings from previous works (Bernstein et al., 2018; Azoulay et al., 2020a), which show that immigrants are generally more innovative than natives. We contribute to this line of work by showing that the path of immigration matters. Namely, immigrants who come to the United States for postgraduate education tend to start more innovative companies.

8 Policy Implications and Conclusion

The results we document in this paper find that immigrants contribute substantially to the U.S. economy as founders of high-growth potential firms, consistent with other work that documents immigrants' contributions to innovation and entrepreneurship. While previous work recognizes the role of immigrants in the start-up ecosystem, identifying the specific channels through which immigrant founders come to the U.S. and how the entry channel affects the companies they found has important implications. Similarly, demonstrating the local spillovers that result from educating immigrant university students provides insights for regions that might seek to promote high-growth potential entrepreneurship. Understanding the various channels and their economic consequences is vital to business, education, and immigration policy.

Moreover, our results highlight the dominant role that U.S. higher education system plays in bringing immigrants that start high-growth potential companies to the United States; the majority of

[18] Cohn, Liu, and Wardlaw (2021) point out that when using count data (such as patent counts), in contrast with the common approach of adding a constant to the outcome variable and estimating log-linear regressions, Poisson models produce consistent and reasonably efficient estimates that admit a natural interpretation under general conditions.

immigrant entrepreneurs in our sample are U.S. educated. Moreover, immigrant entrepreneurs tend to disproportionately start firms in high-tech industries. This result is broadly similar to conclusions drawn in the literature regarding the broader talent pool of IT workers (Bound et al., 2015), which also finds that foreign graduate students who expect to be successful are more likely to stay in the United States (Grogger and Hanson, 2015). Relative to prior work, which focuses on immigrants who come to the United States for graduate school education, our results highlight that immigrants who earned college degrees in the United States also make up a large and increasing fraction of immigrant entrepreneurs. That is, the U.S. undergraduate system plays an important and increasing gatekeeping role in bringing high-skilled immigrants into the country.

Government policies that affect the flow of foreign students into the United States are likely to affect the flow of entrepreneurial talent into the country. Restricting the flow of foreign students into the United States or the ability of foreign students to stay in the country after earning degrees would restrict an important source of innovation and entrepreneurial talent that contribute to the U.S. economy. Similarly, our results highlight that university admissions decisions to admit high-skilled foreign students also carry important implications that carry over into the broader economy.

Immigrant entrepreneurs are likely to start their firms in the state in which they were educated, particularly for postgraduate degrees. While one cannot ignore broader elements of entrepreneurial ecosystems, research universities have been significant importers of entrepreneurial talent. The geographic spillovers we document have their own policy implications. The beneficiaries of immigrant entrepreneurship in our sample have primarily been coastal states. One driver of this fact is the presence of leading research universities, which tend to have a larger share of immigrant students, on the coasts. A sizable proportion of immigrant founders tend to start firms in the same states that they received their education. These results suggest that a potential lever that can contribute to local economic growth is attracting high-skilled immigrant students to local universities. However, given the long average lag between arrival in the U.S. and starting a firm, it would likely take a sustained effort over an extended

period to observe the benefits of such a policy. Policies targeted at attracting immigrant students are also likely not to be sufficient on their own. Broader policy changes to attract capital and other resources must be implemented concurrently to make a location attractive for immigrants to remain for the longer term.

The U.S. has been a substantial beneficiary of "the gift of global talent" over the past three decades, using the terminology from Kerr (2020). Our results make it clear that this point is especially true in the righthand-tail of the skill distribution in which immigrants have contributed substantially as founders of high-growth potential businesses. Our results highlight the dominant role that the U.S. higher education system has played in facilitating high-skilled immigrants' contribution to the economy.

References

Akcigit, Ufuk, Emin Dinlersoz, Jeremy Greenwood, and Veronika Penciakova. *Synergizing ventures* w26196. National Bureau of Economic Research, 2019.

Åstebro, Thomas, Navid Bazzazian, and Serguey Braguinsky. "Startups by recent university graduates and their faculty: Implications for university entrepreneurship policy." *Research Policy* 41:4 (2012): 663–677.

Azoulay, Pierre, Benjamin F. Jones, J. Daniel Kim, and Javier Miranda. *Immigration and entrepreneurship in the United States* w27778. National Bureau of Economic Research, 2020a.

Azoulay, Pierre, Benjamin F. Jones, J. Daniel Kim, and Javier Miranda. "Age and high-growth entrepreneurship." *American Economic Review: Insights* 2:1 (2020b): 65–82.

Balasubramanian, Natarajan, and Jagadeesh Sivadasan. "What happens when firms patent? New evidence from US economic census data." *The Review of Economics and Statistics* 93:1 (2011): 126–146.

Bernstein, Shai, Rebecca Diamond, Timothy McQuade, and Beatriz Pousada. "The contribution of high-skilled immigrants to innovation in the United States." Stanford Graduate School of Business Working Paper 3748, en (2018): 202019–20.

Bernstein, Shai, Xavier Giroud, and Richard R Townsend. 2016. "The impact of venture capital monitoring." *Journal of Finance* 71(4):1591–1622.

Bound, John, Murat Demirci, Gaurav Khanna, and Sarah Turner. "Finishing degrees and finding jobs: US higher education and the flow of foreign IT workers." *Innovation Policy and the Economy* 15:1 (2015): 27–72.

Bound, John, Breno Braga, Gaurav Khanna, and Sarah Turner. "The Globalization of Postsecondary Education: The Role of International Students in the US Higher Education System." *Journal of Economic Perspectives* 35:1 (2021): 163–184.

Cohn, Jonathan B., Zack Liu, and Malcolm Wardlaw. "Count data in finance." Available at SSRN (2021).

Diamond, Rebecca, Tim McQuade, and Franklin Qian. "The effects of rent control expansion on tenants, landlords, and inequality: Evidence from San Francisco." *American Economic Review* 109:9 (2019): 3365–3394.

