

High-Tech Immigrant Entrepreneurship in the U.S.: A Preliminary Report

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Prepared for the Industry Studies Annual Conference
Chicago, May 29, 2009

DRAFT – DO NOT CITE

Abstract

This paper provides a preliminary report on a national survey that estimates the rate of immigrant founding in a representative sample of high-impact firms in high-technology industries. Our sampling frame includes firms that doubled in size (revenues and employment) in the 2002-2006 period in industries classified as high-technology. The paper describes differences between immigrants and non-immigrant founded firms in terms of economic and technological performance. It also compares immigrant and non-immigrant founders in terms of education and experience. We conclude by briefly considering relevant immigration policy issues.

High-Tech Immigrant Entrepreneurship in the U.S.: A Preliminary Report ¹

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1. Introduction

A vigorous high-technology sector is vital to sustain U.S. prosperity in the 21st century. The new products, services, and business models that the high-tech sector generates differentiate this nation's output from that of the rest of the world and enable capital accumulation, wage gains, and productivity growth. A high level of entrepreneurship, by which we mean the founding of new businesses, makes the high-tech sector vigorous. High-tech entrepreneurs take risks that existing high-tech businesses are afraid to take and recognize opportunities that they fail to spot.

High-tech entrepreneurship requires a rare combination of inclinations, capabilities, and resources. Most new businesses fail, so founders must be optimistic, but also capable of weathering severe challenges. Because the opportunities in high-tech sectors blend together technological and market factors, individual entrepreneurs and founding teams in these sectors typically combine technical expertise rooted in formal education and market savvy that flows from extensive business experience. They must also be able to tap quickly and

¹ The survey described here was funded by the U.S. Small Business Administration (SBA) and carried out by the George Mason University Survey Research Center. The project involved collaboration with the Corporate Research Board, LLC and with Zoltan J. Acs of George Mason University. The views expressed here are solely mine. A final report will be released by the SBA under the authorship of Acs, Spencer Tracy, and me in the coming months.

effectively into networks of customers, suppliers, expertise, finance, and talent as business opportunities ripen.

Foreign-born individuals play an important role in U.S. high-tech entrepreneurship. By virtue of having left their native land, they may have entrepreneurial inclinations. Their large presence in American higher education and the U.S. labor force, especially science and engineering disciplines and occupations, equips them with valuable knowledge that bears on high-tech innovation. Their outsider status may allow them to recognize “out-of-the box” opportunities that native-born individuals with similar knowledge and skills do not perceive. These capabilities may be linked to unique entrepreneurial resources, such as access to partners, customers, and suppliers in their countries of origin.

In this study, we quantify the role of immigrants² in high-tech entrepreneurship in a nationally representative sample of rapidly growing “high-impact” companies. This class of companies drives job creation and aggregate growth in the U.S. We find that, while most previous studies have overstated the role of immigrants in high-tech entrepreneurship, it is nonetheless very important. For instance, about 16% of the companies in our sample had at least one foreign-born entrepreneur among their founding teams, and these high-tech companies display better performance in some respects than high-tech companies in our sample whose founders were all native-born. We also provide a profile of high-tech immigrant entrepreneurs. The vast majority are strongly rooted in the U.S., highlighting the

² We use the term “immigrants” in place of “foreign-born” here and in similar spots in this text because, as we show later, the vast majority of foreign-born high-tech entrepreneurs in the U.S. have been in this country for decades and have become citizens. However, we would acknowledge that “foreign-born” is a more precise term.

need to build a coherent pathway to permanent status for highly-educated, highly-skilled immigrants.

2. Theoretical Context

Our research answers the empirical question “how many high-tech immigrant entrepreneurs are there?” In this section, we describe why this question is interesting from a theoretical perspective. There are, in fact, theoretical reasons to think both that the foreign-born will be *over*-represented in high-tech entrepreneurship and that they will be *under*-represented. Building on the seminal work of Shane and Venkataraman (2000), we define entrepreneurship as the creation, recognition, and exploitation of opportunities to supply future goods and services. (Hart forthcoming) The creation of opportunities is a societal function, but the characteristics of individual entrepreneurs, including their nativity, influence whether they recognize and exploit these opportunities.

