High-tech Immigrant Entrepreneurship in the United States

by

David M. Hart, Zoltan J. Acs, and Spencer L. Tracy, Jr.
Corporate Research Board, LLC
Washington, DC 20002

for

Under contract no. SBAHQ-09-M-0455
Survey: OMB Control Number 3245-0364

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This report was developed under a contract with the Small Business Administration, Office of Advocacy, and contains information and analysis that was reviewed and edited by officials of the Office of Advocacy. However, the final conclusions of the report do not necessarily reflect the views of the Office of Advocacy.

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Executive Summary

In this study, we quantify the role of immigrants in high-tech entrepreneurship in the United States. We report the results of a survey of a nationally representative sample of rapidly growing high-impact, high-tech companies.[1] This group of companies is very important to the U.S. economy, because they account for a disproportionate share of job creation and economic growth. We find that about 16% of the companies in our sample had at least one foreign-born person among their founding teams. This estimate is lower than that found in most previous studies of high-tech immigrant entrepreneurship. Nonetheless, our data show that immigrants play a crucial role in this vital economic activity.

High-impact, high-tech companies founded by immigrant entrepreneurs and those founded by native-born entrepreneurs in our sample are similar in many ways. They operate in the same industries and are about the same size. One important difference between the two is their location. Immigrant-founded companies tend to be located in states that have large immigrant populations. Another difference is that immigrant-founded companies in our sample are about twice as likely as native-founded companies to state that they have a strategic relationship with a foreign firm, such as a major supplier, key partner, or major customer. Immigrant-founded companies may also have a higher level of technological

[1]As we describe in more detail below, a high-impact company is a firm with sales that 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. High-tech is defined by the 3-digit SIC codes listed in Appendix A.

performance than native-founded companies, although the evidence on this issue is not conclusive.

This study sheds light on high-tech immigrant entrepreneurs as individuals as well as on the companies that they helped to found. The vast majority of these individuals are strongly rooted in the United States. A large proportion of them have lived in this country for two decades or more. More than three-quarters of them are U.S. citizens. Two-thirds of them received undergraduate or graduate degrees here. The 250 foreign-born entrepreneurs on whom we have data hail from 54 countries in all regions of the world. India is the largest source country, accounting for 16% of this group, followed by the U.K. at 10%.

Policymakers are rightly concerned that government should sustain a healthy climate for starting and running high-impact, high-tech 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.

High-Tech Immigrant Entrepreneurship in the United States

1.0 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, by which we mean the founders of new high-tech businesses, take risks that managers of existing high-tech businesses choose not to take and recognize opportunities that they fail to spot.

High-tech entrepreneurship requires a rare combination of inclinations, capabilities, and resources. Half of new businesses fail within five years (Shane 2008), 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 with market savvy that flows from extensive business experience. They must also be able to tap quickly and 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, in some cases, 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 immigrants[2] in high-tech entrepreneurship in a nationally representative sample of rapidly growing "high-impact" companies (HICs). This class of companies drives job creation and aggregate growth in the United States. 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 United States. Most of them received their highest educational degree here and have become citizens.

[2]We use the term "immigrants" in place of "foreign-born" here and in similar spots in this text because, as we note in the text and show in detail later, the vast majority of foreign-born high-tech entrepreneurs in the United States have been in this country for decades and have become citizens. However, we would acknowledge that "foreign-born" would be a more precise term in certain contexts.

Our report begins by situating the subject of high-tech immigrant entrepreneurship in policy and analytical debates about immigration, entrepreneurship, and technology-based economic development. We then describe our methods and findings. We conclude by highlighting the research and policy agendas that our work illuminates.

2.0 Policy Context

Our research brings together two important areas of public policy: technology-based economic development (TBED) and immigration. In both areas, recent research points to new ways to achieve desirable policy outcomes. The linkages between them are just beginning to be explored.

2.1 Technological Innovation, Entrepreneurship, and Economic Growth

The importance of technological innovation in economic growth is by now firmly established. Well-understood by classical economists, technology's contribution to the economy began to be conceptualized and measured after World War II by modern economists such as Solow (1957), Griliches (1958), Nelson (1959), and Arrow (1962). Applied economists in fields like industrial organization (Scherer 1984) and agricultural economics (Ruttan 2001) sustained this agenda, and they have been joined in recent years by formal theorists such as Romer (1990) and Lucas (1988). As McCraw (2007) has written, the twenty-first century is shaping up to be "Schumpeter's Century," a tribute to Joseph A. Schumpeter (1942), the towering figure whose work on technological innovation, entrepreneurship, and economic growth in the first half of the twentieth century set the stage for the advances of the post-World War II period.

Early studies of technology and economic growth in the post-World War II period centered on the contributions of formal R&D. Economic dynamism in these decades was perceived to flow from the investments made by large organizations with big R&D budgets, including public agencies, like the Department of Defense and the National Aeronautics and Space Administration, and multinational companies, such as IBM and General Electric. In his 1952 book *American Capitalism*, John Kenneth Galbraith described the large company as an "an almost perfect instrument" of technological development. Galbraith argued that oligopoly provided a sufficient level of competition to stimulate innovation, while also assuring an adequate resource flow to fund large-scale R&D operations and sufficient confidence that the benefits of these investments would be reaped by firms that built such operations.

This conventional wisdom was not entirely accurate. Beneath the giant redwoods of the Fortune 500, the industrial landscape of the United States contained a thriving undergrowth of smaller and newer companies in the 1950s and 1960s, including some seedlings that would grow into giants themselves, toppling their elders as they did so (Acs and Audretsch 1990). The post-World War II period heralded not only the expansion of large U.S.-based multinational companies but also the invention of whole new institutional forms, such as the venture capital firm and the high-tech start-up, which would eventually blossom into a unique entrepreneurial ecology in places like California's Silicon Valley and Boston's Route 128 (Kenney 2000, Hsu and Kenney 2005). Indeed, the environment in the United States for high-growth, high-tech start-up companies grew more hospitable over time, culminating in the entrepreneurial frenzy of the dot-com boom at the end of the twentieth century.

Recent research suggests that high-growth entrepreneurship is linked to a variety of important economic outcomes. Acs and Audretsch and their collaborators have shown in several studies that business start-ups are associated with economic growth at the regional and national levels. For instance, Acs and Mueller (2008) demonstrate that sustained economic benefits from entrepreneurship at the regional level derive mainly from young (two to five years old), medium-sized (20 to 499 employees) enterprises and not from small businesses in general or the establishment of branch plants of large firms. Haltiwanger (2009) provides evidence that companies that are less than five years old account for nearly all net job creation in the United States. Autio (2005) summarizes a variety of studies (including Wong, Ho, and Autio 2005) showing that 1-10% of new firms generate 40-75% of new jobs. Henrekson and Johansson (2008, 14) summarize the "clear-cut result" in empirical literature covering several countries, including the United States: "a few rapidly growing companies generate a disproportionately large share of all new net jobs…" In addition, as Scherer (1992) points out, competition from new entrants, even if they fail, forces their older rivals to adapt or die and thus drives productivity growth across the broader economy.

Although young, high-growth companies are present in a wide variety of industries, the dynamics of those in high-technology sectors are especially important for scholars and policymakers to understand. These companies are more likely than others to be pursuing opportunities associated with radical innovations that produce positive knowledge externalities and that may have transformative consequences for society (Baumol, Litan, and Schramm 2007). Because such opportunities are so challenging and so risky, existing

businesses are particularly unlikely to find out about them or to pursue them (Utterback 1994, Christensen and Rosenbloom 1995). High-technology start-ups are one of the main organizational vehicles by which new knowledge in the science and engineering disciplines is converted into economic benefits (Acs, et al. 2005, Acs, Audretsch, and Strom 2009).

It is not surprising, then, that the federal government has made significant efforts to foster technological innovation, at first mainly by investing in R&D and more recently by seeking to stimulate entrepreneurship, especially in high-tech sectors. The federal R&D budget is about $150 billion per year, to which more than $20 billion was added for FY09 and FY10 by the American Recovery and Reinvestment Act of February 2009. Since 1982, a designated fraction of this budget across the major R&D agencies has been devoted to the Small Business Innovation Research (SBIR) program, which supports many innovative small companies (Wessner 2007). The SBIR set-aside has risen from 0.2% of each agency's external research budget at the program's outset to 2.5% in recent years. The creation of SBIR program in 1982 was part of a larger package of federal policy initiatives that began in the late 1970s and helped channel support to high-tech start-ups. These initiatives included the relaxation of the "prudent man" rule for venture capital investment (which allowed pension funds to invest a small fraction of their portfolios in venture firms) in 1978, the 1980 Bayh-Dole Act governing intellectual property generated by federal R&D funding, the National Cooperative Research Act of 1984, and the reorientation and renaming of the National Institute of Standards and Technology in 1988 (Hart 1998, Hughes 2005, Graham 1992).

Many state governments reached the conclusion that technology-based economic development (TBED) deserved their attention in the same period or even earlier. North Carolina's development of Research Triangle Park is a pioneering example that dates back to the 1950s. In addition to seeking to capitalize on federal R&D funding, including SBIR, states have experimented with a wide variety of programs, including support for academic R&D and technology transfer, venture capital investment, loan programs for small businesses, workforce upgrading, and more (Clarke and Gaile 1989, Waits 2000, Pages, Friedman, and von Bargen 2003). The central goal of these diverse efforts was to enable organic growth of existing businesses within the state and to nurture new businesses, rather than to chase the elusive "smokestacks" (that is, branch plants of large enterprises) that might move to the state from elsewhere.[3] Peter Eisinger (1988) captured the trend for scholars in his book *The Rise of the Entrepreneurial State*, and David Osborne (1988) popularized it the same year in *Laboratories of Democracy*. A recent review of state initiatives in economic development by the National Governors Association (NGA) shows that TBED policy momentum at the state level has been sustained, as states seek to shift the basis of competitive advantage from cost reduction to knowledge creation, innovation, and entrepreneurship (NGA 2006).

