HIGH-SKILL MIGRATION AS A POSITIVE-SUM RELATIONSHIP FOR TRADABLE SERVICES: THE CASE OF INDIA AND THE UNITED STATES

By

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Dedication

This is dedicated to my loving wife, Sandy, and our sons, Brad and Evan. I also dedicate this to my parents, Jim and MaryLou Davis.

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I would like to thank the many Indian information technology professionals, medical doctors, and academics across the U.S. who gave me their time and input. This work would not have been possible without their willingness to share their personal stories.

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With sincere appreciation.

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Abstract

HIGH-SKILL MIGRATION AS A POSITIVE-SUM RELATIONSHIP FOR TRADABLE SERVICES: THE CASE OF INDIA AND THE UNITED STATES

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The concept of brain drain contends that the migration of highly-skilled individuals benefits receiving countries at the expense of sending countries. Though research supports this concept, several cases have been documented whereby a positive-sum relationship evolved for services that can be characterized as tradable. The research presented herein seeks to understand the extent of the relationship between the nature of a service (those classified as tradable or nontradable) and the positive-sum growth in human capital through a case study of high-skill migration scenarios. The study focuses on the migration relationship between India and the United States—one of the world's largest high-skill flows. Further, the study is conducted at the sectoral level, including the information technology, medical services, and post-secondary education (academic) sectors. To gain a rich understanding of the migration relationships, the field research is

based on 50 personal interviews and 512 survey responses of high-skilled immigrants and subject matter experts across the United States in the three sectors.

The findings support the hypothesis that occupations in sectors, classified as tradable or nontradable, affect the net brain gain through migration. That is, while controlling for factors relating to transnational communities, working in information technology (a tradable service) versus working as medical doctors and academics (nontradable services) has significant relationships with key migration outcomes pertaining to circular migration. The analysis finds that being an Indian immigrant working in information technology increases the odds by 140 percent that they intend to return to India; whereas being an Indian medical doctor reduces those odds by 59 percent relative to information technology immigrants and being an Indian academic reduces those odds by 53 percent. In addition, the research finds that the factors influencing transnational communities are also significant. These include participation in host communities, access to home-country resources, and institutional factors that may either inhibit or support immigrant circulation, such as bureaucracy and family ties.

Chapter 1: Introduction

Human capital, in the form of talent and ideas, is an essential component upon which innovation thrives and contributes to economic growth. The development of human capital and its movement through migration has been the focus of research and policies on innovation and national competitiveness. Indeed, concerns over declines in the quantity and quality of high-skilled individuals, the coming retirement of baby boomers, rapid growth in developing countries like China and India, and competitive policies in countries like Canada and Australia, have led to alarm that the U.S. is losing its dominant position as an innovator. This alarm resulted in policy proposals to increase funding for research and development, reform STEM (science, technology, engineering, and mathematics) education, and adopt immigration policies that favor high-skilled immigrants and students. On the other hand, concerns over lost jobs due to offshoring, depressed wages and increased social costs resulting from immigrants, abuse of immigration regulations by foreign and domestic firms, and illegal immigration, have led to counter proposals for increased protection of jobs and wages, limits on immigration, and greater emphasis on immigration enforcement policies. Further, there is also an international viewpoint that portrays the flow of talent and ideas as a form of brain drain from less developed countries. To wit there is much emphasis in developing countries to foster return migrations and to capitalize on remittances. Migration flows of human

capital in the form of high-skilled migrants, and their effects on sending and receiving countries, is a complex phenomenon in need of further research to better inform policy decisions.

From Brain Drain to Transnational Communities

With the use of the term 'brain drain' in the 1960s by the British in reference to British scientists emigrating to the U.S., a new focus was brought to bear on the migration of high-skilled individuals rather than the broader migration of largely unskilled populations (Maddox, 1964). At that time, migration was viewed more in social and political terms than economic. That is, a loss of the cultural and intellectual elite amounted to a societal loss brought on by a failure of political institutions to provide for the retention of the elite. Maddox was uncertain whether such emigration would be good or bad in the long run, but believed nobody would profit if British universities lost their vitality.

In the 1980s and 1990s as concerns grew over the disparities between the developed and developing countries, the brain drain was viewed more in economic terms with respect to human capital and growth (Blomqvist, 1986). The chief concern among researchers and policy makers was that poor countries would only become poorer while the rich countries would become richer. Stark, Helmenstein, & Prskawetz (1998) provided a contrary perspective on brain drain that considered the economic benefits to home countries, not through remittance, but through induced human capital formation—giving rise to the notion of brain gain. They argued that individuals in home countries that recognize economic opportunities elsewhere and the value of education are

incentivized to invest in their education, whether or not they emigrate. They also theorized that a home country's migration policy could be formulated in such a way as to be open to the prospect of emigration while facilitating the formation of human capital at home.

Not everyone sees the prospects of emigration as a net benefit to home countries through brain gain. Schiff (2005) argued that the benefits of brain gain are exaggerated. In a static and dynamic equilibrium analysis of prior research, Schiff found that the benefits of brain gain exceeded the costs of brain drain only at low levels of emigration; that in the long run the brain gain was equal to the brain drain in the steady state; and that the brain gain was likely to be negative during the transition period.

Moving on from a brain drain versus a brain gain perspective, Cao (1996) introduced the concept of brain circulation. With changing patterns in the global economy, Cao noted that highly-skilled individuals were staying in host countries for shorter periods as they recognized other international job opportunities. Using data on foreign-born scientists and engineers living in the U.S., Johnson & Regets (1998) found support for the concept of brain circulation in the cases of Taiwan and South Korea, and for brain drain in the cases of China and India. At that time, Johnson and Regets found that about half of foreign doctorate recipients left the U.S. immediately after graduation. Further, those scientists and engineers who remained in the U.S. networked with colleagues in their home countries.

Saxenian (2002a) studied transnational communities in Taiwan, India, and China. Saxenian showed that as U.S. firms established production capabilities in other countries,

such as Taiwan, these countries sent their best students to study in U.S. universities. Due to the lack of opportunities in their home country, many of these students stayed to work in the U.S. and eventually moved up in the ranks of management. According to Saxenian, the home countries of the U.S. foreign nationals played an active part in establishing resources, like Hsinchu Park, to attract their countrymen. Saxenian reported a significant upsurge of Taiwanese foreign nationals returning to Taiwan beginning in the late 1980s and continuing through the 1990s. By 1989, 2,840 Taiwanese foreign nationals returned to Taiwan and by 1999, U.S. educated Taiwanese started 110 companies in the Hsinchu Science Park. The end result of these changes was a transnational community that linked technical communities and firms across national borders.

Transnational Communities and Tradable Services

Movement of highly-skilled individuals through migration, temporary or permanent, affects their accessibility and the distribution of benefits and costs. Since the concept of brain drain was first used, a chief concern has been the gain of talent, and their contributions, by receiving countries at the expense of the sending countries. The mutually beneficial relationship between sending and receiving countries can be characterized as a positive-sum relationship whereby one's gain does not come at the expense of the other (Wright, 2000). Contrary to the concept of brain drain, high-skill migration may not be strictly a zero-sum prospect. There are documented cases in Taiwan, China, India, and Ireland whereby a positive-sum scenario evolved between both

sending and receiving countries. This concept, known as brain circulation, argues that both countries benefit from the movement of individuals and ideas through social and business networks.

The ability of sending countries to replicate the successful cases has been mixed. Of interest is the observation that the success cases for high-skill migration took place in the technology sector. Whereas, the cases in other sectors, such as medical services, align more with the brain drain argument (OECD, 2007). To what extent the nature of the sector may be a factor in leading to a mutually beneficial relationship between sending and receiving countries is unknown. It suggests the specific skills and sectors involved in migration may be a factor. Services provided in the technology sector may be viewed as tradable (or impersonal), where face-to-face contact in the delivery of that service is not imperative (Blinder, 2006). This warrants understanding whether these services are more conducive to brain circulation and the formation of transnational communities.

The research presented herein seeks to understand the extent of the relationship between the nature of a service, those classified as tradable and nontradable, and the positive-sum growth in human capital through a case study of high-skill migration scenarios. The hypothesis is that occupations in sectors, classified as tradable or nontradable, affect the positive-sum accumulation of human capital through migration. That is, work in sectors classified as tradable enables positive-sum accumulation, while work in sectors classified as nontradable inhibits this accumulation.

The research uses the case study methodology to compare and contrast potential factors across a range of high-skill immigration scenarios involving work in sectors classified as tradable and nontradable services. The subject of the case is on the migration relationships between a single pair of sending and receiving countries—specifically the United States (U.S.) and India. This approach allows for the control of country effects—such as political, social, and economic stability. The analysis is conducted at the sectoral level to allow for variation in the tradability of services and migration outcomes—specifically the information technology (tradable), medical services (nontradable), and post-secondary education services (nontradable) sectors. The migration relationship between the U.S. and India is a useful subject of study. India is a developing country that has exhibited high levels of migration across a wide range of services. Further, there is documented evidence of significant growth in the information technology sector despite high levels of migration.

The field research takes into account mixed qualitative, quantitative, and narrative data gathered through a variety of techniques (interviews, surveys, and document analysis). Initial interviews were conducted with subject matter experts, such as heads of immigrant organizations, to establish an expert view on immigrant behavior. Interviews within each sector of study helped to establish terms appropriate to that sector, aided in refining key questions, and identified additional individuals and groups for data gathering via surveys. Follow-on interviews were then conducted to gain a deeper understanding of the individual and group rationale and motivation for actions pertaining to the hypothesis and variables of interest. To gain a rich understanding of the migration relationships, the

field research was based on 50 personal interviews and 512 survey responses of highly-skilled immigrants and subject matter experts across the U.S. in the information technology, medical services, and post-secondary education services sectors.

The findings of this research have the potential to be significant. Developing countries are increasingly concerned with the loss of their high-skilled talent, particularly in the medical and education sectors where they experience significant shortages in qualified personnel. Both of these sectors can directly affect the long-term health and growth of a developing country. As noted in Hart (2006), countries tend to pursue high-skill migration policies independently in line with their sovereign interests. Thus developed countries create policies that give preferential treatment to high-skilled immigrants while the developing countries give preferential treatment to returning migrants. Though these policies are at cross-purposes, they may have been effective in the technology sector due to the nature of the service or other infrastructure and institutional factors. On the other hand, these factors may inhibit success in other sectors, such as the medical and post-secondary education, thus rendering the current policies ineffective. This may call for a different policy strategy, such as multilateral or bilateral cooperation, to overcome cross-purposes in favor of mutual objectives (Davis & Hart, 2010).

Dissertation Organization

This dissertation is organized by the sectoral analysis of the case study. It poses the research question and reviews the relevant literature; introduces the case study; and

provides a sector-by-sector analysis of the data. After examining each sector individually, it provides a comparative analysis to evaluate the research question and presents an analysis of the validity of any findings. It concludes with a discussion of the policy implications of the findings and suggests opportunities for further research. The specific chapters are listed below:

Chapter 2: High-Skill Migration

Chapter 2 provides a detailed review of the relevant literature on high-skill migration as it pertains to the research question. The review discerns the dependent and independent variables from the literature for the research question. Further, it suggests the behavior of these variables based on the literature.

Chapter 3: Methodology

Chapter 3 details the research design based on the case study methodology. It explains the choice of the India and U.S. migration relationship as the basis for the study. Likewise, it explains the choice of the information technology, medical services, and post-secondary education sectors as the units of analysis. Further, it provides an overview on India and U.S. relations as well as aggregate data on high-skill migration.

Chapter 4: Information Technology Sector Data

Chapter 4 presents the data gathered on the information technology sector with regard to the high-skill migration relationship between India and the U.S. It specifically addresses

the factors identified above as related by the various parties. It also includes an initial analysis of that data specific to the sector.

Chapter 5: Medical Services Sector Data

Chapter 5 presents the data gathered on the medical services sector with regard to the high-skill migration relationship between India and the U.S. It specifically addresses the factors identified above as related by the various parties. It also includes an initial analysis of that data specific to the sector.

Chapter 6: Post-Secondary Education Sector Data

Chapter 6 presents the data gathered on the post-secondary education sector with regard to the high-skill migration relationship between India and the U.S. It specifically address the factors identified above as related by the various parties. It also includes an initial analysis of that data specific to the sector.

Chapter 7: Comparative Analysis and Validation

Chapter 7 presents a comparative analysis of the three sectors and seeks to identify and explain similarities and differences between the various factors and their influence on high-skill migration. This chapter also addresses internal and external validity through a combination of regression analysis, counterfactual analysis, and analytic generalization.

Chapter 8: Conclusion

Chapter 8 presents the findings of the research as well as any limitations of those findings. It also includes a discussion on the policy implications of the findings and identifies directions for further research.

Chapter 2: High-Skill Migration

Firms and countries have long recognized the value of, and competed for, highly-skilled individuals as a key resource for production, innovation, competitiveness, and economic growth. Movement of these individuals through migration, temporary or permanent, affects their accessibility and the distribution of benefits and costs. With the use of the term 'brain drain' in the 1960s by the British in reference to British scientists emigrating to the U.S., a new focus was brought to bear on the migration of highly-skilled individuals rather than the broader migration of largely unskilled populations (Maddox, 1964). This encompassed Western Europe as well and at that time was viewed more in social and political terms than economic. That is, a loss of the cultural and intellectual elite amounted to a societal loss brought on by a failure of political institutions to provide for the retention of the elite. Maddox cited complaints by British scientists in wasting too much effort fighting bureaucracy, negotiating with public committees, lacking suitable facilities and equipment, and a general sense of neglect. Maddox was uncertain whether such emigration would be good or bad in the long run, but believed nobody would profit if British universities lost their vitality. Grubel (1966) placed the burden on the home countries, for only they can address their intellectual life and institutions.

In the 1980s and 1990s as concerns grew over the disparities between the developed and developing countries, the brain drain was viewed more in economic terms

with respect to human capital and growth (Blomqvist, 1986). The chief concern among researchers and policy makers was that poor countries would only become poorer while the rich countries would become richer. In an early proposal to address the imbalance between sending and receiving countries, Bhagwati (1979) reviewed the controversial brain drain tax that he originally introduced in 1976. This would have been a supplementary income tax on emigrants in their host country paid to their home country. He cites a key rationale as "representation without taxation." That is, emigrants retain their nationalities, and often their right to vote in their home countries, but bear no financial obligation. The complexities and costs of collecting such an immigration tax and distributing its revenue were not addressed. Further, the flow of funds via remittances was not recognized.

In 2010, over 27 million high-skilled immigrants resided in the Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2012). This chapter reviews the literature on high-skill migration beginning with the fundamental view of migration as flows in human capital. It then examines the actors and forces that shape these flows; and then the evolution of thought on the dynamics of these flows. It then closes with a focus on the research presented herein and the research hypothesis.

Migration of Human Capital

The concerns expressed above couch high-skill migration in terms of human capital, whereby migration results in the potential transfer and development of such capital between sending and receiving countries. The OECD defines human capital as "the

knowledge, skills, competencies and attributes that allow people to contribute to their personal and social well-being, as well as that of their countries (Keeley, 2007)." Further, the OECD gives high priority to raising human capital in order to attain prosperity in under-developed and developing countries. Thus migration portends more than just the movement of individuals, but also their knowledge, skills, and potential, as well as their contribution to economic development.

Romer (1986) developed a theory of endogenous growth whereby knowledge is an input with increasing marginal productivity leading to increasing returns. In Romer's model, knowledge may be embodied in physical or human capital and thus be transportable. Building on the early work of Solow, Lucas (1988) developed a model of economic growth that explicitly accounted for human capital and its externalities. Lucas' model allows human capital to accumulate and enhance the productivity of labor and physical capital. Arguing theoretically, Lucas found that when labor is mobile, and the benefits of human capital spillover from one person to another, then wage rates increase with the wealth of the country. The implication being that labor would tend to flow from poor countries to rich countries. Using these endogenous growth models as a guide, and data from 98 countries between 1960 and 1985, Barro (1991) found that growth rates are substantially related to the starting amount of human capital and negatively related to the initial GDP per capita.

Easterly (2001) criticizes the emphasis placed on human capital with respect to achieving economic growth and development. Based on a review of the literature, Easterly contends that an investment in education, beyond initial schooling, has no

relationship to GDP growth—consistent with Barro's finding cited above. However, studies based on more recent data and analytic methods, which take into account age and experience, find a significant relationship in the change of human capital to economic growth (Cohen & Soto, 2007). Easterly also asserts that without the opportunities and incentives to apply the skills obtained in higher education, those skills will either go to waste or lead the individual to emigrate. Easterly states that high skills are productive if they are matched with the investments in technology and capital with incentives for growth. Easterly's contentions may have some merit, in that, without opportunities a high-skill education could be lost to a home country.

As noted above, Lucas considered the spillover effects of human capital and their possible role in economic growth. It has long been hypothesized that with increased education of individuals, benefits accrue to society in terms of reduced crime, better health and happiness, reduced infant mortality, etc. As indicated in Psacharapoulos (2006), there is greater evidence and support for the private returns of education, but the social returns are still subject to much debate. McMahon (2001) directly explored the external effects of human capital (non-market social outcomes) in a study of 22 OECD countries. McMahon's approach expands on Lucas' model to include impacts on non-market social outcomes, such as health, infant mortality, human rights, poverty, pollution, and crime. McMahon finds that externalities account for 57 percent of the total market and non-market education outcomes.

Human capital provides a theoretical and empirical foundation for understanding high-skill migration. It provides the link from skills to jobs and wages at a

microeconomic level, and then in turn to economic growth and human welfare at the macroeconomic level. It provides the methods for understanding and estimating returns on investments in human capital. Furthermore, it has the potential to explore the role and impact of high-skill migration on sending and receiving countries. On the other hand, human capital has built-in flaws as a basis for understanding migration. Fundamentally, human capital is based on a model of rational choice, both by firms and individuals, based on the knowledge of forgone earnings for future returns on current investments. In practice, individuals and firms are faced with many variables on opportunities, constraints, and risks.

Interpreting Migration as Human Capital

Developments in the theory and empirical studies of human capital provide an opportunity to analyze migration, its effects on growth and development, through extension of these works. One such effort is the model developed by Docquier & Schiff (2008) that analyzes brain drain based on emigration stocks by educational attainment, and analyzes emigration rates as the emigrations stocks as a percentage of the total labor force of the sending country. Docquier and Schiff note that the use of emigration stocks using census data from receiving countries is much more reliable than methods that compute brain drain using flow data; this is due to the poor and inconsistent data collected by sending countries on emigrants and return migrants.

Docquier and Schiff's model lets $M_{t,s}^{i,j}$ represent the stock of working-aged individuals born in country j, of skill s, living in country i at time t. Skill levels are

categorized as s=h for high-skilled, s=m for medium-skilled, s=l for low skilled, and s=u for unknown. Docquier and Schiff then determine the total stock of emigrants of skill s from country j at time t ($M_{t,s}^{\bullet,j}$) as shown in Equation 1 where Ψ_j^i is a binary variable equal to one when the data on immigrant's skill is unknown.

$$(1) \quad \begin{cases} M_{t,h}^{\bullet j} = \sum_i M_{t,h}^{i,j} + \sum_i M_{t,u}^{i,j} . \Psi_t^i . \dfrac{\sum_i M_{t,h}^{i,j}}{\sum_i \sum_s M_{t,s}^{i,j}} \\ M_{t,m}^{\bullet j} = \sum_i M_{t,m}^{i,j} + \sum_i M_{t,u}^{i,j} . \Psi_t^i . \dfrac{\sum_i M_{t,m}^{i,j}}{\sum_i \sum_s M_{t,s}^{i,j}} \\ M_{t,l}^{\bullet j} = \sum_i M_{t,l}^{i,j} + \sum_i M_{t,u}^{i,j} . \Psi_t^i . \dfrac{\sum_i M_{t,m}^{i,j}}{\sum_i \sum_s M_{t,s}^{i,j}} + \sum_i M_{t,u}^{i,j} . (1 - \Psi_t^i) \end{cases}$$

Docquier and Schiff then determine the emigration rate, $m_{t,s}^j$, as a proportion of the total labor stock as shown in Equation 2 where $N_{t,s}^j$ represents the stock of individuals living in country j at time t of skill s.

$$(2) \qquad m_{t,s}^j = \frac{M_{t,s}^j}{N_{t,s}^j + M_{t,s}^j}$$

Docquier and Schiff then equate the brain drain to the emigration rate of high-skilled individuals (m_h), which can be compared across countries or for the same country across

time. Using this model, Docquier, Lowell, & Marfouk (2007) provide estimates of the brain drain in the year 2000 where the OECD are the destination countries. Based on stocks of high-skilled immigrants, the Philippines, India, Mexico, and China were the largest suppliers among developing countries (1.1 million to 0.78 million). Based on emigration rates, islands in the Caribbean and many African countries have the highest rates of skilled emigration (e.g., 83.4 percent in Haiti, 49.2 percent in Sierra Leone). The worldwide emigration rate for high-skilled individuals to the OECD was 5.4 percent.

Shaping Global High-Skill Migration Flows

There are a number of key parties that potentially influence migration behaviors. These parties include the migrants and their families, employers of high-skilled migrants, academic institutions, domestic employees, and the sending and receiving countries. Together, these parties can be viewed as an informal collectivity, or network, of individuals and groups pursuing disparate interests whose formal and informal rules affect the migration process and behavior of individual migrants. The interactions among these parties as they pursue their interests help shape the rules of the game on immigration, its flows, and provide the context for study as they affect migrant outcomes.

An overview of immigration in the U.S. can put the role of firms and academic institutions in context. In the U.S., family-based immigration largely outnumbers employment-based immigration. In their review of international mobility in the U.S., Lowell & Martin (2008) report that 66 percent of immigrants in 2006 were family based and 12.5 percent were admitted for employment. However, the U.S. has the largest

number of foreign workers and 90 percent of those admitted for employment had adjusted from a temporary visa. Further, in fiscal year 2008, the U.S. admitted 859,169 foreign student non-immigrants (Monger & Barr, 2010). These students have the opportunity for a one-year work practicum after completing their education—during which time they may adjust to a temporary work visa. Lowell and Martin report that three-quarters of foreign doctoral students extend their stays to work in the U.S. Chalof & Lemaitre (2009) characterize the U.S. system for high-skill migration as demand-driven whereby an employer determines who to request for immigration. In contrast, Canada and Australia use supply-driven approaches based on point systems whereby potential immigrants apply for entry. Given that employment-based admission requires employer sponsorship and student-based admission requires academic sponsorship, particularly in the U.S., businesses and academic institutions have a role in shaping high-skill migration flows.

In their study of the aerospace industry, Millar & Salt (2008) reported that, in addition to local talent, the large international corporations had a wide range of mobility options to obtain the talent needed. These included international recruitment, long-term assignments of expatriates, short-term assignments, commuting, rotation, extended business travel, business travel, and virtual mobility. Further, Millar and Salt found that cost was not a driving factor when determining the type of mobility; rather, it was the business need.

Industry has made repeated claims that there is a shortage of high-skilled talent that necessitates the use of foreign workers (Committee on Science, Engineering, and

Public Policy, 2006; Gates, 2008). This is counter to the views that claim foreign workers displace domestic workers and depress wages (Hira, 2007). In their review of this issue, Lowell & Salzman (2007) report there is little evidence supporting a shortage of high-skilled talent. Based on the Science and Engineering Indicators, 2006, Lowell and Salzman show that the supply of science and engineering graduates has remained stable and is increasing in absolute numbers. Based on an econometric analysis, Liu & Trefler (2008) find the effects of foreign workers on domestic workers to be very small with a net positive effect. For example, they indicate that an individual exposed to inshoring and offshore outsourcing would be unemployed 0.1 percent less and earn 1.5 percent more over a nine-year period than those not exposed. Lowell and Salzman suggest that firm use of foreign workers may have more to do with hiring difficulties—seeking specific skills—than any shortage. Likewise, the assessment of Salt (2008) of the talent shortage is more a shortage of the right people with the right experience at the right location.

Lynn & Salzman (2005) point to another factor that may contribute to the pattern of firm use of foreign workers, which is the unlocking of organizational forms. They note that with trade liberalization and advancing technology, work can be dispersed globally. Further, the pull of emerging markets helps to bring about highly skilled resources to those markets. Jones & Kierzkowski (1990) characterized the process of fragmentation whereby firms broke up the value chain— a process view of a business in terms of a series, or chain, of activities consisting of inputs, operations, and outputs. Jones and Kierzkowski attributed this phenomenon to the increased specialization that

comes with increasing returns to scale and increased growth and output by firms. They also factor in the decreased relative cost, particularly for transportation and communication services, allowing the use of disparate locations in the production process.

Research by Gereffi (1994) and Gereffi (2005) supports the fragmentation process proposed by Jones and Kierzkowski. Through his global value chain analysis of multiple industries such as garments, electronics, and agriculture, Gereffi documented the process of industrial upgrading (moving up the value chain) whereby nations and firms move from low-value to high-value activities in global production networks. However, with increased fragmentation of global value chains Gereffi expressed the need for increased coordination and reintegration of the value chain. In addition, as firms in foreign countries upgrade by moving up the value chain, they increase the demand for higher skills in their home countries—including the performance of some high-skill innovation activities (Lewin, Massini, & Peeters, 2008).

A direct relationship between high-skill migration flows, or its magnitude, and firm use of global production networks is unknown and a potential subject for further research. However, foreign affiliates of transnational corporations employ 82 million individuals (UNCTAD, 2008). It is conceivable that many of these individuals had the opportunity to emigrate, but chose employment in their home country. Likewise, employers may have previously sponsored some of these individuals for immigration, but had the capacity to employ them, or contract with local firms, in their home countries. Such behavior, though, does not necessarily negate the need for continued, and possibly

increased, immigration of highly-skilled talent. As noted by Gereffi there is a need to reintegrate fragmented value chains through coordination, as well as a need for highly-skilled talent to take advantage of foreign innovations in domestic markets. Further, despite increased research and development offshore, there is still a substantial need for domestic innovation systems (Patel & Pavitt, 1991; Di Minin, 2005; Carlsson, 2006; Lewin et al., 2008). In fact, Ernst (2006) emphasized that innovation offshoring need not be a zero-sum game. Rather, it creates opportunities for the U.S. and its relationships with foreign countries. Ernst still recommends that the U.S. continue to include support for corporate innovation through tax incentives, upgrade the U.S. talent pool of knowledge workers, and encourage immigration of highly-skilled workers.

The concept of value chains, and the practice of fragmentation along those chains, has implications for sourcing of highly-skilled individuals. With the ability to break these chains across national borders in order to seek a comparative or competitive advantage, firms have greater flexibility in locating and sourcing their operations. The need for highly-skilled individuals can be identified in each point of the chain. Furthermore, the location decisions of firms, as well as contractual relations to other firms, can take into account the availability of highly-skilled individuals at those locations—the result leads to a global sourcing of talent.

To better understand the global sourcing of talent, Lewin et al. (2008) conducted an empirical study of firm decisions to offshore innovation activities, including research and development, design, and engineering services. The study was based on surveys of 880 offshore implementations between 1990 and 2006. They found that 26 percent of the

implementations involved offshoring of innovation activities. Following labor cost savings, access to qualified personnel was ranked as the second most important factor for offshoring, which was partly explained by a reduction in domestic supply. Further, labor cost savings and access to qualified personnel were separate strategies by firms. They also found that smaller firms have a higher probability of offshoring development functions. The most significant driver of offshoring was time to market—those seeking growth were less likely to offshore. Bunyaratavej, Hahn, & Doh (2007) also undertook an empirical study in the services sector based on recorded, rather than survey, data. They also found that wages (labor cost savings) were not the only factor considered by firms when making offshoring decisions. In fact, they found that firms are more likely to site services facilities in countries as wages increase. They note that firms may not get the benefits expected in low-wage countries due to the quality of the personnel. Rather, they find that educational and cultural distances are the important factors in making offshoring decisions.

Freeman (2005) views a loss of comparative advantage in the U.S. in high technology as a harbinger for a long adjustment period to a less dominant position. Freeman partly attributes this assessment to increased offshoring of information technology services, as well as research and development facilities, combined with increased growth in technology exports from China and India. Freeman suggests that this adjustment will require new policies on labor and research that will enable the U.S. to benefit from advances in other countries. Manning, Massini, & Lewin (2008) further

assert that the continuation of these trends toward offshoring could negate domestic education and immigration policies.

The interests of migrants and their families, employers of high-skilled migrants, academic institutions, domestic employees, and the sending and receiving countries are varied, overlapping, and in some cases, in conflict. The immigrants may have myriad social and economic interests in choosing to migrate. Employers also pursue multiple interests in seeking top talent, reduced costs, and expanded markets. Domestic employees are concerned with their own economic and social advancement; and sending and receiving countries are interested in their own economic growth and competitiveness. Though migration has the potential to benefit many parties, more often migration is perceived as a conflict. Domestic employees view foreign workers as competition for jobs and they perceive employers' motives as seeking to lower salaries. On the other hand, migrants may view domestic attitudes as racially motivated and consider employer actions as seeking to make them captive to unequal work conditions. At the broader level, sending countries may perceive the actions of receiving countries as stripping away their best talent and exploiting their markets.

From Brain Drain to Transnational Communities

Research by Winters et al. (2003) showed that in the case of temporary high-skill migration, the migrants and the receiving countries derive the greatest benefits while the sending countries are left worse off—supporting a brain drain argument. Gibson & McKenzie (2012) report that migrant incomes may be many times the incomes of return

migrants and nonmigrants. Desai, Kapur, McHale, & Rogers (2009) estimate the annual net fiscal loss to India from high-skill migration to the U.S. to be 2.5 percent of total fiscal revenues. Bhargava & Docquier (2008) find in a study of sub-Saharan countries that a doubling of the medical brain drain rate is associated with a 20 percent increase in adult deaths from AIDS. Kapur and McHale (2005) further argue that high-skill migration strips the sending countries of their institution builders—the people needed in developing countries to build a productive society.

Contrary to the concept of brain drain, high-skill migration may not be strictly a zero-sum prospect. Indeed, there may be winners and losers in both receiving and sending countries (Krugman & Obstfeld, 2009). Despite their productive contributions, high-skilled individuals in receiving countries also have the potential to depress wages and displace domestic workers. Contrarily, Kirkegaard (2007) found that in the aggregate, native computer professionals did not experience adverse effects due to the presence of immigrants. On the other hand, individuals in sending countries may experience gains in wages due to a smaller supply. Those remaining behind in sending countries also benefit as recipients of remittances sent home by their expatriates and inflow of foreign direct investment (Frédéric Docquier & Lodigiani, forthcoming; Ratha, Mohapatra, & Xu, 2008). Kapur (2010) adds that the flow of ideas embedded in human capital may also have a beneficial impact on the home country.

Stark (2004) argued further that the prospect of emigration to a developed country induces investment in sending countries (known as brain gain). Stark argued that individuals in home countries that recognize economic opportunities elsewhere and the

value of education are incentivized to invest in their education, whether or not they emigrate. Stark also theorized that a home country's migration policy could be formulated in such a way as to be open to the prospect of emigration while facilitating the formation of human capital at home. Batista, Lacuesta, & Vicente (2007) directly tested the brain gain hypothesis in a study of emigration data from Cape Verde in Africa. They found that the prospects of emigration accounted for about 40 percent of the college graduates living in Cape Verde and that these graduates did not result from remittances or return migration. Rather, these graduates were influenced by their own prospects for emigration. Specifically, they found that a one percentage point increase in the probability of one's own prospects of emigration increased the probability of completing intermediate secondary schooling by 1.9 percentage points.

Not everyone sees the prospects of emigration as a net benefit to home countries through the brain gain. Schiff (2005) argued that the benefits of brain gain are exaggerated. In a static and dynamic equilibrium analysis of prior research, Schiff found that the benefits of brain gain exceeded the costs of brain drain only at low levels of emigration; that in the long run the brain gain was equal to the brain drain in the steady state; and that the brain gain was likely to be negative during the transition period. According to Batista, Lacuesta, & Vicente (2007), 19 percent of the Cape Verde nationals were living abroad and that 67.5 percent of the highly-educated workforce lived abroad. These statistics would not qualify as a low level of emigration and thus appear to conflict with Schiff's conclusions—though Cape Verde is a very small nation with a population of 441,000 at the time of the study.

Despite the potential losses of high-skill migration to sending countries, Saxenian (2006, 2002a, 2002b) documented cases in Taiwan, China, and India whereby a positive-sum scenario evolved between both sending and receiving countries. This concept, known as brain circulation, suggests that both countries benefit from the movement of individuals and ideas through social and business networks. In these cases, returning migrants bring with them the social capital and human capital gained abroad while maintaining relationships and fostering collaboration in both countries. O'Riain (2004) documented a similar case in Ireland. The successes of these countries have led others to recommend that developed countries foster brain circulation with developing countries as a means to promote economic growth (Dayton-Johnson, Katseli, Maniatis, Munz, & Papdemetriou, 2007; Kapur & McHale, 2005a; Martin, Martin, & Weil, 2006; Pritchett, 2006). Kapur & McHale (2005) commented on the work of Saxenian, agreeing that the Indian experience in Silicon Valley illustrates the diaspora's role in facilitating international commerce; though the strength of that linkage is not clear—necessitating further research.

In contrast to the successes documented in Taiwan, China, India, and Ireland, there are many migration flows that have not evolved into similar positive-sum scenarios. Notable are the cases in some African countries that lost many medical personnel due to their migration to the developed countries and leaving behind severe shortages of doctors and nurses while the countries were suffering from high incidents of disease (OECD, 2007). Nor are the brain circulation successes easily replicated as detailed by Zweig and Han (2008) and Chen (2008).

The disparity between win-win migration relationships versus the win-lose relationships highlight the need to understand the factors that lead to positive-sum versus zero-sum outcomes due to high-skill migration. Taiwan, China, India, and Ireland vary in their size, demographics, culture, social, economic, and political characteristics, yet all had positive outcomes. Of interest is the observation that these countries' high-skill migration success primarily took place in the technology sector. To what extent that may be a factor in leading to a positive-sum outcome is unknown. It suggests the specific skills and sectors involved in migration may have a role, yet other economic, social, political, and technical factors may be significant.

Research Focus

The research presented herein seeks to understand the extent of the relationship between the nature of a service and the positive-sum growth in human capital through a case study of high-skill migration scenarios encompassing services in varying sectors. The OECD concept for a highly-skilled individual is based on educational attainment to include post-secondary education that is university level, but that may involve a vocational, technical, or professional qualification of shorter duration than a bachelor's degree (Chalof & Lemaitre, 2009). Generally, a zero-sum relationship refers to an outcome whereby one's gain comes at the expense of another. In a positive-sum (also known as non-zero sum) scenario, this need not be the case (Wright, 2000). With respect to economics, the distribution of costs and benefits between two countries as they contribute to economic growth (specifically the costs and benefits associated with high-skill migrants in this

research) can be viewed in the context of zero-sum and positive-sum. In the positive-sum case, both countries experience growth with high-skill migration; whereas the zero-sum case connotes an economic loss in the sending country while the receiving country experiences growth. With respect to high-skill migration, this growth can be understood in terms of the accumulation of human capital (the effect of knowledge, skills, and competencies on an individual's productivity) and associated externalities (the influences people have on the productivity of others). The dependent variable then can be defined in terms of human capital. Specifically, it is the net brain gain—that is the brain gain in a country minus its brain drain with respect to the highly skilled (Beine, Docquier, & Rapoport, 2008; Frederic Docquier & Marfouk, 2005; Schiff, 2005). This represents a key factor of economic growth that is linked to mobility. The balance between sending and receiving countries indicates a positive-sum or zero-sum relationship—both countries would have a net positive brain gain in the positive-sum case.