Di Gregorio, Dante, and Scott Shane. "Why do some universities generate more start-ups than others?" *Research Policy* 32:2 (2003): 209–227.

Etzkowitz, Henry. "The norms of entrepreneurial science: cognitive effects of the new university–industry linkages." *Research Policy* 27:8 (1998): 823–833.

Fairlie, R.W., and M. Lofstrom. 2015. Immigration and entrepreneurship. In *Handbook of the economics of international migration* (Vol. 1, pp. 877–911). North-Holland.

Gompers, Paul, Anna Kovner, Josh Lerner, and David Scharfstein. "Performance persistence in entrepreneurship." *Journal of Financial Economics* 96:1 (2010): 18–32.

Gompers, Paul, and Josh Lerner, *The Money of Invention*, Harvard Business School Press, 2000.

Gompers, Paul, Josh Lerner, and David Scharfstein. “Entrepreneurial spawning: Public corporations and the genesis of new ventures, 1986 to 1999.” *The Journal of Finance* 60:2 (2005): 577–614.

Gompers, Paul A., Vladimir Mukharlyamov, and Yuhai Xuan. “The cost of friendship.” *Journal of Financial Economics* 119:3 (2016): 626–644.

Gornall, Will, and Ilya A. Strebulaev. “The Economic Impact of Venture Capital: Evidence from Public Companies.” Stanford Graduate School of Business Working Paper (2015).

Grogger, Jeffrey, and Gordon H. Hanson. “Attracting talent: Location choices of foreign-born PhDs in the United States.” *Journal of Labor Economics* 33:S1 (2015): S5–S38.

Guerrero, Maribel, James A. Cunningham, and David Urbano. “Economic impact of entrepreneurial universities’ activities: An exploratory study of the United Kingdom.” *Research Policy* 44:3 (2015): 748–764.

Hall, B. H., A. B. Jaffe, and M. Trajtenberg (2001). “The NBER Patent Citation Data File: Lessons, Insights and Methodological Tools.” NBER Working Paper 8498.

Haltiwanger, John, Ron S. Jarmin, and Javier Miranda. “Who creates jobs? Small versus large versus young.” *Review of Economics and Statistics* 95:2 (2013): 347–361.

Hanson, Gordon H., and Matthew J. Slaughter. “High-skilled immigration and the rise of STEM occupations in US employment.” In *Education, skills, and technical change: Implications for future US GDP Growth*, 465–494. University of Chicago Press, 2017.

Hausman, Naomi. “University innovation and local economic growth.” *The Review of Economics and Statistics* (2020), 1–46.

Howell, Sabrina T., Josh Lerner, Ramana Nanda, and Richard Townsend. 2020. “Financial Distancing: How Venture Capital Follows the Economy Down and Curtails Innovation.” NBER Working Paper 27150.

Hunt, Jennifer, and Marjolaine Gauthier-Loiselle. “How much does immigration boost innovation?” *American Economic Journal: Macroeconomics* 2:2 (2010): 31–56.

Israel, Emma, and Jeanne Batalova. “International Students in the United States.” *Migration Policy Institute* (2021).

Kerr, William R. “The gift of global talent: Innovation policy and the economy.” *Innovation Policy and the Economy* 20:1 (2020): 1–37.

Kerr, Sari Pekkala, and William R. Kerr. “Immigrant entrepreneurship.” In *Measuring entrepreneurial businesses: Current knowledge and challenges*, 187–249. University of Chicago Press, 2016.

Kerr, Sari Pekkala, and William Kerr. “Immigrant entrepreneurship in America: Evidence from the survey of business owners 2007 & 2012.” *Research Policy* 49:3 (2020): 103918.

Kerr, William R., and Shihe Fu. “The survey of industrial R&D—patent database link project.” *The Journal of Technology Transfer* 33:2 (2008): 173–186.

Kerr, William R., and William F. Lincoln. “The supply side of innovation: H-1B visa reforms and US ethnic invention.” *Journal of Labor Economics* 28:3 (2010): 473–508.

Lee, Yong Suk, and Chuck Eesley. “The persistence of entrepreneurship and innovative immigrants.” *Research Policy* 47:6 (2018): 1032–1044.

Uhlbach, Wolf-Hendrik, Valentina Tartari, and Hans Christian Kongsted. “Beyond scientific excellence: International mobility and the entrepreneurial activities of academic scientists.” *Research Policy* 51:1 (2022): 104401.

Wadhwa, Vivek, Richard Freeman, and Ben Rissing. “Education and tech entrepreneurship.” *Innovations: Technology, Governance, Globalization* 5:2 (2010): 141–153.

Wadhwa, Vivek, Ben A. Rissing, Anna Lee Saxenian, and Gary Gereffi. “Education, entrepreneurship and immigration: America’s new immigrant entrepreneurs, Part II.” Part II (June 11) (2007a).

Wadhwa, Vivek, Anna Lee Saxenian, Ben Rissing, and Gary Gereffi. “America’s new immigrant entrepreneurs.” *Kauffman Foundation Report* (2007b).

Figure 1: Immigrant Founder Share Over Time

This figure plots the share of immigrant founders over time. Shares are calculated from all founder–start-up pairs in each 5-year cohort.