The contribution of immigration to entrepreneurially oriented TBED has not gone unnoticed. American universities, for example, have long argued that their ability to attract the best students and faculty regardless of nationality was an essential element of the country's global leadership in science and, by extension, high-tech innovation. Recent developments have

[3]Most research shows that the use of state incentives to induce external investment in branch plants (so-called "smokestack chasing") has "little or no impact" (Peters and Fisher 2004, 32). By "organic growth," we mean growth without such subsidized investment.

drawn greater attention on this issue. From Richard Florida's (2003) use of a "melting-pot index" to explain high-tech entrepreneurship at the regional level to the debate over the H-1B visa program, which is described in the next section, U.S. policymakers are focused as never before on the linkage between foreign-born talent and high-tech entrepreneurship.

2.2 Immigration

The U.S. immigration system is quite complex. Navigating it can be difficult both for applicants, who seek to come to the United States or to change their immigration status while in this country, and for their sponsors, such as family members and employers. The system is administered by the U.S. Department of Homeland Security (DHS) and U.S. Citizenship and Immigration Services (USCIS) within DHS. The status of legal permanent residence (also known as the "green card") permits the holder most of the same rights as U.S. citizens. Legal permanent residents may also choose to naturalize and become citizens. Nonimmigrant visas permit temporary residence in the United States. There are many types of nonimmigrant visas, and they authorize their holders to undertake some activities, while restricting others. For instance, student visa holders may not be allowed to work as much as they might like, while the holders of certain temporary employment visas, such as the H-1B, may be unable to change employers. Nonimmigrant visa holders may be able to adjust their status to legal permanent residence if they meet certain eligibility requirements. For instance, a nonimmigrant visa holder may become eligible for status adjustment through marriage to a U.S. citizen or because their employer sponsors them. Half or more of all lawful immigration to the United States in most years is accounted for by status adjustment.

The economic implications of immigration are of great public importance. Public interest has concentrated especially on the economic impact of the unskilled and poorly educated workers who constitute the bulk of the immigrant flow. Some advocates argue that these immigrants fill necessary jobs that would otherwise go wanting, especially so-called "3D" (dirty, difficult, and dangerous) jobs (Koser 2007). Others argue that low-skill immigration displaces native-born workers and drives down wages. Both positions find some support in the scholarly literature. Borjas (1999), for one, argues that low-skill immigration redistributes wealth from low-skill natives to high-skill natives and the owners of capital. Card (2005, 2) counters that "evidence that immigrants have harmed the opportunities of less educated natives is scant," while Ottaviano and Peri (2006) find that once the economy equilibrates most native workers actually benefit from immigration.

High-skill immigration cannot be entirely separated from this broad debate about the economic impact of immigration. The annual quota for legal permanent residence, for instance, must be divided among immigrants at all skill levels, which means that policymakers must weigh the merits of high-skill immigration against those of low-skill immigration. The distribution of approximately one million green cards each year is currently dominated by low-skill applicants. Applicants who have family ties to the United States, who are predominantly low-skill, receive about two-thirds of these places, while only about 11% are awarded to principal applicants on the basis of their job skills. Proposals to expand the share of employment-based green cards and to institute a "point system" that would have benefited the highly skilled met with fierce resistance from defenders of the current system during the 2007 immigration debate in Congress.

In addition to being linked legislatively and administratively, the debates about high-skill and low-skill immigration are linked ideologically and analytically. Advocates of a more expansive immigration policy claim that highly skilled immigrants fill positions that natives will not or cannot fill. These are not "3D" jobs, as in low-skill immigration, but rather highly technical ones in the science, technology, engineering, and mathematics (STEM) fields. American students, responding to the national culture and the educational system, they argue, have lost the taste for entering such challenging fields. Andrescu et al. (2008, 1256), for instance, argue that "it is deemed uncool within the social context of USA middle and high schools to do mathematics for fun; doing so can lead to social ostracism." Yet, educating STEM students and filling STEM jobs (often with students and recent graduates from other countries), the argument continues, is essential to drive technology-based economic growth. House Speaker Nancy Pelosi, echoing the National Academy of Sciences report *Rising Above the Gathering Storm* (2005), recently called for the country to be more aggressive in recruiting highly skilled immigrants, for instance, by "stapling a green card to the diploma" of foreign graduate students (Mervis 2009). These advocates find support in studies like those of Kerr and Lincoln (2008) and Hunt and Gauthier-Loiselle (2008), which use patent data to demonstrate a "crowding-in" effect, in which the presence of foreign-born inventors stimulates more native-born invention.

Advocates of a more restrictive policy argue that highly skilled immigrants "crowd-out" their native-born counterparts. The Economic Policy Institute (2007), for example, argues that some measures under debate, such as the expansion of the H-1B visa program, which is described below, would lead to more offshore outsourcing (that is, the use of contractors

based outside the United States), lower wages, and reduced job opportunities for technology industry workers. The share of native-born students interested in STEM fields up through the undergraduate level, this perspective maintains, has not declined. However, many of these students leave these fields in response to labor market signals that reveal that their earnings will be substantially higher in other fields, such as law and finance (Lowell and Salzman 2007). Advocates on this side of the debate can cite in support of their views the work of scholars like Borjas (2005), who estimates that a 10% rise in foreign doctoral students in a field depresses wages by about 3%, and Levin et al. (2004), who find that foreign doctoral recipients displace the native-born from science and engineering positions.

The H-1B visa, a category of nonimmigrant visa for highly skilled workers, illustrates the situation well. This visa was created by the Immigration Act of 1990, which significantly expanded immigration overall, with a cap of 65,000 per year. The cap was tripled by Congress in the late 1990s, as high-tech companies clamored for qualified help during the Internet boom. It has since returned to its original level, but because H-1B visa holders can stay in the country for up to six years and because of a variety of exemptions to the cap, an estimated 500,000 or more now reside here (Lowell 2006). Both sides of the debate find support in the H-1B experience. Kierkegaard (2007, 72), for instance, concludes that H-1B visa holders are “complements to U.S. workers, rather than substitutes.” Lowell (quoted in Bhattacharjee 2007), on the other hand, views the H-1B as “de facto bondage” to employers, which depresses salaries of native workers.

After the failure of the 2007 immigration bill in Congress, the U.S. immigration policy debate receded somewhat,[4] but the global context in which it is being made remains quite dynamic, especially with regard to high-skill migration (Skills Research Initaitive 2008). Traditional countries of immigration that have long favored the highly skilled, such as Canada and Australia, continue to adjust their policies to maintain or expand the flow of these immigrants. Canada, for instance, now attracts about ten times as many educated immigrants relative to its population as the United States does, although unlike the United States, it also loses many highly educated workers through emigration (mainly to the United States) (National Science Board 2008). The high-skill immigration policies of the smaller English-speaking countries have a "Red Queen" aspect to them – they have to run harder just to stay in the same place, as Lewis Carroll's character famously described herself in *Through the Looking Glass*.

Countries that have not historically been receptive to immigration, like Germany and Japan, have also stepped up their efforts to attract scientific and technical talent (Hart 2006). The European Union as a whole is in the midst of launching a "Blue Card" program that aims to attract highly skilled migrants to Europe and facilitate their movement within the EU (EurActiv 2008). Middle- and lower-income countries are now in the global talent game as well. The successful strategies of Taiwan, Ireland, and Israel, which entered high-tech sectors while wooing home expatriates from Silicon Valley, are being emulated by China and India, among others (Saxenian 2006). Countries of emigration like these are also making more

[4]The Obama administration has suggested that it will seek comprehensive immigration reform legislation in the current Congress.

aggressive efforts to retain talented young people who in the past would have seen going abroad as their only viable option for professional success and entrepreneurial opportunity.

It would be inaccurate to conclude that the United States has lost its place as the central hub of the global system for high-skill migration. The foreign student population in the United States is growing and recently hit an all-time high, new restrictions imposed after 9/11 and new competition abroad notwithstanding (Lowell et al. 2007, Institute of International Education 2008). The H-1B visa cap of 65,000 was over-subscribed on the first day that applications were permitted in 2008 and will likely be hit again in 2009.[5] The backlog for employment-based green cards totals more than 500,000 applicants (Wadhwa et al 2007a). These figures indicate that demand for entrance into the United States remains strong. Policymakers face difficult choices about how to respond to this demand and to improve current policy.

3.0 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. The creation of opportunities is a societal function, but the

[5]USCIS reported on April 9, 2009, that it had received approximately 42,000 H-1B visa applications for the fiscal 2010 year, which begins in October.

characteristics of individual entrepreneurs, including their nativity, influences whether they recognize and exploit these opportunities (Hart forthcoming).

3.1 Recognition of Entrepreneurial Opportunity

Scholarly 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 in *Cuno Engineering* (1941)), on timing, and on luck. 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 United States 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 seems to be passed down through families; the children of entrepreneurs are more likely than others to become entrepreneurs themselves (Lentz and Laband 1990). Immigrants may also be more "alert" in this sense than the average native-born person. Those who come to the United States 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 (Borjas 1990).

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 (Bullvaag 2006). 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 constituted 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, pp. 2-31).

Many foreign students, perhaps two-thirds of them, stay in the United States 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). (See also Table 15 below). 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, pp. 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, language ability, 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 (2003, 2005) and Ottaviano and Peri (2006) suggest that there is an association between social diversity due to foreign and domestic 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. Indeed, language barriers may channel immigrants into fields in which their language skills are less important. 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.

3.2 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 (Bates and Dunham 1993). 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 with finding secure and well-compensated employment, in which case their decisions will be biased against entrepreneurship.

The exploitation of high-tech opportunities requires that entrepreneurs draw not only on their own resources, but also on those of colleagues and of society more broadly. These resources include 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 composed

of “bonding” social capital, created through ties of age, gender, and ethnicity. 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 traditional forms of “bonding” social capital 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 best be resolved through empirical observation of the sort that we have undertaken.

4.0 Prior Research

Empirical research on immigrant entrepreneurship in the United States is growing. In recent years, several authors have examined high-tech entrepreneurship. However, no study before this one has focused on the role of immigrant entrepreneurs in the key companies that drive job creation and growth in the U.S. economy.