Lucas (1988) argued that the benefits of human capital and labor would tend to flow from poor countries to rich countries—supporting the concept of brain drain. Yet the cases of Taiwan, China, India, and Ireland show that this flow, and the associated benefits, need not be one way. This suggests that other factors are influencing this behavior. Saxenian (2006) attributes the success of these cases to the formation of transnational communities whereby immigrants return home, temporarily or permanently, in large enough numbers to establish business relationships or start new companies, while maintaining social and professional ties to their receiving country. This behavior affects the accumulation of human capital. Immigrants gain skills and experience in their host

country, which transfer to their home country on return. Moreover, the business and social relationships they establish have the dual effect of influencing human capital in both countries.

Saxenian identifies several factors that influence the formation of transnational communities and thus serve as independent variables for this research. These factors include the formation of ***host communities*** in the receiving country and access to ***home-country resources***. Host communities provide a forum for immigrants to share information on technology, jobs, and business opportunities. They may also be a source of support when pursuing those opportunities. Further, should the immigrants return to their home country, the connections and relationships they established, while in the U.S., could help them in the pursuit of offshore business opportunities. Home-country resources include access to entrepreneurial collaborators in the sending country and a base of skills, as well as technical and economic resources at home on which to build. Immigrants' relationships with home-country resources provide a channel for exchange of information and pursuit of opportunities. In studying high-tech companies founded by immigrants, Hart, Acs, & Tracy (2009) found that these companies were concentrated in states with high immigration populations and that they were twice as likely to have relations with a foreign firm. Participation in migrant communities further aids potential entrepreneurs in obtaining access to capital (Woodruff & Zenteno, 2007).

Saxenian (2006) also suggests that ***infrastructure*** and ***institutions*** can inhibit the formation of these communities. Infrastructure refers to structural factors that may inhibit pursuit of opportunities, such as power, transportation, and telecommunications.

Institutions refers to home-country practices, such as markets, funding models, government regulation, the legal system, and management practices. Saxenian found that returning immigrants typically had to overcome weak infrastructure and institutions in order to successfully pursue transnational opportunities—often by leveraging host-country institutions. In the study of Silicon Valley technology immigrants from India, China, and Taiwan, Saxenian (2002a) report that the majority of Indians consider the unreliable infrastructure, government bureaucracy, and regulations as deterrents to starting a business in India. The Chinese immigrants cited government bureaucracy, regulations, the legal system, and political uncertainty as deterrents.

Moreover, Saxenian cautions that this model will not work for all developing countries as it requires political stability, economic openness and development, and high levels of technical education. Success also may not diffuse across a country. Saxenian (2005) noted in the case of India that distrust in the public sector contributed to technology enclaves that relate better to the U.S. than other regions in India.

Another potentially significant factor, not explicitly recognized by Saxenian, is the nature of the service provided—specifically its ***tradability***. It is notable that all of the success cases documented by Saxenian and O'Riain were in the technology sector, which can be characterized as a tradable service. Jensen & Kletzer (2006) classify domestically-traded activities as potentially traded internationally, and thus vulnerable to offshoring. They developed this classification based on geographic concentration of services in the U.S.—indicating a domestically traded service and inferring an internationally traded service. Thus Jensen & Kletzer's classification is based on the

concept that if a service is traded, then the production of that service is concentrated to exploit economies of production. Using a different approach, Blinder (2006) distinguishes personal services from impersonal services. Personal services are those where face-to-face contact is imperative or highly desirable. All other services, the impersonal services, which may be high- as well as low-skilled, are vulnerable to offshoring. Given these classifications, the authors recognize that the classifications are not absolute, nor are they static. For instance, though the work of physicians is classified as nontradable, advances in technology allow the results of lab tests to be analyzed remotely. Likewise, changes in technology are enabling more services to be traded internationally. Then there are the special cases where the customer travels to the provider, as in medical tourism (Hazarika, 2010). This represents a potentially tradable niche based on a geographical concentration of providers within the broader nontradable medical services.

Saxenian (2006) does recognize the role of fragmentation of production in the technology sector. This fragmentation, characterized by the breaking up of value chains, implies a separation of services from the consumption that is essentially impersonal (Ernst, 2003; Gereffi, 1994; Jones & Kierzkowski, 1990; Porter, 1985; Sturgeon, 2002). The evolution of the resulting global production networks highlights a role that firms have in sourcing talent that may in turn influence migration decisions. The concept of value chains, and the practice of fragmentation along those chains, has implications for high-skilled immigrants. With the ability to break these chains across national borders in order to seek a comparative or competitive advantage, firms have greater flexibility in

locating and sourcing their operations (Bunyaratavej et al., 2007; Lewin et al., 2008; Manning et al., 2008). Fragmentation, the evolution of production networks, and world sourcing in the technology sector raise the question of whether other sectors or occupations characterized by nontradable (or personal) services and high levels of mobility would also be able to achieve the benefits of transnational communities of immigrants. Or whether those benefits would be more limited and whether these sectors would be constrained to a brain drain effect with respect to migration.

Restated Hypothesis

The research presented herein can now be re-stated in terms of the concepts cited above. Specifically, this research seeks to extend the work of Saxenian by understanding the extent of the relationship between the nature of a service (those classified as tradable or nontradable) and the formation of transnational communities of high-skilled immigrants leading to a positive net brain gain. Or whether the previous cited factors of host communities, home-country resources, infrastructure, and institutions are more significant. The hypothesis is that tradability of the service provided by an occupation affects the net brain gain through migration (tradable services enable positive-sum accumulation; nontradable services inhibit this accumulation). The null hypothesis would be that tradability has no effect.

Given the cases documented by Saxenian (2006), one might expect, in the case of work in sectors classified as tradable services, which is by definition more geographically concentrated, that high levels of immigration would allow the formation of ***host***

communities where immigrants can share social and business relations. Further, buoyed by the support of their local community, some immigrants would be more willing to take risks and form new ventures. Likewise, seeing opportunities in their home country, some immigrants take advantage of their access to ***home-country resources*** and experience in the receiving country to pursue these opportunities. Further, given the fragmentation of global production models and impersonal nature of tradable services, it becomes feasible for these services to be delivered remotely. Thus immigrants may be able to pursue these opportunities while remaining in the receiving country, as well as through return migration. If these individuals can overcome any ***infrastructure*** or ***institutional*** barriers, then eventually their ventures will grow and a comparative advantage may form enabling growth in both home and host countries—a positive-sum outcome.

On the other hand, work in sectors classified as nontradable services may lack the geographic concentration to foster the formation of ***host communities***. Further, the personal nature of the delivery of these services may not be conducive to a remote delivery model, thus making access to ***home-country resources*** irrelevant. Both factors may deter an immigrant from taking the risk of returning home to pursue opportunities. Likewise, given the personal nature of the work and the lack of concentration of resources, infrastructure or institutional weaknesses at home may not be as readily overcome by establishing enclaves and applying host-country institutions. Thus immigrants may be deterred from returning to their home country and the formation of home-country ventures may be inhibited. Consequently, growth continues in the host country at the expense of the home country—a zero-sum outcome. These behaviors are

hypothetical. The research design is structured to elicit these behaviors and test the hypothesis. Of significant interest would be the formation of communities and circular migration for work in a sector classified as a nontradable service. Such a case would disprove the hypothesis.

Chapter 3: Case Selection and Methodology

A case study approach is presented that compares and contrasts the factors of host communities, home-country resources, infrastructure, and institutions across a range of high-skill immigration scenarios involving work in sectors classified as tradable and nontradable services with varying results in net brain gain in sending and receiving countries. High-skill migration is a complex social phenomenon with many parties that have an interest, including firms, governments, migrants, and non-migrants. Further, the research seeks to understand individual and group behavior in an international setting and intends to identify the factors that influence those behaviors. Moreover, the lack of quantitative data in this field renders more statistical approaches infeasible at this stage. For these reasons, a rigorous case study approach is suitable as characterized by Yin (2009) whereby research questions and hypotheses are grounded in the literature, and procedures are followed to address construct, internal, and external validity.

The subject of the case is on the migration relationships between a single pair of sending and receiving countries—allowing for the control of country effects, such as those cited by Saxenian (2006), including political stability and economic openness. The unit of analysis is at the sectoral level to allow for variation in the nature of services and migration outcomes. Further, the sectors of study exhibit high levels of high-skill migration in the case study subject, vary on tradable and nontradable services, and vary in

the accumulation of human capital between the subject countries. As Bauer & Kunze (2004) found in studying high-skill immigration in the European Union, analysis at the sectoral level also facilitates cross-county comparison. This aids in the evaluation of external validity.

India as the "Crucial Case"

The subject of the case study focuses on the migration relationships between India and the U.S. This is a significant case for study as the high-skill migration between these two countries is one of the world's largest bilateral flows, while a wide development gap creates an opportunity for economic development. Further, the migration relationship between the U.S. and India in the information technology sector has already been cited for its significant role in development (Hira, 2004; Thatchenkery & Stough, 2005). India exhibits high levels of migration in both tradable and nontradable services and there is documented evidence of positive effects in both sending and receiving countries within the information technology sector (Kapur & McHale, 2005a; Mann & Kirkegaard, 2006; Pandey, Aggarwal, Devane, & Kuznetsov, 2004; Saxenian, 2006). More significant is that the migration relationship between the U.S. and India constitutes a "crucial case" on which to base the research (Gerring, 2007). Controlling for country effects, one can argue that if high-skill migration of individuals working in sectors classified as nontradable services could exhibit a mutually beneficial effect in sending and receiving countries, it would "most likely" occur in India where such an effect has been demonstrated for work in a sector classified as a tradable service (information

technology). Thus this case has the best chance of supporting the null hypothesis, i.e., the null hypothesis is "most likely." This sets up the null hypothesis (tradability has no effect) as a disconfirming proposition ("most likely, and does not"). Should the research then show there is an effect for tradability—that is in the "most likely" case where tradability should have no effect—then the null hypothesis would be disconfirmed; thus allowing the null hypothesis to be rejected and the hypothesis to be accepted.

Selected Sectors as the Unit of Analysis

Given sectors as the unit of analysis, the objective in selecting sectors for inclusion in the crucial case is to look for variability in the factors of interest. Specifically, considering tradability (the independent variable of interest) and positive-sum human capital accumulation (the dependent variable) as binary, then there are four possible scenarios that delineate variability:

- A service is tradable and exhibits positive-sum accumulation.
- A service is nontradable and does not exhibit positive-sum accumulation.
- A service is nontradable and exhibits positive-sum accumulation.
- A service is tradable and does not exhibit positive-sum accumulation.

The first two scenarios together could potentially show that tradability has an effect, i.e., it enables positive-sum growth while nontradability inhibits such growth. Both scenarios potentially support the hypothesis and can then be useful for analyzing

causal relationships. The third scenario does not rule out possible support for the hypothesis. However, it might reveal confounding factors contributing to growth despite the nontradability of the service. It can also aid in identifying possible support for the rival explanations—supporting the null hypothesis. That is, it corresponds to the proposition that tradability has no effect. If the research can show that in this third scenario that the positive-sum accumulation is related to other factors, then the third scenario would be disconfirmed and would not support the null hypothesis. The fourth scenario is of least value. It does not conform to the hypothesis, and thus cannot be used to understand causal relations. Nor does the fourth scenario help in analyzing rival explanations since the scenario does not lead to a positive outcome. By confirming the first two scenarios and disconfirming the third, there then would be sufficient evidence for showing that tradability has an effect. The null hypothesis would then be rejected.

Figure 1 provides estimates of the stocks of highly-skilled Indian immigrants in the U.S. from 2003 to 2011 working as information technology professionals, physicians, post-secondary teachers, and nurses (Ruggles et al., 2011). The stocks of Indian information technology immigrants (left axis) experienced very rapid growth following the recession in 2003. The stocks of Indian physicians, post-secondary teachers, and nurses (right axis) are much smaller than the information technology professionals. These stocks have been relatively stable while experiencing some growth over this time period. These immigrants are of interest since they represent work in sectors classified as tradable and nontradable services. Jensen & Kletzer (2006) classified information

technology occupations as tradable, whereas they classified the health and education sectors as nontradable.

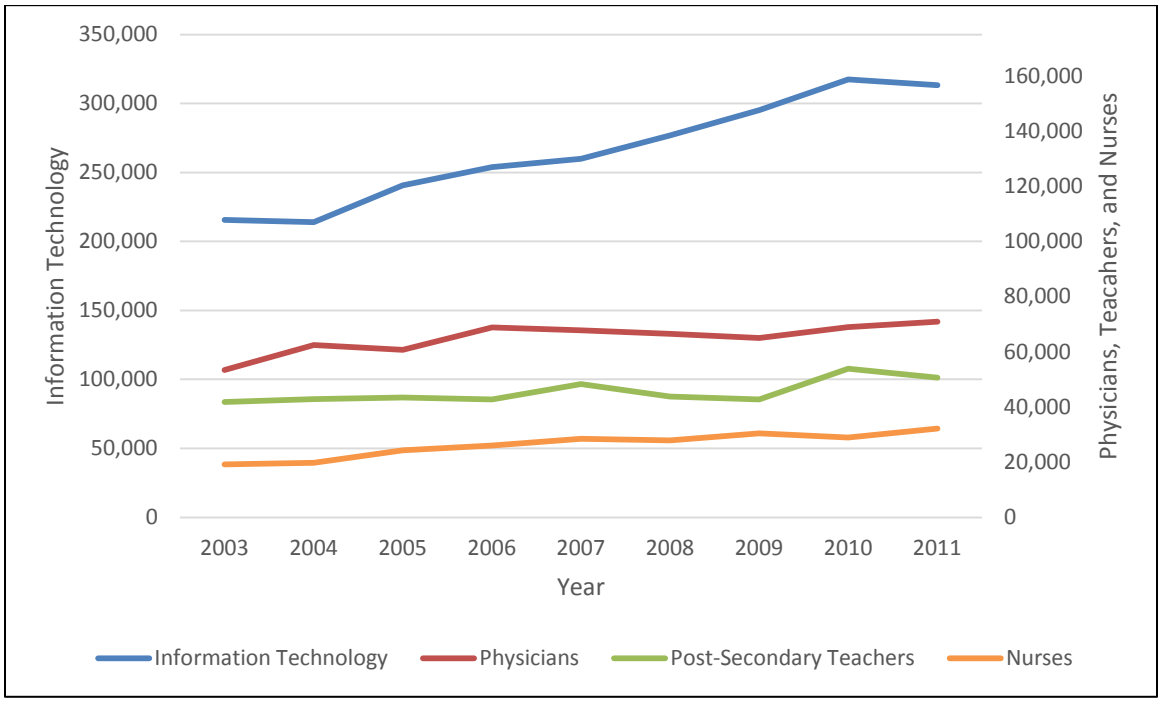

Figure 1. Indian high-skilled immigrant stock by profession, 2003-2011

Table 1 provides some basic estimates of high-skill stocks and growth rates in the U.S. and India for the sectors considered for inclusion in this research. The emigration rates are computed as the percentage of emigration stocks to the total labor force of the sending country as described in Chapter 2 (Docquier & Schiff, 2008). The table shows that the information technology sector has experienced very high levels of migration from India to the U.S. However, the table also shows that India is experiencing substantial growth in its information technology human capital. Thus the information technology sector best corresponds to the first scenario listed above. It is classified as a tradable

service and both the U.S. and India exhibit substantial growth rates in Indian information technology workers.

Table 1. U.S./India emigration stocks and rates by sector for 2010

Sector	Emigration Stock in U.S.	Emigration Rate	Total Skilled Workers in the U.S.	Annual Growth Rate in the U.S.	Total Skilled Workers in India	Annual Growth Rate in India
Information Technology	317,380	11.3%	3,697,993	-1.1%	2,500,000	10.4%
Medical Services						
Physicians	69,000	7.8%	910,619	2.2%	816,629	2.9%
Registered Nurses	29,963	2.7%	3,118,897	1.3%	1,073,638	2.9%
Post-Secondary Teachers	53,859	7.2%	1,634,748	2.8%	699,000	18.7%

Sources: Ruggles et al. (2011), Ministry of Communications & Information Technology (2011), Central Bureau of Health Intelligence (2010), Ministry of Human Resource Development (2011)

On the other hand, though physicians have experienced high levels of migration to the U.S., the growth of physicians in India is relatively small. Hence the medical sector based on physicians best corresponds to the second scenario. It is classified as a nontradable service and the growth rate of Indian physicians in the U.S. is more than double the growth rate in India. Next, the education sector, based on post-secondary teachers, has both high levels of migration and high growth in India, which best corresponds to the third scenario. It is also classified as a nontradable service, yet the

growth rate of post-secondary teachers in India is very high despite the high emigration rate to the U.S. The nursing sector is also considered, however, the emigration rates for nurses are relatively low, and thus do not meet minimal conditions for inclusion in the study.

One aspect of the data in Table 1, that might call into question the suitability of the medical and education sectors for this research, is the large difference between emigration stocks compared to the information technology sector. The high level of Indian information technology workers in the U.S. is exceptional when compared to other high skill occupations. Saxenian (2006) suggests there needs to be a critical mass of immigrants in a sector to foster the formation of transnational communities. Yet Saxenian does not establish what constitutes a critical mass. It may be the case that immigrant stocks for physicians and post-secondary teachers have yet to reach the necessary threshold. If true, this could jeopardize the research design. However, Saxenian's research on Taiwan would seem to indicate that much lower levels may be sufficient. Saxenian documents the formation of transnational communities in Taiwan between 1990 and 2000. At that time the number of Taiwanese working in information technology in the U.S. ranged from approximately 14,000 to 32,000 (Ruggles et al., 2011). The number of Indian physicians and post-secondary teachers working in the U.S. far exceeds this range.

Construct, Internal, and External Validity

To ensure the quality of the empirical research for the case study, steps are undertaken to provide for the construct validity, internal validity, and external validity. The measures and data gathering instruments are modeled after those used by Saxenian (2002a). Given that this research seeks to extend Saxenian's findings, use of similar constructs supports comparability of the concepts measured. Further steps are taken to improve upon criticisms of Saxenian's data, such as the selection bias due to a reliance on professional associations, and refinements suggested by subject matter experts to make the instruments applicable to medical doctors and academics. Details on these measures and instruments are provided later in this chapter.

To address internal validity and rule out possible spurious relationships, three rival explanations are considered. One explanation is that the growth exhibited in India is due to a ***brain-gain effect***—that is, growth is experienced due to the prospects of migration rather than circulation and transnational communities. Another explanation is that the successes exhibited during the previous decade in the information technology sector are unique to the ***time period*** of rapid growth in information technology, and thus the conditions may not present themselves in other sectors at this time. The third explanation, ***migration relevance***, is that there is no relationship between high-skill migration and the economic outcomes exhibited in the sector. It considers the possibility that immigrants are not pursuing business opportunities in their home country, either remotely from the U.S. or through return migration, and thus their migration is not a factor in home-country economic outcomes. Exploring these rival explanations reduces

potential endogenous effects and aids in the interpretation of any findings regarding the contributing factors in high-skill migration outcomes.

External validity is evaluated by attempting to generalize the findings to other cases through analytic argument. Candidates for this analysis include the documented cases whereby positive-sum migration relationships have evolved. The case of the Philippines is a strong candidate since it has experienced positive migration outcomes in the information technology sector while simultaneously experiencing negative outcomes in the medical sector—specifically in the nursing field.

The U.S./India Case

The previous section explained the use of the U.S./India case as a crucial case in the research design. This section further elaborates on the U.S./India case to exemplify its practical significance.

With a population over 1.2 billion, India is the second most populous country in the world with approximately 17 percent of the world's population (Office of the Registrar General, 2011). Of this population, over 273 million are illiterate. According to the United Nations millennium indicators approximately 32.7 percent of the Indian population lives in poverty (less than one dollar purchasing power parity per day) and 29.4 percent of the urban population lives in slums (UNSTATS, 2013). In contrast, the population in the U.S. in 2011 was 311 million people (U.S. Census Bureau, 2012). Of this population, 58 percent completed some college and 29 percent completed at least a bachelor's degree. Further, less than 16 percent of the U.S. population had income below

the poverty level. These statistics suggest that India has significant challenges to overcome in advancing the quality of life of its citizens.

However, this data should not obscure the significant economic progress that has been made by India. Since the early 1990s, India has experienced rapid economic growth—averaging over 7 percent gross domestic product (GDP) growth since 1997 and ranking fifth in the world in purchasing power parity (CIA, 2012). Further, India has grown to become the seventeenth largest export market for the U.S. and the thirteenth largest source of imports (Office of the United States Trade Representative, 2012). U.S. foreign direct investment in India was $27.1 billion in 2010 and Indian firms invested $3.3 billion in the U.S. in that year.

Beyond trade in goods and services, the U.S. and India have had a strong relationship with respect to high-skill migration. Since the U.S. liberalized its immigration policy in 1965, and especially since the further liberalization of 1990, the Indian-born population in the U.S. has boomed. According to the U.S. Census Bureau (2012), there are more than 1.8 million Indians living in the U.S.—49 percent of whom have entered the U.S since 2000. These Indian immigrants are highly educated. Approximately 84 percent of Indians living in the U.S. have completed some college and over 75 percent have completed at least a bachelor's degree.

In 2009, India had the highest level of H-1B and L-1 admissions for high-skill employment (Monger & Barr, 2010). Their H-1B admissions were more than five times that of Canada, the second ranked country. They also had the third highest F-1 admissions for advanced education and the fourth highest individuals accepted for legal

permanent residence. According to the U.S. Census Bureau (2012), the per capita income of Indians in the U.S. is $51,037 compared to the U.S. average of $27,158. In 2000, about 300,000 Indians worked in Silicon Valley technology firms and accounted for 15 percent of high-tech start-ups; their average salary was over $200,000; and there were about 700 Indian-owned companies (Ministry of External Affairs, 2000). Many Indians in the U.S. also advanced to high positions in U.S. companies, such as the CEO of Microchip Technologies, the president of Bell Labs, and senior vice-president of Qualcomm.

Successful Indians in the U.S. are notable for the relations they maintain to India. These relationships brought attention to resources and opportunities in India—leading many multinational firms to locate research and development centers in India, including General Electric, CISCO, Sun Microsystems, Microsoft, IBM, Intel, and Oracle (Ministry of External Affairs, 2000). The information technology sector in India, in particular, has shown significant growth with a compounded annual growth rate of 55 percent from 1992 to 2000. In 2010-2011 the revenue of the information technology and business process outsourcing industry in India was estimated at US$88.1 billion with an annual growth rate of 19.2 percent (STPI, 2011)—directly employing 2.5 million individuals and indirectly employing another 8.3 million individuals. Moreover, their export market was estimated at US$59.4 billion—capturing 55 percent of the global offshore market for information technology outsourcing.

In concept, a positive-sum scenario occurs when two parties in a relationship receive mutual benefits from that relationship and that one does not benefit at the expense

of the other. Qualitatively, the U.S. and India appear to have such a positive-sum relationship—particularly in the information technology sector with respect to high-skill migration and economic outcomes—though such a relationship may not be uniform across the sectors. The precise nature of these relationships, and their benefits, needs to be explored.

Sectoral Distinctions

Docquier and Schiff (2008) provide a possible means for quantitatively understanding the migration relationship between countries. Their model is based on emigration stocks and emigration rates varied by educational attainment. Docquier and Schiff note that the use of emigration stocks using census data from receiving countries is much more reliable than methods that compute migration flow data; this is due to the poor and inconsistent data collected by sending countries on emigrants and return migrants. Docquier and Schiff then equate the brain drain to the emigration rate of high-skilled individuals, which can be compared across countries or for the same country across time. Docquier and Marfouk (2005) estimated the high-skill emigration rate in 2000 at 4.3 percent for India.

Note that the Docquier and Schiff model does not explicitly represent any potential brain gain effect or benefit to the sending country. Nevertheless, a brain gain may be discerned by contrasting changes in the domestic population with changes in the emigrant population at varying skill levels (Beine et al., 2008). That is, as a sending country's emigration stock increases elsewhere, changes in the local stock can be tested

for a positive relationship. Using the Docquier and Marfouk data, the annual growth rate of highly-skilled individuals living in India between 1990 and 2000 was 8.5 percent.

By definition, the Docquier and Schiff model can be used to calculate the emigration rate between two countries. Between India and the U.S., the high-skill emigration rate from India is three percent based on 1.18 million high-skilled immigrants (Office of the Registrar General, 2011; U.S. Census Bureau, 2012). Further, the model can be extended by restricting the analysis to sectors within a country. Thus it is possible to calculate the emigration rate of Indian information technology professionals to the U.S. In the previous section, Table 1 provides such emigration rates for the information technology, medical services, and post-secondary education sectors.

The data shows that the annual growth rate of information technology professionals in India is very high despite a high emigration rate to the U.S. However, a quite different picture emerges when examining the medical services sector, especially in the case of physicians with 69,000 Indian physicians in the U.S. Physicians from India emigrated to the U.S. at a high rate (7.8 percent), but the growth rate of physicians in India was quite low (2.9 percent). Meanwhile, there were six doctors to every 10,000 inhabitants in India (OECD, 2007), which is about one quarter of that in the U.S. The case of post-secondary teachers is similar to the information technology professionals with respect to a high emigration rate and high growth rate in India. However, outcomes are very different. India's tertiary gross enrollment ratio is only about 18 percent compared to 95 percent in the U.S. (Institute for Statistics, 2010). Moreover, despite the growth shown in post-secondary teachers, many Indian students travel to the U.S. for

their education. Indian nationals enrolled in U.S. universities in 2010-11 numbered 103,895 (Institute of International Education, 2011). This is also significant as these students are part of the pool for future college professors and may contribute to a long-term shortage of doctoral degree holders in India to fill teaching and research positions (Pritchett, 2006).

Except for the information technology sector, it is unclear what role migration had in the results shown in Table 1. In the aggregate, the migration relationship between the U.S. and India, and its outcomes, appears to be of mutual benefit. Yet when examining that relationship at the sectoral level there is significant variation. While the information technology sector exhibits significant gains in skilled individuals in India, the medical sector exhibits only small gains that are insufficient for the demand. Likewise, the education sector shows significant emigration in the face of high demand for advanced education at home.

Data Collection and Analysis

There are a number of key parties that potentially influence migration behaviors. These parties include the migrants and their families, employers of high-skill migrants, domestic employees, source and host communities, immigration agencies, and the sending and receiving countries. The interests of these parties are varied, overlapping, and in some cases, in conflict. This mix of interests, assumptions, and conflicts provides for a complex area of study that does not readily lend itself to a strictly quantitative analysis. Rather, a richer analysis through field research could better capture the inherent

subtleties and complexities in order to make meaning in this environment. Further, this area and subject of study does not lend itself to participant observation methods—global processes of immigration over time are not easily observed. Thus to gain the richness of understanding sought, the research is based on personal interviews and surveys of high-skilled immigrants and subject matter experts using a purposive sampling technique (Goodman, 1961; Patton, 2002). The population for these interviews includes tertiary-educated Indian immigrants to the U.S., permanent and temporary, employed in the information technology, medical (physicians), post-secondary education (university professors) sectors.

The field research follows a basic interview-survey-interview pattern. Initial interviews are conducted with subject matter experts, such as the chairpersons of immigrant associations, to establish an expert view on immigrant behavior. Though these experts may not be representative of the population, their responses help to define the range of relevant variation on elements of the model, such as potential infrastructure and institutional factors. Further, interviews within each sector of study establish terms appropriate to that sector, aided in refining survey questions, and identifying survey respondents. The surveys are conducted to reach a broader audience and to gather data directly from the immigrants under study. The surveys are not therefore based on a random sample. However, it was not the intent of this research to make predictions on immigrant populations. Rather, it seeks evidence of circular migration and the formation of transnational communities to test the hypothesis. Nevertheless, repeated and targeted sampling of individuals against national profiles is used to assure diverse representation

and mitigate against a selection bias. Potential respondents are identified via public directories and selected from areas with the highest concentration of high-skilled Indian professionals (a condition for the formation of transnational communities). The survey is also used to identify volunteers for follow-up interviews. The purpose of those interviews is to gain a better understanding of the respondents' rationale and motivations for their actions, which is not readily collected in a survey. Such data are valuable in evaluating the validity of the model. Chapters 4-6 provide additional details on the data collection approaches specific to each sector respectively.

Fifty interviews were conducted with subject matter experts and high-skilled immigrants across the three sectors. A count of 2,246 surveys was issued with 558 responses resulting in a 25 percent response rate. Responses that only provided demographic information were dropped from the data set, thus providing 512 responses for analysis. The responses are widely distributed and diverse. Figure 2 shows the distribution of respondents by census region. The responses break down across the sectors as follows:

- Information technology professionals: 128 respondents from 37 U.S. metropolitan areas working in 34 technology occupations across 27 industries
- Medical professionals: 185 respondents from 25 U.S. metropolitan areas working in 50 specialties
- Academic professionals: 199 respondents from 30 U.S. metropolitan areas working in 35 fields of study at 36 universities

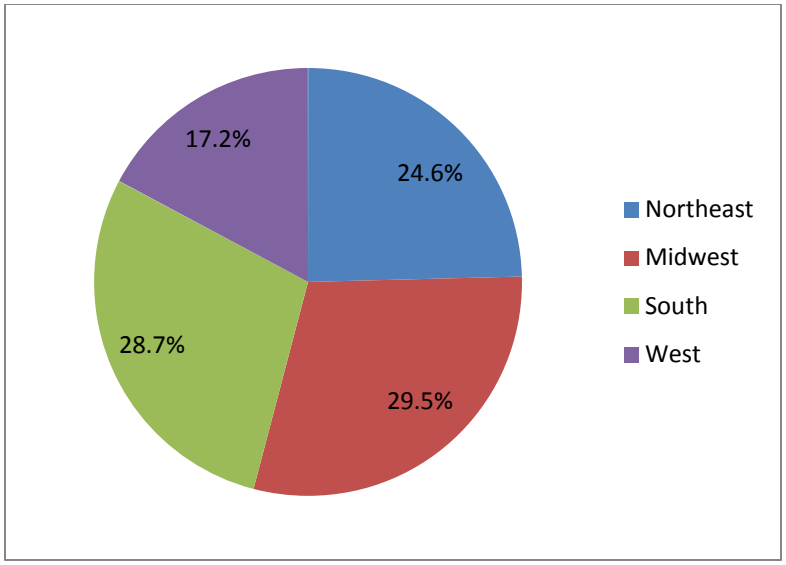

Figure 2. Distribution of survey respondents by census region

Topics and questions for the interviews and surveys are designed to collect data on the specified variables in the proposed model detailed in Chapter 2 based on the work of Saxenian (2002a), including ***host communities***, ***home-country resources***, ***infrastructure***, and ***institutions***. As there is no direct measure of these variables, multiple questions are used that indirectly assess their values. In aggregate, the questions are intended to be suggestive of the existence and strength of their corresponding variable. Table 2 lists the variables with their corresponding interview topics and questions. Topics are also included to support the evaluation of internal validity as discussed below. The interviews are based on the narrative approach advocated by Riessman (2007). Rather than the question-and-response style of interview, this approach seeks to elicit narratives suitable for analysis. The objective is to get the participant to relate detailed accounts rather than brief answers to questions. The

questions shown in Table 2 are meant to be facilitative rather than exhaustive. These questions are used to initiate the discussion in a direction to explore the factor under study. However, follow-up questions are used depending on the direction and nature of the responses of the subject to gain an understanding not only of what the respondents believe, but why they hold those beliefs.

In contrast to the open-ended interviews, a specific list of questions and responses are used in the online surveys. Table 3 lists the survey questions as they map to variables in the model. Note that the list of factors rated under ***Institutions*** is derived from the interviews with subject matter experts. The initial interviews identify the potential factors for consideration, which are then validated by the surveys.

Table 2. Interview topics and questions

Research Factor	Interview Topics/Questions
Net brain gain in human capital (dependent variable)	What levels of high-skill resources are available in the sending and receiving countries? What are their rates of growth? What is the rate of return migration?
Tradability	Jensen & Kletzer (2006) classification: Information technology – tradable Physician – nontradable Post-secondary teacher – nontradable
Host communities	What is the level of participation in professional, immigrant, or alumni associations? What role, if any, are these associations used to provide business information?
Home-country resources	To what extent do high-skill migrants maintain personal, business, and political relationships with their home country? Are potential collaborators/partners available? Is there a sufficient skill base available to pursue business relations? Are technical and economic resources available?
Infrastructure	What structural factors may inhibit pursuit of opportunities from the home country, such as access to markets, access to capital, availability of power, transportation, and telecommunications, working conditions, financial or other incentives from the government?
Institutions	What problem areas inhibit pursuit of home-country relations, such as immature market conditions, unfair competition, poor business services, government bureaucracy/regulation, and an inadequate legal system (such as protection of intellectual property rights)?
Brain-gain effect (internal validity)	To what extent is an education or profession pursued with intent to migrate? Do most of these individuals migrate as intended?
Time-period specific (internal validity)	To what extent are home-country relations specific to the time period of rapid growth in information technology?
Migration relevance (internal validity)	To what extent do immigrants have a role in pursuit of home-country relations and leveraging business opportunities?

Table 3. Mapping of survey questions to model variables

Model Variable	Survey Questions
Host communities	How often do you attend meetings of immigrant associations? How often do you attend meetings of professional associations? Have you ever served as an officer or a board member for any of these associations?
Home-country resources	How often have you traveled to India for professional purposes (for social purposes)? How often do you exchange information on jobs, research, and technology with associates in India? Have you ever helped others arrange professional relationships in India? Have you ever helped to arrange business contracts in India? Have you ever served as advisor or consultant for companies in India? How often do you meet with Indian government officials?
Infrastructure	Please rate the extent to which infrastructure in India would either support or inhibit whether you would return to India.
Institutions	Please rate the extent to which the following factors would either support or inhibit whether you would return to India: professional opportunities, professional relationships, culture and lifestyle, bureaucracy or corruption, favorable government treatment of returnees, limits on professional advancement in the U.S., desire to contribute to the welfare of India, family relationships in India (in the U.S.).
Migration relevance (internal validity)	Would you consider returning to live in India in the future? How many of your technology friends and/or colleagues have returned to India? Have you invested your own money in professional or social ventures in India?

The analysis also evaluates the internal and external validity of the findings. The internal validity is evaluated by examining rival explanations for the findings discussed in Chapter 2. Three rival explanations are examined. One scenario is that the growth exhibited in India is due to a ***brain-gain effect***. This variable is assessed by directly asking the interview participants about their intentions to migrate as they pursued their

education and careers. Another scenario is that the successes exhibited in the information technology sector are unique to the ***time-period*** of rapid growth in information technology, and thus the conditions may not present themselves in other sectors at this time. This variable is assessed for the information technology sector by contrasting the responses to the questions in Table 3 for the Internet boom period prior to the year 2000, from Saxenian (2002a) data, to the current data for the post year 2000 period. The third scenario, ***migration relevance***, considers that there is no relationship between high-skill migration in the sector and the economic outcomes exhibited in that sector. The questions in Tables 2 and 3 for this variable consider evidence for brain circulation activity, both intended and actual.

The external validity is evaluated by attempting to generalize the findings to other cases through analytic argument. Candidates for this analysis include the documented cases whereby positive-sum migration relationships have evolved. The case of the Philippines is a strong candidate since it has experienced positive migration outcomes in the information technology sector while simultaneously experiencing negative outcomes in the medical sector—specifically in the nursing field.