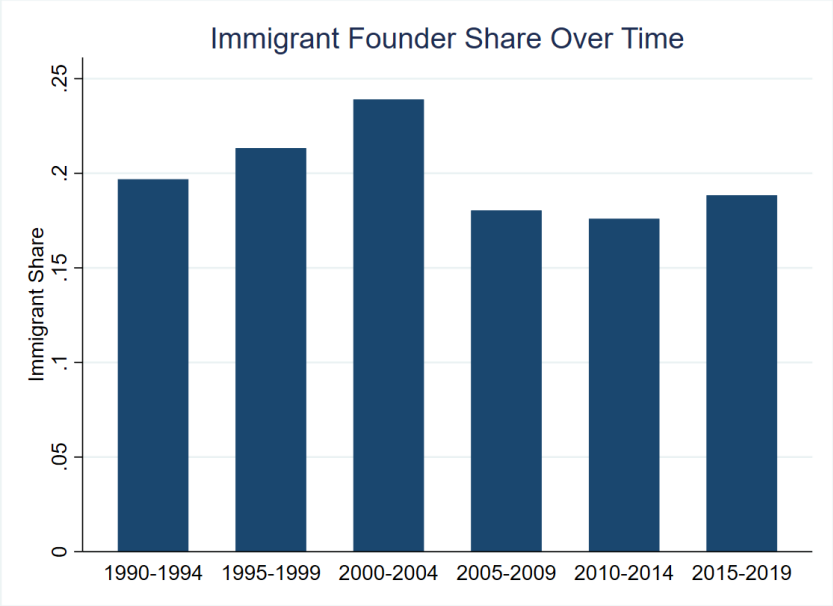


Figure 2: Immigrant Founder Share by Ethnicity over Time

This figure plots immigrant founders' ethnicity breakdown over time. Shares are calculated from all founder–start-up pairs in each 5-year cohort.

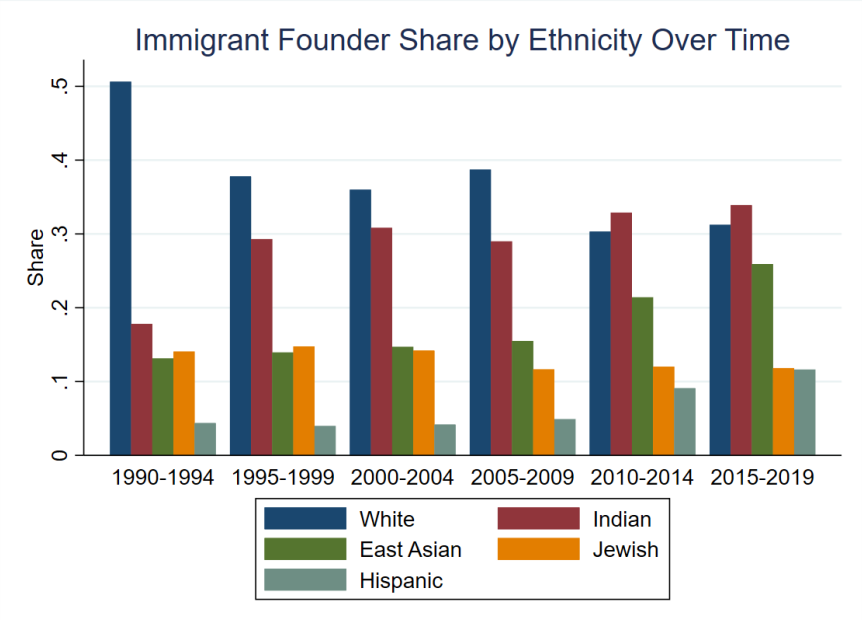


Figure 3: Immigrant Founder Share by Immigration Path

This figure plots immigrant founders' immigration path breakdown over time. Shares are calculated from all founder–start-up pairs in each 5-year cohorts. Group 1 immigrant founders are those who came to the United States for undergraduate studies. Group 2 immigrant founders are those who came to the United States for graduate studies. Group 3 immigrant founders are those came to the United States for work. Number of immigrant founder–start-up pairs in each immigrant group is scaled by the total founder–start-up pairs in each 5-year cohort.

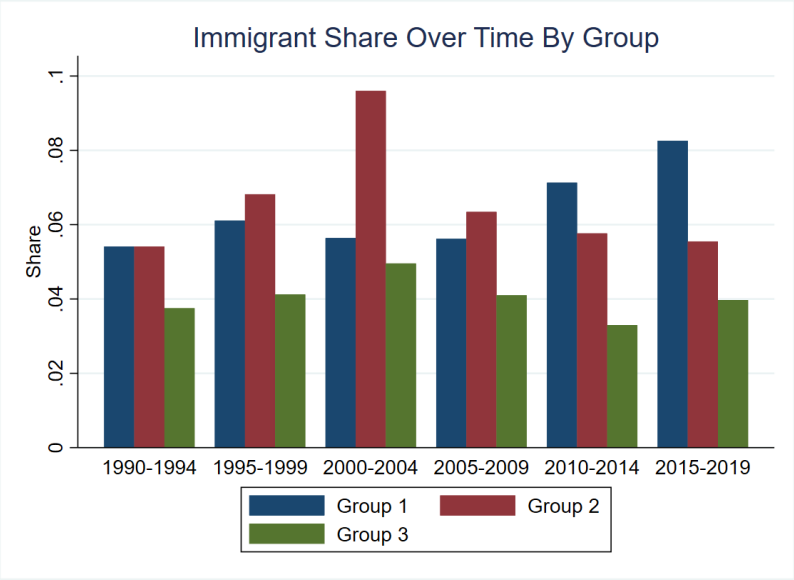


Table 1A: Founder Characteristics by Immigration Status

This table presents summary statistics for native-born and immigrant founders' characteristics. Each observation is a founder. Gender and ethnicity are assigned using name-based algorithms. IPO equals 1 if the start-up had gone public by 2019 and zero otherwise. *IPO Rate* is the percentage of the founder's start-ups that had gone public. Success equals 1 if the start-up had gone public or was acquired for more than $100 million USD by 2019 and zero otherwise. *Success Rate* is the percentage of the founder's start-ups that succeeded. *Patent Rate* is the percentage of the founder's start-ups that successfully filed at least one patent within two years of founding. *Patent Count* is the average number of patents filed by the founder's start-ups within two years of founding. *Number of Firms* counts the number of VC-backed ventures that each founder had started throughout the sample. *Founding Age* is the average of the founder's age at the time the start-up was formed. Asterisks denote statistical significance level from t-tests on differences in sample means, * is for 10%, ** is for 5%, and *** is for 1% level, respectively.