4.1 Immigrant Entrepreneurship in General

Research on immigrant entrepreneurship is dominated by the study of self-employment, ethnic enclaves, and, most recently, "transnationalism."[6] This literature finds that the foreign-born are more likely to start companies than the native-born (Fairlie 2008, Light and Rosenstein 1995). The self-employment rate for foreign-born residents of the United States has grown much faster than that of native-born residents over the past ten years (U.S. Small Business Administration 2007). Most of these businesses, like most of those started by the native-born, remain very small, often employing no one other than the owner. Immigrant-founded companies play key roles in creating and sustaining ethnic communities in major U.S. cities, such as New York, Los Angeles, and Miami (Light and Gold 2000). Business networks, populated by highly educated managers and entrepreneurs who have deep roots in the United States, 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).

[6]Portes, Guarnizo, and Haller (2002, 279) define transnationalism in this fashion: "In recent years, a new concept, "transnationalism," has introduced an alternative analytic stance in international migration studies. Instead of focusing on traditional concerns about origins of immigrants and their adaptation to receiving societies, this emerging perspective concentrates on the continuing relations between immigrants and their places of origin and how this back-and-forth traffic builds complex social fields that straddle national borders."

4.2 High-Tech Immigrant Entrepreneurship

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.

Saxenian's work demonstrates that high-tech immigrant entrepreneurship is very important for Silicon Valley (and for the home countries of the immigrants as well), but because it concentrates on the region of the United States in which high-tech immigrant entrepreneurs are most likely to be found, one cannot generalize easily from it. More recent studies by the National Venture Capital Association (Anderson and Platzer 2006) and the Massachusetts Biotechnology Association (Monti et al. 2007) have a similar positive selection bias in their approach to the subject and report similar results, a rate of immigrant founding of about 25%. Hsu et al. (2007) and Bhide (2008) also study elite groups, MIT alumni and venture capital-backed companies respectively, and find that non-U.S. citizens and foreign-born in these groups are more likely to be entrepreneurs than U.S. citizens and native-born.

Wadhwa et al. (2007b) seek to generalize Saxenian (1999) to the national level and update it with more recent data. They find that 25% of high-tech companies founded between 1995 and 2005 that had achieved more than $1 million in sales or employed more than 20 people had CEOs or chief technical officers (CTOs) who were born abroad. This is a valuable study, but it has important weaknesses. The $1 million size threshold excludes a large proportion of high-tech companies that may still be growing rapidly and making important economic contributions. By limiting "founder" to CEO or CTO, the study may exclude up to half of all founders (Burton 1995, Hannan, Burton, and Baron 1996).

Two large national survey projects yield results on the proportion of immigrant company founders that are substantially lower than those of Wadhwa et al. (2007b). The Kauffman Firm Survey (DesRoches et al. 2007), is a random sample of all companies founded in 2004, and it over-samples high-tech sectors.[7] About 16% of the companies in the high-tech sectors reported having at least one foreign-born founder. The weakness of this study for our purposes is that the sampling frame includes companies with zero or one employee, which constitute the vast majority of U.S. start-ups, but which do not account for very much net job creation or aggregate economic growth. 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. These results, too, are indicative, but not definitive, since they are based on expectations rather than outcomes and the absolute numbers involved are very small.

[7]The Kauffman Firm Survey uses the term "medium-tech" as well as "high-tech." Our definition of "high-tech," described below, encompasses both of these categories, so we will use that term here.

The main findings of the earlier studies covered in this section are summarized along with our own key findings in Table 1 below.

5.0 Data and Methods

Our study focuses on foreign-born founders of "high-impact" companies (HICs) in high-tech sectors. As Acs, Parsons, and Tracy (2008) show, high-impact companies account for the bulk of job creation and economic growth in the United States. High-tech companies within this group are disproportionately important, because of the positive externalities they generate for companies in the rest of the economy. We conducted a professional-quality survey that produced a representative national random sample of these companies.

5.1 The American Corporate Statistical Library (ACSL)

The universe of companies from which our population and survey sample were drawn is the Corporate Research Board's American Corporate Statistical Library (ACSL). The ACSL is among the most comprehensive business databases in the United States, containing more than 140 variables on all firms in the country. The ACSL links each firm over time from its birth through any physical location moves it makes, capturing changes in ownership along the way, and recording the firm's death if it occurs. The result is a unique longitudinal business file that allows for analysis of the U.S. economy at the firm level. The Corporate Research Board updates the ACSL every 6 months, drawing on hundreds of public and private sector data sources.

5.2 2007 SBA High-Impact Company Study

We draw upon prior SBA-sponsored work by Acs, Parsons, and Tracy (2008), which identified all HICs in the ACSL for the period 2002-2006. An HIC is a firm 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.[8] There were 376,605 HICs (approximately 2.2% of all companies) in the United States between 2002 and 2006.

5.3 Definition of Survey Population

From this group of HICs, we selected those classified by the ACSL as having their primary activity in a high-tech industry. An industry is defined as a 3-digit Standard Industrial Classification (SIC).[9] Our list of high-tech SICs appears in Appendix 1. There are 49 such industries, 44 in the manufacturing domain and five in the services domain. Our definition of "high-tech" draws heavily on the work of the Bureau of Labor Statistics (Hadlock, Hecker, and Gannon 1991), which uses R&D employment as a share of total employment as the key criterion. We also include several other industries that have a high ratio of R&D spending to total revenues, which are identified in Varga (1998). Our list of high-tech sectors is very similar to that used by the Kauffman Firm Survey. The total population of HICs for 2002-2006 in our 49 high-tech SICs was about 24,000. Of these companies, 17,000 (about 70%) were in the five service SICs; the remaining 7,000 were in manufacturing sectors. Computer and data processing services (SIC 737) and engineering and architectural services (SIC 871)

[8]The employment growth quantifier (EGQ) is the product of the absolute and percent change in employment over a 4-year period of time, expressed as a decimal. EGQ is used to mitigate the unfavorable impact of measuring employment change solely in either percent or absolute terms, since the former favors small companies and the latter large businesses.

[9]In order to maintain historical continuity, the ACSL uses SIC codes rather than NAICS codes.

were the industries containing the largest number of HICs, together accounting for about half the total.[10]

5.4 Survey Method

Our strategy for the design of the survey questionnaire was to keep it short and focused. This approach boosts the response rate and minimizes respondent error. The questionnaire is attached as Appendix 2**.** It asks about the respondent company's technological and business activities in general terms, such as whether it has an R&D laboratory or holds patents. It then concentrates on the company's founders, gathering information for each founder about his or her home country, citizenship, length of residence in the United States, educational background, gender, race,[11] and relationship with other members of the founding team.

The survey was administered by the George Mason University Center for Social Science Research between October 2008 and January 2009. Telephone interviewers received general training as well as training specific to the questionnaire. For quality assurance purposes, supervisors used wireless headsets to monitor telephone interviews, providing both audio and visual access to interviewer performance. Telephone numbers were called up to eleven times at varying times of day, particularly during weekdays, with times varying to accommodate different time zones. To help maximize response rates, the computer-assisted telephone interviewing (CATI) system was programmed to make callbacks until a final disposition was

[10]We dropped SIC 874, management and public relations, which met the BLS definition. Nearly 15,000 HICs were found in this SIC, a very large number, which would have skewed our results.

[11]We did not ask the race of foreign-born founders, because of the great variation in racial and ethnic definitions and identities across the many countries of origin of these founders.

reached. Interviewers set specific callback appointment times whenever appropriate, and these were automatically processed by the CATI program to be called at the specified time.

Of the nearly 24,000 HICs, we surveyed 2,668. This number was driven by two principal considerations: project resources and expected response rate. Of the 2,668 HICs surveyed, 1,415 provided completed responses, giving us a response rate of 53%. The number of responses to each question on the survey that are usable in our analysis varies from about 1,200 to about 1,350, because of respondent choice or interviewer error. These data were validated to ensure that they were representative of the full population of companies and were used to create two databases, one in which the unit of observation is the company and another in which the unit of observation is the founder. (Many companies have more than one founder, as described in more detail below.)

5.5 Analytic Methods

We use three basic methods for the analysis of the survey data, which are highlighted in the tables in this report. In some cases, we carry out cross-tabulations of two variables in order to see whether they are associated with one another in a non-random way. We use Pearson's chi-square test to assess the strength of the association. The results of this test are reported as a probability value (denoted as "P"), which describes the odds of the association being merely a matter of chance. If the probability value is .05, for instance, there is only a 1 in 20 chance that the two variables are associated with one another by chance, which is the level commonly used to define statistical significance.

The other two methods are regression methods, which seek to find associations between multiple variables. If the dependent variable takes on continuous values, such as company employment, we use linear regression. If the dependent variable is binary, such as an answer to a yes or no survey question, we use logistic regression. The purpose of these regressions is to explore whether an association between two variables found in a cross-tabulation remains strong when other variables that we also expect to have a relationship to the dependent variable are added to the analysis. These other variables are known as control variables. For instance, firm employment is likely to be related to company age, since we expect older companies to be bigger than younger companies. We therefore controlled for company age in our regression analyses that explored whether firms founded only by natives are larger than those in which at least one immigrant was a member of the founding team. Regression analysis yields a probability value that is similar to that produced by the Pearson's chi-square test for cross-tabulations described above. The smaller the P-value, the more likely it is that the association between the two variables is not a matter of chance. In the regression analyses, we weighted our sample data, so that they more closely resemble the full population of firms with respect to four variables: company age, company employment, manufacturing or service sector, and share of foreign-born population by state. Weighting allows us to be more confident that we can generalize from the analyses.

6.0 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 (Tables 1 and 2). This rate is very close to the rate found by the Kauffman Firm Survey,

despite the fact that the populations sampled were quite different. Eighty-one percent of the companies in our sample reported that all of their founders were born in the United States, 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 responses to other questions about the companies in our sample are provided in Table 2. These are analyzed in more detail in the following section.