2.1 Recognition of Entrepreneurial Opportunity

Our understanding of how and why entrepreneurs recognize opportunities is incomplete. Some part of the process may never be entirely comprehensible from the outside, depending on an ineffable “flash of creative genius,” as Justice William O. Douglas famously described the process of invention. (*Cuno Engineering* 1941) But we can say with some confidence that recognition of entrepreneurial opportunity depends in part on psychological attributes and in part on knowledge and experience, with the latter weighing particularly heavily in high-tech entrepreneurship. And we know that foreign-born residents of the U.S. are different in both of these respects from the native-born.

The most commonly accepted distillation of the psychological element of entrepreneurial opportunity recognition is “alertness.” (Kirzner 1973) Some people are on the lookout for opportunities, while others are not. This attribute may be passed down through families, either through nature or nurture; the children of entrepreneurs are more likely than others to become entrepreneurs themselves. Immigrants may also be more “alert” in this sense than native-born. Those who come to the U.S. for education or employment, for instance, have, at a minimum, recognized opportunities for personal achievement outside the borders of their native land. This group is the end product of a self-selection process that separates them from those in their home countries who do not migrate, in part on the basis of the capacity to recognize opportunities.

Educational attainment is easier to measure than “alertness.” High-tech entrepreneurs have higher levels of educational attainment than the general public. The Global Entrepreneurship Monitor finds, for instance, that nascent entrepreneurs who expect to create many jobs are better educated than other entrepreneurs. (Bullevag 2005) High-tech entrepreneurs are also more likely to have degrees in science and engineering (S&E) disciplines than other fields. The foreign-born are disproportionately represented in these disciplines in U.S. higher education. Foreign students comprised 25% of all S&E graduate students in 2005, with the highest concentrations in engineering (45%) and computer sciences (43%). (NSB 2008, p. 2-21) The National Science Board points out that “[n]oncitizens, primarily those with temporary visas, account for the bulk of the growth in S&E doctorates awarded by U.S. universities from 1985 through 2005... The temporary resident share of S&E doctorates rose from 21% in 1985 to 36% in 2005.” (NSB 2008, p. 2-31)

Many foreign students, perhaps two-thirds of them, stay in the U.S. after graduation and join the labor force. Given their academic training, it is not surprising that the foreign-born are disproportionately present in S&E occupations. The U.S. Census Bureau, for instance, estimates that 26% of college-educated workers in such occupations were foreign born, compared to their 12% share of the overall population. (NSB 2008) This population has been growing steadily in recent years. “In the 2000 census, about 43% of all college-educated, foreign-born individuals in S&E occupations (62% of doctorate holders) reported arriving in the United States after 1990.” (NSB 2008, p. 3-50) The formal knowledge reaped from their education and the business experience gained from their work combine to provide the prerequisites for over-representation of the foreign-born in U.S. high-tech entrepreneurship.

Although their educational and occupational backgrounds are similar, foreign-born high-tech entrepreneurs may recognize different opportunities than their native-born counterparts. As Carlsson and Jacobson (1997) put it (in a different context), the blending of cultures experienced by immigrants may enlarge the “search space” in which opportunities are sought. Immigrants may see, for instance, potential markets or supply chain relationships in their native lands that are not visible to those who lack their knowledge and experience. People holding diverse values may also resolve uncertainties about the same opportunity differently. These differences may then drive disagreements about how promising that opportunity is, leading to spin-offs from existing businesses, and start-ups of brand new companies, to exploit that opportunity. The work of Florida (2002, 2005) and Ottaviano and Peri (2006) suggest that there is an association between social diversity due to country of nativity on the one hand and levels of entrepreneurship at the regional and national levels on the other.

We have emphasized in this section the theoretical factors that lead us to hypothesize that the foreign-born will be over-represented in high-tech entrepreneurship, but we also want to point out as well that there are factors that pull in the opposite direction. Language barriers, for instance, may make it difficult for even highly-educated and well-experienced foreign-born technical experts to recognize entrepreneurial opportunities quickly enough to seize them. Language proficiency in general is the most important determinant of immigrant success in the labor market. (Borjas 1999) Foreign-born experts may also be more likely to pursue (or to be shunted into) technical career ladders and get off of the management track. This career path leads to less exposure to market trends and customer feedback that may give rise to the “flash of creative genius” that sparks an entrepreneurial venture.