	Natives		**Immigrants**		**Natives-Immigrants**	
	N	**Mean**	**N**	**Mean**	**Mean**	**t-Statistic**
Female	30,118	0.0942	7,195	0.103	-0.00918*	-2.31
Jewish	30,112	0.184	7,194	0.126	0.0573***	12.7
East Asian	30,112	0.0456	7,194	0.185	-0.139***	-29.42
Indian	30,112	0.0338	7,194	0.298	-0.264***	-48.12
Hispanic	30,112	0.0371	7,194	0.0669	-0.0298***	-9.48
White	30,112	0.706	7,194	0.357	0.349***	56.09
# of Firms	30,118	1.104	7,195	1.132	-0.0286***	-4.48
Founding Age	18,368	39.9	4,934	44.55	-4.652***	-23.75
Success Rate	30,118	0.271	7,195	0.279	-0.00824	-1.44
IPO Rate	30,118	0.0443	7,195	0.0493	-0.005	-1.84
Patent Rate	30,118	0.13	7,195	0.159	-0.0297***	-6.45
Patent Count	30,118	0.456	7,195	0.66	-0.204***	-4.53

Table 1B: Industry Breakdown by Immigration Status

This table compares number and proportion of start-ups in each industry across native-born and immigrant founders. Z-statistics from tests for differences across population proportions are presented in the final column. Each observation is a founder–start-up pair.

	Natives		Immigrants		Natives-Immigrants	
	N	**%**	**N**	**%**	**Diff**	**Z-statistic**
Business and Finance	7,353	22.14%	1,418	17.43%	4.7%	9.86
Consumer Goods	1,106	3.33%	159	1.95%	1.4%	7.55
Consumer Services	5,987	18.03%	989	12.15%	5.9%	14.02
Energy	462	1.39%	105	1.29%	0.1%	0.72
Health	5,799	17.46%	1,350	16.59%	0.9%	1.89
Industrials	681	2.05%	176	2.16%	-0.1%	-0.63
IT	11,794	35.52%	3,938	48.40%	-12.9%	-21.00
Unassigned	22	0.07%	2	0.02%	0.0%	1.40
Total	33,204	100.00%	8,137	100.00%	-	-

Table 2: Immigrant Founder Count and Share by State

The bottom panel presents the top and bottom 10 states with the highest and lowest number of immigrant founder–start-up pairs. The bottom panel presents the top and bottom 10 states with the highest and lowest immigrant founder–start-up pair shares. Shares are calculated as the proportion of immigrant founder–start-up pairs divided by total founder–-start-up pairs.

Top 10 States by Count		Bottom 10 States by Count	
State	**Count**	**State**	**Count**
CA	4575	HI	5
MA	743	LA	3
NY	612	VT	2
TX	276	ID	1
WA	215	MS	1
PA	195	MT	1
NJ	153	ND	1
FL	140	WY	1
IL	126	SD	0
VA	121	WV	0

Top 10 States by Share		Bottom 10 States by Share	
State	**Share**	**State**	**Share**
DE	30.1%	NH	8.1%
CA	26.5%	RI	7.1%
NJ	26.3%	MS	6.3%
MA	19.5%	KS	6.1%
FL	18.6%	LA	4.7%
MD	17.6%	VT	4.5%
AR	17.2%	MT	3.1%
NY	16.0%	ID	2.1%
PA	15.6%	SD	0.0%
AZ	15.3%	WV	0.0%

Table 3A: Founder Characteristics by Immigration Path

This table presents summary statistics for immigrant founders' characteristics by immigration path. Each observation is a founder. Group 1 immigrant founders are those who came to the United States for undergraduate studies. Group 2 immigrant founders are those who came to the United States for graduate studies. Group 3 immigrant founders are those came to the United States for work. Gender and ethnicity are assigned using name-based algorithms. *IPO Rate* is the percentage of the founder's start-ups that had gone public by 2019. Success equals 1 if the start-up had gone public or was acquired for more than $100 million USD by 2019 and zero otherwise. *Success Rate* is the percentage of the founder's start-ups that succeeded. *Number of Firms* counts the number of VC-backed ventures that each founder had started throughout the sample. *Patent Rate* is the percentage of the founder's start-ups that successfully filed at least one patent within two years of founding. *Patent Count* is the average number of patents filed by the founder's start-ups within two years of founding. *Founding Age* is the average of the founder's age at the time the start-up was formed. *SSN Age* is the founder's age when he received his Social Security number.

	Group 1		**Group 2**		**Group 3**	
	N	**Mean**	**N**	**Mean**	**N**	**Mean**
Female	2,391	0.116	2,346	0.0899	1,462	0.0937
Jewish	2,391	0.148	2,346	0.0968	1,462	0.131
East Asian	2,391	0.192	2,346	0.202	1,462	0.124
Indian	2,391	0.202	2,346	0.463	1,462	0.276
Hispanic	2,391	0.076	2,346	0.0541	1,462	0.0746
White	2,391	0.419	2,346	0.216	1,462	0.428
SSN Age	1,225	22.23	1,759	24.04	1,094	28.96
# of Firms	2,391	1.127	2,346	1.168	1,462	1.129
Founding Age	1,235	45.21	1,771	41.78	1,098	45.5
IPO Rate	2,391	0.0354	2,346	0.0453	1,462	0.0545
Success Rate	2,391	0.25	2,346	0.296	1,462	0.288
Patent Rate	2,672	0.127	2,346	0.205	1,462	0.171
Patent Count	2,672	0.491	2,346	0.935	1,462	0.642

Table 3B: Education Information by Immigration Status and Path

This table presents education information by immigration status and path. Each observation is a founder. Group 1 immigrant founders are those who came to the United States for undergraduate studies. Group 2 immigrant founders are those who came to the United States for graduate studies. Group 3 immigrant founders are those came to the United States for work. Definition for Top School follows Gompers et al. (2016).