Table 1. Foreign-Born Share of High-Tech Entrepreneurship in the United States: Comparison of Studies				
Author	**Year Released**	**Population/Source**	**Estimated Share Foreign-Born**	**Definition**
Hart et al. (this study)	2009	*Population:* High-impact companies in select SICs as identified in Acs et al. 2007 *Source:* CRB American Corporate Statistical Library	16%	Companies with at least one foreign-born founder (self-defined) as stated by survey respondent.
DesRoches et al.	2007	*Population:* Firms in select SICs founded in 2004 *Source:* Kauffman Firm Survey	16%	Companies with at least one foreign-born founder (self-defined) as stated by survey respondent.
Reynolds and Curtin	2007	*Population:* U.S. adults *Source:* Panel Study of Entrepreneurial Dynamics I and II	15%	Nascent entrepreneurs who expect to have substantial impact (50+ jobs) who reported being foreign-born.
Wadhwa et al.	2007	*Population:* Firms in select SICs with $1 MM+ sales, 20+ employees, 1995-2005 *Source:* D&B Million Dollar Database	25%	Companies with foreign-born CEO or CTO, as stated by respondent.
Monti, Smith-Doerr, and MacQuaid	2007	*Population:* Biotech firms founded in New England *Source:* 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.
Anderson and Platzer	2006	*Population:* Publicly traded, venture-backed companies that are still independent, 1990-2005 *Source:* Thomson Financial	25%	Companies with at least one foreign-born founder (self-defined), as stated by respondent or listed in public or Internet documents.
Saxenian	1999	*Population:* High-tech firms in select SICs founded in Silicon Valley, 1980-1998 *Source:* D&B custom database	24%	Companies that have CEOs with Chinese or Indian surnames.

Table 2. High-Impact, High-Tech Company Survey: Descriptive Data						
Question	**Response Options/Number of Responses and Percent of Total**					
	0-6%	6.1-10%	10.1+%	Total Respondents		
Location (Share of Foreign-Born by State)	497 (37.1%)	210 (15.7%)	634 (47.3%)	1,341		
	Manufacturing	Services	Total Respondents			
Sector	434 (32.4%)	907 (67.6%)	1,341			
	< 10	10 to < 20	20 to < 30	30+	Total Respondents	
Age (years)	400 (31.1%)	532 (41.4%)	204 (15.9%)	149 (11.6%)	1,285	
	Public	Private	Other/Don't Know/Refused	Total Respondents		
Publicly or Privately Held Company	51 (3.8%)	1,247 (93.9%)	30 (2.2%)	1,298		
	Yes	No	Don't Know or Refused	Total Respondents		
Own R&D Lab	370 (27.6%)	959 (71.6%)	11 (.8%)	1,340		
	Yes	No	Don't Know or Refused	Total Respondents		
Outside R&D Contracts	220 (16.9%)	1,047 (80.2%)	38 (2.9%)	1,305		
	Yes	No	Don't Know or Refused	Total Respondents		
Hold Patents	289 (21.6%)	983 (73.4%)	68 (5.1%)	1,340		
	Yes	No	Don't Know or Refused	Total Respondents		
Strategic Relationship with Foreign Firm	347 (25.9%)	958 (71.4%)	36 (2.7%)	1,341		
	1	2	3	4	5 or more	Total Respondents
Number of Founders	727 (54.9%)	433 (32.7%)	104 (7.8%)	35 (2.6%)	25 (1.9%)	1,324
	Family	Attended School or College Together	Worked Together Previously	Got Together to Start Business	Other or More Than 1 Reason	Don't Know or Refused
How Founders Brought Together	196 (28.1%)	52 (7.4%)	235 (33.7%)	95 (13.6%)	78 (11.2%)	42 (6.0%)
	No	Yes	Don't Know or Refused	Total Respondents		
At Least One Foreign-Born Founder	1,057 (80.7%)	205 (15.7%)	47 (3.6%)	1,309		

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Number of responses may vary by question.

6.1 Profile of Immigrant Founded Firms (IFCs)

The demographics of immigrant-founded companies (IFCs), those that have at least one foreign-born founder, 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 (Table 3) and across age categories (Table 4) were not significantly different in a chi-square test.

Table 3. High-Impact, High-Tech Companies by Founder Nativity and Economic Sector

Sector	Native-Founded	Immigrant-Founded	TOTAL
Manufacturing	343 (32.6%)	56 (27.3%)	399 (31.7%)
Service	709 (67.4%)	149 (72.7%)	858 (68.3%)
TOTAL	**1,052** **(100%)**	**205** **(100%)**	**1257** **(100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 2.21. P = 0.14.

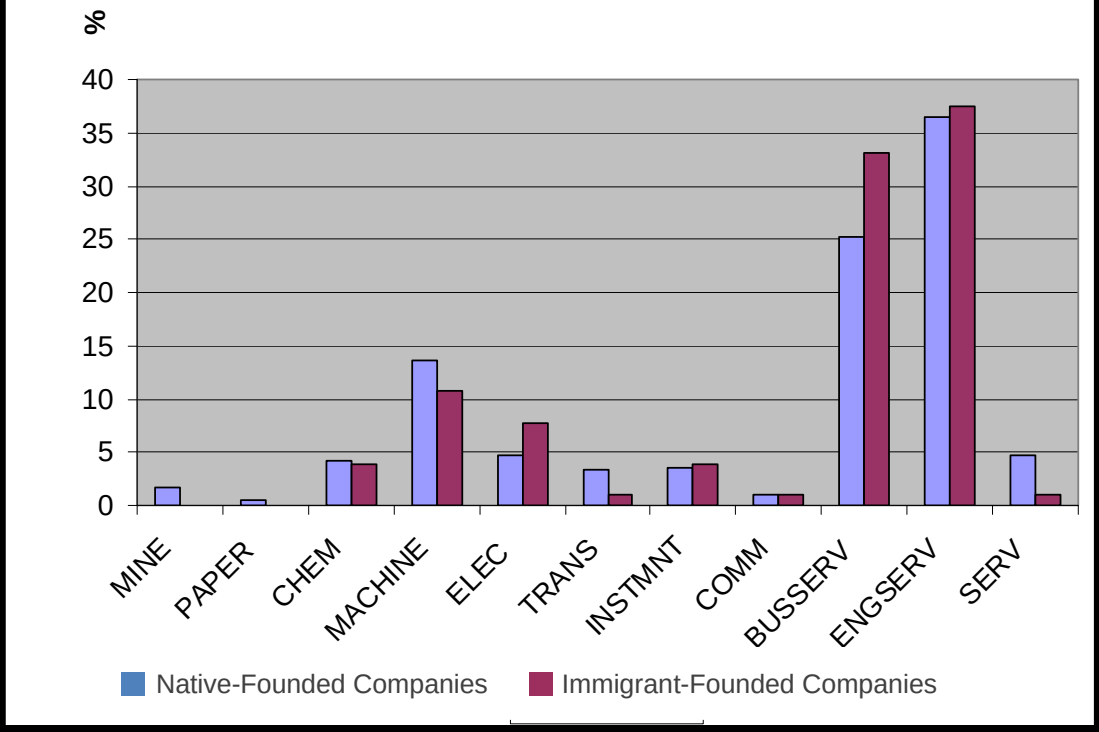
Table 4. High-Impact, High-Tech Companies by Founder Nativity and Company Age

Age	Native-Founded	Immigrant-Founded	TOTAL
Less than 10 years	305 (30.2%)	69 (34.3%)	374 (30.9%)
10 to less than 20 years	415 (41.0%)	83 (41.3%)	498 (41.1%)
20 to less than 30 years	171 (16.9%)	27 (13.4%)	198 (16.3%)
30 years and above	120 (11.9%)	22 (10.9%)	142 (11.7%)
TOTAL	**1,011** **(100%)**	**201** **(100%)**	**1,212** **(100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (3) = 2.31. P = 0.51.

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 (Figure 1).

Figure 1. High-Impact, High-Tech Companies by Founder Nativity and 2-Digit SIC

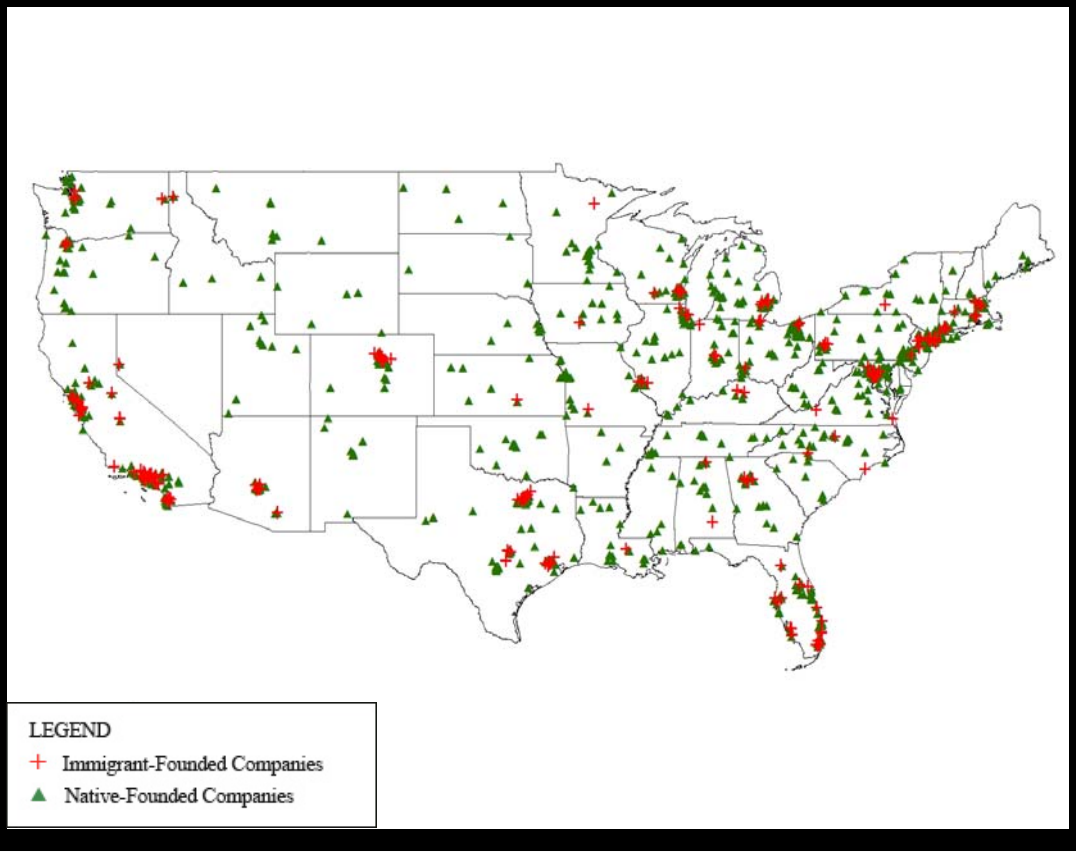


Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Note: Mine = Mining, Chem = Chemicals, Machine = Machinery, Elec = Electronics, Trans = Transportation Equipment, Instmnt = Instruments, Comm = Communications Equipment, Busserv = Business Services, Engserv = Engineering Services, Serv = Other Services.