2.2 Exploitation of Entrepreneurial Opportunity

It is one thing to recognize an entrepreneurial opportunity and another to take advantage of it by creating a new business. Like recognition of opportunity, exploitation of opportunity involves both the attitudes and the attributes of the entrepreneur. The foreign-born and native-born populations differ in important ways with respect to both. These differences, more so than those that bear on opportunity recognition, provide arguments both for and against over-representation of the foreign-born among U.S. high-tech entrepreneurs.

We can conceive of the attitudinal factors that determine entrepreneurial behavior as involving both rational calculation and speculative risk-taking. Rational calculation involves the financial tradeoff of giving up, at least temporarily, what is usually a reasonably secure and remunerative

position for a new and uncertain career trajectory. This calculus may also encompass the utility derived from personal satisfaction and social esteem that flow from one's choice. The foreign-born may have less to lose from taking the entrepreneurial plunge than the native-born in these respects, particularly if discrimination blocks their promotion within existing businesses. The opportunity cost of entrepreneurship is lower in such a circumstance. On the other hand, they may also perceive greater difficulties in getting back on their old career track in the likely case of failure, and so be reluctant to become entrepreneurs.

The rational calculation of costs and benefits is inevitably incomplete, and potential entrepreneurs must fill in the gaps with guesses and beliefs. For those who move forward in entrepreneurship, these guesses and beliefs typically reflect optimism and a penchant for risk. The stereotypical immigrant in American folklore possesses just these qualities, suggesting that foreign-born individuals will more likely make the decision to start a company than native-born individuals with similar backgrounds. However, this stereotype does not characterize all highly-skilled immigrants. For some, the reasons for immigration may have less to do with seeking a fortune than in finding security, in which case their decisions will be biased against entrepreneurship.

The exploitation of high-tech opportunities requires that entrepreneurs draw not only their own resources, but also on those of colleagues and of society more broadly. These resources include including money, talent, contacts, and knowledge. Access to these resources quickly and at a reasonable cost depends on the entrepreneurs' social capital – that is, the networks in which they are embedded and the levels of trust that exist in these networks – and the social institutions that

surround the high-tech start-up process. Some key networks in the U.S. high-tech sector, most notably those that provide access to venture capital, seem to be comprised by “bonding” social capital, epitomized by “old-boys clubs.” Brush (2003), for example, shows that female entrepreneurs tend to be excluded from these networks, and the foreign-born may suffer from a similar process of discrimination in seeking financial support.

The dominance of “old-boys clubs” ought to reduce the probability that foreign-born entrepreneurs can effectively exploit the opportunities that they perceive. Saxenian (2006), though, has shown that, at least in some cases, foreign-born high-tech entrepreneurs take effective advantage of their own “bonding” social capital in the form of networks of co-ethnics and linkages to their countries of origin. Ethnic professional associations and alumni clubs, for instance, provide access to potential new hires and funders. The Indus Entrepreneurs, an organization of U.S. residents from South Asia, for example, aims to enhance the social capital of its membership. Some foreign governments have also enacted “diaspora policies” that support these kinds of networks and even provide venture capital to high-tech entrepreneurs abroad. Scotland, Chile, South Africa, and Armenia are among the countries that have undertaken such policies, demonstrating the breadth of the appeal of this idea. (Ionescu 2006, Kuznetsov and Sabel 2006)

We can conclude that theory does not provide conclusive guidance about the relative representation of foreign-born and native-born in the population of high-tech entrepreneurs. Although like most others in this field, we would expect the factors that predict over-

representation to dominate those that predict under-representation, the issue can only be resolved through empirical observation of the sort that we have undertaken.