The analysis of the case study data takes into account the mixed quantitative, qualitative, and narrative data. To that end it employs the case study analysis techniques described by Yin (2009). The analysis initially focuses on the data within a sector to discern the behavior of the identified factors as propositioned. The analysis is also open to factors discovered in the case study, but not anticipated in the proposed model. Following analysis of the individual sectors, a comparative analysis is performed to

evaluate the hypothesis, which is presented in Chapter 7. A basic pattern-matching logic is employed to compare the empirical pattern, as characterized by the behaviors elicited for the factors, with the predicted behaviors across the sectors. A regression analysis on the survey data is also performed to understand the possible relationships between the variables of the model.

Chapter 4: Information Technology Sector Data

The information technology sector is included in the case study as the basis for comparison to the medical services and post-secondary education sectors. It represents the scenario whereby work in a sector classified as a tradable service exhibits a positive-sum accumulation of information technology professionals in India and the U.S. Saxenian (2002a) provides data on the information technology sector in Silicon Valley based on surveys conducted in 2001. These data are dated and limited to a single region. To provide a valid basis for comparison with the other sectors, this research is conducted using new surveys of Indian information technology immigrants across the U.S. To validate the current data, given their broader geographic scope and current time frame, they are contrasted with the Saxenian (2002a) data to determine whether the new data exhibit the characteristics and behaviors that Saxenian observed with respect to the formation of transnational communities, immigrant circulation, and the accumulation of human capital.

To provide a context for the analysis, the chapter begins by reviewing the evolution of the relations, and immigrant behavior, between India and the U.S. in the information technology sector. Here the literature portrays an initial transition from job shopping of Indian information technology immigrants in the U.S. to the offshoring of services to India, resulting in many Indians returning to their home country. This then

evolves into a global production process with Indian information technology professionals circulating between countries.

Next, this chapter reviews the data collection strategy—particularly the use of LinkedIn to provide a sample frame. This section discusses how the selection bias is mitigated and representativeness is improved by matching purposive samples with population characteristics, while maintaining correlations of interest. This section also presents challenges in obtaining responses from information technology professionals and the steps taken to improve the response.

The main focus of this chapter is then the presentation of the survey and interview data on the Indian information technology professionals in accordance with the variables of the model as described earlier in Table 3. That is, it examines the data that enable the formation of transnational communities, including active host communities and access to home-country resources, as well as the infrastructure and institutional factors that might inhibit circulation. The data show that the respondents are active in professional communities—more so than immigrant-specific associations. They have high levels of interaction with their peers in India in the context of the global production process. Technology infrastructure is much less of a concern of these respondents than those responding in 2001. Many factors support their return to India, including professional opportunities, culture and lifestyle, and the desire to contribute to the welfare of India. Family relationships are a particularly strong supporting factor. On the other hand, bureaucracy and corruption continue to be inhibiting factors affecting the respondents' likelihood of returning to India.

Given the data presented, which appears to support the formation of transnational communities and immigrant circulation in the information technology sector, this chapter then considers the possible rival explanations identified in Chapter 3. Beginning with migration relevance, it assesses whether information technology immigrants are pursuing business opportunities remotely or through return migration. The data indicate substantial activity in this area. A possible brain-gain effect is considered next to explain the growth of information technology professionals in India. Based on the interviews, only a minority of respondents indicate they had intentions to migrate when completing their undergraduate degree. Most respondents report that they came to the U.S. for their advanced education or were transferred by their employers. Last, this section considers the possibility that the behaviors observed by Saxenian were unique to that time period, which corresponded to the Internet boom. Comparing post-2000 data from the current research with the pre-2000 data collected by Saxenian finds little difference in behavior between these time periods.

The chapter closes with findings that support the use of the information technology sector as the basis for comparison to the medical sector and post-secondary education sector as proposed. The survey and interview responses are consistent with the scenario leading to the formation of transnational communities, circulation, and accumulation of human capital. The possible rival explanations do not significantly counter this scenario. However, the data show signs that this scenario is not necessarily static.

India and U.S. Relations in the Information Technology Sector

The relationship between India and the U.S. in the information technology sector has evolved substantially over the past 30 years, as well as its effects on migration flows. As described below, it evolved from a model of body shoppers that migrated to the U.S. to a model of offshore outsourcing that saw many Indian immigrants return to India, then to a global production system and multinational firms that promote circulation of immigrants. Also presented below is the system that produces the supply of Indian information technology professionals and potential immigrants. Then this section ends by raising potential concerns for the continued growth of the India and U.S. relationship.

Body Shopping

In the early days of the nascent Indian software industry there was little interaction with the Indian diaspora in the U.S. (Pandey, et al, 2004). It was not until the 1990s where U.S. immigration constraints led to the creation of firms where a portion of work was done in the U.S., while the remainder was outsourced to resources in India. Then when the Year 2000 became a major concern of the U.S. government and software development companies, demand for technical resources quickly outstripped the supply in the U.S. To meet the need for information technology professionals in the U.S., Indian firms established "body shops" that specialized in international recruitment of Indian information technology professionals for placement in the U.S. (Xiang, 2002). This led to relaxation of immigration limits in the U.S. and opened a channel to a new wave of Indian immigrants during the Internet boom.

Offshore Outsourcing

As many U.S. companies were bringing Indian information technology professionals to the U.S., they also began to recognize the advantages of offshore outsourcing directly to the resources in India to take advantage of cost differences and skills. This model had two forms, captives and third-party service providers. In the initial stages of the evolution of Indian information technology outsourcing, the primary service providers in India were the U.S. clients themselves, known as captives. Companies like General Electric and Texas Instruments, began locating their development centers in India to take advantage of the local resources (Leclerc, 2008). Further, these companies would send their employees of Indian origin back to India to manage these operations and establish relationships with the local government and businesses. Thus these firms created a channel for return migration and circulation.

As outsourcing evolved, local third party suppliers emerged, like Tata Consultancy Services (TCS) and Wipro, who began to acquire substantial capabilities leading to the establishment of the Indian information technology services industry (Palugod & Palugod, 2011). The low cost of Indian resources, advanced telecommunications, and 12-hour time difference with the U.S. made India an ideal location for establishing firms for handling the offshoring of services. In 2008, the U.S. alone accounted for 60 percent of Indian information technology and business process outsourcing exports. The growth of this sector also attracted Indian expatriates to return and start their own businesses. In a survey of Indian entrepreneurs returning from the

U.S. to start a business in India, 60 percent said that available economic opportunities were very important and 77 percent indicated that lower operating costs were very important (Wadhwa, Jain, Saxenian, Gereffi, & Wang, 2011).

Indian Multinational Companies and Global Production

As the third party services companies grew, some took over the operations of the captives and began multi-sourcing across countries, leading to the growth of Indian multinational companies (Palugod & Palugod, 2011). Third party service providers are now the dominant form of provider in India—comprising about 70 percent of the offshore market, while captives account for the remainder (Sadagopan, 2012). India is a world leader in this market, with exports in information technology-enabled services and business process outsourcing estimated at US$59.4 billion in 2010-11 (STPI, 2011).

One of the largest Indian multinational firms, TCS, reached $12 billion in revenue in 2012 (Sadagopan, 2012). These firms, also including Infosys, Wipro, Cognizant Technology Solutions (CTS), and Hindustan Computers Limited (HCL), now operate in the U.S. Not only do they provide resources to companies and the government to work on information technology projects, they also compete with U.S. companies to provide complete solutions. As a result, they create jobs for U.S. nationals as well as Indian immigrants—providing another channel for migration (NASSCOM, 2012). In 2011, Indian information technology companies operating in the U.S. had a direct employment of 107,000 individuals. In the five largest states where these companies operate, 31 percent of the jobs went to U.S. nationals. Thatchenkery & Stough (2005) conclude that

the circulation of human and intellectual capital through these linkages contributes to improved productivity in the U.S. while contributing to economic growth in India.

Mann & Kirkegaard (2006) portray the information technology sector and market as a microcosm for what is happening in broader markets. They characterize information technology as a productivity-enhancing technology with growing demand globally. As countries ramp up their information technology production capabilities they help reduce costs and further spur demand. Information technology itself aids in the fragmentation and globalization of production, which further reduces prices and exposes U.S. information technology workers to greater competition, cross-border movement of high-skilled workers, and the commoditization of lower-skilled jobs. As noted by Xiang (2002), in the case of the Indian information technology professionals, their transnational connections are based on the globalization of the industry's production process, thus their transnational connections are more institutionalized. These transnational connections, in turn, rely on a steady supply of Indian information technology professionals.

Supply of Indian Information Technology Professionals

Fueling the information technology industry in India is an abundance of engineers with more than 500,000 undergraduate information technology engineers graduating per year (Sadagopan, 2012). The number of information-technology graduates and post-graduates in India increased by 57.8 percent between 2008 and 2011 (Satija & Mukherjee, 2013). To produce these engineers, India has 79 nationally-funded institutes of technology and science education, including fifteen Indian Institutes of Technology (deemed institutions

of national importance) (Ministry of Human Resource Development, 2011). Enrollment at these elite institutes is limited; however, there has been an explosion in private education (Gereffi, Wadhwa, Rissing, & Ong, 2008). Today there is over 6,500 degree-granting technical institutions. In their survey, Satija & Mukherjee (2013) found that many of these information technology graduates have been turning into entrepreneurs by starting their own firms. The total number of start-ups in India is around 10,000, with 5,000 start-ups in Bangalore, followed by Mumbai, Delhi and Chennai (Satija & Mukherjee, 2013).

A study by Gupta (2012) characterizes the Indian information technology engineers as relatively young (71.8 percent between the ages of 20 and 30); mostly male (78.2 percent); living in urban areas (85.2 percent); unmarried (60.2 percent); holding non-managerial positions (94.2 percent); and having less than five years of experience (61.6 percent). Sarkar, Mehta, & Nathan (2013) report that the average earnings of an information technology engineer increased by 80 percent between 1999 and 2009. These earnings are twice that of all other workers in India; the starting salary was $7,000 per year for a software engineer in 2009. However, India is facing unemployment for some of its engineers (Gereffi et al., 2008). NASSCOM (2009) indicated that the employability of graduates in information technology services was only 26 percent.

Concerns for Growth

According to Sadagopan (2012), India has experienced higher wages, reduced productivity, and unionism among its information technology employees in the services

sector. These pressures are driving Indian information technology firms to attempt economic upgrading to increase margins (Sarkar et al., 2013). To continue growth and leadership, KPMG (2012) advocates that multinational Indian firms evolve their sourcing model. They promote a "hub and spoke" model whereby the hub located in India acts as the single point of contact to the clients in the U.S., Canada, and Europe, while managing resources from strategically located spokes in other countries, such as Malaysia, that can offer cost advantages.

Sadagopan (2012) suggests that Indian information technology companies must move up the value chain by creating products and developing next-generation technologies, as well as increasing the use of information technology in the domestic market. This would require a greater investment in research and development. Today, most of the U.S. share of offshored research and development actually goes to Europe and China ahead of India. Further, India's research and development investment is only 0.85 percent of GDP compared to 2.85 percent of GDP for the U.S. (Battelle, 2011).

Saxenian (2006) also qualifies the rapid growth and success of the Indian software industry, and its ties to the U.S., by noting that this export focus and long-distance relationship have resulted in enclaves of economic growth in cities, like Bangalore. Further, the infrastructure and institutional barriers in India keep such growth from diffusing across the country. India has a low penetration of information and computing technology across the country; only 7.5 percent of the population uses the Internet (Dutta, Bilbao-Osorio, & Geiger, 2012). These challenges also present Indian information

technology companies with opportunities for growth. Saxenian offers hope that the information technology industry could play a leadership role in addressing these barriers.

Data Collection and Demographics of Survey Respondents

In conducting the surveys, a key objective was to obtain a broad representation of Indian information technology professionals working across the U.S. to serve as a basis of comparison to Indian medical and academic professionals. However, there is no evident database of such individuals that provides their contact information. As done by Saxenian (2002a), one approach to reach these individuals is through information technology associations for Indian professionals, such as the Global Indian Technology Professionals Association, whereby the association distributes the survey to its members. However, this approach, by definition, is biased on participation in host communities—a key variable to be examined in the study. Nor does this approach necessarily provide for a broad geographic representation. Alternatively, this research identified survey participants through the social network site, LinkedIn.

Social network sites constitute a possible source for producing a sample frame for social research. Boyd & Ellison (2008) define social network sites as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system." LinkedIn is a business-oriented social network site that allows users to maintain connections with other individuals in their line of work that they know and trust

(Papacharissi, 2009). The wealth of data online, including social network sites, offers practical advantages, such as ease of access, the potential for increasing the geographic scope of the sample, and the ability to reach hard-to-identify populations (Baltar & Brunet, 2012; Snee, 2008). However, researchers must take steps to ensure representativeness of their samples to minimize any selection bias.

Haythornthwaite (2005) notes that technology makes connections between individuals possible, but they are only activated by some sort of social action between the members. Boyd & Ellison (2008) add that online social networks tend to conform to individuals' actual networks. That is, on large social network sites, people are not necessarily looking to meet new people. Rather, they are primarily communicating with people who are already a part of their extended social network. Thus these online networks tend to approximate actual social networks. In a study of Argentinian immigrants in Spain, Baltar & Brunet (2012) found that their use of Facebook and snowball sampling improved representativeness and response rates. They attribute the latter to the increased confidence of potential respondents from the ability to view the researcher's profile before responding. They also found that the respondents were truthful in their responses. Avnimelech & Feldman (2010) used LinkedIn to develop a sample in their study of entrepreneurs who subsequently founded companies. To validate the representativeness of the LinkedIn sample, they compared the LinkedIn profiles to a database of founders, which resulted in a 70 percent match.

Use of a social network site can constitute a set population and geographic scope, but that is not sufficient to ensure representativeness. Wong (2008) argues that matching

purposive samples with population characteristics can minimize selection bias when using uncorrelated properties. Brickman-Bhutta (2012) adds that this approach can preserve correlations of interest, but researchers must be sure the potential source of bias does not correlate with the relationship of interest. Achieving representativeness in this manner may not be useful in supporting statistical analysis for the purpose of predictive generalizations, but it does support theoretical validation (Baltar & Brunet, 2012).

Indian immigrants working in the information technology sector in the U.S. constitute a hard-to-find population. However, many of these professionals are members of LinkedIn. Comparing LinkedIn profiles to chapter leaders for The Indus Entrepreneur in each region of the U.S. resulted in a 94 percent match (the Indus Entrepreneur membership was the primary source for Indian respondents for Saxenian (2002a)). There are over 200 million LinkedIn members worldwide, with 75 million in the U.S. (Nishar, 2013). The largest LinkedIn industry group is for the members in information technology and services.

LinkedIn publishes profiles of professionals on the Internet that can be used to identify Indians working in the information technology and services sector in the U.S. LinkedIn does not specifically identify individuals by country of origin. Nevertheless, by including the keyword "India" in the search, one can quickly narrow down a likely candidate pool (over 40,000 individuals are in this pool). Appropriate candidates are then selected by examining their education and work history to verify their Indian origin. There is still some potential bias given that not all Indian information technology professionals publish a profile on LinkedIn. For those individuals who do publish

profiles, it likely suggests they are open to maintaining professional contacts and thus may be open to participation in transnational communities.

Another limiting factor may be due to the likelihood that information technology professionals, by training and experience, do not trust electronic mail from unrecognized sources. LinkedIn, however, does not publish electronic mail addresses for its members. Rather, one must send an internal message through LinkedIn. This gives the recipient the option of accepting or declining the message without sharing contact information. It also allows him or her to review the profile of the sender to help judge the veracity of the source. In addition, the survey was provided as an encrypted link via SurveyMonkey to further secure communication. These measures help minimize the number of subjects rejecting survey requests. Nevertheless, the information technology professionals responded at a slightly lower rate (21 percent) compared to the medical professionals (25 percent) and the academics (28 percent). There was also a higher instance of incomplete responses that had to be dropped due to insufficient information (23 responses provided only demographic information). One of the information technology professionals interviewed offered the following unsolicited explanation regarding the participation of other Indian information technology professionals in the survey:

> Normally, Indians are not open to talk about their situation. Indians will talk to their Indian friends. You will not find many people opening up or speaking out to an American. On the one hand, they are taking an opportunity of an American, but on the other hand are criticizing the system. (Interview Participant 3, 2012)

This comment suggests there are many Indian information technology professionals who may not be comfortable discussing their situation in the U.S. These individuals may then be less likely to participate in transnational communities, though perhaps more likely to return to India.

In surveys of this nature, there is also potential for a self-selection bias and that the respondents will not be representative of the broader population. To improve the representation of the responses, a profile of respondents was created based on estimates from the American Community Survey data (Ruggles et al., 2011). The profile provides a distribution of information technology professionals by state and region across the U.S. In accordance with Wong (2008), purposive sampling of Indian information technology professionals is conducted based on the state and region of residence. Region of residence is not likely correlated to immigration behavior (the lack of correlation is verified in Chapter 7). To further improve the representativeness of the sample, repeated sampling is used based on the responses, to that point, to target underrepresented areas. A limitation of LinkedIn is the restriction on the number of messages that may be sent per week based on the fee paid. This limitation, though, did not overly constrain the repeated sampling approach. Figure 3 illustrates the respondent distribution by census region, with standard error bars, in contrast to the estimated distribution in the American Community Survey.

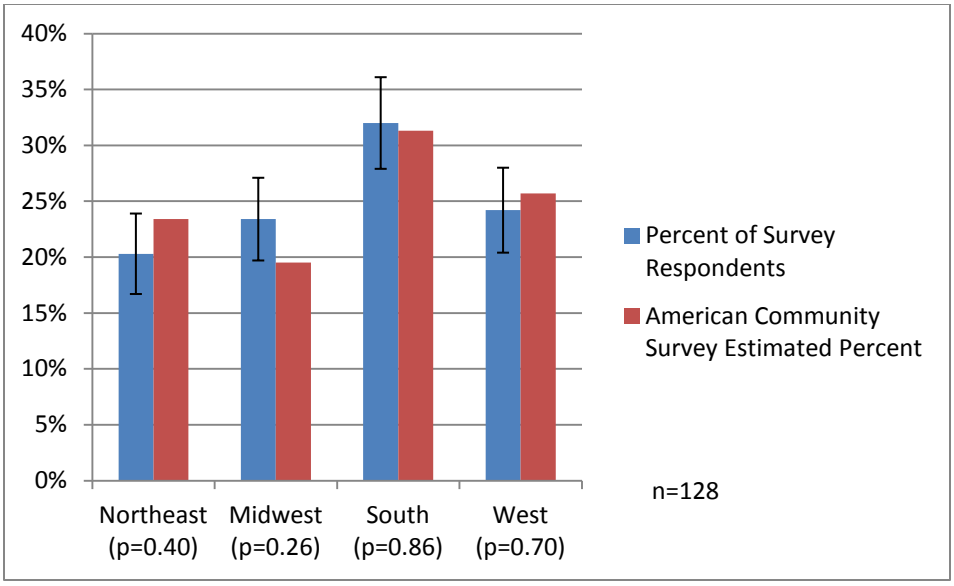

Figure 3. Distribution of information technology survey respondents by census region

Figure 3 shows that the respondents are widely distributed across the U.S. The p-values for testing any significance in the difference in regional representation range from 0.26 for the Midwest to 0.86 for the South. Thus there is no significant difference for any region. However, there is a concentration of respondents from California, Texas, New York, and New Jersey (accounting for 32.8 percent of the responses). Estimates from the American Community Survey data put this concentration at 43.3 percent for these states (Ruggles et al., 2011).

Table 4 provides some basic demographic information on the respondents. Most respondents are relatively young, male, highly educated, somewhat recent arrivals, and H-1B visa holders. This is characteristic of the Indian population at large working in information technology, based on the American Community Survey data profiles (Ruggles et al., 2011). The exception is that females are underrepresented, which should

account for about 23 percent of the population. The repeated sampling approach with LinkedIn is less effective with respect to gender since it is not always apparent in the LinkedIn profiles (name and photo may not be included). Females also made up only 9 percent of the responses in Saxenian (2002a). There may also be a cultural or other factor that deters Indian female information technology professionals from responding to surveys. Consequently, gender is not further considered in this analysis.

Table 4. Demographic characteristics of information technology survey respondents

Characteristic	Response Rate	Response Count	Reference Rate
Age 26-35	55.0%	78	53%
Male	91.4%	117	77%
Attained a master's degree or higher	70.3%	90	55%
Settled in the U.S. in 2000 or later	84.1%	106	*
Naturalized citizen	16.8%	65	28%

* Not available

Enabling Factors for Transnational Communities

Two key enablers of transnational communities relate to the ability of immigrants to maintain social and professional relationships within their host community, as well as the access and relationships to home-country resources. Host communities provide a forum for immigrants to share information on technology, jobs, and business opportunities. They may also be a source of support when pursuing those opportunities. Further, should

the immigrants return to their home countries, the connections and relationships they established, while in the U.S., could help them in the pursuit of offshore business opportunities. Similarly, immigrants' relationships with home-country resources provide a channel for exchange of information and pursuit of opportunities.

Host Communities

Figure 4 portrays the participation and frequency of attendance by Indian information technology immigrants at immigrant and professional associations (not specific to immigrant groups). It shows that a majority of the Indian information technology immigrants (79.7 percent) never attend meetings of immigrant associations; however, a majority of these immigrants (70.3 percent) do participate in professional associations. They also attend these meetings frequently, with 46.9 percent attending two or more times a year.

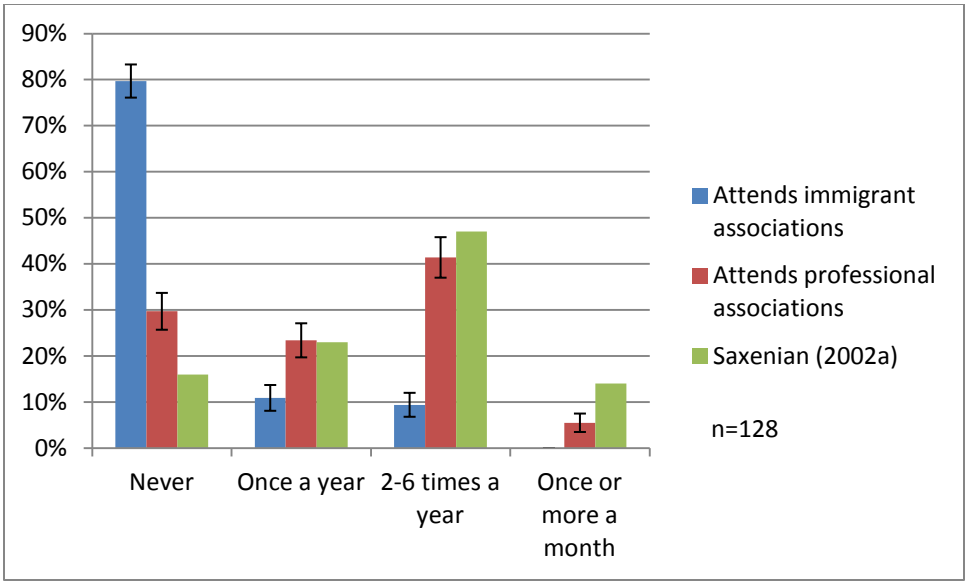

Figure 4. How often do you attend meetings of immigrant or professional associations?

Figure 4 also illustrates Saxenian's results whereby 84 percent of Indian information technology immigrants participated in immigrant or professional associations. Saxenian (2002a) recognized that the data collection methodology used would likely contribute to a higher participation rate in associations. Yet the current data, which are not based on data collection from associations, are still relatively high in their participation in professional associations. Saxenian (2002a) also reported that only eight percent of the Indian respondents served as an officer or board member of these associations. The current survey results indicate that still only 7.8 percent of respondents serve as officers or board members.

These data suggest that current Indian information technology immigrants are still active in host communities. However, these host communities are more focused on their professional ties rather than nationality. Such professional ties would enable Indian

information technology immigrants to establish relationships with other individuals active in their professional community who are not necessarily from India.

Home-Country Resources

Multiple indicators are used here to assess Indian information technology immigrants' access to, and relationships with, home-country resources. These indicators cover traveling to India to meet with peers, exchanging information with peers, arranging professional relationships or business contracts in India, advising Indian companies, and meeting with Indian government officials.

Figure 5 denotes the frequency with which Indian information technology immigrants travel to India for social and professional purposes. It is notable that 85.9 percent travel to India one or more times a year for social purposes; while 36.2 percent travel one or more times a year for professional purposes. The latter increases to 46.2 percent for respondents over age 35. Saxenian (2002a) reported that 52 percent travel one or more times a year for professional purposes. Saxenian (2002a) also found a correlation between age and travel. This is understandable given the expense and time required for travel to India.

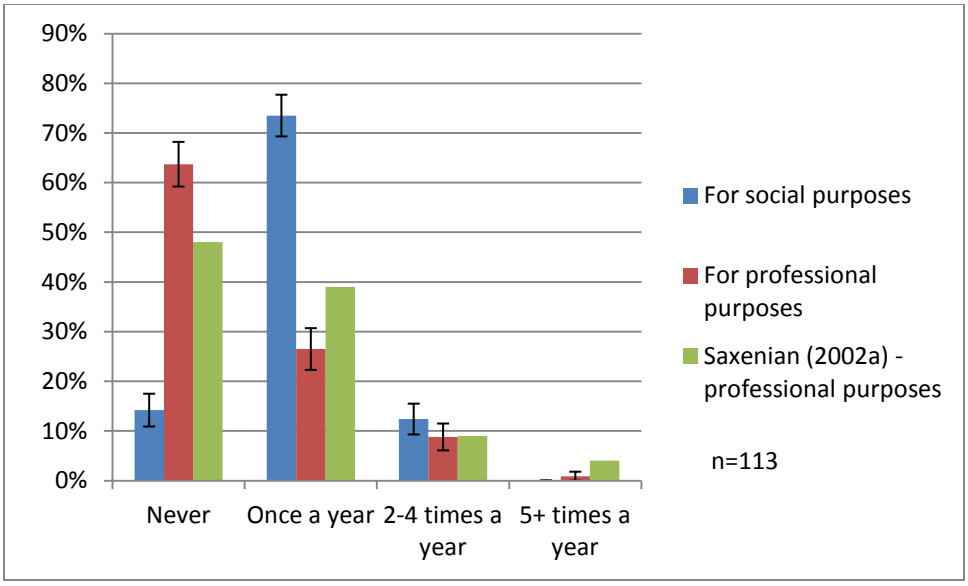

Figure 5. How often have you traveled to India for social or professional purposes on average during the past three years?

The Indian information technology professionals interviewed for this research indicated that their professional travel to India was normally done through their employers. One information technology professional indicated that the headquarters for his company was back in India (Interview Participant 2, 2012). He would often travel to India with his U.S. clients to introduce them to the operations in India.

The exchange of information on jobs or professional opportunities, technology, and research not only indicates access to home-country resources, but also suggests the strength of the relationship and information flow between them. Figure 6 shows the percentage of respondents that said they regularly shared information. Note that the percentage of respondents that regularly share information on jobs or professional opportunities is comparable to that reported by Saxenian (2002a). The percentage of

respondents regularly sharing information on technology exceeds Saxenian (2002a) by an additional 11 percent. The respondents who indicate that they sometimes or regularly share information on technology is 84.6 percent. This survey added "research" as a category for information sharing. Over 21 percent of respondents regularly share information on research. Taken together, these responses characterize a strong flow of information between the respondents and their colleagues in India.

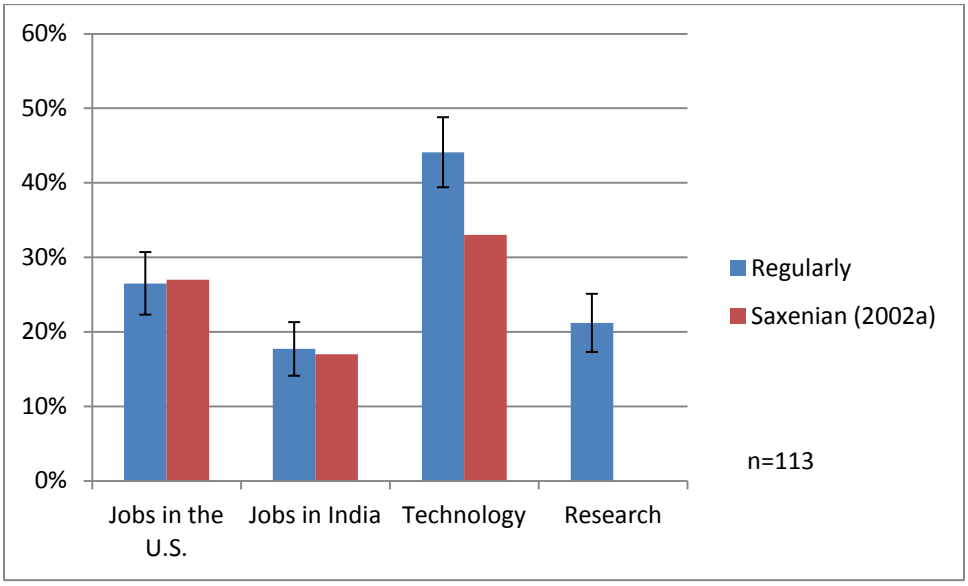

Figure 6. How often do you exchange information with friends, classmates, or professional associates in India?

Figure 7 looks beyond the sharing of information between immigrants and their home-country colleagues to consider the arranging of business contracts, serving as a company advisor, and meeting with government officials. The frequency of positive responses is less than that reported by Saxenian in each activity. For example, 25.2

percent arranged contracts, which is well below the 46 percent level reported by Saxenian (2002a). However, 39.3 percent of the current respondents shared that they helped others arrange such professional relationships. Only 6.3 percent indicated they had met with government officials. This is consistent with the lack of trust in government officials by information technology professionals discussed later in this chapter.

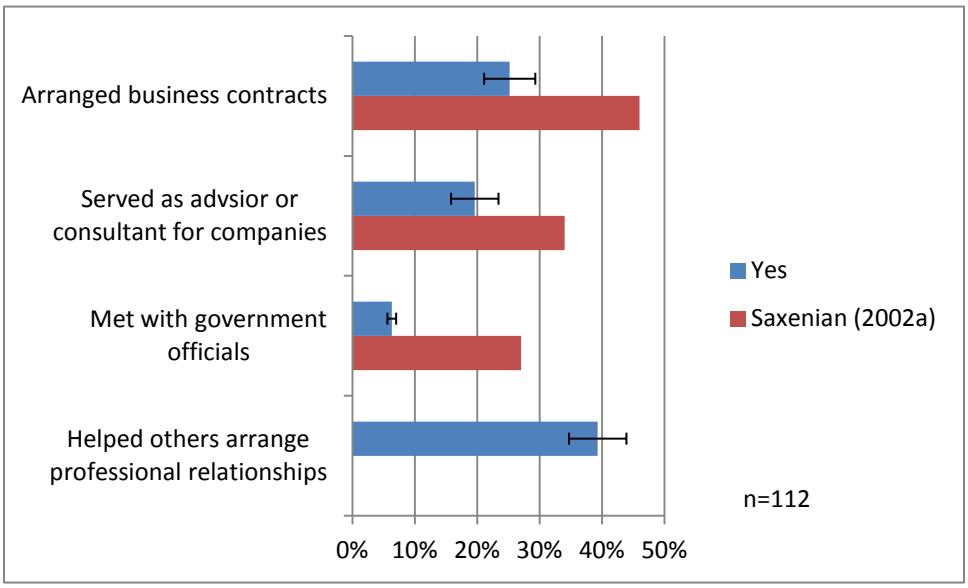

Figure 7. Have you had these types of contacts in India?

There may be another factor that explains the lower direct involvement in arranging contracts based on the characterization provided by the interview participants. Like travel, they indicated that most of their interaction with peers in India is through established channels via their employer. They described a common business model where the information technology professionals in the U.S. work primarily with the local customers and technology teams to define the scope, develop the requirements and

blueprint, and then design the work packages. They would then send these work packages to the teams in India that would configure, code, and deliver the packages back to the U.S. for testing and deployment. The U.S.-based team maintains communications with the India-based team throughout this process to ensure the design is understood and the packages are implemented to specifications. This depiction characterizes a high level of access and interaction with home-country resources. However, it is done primarily through existing work channels as part of the global production process.

One respondent classified information technology employment in India into three categories: captives, product companies, and information technology services (Interview Participant 20, 2012). Captives include global companies, like Bank of America, that locate their information technology divisions in India to take advantage of the available skilled workforce. Product companies, like Microsoft and Siemens, are developing new products for the local and global markets. The service companies, like Accenture, Wipro, and Infosys, operate in the implementation and delivery model described above with high levels of interaction with home-country resources. The interview participant estimated that service employers account for about 90 percent of the information technology employment opportunities in India.

Another information technology professional went on to say that it is not unusual for the Indian immigrants, on H-1B visas, working in this model to be put on "four or five projects" by their sponsor—exploiting their access to home-country resources (Interview Participant 21, 2012). They are expected to work "19 hour days, including Saturday and Sunday," that they will be "on the phone with India at 3:00 and 4:00 in the

morning, then expected to show up at the office at 8:00 am." He stated that "there are hundreds and hundreds of people who are working in this model." Another interview participant supported this view and added that it is difficult to maintain professional relationships with peers in India outside of this model and thus one is more likely to stay in contact with friends only (Interview Participant 3, 2012). Yet another interview participant acknowledged that this experience is common for Indian immigrants, especially those new to the U.S. (Interview Participant 4, 2012). However, he indicated that it depends on the company. Some companies are well known to operate this way, but this individual got out of that environment and into a company that provides growth opportunities and a good work/life balance. These working conditions may be a consequence of the temporary work visas, like H-1B, which are owned by the employer, but require the immigrant be paid at market wages. The latter is intended to mitigate the risk to native workers from being displaced by lower paid competition, but firms can still gain a cost advantage by assigning the immigrant to many projects and requiring long work hours. At the same time, the immigrant may be beholden to the employer since the employer holds the visa. This phenomenon may, in turn, lead to dissatisfaction and an increase in return migration.

Speaking directly on access to home-country resources, an engineer working in the business model described above decided to return to India in 2007, after ten years in the U.S., to start an information technology development company (Interview Participant 20, 2012). His company implemented the work packages described above for delivery back to the U.S. He grew that company to 80 staff in three years. Though information

technology-skilled resources were plentiful in Bangalore where he located the company, he found the work culture to be far different from what he had become accustomed to in the U.S. He said that in the U.S., "people are more independent and take ownership and responsibility for their work." Whereas in India if you "raise your head, you get shot down." He described the workforce as "brilliant mediocres—happy to not do anything till told what to do." Though "you can't be too pushy, they will just quit and go elsewhere." He also shared that with rising demand and expectations on information technology professionals in India, wages are rising, and that companies in the U.S. are competing their offshore work in other countries—even within the same division of the company. Thus, he found his company competing with Malaysia and the Philippines. In support of this observation, IBM Global Business Services (2010) reported that the Philippines surpassed India as a global leader in business process outsourcing in 2009. Further, it reported that India experienced substantial declines in research and development investment from abroad.

The surveys and interviews support the continued presence of high levels of interaction between Indian information technology immigrants and their peers in India. Though, these exchanges frequently take place in the context of an established global production network. There is some evidence that firms operating in the U.S. may be exploiting the immigrants' access to home-country resources, which could lead to dissatisfaction and return migration. Also, there are indications supporting the need for the information technology industry in India to move up the value chain—taking on

higher-value functions in the network as Ernst (2003) observed in the East Asian electronics industry. These implications warrant further research.