The locations of IFCs correspond with the locations of foreign-born populations generally. They are disproportionately concentrated in states with high and very high shares of foreign-born residents, such as California and Texas (Figure 2).

Figure 2. Geographical Distribution of High-Impact, High-Tech Companies by Founder Nativity



Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

In bivariate tests of economic performance, IFCs outperform NFCs. We use company employment to measure economic performance, because it is generally regarded as more reliable in the D&B data than company revenue. Using three categories of company employment (1-4 employees, 5-20 employees, and 21 or more employees), we found that IFCs are more likely to be in the larger two categories to a statistically significant degree. In particular, about 33% of the IFCs were in the largest employment group, compared with about 24% of the NFCs (Table 5). However regression results generally suggest that

Table 5. High-Impact, High-Tech Companies by Founder Nativity and Employment (bivariate)			
Employment	**Native-Founded**	**Immigrant-Founded**	**TOTAL**
Low Employment (1-4 employees)	175 (16.6%)	35 (17.1%)	210 (16.6%)
Medium Employment (5-20 employees)	633 (59.9%)	103 (50.2%)	736 (58.3%)
High Employment (>20 employees)	249 (23.6%)	67 (32.7%)	316 (25.0%)
TOTAL	**1,057 (100%)**	**205 (100%)**	**1,262 (100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (2) = 8.48. P = 0.014.

controlling for other factors, such as company age and the founders' educational level, washes out this result. In most specifications, when these control variables are added to the analysis, the coefficient on the nativity of the founder is no longer significantly different from zero (Table 6).

Table 6. High-Impact, High-Tech Company Employment Regressed on Founder Nativity (multivariate w/controls)		
Independent variables	**Coefficient**	**P value**
Founder Nativity	2.36	.83
Company Age	24.95	.07

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Note: Linear regression, sample weighted by age, sector, employment, and location. N = 1018. R-squared = .032. Dependent variable: company employment. Control variables (not displayed): 2-digit SIC, education level of most educated founder.

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 for the sample as a whole ranged from 17% for contract R&D to 27% for in-house R&D, with patent-holding lying in between at about 22% (Table 2). IFCs outperformed NFCs in bivariate tests on two of these three measures. About 36% of the IFCs

maintained internal R&D labs, compared to 25% of the NFCs (Table 7). For patents, the difference was about the same, 29% for IFCs to 20% for NFCs (Table 8). Contract R&D was outsourced by the two groups of companies at roughly the same rate (Table 9).

Table 7. High-Impact, High-Tech Companies by Founder Nativity and Internal R&D

Internal R&D?	Native-Founded	Immigrant-Founded	TOTAL
Yes	263 (25.1%)	73 (36.1%)	336 (26.9%)
No	786 (74.9%)	129 (63.9%)	915 (73.1%)
TOTAL	**1,049** **(100%)**	**202** **(100%)**	**1,251** **(100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 10.56. P = 0.001.

Table 8. High-Impact, High-Tech Companies by Founder Nativity and Patent-Holding

Patent?	Native-Founded	Immigrant-Founded	TOTAL
Yes	207 (20.4%)	55 (28.6%)	262 (21.8%)
No	805 (79.5%)	137 (71.3%)	942 (78.2%)
TOTAL	**1,012** **(100%)**	**192** **(100%)**	**1,204** **(100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 6.36. P = 0.012.

Table 9. High-Impact, High-Tech Companies by Founder Nativity and Contract R&D

Contract R&D?	Native-Founded	Immigrant-Founded	TOTAL
Yes	167 (16.6%)	36 (18.9%)	203 (17.0%)
No	840 (83.4%)	154 (81.0%)	994 (83.0%)
TOTAL	**1,007** **(100%)**	**190** **(100%)**	**1,197** **(100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 0.63. P = 0.43.

We conducted a variety of multivariate tests to explore how closely these variables, which are indicators of technological performance, are associated with founder nativity. Because the dependent variables here are binary (that is, they can only take on two values), we use a different set of statistical tools than in the analysis of economic performance, which is described above (Table 6). For instance, we use logistic regression, rather than ordinary least-squares regression. Viewed as a whole, our tests indicate that the relationship between founder nativity and technological performance is stronger than that between founder nativity and economic performance. However, this relationship falls short of statistical significance in our favored specification, which controls for company age, company employment, industry sector, and founder's level of education (Table 10).

Table 10. High-Impact, High-Tech Company Technological Performance Regressed on Founder Nativity (multivariate w/controls)

Independent Variables	Coefficient	P-value
Founder Nativity	0.75	0.69
Company Age	-0.0043	0.51
Company Employment	0.00045	0.31

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Note: Logistic regression, weighted by age, sector, employment, and location. N = 1012. Pseudo R-Squared = .10. 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.

IFCs are also about twice as likely as NFCs to report that they had a strategic relationship with a company outside the United States, such as a major supplier, key partner or major customer (Table 11). This bivariate relationship suggests that the cross-border social capital of foreign-born founders may be employed in building IFCs.

Table 11. High-Impact, High-Tech Companies by Founder Nativity and Strategic Relationship with Company Outside United States			
Foreign partner?	**Native-Founded**	**Immigrant-Founded**	**TOTAL**
Yes	238 (23.0%)	83 (41.9%)	321 (26.0%)
No	798 (77.0%)	115 (58.1%)	913 (74.0%)
TOTAL	**1,036 (100%)**	**198 (100%)**	**1,234 (100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 31.0. P = 0.000.

Of the 205 IFCs in the sample, more than half were founded only by foreign-born entrepreneurs – 85 by a single individual, 30 by a team of two, and five by teams of three or more (Table 12). About 55% of all companies in the sample were founded by a single individual (Table 2). We asked the rest of the companies about how the founders came together to create the company. Founding teams of companies with at least one foreign-born founder were slightly more likely to have gotten together through previous school or work relationships and slightly less likely to have done so through family relationships than founding teams made up only of U.S.-born founders (Table 13).

Table 12. Immigrant-Founded High-Impact, High-Tech Companies by Number of Founders and Founder Nativity							
Total number of founders in company							
Number of Foreign-born Founders	1	2	3	4	5	6	Number of Companies
1	85	52	14	5	3	1	160
2	0	30	4	3	0	1	38
3	0	0	4	1	0	0	5
5	0	0	0	0	2	0	2
Number of Companies	85	82	22	9	5	2	205

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Table 13. High-Impact, High-Tech Companies with Two or More Founders by Founder Nativity and How Founding Team Came Together				
How founding team came together	**Native-Founded**	**Native-Founded (%)**	**Immigrant-Founded**	**Immigrant-Founded (%)**
Family	149	32.0	38	27.3
Attended school/college together	34	7.3	14	10.1
Worked together previously	166	35.6	57	41.0
Got together to start his business	65	13.9	15	10.8
Something else	40	8.6	9	6.5
More than one reason	12	2.6	6	4.3
TOTAL	**466**	**100**	**139**	**100**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

6.2 Profile of Immigrant Founders

We created a second database from our sample in which the unit of analysis is the individual founder, rather than the company. We obtained nativity data on 2,034 founders in total from our set of 1,415 companies. Of these, 261 are foreign-born, or about 12.8% (Table 14).

Table 14. Founders of High-Impact, High-Tech Companies by Nativity		
	Number	Percentage
Native-born	1,773	87.2
Foreign-born	261	12.8
TOTAL	**2,034**	**100**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

This share is very close to the current share of foreign-born in the U.S. population, which is about 12.6%, but smaller than the share of foreign-born in the science and engineering (S&E)

graduate student population and the science, technology, engineering, and mathematics (STEM) workforce (Table 15).

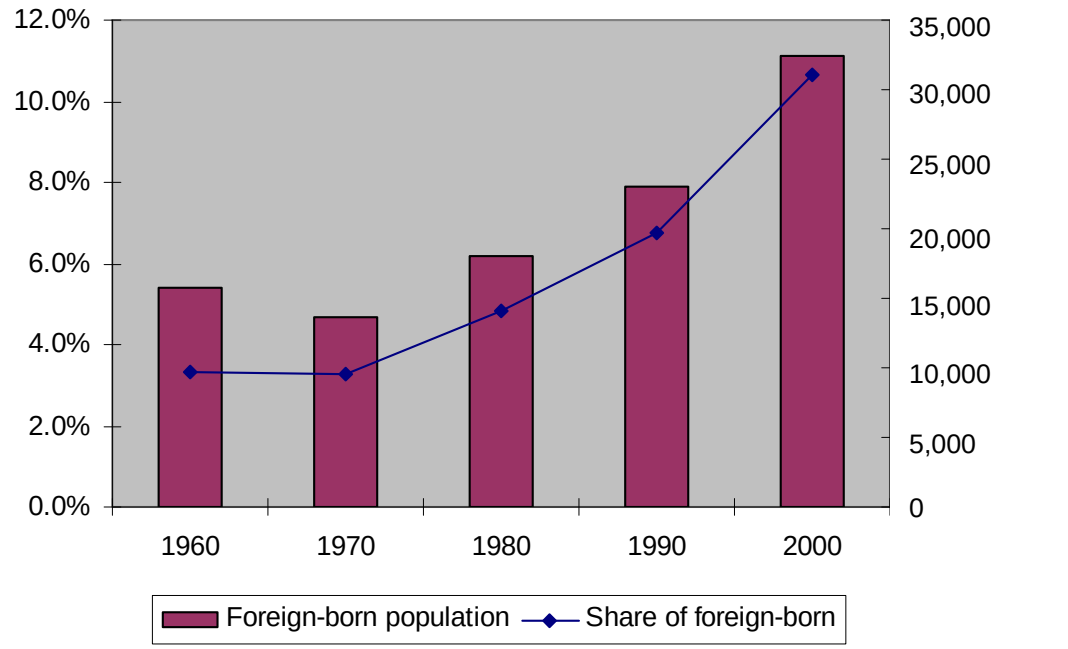
Table 15. S&E Graduate Student Enrollment and Employment in STEM Occupations			
S&E Graduate Student Enrollment			
Year	1985	1995	2005
Foreign-Born	79,940	102,885	146,696
Total	404,021	499,640	583,226
Foreign-Born Share	19.8%	20.6%	25.2%
Employment in STEM Occupations (in thousands)			
Year	1980	1990	2000
Foreign-Born	284	542	1,150
Total	3,459	5,046	6,871
Foreign-Born Share	8.2%	10.7%	16.7%

Source: NSB (2008) and Lowell and Regets (2006).