3. Prior Research, Data, and Methods: A Very Brief Summary

Research on immigrant entrepreneurship is dominated by the study of self-employment, ethnic enclaves, and, most recently, transnationalism. This literature finds that the foreign-born are more likely to start companies than the native-born. (Fairlie 2008, Light and Rosenstein 1995) Immigrant-founded companies play key roles in creating and sustaining ethnic communities in major U.S. cities, such as Los Angeles and Miami. (Light and Gold 2000) Business networks, populated by highly-educated elites who have deep roots in the U.S., link these communities to their countries of origin. (Portes, Guarnizo, and Haller 2002) Immigrant entrepreneurs from particular ethnic groups tend to concentrate in specific niches, including high-skill as well as low-skill sectors. (Fairlie 2008, Federman, Harrington, and Krynski 2006)

Saxenian (1999) pioneered research focused specifically on high-tech immigrant entrepreneurship. She observed that Indians and Chinese were an increasingly visible presence within Silicon Valley and that many had founded start-ups there, in part because of the “glass ceiling” that blocked their promotion within existing high-tech companies. She discovered that 24% of Silicon Valley start-ups between 1980 and 1998 had CEOs with Chinese or Indian surnames, although she was unable to distinguish their location of birth. Qualitative research revealed that the Indian and Chinese high-tech communities, like ethnic enclaves in the rest of the economy, were sustained by a rich network of associations and maintained linkages to their

countries of origin. Later work, also focused primarily on existing high-tech clusters, has found rates in the same range. (See Table 1.)

Two large national survey projects yield results that are substantially lower than those of Saxenian and her followers. The Kauffman Firm Survey (DesRoches et al. 2007), is a random sample of all companies founded in 2004, and it over-samples high- and medium-tech sectors. About 16% of the companies in the over-sampled sectors reported having at least one foreign-born founder. The Panel Study of Entrepreneurial Dynamics is a representative national sample of individuals involved in business founding. (Reynolds and Curtin 2007) Of those in this group who expected their companies to create 50 or more jobs after 5 years (about 5% of the sample), 15% were foreign-born. The main findings of the earlier studies covered in this section are summarized along with our own key findings in Table 1.

Table 1: High-Tech Immigrant Entrepreneurs – Comparison Across Studies

Author	Year Released	Population	Foreign-Born	Definition
Saxenian	1999	D&B custom database of high-tech firms founded in Silicon Valley, 1980-1998, in selected SICs.	24%	Companies that have CEOs with Chinese or Indian surnames.
Anderson and Platzer (NVCA)	2006	Publicly traded, venture-backed companies that are still independent, 1990-2005, as tracked by Thomson Financial.	25%	Companies with at least one foreign-born founder (self-defined), as stated by respondent or listed in public or Internet documents.
Monti, Smith-Doerr, and MacQuaid (MBA)	2007	Biotech firms founded in New England from Mass. Biotech. Assn. members' list.	26%	Companies with at least one foreign-born founder (self-defined) as stated by respondent or listed on company website.
Wadhwa et al.	2007	Firms founded between 1995 and 2005 listed in <i>D&B Million Dollar Database</i> (\$1M or more in sales, 20 or more employees) in selected SICs.	25%	Companies with foreign-born CEO or CTO, as stated by respondent.
Reynolds and Curtin	2007	U.S. adults (Panel Study of Entrepreneurial Dynamics I and II).	15%	Nascent entrepreneurs who expect to have substantial impact (50+ jobs) who reported being foreign-born.
DesRoches et al. 2007	2007	Kauffman Firm Survey, high- and mid-tech firms founded in 2004.	16%	Companies with at least one foreign-born founder (self-defined) as stated by survey respondent.
Hart et al. (this study)	2009	High-impact companies as identified in Acs et al. 2007 from ACSL in selected SICs.	16%	Companies with at least one foreign-born founder (self-defined) as stated by survey respondent.

Our study focuses on foreign-born founders of “high-impact” companies (HICs) in high-tech sectors. An HIC is an enterprise the sales of which have at least doubled over the most recent 4-year period and which has an employment growth quantifier of 2 or greater over the same period. Acs, Parsons, and Tracy (2008) identified 376,605 HICs in the U.S. for the period 2002-2006. From this group, we selected those classified by the American Corporate Statistical Library (a proprietary database that uses data licensed from Dun & Bradstreet) as having their primary activity in a high-tech industry. Our list of high-tech SICs appears in Appendix 1.