Supporting and Inhibiting Factors for Returning to India

As Saxenian (2002a) found, returning immigrants had to overcome weaknesses in their home countries infrastructure and institutions in order to successfully pursue transnational opportunities. In the case of India, Saxenian (2002a) reported that 30 percent of respondents identified unreliable infrastructure as a significant problem for doing business in India; 16 percent identified government bureaucracy. For the current research, preliminary interviews with subject matter experts and immigrants were used to identify possible additional factors influencing return migration and circulation. In addition to infrastructure and government bureaucracy, the factors cover professional growth, culture, family relationships, and the desire to contribute to the welfare of India. Survey respondents were then asked to rate the extent to which these factors supported or inhibited their return to India.

Figure 8 lists those factors that the respondents indicate somewhat supports or supports return. Similarly, Figure 9 lists those factors that somewhat inhibits return or inhibits return. One factor not shown, "Favorable government treatment of returnees in India," had an equal number of respondents indicating it supports or inhibits return. These figures indicate that nearly all of the factors are supportive of information technology immigrants returning to India. Of note is the change in view on the infrastructure. Whereas 30 percent of Silicon Valley respondents had identified

infrastructure as a top problem to overcome in 2001 (Saxenian 2002a), now 66.1 percent of nationwide respondents indicate the infrastructure somewhat supports or supports return. This may reflect the program by India to establish software technology parks and export processing zones across the country under the Software Technology Parks of India scheme established in 1991 (STPI, 2011). A key function of this program is to establish and manage infrastructural resources. There are now 52 such technology parks across the country. In another survey of returning engineering professionals, Kelly Engineering Resources (2011) reported that 88 percent of the respondents indicated the infrastructure was better.

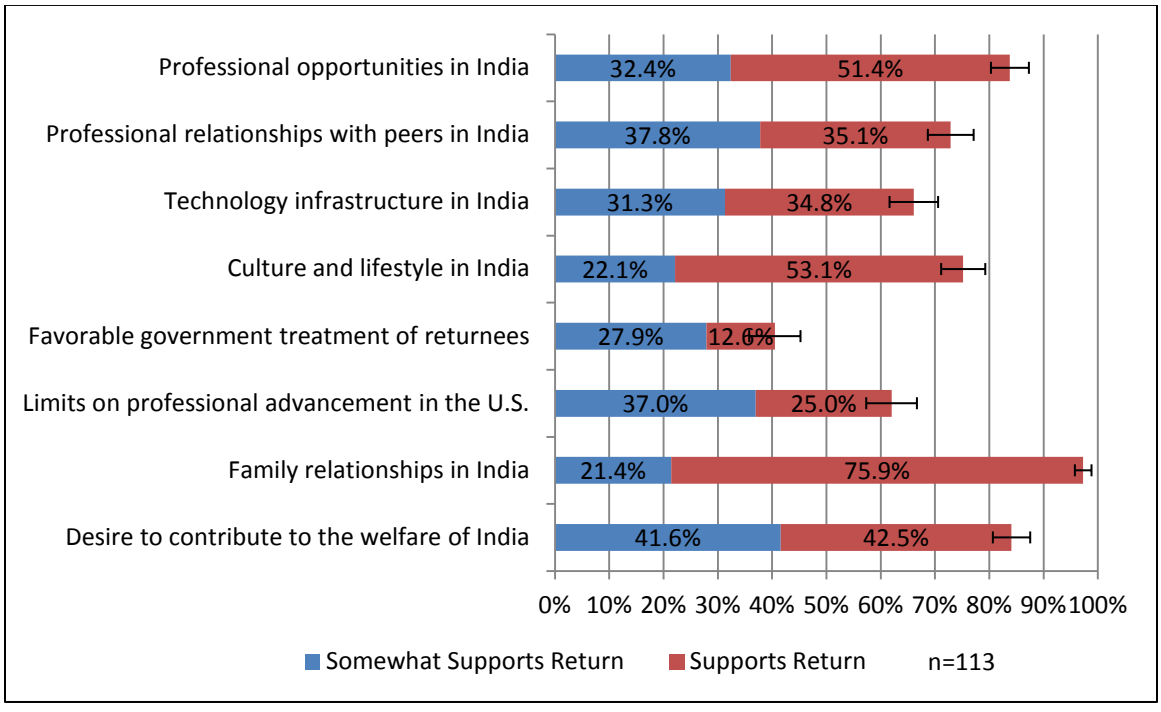

Figure 8. Please rate the extent these factors somewhat supports or supports return to India

Another response that stands out is that 97.3 percent indicate that family relationships in India somewhat supports or supports return. This response outweighs the 34.5 percent that family relationships in the U.S. somewhat inhibits or inhibits return as shown in Figure 9. Given that most of the respondents are under 35 years of age and recently arrived to the U.S., one can expect that their families in the U.S. are newly forming and that their stronger relationship is with family in India.

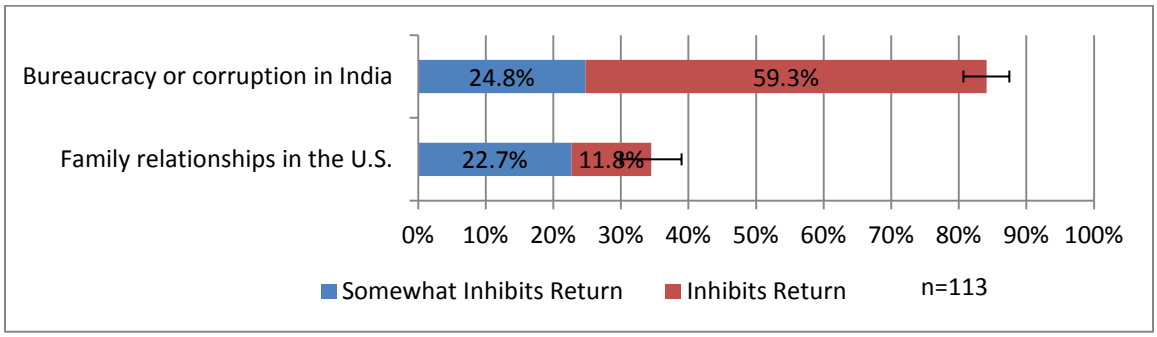

Figure 9. Please rate the extent these factors somewhat inhibits or inhibits return to India

One interview participant explained that they have large, extended families back home in India and that, in his case, vacations at home are needed to spend time with all branches of the extended family (Interview Participant 19, 2012). Another interview participant added that the social structures are much different in the U.S. than in India (Interview Participant 21, 2012). He feels that social life in the U.S. is very restrictive, whereas in India it is more supportive. He stated that "he does not want to grow old here" in the U.S. due to this difference. In a survey of Indian and Chinese immigrants

who had returned to their home countries, Wadhwa, Saxenian, Freeman, Gereffi, & Salkever (2009) found that family played an important part for the Indian immigrants' decisions to return. They reported that 89.4 percent believed that care of aging parents was better in India and that 88.0 percent believed closeness to family and friends was also better in India.

The response on the limits on professional advancement in the U.S., with 62 percent indicating that this somewhat supports or supports return to India, is also an inhibitor for staying in the U.S. One interview participant explained that due to his H-1B visa status that he "could not work for someone else," that he "could not work on other projects," that he "could not own your own business," that it is "difficult to leave and come back," and that a "person loses his best years, his spark" while hoping for a green card (Interview Participant 3, 2012). Several respondents wrote in the survey of their displeasure over their immigrant status. One wrote the following:

> Have to live in constant fear of losing visa status supports return, after 8 years in US, 5 years of tax returns, master in science and MBA degree in US university does not give you guarantee that you will return back to US after a family visit to India because of immigration practices observed by US. It pains to see that an illegal immigrant features most in the plan of events rather than a law abiding legal immigrant. Leaves [one] with no other option than to go back. (Technology Survey Respondent 52, 2012)

These responses and comments suggest that some immigrants may return to India due to a restrictive experience in the U.S. over some opportunity in India. Yet in the case

described in the interview above, the individual chooses to remain in the U.S., hoping for that green card, because his wife and family would not enjoy the quality of life in India.

As shown in Figure 9, 84.1 percent of the respondents view bureaucracy and corruption in India as an inhibitor to their return. Many of the interview participants commented on this aspect of life in India. One shared a story of when he visited an Indian college (Interview Participant 38, 2011). He asked a class of students "how many of you believe that nothing can be done in India without giving a bribe?" He estimated that 95 percent of the students raised their hands and added that "there is a mindset that nothing can be done in India unless you are corrupt." In his case, he has no plans to return to India permanently, however, he believes that to change this mindset, Indian adults must provide role models for the children. He is actively involved in a social venture to provide sustainable sources of clean drinking water in his hometown.

Another respondent pointed to government inefficiency and also stated there is corruption from the top to bottom layer (Interview Participant 1, 2012). He viewed any effort to do something positive as a struggle and that some people just give up and stay in the U.S. He does plan to return to India soon and also hopes to start a social venture in organic farming. Survey and interview respondents also commented on the role of connections and status. They emphasized the need for connections to get ahead and that status (i.e., education, job, family) is constantly being evaluated, as well as caste, when trying to grow professionally.

Rival Explanations

The previous sections presented the data with respect to the conditions that support or inhibit the formation of transnational networks as a possible explanation of the positive growth in human capital exhibited in the information technology sector. Recall that Table 1 reported an emigration rate of 11.3 percent for Indian information technology professionals to the U.S. and a 10.4 percent growth rate in India. As discussed in Chapter 3, internal validity is difficult to establish in a case study such as this, where the behavior cannot be directly observed. To address this challenge, Chapter 3 identified three rival explanations: migration relevance, brain-gain effect, and time period-specific scenarios. This section considers the survey and interview data for each of these scenarios.

Migration Relevance

Migration relevance refers to the rival explanation that there is no relationship between high skill migration and economic outcomes. Although the data reported to this point may indicate an environment conducive to transnational communities and circulation, this scenario considers the possibility that information technology immigrants are not pursuing business opportunities in their home country, either remotely from the U.S. or through return migration, and thus their migration is not a factor in economic outcomes. If that were the case, then the migration experience in the information technology sector would neither be relevant nor an adequate basis for testing the hypothesis.

Unfortunately, reliable, quantitative data on return migration of information technology professionals to India are not available. The 64th Round of the National

Sample Survey, conducted by the Government of India, does examine return migration (both internal and outward) (National Sample Survey Office, 2010). That survey estimates that 16,100 migrants returned from the U.S. in July 2007 to June 2008. In that same time period, the U.S. had a net gain of 36,520 Indian immigrants (Ruggles et al., 2011). However, these data do not give any indication of skill-level and sector. Based on a survey of 750 returnees, Kelly Engineering Resources (2011) estimate that 300,000 Indian engineering professionals will return to India between 2011 and 2015. This would constitute a substantial accumulation of human capital in India; though these data do not specify the countries of origin or sector of employment.

The approach herein, examines return migration indirectly via the intentions and experience of the survey and interview participants. Figure 10 shows the percentage of respondents that indicate they are somewhat likely or quite likely to return to India. Nearly 64 percent of respondents said they were somewhat likely or quite likely to return. Approximately one-third indicated they were quite likely to return. This is a stronger response than that reported by Saxenian (2002a).

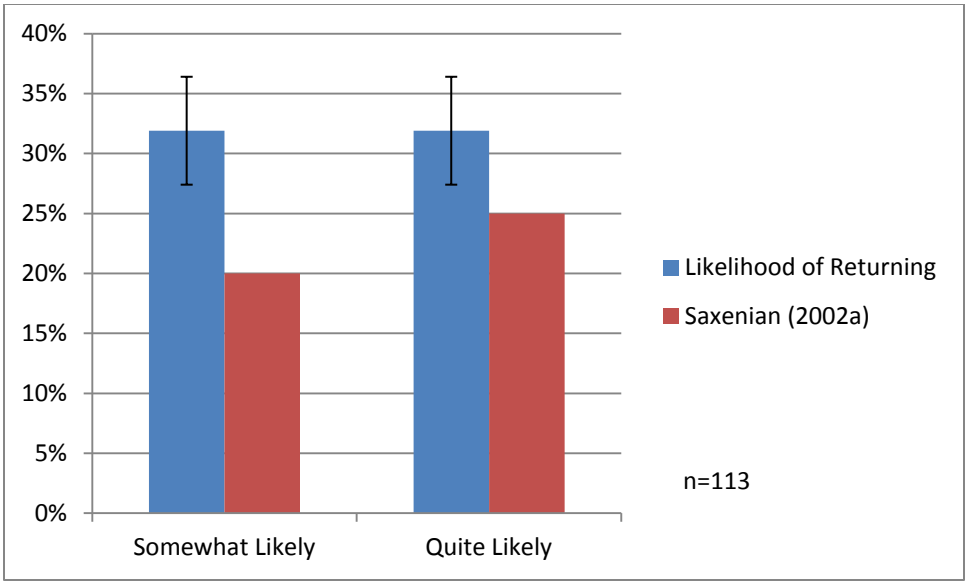

Figure 10. Would you consider returning to live in India in the future?

Many of the interview participants shared that when coming to the U.S. they do not think about the long-term prospects for settling in the U.S. given they have good prospects back home. Of course, these responses speak to intentions rather than actions. Figure 11 reports on those technology immigrants known by the respondents to have returned to India. Nearly 88 percent of the respondents know at least one person who returned; over 21 percent know ten or more technology immigrants who returned. Again, this is a stronger response than that reported in Saxenian (2002a).

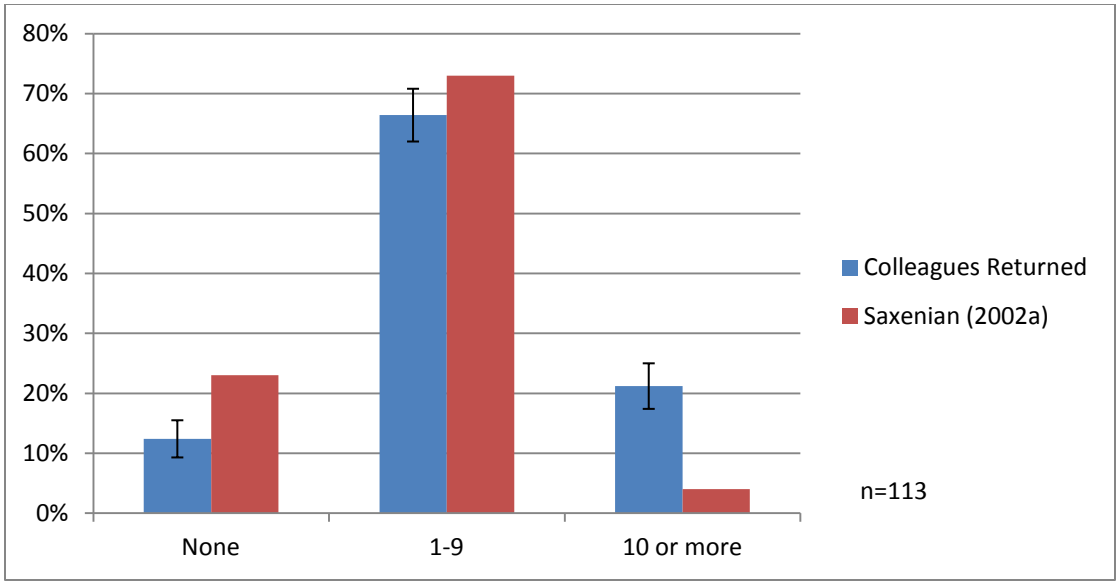

Figure 11. How many of your technology friends and/or colleagues have returned to India to conduct research or business?

Figures 10 and 11 show a high potential for Indian information technology immigrants to return to India and contribute to its growth. Previously, Figure 7 illustrated the direct and indirect involvement of Indian information technology immigrants in the U.S. remotely establishing business relationships in India. Figure 12 reports on the respondents' direct investment in business and social ventures in India, with 33.7 percent having invested at least once. The interview participants also expressed the ability or interest in conducting business with India, remotely or directly. Their responses illustrate the range of possibilities whereby one started a business in the U.S., then he transitioned it to India; another started a business in the U.S., then he helped others migrate from India to support that business; yet another returned to India to start a business that

provided services to the U.S.; one started a business in India from the U.S.; and several expressed the desire to start their own businesses someday in the U.S. or India.

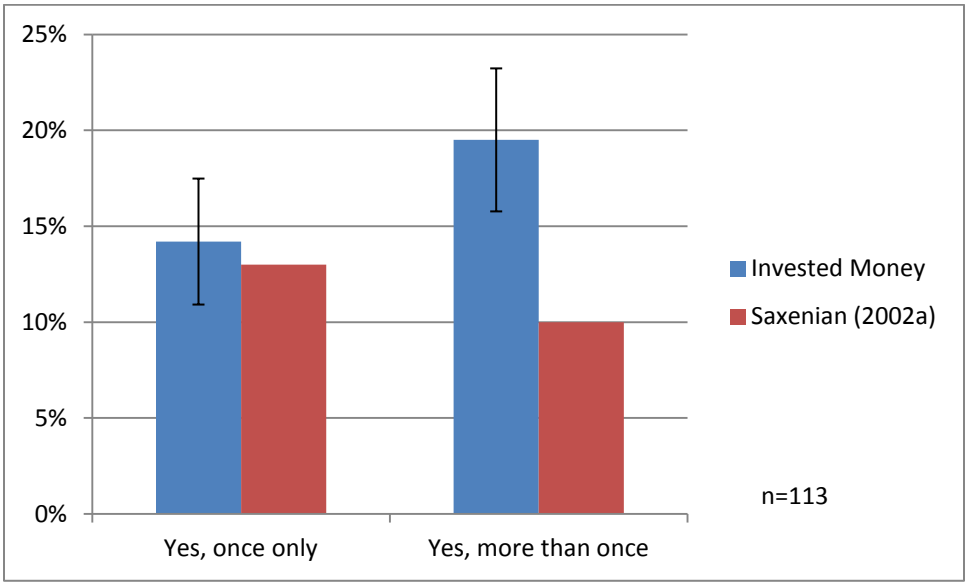

Figure 12. Have you invested your own money in professional or social ventures in India?

The data above show a substantial magnitude of activity relative to the information technology immigrants in the U.S. with respect to intentions for returning, colleagues who have returned, and investment in Indian businesses. These suggest that migration is relevant and thus the rival explanation does not hold. What is less understood is the magnitude of information technology immigrant activity relative to the information technology sector in India. The information technology sector in India is very large, so the magnitude may not be substantial in absolute numbers. However, given the 794 percent increase to $16.9 billion in imports of Indian business,

professional, and technical services to the U.S. (Office of the United States Trade Representative, 2013), much would be at stake if the ability to remotely deliver services did not exist as exemplified in the information technology sector.

Brain Gain

Another rival explanation to consider is that although there is evidence of circulation among Indian information technology immigrants, the human capital growth in India is due to a brain-gain effect. That is, presented with economic opportunities abroad, individuals will be induced to invest in their education, even if they do not actually emigrate (Stark, 2004). Since surveying or interviewing Indian information technology professionals who did not emigrate to the U.S. is outside the scope of this research, an indirect approach was taken by asking interview participants whether they had intentions to emigrate as they invested in their undergraduate education and careers. Many of the interview respondents indicated they and their families originally had no expectation of going overseas. Rather, many said they came to the U.S. to receive an advanced degree with the expectation they would then return to India—they noted that they highly value education. However, after completing their advanced education they decided to stay in the U.S. on H-1B visas while gaining work experience. More recent arrivals to the U.S. indicated they were transferred to the U.S. by their employers in India, as well as seeking advanced education. About 24 percent of the survey respondents still have L-1 visas (intra-company transfers) or F-1 visas (full-time students).

A minority of the interview participants indicated that they had intentions to migrate upon completing their undergraduate education in information technology. In nearly all cases they were due to strong family influences. It was usually the case where an elder in the family believed the only way for their family member to succeed and get out of their current economic conditions was to emigrate—specifically to the U.S. Others intended to emigrate because they already had siblings or friends in the U.S. Overall, the experiences reported by the interview participants do not support the brain-gain rival explanation. Varma & Kapur (2013) point to a growing and more likely trend in contributing to growing human capital in India, referred to as brain retain. That is, more information technology students seek advanced education and stay in India due to the increased economic opportunities in India.

Time-Period Specific

The last rival explanation examined here applies specifically to the information technology sector. That is the experiences reported by Saxenian (2002a) were specific to the time period up to the year 2000 when the information technology sector was experiencing the Internet boom. Again, if that were the case, then the migration experience in the information technology sector would no longer be relevant nor an adequate basis for testing the hypothesis. To examine the data for a time period-specific relationship, the current research data are filtered to include only arrivals in the year 2000 or later. In this latter time period the U.S. has experienced multiple recessions, wars, and economic recoveries. These data are then contrasted with Saxenian (2002a), which

includes data on arrivals prior to the year 2000. Table 5 presents this comparison for several of the indicators discussed above (all differences are significant at the 0.001 level). It shows that the respondents arriving in the year 2000 or later exhibit a significantly better likelihood of returning to India and investing in Indian ventures.

Table 5. Comparison of responses before and after the year 2000

Response	**Before 2000**	**After 2000**
Attends association meetings	84%	71.7%
Regularly exchanges information on technology	33%	48.4%
Arranged business contracts in India	46%	21.7%
Infrastructure inhibits returning to India	30%	5.4%
Quite likely to return to India	25%	36.6%
10 or more technology colleagues returned to India	4%	22.6%
Invested money more than once in ventures in India	10%	19.4%

Similar to the data reported previously, it is evident that the respondents are active in host communities—more so in professional associations than in immigrant associations. The respondents have access to home-country resources and regularly share information on technology. Much of this exchange takes place through their current employment channels. The respondents' perceptions on institutional factors are more likely to support, than inhibit, their return to India. Many of them indicate they are quite likely to return and have colleagues who did return to India to live. A fair number of the

respondents also have an interest in starting a business and have invested their own money in ventures in India. Again, the data do not support a rival explanation, in this case, that the behaviors observed by Saxenian were unique to that time period of rapid growth in information technology.

Findings and Conclusion

This chapter presented the survey and interview data on Indian information technology immigrants with respect to the variables of the model defined in Chapter 3; including host communities, home-country resources, infrastructure, and institutions. These data were contrasted with the data collected by Saxenian in 2001. The objective was to validate that the current data, based on a broader geographic scope, exhibited similar behaviors on the formation of transnational communities, circulation, and human capital accumulation; thus providing a basis to examine the medical and post-secondary education sectors. To assess internal validity, this chapter also considered three rival explanations identified in Chapter 3: migration relevance, brain-gain effect, and time-period specific.

Based on the data presented, this research finds the following:

- The respondents are active in professional communities—more so than immigrant-specific associations.
- The respondents have high levels of interaction with their peers in India—though mostly through their employment and in the context of the global production process.

- Technology infrastructure is much less of a concern to these respondents than those responding in 2001.
- Many factors support the respondents return to India, including professional opportunities, culture and lifestyle, and the desire to contribute to the welfare of India. Family relationships are a particularly strong supporting factor.
- Bureaucracy and corruption continue to be inhibiting factors for the respondents' likelihood of returning to India.
- The data do not support the rival explanations that the migration experience is not relevant to the economic outcomes, that the human-capital growth exhibited in India is due to a brain-gain effect, and that the data reported for the information technology sector was specific to the period of rapid growth during the Internet boom.

The relationship between India and the U.S. in the information technology sector has evolved substantially over the past 30 years, from a model of body shoppers that migrated to the U.S. to a global production system that promotes circulation of immigrants. The Indian information technology immigrants are active in professional associations, regularly share information on technology with their peers, and invest in Indian ventures. However, unlike the time period documented by Saxenian when similar outcomes were more entrepreneurial in nature, today they are part of an established global production process. However, the data presented also point to possible changes in the information technology sector that could have a bearing on this scenario. It reports

adverse working conditions of many Indian information technology professionals in the U.S. that could contribute to higher return migration or deter migration. It reports on a growing group of underqualified and underemployed professionals, as well as challenges in managing resources in India, that could impact India's comparative advantage. It also points to the need for India to move up the value chain in order to continue its leadership role and growth.

These findings are consistent with the scenario leading to the formation of transnational communities, circulation, and accumulation of human capital. The conclusion is that the information technology sector provides a viable basis for comparison to Indian immigrants' experiences in the medical and academic sectors as proposed. At the same time, one must recognize that behaviors in this sector are dynamic and that the mutually beneficial environment in place today is subject to change.

Chapter 5: Medical Services Sector Data

The medical services sector, particularly the services provided by medical doctors, is included in the case study since it is classified as a nontradable service and there is a substantial migration flow from India to the U.S. It is also of special interest due to the potential impact this flow may have on the health and welfare of India. As defined in Chapter 3, the medical services sector represents the scenario whereby migration of Indian medical doctors to the U.S. is coincident with slow growth of medical doctors in India. As reported in Table 1, the emigration rate of medical doctors to the U.S. (7.8 percent) is greater than the annual growth rate in India (2.9 percent). This chapter presents and examines the data gathered via surveys and interviews with Indian medical doctors working in the U.S. It also compares these results to those presented in Chapter 4 on information technology professionals. The analysis is based on the model and variables provided in Chapter 3 to ascertain whether the data exhibit the characteristics and behaviors with respect to the formation of transnational communities, immigrant circulation, and the accumulation of human capital.

To provide a context for the analysis, the chapter begins by reviewing the international mobility of medical doctors, the state of the Indian health system, as well as the supply of medical doctors, and the evolving globalization of health care. The literature portrays a brain drain of healthcare professionals from the developing countries

to the developed countries. It characterizes the challenges to the Indian health system in serving the second largest population in the world. It reports on a medical education system that produces twice as many doctors than the U.S., but only to have many of those doctors go overseas for specialty training. It also introduces the nascent global healthcare industry in the form of hospital chains and medical tourism.

Next, this chapter reviews the data collection strategy—particularly the use of teaching hospitals to provide a sample frame. This section discusses how the selection bias is mitigated and representativeness is improved by matching purposive samples with population characteristics, while maintaining correlations of interest. This section also provides basic demographics of the respondents in contrast to the reference population.

The main focus of this chapter is then the presentation of the survey and interview data on the Indian medical doctors in accordance with the variables of the model as described in Table 3. It examines the data that measure the conditions for the formation of transnational communities, including active host communities and access to home-country resources, as well as the infrastructure and institutional factors that might inhibit circulation. The data show that the respondents are more active in professional communities than the information technology professionals. However, the medical doctors exchange information with peers far less than information technology professionals, though many have consulted with peers in India on medical care. Fewer medical doctors are attracted by professional opportunities in India than the information technology professionals, and fewer medical doctors have concerns over family ties in

India. The data also indicate that bureaucracy and corruption in India are inhibiting factors for the respondents' likelihood of returning to India.

Given that the data presented do not strongly support the formation of transnational communities and immigrant circulation in the medical sector, this chapter then considers the possible rival explanations identified in Chapter 3. Beginning with migration relevance, it assesses whether medical doctor immigrants are pursuing opportunities remotely or through return migration. The data indicate much less activity in this area than with the information technology professionals. A possible brain-gain effect is considered next to explain the growth, albeit relatively low, of medical doctors in India. Based on the interviews, most respondents reported that they did not pursue a medical education with the intent to emigrate. Rather, their emigration was driven more by the desire to obtain specialty training.

The chapter closes with the finding that the data on medical doctor immigrants are not consistent with the scenario leading to the formation of transnational communities that facilitate circulation and the accumulation of human capital. The conclusion is that migration of medical doctors, whose work is classified as a nontradable service, does not contribute to a positive-sum accumulation of human capital in the medical doctor immigrants' home country. Rather, the data on Indian emigration in the medical sector support the brain-drain phenomenon.

International Mobility of Medical Doctors

Following World War II, the pattern of medical doctor migration shifted from a bi-directional relationship between developed countries to one where medical doctors primarily emigrated from developing countries to developed countries (Mej'ia, Pizurki, & Royston, 1979). It was estimated that by 1972 there were 140,000 medical doctors working outside their country of origin. At that time, the U.S. was the leading recipient, with 77,000 immigrants, and India was the leading supplier, with 15,000 emigrants worldwide (6,300 in the U.S.). Mullan (2005) shows this pattern was still true almost 30 years later, with nearly 60,000 Indian medical doctors working outside of India. As noted in Table 1, today there are about 69,000 Indian medical doctors working in the U.S.—a tenfold increase in 40 years.

International mobility of medical doctors is a significant aspect of high-skilled migration, with consequences of greater concern due to its link to the health of the people. This section establishes the context for the data presented by reviewing the literature on the global brain drain of medical doctors, its costs, and consequences. It then examines the Indian health system and its supply of medical doctors, as well as the doctors' path into the U.S. health system. Finally, it considers the globalization of health care and the potential influence on migration by hospital chains and medical tourism.

Medical Brain Drain

In 2006, the World Health Organization raised the international alarm over the shortage of health workers in developing countries (WHO, 2006). It estimated that there would be

a deficit of 2.4 million doctors, nurses, and midwives in meeting the Millennium Development Goals for improving health, reducing mortality, and reversing the spread of major diseases. The report also expressed concern over the distribution of these critically needed personnel, whereby those with the greater need had the least supply—a situation that is exacerbated by the migration of medical personnel from the countries that are most in need. It noted that the African region had 24 percent of the disease burden, but only three percent of the medical workforce. Clemens & Pettersson (2007) established a dataset that shows 65,000 African-born physicians and 70,000 nurses were working overseas in the year 2000. Capuano & Marfouk (2013) add that the health indicators for these countries are poor and the mortality rate is high. Chen, Evans, Anand, & Boufford (2004) estimate that nearly one million health workers would be needed in sub-Saharan Africa alone and that the loss of these workers to international migration is crippling health systems in poor sending countries. The World Health Organization recognizes that emigration of the medical workforce is neither the cause of the shortage nor would halting emigration be a sufficient solution.

OECD (2008) acknowledges that even developed countries in the OECD are facing shortages of health workers, particularly as baby boomers reach retirement age, and that it is understandable these countries rely on immigration to help fill the gaps. However, to mitigate the effects on developing countries, OECD (2008) recommends that the member countries consider four options: 1) train more staff at home; 2) increase the retention and delay retirement of existing health workers; 3) raise productivity of existing

health workers; and 4) recruit health workers internationally from other OECD countries or from outside the OECD area.

With respect to international recruitment of health workers, the World Health Organization produced the Global Code of Practice on the International Recruitment of Health Personnel (WHO, 2010). It is a voluntary guideline that can be used as a framework for bilateral agreements among countries to promote ethical principles on international recruitment in a manner that strengthens the health systems of developing countries. Adoption and implementation of the Code of Practice is still in its formative stage. In the U.S., the Health Resources and Services Administration and the Office of Global Affairs with the Department of Health and Human Resources have been designated as the national authorities with responsibility for promoting and reporting on implementation of the Code of Practice (Wakefield & Daulaire, 2011). Preliminary empirical studies report that there is only a limited awareness of the Code of Practice among national and subnational actors among the majority of high-income countries, including the U.S. (Edge & Hoffman, 2011; Mackey & Liang, 2012).

Though medical workforce migration is not the sole cause of the shortage, several studies examine the potential effect of medical doctor migration on child health, lost investment, and potential brain-gain effects. Modelling medical doctor migration data with country health data, Bhargava, Docquier, & Moullan (2011) find a negative association between infant and child mortality rates with the number of medical doctors per capita, but only where adult literacy rates exceed 60 percent. Thus they conclude that reducing the medical brain drain is likely to have only a small benefit. Mills et al. (2011)

estimated the loss of return on investment, due to medical doctor migration based on data in nine sub-Saharan countries, to be a total of $2.17 billion. They conclude that the evidence to date does not show a brain-gain effect compensating for such losses. Kangasniemi, Winters, & Commander (2007) note that for brain gain to occur, the possibility of migration significantly affects decisions to take medical training, and the migrants not be strongly screened. They found neither to be true in a study of medical doctor immigrants in the United Kingdom. Though Bhargava, Docquier, & Moullan (2011) found a positive effect on the decision to take medical training, it was too small to result in a net brain-gain effect. Clemens (2009) notes this correlation does not show causation and one cannot conclude the outcome is an effect of high-skill migration.

Indian Health System

For a developing country that leads in the emigration of medical doctors, the Indian health system faces major challenges in providing for the health of its people (OECD, 2007). India has six medical doctors and nine hospital beds per 10,000 people in population; it ranks third in the world for deaths due to HIV/AIDS; and it is rated as having a very high degree of risk for major infectious diseases (CIA, 2012). The Indian health system has both private and public health care. Private medical practices and hospitals primarily serve middle and upper classes in urban areas; whereas public practices and hospitals, managed by the states, primarily serve poor and rural populations, which constitute the majority of Indians (Rao, Rao, Kumar, Chatterjee, & Sundararaman, 2011). According to the National Family Health Survey, 65 percent of all

Indians seek health care from the private sector; however, 64 percent of rural households do not seek care from the private sector (IIPS, 2007). Rather, many rural Indians seek care from alternative and unlicensed practitioners. The most common reasons for not using the public sector are the poor quality of service and lack of a nearby facility. Only five percent of households report having any medical insurance, thus requiring out-of-pocket expenditures, which creates a barrier for the poor in seeking care from private practices. Out-of-pocket expenses cover 70 percent of the total health care expenditure in India (La Forgia & Nagpal, 2012). Whereas in the U.S., out-of-pocket expenses are 28 percent of the total health expenditure (Centers for Medicare & Medicaid Services, 2012).

Public and private spending are major factors affecting the quality of health care in India. As noted by La Forgia & Nagpal (2012), India has 16 percent of the world's population, but only one percent of the world's total health expenditure. According to Mullan (2006), India spends 5.1 percent of GDP on health care—compared to 5.4 percent in China and 15.6 percent in the U.S. Of the 5.1 percent of GDP spent in India, less than one percent is public spending—giving India a rank of 171 out of 175 countries in terms of public spending on health.

Insufficient spending on health care contributes to shortages of medical practitioners and facilities across the country, but particularly in the rural areas. Rao, Rao, Kumar, Chatterjee, & Sundararaman (2011) report that 18 percent of primary health centers do not have a medical doctor; 38 percent do not have a laboratory technician; and that 52 percent of specialist positions are vacant. Ul Haq Wani, Taneja, & Adlakha

(2013) note that the ratio of doctors to population is six times lower in rural areas than in urban areas. The total ratio of doctors, nurses, and midwives in India is 11.9 per 10,000 people, which is less than half of the 25.4 workers per 10,000 people recommended by the World Health Organization (Rao et al., 2011).

International migration of Indian medical doctors also contributes, though not solely, to this shortage and the loss of public funds invested in training these doctors. In reviewing 1989-2000 data on the graduates of India's premier, publically-funded, medical school, the All India Institute of Medical Sciences (AIIMS), Kaushik, Jaiswal, Shah, & Mahal (2008) found that nearly 54 percent of AIIMS graduates resided outside of India—85.4 percent of those graduates emigrated to the U.S. Yet, Rao, Rao, Kumar, Chatterjee, & Sundararaman (2011) conclude that the Indian Government's inattention to this phenomenon suggests it is not of major concern.

Private sector health care in India also faces challenges over access and quality of care. According to HOSMAC (2009), private sector infrastructure is essentially unregulated and leads to lower quality standards. Further, investments are not tied to local needs, resulting in infrastructure for financially-lucrative services. Sengupta & Nundy (2005) also report that large corporations have started to provide health care to make money—providing services that only foreigners and the richest Indians can afford. There is also a concern that private sector hospitals are using unregistered (unlicensed) medical staff (Rao et al., 2011).