The foreign-born share of all of these populations has grown rapidly over the past several decades. The 2000 Census found that 11.1% of the U.S. population was foreign born. In 1990, that figure was 7.9%, and it was 6.2% in 1980 (Figure 3). Among S&E graduate students, the foreign-born share was about 25% in 2005, up from 20% in 1985. And in the S&E workforce, the numbers show a rise to 16.7% in 2000, up from 8.2% in 1980 (Table 15).

These earlier population estimates are the most relevant comparisons for this study, rather than the current estimate, because the vast majority of foreign-born founders were reported to have lived in the United States for decades. The average duration was more than a quarter-century, 25.9 years.

Figure 3. Foreign-Born Population of the United States (000s)



Source: United States Census Bureau, *Decennial Census* (1960-2000).

Only about 25% were reported to have been in the United States for less than 15 years (Table 16). About 77% of the foreign-born high-tech entrepreneurs in our sample are U.S. citizens (Table 17).

Table 16. Foreign-Born Founders of High-Impact, High-Tech Companies by Duration of Stay in the United States	
Percentile	**Length of Stay (years)**
25%	15
50%	25
75%	38
90%	50
95%	54
99%	60

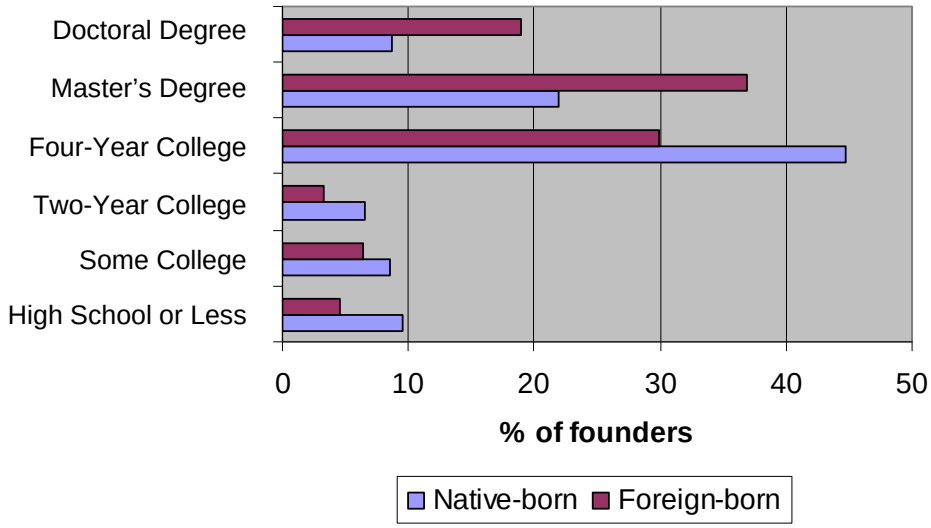
Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: N = 233. Mean = 25.9. Std. dev. = 16.3.

Table 17. Foreign-Born Founders of High-Impact, High-Tech Companies by U.S. Citizenship		
U.S. Citizenship	**Frequency**	**Percent**
Yes	186	77.2
No	55	22.8
TOTAL	**241**	**100**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

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, U.S.-born founders of high-impact, high-tech firms are about twice as likely as foreign born founders (9.5% versus 4.6%) to hold a high school degree or less (Table 18 and Figure 4).

Figure 4. Founders of High-Impact, High-Tech Companies by Nativity and Level of Education



Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Table 18. Founders of High-Impact, High-Tech Companies by Nativity and Level of Education

Level of Education	Native-born	Foreign-born	TOTAL
High School Degree or Less	154	10	**164**
%	9.5	4.6	**8.9**
Some College	139	14	**153**
%	8.6	6.4	**8.3**
Two Year College/Technical Degree	107	7	**114**
%	6.6	3.2	**6.2**
Four Year College Degree	724	65	**789**
%	44.7	29.9	**42.9**
Master's Degree	356	80	**436**
%	22.0	36.9	**23.7**
Doctoral/Professional Degree	141	41	**182**
%	8.7	18.9	**9.9**
TOTAL	**1,621**	**217**	**1,838**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Exactly two-thirds of the foreign-born founders about whom we have information received their highest level of education in the United States (Table 19).

Table 19. Foreign-Born Founders of High-Impact, High-Tech Companies by Location of Highest Degree

Highest Education in U.S.?	Frequency	Percent
Yes	148	66.7
No	74	33.3
TOTAL	**222**	**100**

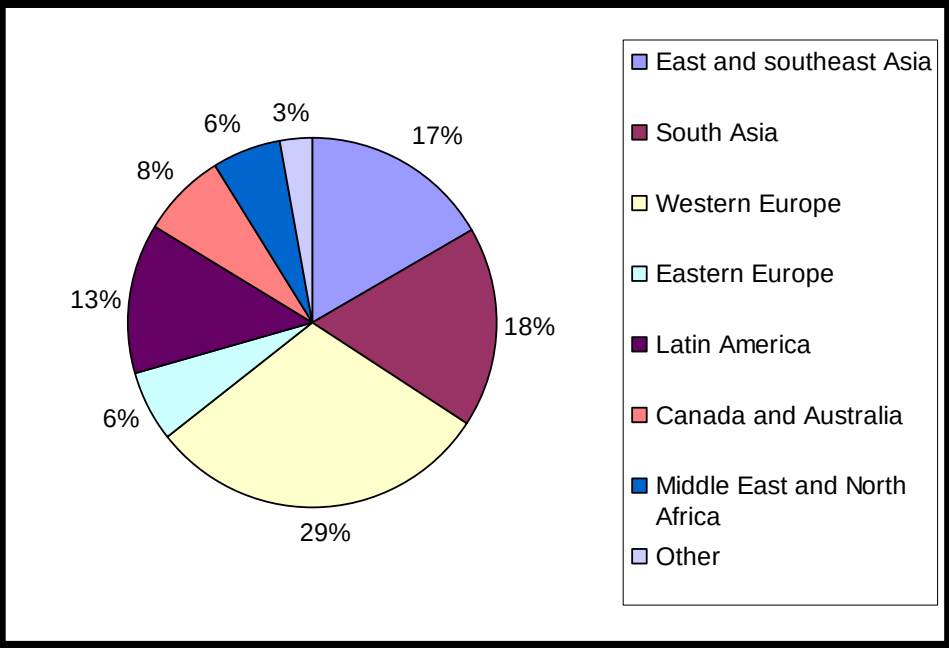
Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

The countries of origin of the foreign-born founders are diverse. Fifty-four 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 constituted 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. Table 20 lists the countries of origin, and they are broken down by region in Figure 5.

Table 20. Foreign-Born Founders of High-Impact, High-Tech Companies by Country of Origin					
Country	**Number**	**Percent**	**Country**	**Number**	**Percent**
India	40	15.9	Haiti	2	0.8
UK	25	10.0	Holland	2	0.8
Canada	15	6.0	Iraq	2	0.8
China	15	6.0	Jamaica	2	0.8
Japan	15	6.0	Philippine	2	0.8
Germany	13	5.2	Serbia	2	0.8
Cuba	8	3.2	Sweden	2	0.8
Iran	7	2.8	West Indies	2	0.8
Russia	7	2.8	Argentina	1	0.4
France	6	2.4	Burma	1	0.4
Mexico	5	2.0	Chile	1	0.4
Vietnam	5	2.0	Colombia	1	0.4
Australia	4	1.6	Croatia	1	0.4
Belgium	4	1.6	Denmark	1	0.4
Ireland	4	1.6	El Salvador	1	0.4
Korea	4	1.6	Ghana	1	0.4
Pakistan	4	1.6	Guyana	1	0.4
Ukraine	4	1.6	Israel	1	0.4
Austria	3	1.2	Nicaragua	1	0.4
Brazil	3	1.2	Nigeria	1	0.4
Italy	3	1.2	Panama	1	0.4
Lebanon	3	1.2	Peru	1	0.4
Netherlands	3	1.2	Poland	1	0.4
Romania	3	1.2	Spain	1	0.4
South Africa	3	1.2	Tanzania	1	0.4
Switzerland	3	1.2	Turkey	1	0.4
Greece	2	0.8	Uruguay	1	0.4

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Figure 5. Foreign-Born Founders of High-Impact, High-Tech Companies by Region of Origin



Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

6.3 Gender and Race of Founders

We asked respondents about the gender of all founders and the race of U.S.-born founders (using the standard categories of the U.S. Census). About 22% of all the high-tech HICs in our sample included at least one woman in their founding teams. The founding teams of IFCs were statistically significantly more likely to include at least one woman; about 30% did so, compared to about 20% of NFCs (Table 21).

Table 21. High-Impact, High-Tech Companies by Founder Nativity and Gender			
	Native-Founded	**Immigrant-Founded**	**TOTAL**
All Male Founders	824 (79.4%)	142 (69.9%)	966 (77.9%)
At Least One Female Founder	213 (20.5%)	61 (30.0%)	274 (22.1%)
TOTAL	**1,037 (100%)**	**203 (100%)**	**1,240 (100%)**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).
Note: Pearson chi-squared (1) = 8.92. P = 0.003.

About 15% of all the founders of the high-tech HICs in our sample are female. The female founders are distributed similarly by nativity to all founders, that is, females constitute about the same share of U.S.-born founders as of foreign-born founders (Table 22). Male foreign-born founders are more likely to team up with women, regardless of nativity, than male native-born founders (Table 23). Although the absolute numbers are very small, we find a similar pattern in the data on teams that include U.S. minorities. Foreign-born founders are more likely to team up with U.S. minority founders than are native-born white founders (Table 24).