Our strategy for the design of the survey questionnaire was to keep it short and simple. Although a short, simple instrument yields less information about each company than a long, complicated one, it allows for a wide range of potential respondents within each company and avoids the requirement that a senior decision-maker be reached, boosting the response rate. The short and simple approach also minimizes respondent error. We received data for 1,415 completed surveys. The response rate for eligible respondents who were actually reached (completed surveys/completed surveys + refusals + terminated early) was 53%.

4. Preliminary Findings

The main findings of the survey are presented in this section. Our key finding is that about 16% of the companies in the sample reported that at least one of their founders was foreign-born. (See Table 1.) This rate is very close to the rate found by the Kauffman Firm Survey, despite the fact that the populations sampled were quite different. 81% of the companies in our sample reported that all of their founders were born in the U.S., and 3% of the respondents did not know the answer to this question or refused to answer it. Although the 16% rate is at the low end of

the range of published studies reported above, it nonetheless represents a substantial fraction of HICs.

The demographics of immigrant-founded companies (IFCs) are very similar to those of native-founded companies (NFCs), with the exception of their location. The distributions of the two groups of companies between manufacturing and services (see Table 2) and across age categories were not significantly different in a chi-square test. The distributions across SICs showed some statistically significant differences (for instance, IFCs are over-represented in business services and electronics), but the overall pattern is very similar to that of NFCs. The locations of IFCs correspond with the locations of foreign-born populations in generally. They are disproportionately concentrated in states with high and very high shares of foreign-born residents, such as California and Texas.

Table 2: Companies by Founder Nativity and Sector

Sector	Native-Founded	Immigrant-Founded	Total
Manufacturing	343 (32.60%)	56 (27.32%)	399 (31.74%)
Service	709 (67.40%)	149 (72.68%)	858 (68.26%)
Total	1,052 (100.00)	205 (100.00)	1257 (100.00)
	Pearson chi-squared (1) = 2.2138		P = 0.137

Source: authors' calculations

In bivariate tests of economic performance, IFCs outperform NFCs. We use company employment as the dependent variable for economic performance, because it is generally regarded as more reliable in the D&B data than company revenue. Using three categories of

company size (less than 20 employees, 21-100 employees, and more than 100 employees), we found that IFCs are more likely to be in the higher categories to a statistically significant degree. In particular, about 33% of the IFCs were in the largest size group, compared with about 24% of the NFCs. However, regression results generally suggest that controlling for age and other factors washes out this result.

We measured technological performance in our survey by asking whether companies conducted R&D in their own labs, contracted out R&D, and held patents. Positive responses to these questions overall ranged from 17% for contract R&D to 28% for in-house R&D, with patent-holding lying in between at about 22%. IFCs out-performed NFCs to a statistically significant degree in bivariate tests on two of these three measures. Although the variables for technological performance are more likely to be associated with immigrant founding than those associated with economic performance (company employment, company revenue) in a variety of specifications, the relationship is not significant in the most complete specification, which controls for company age, company employment, and other factors. (See Table 3.)

Table 3: Company Technological Performance Regressed on Founder Nativity (multivariate w/controls)

Independent variables	Coefficient	P-value
Founder nativity	0.46	0.81
Company age (log)	-0.10	0.41
Company employment (log)	0.23	0.001

Logistic regression, weighted by age, sector, size, and location

N = 1088

Dependent variable: technological performance (dummy variable for positive response to any survey question on patenting, in-house R&D, or contract R&D)

Control variables (not displayed): 2-digit SIC, education level of most educated founder

Source: authors' calculations

IFCs are also about twice as likely as NFCs to report that they had strategic relationship with a company outside the U.S., such as a major supplier, key partner or major customer. (See Table 4.) This bivariate relationship suggests that the cross-border social capital of foreign-born founders may be employed in building IFCs and will be explored further in future research.