Despite the current state of Indian health care, the Government of India is making improvements. It is increasing spending and medical resources through the National

Rural Health Mission, launched in 2005, which seeks to provide accessible, affordable, and quality health care services to rural populations (Ministry of Health and Family Welfare, 2010). It is expanding access to, and options for, government-sponsored health insurance that can be used in public or private facilities that do not require patients to pay the hospital (limited to inpatient/surgical care) and use pre-agreed upon rates (La Forgia & Nagpal, 2012). The Government of India is also taking steps to increase the number of medical doctors and medical colleges by raising admission levels, relaxing land use requirements for colleges, and allowing companies registered in India to open medical colleges. Furthermore, the Government of India is providing incentives to encourage medical school graduates to serve in remote areas (Ministry of Health and Family Welfare, 2010).

Indian Supply of Medical Doctors

In 2011, India had 314 medical colleges granting Bachelor of Medicine, Bachelor of Surgery (MBBS) degrees that admitted 40,485 medical students; an increase of 34 percent since 2007-08 (Ernst & Young & FICCI, 2012). In contrast, 141 U.S. medical schools admitted 19,230 students in 2011-12 (AAMC, 2012). To increase Indian medical college admissions, the Medical Council of India raised the ceiling of 150 students per medical class to 250 students depending on bed strength (Ministry of Health and Family Welfare, 2010). The Medical Council of India controls medical education in India as well as the registration (licensing) of medical doctors (Medical Council of India, 2013). Unlike students in the U.S. that first obtain a bachelor's degree and then attend medical

school, medical students in India attend a 5.5 year medical program, which includes a one-year internship, following their secondary education. They can then register and practice as medical doctors. They also have the option of then obtaining a post-graduate diploma in a specialty, followed by a post-graduate degree in a subspecialty. To encourage doctors to serve in rural areas, the Medical Council of India reserves seats in post-graduate education for doctors that make that commitment (Ministry of Health and Family Welfare, 2010).

As Kangasniemi, Winters, & Commander (2007) noted for the United Kingdom, Indian medical college graduates seeking to migrate to the U.S. and practice medicine must participate in a rigorous and competitive screening process. In the U.S., students attend a four-year medical school program after obtaining a bachelor's degree (Lesky, 2011; OECD, 2007). Medical school is followed by residency training, known as graduate medical education. All states require at least one year of residency (internship) in order to obtain licensure; many states require three years of residency, and some specialties require much more. All international medical graduates must complete their residency in the U.S., including registered Indian medical doctors.

To enter residency the international medical graduates must obtain a certificate from the Educational Commission for Foreign Medical Graduates (ECFMG, 2013a). To obtain the certificate, they must have graduated from an approved medical college, pass an exam equivalent to Steps One and Two of the U.S. Medical License Examination conducted in the U.S., and pass a language test. In 2011, 9,791 certificates were issued to students who had attended medical schools in 135 countries (ECFMG, 2012). Indian

citizens were the largest group of non-U.S. citizens to receive certificates (17.1 percent). Preparation programs in the U.S. specifically target Indian medical graduates for aid in passing the USMLE and in preparing for residency interviews (PASS Program, 2013). In addition to the certificate from the ECFMG, the international medical graduates must complete at least one interview for residency before they can enter the Main Residency Match or Specialties Matching Service—these are competitive processes for matching student preferences to residency programs or fellowships for subspecialties. In 2013, 7,568 non-U.S. citizen international medical graduates entered the match—48 percent were successfully matched to a residency program (ECFMG, 2013b). Upon acceptance into a residency program, the foreign medical graduate can obtain an H-1 or J-1 visa sponsored by the residency program. After at least one year of residency, the student must complete Step Three of the U.S. Medical License Examination to obtain licensure.

Globalization of Health Care

Chapter 4 described the role of multinational corporations and the fragmentation of global production systems in the migration of information technology professionals. This section considers the advent of hospital chains (systems or networks) and medical tourism as analogous phenomena that may impact migration of Indian medical doctors. As noted previously, though medical services are classified as nontradable, advances in technology and practices may enable some work to be performed remotely, and thus be considered tradable.

In the U.S., competitive pressures, budget cuts, and health care reform are driving changes in the U.S. health system. In 2012, there were over 100 merger and acquisition transactions among U.S. hospitals and health systems to lower costs, raise capital, and better coordinate care (Saxena, Sharma, & Wong, 2013). These systems are evolving from the traditional community-based hospitals to loosely confederated multi-hospitals to a variety of integrated forms, including geographic cluster systems and hub and spoke systems (Ahlquist, Saxena, Belokrinitsky, & Kapur, 2012). Over 3,000 U.S. community hospitals participate in such systems or networks (Health Forum, 2013). These hospital chains are still predominately focused on geographic regions within a country. However, hospital systems that cross national boundaries are emerging—Hospital Corporation of America, one of the largest systems with 162 hospitals, operates in the U.S. and the United Kingdom (HCA, 2013).

Similar growth and evolution of hospital chains are taking place in other regions of the world, including India (Lefebvre, 2010). Apollo Hospitals, founded in 1983 with its first hospital in Chennai, now has over 50 hospitals across India and abroad, including Sri Lanka, Dubai, Ghana, Mauritius, and Bangladesh (Apollo Hospitals, 2013). As in the case at Sri Lanka, Apollo could not find sufficient qualified doctors in Sri Lanka, so they provided doctors from India (Oberholzer-Gee, Khanna, & Knoop, 2005). Further, two-thirds of Apollo's doctors are Indians who returned from the U.S. and United Kingdom. Hospital chains, as an analogy to multinational corporations, may still be in their early formative stages. At this time, there does not appear to be an Indian hospital chain operating directly inside the U.S. or vice versa. Yet these chains appear to have some

impact on out-migration, as well as return migration, of Indian medical doctors. The magnitude and implications of these movements are subject to further research.

In addition to establishing hospitals in other countries to reach a larger market, some hospitals now increase their market by bringing patients from other countries to their facilities for treatment, known as medical tourism (Lefebvre, 2010). Services include treatments such as cosmetic surgery, hip and knee replacement, eye surgery, and organ transplants. According to Lunt et al. (2012), medical tourism is not a new phenomenon, but the shift toward patients traveling from developed nations to less-developed nations, driven by the cost of care, is relatively recent. Lunt et al. (2012) contrasts the disparity in prices across medical markets. For instance, a heart bypass surgery would cost $113,000 in the U.S., but would only cost $10,000 in India. Turner (2010) states that the U.S. offers a large market of uninsured individuals, with limited economic resources that need critical medical procedures.

Hospital systems, in countries with large contingents of doctors working outside the country, like India, are trying to attract their expatriates to return, contributing to a reverse brain drain (Lunt et al., 2012). Hospital web sites advertise the credentials of their doctors having been trained and certified in the U.S. (Turner, 2010). These hospitals also form partnerships with U.S. hospitals and medical schools to further improve their brand. For example, Johns Hopkins Medicine International is affiliated with Apollo Hospitals, which operates a clinic in Singapore. Many of these hospitals are also seeking accreditation from the U.S.-based Joint Commission International (Lunt et al., 2012). These linkages and relationships could be key to the development of a global

production model for health care. As in other global production systems, where services are fragmented along the value chain, the need for integration across these services is essential. In the case of medical tourism, the continuity of care is a chief concern (Lunt et al., 2012). That is, following an intensive medical procedure in a foreign country, the need for treatment in the recovery process in the home country is vital. The use of medical brokerages and relationships with U.S. doctors and hospitals can fill this role. A global production environment for health care may influence the out migration and return migration of medical doctors and other health professionals. The magnitude of this effect is unknown. Lunt et al. (2012) raises the concern that this model could lead to an internal brain drain and result in a two-tiered health system as doctors are attracted to providing care to overseas patients rather than the domestic population. A similar situation has arisen in the information technology sector, discussed in Chapter 4, where the best personnel are used to advance the use of technology for overseas customers while the domestic use of technology remains very low.

Data Collection and Demographics of Survey Respondents

The previous section provides the context within which Indian medical doctors make decisions on migration, including their medical education and the health system in India, requirements for entry into the U.S., and the evolving global system for health care. This section presents the approach and results for surveying these Indian medical doctors currently working in the U.S. An objective of the data collection is to obtain a broad representation of Indian medical doctor immigrants. This is necessary to understand their

peer relationships in India and their intentions with respect to circulation, and to support the comparison with the information technology professionals. The approach for developing the sample frame, potential impacts of selection bias, and the demographic characteristics of the respondents are provided below.

To develop a sample frame there are no evident public directories of Indian medical doctor immigrants. The U.S. Department of Health and Human Services publishes a list of web sites to support patients in finding doctors, such as the AMA Doctor Finder (Health and Human Services, 2013). These sites enable one to search for a doctor by name, specialty, and geographical area, and they provide valuable information on doctor credentials. However, they do not provide sufficient contact information to conduct the survey. Nor, in this case, does LinkedIn provide the level of representation as found for the information technology professionals.

An alternative approach to identifying Indian medical doctor immigrants with sufficient contact information is through the directories of teaching hospitals. In a study of out migration of information technology and health workers, Khadria (2004) surveyed medical doctors and nurses from six teaching hospitals. The practical advantage of using teaching hospitals as a source for the sample frame is that they publish directories of their medical doctors through search databases (e.g., Find a Physician) and they publish contact information through the associated university. The disadvantages are that these medical doctors may not represent doctors in general and may have similar characteristics to academics. The latter was mitigated by selecting clinical staff, and excluding research staff, to focus on practicing physicians. Indian medical doctors practicing in teaching

hospitals are of interest to this research since their concentration in these facilities satisfies a condition of this study and they would be of high value to hospitals in India. A further step was taken in the interviews to understand the views and intentions of these medical doctors at various points in their careers—prior to their current role in teaching hospitals.

The sample frame for this survey was produced based on the directories available at 45 teaching hospitals across the U.S. As in the case with information technology professionals, there is a potential self-selection bias. Again, to improve the representation, a profile of respondents was created based on the American Community Survey data (Ruggles et al., 2011). The profile provided a distribution of Indian medical doctors by state and region across the U.S. In accordance with Wong (2008), purposive and repeated sampling of Indian medical doctors was conducted based on the state and region of residence, which are not likely correlated to immigration behavior, in order to preserve correlations of interest (the lack of correlation is verified in Chapter 7). Figure 12 illustrates the respondent distribution by census region, with standard error bars, in contrast to the estimated distribution in the American Community Survey. As shown in Figure 13, there is a statistically significant underrepresentation in the West region, at the 0.05 level, where individuals were less responsive. The quantitative analysis in Chapter 7 will compensate for this difference through the application of person-weights based on region. Given the likelihood that region is not correlated to immigration behavior, there should be a minimal impact on the results.

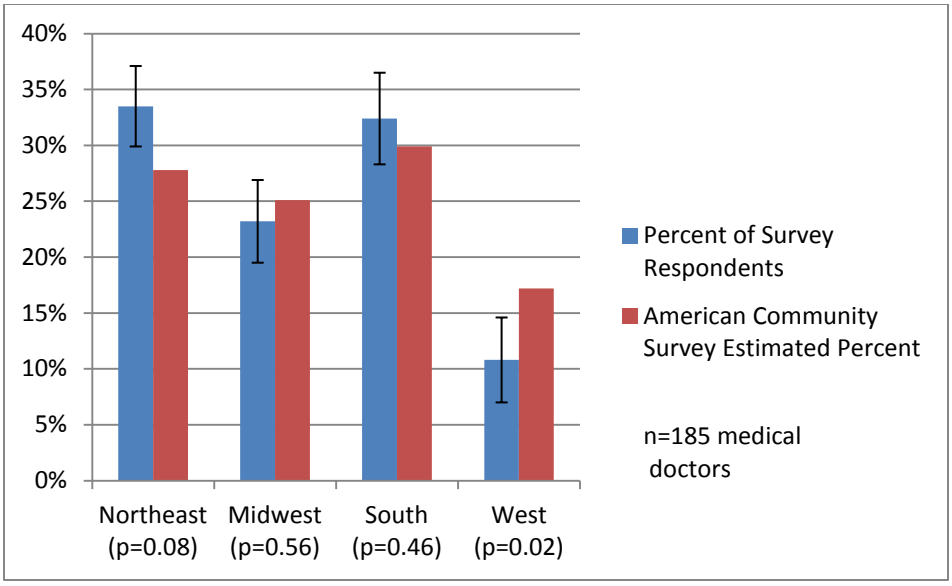

Figure 13. Distribution of medical doctor survey respondents by census region

Table 6 provides some basic demographic information on the respondents. The largest group of respondents is middle-aged, male, relatively recent arrivals, and naturalized citizens. In contrast, the information technology professionals are young and hold temporary-worker visas as reported in Chapter 4. Table 6 also provides the available demographic characteristics for the reference population based on the American Community Survey data. The reference population is somewhat older with more individuals naturalized as citizens. This difference may have some effect, as the respondents not yet naturalized as citizens could be more open to circular migration.

Table 6. Demographic characteristics of medical services survey respondents.

Characteristic	Response Rate	Response Count	Reference Rate
Age 36-50	60.0%	111	49.4%
Male	65.4%	119	60.1%
Attending physician	60.9%	112	*
Settled in the U.S. in 2000 or later	41.6%	77	*
Naturalized citizen	54.6%	100	66.3%

* Not available

Enabling Factors for Transnational Communities

This section presents the Indian medical doctor responses, in contrast to the information technology immigrants, with respect to their participation in transnational communities. It includes their social and professional relationships within their host community, as well as their access and relationships to home-country resources. The latter takes into account the immigrants' travel to India, their exchange of information with peers in India, and their professional contacts in India. Host communities and home-country resources can provide a forum for immigrants to share information on technology, jobs, and business opportunities, as well as provide support for pursuing those opportunities.

Host Communities

Figures 14 and 15 portray the participation and frequency of attendance by Indian medical doctors at immigrant and professional associations, respectively. Similar to the information technology professionals, most Indian medical doctors never attend meetings of immigrant associations (71.7 percent); however, most of these immigrants do participate in professional associations (96.7 percent). Over 66 percent of the Indian medical doctors attend meetings of professional associations two or more times a year. As one medical doctor immigrant noted, it was through his membership in a professional association, the American Society of Nephrologists, that he had the opportunity to associate with other Indian nephrologists in the U.S. (Interview Participant 8, 2012).

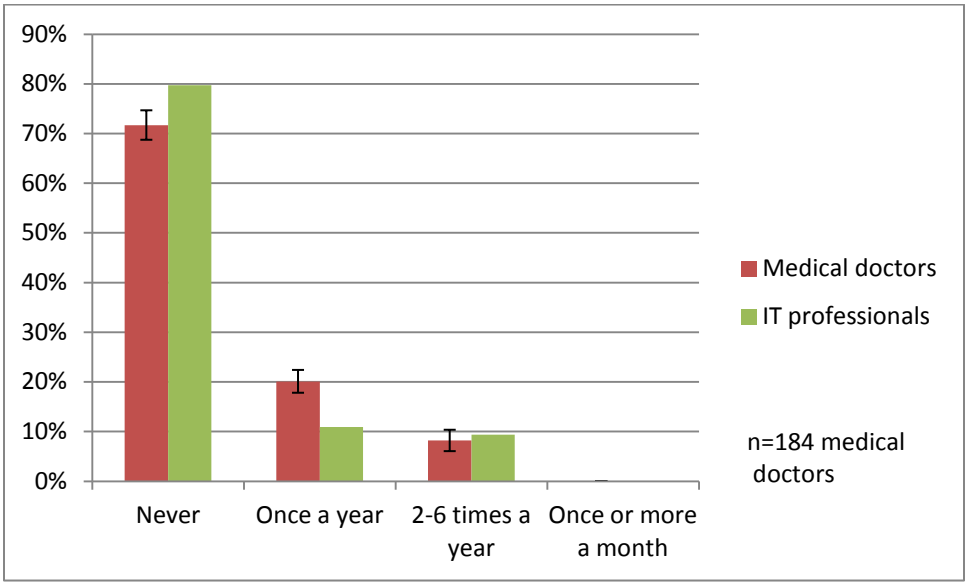

Figure 14. How often do you attend meetings of immigrant associations?

Compared to information technology professionals, Figure 15 shows that Indian medical doctors participate in professional associations at higher rates. Where 70.3 percent of information technology professionals attend meetings of professional associations, 96.7 percent of the medical doctor respondents indicate they attend these meetings. The survey results also show that more medical doctor respondents have served as an officer or a board member of these associations (28.3 percent) than the information technology professionals (7.8 percent). These results change very little when looking only at the medical doctors who settled in the U.S. after the year 2000 (like most information technology professionals). In this case 94.8 percent of medical doctors participate in professional associations and only 9.1 percent of these medical doctors have served as officers or board members. This reduction in officer or board service likely reflects the time needed to achieve these roles. These data indicate that Indian medical doctors are active in host communities, more than the information technology professionals, but again their participation is more focused on professional ties rather than nationality.

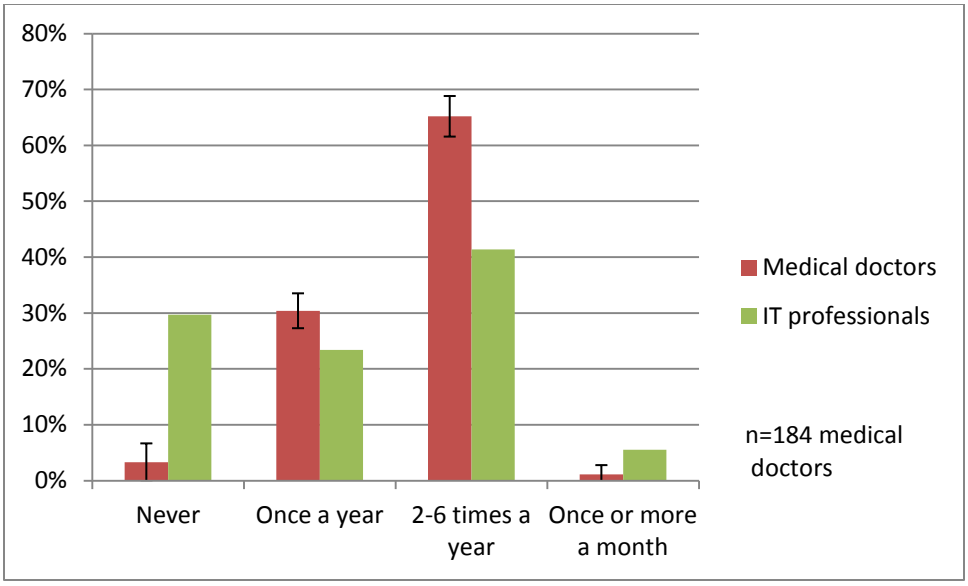

Figure 15. How often do you attend meetings of professional associations?

Home-Country Resources

Figures 16 and 17 denote the frequency with which Indian medical doctor immigrants travel to India for social and professional purposes, respectfully. Like information technology professional immigrants, medical doctors travel to India much more frequently for social purposes than for professional purposes. The survey results indicate that 88.1 percent of the medical doctor respondents traveled to India for social purposes at least once per year; whereas, 31.5 percent traveled to India for professional purposes. The latter rate drops to 14.3 percent for medical doctors who settled in the U.S. in the year 2000 or later, which is 21.2 percent less than the information technology professionals who settled in that same time period.

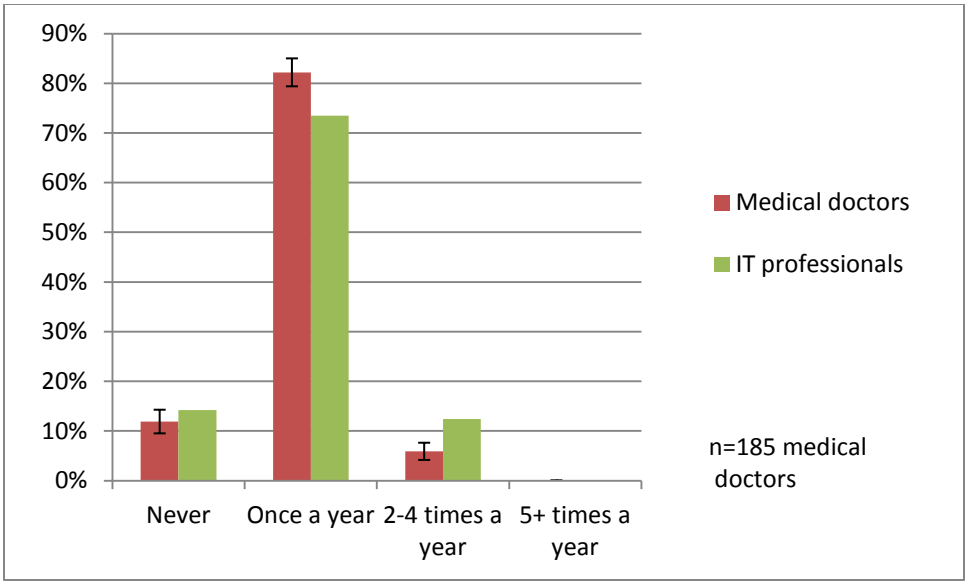

Figure 16. How often have you traveled to India for social purposes on average during the past three years?

Interview participants indicated their professional travel to India was typically for the purpose of attending conferences, though these trips were also used for social purposes—especially to visit family members (Interview Participant 26, 2012; Interview Participant 29, 2012). In addition, the interview participants used their trips to visit with family to also visit their medical schools, to meet with their medical school cohort, and give guest lectures. However, they primarily considered these visits to be social (Interview Participant 12, 2012; Interview Participant 18, 2012; Interview Participant 28, 2012). Interview Participant 25 (2012) warned that it is not possible to practice medicine while visiting India since he could be "sued or arrested for practicing without a license." Neither the information technology professionals nor the academics reported having such barriers to practicing their profession in their home country.

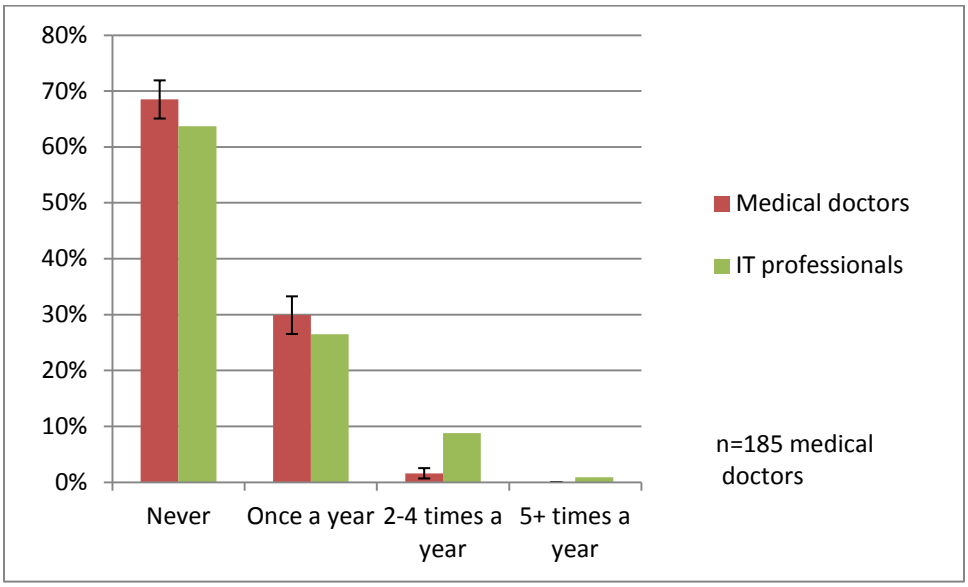

Figure 17. How often have you traveled to India for professional purposes on average during the past three years?

Figure 18 depicts the percent of medical doctor respondents that regularly exchange information with their peers in India as compared to the information technology professionals. These results not only show access to home-country resources, but give some indication of the strength of those exchanges. The data indicate a substantially stronger exchange of information by the information technology professionals than the medical doctors in every category. Less than 5 percent of medical doctors regularly exchange information on jobs and less than 11 percent regularly exchange information on technology or research. The interview participants shared that much of their exchange of information with peers is very casual and informal through their medical school cohorts (Interview Participant 15, 2012; Interview Participant 25, 2012; Interview Participant 26,

2012). They added that their medical school cohorts tend to be small and tight knit, and that they continue to maintain informal communications. Interview Participant 5 (2012) and Interview Participant 26 (2012) go further to state that they have no peers in India due to the nature of their specialty and lack of a corresponding practice in India.

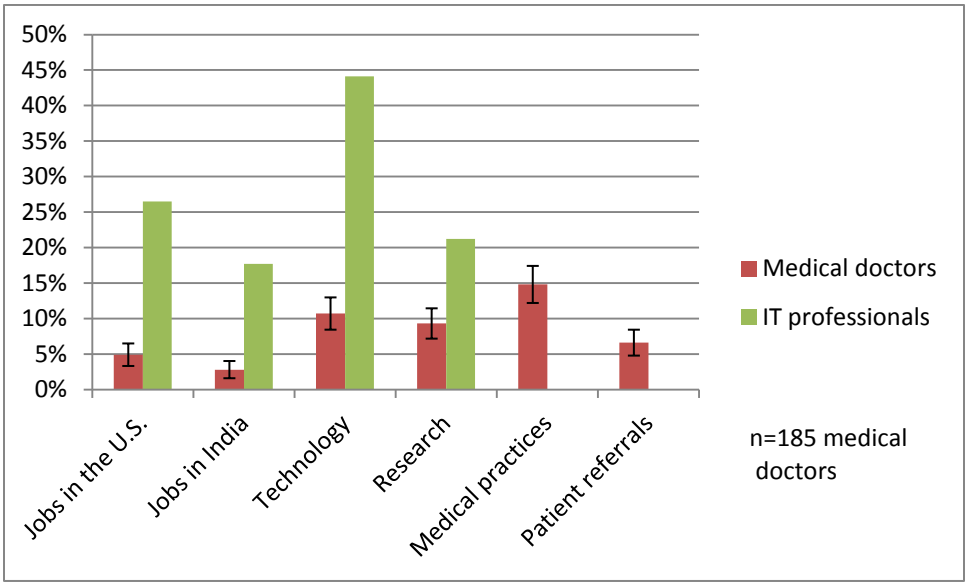

Figure 18. In what areas do you regularly exchange information with friends, classmates, or professional associates in India?

Appropriate to the medical profession, the additional categories of "medical practices" and "patient referrals" were included in the survey. Note that although 14.8 percent of medical doctors regularly exchanged information on medical practices, that is about one third of the rate at which information technology professionals regularly exchanged information on technology. More medical doctors respond that they

sometimes exchange information on medical practices (60.4 percent); indicating that they have access to home-country resources, but that these ties are weak.

In examining medical doctor immigrants' ties to home-country resources, Figure 19 goes beyond information exchange to consider more direct relations with their peers in India. It shows that 40.5 percent of the respondents helped others arrange professional relationships in India, thus building professional ties between doctors in the U.S. and India. This response is comparable to the 39.3 percent of information technology professionals who helped arrange professional relationships. More medical doctors responded that they met with government officials (10.8 percent) than the information technology professionals (6.3 percent). This low rate of interaction with the Indian government remains consistent with the lack of trust reported later in this chapter.

Additional types of interaction were included in the survey that were specific to medical doctors. Figure 19 shows that 49.2 percent of the respondents have consulted on medical care with physicians in India. This appears to be a substantial level of interaction; however, as noted above, this practice is mostly informal with colleagues in their medical cohort. One interview participant reports practicing medicine in India for a couple of weeks every year (Interview Participant 22, 2012). In this case, the doctor comes from a family of physicians and works in the family-owned hospital in the private sector.

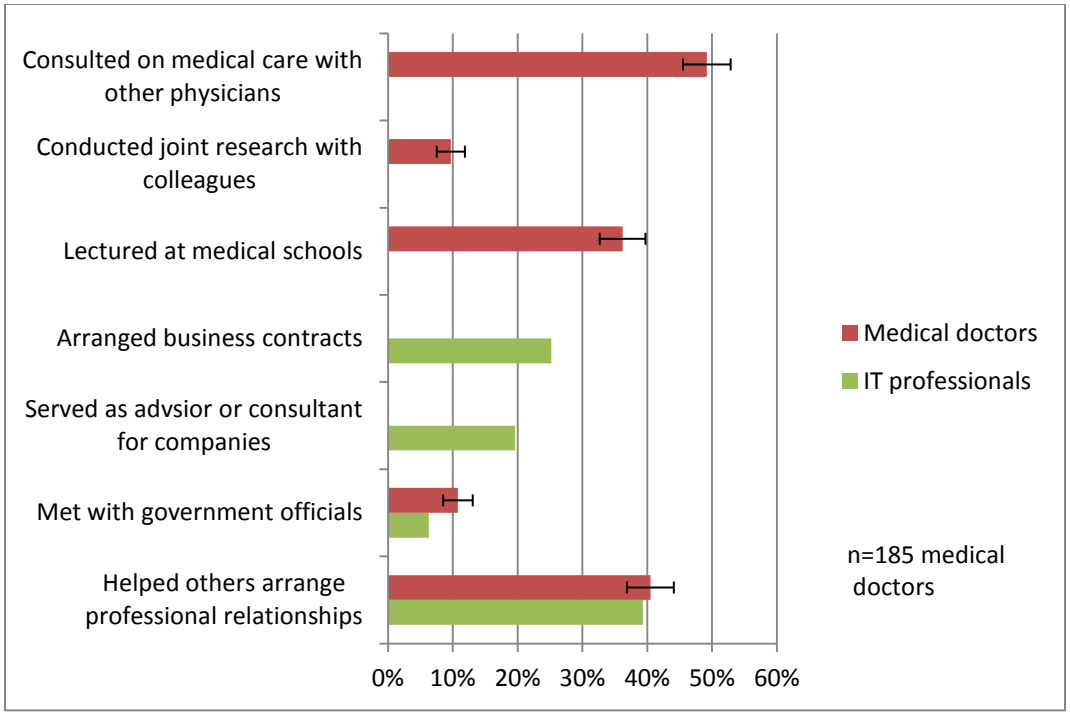

Figure 19. Have you had these types of contacts in India?

Figure 19 also shows 36.2 percent of the respondents have lectured at medical schools in India, though only 9.7 percent have conducted joint research with their colleagues in India. Interview Participant 13 (2012) reported that she traveled to India annually, taught there regularly, and conducted joint research with Indian colleagues in neonatology. Her research was made possible by a study jointly funded by the National Institutes of Health and the Indian Council on Medical Research. Considering the sample for this survey was based on medical doctors from teaching hospitals, research would be a focus of their profession, but joint research with peers in India appears to be relatively low. Most of the interview participants express that there is a high potential for joint medical research with India, given the research and management skills of Indian medical

doctors in the U.S. and the vast volume of potential patients in India that could be recruited to participate. However, they believe more funding is needed and that patient medical recordkeeping in India needs to be improved.

Supporting and Inhibiting Factors for Returning to India

Saxenian (2002a) identified infrastructure and government bureaucracy as chief concerns for returning Indian technology immigrants. The current research used preliminary interviews with subject matter experts and immigrants to identify possible additional factors influencing return migration and circulation. These additional factors cover professional growth, culture, family relationships, and the desire to contribute to the welfare of India. Medical doctor survey respondents were then asked to rate the extent to which these factors supported or inhibited their return to India. These results are compared to the responses from the Indian information technology immigrants presented in Chapter 4.

Figure 20 reports the proportion of respondents who indicated the factors would support their return to India. Like the information technology professionals, family relationships in India (49.7 percent) and culture and lifestyle in India (48.1 percent) are the top factors supporting return. Note though that the response on family relationships in India is substantially lower for medical doctors than for the information technology professionals—a difference of 26.2 percent. However, when filtering the results to include only those respondents who settled in the U.S. in the year 2000 or later, the proportion where family relationships supports return increases to 64 percent. Family

relationships in India fall to 39.8 percent for those that settled in the U.S. before the year 2000. These data indicate the pull of family ties in India diminish the longer one stays in the U.S. This phenomenon may contribute to the result in Figure 21 where 26 percent of respondents indicate that family relationships in the U.S. inhibit their return to India. Interview Participant 22 (2012) stated that he "could be as happy economically, socially, and professionally here as there, so it is family commitments that can make the difference." Those commitments can be to children in the U.S. and parents in India.

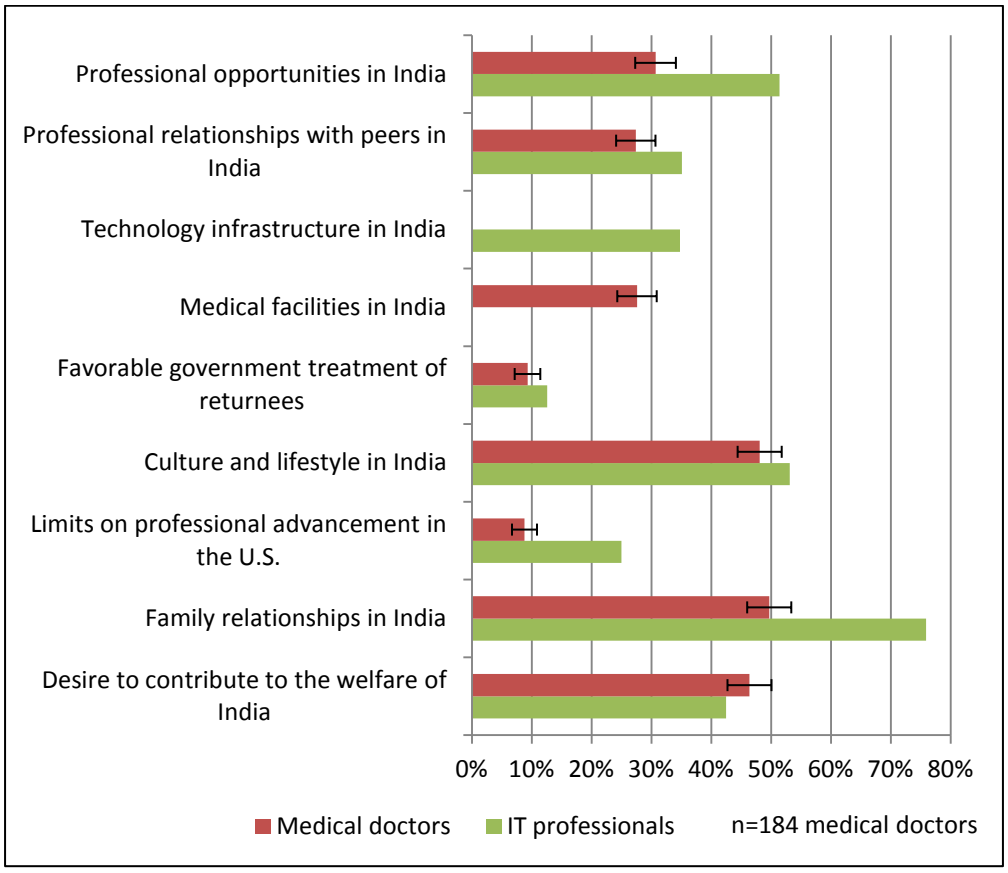

Figure 20. Please rate the extent these factors support return to India

Another top factor supporting return for medical doctors is the desire to contribute to the welfare of India (46.4 percent), which is comparable to the response by the information technology professionals (42.5 percent). Though the interview participants believe that one does not necessarily need to return to India in order to give back. For example, Interview Participant 15 (2012) collaborated with his medical school alumni to raise $1.8 million to build a lab for their medical school. When it comes to infrastructure, the medical doctors indicating that medical facilities in India support return (27.6 percent) are more than double those who indicate they inhibit return (12.2 percent). This support for return is somewhat lower than the information technology professionals' view of the technology infrastructure supporting return (34.8 percent). The respondents' chief concerns are the inadequate health records, charting practices, electronic records, and labs for diagnostic testing (Interview Participant 14, 2012; Interview Participant 26, 2012; Interview Participant 5, 2012). With respect to diagnostic testing, Interview Participant 5 (2012) explained that U.S. medical practice emphasizes testing, and, in India it is more common practice to make diagnoses without laboratory testing. She stated that there is a great need for inexpensive tests and that she would like to return to India at some point in her career to establish and run clinical laboratories.