Table 22. Founders of High-Impact, High-Tech Companies by Founder Nativity and Gender			
	Native-born Founder	**Foreign-born Founder**	**TOTAL**
Male	1,503	218	**1,721**
%	85.3	83.8	**85.1**
Female	259	42	**301**
%	14.7	16.1	**14.9**
TOTAL	**1,762**	**260**	**2,022**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Table 23. High-Impact, High-Tech Companies by Founder Nativity and Gender in Companies with More than One Founder			
	All Founders Male	**At Least One Female Founder**	**TOTAL**
All Male Founders Native-born	271	156	**426**
%	63.5	36.5	**100**
At Least One Male Founder Foreign-born	58	41	**100**
%	58.6	41.4	**100**
TOTAL	**329**	**197**	**526**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

Table 24. High-Impact, High-Tech Companies by Founder Nativity and Race of Native-Born Founders in Companies with More than One Founder			
	All Founders Are White or Foreign-born	**At Least One Minority Founder**	**TOTAL**
Native-founded Companies with at Least One White Founder	370	23	**393**
%	94.1	5.9	**100**
Immigrant-founded Companies with at Least One Native-born Founder	55	12	**67**
%	82.1	17.9	**100**
TOTAL	**425**	**35**	**457**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

U.S. minorities constitute about 6% of all founders. Hispanic or Latino founders are the most commonly represented group, accounting for 2% of all founders, followed by African Americans, Asian Americans, and American Indians in that order. U.S. minorities represent about 15% of the native-born founders of IFCs, compared to about 5% of the founders of NFCs (Table 25). Here, too, the small absolute number (15 U.S. minority individuals out of

102 native-born individuals who were included in the founding teams of IFCs) makes generalization hazardous.

Table 25. Native-Born Founders of High-Impact, High-Tech Companies by Race and Company Type			
	Native-Founded Company	**Immigrant-Founded Company**	**TOTAL**
American Indian or Alaska Native	14	2	**16**
%	0.9	2.0	**1.0**
Asian	15	3	**18**
%	1.0	2.9	**1.1**
Black or African American	25	1	**26**
%	1.6	1.0	**1.6**
Hispanic or Latino	24	8	**32**
%	1.6	7.8	**2.0**
Native Hawaiian or Other Pacific Islander	4	1	**5**
%	0.3	1.0	**0.3**
All U.S. Minorities	82	15	**97**
%	5.4	14.7	**6.0**
White	1,445	87	**1,532**
%	94.6	85.3	**94.0**
TOTAL	**1,527**	**102**	**1,629**
%	**100**	**100**	**100**

Source: Corporate Research Board, *High-Impact, High-Tech Company Survey Database* (2009).

The higher likelihood of foreign-born founders to team up with female and U.S. minority founders is intriguing, small sample size notwithstanding. The gender variation might be accounted for by marriage if foreign-born male founders are more likely to go into business with their native-born spouses than native-born male founders are. The minority variation might be accounted for by co-ethnicity between foreign- and native-born founders. These findings provide hypotheses for further research with larger sample sizes.

7.0 Research and Policy Agenda

Our study quantifies the role of foreign-born founders involved in high-tech entrepreneurship by examining a nationally representative sample of rapidly growing high-impact companies. In this section, we briefly identify some of the key policy issues that relate to our study's findings. We also describe a future agenda for research in this area.

7.1 Key Policy Issues

One important set of issues illuminated by this study involves the linkages among non-immigrant visa categories and between non-immigrant status and legal permanent residence. A large proportion of the immigrant founders in our sample 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. It is possible that some potential high-tech entrepreneurs who are admitted in a non-immigrant status get trapped in that status without sufficient reason. Even those individuals who have a reasonable prospect of extending their stay in the United States may lack the certainty that they will be here long

enough to be able to reap the benefits of taking the entrepreneurial "leap," because of the way the immigration system handles their cases. As a result, they never take the leap, and their potential entrepreneurial contribution to the nation may be lost.

The adjustment process by which a visa holder moves from one status to another is often slow and cumbersome, and it 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 (Lowell et al. 2007). 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 (*Migration News* 2008). 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 employment visa slots to graduating students and employers who desire them is uncertain. As we noted in section 2, the H-1B 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 H-1B "cap gap," that seems to have stimulated the extension of OPT described above (U.S.I.C.E. 2009). Yet, this fix simply expands the pool of H-1B 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 H-1B process (Economic Policy Institute 2007).

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 July 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 2000. 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.

Although immigration policy is a domain of exclusive federal competence in the United States,[12] state and local actors may play constructive roles in shaping a federal policy that supports technology-based economic development. The Greater Cleveland Partnership, for instance, has recently called for the federal government to establish high-skill immigration

[12]In Canada and Australia, provinces and states play an active role in immigration policy.

zones in distressed metropolitan areas (Greater Cleveland Partnership, 2009). Such calls are natural extensions of policies that focus on attraction of entrepreneurial talent at the regional, state, and local levels.

7.2 Areas for Further Research

This study and related work on high-tech immigrant entrepreneurship leaves open many questions. Three areas for further research strike us as particularly interesting to pursue. The first and most fundamental of these areas is whether native-born and foreign-born high-tech entrepreneurs are substitutes or complements. Do the foreign-born exploit opportunities that, in their absence, native-born entrepreneurs would have recognized and exploited, or are these opportunities generated by their presence? The evidence in other areas of immigration is ambiguous (Card 2005, Fairlie and Meyer 2003, Light and Rosenstein 1995). Even a high rate of high-tech immigrant entrepreneurship, such as that found by Saxenian (1999) in Silicon Valley, does not necessarily indicate that immigrants and natives are complements, rather than substitutes. And, of course, we cannot re-run history to explore the counterfactual in which the border is closed. However, carefully controlled comparative research designs may help us move closer to the elusive answer to this question.

The second area of interest is closely related to the first: do IFCs and NFCs follow similar strategies and operate similarly? If the two groups of companies tend to pursue different opportunities, as implied by the complementarity hypothesis, we should be able to observe differences in their business models and value chains. IFCs, for example, may export more aggressively than NFCs and tailor their products accordingly. Our finding that IFCs are more

likely than NFCs to report that they had strategic relationship with a company outside the United States is an intriguing bit of evidence, but it requires much more substantiation before broader claims can be made with respect to this issue. This agenda would also lead naturally toward an exploration of the causes of such differences, such as differences in the life experiences and social networks of the companies' founders.

The final research agenda that we highlight centers on the regional impacts of high-tech immigrant entrepreneurship. Economic growth and migration both exhibit geographical agglomeration. Industrial clusters rise and fall, and with them, the cities (such as Detroit or Hollywood) with which these clusters are associated. Immigrants, too, tend to cluster as ethnic communities grow in gateway cities like New York, Los Angeles, and Miami. The study of high-tech immigrant entrepreneurship should allow us to link these two phenomena together. This study reveals that high-tech immigrant entrepreneurs are distributed much like the immigrant population as a whole, but our sample is not large enough to explore the economic consequences at the regional level. Comparative regional studies would shed light on these fascinating issues. The apparent propensity of immigrants to team up with U.S.-born women and minorities might also be studied in this context.

8.0 Conclusion

Immigrants play an important role in founding high-impact, high-tech companies in the United States. This group of companies is very important to the nation, because it accounts for a disproportionate share of job creation and economic growth. About 16% of the

companies in our nationally representative sample count at least one immigrant among their founders.

High-impact, high-tech companies founded by immigrant entrepreneurs and those founded by native-born entrepreneurs are similar in many ways. They operate in the same industries and are about the same size. One important difference is their location. Immigrant-founded companies tend to be located in states that have large immigrant populations. Another difference is that immigrant-founded companies in our sample are about twice as likely to have a strategic relationship with a foreign firm, such as a major supplier, key partner, or major customer. Immigrant-founded companies may also have a higher level of technological performance. Of the immigrant-founded companies in our sample, for instance, 36% conducted R&D, compared to 25% of the native-founded companies, and 29% held patents, compared to 20% of the native-founded companies. However, when control variables are included in the analysis, the association between immigrant founding and these technological variables becomes statistically insignificant.

The immigrant high-tech entrepreneurs in our sample are deeply rooted in the United States. A large proportion of them have been in this country for two decades or more. More than three-quarters of them are U.S. citizens. Two-thirds of them received undergraduate or graduate degrees in this country. The 250 foreign-born entrepreneurs on whom we have data hail from 54 countries in all regions of the world. India is the largest source country, accounting for 16% of this group, followed by the U.K. at 10%.

Policymakers are rightly concerned that government sustains 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. This element 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)

As noted in the main text of this report, our definition of high-technology draws primarily on the Bureau of Labor Statistics' definition, which uses R&D *employment* as a share of total employment as the key criterion, as described by Hadlock, Hecker, and Gannon (1991). Industries in which R&D employment as a share of total employment is 50% greater than the industry average are included in the BLS definition. We dropped SIC 874, management and public relations, which met the BLS definition, but which has a far larger number of firms in it than any other industry and therefore would have skewed our results toward that industry. We also added several other SICs that have a high ratio of R&D *spending* to total revenues, which are identified in Varga (1998). Our final list of high-tech sectors is very similar to that used by the Kauffman Firm Survey (DesRoches *et al.* 2007, 27).

Manufacturing	**SIC**
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 rolling and drawing	335
Ordnance and accessories, not elsewhere classified	348
Engines and turbines	351
Construction and related machinery	353
Metalworking machinery	354
Special industry machinery	355
General industrial machinery	356
Computer and office equipment	357
Industrial machines, not elsewhere classified	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
Manufacturing (*continued*)	**SIC**
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, not elsewhere classified	899

APPENDIX 2: QUESTIONNAIRE

OMB CONTROL NUMBER: 3245-0364
EXPIRATION DATE: 08/31/2011

****

Hello, have I reached [Business Name]?

Yes	1
No **[okay, thank you]**	2

Is this a non-profit organization?
[Ask only if this name appears to be a non-profit, such as a university, school, hospital, etc.]

No	1
Yes **[okay, thank you for your time]**	2
Not asked	3
Don't know	8
Refused	9

I'm calling from George Mason University. Can you put me through to [Name]'s office?

Not available	1
Yes	2
This is him/her	3
No one here by that name, no longer works here, etc.	4
No/refuse	5

Perhaps there is someone else I can speak with. I'm calling from George Mason University. I'm working on a research project and we would like to ask a few questions of someone who knows about the founding and history of [Business Name]. We are not asking for any financial information.