Table 4: Companies by Founder Nativity and Foreign Partner

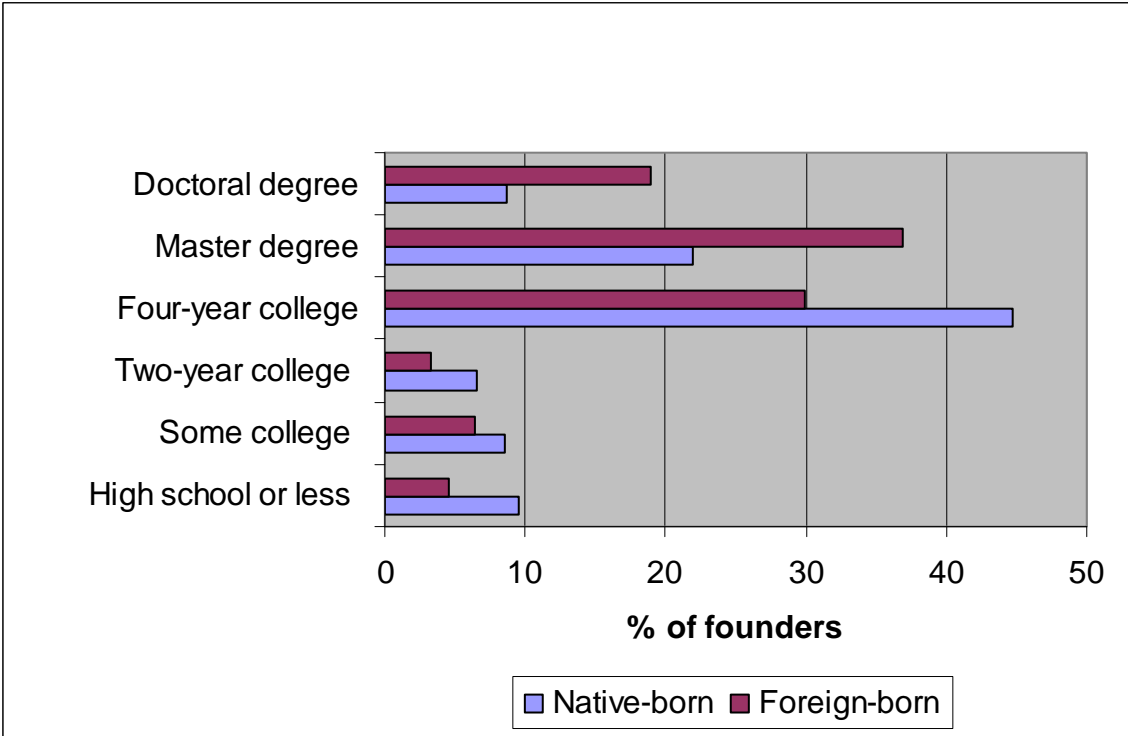
Foreign partner?	Native-Founded	Immigrant-Founded	Total
Yes	238 (22.97%)	83 (41.92%)	321 (26.01%)
No	798 (77.03%)	115 (58.08%)	913 (73.99%)
Total	1,036 (100.00)	198 (100.00)	1,234 (100.00)
	Pearson chi-squared (1) = 31.00		P = 0.000

Source: authors' calculations

We created a second data base from our sample in which the unit of analysis is the individual founder, rather than the company. We obtained nativity data on more than 2000 founders in total from our set of some 1400 companies. Of these, 261 are foreign-born, or about 12.8%. The vast majority of foreign-born founders were reported to have lived in the U.S. for decades. The average duration was more than a quarter-century, 25.9 years. Only about 25% were reported to have been in the U.S. for less than 15 years. About 77% of the foreign-born high-tech entrepreneurs in our sample are U.S. citizens.

The foreign-born founders are a highly educated group. Roughly 55% of them hold a masters degree or doctorate. In fact, foreign-born founders are more than twice as likely as native-born founders to hold a doctorate and substantially more likely to hold a masters degree as well. On the other end of the spectrum, about twice as many of the U.S.-born founders (9.5%) held a high school degree or less. (See Figure 1.) Exactly two-thirds of the foreign-born founders about whom we have information received their highest level of education in the U.S.