	Natives	**Group 1**	**Group 2**	**Group 3**
	%	**%**	**%**	**%**
College Major				
STEM	64.50%	72.40%	87.80%	77.00%
Business	28.40%	25.90%	4.80%	13.40%
Graduate Degree				
Any	47.80%	54.70%	100%	56.80%
MBA	17.50%	18.90%	24.30%	8.30%
Non-MBA	34.60%	41.40%	90.00%	50.50%
STEM Master's	14.40%	21.90%	41.40%	23.40%
Ph.D.	10.20%	11.50%	39.40%	17.60%
Top School				
Any	30.60%	42.30%	38.00%	3.80%
College	19.20%	30.90%	0.60%	1.20%
Graduate	20.20%	26.40%	39.20%	3.10%
MBA	8.70%	10.60%	13.10%	0.80%
Non-MBA	12.80%	18.00%	26.50%	2.50%

Table 3C: Industry Breakdown by Immigration Path

This table presents start-up industry proportions by immigration status and path. Each observation is a founder–start-up pair. Group 1 immigrant founders are those who came to the United States for undergraduate studies. Group 2 immigrant founders are those who came to the United States for graduate studies. Group 3 immigrant founders are those came to the United States for work.

	Natives	Group 1	Group 2	Group 3
Business and Finance	22.1%	21.7%	15.4%	17.3%
Consumer Goods	3.3%	2.7%	1.2%	1.7%
Consumer Services	18.0%	17.9%	7.8%	10.5%
Energy	1.4%	1.1%	1.5%	0.8%
Health	17.5%	14.4%	16.5%	17.1%
Industrials	2.1%	2.2%	2.1%	1.9%
IT	35.5%	40.0%	55.5%	50.7%
Unassigned	0.1%	0.0%	0.0%	0.1%

Table 4: Top Institutions by Immigration Paths

The top panel presents top 10 institutions that produced the greatest number of immigrant entrepreneurs by immigration path. Column 1 lists the top 10 universities that granted the greatest number of college degrees to Group 1 immigrant entrepreneurs. Column 2 lists the top 10 universities that granted the greatest number of graduate degrees to Group 2 immigrant entrepreneurs. Column 3 lists the top 10 companies that employed the greatest number of Group 3 immigrant entrepreneurs. The bottom panel presents, for the top 10 colleges shown in column 1 of the top panel, the number of native-born founders, number immigrant founders, share of immigrant founders, and College Scorecard foreign undergraduate student share.

College (Group 1)		Graduate School (Group 2)		Firms (Group 3)	
University	**Count**	**University**	**Count**	**Firm**	**Count**
Stanford U.	127	Stanford U.	222	Oracle	36
UC, Berkeley	116	UC, Berkeley	127	Microsoft	33
MIT	115	MIT	116	Cisco	29
Harvard U.	74	Harvard U.	99	Nokia	24
U. of Penn	53	Columbia U.	78	IBM	22
Cornell U.	49	U. of Penn	77	Google	21
Columbia U.	41	Carnegie Mellon U.	59	Hewlett-Packard	17
U. of Texas at Austin	38	USC	55	Apple	15
Yale U.	36	UCLA	46	Sun Microsystems	15
U. of Michigan	33	New York U.	42	Opelin	15

	Native-Born Founders	Immigrant Founders	Immigrant Founder Share	Foreign Student Share
Stanford U.	793	127	0.14	0.07
UC, Berkeley	659	116	0.15	0.07
MIT	635	115	0.15	0.09
Harvard U.	631	74	0.10	0.09
U. of Penn	441	53	0.11	0.10
Cornell U.	464	49	0.10	0.09
Columbia U.	236	41	0.15	0.11
U. of Texas at Austin	244	39	0.13	0.10
Yale U.	313	36	0.10	0.09
U. of Michigan	416	33	0.07	0.05

Table 5: Education and Start-Up Locations

This table presents the percentage of founders who started their companies in the same state where they received their education. The *Education* row calculates the percentage of founders who started a company in the same state where they received their undergraduate or graduate degree. The *B-school* row calculates the percentage of founders who started a company in the same state where they received their M.B.A. The *G-School* row calculates the percentage of founders who started a company in the same state where they received their non-M.B.A. graduate degree. The *College* row calculates the percentage of founders who started a company in the same state where they received their college degree.

	Firm State Same as	**Natives**		**Group 1**		**Group 2**	
Sample	**State of**	**N**	**%**	**N**	**%**	**N**	**%**
All	Education	26,439	40.2%	2,391	43.0%	2,346	36.1%
	B-School	5,450	36.7%	463	35.4%	606	34.0%
	G-School	9,773	37.9%	974	38.9%	2,034	32.9%
	College	22,809	32.0%	2,388	32.8%	-	-
CA	Education	10,115	42.1%	1,214	45.6%	1,403	38.6%
	B-School	2,017	38.3%	237	34.3%	320	37.2%
	G-School	3,739	44.2%	605	44.6%	1,253	35.1%
	College	8,532	33.5%	1,212	34.4%	-	-
MA	Education	2,446	53.1%	205	59.5%	220	42.7%
	B-School	542	57.6%	48	52.1%	54	51.9%
	G-School	1,136	50.4%	103	47.6%	194	36.6%
	College	2,101	36.9%	204	43.1%	-	-
NY	Education	2,716	31.4%	279	33.0%	120	35.8%
	B-School	550	30.0%	62	29.0%	41	29.3%
	G-School	774	34.0%	78	28.2%	92	34.8%
	College	2,357	24.3%	279	26.2%	-	-
Other	Education	11,609	36.5%	725	35.9%	644	25.9%
	B-School	2,440	30.7%	145	33.1%	199	23.6%
	G-School	4,316	28.3%	284	25.7%	532	23.9%
	College	10,217	30.4%	725	28.3%	-	-