No one can do this *[offer to call back at a specific time]*	1
Put through to potential respondent	2

Hi. Is this the office of [Name] or [Name] him/herself?

No	1
Yes	2

I'm calling from George Mason University. We are working on a research project supported by the Small Business Administration of the U.S. government. We are studying the role of high-growth companies in the American economy. For the study,

we would like to speak for a few minutes with someone who knows about the founding and history of [Business Name]. Are you knowledgeable about that? We are not asking for any financial information.

Yes	1
No	2

Can you suggest someone else?

Yes	1
No	2

[I'm calling from George Mason University]. I'm working on a research project supported by the Small Business Administration of the US government. For this study, we would like to speak for a few minutes with someone who knows about the founding and history of this company. Can you suggest someone? We are not asking for any financial information.

Yes—transfer	1
Yes—person on the phone	2
No *[code as soft refusal, unless respondent says not to call back]*	3

[I'm calling from George Mason University]. We are working on a research project supported by the Small Business Administration of the U.S. government. For this study, we would like to speak for a few minutes with someone who knows about the founding and history of this company. Are you knowledgeable about that? We are not asking for any financial information.

Yes	1
No	2

OK, great. Before I ask the questions, I want to let you know that they will only take about 5 to 10 minutes to answer. Participation in this study is voluntary and you can skip any questions you choose not to answer. Responses will be kept confidential and the names of businesses or individuals will not be published.

What is your job title?

In what city or county is the company's headquarters located?

In what state?

In what country?

What industry would you say your firm is part of?

[If the respondent is not sure, probe: For example, is your company involved with pharmaceuticals, aircraft, software, industrial equipment, computer equipment, engineering, or something else?]

What year was this business founded? *[Enter 4-digit year]*

[If no response] **Was it:**

Before 1980	1
1980 to 1989	2
1990 to 1999	3
2000 or later	4
Don't know	8
Refused	9

Is the company publicly traded or privately held?

Publicly traded	1
Privately held	2
Something else	3
Don't know	8
Refused	9

Does the company have a research and development division or laboratory?

Yes	1
No	2
Don't know	8
Refused	9

Does it support R&D projects elsewhere, such as at a university or contract research firm?

Yes	1
No	2
Don't know	8
Refused	9

Does the company hold any patents or have patent applications pending?

Yes	1
No	2
Don't know	8
Refused	9

Does the company have a strategic relationship with any firms outside the U.S.? That would include foreign firms that are major suppliers, key partners or major customers.

Yes	1
No	2
Don't know	8
Refused	9

Now I have some questions about the founder or founders of this company. How many individuals would you identify as founders?

[DEFINITION: a founder is the person or people who owned part of the firm when it first began to cover all salaries and wages].

We would like to get information on the 5 most important founders.

Can you please provide their first names?

What is the first person's name?

What is the 2nd person's name?

What is the 3rd person's name?

What is the 4th person's name?

What is the 5th person's name?

OK, for [Founder 1], that is a man (woman) correct?

Male	1
Female	2
Don't know	8
Refused	9

Can you tell me if he/she was born in the U.S. or somewhere else?

[DEFINITION: U.S. includes Puerto Rico, Guam, etc. and territories]

U.S.	1
Somewhere else	2
Don't know	8
Refused	9

What country was that?

About how many years has he/she lived in the U.S.?

[If deceased: About how many years was he/she in the U.S. when he/she passed away?]

Is he/she now a U.S. citizen?

Yes	1
No	2
Don't know	8
Refused	9

What is his/her highest level of education? Would you say high school or less, some college, two-year college or technical degree, four-year college degree, Master's degree or doctoral/professional degree?

High school degree or less	1
Some college	2
Two year college or technical degree	3
Four year college degree	4
Master's degree	5
Doctoral/professional degree	6
Don't know	8
Refused	9

Was the most recent education obtained in the U.S.?

Yes	1
No	2
Don't know	8
Refused	9

What best describes his/her race-ethnicity?

American Indian or Alaska Native	1
Asian	2
Black or African American	3
Hispanic or Latino	4
Native Hawaiian or other Pacific Islander	5
White	6
Don't know	8
Refused	9

Is he/she currently an owner of the company?

Yes	1
No	2
Don't know	8
Refused	9

Was he/she an owner of the company before it became public?

Yes	1
No	2
Don't know	8
Refused	9

OK, for [Founder 2], that is a man (woman) correct?

Male	1
Female	2
Don't know	8
Refused	9

Can you tell me if he/she was born in the U.S. or somewhere else?

[DEFINITION: U.S. includes Puerto Rico, Guam, etc. and territories]

U.S.	1
Somewhere else	2
Don't know	8
Refused	9

What country was that?

About how many years has he/she lived in the U.S.?

[If deceased: About how many years was he/she in the U.S. when he/she passed away?]

Is he/she now a U.S. citizen?

Yes	1
No	2
Don't know	8
Refused	9

What is his/her highest level of education? Would you say high school or less, some college, two-year college or technical degree, four-year college degree, Master's degree or doctoral/professional degree?

High school degree or less	1
Some college	2
Two year college or technical degree	3
Four year college degree	4
Master's degree	5
Doctoral/professional degree	6
Don't know	8
Refused	9

Was the most recent education obtained in the U.S.?

Yes	1
No	2
Don't know	8
Refused	9

What best describes his/her race-ethnicity?

American Indian or Alaska Native	1
Asian	2
Black or African American	3
Hispanic or Latino	4
Native Hawaiian or other Pacific Islander	5
White	6
Don't know	8
Refused	9

Is he/she currently an owner of the company?

Yes	1
No	2
Don't know	8
Refused	9

Was he/she an owner of the company before it became public?

Yes	1
No	2
Don't know	8
Refused	9

OK, for [Founder 3], that is a man (woman) correct?

Male	1
Female	2
Don't know	8
Refused	9

Can you tell me if he/she was born in the U.S. or somewhere else?

[DEFINITION: U.S. includes Puerto Rico, Guam, etc. and territories]

U.S.	1
Somewhere else	2
Don't know	8
Refused	9

What country was that?

About how many years has he/she lived in the U.S.?

[If deceased: About how many years was he/she in the U.S. when he/she passed away?]

Is he/she now a U.S. citizen?

Yes	1
No	2
Don't know	8
Refused	9

What is his/her highest level of education? Would you say high school or less, some college, two-year college or technical degree, four-year college degree, Master's degree or doctoral/professional degree?

High school degree or less	1
Some college	2
Two year college or technical degree	3
Four year college degree	4
Master's degree	5
Doctoral/professional degree	6
Don't know	8
Refused	9

Was the most recent education obtained in the U.S.?

Yes	1
No	2
Don't know	8

Refused	9

What best describes his/her race-ethnicity?

American Indian or Alaska Native	1
Asian	2
Black or African American	3
Hispanic or Latino	4
Native Hawaiian or other Pacific Islander	5
White	6
Don't know	8
Refused	9

Is he/she currently an owner of the company?

Yes	1
No	2
Don't know	8
Refused	9

Was he/she an owner of the company before it became public?

Yes	1
No	2
Don't know	8
Refused	9

OK, for [Founder 4], that is a man (woman) correct?

Male	1
Female	2
Don't know	8
Refused	9

Can you tell me if he/she was born in the U.S. or somewhere else?

[DEFINITION: U.S. includes Puerto Rico, Guam, etc. and territories]

U.S.	1
Somewhere else	2
Don't know	8
Refused	9

What country was that?

About how many years has he/she lived in the U.S.?

[If deceased: About how many years was he/she in the U.S. when he/she passed away?]

Is he/she now a U.S. citizen?

Yes	1
No	2
Don't know	8
Refused	9

What is his/her highest level of education? Would you say high school or less, some college, two-year college or technical degree, four-year college degree, Master's degree or doctoral/professional degree?

High school degree or less	1
Some college	2
Two year college or technical degree	3
Four year college degree	4
Master's degree	5
Doctoral/professional degree	6
Don't know	8
Refused	9

Was the most recent education obtained in the U.S.?

Yes	1
No	2
Don't know	8
Refused	9

What best describes his/her race-ethnicity?

American Indian or Alaska Native	1
Asian	2
Black or African American	3
Hispanic or Latino	4
Native Hawaiian or other Pacific Islander	5
White	6
Don't know	8
Refused	9

Is he/she currently an owner of the company?

Yes	1
No	2
Don't know	8
Refused	9

Was he/she an owner of the company before it became public?

Yes	1
No	2
Don't know	8
Refused	9

OK, for [Founder 5], that is a man (woman) correct?

Male	1
Female	2
Don't know	8
Refused	9

Can you tell me if he/she was born in the U.S. or somewhere else?

[DEFINITION: U.S. includes Puerto Rico, Guam, etc. and territories]

U.S.	1
Somewhere else	2
Don't know	8
Refused	9

What country was that?

About how many years has he/she lived in the U.S.?

[If deceased: About how many years was he/she in the U.S. when he/she passed away?]

Is he/she now a U.S. citizen?

Yes	1
No	2
Don't know	8
Refused	9

What is his/her highest level of education? Would you say high school or less, some college, two-year college or technical degree, four-year college degree, Master's degree or doctoral/professional degree?

High school degree or less	1
Some college	2
Two year college or technical degree	3
Four year college degree	4
Master's degree	5
Doctoral/professional degree	6

Don't know	8
Refused	9

Was the most recent education obtained in the U.S.?

Yes	1
No	2
Don't know	8
Refused	9

What best describes his/her race-ethnicity?

American Indian or Alaska Native	1
Asian	2
Black or African American	3
Hispanic or Latino	4
Native Hawaiian or other Pacific Islander	5
White	6
Don't know	8
Refused	9

Is he/she currently an owner of the company?

Yes	1
No	2
Don't know	8
Refused	9

Was he/she an owner of the company before it became public?

Yes	1
No	2
Don't know	8
Refused	9

What one or more of the following things would you say brought the founders together to start this business?

Family	1
Attended school/college together	2
Worked together previously	3
Got together to start this business	4
Something else	5
More than one reason	6
Don't know	8
Refused	9

[Other reason] What was it?

Thank you very much for helping out with this study. If you have any questions you can contact _____ by email at _____.