The medical doctor respondents' view on professional opportunities in India, with respect to supporting return (30.7 percent), is much lower than the information technology professionals (51.4 percent). Likewise, the percent of medical doctors who indicate that limits on professional advancement in the U.S. is low (8.8 percent) compared to the information technology professionals (25 percent). Most medical

doctors (37 percent) indicate this factor is not applicable. Factors that influence the respondents' views on professional opportunities in India include the lack of recognition of specialty certifications, the absence of specialty equivalency, and requirements for retraining (Interview Participant 12, 2012; Interview Participant 28, 2012). Medical Survey Respondent 43 (2012) further commented that:

> "India still does not have a way to understand the differences between the individual credentials and capabilities and instead lumps all people trained in the US as one broad category. It is much easier to advance in your career based on your individual merit and hard work in the US as compared to India."

Figure 21 shows that most medical doctor respondents view the bureaucracy and corruption in India as inhibiting their return (73.9 percent), which is greater than the information technology professionals (59.3 percent). Interview Participant 22 (2012) explained that "kickbacks and gifts" are common practice and that the attitude is "I sent you a hip replacement, so I should get ten percent." Other respondents note that the political climate, corruption, and quota reservations based on caste or tribe are significant and promote poor competencies (Interview Participant 17, 2012; Interview Participant 25, 2012; Medical Survey Respondent 50, 2012).

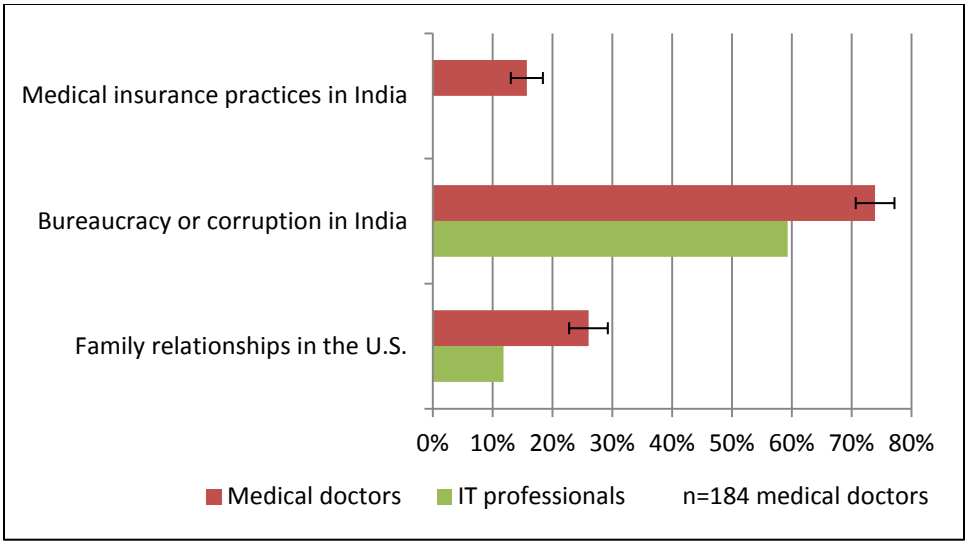

Figure 21. Please rate the extent these factors somewhat inhibit return to India

A much smaller group of medical doctor respondents (15.7 percent) considers the medical insurance practices in India as inhibiting their return—most indicated that these practices somewhat inhibit their return (27.5 percent). More broadly, the respondents' consider the patient care models to be very different in India where there is weak governance and delivery of care in the public sector, and more emphasis on profit in the private sector (Interview Participant 26, 2012; Interview Participant 29, 2012). Medical Survey Respondent 43 (2012) states that:

> "Medicine is practiced very differently in India as compared to the US. The private sector has more facilities but has zero accountability towards the patients and is purely a money-making operation. The public sector bureaucracy is impossible to deal with. The salaries are totally not

comparable between India and US (even taking cost of living into consideration)."

Rival Explanations

The previous sections presented the data with respect to the conditions that support or inhibit the formation of transnational networks as a possible explanation of the positive growth in human capital exhibited in the information technology sector. As discussed in Chapter 3, internal validity is difficult to establish in a case study such as this, where the behavior cannot be directly observed. This section considers possible rival explanations for the reported behaviors and outcomes. That is whether migration is irrelevant to any positive behaviors and outcomes, and whether any growth in home-country resources can be attributed to a brain-gain effect.

Migration Relevance

Figure 22 shows the percentage of medical doctor respondents who indicate they are somewhat likely or quite likely to return to India. Only 9.8 percent of medical doctors indicated they are quite likely to return, whereas 31.9 percent of information technology professionals indicated they are quite likely to return. The total response for medical doctors indicating somewhat likely or quite likely (30.5 percent) is less than half of that of the information technology professionals (63.8 percent).

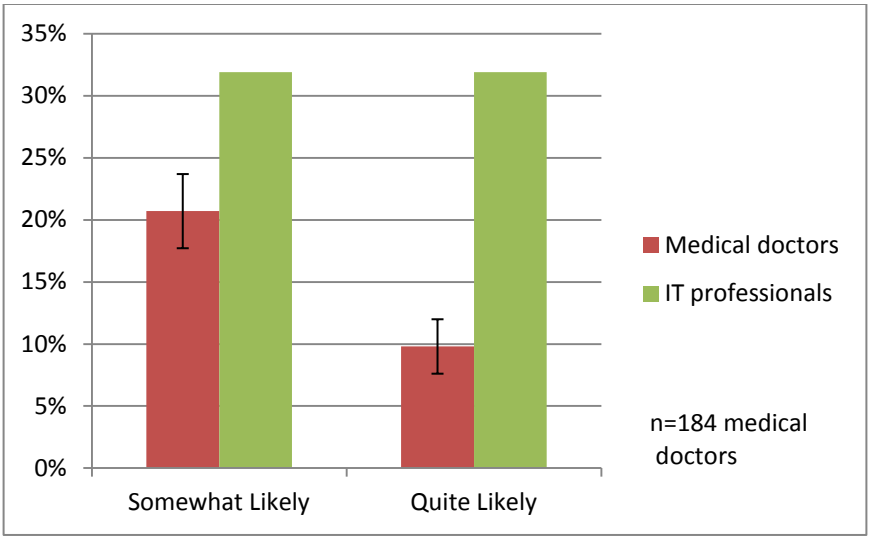

Figure 22. Would you consider returning to live in India in the future?

The respondents offered a variety of views on whether or not to return to India:

- A respondent indicated he had planned to return, but that there were no opportunities to practice the specialty in which he trained (Interview Participant 12, 2012).
- A respondent does not wish to give up the career he established in the U.S. (Interview Participant 13, 2012).
- A respondent expressed feelings of guilt knowing that she is spending the most productive years of her life in another country, but that has not changed her immediate plans to remain in the U.S. (Interview Participant 18, 2012).
- A respondent said he would consider returning after his children complete college and get established in the U.S. (Interview Participant 12, 2012)

Interview Participant 14 (2012) is among the minority in stating she would quite likely return to India. Given her expertise in genetics and testing, she believes she could make a difference in addressing many diseases in India. She is also among the minority in that she travels regularly to India, collaborates with Indian peers, and conducts joint research. However, she still considers her plans to return to India as a long-term prospect.

The medical doctors were also asked to consider that if they were to return to India, would they prefer to practice medicine in the public sector or private sector. Most of the medical doctors prefer to practice in the private sector (36.3 percent) versus the public sector (14.5 percent), although 25.7 percent indicated that they would be willing to practice medicine in either. The interview participants stated that a lot of the medical doctors returning to India are going into the private sector (Interview Participant 22, 2012; Interview Participant 26, 2012; Interview Participant 8, 2012). They explained that the facilities in the private sector are comparable to the facilities in the U.S. and that portability of certifications is not a problem. However, they also believe the private sector is focused on cash for services, would not take advantage of their skills, and would not be professionally stimulating.

Figure 23 reports on those medical doctors known by the respondents to have returned to India. It shows that 39 percent of the respondents do not know medical friends or colleagues who returned to India, whereas this only applies to 12.4 percent of the information technology respondents. Likewise, only 4.3 percent of medical doctor respondents know six or more returnees, versus 34.5 percent of the information technology respondents. Interview Participant 28 (2012) noted that he knew two doctors

who returned to India. One had to return since he was the eldest son; the other returned because he was in the U.S. on a J-1 visa, was required to work in an underserved area, and was dissatisfied with this situation. Foreign medical graduates who complete residency while holding a J-1, Exchange Visitor, visa are required to return to their home country for two years (Health Resources and Services Administration, 2013). However, this requirement can be waived if they agree to serve in a Health Professional Shortage Area. Upon approval of the waiver, they are granted an H-1B visa and must deliver primary care health services in a shortage area for three years. Neither doctor identified above returned as a result of a desire to pursue better opportunities in India. These data indicate that medical doctors may be returning to India at much lower rates than information technology professionals.

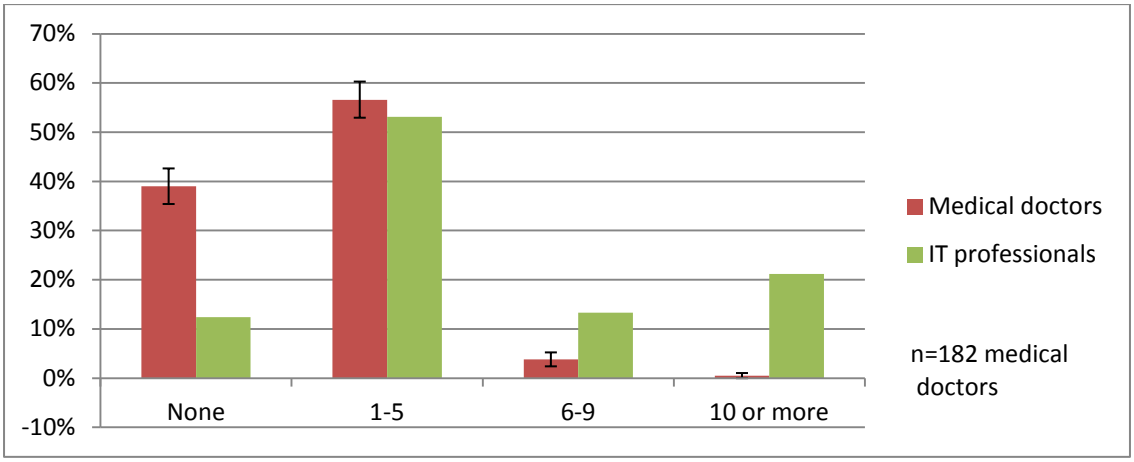

Figure 23. How many of your medical friends and/or colleagues have returned to India to conduct research or business?

Figure 24 shows that the medical doctor respondents' frequency of investment in ventures in India is only slightly less than that of the information technology professionals. Where 33.7 percent of the information technology professionals responded that they invested their money once or more than once, 28.2 percent of the medical doctors responded that they invested once or more than once. Several of the interview participants explained that one does not necessarily need to return to India in order to give back to the community. Most are financing their own efforts to collaborate and contribute. However, they would like to see more joint, government-funded research, exchange programs between doctors in both countries, and participation in global health initiatives (Interview Participant 12, 2012; Interview Participant 14, 2012; Interview Participant 26, 2012; Interview Participant 27, 2012).

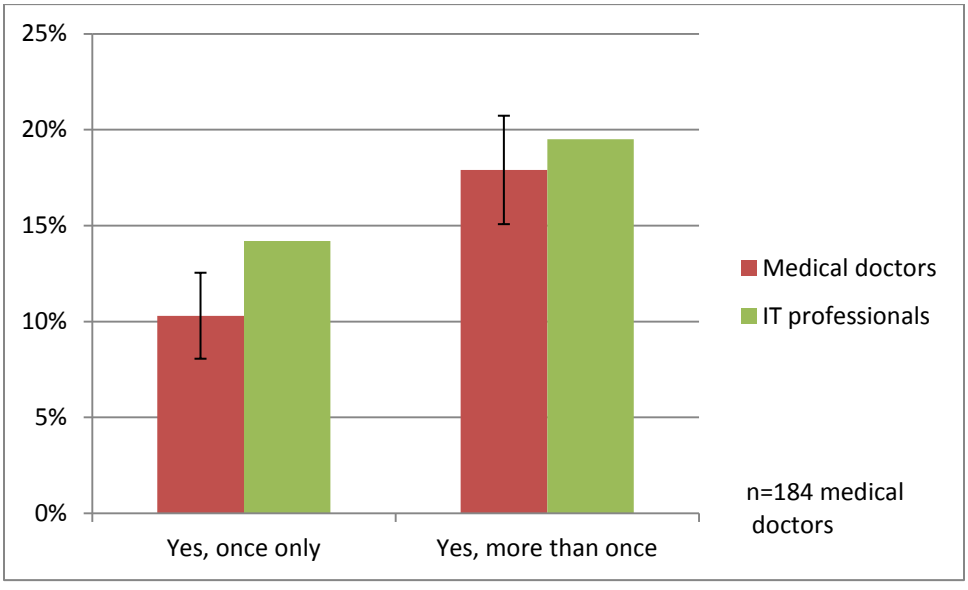

Figure 24. Have you invested your own money in professional or social ventures in India?

Although Indian medical doctors are contributing to ventures in India, at a slightly lower level than information technology professionals, the data indicating that the medical doctors are less likely to return and that fewer of their colleagues have returned, suggest a minimal positive impact on India. Barring a brain-gain effect, it more likely indicates a negative effect. Thus, the data suggests that migration is not relevant to any positive outcome in India.

Brain Gain

The data in Table 1, Chapter 3, show that the stock of Indian medical doctors in the U.S. is growing at a faster rate (7.8 percent) than the stock of medical doctors in India (2.9 percent). Further, the latter rate is much lower than the rate of growth for information technology professionals in India (10.4 percent). Thus a brain-gain effect is not apparent at this level—that is, there is no apparent growth in the stock of medical doctors inspired by the prospect of migration, but who remained in India.

Surveying or interviewing Indian medical doctors working in India is out of scope of this research. However, the Indian medical doctors interviewed were questioned on their intentions to emigrate to the U.S. when they were pursuing their medical education. Some stated they came to the U.S. because they already had other family members in the U.S. (Interview Participant 27, 2012; Interview Participant 8, 2012). The common response from the interview participants was that they did not pursue their medical education with intentions to emigrate. Rather, they emigrated to the U.S. for what they

perceived to be advanced, high-quality training—particularly for their chosen specialty (Interview Participant 13, 2012; Interview Participant 14, 2012; Interview Participant 18, 2012; Interview Participant 25, 2012; Interview Participant 29, 2012). Interview Participant 8 (2012) added that the training in Indian medical schools primarily focused on family practice and that there are very few spots for specialty training—he stated there were eight slots across the country for his specialty in nephrology. It is his conclusion that the scarcity of specialty training in India is "driving medical doctors out of the country." These motivations do not conform to a brain-gain scenario.

Interview Participant 8 (2012) also explained that the U.S. is not typically the initial destination due to the difficulty of obtaining a visa as a medical doctor, which he likened to winning the lottery. Rather, he and his peers went to the United Kingdom or Europe for their initial specialty training—though they would need to re-apply every six months. After completing their specialty training, some of the emigrants would stay in the United Kingdom and some would emigrate to the U.S. To emigrate to the U.S. he said they would obtain F-1 student visas for pursuit of a master's degree, such as a Master's in Public Health. They would then apply for residency training in the U.S. F-1 student visas cannot be used for residency (Lesky, 2011). However, rather than obtain a J-1 Exchange Visitor visa, which has a requirement to return to India, students on F-1 visas can save their Optional Practical Training (OPT) period to cover their internship, first year of residency, while pursuing an H-1B visa. As already noted, the specialty skills of these medical doctors, obtained in residency, also keep them from returning to India.

Studies by Khadria (2004) and Kangasniemi, Winters, & Commander (2007) also examined the intentions of Indian medical doctors to pursue medical training due to migration prospects. Khadria (2004) surveyed 34 medical doctors in New Delhi and found that the majority wanted to go overseas for better training opportunities. Similarly, in their survey of foreign doctors in the United Kingdom, Kangasniemi, Winters, & Commander (2007) found that for the 58 Indian respondents only 9 percent considered migration as a factor in their decision to train in medicine. However, 34 percent indicated that training oversees affected their decision to pursue a medical career. These findings further support the case against a brain-gain effect.

Findings and Conclusion

This chapter presented the survey and interview data on Indian medical doctor immigrants with respect to the variables of the model defined in Chapter 3; including host communities, home-country resources, infrastructure, and institutions. These data were contrasted with the data gathered on information technology professionals. One objective was to examine the behaviors of medical doctors to assess the formation of transnational communities, circulation, and human capital accumulation. Another objective was to contrast the migration scenarios involving work in sectors classified as tradable and nontradable services. Further, to assess internal validity, this chapter also considered two rival explanations identified in Chapter 3: migration relevance and brain-gain effect.

Based on the data presented, this research finds the following:

- The respondents are active in professional communities—more so than information technology professionals.
- The respondents exchange information with peers far less than information technology professionals, though many have consulted with peers in India on medical care.
- Fewer medical doctors are attracted by professional opportunities in India than the information technology professionals.
- Fewer medical doctors have concerns over family ties in India, but have stronger concerns over family ties established in the U.S.
- The respondents indicated that India has inadequate health records, charting practices, electronic records, and labs for diagnostic testing.
- Bureaucracy and corruption are inhibiting factors for the respondents' likelihood of returning to India.
- The respondents have a desire to contribute to the welfare of India, but believe that one does not necessarily need to return to India in order to give back.
- The likelihood of medical doctors returning to India is substantially lower than information technology professionals. Further, the medical doctors know fewer colleagues who have returned to India.
- A brain-gain effect is not apparent for medical doctors—that is, there is no apparent growth in the stock of medical doctors inspired by the prospect of migration, but remained in India. A study of foreign doctors in the United

Kingdom confirms this finding. Rather, medical doctors are more likely to emigrate from India to obtain specialty training.

In terms of absolute numbers, the number of Indian doctors emigrating to the U.S. is relatively small compared to the total stock of medical doctors in India. However, in terms of the need for health care—given that much of the population does not have access to adequate medical care and many facilities have no doctor on staff—the loss of doctors that could help fill these gaps may be significant. The common motive for emigrating by the respondents was that they were seeking advanced training in their desired specialty. They believed that the slots and options for such training were very limited in India, which they viewed as being more focused on primary care. Likewise, they perceived India's lack of recognition of their specialty as an inhibitor to their return. They also believe that the nature and quality of medical practices in India, such as the lack of clinical testing in diagnosis, diminish their likelihood of returning. These medical doctors are very active in their professional communities, but appear to have weak ties to their peers in India. Their strongest ties, though informal, are with their medical school cohort. The doctors also expressed a desire to give back to their country, but believe they do not need to return in order to give back. Most are financing their own efforts, but would like to see more government-funded research and exchanges.

These findings are not consistent with the scenario leading to the formation of transnational communities that facilitate circulation and the accumulation of human capital. Indian medical doctors working in the U.S. participate in professional host

communities, they have access to peers in India, and many have consulted with their peers in India on medical practices. However, their exchange of information with peers in India is weak. Most indicate they are not likely to return to India, and many know few colleagues who have returned. The conclusion is that migration of medical doctors, whose work is classified as a nontradable service, does not contribute to a positive-sum accumulation of human capital in the medical doctor immigrants' home country. Rather, the data on emigration in the medical sector for Indian medical doctors support the brain-drain phenomenon.

Chapter 6: Post-Secondary Education Sector Data

The post-secondary education sector, particularly the services provided by university academics, is included in the case study since it is classified as a nontradable service where there is a substantial migration flow from India to the U.S. It is also of special interest due to the potential impact this flow may have on the education and innovation systems of India. As defined in Chapter 3, the post-secondary education sector represents the scenario whereby migration of Indian academics to the U.S. is coincident with high growth of academics in India. As reported in Table 1, the emigration rate of academics to the U.S. (7.2 percent) is much less than the annual growth rate in India (18.7 percent). It is important to understand whether this high growth rate in India is a result of migration or can be attributed to other factors.

This chapter presents and examines the data gathered via surveys and interviews with Indian academics working in the U.S. It also compares these results to those presented in Chapter 4 on information technology professionals. The analysis is based on the model and variables provided in Chapter 3, to ascertain whether the data exhibit the characteristics and behaviors with respect to the formation of transnational communities, immigrant circulation, and the accumulation of human capital.

To provide a context for the analysis, the chapter begins by reviewing the international mobility of academics, the state of the Indian higher education system, as

well as the supply of academics, and the evolving globalization of education. The literature characterizes the challenges resulting from the intense massification of higher education in India to meet demands, yet still has much further to go to fulfill education objectives. A chief concern is for the quality of that education, both in terms of producing employable graduates and in contributing to research and innovation. It reports on an environment for Indian academics that would encourage emigration, as well as discourage return migration. It also introduces the evolving globalization of higher education, including the mobility of students and academics, as well as academic programs; distance education; and the internationalization of research.

Next, this chapter reviews the data collection strategy—particularly the use of university faculty directories to provide a sample frame. This section discusses how the selection bias is mitigated and representativeness is improved by matching purposive samples with population characteristics, while maintaining correlations of interest. This section also provides basic demographics of the respondents in contrast to the reference population.

The main focus of this chapter is the presentation of survey and interview data on the Indian academics in accordance with the variables of the model as described in Table 3. That is, it examines the data that measure the conditions for the formation of transnational communities, including active host communities and access to home-country resources, as well as the infrastructure and institutional factors that might inhibit circulation. The data show that the respondents are much more active in professional communities than the information technology professionals; they also travel to India for

professional purposes more frequently. However, they exchange information with peers far less than information technology professionals. Many academics have lectured at colleges or universities in India while visiting, but few coauthored papers with their peers in India. Like the medical doctors, fewer academics are attracted by professional opportunities in India than the information technology professionals, and fewer have concerns over family ties in India. Again, bureaucracy and corruption in India are inhibiting factors for the respondents' likelihood of returning to India.

In this case, the data presented provides some support for the formation of transnational communities in the academic sector. So this chapter also considers the possible rival explanations identified in Chapter 3. Beginning with migration relevance, it assesses whether academic immigrants are pursuing opportunities remotely or through return migration. Like the medical doctors, the data indicate much less activity in this area for academics than with the information technology professionals. A possible brain-gain effect is considered next to explain the high growth of academics in India. Based on the interviews, only a minority of respondents indicated they had intentions to migrate when completing their undergraduate degree. Rather, many emigrated due to the limited options for advanced education in India.

The chapter closes with the finding that the data are not consistent with the scenario leading to the formation of transnational communities that facilitate circulation and the accumulation of human capital. Nor can the high growth of academics in India be attributed to migration. The conclusion is that migration of academics, whose work is classified as a nontradable service, does not contribute to a positive-sum accumulation of

human capital in their home country. Like the medical sector, emigration in post-secondary education supports the brain-drain phenomenon.

Higher Education and Globalization

The development of knowledge and skills is essential to economic growth, institutional capacity, civil society, the ability to maximize technological advances, and governance for the developing and developed nations (World Bank, 2013). Higher education is critical to providing this knowledge and these skills, as well as contributing to research and driving innovation and competitiveness in a knowledge-based economy (OECD, 2009). It also has an increasing role in the global environment; including international flows of students and academics, as well as ideas. Highly-skilled teachers, lecturers, and professors are essential to the success of the nations' higher education systems and subject to the push and pull of migration.

As reported in Table 1, Chapter 3, there were over 53,000 Indian post-secondary teachers (academics) working in the U.S. in 2010. This may appear to be a relatively small fraction (7.2 percent) of the 699,000 academics working in India. However, in light of the needs for higher education in India with respect to access and quality, the loss of academics to other nations may still be significant. As a proxy for academic immigrants, 87.9 percent of Indians who received their doctorates in the U.S. since 2001 remained in the U.S. by 2008—only 5.2 percent had returned to India (Chang & Milan, 2012). In India, the tertiary gross enrollment ratio (GER) was at 15 percent in 2010 (Department of Higher Education, 2012). GER is the ratio of persons in all age groups

enrolled to the total population in the age group of 18 to 23. For comparison, the tertiary GER for China is 27 percent and 95 percent for the U.S. (World Bank, 2013). India hopes to achieve a tertiary GER of 30 percent by 2020, requiring a much greater faculty strength. There are already challenges in filling existing slots for academics. In a recent response to the Lok Sabha (the lower chamber of the Indian Parliament), a minister reported that there is a 43 percent vacancy rate at their elite Indian Institutes of Technology (Thakur, 2013). To address shortages, India is increasing reliance on adjunct faculty, visiting faculty, and the use of trainee teachers (i.e., top students), which may in turn impact quality.

In addition to scale, there are indications that India also has challenges with respect to the quality of the higher education system. Kapur & Mehta (2007) state that despite the large size of the Indian system and high volume of graduates, the pool of skilled labor is low. They suggest that the success of a few professional schools is masking the median education. Even so, among the BRIC countries (Brazil, Russia, India, and China), India is the only country that does not have a university ranked in the top 100 of the Times Higher Education Rankings (Baty, 2013). As a driver of research and innovation, there remains much to do as well. A bibliometric study, conducted by Thomson Reuters on behalf of the Government of India, found that the Indian global share of scientific publications is about 3.5 percent—ahead of Brazil and Russia, but well behind China (Department of Science and Technology, 2012).

Despite these significant challenges to the Indian education system, India is making continual progress. The remainder of this section provides further background on

the Indian higher education system, the supply of academics, and the potential effects of globalization of higher education as they pertain to migration.

Higher Education in India

At the time of its independence in 1947, India had 20 universities and 500 colleges that they inherited from the British system (Department of Higher Education, 2012). The colleges were small, undifferentiated, and affiliated to the universities. The latter set the curriculum, administered examinations, guided admissions, and awarded degrees (Altbach, 2009). Today, India has 523 universities and 33,023 colleges enrolling more than 16 million students (Department of Higher Education, 2012). The affiliation system continues today, as well as much of the undifferentiation (Altbach, 2009). Many of the universities are governed by the states, but serve the federal system with little differentiation. However, there are also 42 central universities governed by the federal government, as well as a variety of specialized institutes, such as the Indian Institutes of Technology, National Institutes of Technology, Indian Institutes of Management, Indian Institutes of Information Technology, and the All-India Institute of Medical Science.

Despite the rapid expansion of state-sponsored universities and institutes, a majority of students attend private institutions, which primarily offer programs in professional disciplines, such as engineering, pharmacy, and hotel management (Altbach, 2009; FICCI, 2011). The University Grants Commission currently recognizes 159 private universities that are competent to award degrees (UGC, 2013). These private universities are not permitted to affiliate colleges or institutes. The private sector's share of higher

education institutions is 63.2 percent (Sethi, Ghuman, & Ukpere, 2012). FICCI (2011) notes that if India is to reach a GER of 30 percent, then about 40 million students would be enrolled. Given that India is spending less than one percent of GDP on higher education, the private sector could have a greater role in filling the gap. However, there are concerns over malpractices in the private sector covering every aspect from admissions, fees, and awarding degrees (Sethi et al., 2012).

Given the large number of students to be educated, it is understandable that the emphasis in India's institutions is on teaching rather than research. India's gross expenditure in research and development is less than one percent (Mani, 2010). Of that amount, it is estimated that the entire higher education sector contributes to no more than five percent of the gross domestic expenditure on research and development (GERD). The Government of India is trying to rectify this shortfall. In the Twelfth Five-Year Plan they propose to increase full-time research and development personnel by two-thirds within five years (Planning Commission, 2013). They also plan to increase the output of doctorates awarded to 12,500 per year. In contrast, over 49,000 doctorates were awarded in the U.S. in 2011 (NSF, 2012).

The rapid growth of the higher education system may partly explain the high growth in post-secondary teachers as reported in Table 1 (18.7 percent in 2010). However, this rapid expansion appears to be outstripping the supply as academic positions remain vacant. Furthermore, even greater growth is necessary to meet India's goals and needs. This suggests the loss of academics to other countries may have a greater impact than what might be expected based on the relative emigration rate.

Furthermore, the necessary emphasis on teaching and professional development in the public and private institutes, as well as the limited role of these institutes in research, may be factors that induce academics to emigrate and not return.

Supply of Indian Academics

In the 2011-2012 academic year, there were about 934,000 academics in India. Most of these academics were teachers in colleges; only 16.9 percent were academics in universities (UGC, 2012). The majority of academics teach undergraduate courses and do very little research—about 35 percent of the academics in the research universities hold doctorates (Altbach, 2009). The University Grants Commission establishes the minimum qualifications for academics in public colleges and universities, the selection and evaluation processes, and the pay scales (UGC, 2010). Minimal qualifications for an assistant professor include a good academic record and a qualifying score on the National Eligibility Test or accredited State Level Eligibility Test. Except in the case of some elite institutes, a doctorate is not required, however, holders of doctorates are exempt from taking an eligibility test. A doctorate is a mandatory qualification for a professor and for associate professors appointed through direct recruitment.

Based on an international comparison of academic salaries in 2008 for 15 countries, in terms of purchasing power parity, Indian academics had about 27 percent of the purchasing power as academics in the U.S. (OECD, 2009). Academic salaries also are not competitive within India compared to industry. The starting annual salary of $7,000 for a software engineer is equivalent to the top-of-scale salary of an assistant

professor (Sarkar et al., 2013; UGC, 2010). According to National Knowledge Commission (2009), the expanding market economy has devalued the academic profession, and thus its desirability. The Commission advocated that the prestige, social standing, and remuneration for academics be enhanced. Another factor impacting the desirability of the academic profession in India is the reservation system, whereby colleges and universities must hold a fixed percentage, almost half, of the seats for lower castes and tribal groups (Altbach, 2009). This potentially creates a climate where the best qualified academics are not selected, recognized, or promoted.

Considering doctoral students as the potential pool for academics, particularly at the professor level, one can judge the potential supply of academics as India's higher education system grows. In 2010-2011, there were 72,048 students enrolled in doctoral programs—less than one percent of total enrollments (UGC, 2012). Of these, there were 16,093 doctorates awarded. That same year in the U.S., there were 14,245 doctorates awarded to temporary visa holders, including 2,161 Indians (NSF, 2012). Thus 11.8 percent of Indian doctorates were awarded in the U.S. Following the award of a doctorate in India, however, there are few graduates entering academia, as better-paying industry jobs are more appealing and those intent on postgraduate education employment frequently go to the U.S. or Europe (Cyranoski, Gilbert, Ledford, Nayar, & Yahia, 2011). Recognizing this problem, some of India's elite institutions are recruiting expatriates, offering research grants, and creating collaborative relationships with industry and foreign institutions (Mishra, 2013). More than half of the 37 full-time faculty at IIIT – Delhi hold doctorates from the U.S. (IIIT-Delhi, 2013).

Globalization in Higher Education

Altbach, Reisberg, & Rumbley (2009) views globalization, with respect to higher education, as "the reality shaped by an increasingly integrated world economy, new information and communications technology, the emergence of an international knowledge network, the role of the English language, and other forces beyond the control of academic institutions." They go on to note that higher education cannot operate independently of this environment. A major aspect of this environment is the global flow of students and academics. OECD (2012) estimates that there were 4.1 million tertiary international students worldwide in 2010 with an annual growth rate of 7.1 percent. There were 100,270 Indian tertiary students in the U.S. in 2011-2012 (IIE, 2012). Little data exists on the quantity of academics in the global flow. However, National Science Board (2012) estimates that the foreign-born academics with doctoral degrees from the U.S. comprise 46 percent of postdoctoral positions and 23 percent of full-time faculty positions in science and engineering.

In addition to the mobility of students and academics, academic programs and institutions are mobile, whereby hundreds of thousands of students attend foreign programs in their home country (OECD, 2009). A common form practiced in India is twinning programs where foreign universities, such as those in the U.S., partner with colleges and universities in India to offer degree programs. Another form would be for foreign universities to operate branch campuses, franchises, in India. Franchise universities are already a significant practice in some Asian countries, including Malaysia

and Singapore. India introduced the Foreign Educational Institutions Bill, 2010, to enable the establishment of such branch campuses. The bill is still pending action in the Indian parliament (PRS Legislative Research, 2013). Opponents of the bill believe it will limit access, whereas proponents believe it will increase choice and competition.

With advances in the Internet and information communication technologies, distance education is an alternative form for universities to offer their programs nationally and internationally. It is already growing rapidly in the U.S. with large programs at the University of Phoenix and University of Maryland University College (OECD, 2009). Recently, MIT and Harvard University partnered to establish EdX, a not-for-profit company that offers courses online for free around the world (Harvard University, 2013). IIT-Bombay and other universities around the world are also offering courses online through EdX (EdX, 2013). Distance education is also a strategy within India to increase access and enrollment. Distance education at 176 institutions in India accounts for 26 percent of tertiary enrollment (FICCI, 2011).

A third major aspect of mobility in higher education is the internationalization of academic research. This is evident in the growth of internationally coauthored scientific articles, which increased from 8 percent to 18 percent from 1998 to 2005 (OECD, 2009). With respect to the national output, India's proportion of international collaborations increased from 10 percent to 22 percent, which is still behind Brazil (35 percent), Russia 43 percent), and China (25 percent). The U.S. international proportion was 27 percent in 2005. The number of countries with which India collaborated on scientific articles increased from 82 to 107 between 1996 and 2003. Another indicator of international

research by universities is the number and share of patents filed under the Patent Cooperation Treaty. From 2004-2006, Indian universities filed only 12 such patent applications, which comprises a 0.5 percent share of all such filings from India; whereas the shares in Brazil and China were 7.06 percent and 4.03 percent, respectively (OECD, 2009).

In a global environment with high flows of Indian students and academics, the establishment of university partnerships and growing collaboration on research, there is potential for an environment that is conducive to the formation of transnational communities for Indians in academia and their circulation.

Data Collection and Demographics of Survey Respondents

The previous section provides the context within which Indian academics make decisions on migration, including their education, the higher education system in India, and the evolving global system for higher education. This section presents the approach and results for surveying these Indian academics currently working in the U.S. The objective of the data collection is to obtain a broad representation of Indian academic immigrants. This is necessary to understand their relationships to their peers in India and intentions with respect to circular migration, and to support the comparison with the information technology professionals. The approach for developing the sample frame, potential impacts of selection bias, and the demographic characteristics of the respondents are provided below.

To develop a sample frame there are no evident public directories of Indian academic immigrants from which to draw. However, it is common for universities to publish their faculty directory with the curriculum vitae (CVs) and contact information. By reviewing the faculty directories and CVs, one can readily identify the Indian immigrants and build a contact database suitable for conducting surveys. Like the medical doctors, use of LinkedIn by academics is not as prevalent as is the case with information technology professionals.