Table 6: Determinants of Start-Up Success

This table reports OLS regression results from a series of regressions where *success* (defined as firms with an initial public offering or acquired at a valuation greater than $100 million) is regressed onto a series of founder characteristics. The founder characteristics include whether the founder has previous experience working at a VC-backed start-up (*Prev XP*), whether the founder previously founded a VC-backed firm (*Prev Founding XP*), whether the founder attended a top school (*Top School*), and whether the founder attended business or various types of (*non-M.B.A.*) graduate school, as well as gender and ethnicity indicators. The observations in the regressions are founder-firm pairs. Each column in the table corresponds with a regression run using a different sample: native-born founders, immigrant founders, Group 1 immigrant founders (who have a U.S. college degree), Group 2 immigrant founders (who do not have a U.S. college degree but have a U.S. postgraduate degree), and Group 3 immigrant founders (who do not have any U.S. education). Standard errors are reported in parentheses and clustered at the founder level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Natives	Immigrants	Group 1	Group 2	Group 3
Prev XP	0.0534***	0.0401	0.0707	0.013	0.104*
	(0.0124)	(0.0269)	(0.0517)	(0.0449)	(0.0558)
Prev Founding XP	-0.0311**	-0.016	-0.0653	-0.00687	-0.0507
	(0.0146)	(0.0299)	(0.0567)	(0.0478)	(0.0653)
Female	-0.0244***	-0.0248	0.00663	-0.0112	-0.0946***
	(0.00784)	(0.0159)	(0.0271)	(0.0301)	(0.0338)
Jewish	0.00738	-0.00982	0.00843	-0.0351	0.0271
	(0.00624)	(0.0153)	(0.0234)	(0.0302)	(0.0353)
East Asian	-0.0196*	-0.0204	0.000667	-0.00686	-0.0654**
	(0.0107)	(0.0131)	(0.0227)	(0.0243)	(0.0307)
Indian	0.00976	0.0314***	0.0058	0.0337	0.0404
	(0.013)	(0.0119)	(0.0218)	(0.0208)	(0.0269)
Hispanic	-0.0153	-0.0213	0.0111	-0.0109	-0.134***
	(0.0114)	(0.0174)	(0.0271)	(0.0369)	(0.0323)
Top School	0.0410***	0.0388***	0.0403**	0.0380**	0.0142
	(0.00564)	(0.0118)	(0.0181)	(0.0185)	(0.0565)
Business School	-0.00109	-0.0245*	-0.0365	0.000272	-0.000867
	(0.0066)	(0.014)	(0.0224)	(0.0267)	(0.0405)
Non-MBA Grad School	-0.00192	0.0519***	0.044	0.119***	-0.00449
	(0.00785)	(0.0182)	(0.0321)	(0.041)	(0.0377)
STEM Masters	0.0155	-0.0469**	-0.0511	-0.0413	-0.0402
	(0.00952)	(0.0194)	(0.0359)	(0.0304)	(0.0403)
PhD	0.00322	-0.0483**	-0.0613	-0.0325	-0.0667
	(0.0104)	(0.02)	(0.0389)	(0.0307)	(0.042)
Constant	0.263***	0.273***	0.244***	0.203***	0.324***
	(0.00375)	(0.00995)	(0.0153)	(0.0383)	(0.0237)
Observations	33,189	8,130	2,663	2,730	1,646
R-squared	0.109	0.103	0.119	0.119	0.125
Industry FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y

Table 7: Determinants of Start-Up Patenting

This table reports regression results from a series of regressions where two firm-level patenting measures are regressed on a founder's immigrant status, controlling for founder characteristics. The founder characteristics include the same experience, educational background, and demographic controls found in the Table 6 success regressions. The observations in the regression are founder-firm pairs. Columns (1) – (3) present OLS regression results where *Patent Rate*, an indicator variable that equals one if the company produced at least one patent within two years of founding, is regressed onto the variables described above. Columns (4)–(6) report Poisson regression results of firm-level *Patent Count* (the number of successful patents filed within two years of firm founding) on the variables described above. Columns (3) and (6) decompose the Top School and Immigrant variables into College/MBA/Other Graduate and G1/G2/G3 subgroups, respectively. Standard errors are reported in parentheses and clustered at the founder level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Patent Rate	Patent Rate	Patent Rate	Patent Count	Patent Count	Patent Count
Prev XP	0.0497***	0.0377***	0.0372***	0.604***	0.533***	0.532***
	(0.00973)	(0.00956)	(0.00955)	(0.117)	(0.113)	(0.113)
Prev Founding XP	0.00623	0.0152	0.015	0.143	0.172	0.169
	(0.0119)	(0.0116)	(0.0116)	(0.145)	(0.142)	(0.142)
Immigrant	0.0163***	0.0103**		0.189***	0.155**	
	(0.00507)	(0.00498)		(0.0689)	(0.0691)	
Group 1 Imm.			-0.00789			0.123
			(0.00701)			(0.215)
Group 2 Imm.			0.0272***			0.215*
			(0.00899)			(0.113)
Group 3 Imm.			0.0240**			0.124
			(0.00956)			(0.106)
Top School	0.00745*	0.0122***		0.0939	0.110*	
	(0.00416)	(0.0041)		(0.0667)	(0.0666)	
Top College			0.00465			0.0585
			(0.0048)			(0.0841)
Top Business School			0.00849			0.149
			(0.00819)			(0.116)
Top Other Grad School			0.0214***			0.103
			(0.00668)			(0.0854)
Business School	-0.00542	-0.00457	-0.00596	-0.128*	-0.0978	-0.155*
	(0.00476)	(0.00468)	(0.00602)	(0.0699)	(0.0692)	(0.0847)
(Non-MBA) Grad School	0.0249***	0.0163***	0.0102*	0.139*	0.082	0.0527
	(0.00575)	(0.00566)	(0.00594)	(0.0838)	(0.0858)	(0.0907)
STEM Masters	0.0253***	0.0218***	0.0204***	0.203**	0.182**	0.178**
	(0.00701)	(0.0069)	(0.00691)	(0.0916)	(0.0894)	(0.0896)
PhD	0.0805***	0.0505***	0.0469***	0.645***	0.435***	0.428***
	(0.00797)	(0.008)	(0.00807)	(0.101)	(0.0999)	(0.107)
Constant	0.106***	0.112***	0.115***	-0.899***	-0.746***	-0.723***
	(0.00272)	(0.00273)	(0.00274)	(0.0527)	(0.0492)	(0.0538)
Observations	41,375	41,325	41,325	41,012	40,962	40,962
R-squared	0.045	0.068	0.068			
Demographic Controls	Y	Y	Y	Y	Y	Y
Industry FE	N	Y	Y	N	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Appendix