Figure 1: Founders by Nativity and Level of Education



The countries of origin of the foreign-born founders are diverse. 54 countries are represented in our founder database – about 28% of the United Nations’ membership. India is the largest source country, accounting for about 16% of this group. The U.K. provided 10%, followed by Canada and Japan, each of which comprised 6%, and Germany, which accounted for 5%. China and

Cuba were the home countries of about 3%. To China's total, one might add Hong Kong and Taiwan, which bring it up to a third-place tie with Canada and Japan. All of the inhabited continents and major world regions are represented in the group.

5. Key Policy Issues

The results of our study are descriptive, not prescriptive. Additional assumptions and assertions are required to reach policy conclusions, and reasonable people may differ as to what these ought to be. In this section, we briefly lay out our views on some of the key policy issues to which our study contributes.

The broadest questions in immigration policy are how many people the U.S. ought to admit, for what length of stay, and what criteria it ought to use to admit them. Our findings to date do not provide strong insights into the issue of "how many." The admission of more immigrants, however chosen, might produce more opportunities for high-tech entrepreneurship if diversity of country of origin is a key societal driver of opportunity creation. To put it another way, if immigrants help to create high-tech entrepreneurial opportunities, then admitting more immigrants is a good idea. If immigrants recognize and exploit opportunities that American society would generate even in the absence of immigration and that the native-born would recognize and exploit, then the case for expansion is harder to make. We are not confident enough about the relationship between immigration and opportunity creation to make policy recommendations that presume that there is such a relationship, although we suspect that one does in fact exist. Future work will shed additional light on this question.

We have more to say about the length of stay and criteria for admission. The extensive work experience and strong educational backgrounds of the immigrant founders in our sample provide support for maintaining and possibly strengthening the long-term educational and employment-based immigrant and non-immigrant visa categories. People who come to the U.S. seeking opportunities to learn at the university and graduate school levels and to work in high-skill positions for extended periods of time add significantly to the pool of residents who have a reasonable chance of creating high-impact high-tech companies. This pool is composed of people who not only have the requisite human and social capital to found such companies, but who are also more likely to have entrepreneurial attitudes and outlook. Yet, the U.S. immigration system does not generally favor such people, relying heavily on family relationships to determine who is admitted.

The linkages among non-immigrant visa categories and between non-immigrant status and legal permanent residence are also important policy issues illuminated by this study. These linkages ought to create clear pathways for immigrants, including those who have the potential to become high-tech entrepreneurs, but they do not do so now. A large proportion of the immigrant founders in our sample somehow found their way from higher education to professional work to the green card and, ultimately, citizenship. They gained sufficient certainty about their immigration status during this journey that they were willing to make the investment of a lifetime by starting their own businesses. We worry, though, that some potential high-tech entrepreneurs who are admitted in a non-immigrant status get trapped in that status without sufficient reason. Or, even if such individuals have some prospect of extending their stay in the U.S., they lack the certainty that they will be here long enough able to reap the benefits of taking

the entrepreneurial “leap,” because of the way the immigration system treats them. As a result, they never take the leap, and their potential entrepreneurial contribution to the nation is lost.

The pathway from one status to another is by no means easy and has gotten harder in some respects in recent years. Admission as a student is generally not too difficult, as long as the applicant has an offer of a place from a credible school and the means to pay. However, the adjustment from student status to non-immigrant work status is strewn with obstacles. In many cases, recent graduates can stay for an additional year after graduation without changing status if they are employed in “optional practical training” (OPT) directly related to their field of study. OPT was recently extended to 29 months for graduates in STEM fields. However, if the student visa holder is without a firm job offer from a sponsor who holds a non-immigrant visa slot when the OPT period expires, the former student must leave the country immediately (as he or she must upon graduation as well if not eligible for OPT).

The availability of non-immigrant visa slots to graduating students and employers who desire them is spotty at best. The H1-B category, which is the largest one for long-term non-immigrant workers, has faced a glut of applicants for a limited number of visas in recent years. These visas are distributed primarily through a lottery, and no priorities are set with respect to the types of qualifications that the country might value beyond the general language of the law. Applicants are left in the dark for many months and sometimes years as to whether they will be admitted. Indeed, it was this uncertainty, the so-called H1-B “cap gap,” that seems to have stimulated the extension of OPT described above. Yet, this fix simply expands the pool of H1-B applicants who are in limbo. The second largest long-term non-immigrant work visa category, the L-1 for

intra-company transferees, is increasingly subject to similar uncertainty as companies have apparently begun to use it to try to work around the constraints of the H1-B process.