The sample frame for this survey was produced based on the directories available at 40 universities across the U.S. These universities were chosen based on their high concentration of international scholars. Again, such concentrations are a condition of the transnational communities under study. As in the case with information technology professionals and medical doctors, there is a potential self-selection bias. Likewise, to improve the representation, a profile of respondents was created based on the American Community Survey data (Ruggles et al., 2011). The profile provided a distribution of Indian academics by state and region across the U.S. In accordance with Wong (2008), purposive and repeated sampling of Indian academics was conducted based on the state and region of residence, which are not likely correlated to immigration behavior (the lack of correlation is verified in Chapter 7). Figure 25 illustrates the respondent distribution by census region, with standard error bars, in contrast to the estimated distribution in the American Community Survey. As shown in Figure 25, there is a statistically significant overrepresentation in the Midwest region at the expense of the South region, at the 0.01 level. A factor contributing to this difference was a “last call” email to individuals who

had not responded to the survey, leading to a higher response from the Midwest. One approach to balance this difference would be to randomly drop responses from the Midwest. However, rather than lose this data, the quantitative analysis in Chapter 7 will compensate for the difference through the application of person-weights based on region. Given the likelihood that region is not correlated to immigration behavior, there should be a minimal impact on the results.

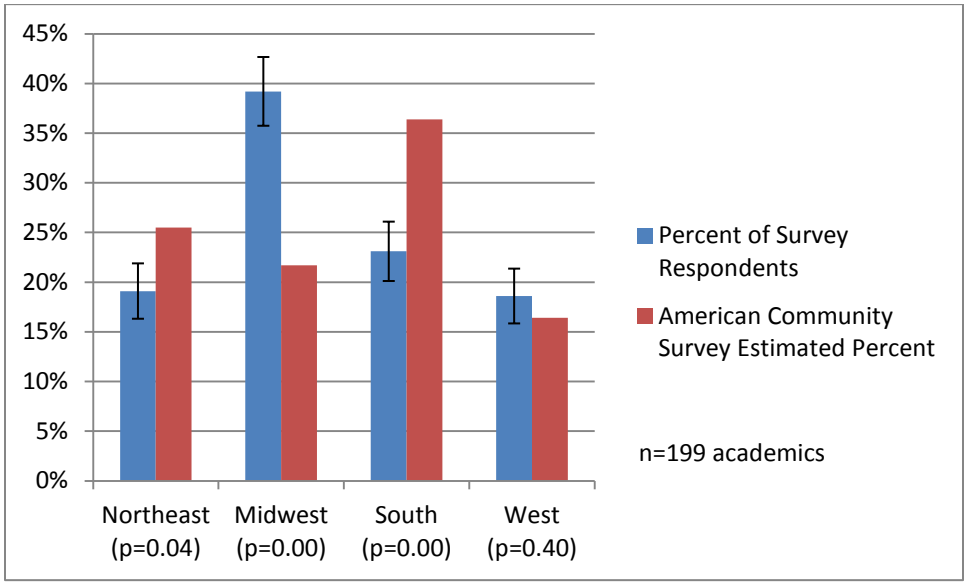

Figure 25. Distribution of academic survey respondents by census region

Table 7 provides some basic demographic information on the respondents. Similar to the Indian medical doctors, the largest group of respondents is middle-aged, male, relatively recent arrivals, and are naturalized citizens. These demographic similarities may reflect the time needed to achieve the educational status necessary in

their profession, versus that required for information technology professionals. Table 7 also provides the available demographic characteristics for the reference population based on the American Community Survey data. In this case, the reference population is somewhat younger with fewer individuals naturalized as citizens. This difference may have some effect in that the respondents that are naturalized as citizens could be less open to circular migration than the reference population.

Table 7. Demographic characteristics of academic survey respondents

Characteristic	Response Rate	Response Count	Reference Rate
Age 36-50	48.7%	96	52.5%
Male	83.2%	163	75.8%
Professor	44.7%	89	*
Settled in the U.S. in 1990-1999	33.7%	66	*
Naturalized citizen	51.5%	102	41.2%

* Not available

Enabling Factors for Transnational Communities

This section presents the Indian academic responses in contrast to the information technology immigrants with respect to their participation in transnational communities. It includes their social and professional relationships within their host community, as well as their access to and relationships with home-country resources. The latter takes into account the immigrants' travel to India, their exchange of information with peers in India,

and their professional contacts in India. Host communities and home-country resources can provide a forum for immigrants to share information on technology, jobs, and business opportunities, as well as provide support for pursuing those opportunities.

Host Communities

Figures 26 and 27 portray the participation and frequency of attendance by Indian academics at immigrant and professional associations, respectively. As seen with the information technology professionals and medical doctors, most Indian academics never attend meetings of immigrant associations (77.8 percent). The academic respondents who did report participation in immigrant associations indicated they wanted to preserve their culture and to assist Indian students in their transition to life in the U.S. (Interview Participant 31, 2012; Interview Participant 34, 2011; Interview Participant 37, 2011). Other respondents participate in organizations, like the Association for Indian Development, to support development activities in India, such as education for children (Interview Participant 35, 2011; Interview Participant 6, 2012). On the other hand, most of the academic respondents do participate in professional associations (95 percent). Most Indian academics participate in professional associations that are not specific to Indian immigrants. However, some respondents reported that they participate in the Society of Indian Academics, which supports social and professional relations among Indian academics in the northeastern U.S. (Interview Participant 36, 2011; Interview Participant 37, 2011). Over 81 percent of the Indian academics attend meetings of professional associations two or more times a year, which is substantially more active

than the information technology professionals (46.9 percent), as well as the medical doctors (66 percent).

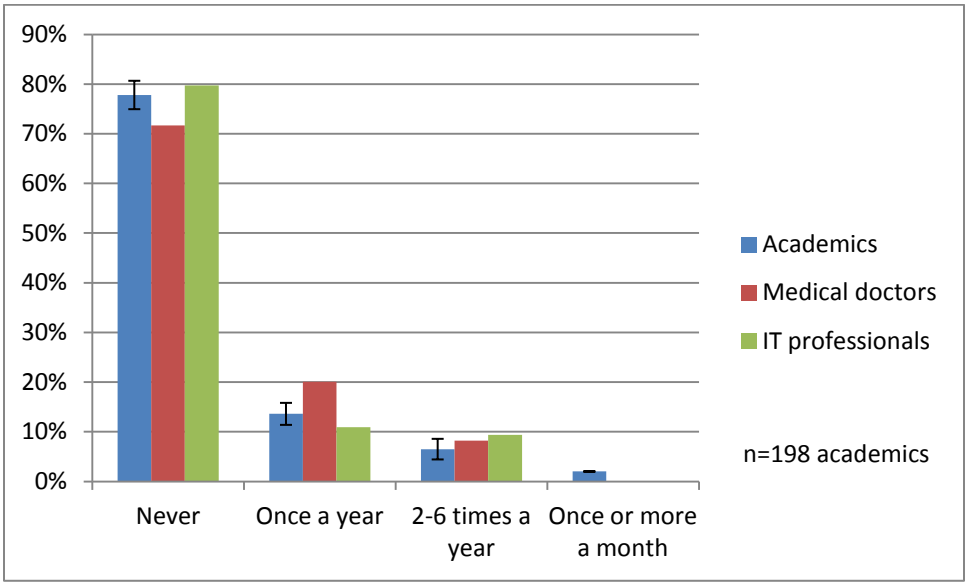

Figure 26. How often do you attend meetings of immigrant associations?

The survey results also show that more academic respondents have served as an officer or a board member of these associations (46.7 percent) than the information technology professionals (7.8 percent) and medical doctors (28.3 percent). These results change very little when looking only at the academics that settled in the U.S. after the year 2000 (like most information technology professionals), with still 91.4 percent of academics participating in professional associations and 29.3 percent of academics now having served as officers or board members. The latter results, though lower for academics, is still higher than earlier arrivals among the medical doctor and information technology respondents. These data suggest that Indian academics are active in host

communities, more than the information technology professionals, but like the medical doctors, their participation is more focused on professional ties rather than nationality.

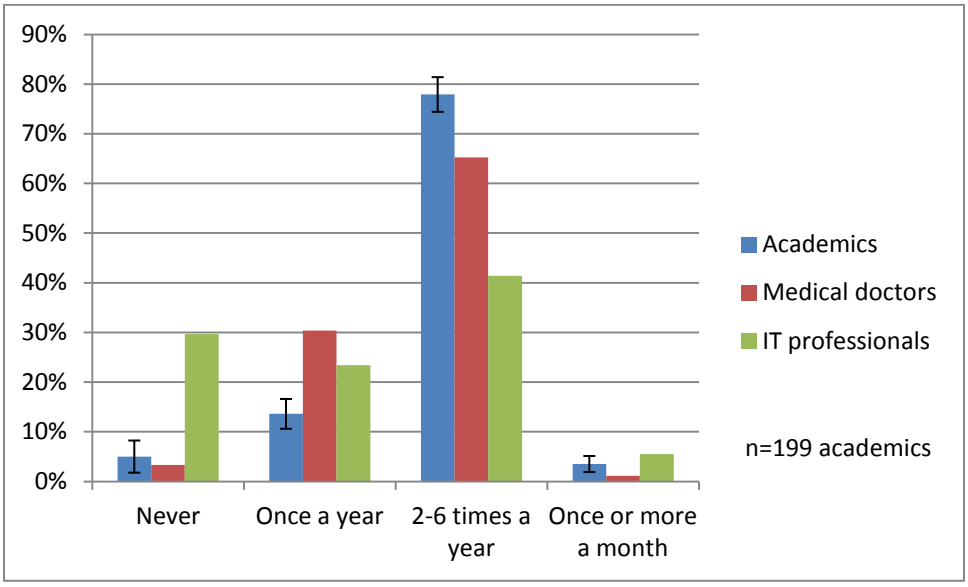

Figure 27. How often do you attend meetings of professional associations?

Home-Country Resources

Figures 28 and 29 denote the frequency with which Indian academic immigrants travel to India for social and professional purposes, respectfully. Like the information technology professional and medical doctor immigrants, the academics travel to India much more frequently for social purposes than for professional purposes. The survey results indicate that 84.9 percent of the academic respondents traveled to India for social purposes at least once per year; whereas, 57.6 percent traveled to India for professional purposes. However, the latter result is higher than either the information technology professionals

(36.3 percent) or medical doctors (31.5 percent). The rate drops slightly to 43.1 percent for academics that settled in the U.S. in the year 2000 or later.

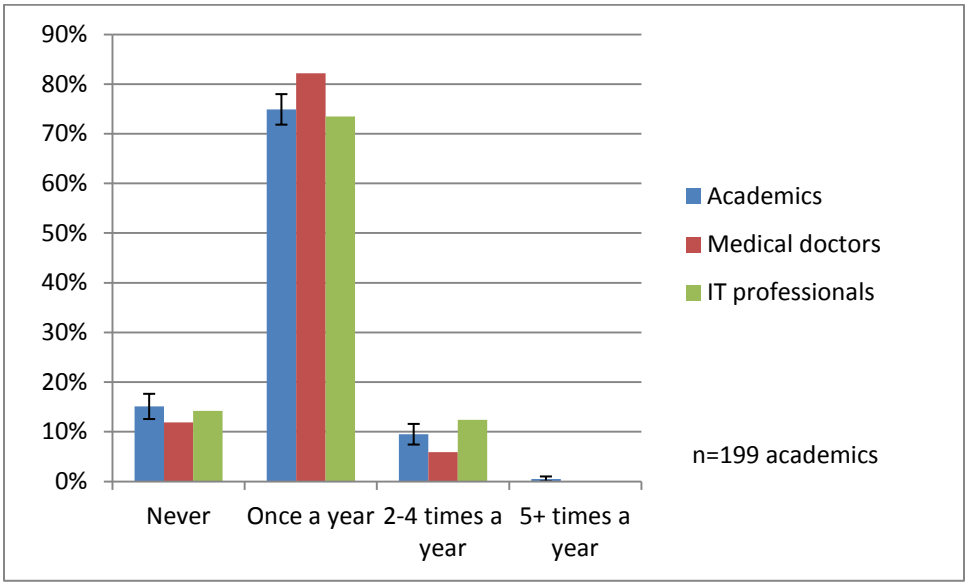

Figure 28. How often have you traveled to India for social purposes on average during the past three years?

Several of the academic interview participants use, and advocate the use of, academic sabbaticals as opportunities to travel to India for extended periods of time (one or two semesters every six years) to conduct research (Interview Participant 10, 2012; Interview Participant 11, 2012; Interview Participant 7, 2012). Though infrequent, the sabbatical is an opportunity for extended professional travel to India for academics that is not typically available to information technology professionals and medical doctors. In one atypical case, an academic respondent reported traveling to India every two weeks for a two week rotation for over two years (Interview Participant 9, 2012). In this case,

he was travelling to India to run a start-up company in supercomputing, which he believed could not be done remotely. His travel and work did enable him to establish many relationships with counterparts in India, though he has no plans to return to India on a permanent basis.

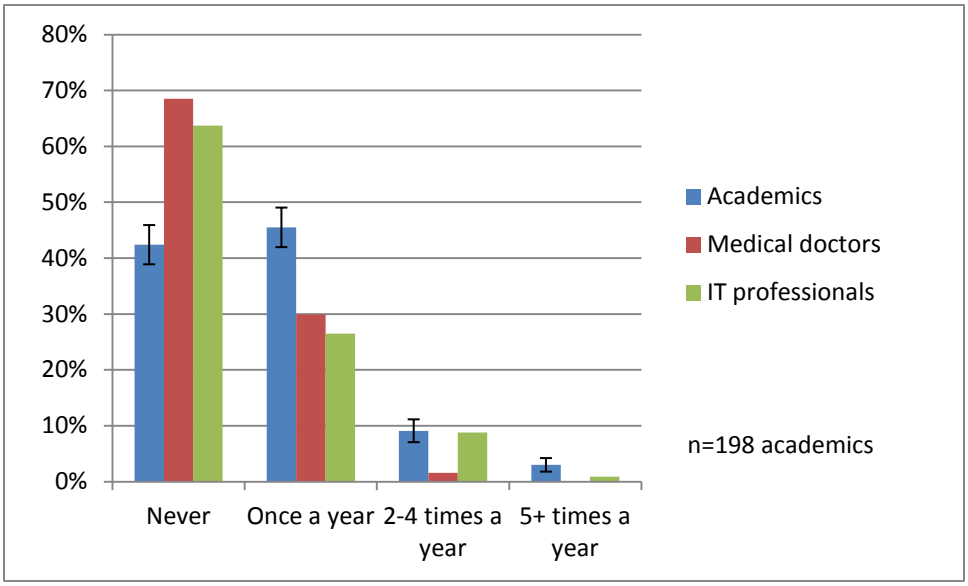

Figure 29. How often have you traveled to India for professional purposes on average during the past three years?

Figure 30 depicts the percent of academic respondents who regularly exchange information with their peers in India as compared to the information technology professionals. These results not only show access to home-country resources, but give some indication of the strength of those exchanges. Similar to the medical doctors, the data indicate a substantially stronger exchange of information by the information technology professionals than the academics in every category. Less than 5 percent of

academics regularly exchange information on jobs in India or the U.S. and less than 10 percent regularly exchange information on technology. More academic immigrants exchange information on research at a comparable rate to the information technology professionals (20.1 percent) in that category. However, when comparing the rate of academics sharing information on research (20.1 percent) to information technology professionals sharing information on technology (44.1 percent), then it appears there is much less regular sharing of information in their area of specialty. More academics respond that they sometimes exchange information on research (64.3 percent); indicating that they have access to peers in India, but that those relationships are weaker than those among the information technology professionals. The interview participants described their exchange of information as informal, primarily through social media, with members of their cohort and former doctoral students (Interview Participant 30, 2012; Interview Participant 31, 2012).

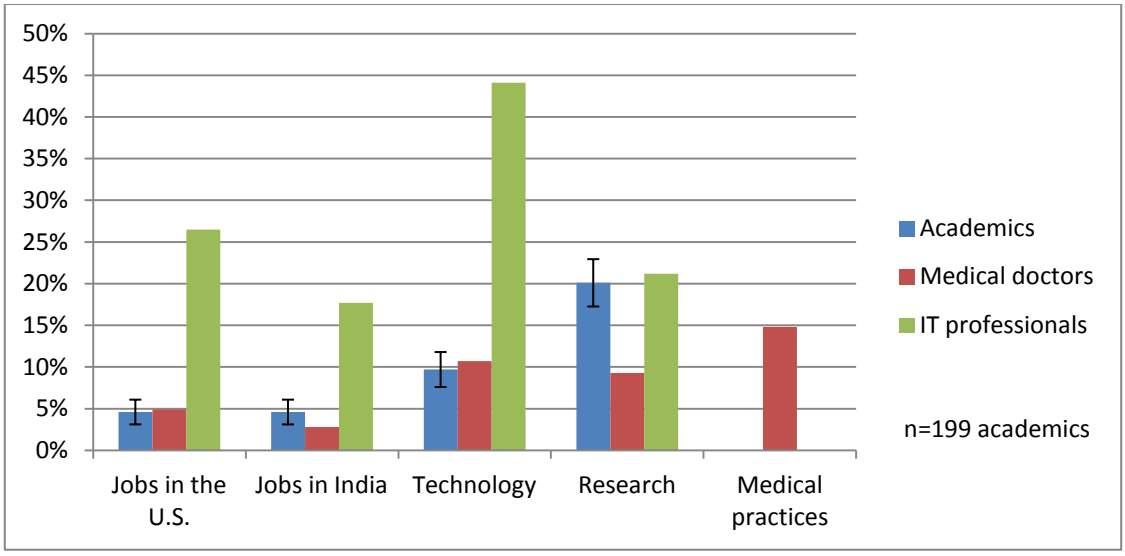

Figure 30. In what areas do you regularly exchange information with friends, classmates, or professional associates in India?

In examining academic immigrants' ties to home-country resources, Figure 31 goes beyond information exchange to consider more direct relations with their peers in India. It shows that 60 percent of the respondents helped others arrange professional relationships in India, thus building professional ties between academics in the U.S. and India. This response is significantly higher than the 39.3 percent of information technology professionals that helped arrange professional relationships. More academics responded that they met with government officials (30.3 percent) than the information technology professionals (6.3 percent) or medical doctors (10.8 percent). This relatively higher rate of interaction with the Indian government is contrary to the lack of trust reported later in this chapter, where 73 percent indicate that bureaucracy and corruption in India would inhibit their return. Interview Participant 11 (2012) said that he is

working on a joint research proposal with the Government of India. He shared that for many years he had no professional contacts with India, but once agreed to give a talk to the Computer Society of India, that led to more invitations to speak, conference visits, sabbatical visits, joint papers, and then the joint proposal with the government. A more common view though, particularly among those academics doing development work in India, is that the government has differing priorities and can be a hindrance (Interview Participant 6, 2012).

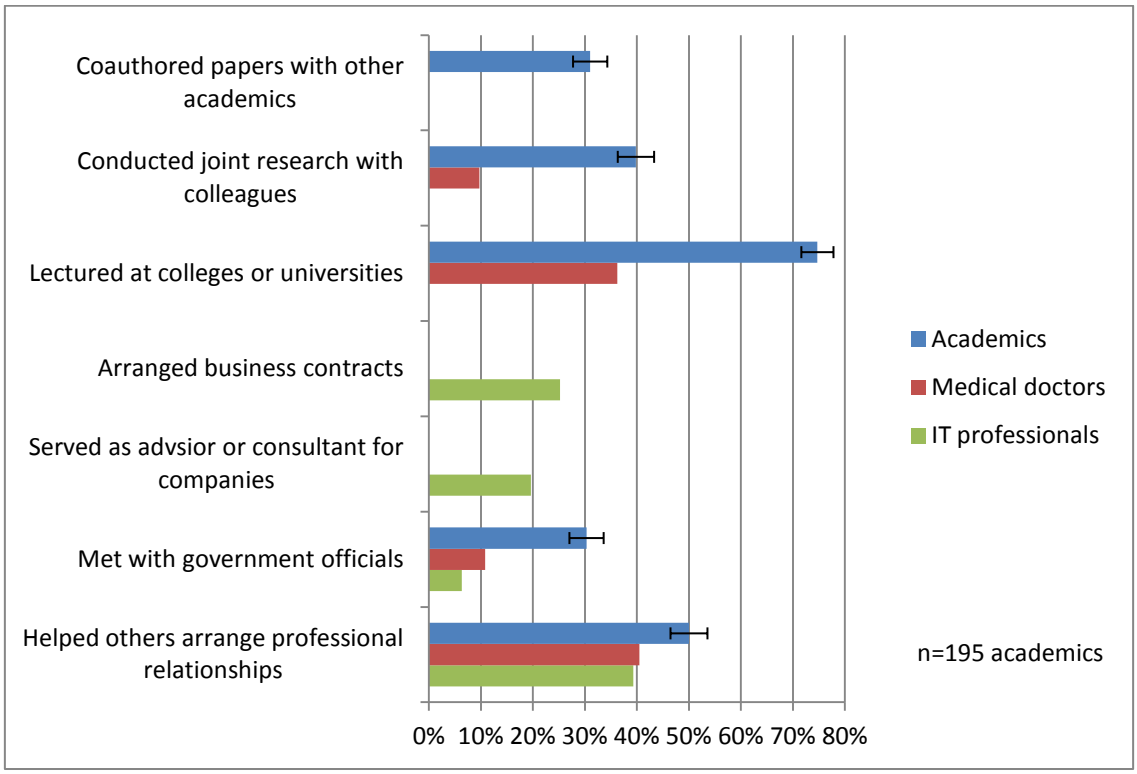

Figure 31. Have you had these types of contacts in India?

Additional types of interaction, specific to academics, were included in the survey. Figure 31 shows that 74.7 percent of the respondents have lectured at colleges or universities in India (recall that 36.2 percent of the medical doctor respondents have lectured at medical schools). Furthermore, 39.8 percent have conducted joint research with their colleagues in India. These data suggest a somewhat high level of interaction among Indian academics, yet the rate of respondents that coauthored papers with India colleagues is 31 percent. Given the previous results on lectures and joint research, as well as the significance given to publications in the academic community, one might expect a higher rate of coauthorship. Interview participants indicated that they are willing to give lectures while in India, but they do not conduct joint research or coauthor papers because they do not see opportunities for such joint efforts (Interview Participant 31, 2012; Interview Participant 34, 2011). However, Interview Participant 32 (2012) asserts the reasons are the gaps in research skills and the lack of quality data. He views the prospect of conducting joint work with a peer in India would actually become a mentorship and that he would need to collect his own data.

Several of the interview participants commented on the relationships their universities are establishing with universities in India, which they view as primarily commercial relationships rather than relationships focused on research. They believe greater investment is needed in research and more exchange programs need to be established for professors and students (Interview Participant 10, 2012; Interview Participant 35, 2011; Interview Participant 7, 2012; Interview Participant 9, 2012).

Supporting and Inhibiting Factors for Returning to India

The current research used preliminary interviews with subject matter experts and immigrants to identify possible factors influencing return migration and circulation, in addition to bureaucracy and infrastructure. These additional factors cover professional growth, culture, family relationships, and the desire to contribute to the welfare of India. Academic survey respondents were then asked to rate the extent to which these factors supported or inhibited their return to India. These results are compared to the responses from the Indian information technology immigrants.

Figure 32 reports the proportion of academic respondents who indicated the factors would support their return to India. Like the information technology professionals, family relationships in India (50.3 percent) and culture and lifestyle in India (38.9 percent) are the top factors supporting return. As in the case of the medical doctors, the response on family relationships in India is lower by a difference of 25.6 percent compared to the information technology professionals. Again, when filtering the results to include only those respondents who settled in the U.S. in the year 2000 or later, the proportion where family relationships support return increases to 60.3 percent. Further, Figure 33 shows that 40.5 percent of respondents indicate their family relationships in the U.S. inhibit returning to India. This continues to support the concept that the longer the immigrants stay in the U.S. and establish their families locally, the less likely their intentions are to return to India. Contrary to this relationship is that as the immigrants stay longer in the U.S., their parents are getting older and need more support (Interview Participant 31, 2012). It is difficult and expensive to bring one's parents to the

U.S. The parents may also have difficulty adjusting to the weather and environment in the U.S. This leads some immigrants to return to India.

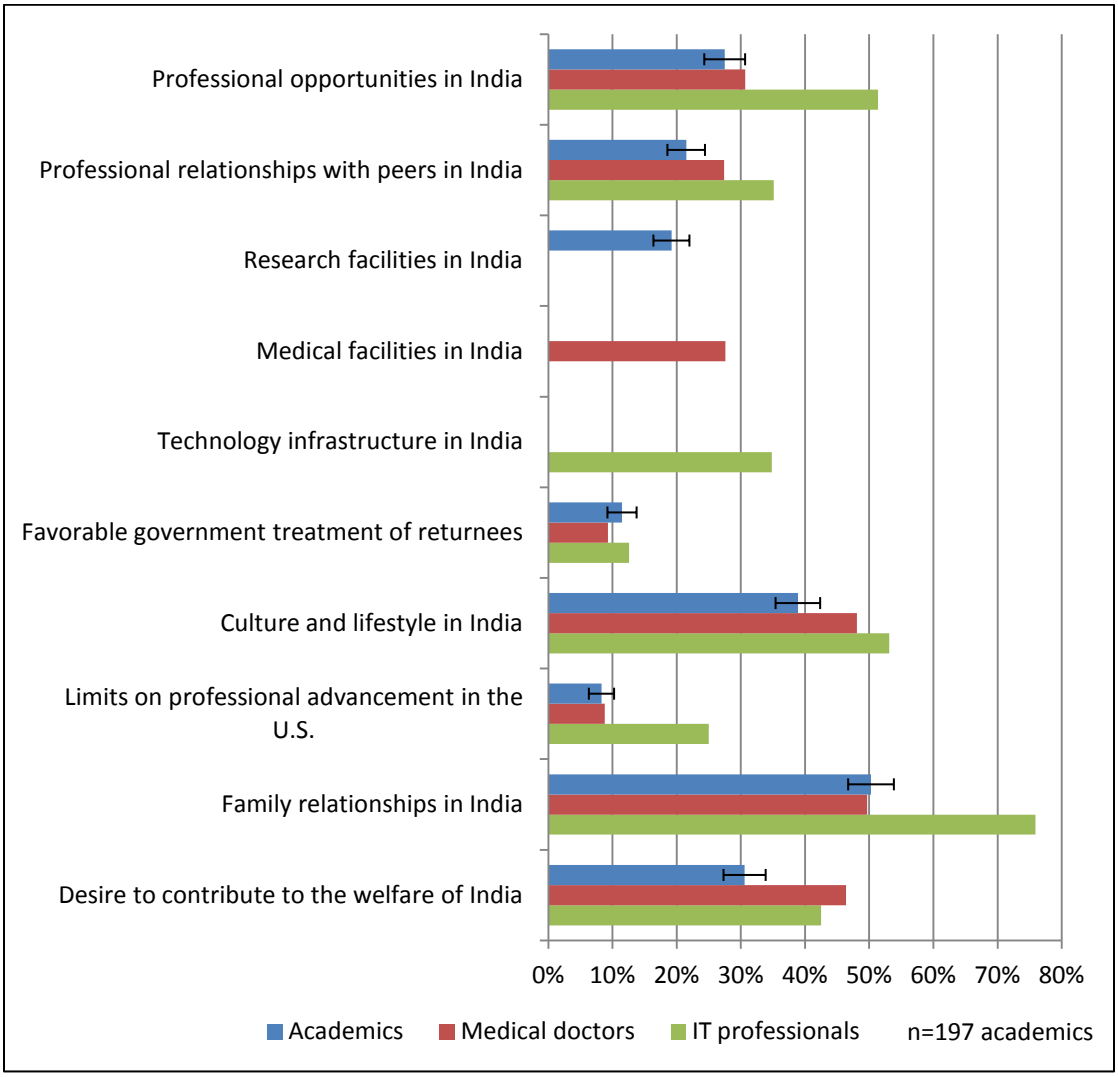

Figure 32. Please rate the extent these factors support return to India

Another top factor supporting return for academics is the desire to contribute to the welfare of India (30.6 percent), which is lower than the response by the information

technology professionals (42.5 percent). Several interview participants commented on their efforts to give back to India. Two of the academics are working on development projects in India for a clean water supply initiative and child education (Interview Participant 30, 2012; Interview Participant 6, 2012). One academic is contributing directly to her field (Interview Participant 7, 2012). She cited the need for improved research practices in India, so she travels to India periodically to conduct workshops on research. All three academics believed they did not need to return to India in order to give back to their home country.

When it comes to infrastructure, the academics indicating that research facilities in India support return (19.2 percent) is much lower than the information technology professionals' view of the technology infrastructure supporting return (34.8 percent). Interview Participant 35 (2011) and Interview Participant 32 (2012) consider the research infrastructure to be lagging behind other countries. They explained that Indian education does not have a research culture, their libraries are full of textbooks, faculty members are more interested in making money in industry, and empirical research and data collection infrastructure are not adequate. However, one interview participant, who arrived in the U.S. more recently, noted that facilities are getting better and that interactions for academics in India with others outside of the country is easier today (Interview Participant 33, 2011).

The academic respondents' view on professional opportunities in India with respect to supporting return (27.5 percent) is significantly lower than the information technology professionals (51.4 percent). In addition to the lack of a research focus

described above, salaries for academics in India are cited as an inhibitor for professional opportunities in India; one stating that where "professors can barely make enough to survive, their undergraduate students go on to make more money in industry (Interview Participant 9, 2012)." On the other hand, the academics that indicate that limits on professional advancement in the U.S. support return is low (8.3 percent) compared to the information technology professionals (25 percent). Like the medical doctors, most academics (45.6 percent) indicate this factor is not applicable.

Figure 33 shows that most academic respondents view the bureaucracy and corruption in India as inhibiting their return (73 percent), which is greater than the information technology professionals (59.3 percent). Interview Participant 10 (2012) indicated he experienced corruption firsthand in trying to run his start-up company in supercomputing, but other respondents focused on discrimination and sexism (Academic Survey Respondent 171, 2012; Interview Participant 31, 2012; Interview Participant 32, 2012). They noted that the quota reservation system based on caste is a significant factor in determining who gets promoted and rewarded; whereas in the U.S., reward is primarily based on merit.

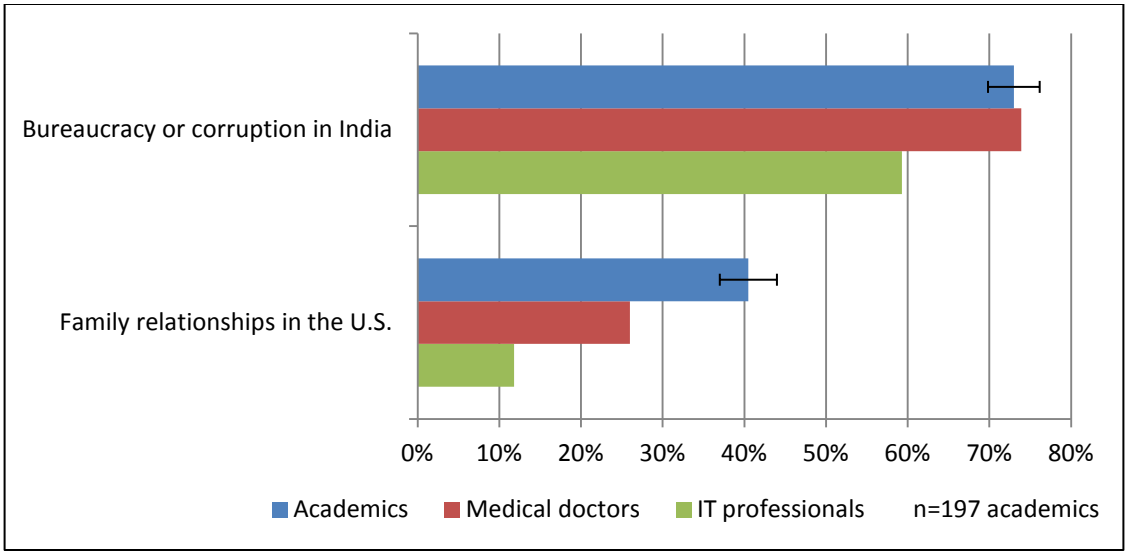

Figure 33. Please rate the extent these factors inhibit return to India

Rival Explanations

The previous sections presented the data with respect to the conditions that support or inhibit the formation of transnational networks as a possible explanation of the positive growth in human capital. As discussed in Chapter 3, internal validity is difficult to establish in a case study such as this, where the behavior cannot be directly observed. This section considers possible rival explanations for the reported behaviors. That is, whether migration is not relevant to these behaviors and outcomes, and whether any growth in home-country resources can be attributed to a brain-gain effect. The latter is of special interest given the high rate of growth (18.7 percent) reported in Table 1.

Migration Relevance

Figure 34 shows the percentage of academic respondents who indicate they are somewhat likely or quite likely to return to India. Comparable to the medical doctors, only 8.6 percent of academics indicated they are quite likely to return, whereas 31.9 percent of information technology professionals indicated they are quite likely to return. The total response for academics indicating somewhat likely or quite likely (29.4 percent) is less than half of that of the information technology professionals (63.8 percent).

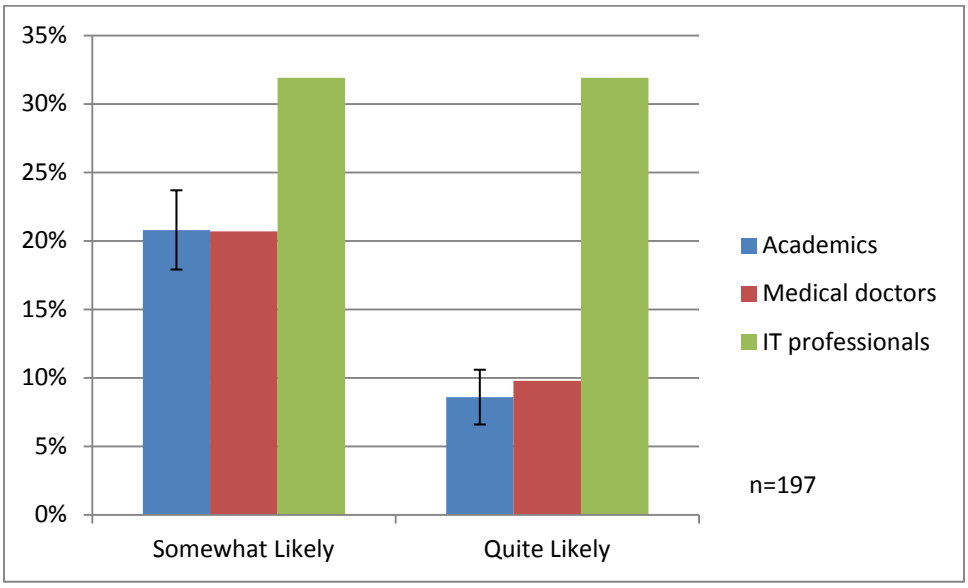

Figure 34. Would you consider returning to live in India in the future?

One interview participant indicated she would likely return to India if she could obtain a suitable offer (Interview Participant 10, 2012). This academic is active in collaborating with peers in India, spending sabbaticals in India, and coauthoring papers. Other participants cite various reasons for remaining in the U.S.:

- Many institutions in the U.S. enable academics to teach, conduct research, and perform services; where the institutions in India focus primarily on teaching (Interview Participant 37, 2011).
- One cannot do world-class research in India (Interview Participant 35, 2011).
- Remaining in the U.S. enables one to earn and give more money to parents and family in India (Interview Participant 11, 2012).
- A lot has been invested to obtain tenure in the U.S. (Interview Participant 36, 2011).
- One becomes accustomed to the high quality of life on U.S. college campuses—the colleagues, students, teaching, and research (Interview Participant 7, 2012).