A Venture Source–Infutor Merge Procedure

Here, we outline our procedure for merging the VentureSource data set with the Infutor data set, which enables us to identify founders as immigrants. Our enhanced VentureSource data set includes zip code, state information, and year information for firms and founder's educational institutions. The Infutor data set contains residential address history information (including zip code and state), as well as the years that an individual resided at a particular address. Our merge procedure identifies potential matches across the two data sets by using first and last name information, and filters potential matches by using location information and age information.

Step 1: We first identify potential matches between the VentureSource and Infutor data sets. We consider a person in the Infutor data set a potential match for an observation in the VentureSource data set if they share the same last name, and they share the same first three letters of the first name.

Step 2: For all potential matches identified in Step 1, we apply age filters based on date of birth information in Infutor, and graduation year information linked to VentureSource. The graduation year data are from Emsi, where available, and hand collected otherwise. The specific restrictions imposed are:

- All potential matches must imply college graduation ages between 16 and 25.
- All potential matches must imply M.A. graduation ages between 18 and 40.
- All potential matches must imply Ph.D. graduation ages between 20 and 40.
- All potential matches must imply M.B.A. graduation ages between 22 and 40.

Step 3: For all potential matches, we identify if the following criteria are satisfied across the two data sets:

A. First name (exact match)
B. Matching state of firm founding and state of residence
C. Matching state of firm founding and state of residence, where firm founding date is during time of residence
D. Zip code of firm founding within 25, 50, or 100 miles of residence (using the NBER Zip Code Distance Database)
E. Zip code of firm founding within 25, 50, or 100 miles of residence, matching founding date and residence dates

Step 4: We impose the following criteria, in the order listed, and filter potential matches such that they meet the listed criteria. At each point, we consider a match to be unique if imposing the listed criteria yields a one-to-one match.

1. Criteria B or D
2. Criterion D
3. Criteria C or E
4. Criterion E

Step 5: We run Step 4 using all potential matches, then restricting to observations with more stringent age filters (described below), then restricting the set of potential matches to having first names match exactly (Criterion A), and finally restricting the set of potential matches to having first names match exactly and to meet the more stringent age filters. This matching procedure yields a unique match for 45% of founders in the VentureSource data set.

The more stringent age filters are:

- All potential matches must imply college graduation ages between 18 and 24.
- All potential matches must imply M.A. graduation ages between 18 and 35.
- All potential matches must imply Ph.D. graduation ages between 25 and 35.
- All potential matches must imply M.B.A. graduation ages between 22 and 40.

Step 6: For founders without unique matches that have potential matches, we calculate the proportion of potential matches who are immigrants that satisfy Criteria A (exact first name match) and E (residential zip code within 100 miles of firm founding at time of founding). If this proportion exceeds 80%, we consider the founder an immigrant; if it is below 20%, we classify the founder as a native born. Including this step, we have an immigrant variable for approximately 65% of observations in the VentureSource sample.

B Merged and Unmerged Observations

Our analysis in the paper focuses on founders in the VentureSource data for whom we are able to identify immigration status by merging into the Infutor data. **Table B.1** displays statistics on various characteristics of founders in our final merged data set, versus characteristics for founders that are not in the merged data set. Founders in our merged data set are more likely to be educated in the U.S. (91% versus 74%, respectively), slightly more likely to start a successful firm that has an initial public offering or is acquired for a valuation of greater than $100 million (27% versus 21%, respectively), more likely to attend a top school (30% versus 25%, respectively), more likely to be White (64% versus 59%, respectively), and less likely to be East Asian, Indian, or Hispanic.

The characteristics of the merged versus unmerged data suggest that data limitations may lead us to slightly *underestimate* the contribution of immigrant founders to the VC ecosystem. For example, if we assume all non-U.S.-educated founders in the unmerged sample are immigrants, the proportion of immigrant founders in our data is around 21%, slightly higher than the figure reported in the main text.