The third step along this pathway, from temporary work status to the green card, is perhaps the most difficult of all. Unless the aspiring immigrant marries an American citizen and thus becomes eligible for legal permanent residence as a member of a citizen's family, the wait can be quite long and burdened with onerous conditions and uncertainty. The conditions include remaining with the sponsoring employer until the green card has been approved. The wait for an employment-based green card usually lasts several years, and it is often much longer. The May 2009 *Department of State Visa Bulletin*, for instance, shows that green cards are now being processed for applicants who filed their initial forms as far back as 1986. Because green cards are subject to annual per-country limits, applicants from India, China, Mexico, and the Philippines, which are among the largest source countries, must usually wait longer than applicants from other countries.

There are no easy fixes to the substantial problems that vex the U.S. immigration system. Our study suggests several options for consideration that might allow the country to better utilize high-tech-oriented entrepreneurial talent from outside its borders. One option is to set priorities within temporary employment visa programs, like the H1-B, that favor the most qualified applicants. A second is to restructure or abolish the numerical per-country limits on green cards, which operate without regard for the size of the home country population. A third option is to loosen the linkages between employment and immigration in order to facilitate high-tech

immigrant entrepreneurship, for instance, through the introduction of a point system that rewards attributes associated with entrepreneurial potential.

6. Conclusion

The foreign-born play an important role in founding some of the nation's most important businesses. About 16% of the companies in our nationally representative sample of high-impact, high-tech companies count at least one immigrant among their founders. These immigrant high-tech entrepreneurs are deeply rooted in the U.S. A large proportion of them have been in this country for two decades or more, are citizens, and received graduate degrees here. They hail from a diverse array of countries.

High-impact, high-tech companies founded by immigrant entrepreneurs tend to be located in states that have large immigrant populations. They operate in the same industries as their native-founded counterparts and are about the same size. They may have a higher level of technological performance (as measured by patenting and R&D activity), although the evidence on this issue is not conclusive, and they are more likely to have strategic relationships with foreign partners. The significance of these companies to the U.S. economy stems from their disproportionate role in employment and revenue growth. Policy-makers are rightly concerned that government sustain a healthy climate for starting and running high-impact companies like those in our sample. Immigration policy, as it affects highly-educated and highly-experienced foreign-born individuals who might be drawn into high-tech entrepreneurship, is an important element of that climate that deserves more attention and more creative thinking than it has received in the past.

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Appendix 1: High-Technology SICs (3 Digit)

Manufacturing

Crude petroleum and natural gas	131
Cigarettes	211
Miscellaneous textile goods	229
Pulp mills	261
Miscellaneous converted paper products	267
Industrial inorganic chemicals	281
Plastic materials and synthetics	282
Medicinals and botanicals	283
Soap	284
Paints	285

Industrial organic chemicals	286
Agricultural chemicals	287
Miscellaneous chemical products	289
Petroleum refining	291
Miscellaneous petroleum and coal products	299
Reclaimed rubber	303
Nonferrous roling and drawing	335
Ordnance and accessories not elsewhere classified	348
Engines and turbines	351
Construction and related machinery	353
Metal working machinery	354
Special industry machinery	355
General industrial machinery	356
Computer and office equipment	357
Industrial machines. N.e.c	359
Electronic distribution equipment	361
Electrical industrial apparatus	362
Household appliances	363
Electric lighting and wiring	364
Audio and video equipment	365
Communications equipment	366
Electronic components and accessories	367
Miscellaneous electrical equipment and supplies	369
Motor vehicles and equipment	371
Aircraft and parts	372
Railroads	374
Guided missiles and space	376
Miscellaneous transportation equipment	379
Search and navigation equipment	381
Measuring and controlling devices	382
Optical instruments and lenses	383
Medical instruments and supplies	384
Ophthalmic goods	385
Photographic equipment and supplies	386
Services	
Communication services not elsewhere classified	489
Computer and data processing services 737	737
Engineering and architectural services	871
Research and development and testing services	873
Services, n.e.c	899