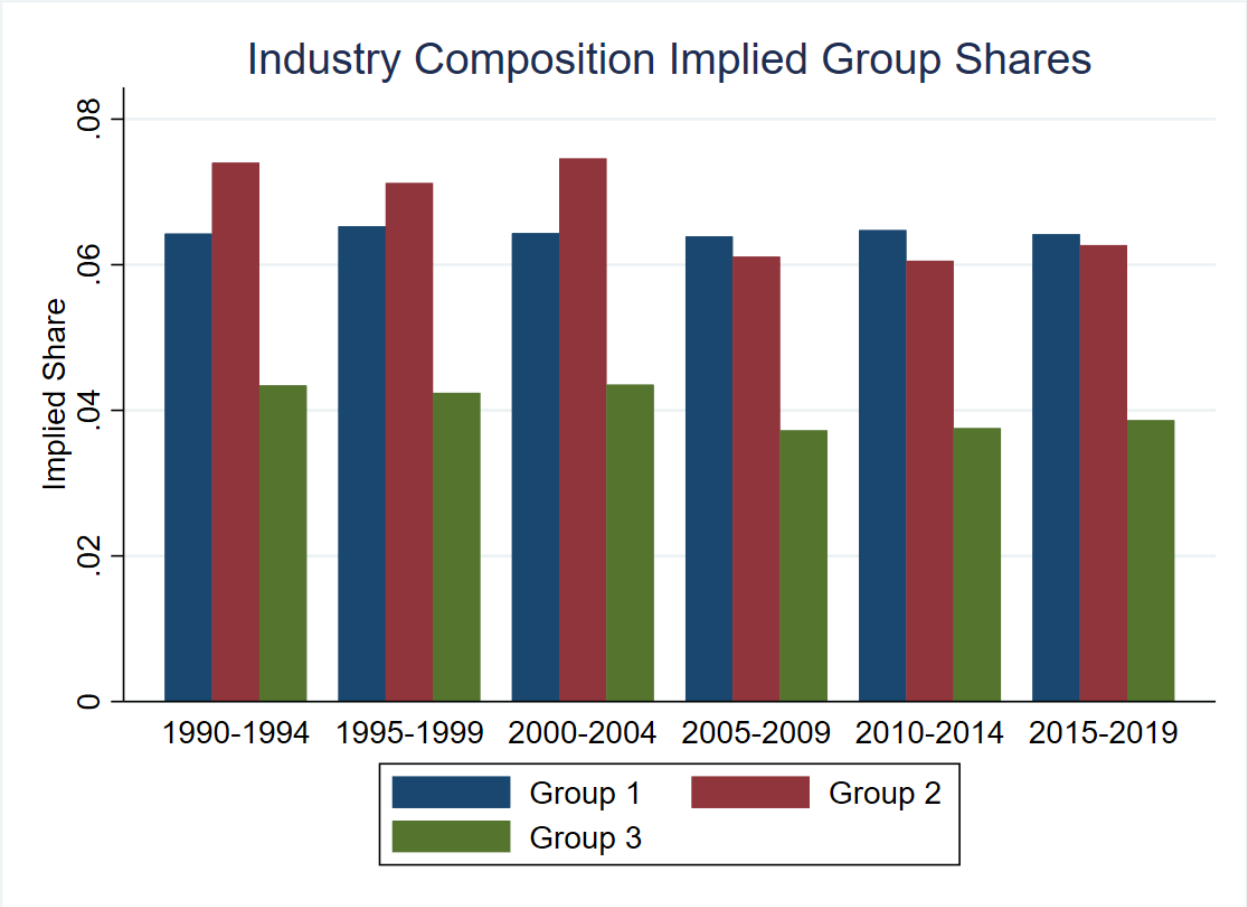
Table B.1: Merged and Unmerged Observations

	Merged		**Unmerged**	
	N	**Mean**	**N**	**Mean**
US Educated	32,638	0.912	12,890	0.742
Success	37,313	0.272	15,960	0.213
IPO	37,313	0.0453	15,960	0.0277
Female	37,313	0.0960	15,960	0.116
Top School	37,313	0.299	15,960	0.248
No Post Grad	37,313	0.494	15,960	0.578
Jewish	37,306	0.173	15,947	0.149
East Asian	37,306	0.0724	15,947	0.111
Indian	37,306	0.0848	15,947	0.137
Hispanic	37,306	0.0428	15,947	0.106
White	37,306	0.639	15,947	0.588

C Industry Composition-Implied Immigrant Founder Shares

Figure C.1: Industry Composition-Implied Immigrant Founder Share by Immigration Path

This figure plots industry composition-implied immigrant founders' immigration path breakdown over time. Per-period industry-implied group shares are calculated as the product of the full-sample industry-group shares (e.g., share of Group 1 founders in the IT industry) and the per-period industry shares (e.g., share of IT founder–start-up pairs). Group 1 immigrant founders are those who came to the United States for undergraduate studies. Group 2 immigrant founders are those who came to the United States for graduate studies. Group 3 immigrant founders are those came to the United States for work.



D Patenting by Immigrant- and Native-Founded Firms Across Industry

Table D.1: Patenting by Industry and Immigrant Status

This table compares the patenting activities of immigrant vs. native-founded firms across different industries. Columns (1) and (4) report the share of firms founded by immigrants vs. natives (respectively) in the industry detailed on left. Columns (2) and (5) report the share of patenting firms among immigrant vs. native-founded firms in the specified industry, while Columns (3) and (6) report the average number of patents filed by immigrant vs. native-founded firms in the specified industry. Column (7) reports the total number of firms in the specified industry, while columns (8) and (9) report the share of patenting firms and average number of patents per firm in the specified industry, respectively. A firm is classified as immigrant-founded if at least one of its founders is an immigrant, whereas native-founded firms are exclusively founded by U.S.-born entrepreneurs. A firm is classified as *patenting* if it files at least one, ultimately, successful patent application within two years of founding. Likewise, a firm's patent count is calculated as the number of ultimately successful patent applications filed within two years of founding.

	Immigrants			**Natives**			**Overall**		
Industry	(1) Firm Share	(2) Patent Rate	(3) Patent Count	(4) Firm Share	(5) Patent Rate	(6) Patent Count	(7) Total Firms	(8) Patent Rate	(9) Patent Count
Business and Finance	22.06%	0.094	0.347	77.94%	0.077	0.200	5,466	0.081	0.232
Consumer Goods	15.94%	0.204	1.373	84.06%	0.126	0.489	891	0.138	0.630
Consumer Services	19.72%	0.069	0.159	80.28%	0.056	0.176	4,463	0.059	0.173
Energy & Utilities	24.04%	0.466	1.636	75.96%	0.219	0.766	366	0.279	0.975
Healthcare	26.26%	0.210	0.960	73.74%	0.208	0.713	4,399	0.208	0.778
Industrials	25.47%	0.280	1.187	74.53%	0.232	0.756	589	0.244	0.866
IT	32.53%	0.176	0.732	67.47%	0.138	0.535	9,455	0.150	0.599
Unassigned	8.33%	0.000	0.000	91.67%	0.182	0.545	24	0.167	0.500