Interview Participant 35 (2011) describes a typical scenario for academics' views on returning to India:

> "Like me, those thinking to come for an education are 50-50 thinking about going back after completed; after completion it is 75-25 (staying-going back); after spending time here 7-10 years and they go back to India, they see things they have not seen before with the quality of life. They have clean house, but once you come out, the roads are not clean. They can't get a simple thing done without bribing officials, things don't move quickly, officials want to find fault so they can squeeze money out

> of you. Then you compare to U.S. and ask why go back. If you leave the U.S. there is someone else to take your job. So you stay and children come into your life, they don't want to go back, so you decide to stay here permanently."

Figure 35 reports on those academics known by the respondents to have returned to India. It shows that 18.9 percent of the respondents do not know academic friends or colleagues who returned to India, which is somewhat higher than the 12.4 percent of the information technology respondents. However, only 12.8 percent of academic respondents know six or more returnees, versus 34.5 percent of the information technology respondents. These data indicate that academics may be returning to India at lower rates than information technology professionals, though perhaps not as low a rate as the medical doctors. Interview Participant 32 (2012) explained that those academics who return to India are not necessarily returning to work in academia. Rather, they are returning to set up a business or work for a multinational corporation.

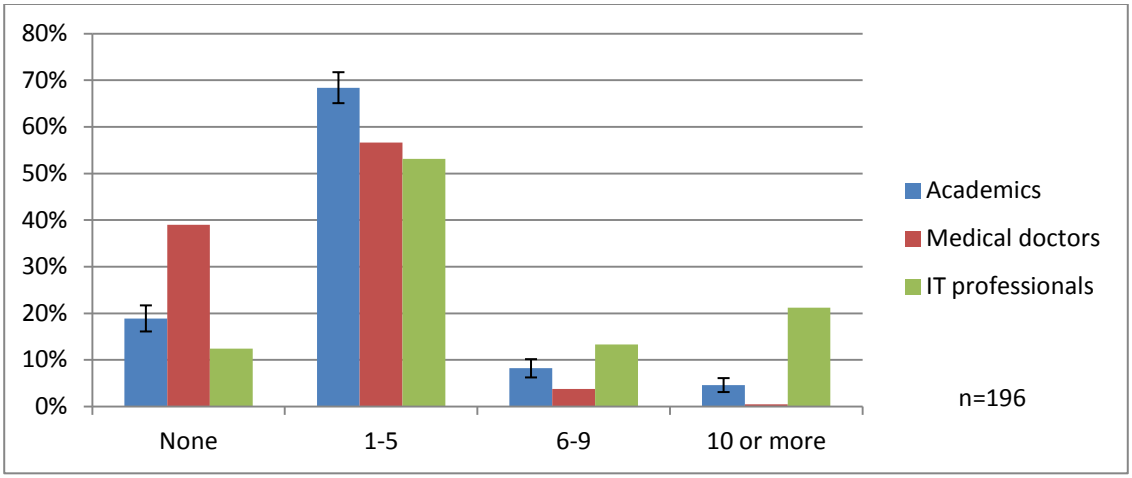

Figure 35. How many of your academic friends and/or colleagues have returned to India to conduct research or business?

Figure 36 shows that the academic respondents' frequency of investment in ventures in India is only slightly less than that of the information technology professionals. Where 33.7 percent of the information technology professionals responded that they invested their money once or more than once, 29.8 percent of the academics responded that they invested once or more than once. As noted previously, some Indian academics seek to give back by participating in social and professional ventures in India. Some also add that they receive only minimal support from their universities in the U.S., usually only the ability to take time off (Interview Participant 6, 2012; Interview Participant 7, 2012). They would like to see more formal programs and investment from their universities, which they believe can benefit universities in the U.S. and India.

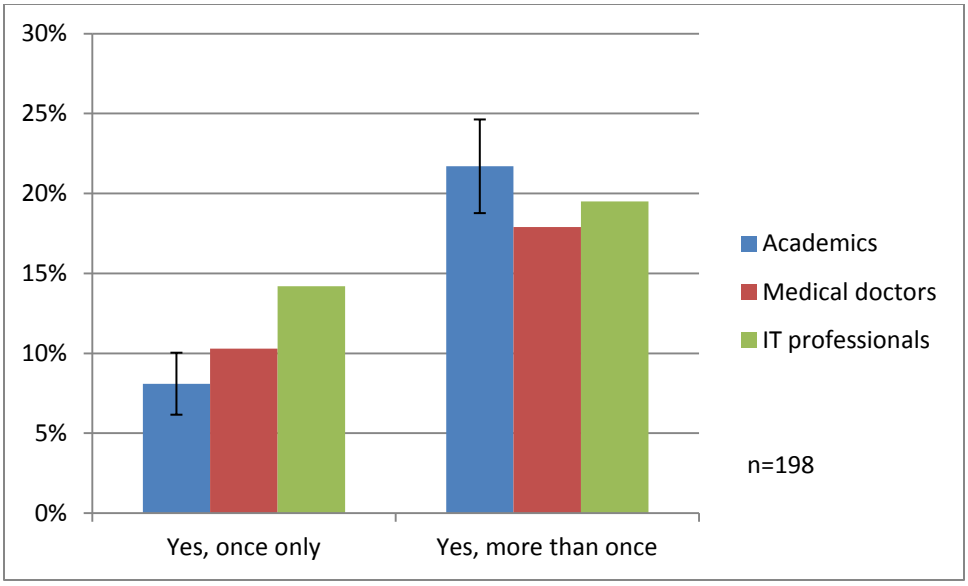

Figure 36. Have you invested your own money in professional or social ventures in India?

Similar to the Indian medical doctors, Indian academics are contributing to ventures in India, at a slightly lower level than information technology professionals. However, they are much less likely to return to India and have far fewer colleagues who have returned. Again, this suggests a minimal positive impact on India. Thus, it appears their behavior would not be relevant to any positive outcome in India. Still at question though, is whether their behavior has contributed to the rapid growth of Indian academics in India via a brain-gain effect.

Brain Gain

The data in Table 1, Chapter 3, show that the stock of Indian academics in India is growing at a faster rate (18.7 percent) than the stock of Indian academics in the U.S. (7.2

percent). Further, the growth rate in India for academics is much higher than the rate of growth for information technology professionals in India (10.4 percent). A brain-gain effect is plausible given these rates—that is, the growth in the stock of academics in India may be the result of individuals inspired by the prospect of migration to pursue academia, but remained in India. Surveying or interviewing Indian academics working in India is out of the scope of this research. However, the Indian academics interviewed were questioned on their intentions to emigrate to the U.S. when they were pursuing their education. Common reasons for emigrating to the U.S. offered by the interview participants include the following:

- There were limited options for pursuing advanced education, especially doctorates, in India (Interview Participant 33, 2011; Interview Participant 34, 2011; Interview Participant 35, 2011; Interview Participant 7, 2012). Note that India is second to China with 2,161 doctorates earned in the U.S. in 2011 (National Science Foundation, 2011).
- The U.S. higher education system for doctorates is perceived as the best in the world (Interview Participant 10, 2012; Interview Participant 36, 2011; Interview Participant 9, 2012).
- As noted by a respondent, he came to the U.S. for a master's degree, but only became interested in a doctorate after attending a U.S. university (Interview Participant 33, 2011; Interview Participant 7, 2012).

Interview Participant 35 (2011) taught at a college in India for two years before coming to the U.S., but without having a doctoral degree. He believed that he could not make significant progress without a doctorate. As noted above, he believed his options were limited in India for obtaining his doctorate, so he emigrated to the U.S. While still working on his doctorate, he was accepted as a member of the faculty in his U.S. university. With the exception of this case, the interview participants said they emigrated to the U.S. to obtain their advanced education, not to enter academia directly as a professor. These cases do not support a brain-gain effect to explain the high rate of growth in the stock of academics in India. It is more likely that the growth rate of academics in India is influenced by the rapid expansion of education institutes and the lowering of the qualifications to teach in higher education. This requires further research.

Findings and Conclusion

This chapter presented the survey and interview data on Indian academic immigrants with respect to the variables of the model defined in Chapter 3; including host communities, home-country resources, infrastructure, and institutions. These data were contrasted with the data gathered on information technology professionals. One objective was to examine the behaviors of academics to assess the formation of transnational communities, circulation, and human capital accumulation. Another objective was to contrast the migration scenarios involving work in sectors classified as tradable and nontradable services. Further, to assess internal validity, this chapter also considered two rival

explanations identified in Chapter 3: migration relevance and brain-gain effect.

Based on the data presented, this research finds the following:

- The respondents are much more active in professional communities than the information technology professionals; they also travel to India for professional purposes more frequently.
- The respondents exchange information with peers in India far less than information technology professionals.
- Many Indian academic immigrants have lectured at colleges or universities in India while visiting, but few co-authored papers with their peers in India.
- Fewer academics are attracted by professional opportunities in India than the information technology professionals.
- Fewer academics have concerns over family ties in India, but have stronger concerns over family ties established in the U.S.
- Bureaucracy and corruption are inhibiting factors for the respondents' likelihood of returning to India.
- The respondents indicated that the research infrastructure is lagging in India, that empirical research practices are not adequate, and that there is not a research culture in India.
- The likelihood of academics returning to India is substantially lower than information technology professionals. Further, the Indian academic immigrants know fewer colleagues who have returned to India.

- A brain-gain effect is not apparent for academics. The interview participants emigrated to the U.S. to obtain their advanced education, not to enter academia directly. It is more likely the growth rate of academics in India is influenced by the rapid expansion of education institutes and the lowering of the qualifications to teach in higher education.

India has experienced a rapid massification of their higher education system in order to provide access to a very large, young, and growing population. Yet to date they achieved a tertiary GER of 15 percent, which they plan to double by the year 2020. Fulfilling this goal will require continued massification, creating a high demand for more post-secondary teachers. As noted by the respondents, the Indian system can produce many undergraduates, but they believe it is necessary to go overseas for advanced graduate education. They view the U.S. as the premier choice. Initially attracted to the higher education system in the U.S., after obtaining their advanced degrees, they choose to stay and pursue careers in academia. These academics are active with others in their discipline of study. However, their ties to peers in India are weak despite their travel to India for conferences and guest lectures. There is very little joint research and coauthoring of papers, because they do not see the opportunities and perceive a gap in empirical research practices and data in India. These academics perceive the Indian higher education system as predominately focused on teaching—to the exclusion of research. They also have concerns over the quality of education and research practices, low salaries for academics, and a reservation system and bureaucracy that do not reward

merit. These factors inhibit their return to India as academics. Some of these academics are involved in programs in India as a means to give back to their home country. They indicated that their universities provided little support—usually in the ability to take leave or sabbaticals. They would like to see more formal programs and investment between their universities in the U.S. with those in India.

These findings are not consistent with the scenario leading to the formation of transnational communities that facilitate circulation and the accumulation of human capital, nor can the high growth of academics in India be attributed to migration. The Indian academics working in the U.S. participate in professional host communities, have access to peers in India, and many have lectured at Indian colleges and universities. However, their exchange of information with peers in India is weak, most indicate they are not likely to return to India, and many know few colleagues who have returned. The conclusion is that migration of academics, whose work is classified as a nontradable service, does not contribute to a positive-sum accumulation of human capital in their home country. Like the medical sector, emigration in post-secondary education supports the brain-drain phenomenon.

Chapter 7: Comparative Analysis and Validation

The research presented herein seeks to understand the extent of the relationship between the nature of a service, those classified as tradable or nontradable, and the formation of transnational communities of highly-skilled immigrants leading to circular migration or whether the factors of host communities, home-country resources, infrastructure, and institutions are more significant. The previous chapters present the results of surveys and interviews with Indian immigrants working in information technology (classified as a tradable service), and medical doctors and academics (classified as nontradable services). The surveys gather data on factors related to transnational communities, including participation in host communities, access to home-country resources, and institutional factors that inhibit or support immigrant circulation. The surveys also capture data on migration outcomes, including immigrants' views on their likelihood of returning to India, the number of their colleagues who have returned to India, and their frequency of investment in Indian ventures. Based on the survey results, information technology respondents are more than twice as likely to indicate that they are quite likely or somewhat likely to return to India compared to medical doctors and academics. Furthermore, information technology respondents are nearly three times as likely to know six or more colleagues who returned to India than the academic respondents and eight times more likely than the medical doctor respondents. In addition, the information

technology respondents are more likely than medical doctor or academic respondents to invest their own money in business or social ventures in India. These data suggest that information technology professionals are returning to India at a higher rate and are more active in Indian ventures. Through a combination of regression analysis, counterfactual analysis, and analytical generalization, this chapter assesses whether there is a significant relationship between the sector (tradable versus nontradable) of the immigrants and these outcomes, or whether other factors explain these variances.

Before examining the relationships between sectors and migration outcomes, this chapter first examines the sample of the combined datasets for the information technology, medical doctor, and academic respondents. As noted in the prior chapters, matching a purposive sample with population characteristics can minimize selection bias and preserve correlations of interest. To be effective, the population characteristics should not be correlated to the outcomes under study. In the case of this research, the correlation between the population characteristic, census region, used for sampling is found to have a weak correlation to the migration outcomes. In addition, the cases of overrepresentation and underrepresentation in the sample identified previously are adjusted through the use of person weights. Although, a sensitivity analysis shows little difference between the weighted and unweighted results, which is a further indication that the selection bias is minimized.

Next, the chapter examines the relationships between the sectors and the migration outcomes, including their significance and impact, by performing a regression analysis on the sample data. The regression analyses are based on a model where

migration outcomes are treated as dependent variables, the sectors in which the immigrants work (tradable and nontradable) are the independent variables, and the factors that influence transnational communities are the control variables. The objective is to determine whether there is a significant relationship between the tradability of a service and the migration outcomes while controlling for the factors that influence transnational communities. The migration outcomes include the likelihood of the immigrant returning to India, the number of colleagues known to have returned to India, and the frequency of investment in Indian ventures. Combined, these three outcomes provide a stronger indication of circular migration and transnational relations. Whereas the likelihood of return is a statement of intent that may not take place, the number of colleagues known to have returned provides some indication of the magnitude of actual return migration. Likewise, frequency of investment provides an indication of the magnitude of actual transnational relations.

Comparable to the analysis performed by Saxenian (2002), the initial analysis is based on a simple model that examines the migration outcomes as they relate to the sector and demographic variables. With the exception of investment, the analysis finds that these relationships are significant and that the sector has a greater impact. An enhanced model then introduces additional control variables based on the conditions that Saxenian (2006) concludes are factors that influence the formation of transnational communities. These factors include participation in host communities, access to home-country resources, and institutional factors such as infrastructure and bureaucracy. The analysis examines correlations among these factors to determine their inclusion in the

model. Again, the analysis finds that the sectors are significant. Furthermore, the analysis finds that the variables representing host community participation, access to home-country resources, and select institutional factors are also significant.

Using the resulting best-fit regression model, a counterfactual analysis is then performed to assess the possible impact of hypothetical changes to conditions of the model. Specifically, it considers the impact on the mean probability of the likelihood of return if changes are made to the tradability of a service, perceptions on bureaucracy, perceptions on infrastructure in India, and the level of exchange of information with peers in India. The analysis finds that perceptions on bureaucracy have the largest effect.

The chapter then considers whether the findings are generalizable beyond the immediate case study. Through analytic generalization, it assesses the external validity by logically replicating the results in the case of the Philippines, thus providing further support for the findings in this case and the hypothesis.

Sample Assessment and Adjustments

As reported in prior chapters, the sample frame was developed through purposive sampling from public directories according to the distribution of immigrants by census region from the American Community Survey data. Wong (2008) argues that matching purposive samples with population characteristics can minimize selection bias when using uncorrelated properties. Brickman-Bhutta (2012) adds that this approach can preserve correlations of interest, but researchers must be sure the potential source of bias does not correlate with the relationship of interest. A correlation analysis of the sample

data verifies this condition is met. Table 8 presents the correlations of the population characteristic, census region, to the migration outcomes of interest, likelihood of return, colleagues returned, and investment frequency. In all cases, the correlations are less than 0.1, indicating that the correlations are weak. Thus the analyst can have some confidence that the correlations of interest are preserved and support testing of the relationships between tradability and the migration outcomes.

Table 8. Correlation between census region and migration outcomes by sector

Sector	Variable	Likelihood of Return	Colleagues Returned	Investment Frequency
Information Technology	Census Region	0.0525	0.0317	-0.0563
Medical	Census Region	0.0394	0.0655	0.0924
Academic	Census Region	-0.0752	0.0923	-0.0058

The prior chapters also reported cases of overrepresentation and under-representation in the samples by census region, particularly in the academic sample that had an overrepresentation in the Midwest region and an underrepresentation in the South region. Rather than drop observations in order to attain the desired distribution across census regions, thus losing data, the samples are adjusted using person weights in the regression analysis. In a weighting adjustment a weight is assigned to each observation whereby overrepresented areas receive a value less than one and underrepresented areas receive a value greater than one (Bethlehem, 2009).

The equation used to calculate the weights is shown below. Applying the method from Bethlehem (2009), every observation receives a weight based on the proportion expected for that sector and region from the American Community Survey and the proportion realized in the sample. For example, the weight assigned to an academic observation in the South region is equal to the expected proportion, 0.364, divided by the realized proportion, 0.231, which gives a weight of 1.576. This weight increases the value of the observations in the underrepresented South region for academics commensurate with the expected distribution.

$$weight_{Sector,Sample\ Region} = \pi_{Sector,Reference\ Region} / \pi_{Sector,Sample\ Region}$$

Based on a sensitivity analysis examining both weighted and unweighted regressions, there appears to be little impact from the overrepresentation and under-representation. For example, the unweighted mean probability that a respondent is somewhat likely or quite likely to return to India is 0.420; the weighted mean probability is 0.426. The small difference suggests that the overrepresentation and underrepresentation of regions in the original sample is not adversely contributing to a selection bias. Nevertheless, all results reported in this chapter are based on the weighted observations.

In addition to the weighting adjustments, the survey responses are coded to enable the regression analysis. Appendix B defines the variables used in the regression analysis,

as well as their encoding. Given the fixed range of possible responses for each survey question, all of the variables are necessarily categorical. The variable for an immigrant's age is also categorical since the possible responses are defined as age groups—18-25, 26-35, 36-50, and 51 and over—that are coded as 1 through 4, respectively. Further, in the cases of the dependent variables, observations that had a response of "Don't Know" for the corresponding survey question, or had no response are dropped from the dataset.

Regression Analysis for a Simple Model

As noted above and in previous chapters, there are key differences for information technology workers (tradable) versus the medical doctors and academics (nontradable) regarding the likelihood one would return to India, the number of colleagues known to have returned to India, and the frequency of investment in Indian business or social ventures. A regression analysis is provided here to determine whether there is a significant causal relationship between tradability and these migration outcomes. The regression analyses are based on a model where migration outcomes are treated as dependent variables, the sectors in which the immigrants work (tradable and nontradable) are the independent variables, and the factors that influence transnational communities are the control variables.

$$MigrationOutcome = b_0 + b_1 Sector + b_2 Demographic + b_3 HostCommunity + b_4 HomeResource + b_5 SupportFactor + \varepsilon$$

The analysis begins with a simple regression model that examines the effects of the sector and the demographic characteristics of the immigrants on the migration outcomes. A similar analysis was performed by Saxenian (2002), whereby a linear regression was performed for the outcomes against the country of origin and the demographic characteristics. In the current analysis, the sector replaces the country of origin, and age and gender comprise the demographic characteristics. Saxenian (2002) found that age had a negative relationship on the likelihood of return. That is, as one gets older, the less likely they are to return to India. Saxenian (2002) found no relationship between age and the number of colleagues who returned to India, and a small positive relationship between age and frequency of investment. Gender had a small positive relationship for men in the latter case.

The results of the linear regression for the migration outcomes for sector and demographics are included in Appendix B. However, a linear regression is not the most appropriate method to use in this case. For categorical dependent variables, a linear regression would treat the possible responses as being equidistant, which is not necessarily true given the responses are not truly numeric. Furthermore, the Shapiro-Wilk test for these linear regression models is significant, which implies that the data do not meet the normality assumption required for linear regression. To address this issue, a logistic regression is used. More specifically, an ordered logistic regression is used since the dependent variables are not dichotomous, but are ordinal categorical variables. These models do not make assumptions about normality, linearity, or homoscedasticity (Agresti, 2007).

Table 9 reports the results for the ordered logistic regression for the simple models. In these cases, the regression coefficients are in terms of odd ratios. They show that being a medical doctor or academic is significant at the 0.001 level for the likelihood of returning. Based on the coefficients, being a medical doctor reduces the odds by 68 percent compared to the information technology professionals that an immigrant is somewhat likely or quite likely to return—these odds are reduced by 76 percent for the academics. Likewise, age is significant, but has a smaller effect. An increase by one age group reduces the odds that an immigrant is somewhat likely or quite likely to return by 32 percent.

Table 9. Ordered logistic regression with odds ratio for simple models

	Likelihood of Return			Colleagues Returned			Investment Frequency		
Variable	OR	z	P>|z|	OR	z	P>|z|	OR	z	P>|z|
Medical doctor	0.318	-4.18	**0.000**	0.126	-6.32	**0.000**	0.625	-1.65	0.100
Academic	0.238	-5.10	**0.000**	0.319	-3.61	**0.000**	0.694	-1.26	0.206
Age group	0.680	-2.92	**0.003**	1.119	0.74	0.457	1.428	2.21	**0.027**
Male	1.170	0.70	0.481	1.767	2.64	**0.008**	0.939	-0.24	0.808
N	438			485			489		
Pseudo R^2	0.055			0.075			0.008		

Information technology is reference; significant relationships are highlighted in bold

For the model on the number of colleagues known to have returned to India, being a medical doctor or academic is again significant at the 0.001 level. Being a medical

doctor has the largest effect, whereby being a medical doctor reduces the odds by 87 percent of knowing six or more returnees. However, in this model, gender is now significant at the 0.01 level. It indicates that being an Indian male increases the odds by 77 percent compared to a female of knowing six or more returnees. In the investment model, age is significant at the 0.05 level, indicating that an increase in age group increases the odds by 43 percent of investing once or more than once in Indian ventures. However, the sector in which they work is not significant.

Note that the Pseudo R^2 values in Table 9 do not have the same interpretation as the R^2 values reported in the linear regression. That is, they do not equate to the explanatory value of the models. Rather, they can be used to compare models to identify the best fit, as will be done in the following section.

Regression Analysis for an Enhanced Model

Saxenian (2006) identified host communities, access to home-country resources, infrastructure, and other institutional factors as the foundation for the formation of transnational communities, which in turn foster immigrant circulation in the pursuit of professional opportunities and investment in the home country. Chapters 4 through 6 presented the information technology, medical doctor, and academic respondents' experiences and views for each of these factors, as well as their intentions on returning to India and their investments in Indian ventures. A specific goal of this research is to assess the role that the tradability of a service may have in this environment. This section presents a regression analysis for the migration outcomes corresponding to circulation

and investment against the sector of a service, and controlling for the factors that support the formation of transnational communities. This analysis enables the determination of whether the sector has a significant relation to the migration outcomes or whether other factors, those supporting transnational communities, are more significant.

In order to set up this enhanced regression model, select survey questions are included to represent host communities, home-country resources, infrastructure, and other institutional factors. The survey questions included are those that best represent the concept and capture the variability in the responses. Host communities are represented by participation in professional associations. Access to home-country resources is represented by the extent of regular exchange of information with peers in India. The latter is specific to each sector's domain, that is, the extent information technology immigrants exchange information on technology; medical doctors exchange information on medical practices; and academics exchange information on research. Finally, factors are included that correspond to professional opportunities in India, family ties in India, infrastructure in India, and bureaucracy in India.

As a further step in defining the model, it is noted that in logistic regression only meaningful variables should be included (Agresti, 2007). That is, all relevant predictors should be included and insignificant predictors should be excluded. A correlation matrix among the independent and control variables aids this analysis (see Appendix B). There are two cases that need to be examined. The first case is a fairly strong correlation between the sector and age (0.39). Age is omitted for several reasons: sector is the independent variable and shown to have the greater effect in the simple model; the

direction of the relationship is from sector to age (given the advanced education requirements for medical doctors and academics, it is understandable that they may be older); and a regression focused on each sector found that age is not significant in all three cases. This may be a limitation due to the definition of age as a categorical variable.

The second case is a very strong correlation between infrastructure and professional opportunities in India (0.75), plus fairly strong correlations between bureaucracy and professional opportunities (0.31), and between family in India and professional opportunities (0.33). Given the comments made by interview participants regarding professional opportunities, the primary direction of this relationship is from infrastructure, family in India, and bureaucracy to professional opportunities. That is, an immigrant's perceptions on infrastructure, bureaucracy, and family influences their perceptions on professional opportunities in India. A regression model shows that infrastructure, bureaucracy, and family are significant predictors of professional opportunities (included in Appendix B). Thus professional opportunities is omitted from the model, while infrastructure, bureaucracy, and family in India are included.

Gender is also omitted from the model since it is found not to be significant in all regression models that include the independent and control variables. Table 10 presents the final model. A link test performed on this model finds no specification error whereby relevant variables have been omitted (X. Chen, Ender, Mitchell, & Wells, 2013). In addition, a collinearity test on the model results in a mean variance inflation factor (VIF) of 1.11, which indicates that multicollinearity is not a problem.

Table 10. Ordered logistic regression for likelihood of return with controls

	Likelihood of Return		
	OR	z	P>|z|
Information Technology	2.400	3.51	**0.000**
Professional Associations	0.792	-2.02	**0.043**
Exchange Information	1.812	3.98	**0.000**
Family in India	1.843	4.46	**0.000**
Infrastructure	1.417	3.55	**0.000**
Bureaucracy	1.672	3.58	**0.000**
N	430		
Pseudo R^2	0.140		

The ordered logistic model shows that working in the information technology sector is significant for the likelihood of returning to India when controlling for the factors that influence transnational communities. It shows that working in information technology is significant at the .001 level and increases the odds by 140 percent that an immigrant is somewhat likely or quite likely to return to India. Participation in professional associations is significant at the 0.05 level, and unexpectedly, the coefficient indicates that more frequent attendance at meetings of professional associations reduces the odds of returning to India by 21 percent. As reported in Chapters 4 through 6, the immigrant respondents are not active in social organizations specific to immigrants, but are active in professional associations not specific to immigrants. These results suggest

that more frequent participation in the professional associations, which are not specific to immigrants, increases ties to the host country.

Table 10 further shows that the other factors that influence transnational communities are all significant at the 0.001 level. Exchange of information with peers in India and family ties in India have the greatest effects. Increases in the exchange of information with peers increases the odds by 81 percent that an immigrant is somewhat likely or quite likely to return to India; family ties in India increase the odds by 84 percent. Bureaucracy has the next greatest effect. It shows that as one's perception of bureaucracy in India improves, the odds increase by 67 percent that an immigrant is somewhat likely or quite likely to return to India. Perceptions of infrastructure have the smallest effect by increasing the odds of return by 42 percent. This may be due to the result that 30 percent of respondents that indicated the infrastructure somewhat inhibits or inhibits return to India also indicated they were somewhat likely or quite likely to return to India.

Table 11 examines the relationships more specifically for medical doctors and academics to the migration outcomes. It shows that being a medical doctor or academic reduces the odds that one is somewhat likely or quite likely to return to India compared to the information technology professionals. Being a medical doctor reduces the odds by 59 percent that one is somewhat or quite likely to return, which is significant at the 0.001 level. Being an academic reduces the odds by 58 percent and is significant at the 0.01 level. However, with respect to knowing colleagues who have returned to India, being a medical doctor has a larger effect and is significant at the 0.001 level. In this case, being

a medical doctor reduces the odds by 95 percent of knowing six or more colleagues who have returned; being an academic reduces those odds by 58 percent and is significant at the 0.01 level.

Table 11. Ordered logistic regression with odds ratio for best fit model

	Likelihood of Return			Colleagues Returned			Investment Frequency		
Variable	OR	z	P>|z|	OR	z	P>|z|	OR	z	P>|z|
Medical Doctor	0.411	-3.35	**0.001**	0.152	-6.24	**0.000**	1.310	0.99	0.322
Academic	0.424	-3.05	**0.002**	0.424	-3.00	**0.003**	1.386	1.14	0.254
Professional Associations	0.791	-2.03	**0.042**	1.270	1.92	0.055	1.115	0.90	0.370
Exchange Information	1.812	3.98	**0.000**	1.914	3.80	**0.000**	1.920	3.82	**0.000**
Family in India	1.844	4.48	**0.000**	0.977	-0.20	0.843	1.262	1.75	0.080
Infrastructure	1.420	3.49	**0.000**	1.060	0.60	0.545	1.136	1.32	0.186
Bureaucracy	1.669	3.51	**0.000**	1.383	1.98	**0.048**	1.215	1.48	0.140
N	430			475			476		
Pseudo R^2	0.139			0.105			0.045		

Information technology is the reference

Similar to the results in Table 10, Table 11 shows that while controlling for the sector, participating in professional associations reduces the odds of return, while exchanging information with colleagues in India, professional opportunities in India, family ties in India, and improved perceptions of bureaucracy in India all significantly improve the odds of return. However, participation in professional associations, family ties in India, and infrastructure are not significant for knowing colleagues who have

returned. This is understandable given that one's own activities and perceptions would not likely have a significant bearing on other immigrants' plans to return. On the other hand, regular exchange of information, which improves the odds by 91 percent, is also understandable in that the immigrants would likely be exchanging information with their returned colleagues. Improved perceptions of bureaucracy in India is significant at the 0.05 level and improves the odds by 38 percent of knowing six or more colleagues who returned to India. The direction of this relationship is not clear. It may be that one's perceptions of bureaucracy are influenced by colleagues that returned to India.

For the model on investment, Table 11 shows that only one variable is significant—the exchange of information with peers in India. It shows that regular exchange of information with peers in India increases the odds by 92 percent that one will invest once or more than once in business or social ventures in India. This outcome may be the result of immigrants learning of investment opportunities through their colleagues in India or perhaps they are investing in their colleague's ventures.

Taken together, Tables 10 and 11 show that while controlling for factors relating to transnational communities, working in information technology (a tradable service) versus working as medical doctors and academics (nontradable services) has significant relationships with key migration outcomes pertaining to circular migration, specifically, the likelihood of return and knowing colleagues of those who have returned. Furthermore, it shows that working in the information technology sector substantially increases the odds of circular migration. In addition, the results show that the factors influencing transnational communities, identified by Saxenian, are also significant. The

latter result is of special interest given the current research is not limited to the experience of Indian technology immigrants in Silicon Valley sampled from a few Indian professional associations.

Counterfactual Analysis

Based on the regression analysis presented in the previous section, this section extends that analysis by conducting a counterfactual analysis that considers what might be the outcome of an immigrant's likelihood of returning to India should select conditions change. Specifically, it considers the possible change in the likelihood of return should services classified as nontradable evolve to exhibit characteristics considered to be tradable. As discussed in the prior chapters, the trends toward medical tourism and online education have the potential to at least partially transform the medical services and education to exhibit tradable characteristics. Granted, such a change is not readily accomplished through policy. However, it provides a basis for comparison to other scenarios. These additional scenarios include improving immigrant perceptions on bureaucracy in India versus setting back those perceptions; improving immigrant perceptions on infrastructure versus setting back those perceptions; and improving the regular exchange of information with peers in India. The impact of each of these scenarios is assessed separately for immigrants in each sector (information technology, medical doctors, and academics).

The counterfactual analysis is performed based on the ordered logistic regression model shown in Table 12, which includes a variable for tradability. In this model the

information technology responses are classified as tradable, while the medical doctor and academic responses are classified as nontradable. Thus sectors classified as tradable increase the likelihood of return by 140 percent compared to sectors classified as nontradable.

Table 12. Ordered logistic regression with odds ratio for counterfactual analysis

	Likelihood of Return		
	OR	z	P>|z|
Tradable	2.400	3.51	**0.000**
Professional Associations	0.792	-2.02	**0.043**
Exchange Information	1.812	3.98	**0.000**
Family in India	1.843	4.46	**0.000**
Infrastructure	1.417	3.55	**0.000**
Bureaucracy	1.672	3.58	**0.000**
N	430		
Pseudo R^2	0.140		

To perform the counterfactual analysis, a condition is changed to create a set of possible scenarios. In each scenario only one variable is changed while the other variables are held at their means. The mean probability is calculated for the estimated likelihood of return, before and after, the condition is changed for each scenario. This

procedure is performed separately for each sector in order to understand the impact of the specified change on the likelihood of return for individuals working in that sector.

Table 13 presents the mean probabilities (P), mean counterfactual probabilities (CFP), and the change in probability (CFP-P) for six scenarios in each sector. It shows that before any change in conditions are made, the probability that an information technology immigrant is somewhat likely or quite likely to return (0.713) is approximately twice that for medical doctors (0.370) and academics (0.324). For each scenario, Table 13 identifies the variable that is changed and the mean value of that variable prior to the change.

Scenario 1 represents the case where services classified as nontradable exhibit characteristics of services classified as tradable. As expected, there is no impact on the mean probability to return for information technology immigrants since their services are already classified as tradable. However, the mean probability of return increases by 0.175 to 0.545 for medical doctors and increases by 0.175 to 0.499 for academics. These results indicate that should the services of medical doctors and academics evolve to exhibit tradable characteristics, like the information technology professionals, then there could be a greater probability of return for the medical doctor and academic immigrants in this sample.

Table 13. Counterfactual analysis based on mean probability of return

	Information Technology (P=0.713)		Medical Doctor (P=0.370)		Academic (P=0.324)	
Scenario	CFP	CFP-P	CFP	CFP-P	CFP	CFP-P
1. Nontradable services exhibit tradable characteristics (TRADABLE=1, Mean=0.2)	0.713	0.0	0.545	0.175	0.499	0.175
2. Perception of bureaucracy in India supports return (BUREAUCRACY=4, Mean=1.3)	0.891	0.178	0.657	0.287	0.611	0.287
3. Perception of bureaucracy in India inhibits return (BUREAUCRACY=1, Mean=1.3)	0.672	-0.041	0.342	-0.028	0.295	-0.029
4. Infrastructure in India perceived as supporting return (INFRASTRUCTURE=4, Mean=1.2)	0.781	0.068	0.463	0.093	0.446	0.122
5. Infrastructure in India perceived as supporting return (INFRASTRUCTURE=1, Mean=1.2)	0.583	-0.130	0.254	-0.116	0.241	-0.083
6. Exchange of information in the domain is regular with associates in India (EXCHANGEDOM=3, Mean=2.0)	0.791	0.078	0.495	0.125	0.447	0.123

P – probability; CFP – counterfactual probability

Scenario 2 shows the change in mean probability of return should perceptions on bureaucracy be rated as supporting return (given a mean value for bureaucracy of 1.3, most respondents indicated bureaucracy inhibits return). Both medical doctors and academics show large increases in probability. The mean probability increases by 0.287 for both medical doctors and academics. The mean probability of return also increases by 0.178 for information technology professionals. Table 13 also shows the change in mean probability should perceptions on bureaucracy be rated as inhibiting return (**Scenario 3**). This action reduces the probabilities of return, though by smaller margins. This reflects the responses indicating that the immigrants' already have poor perceptions of bureaucracy, so there is more to be gained by improving these perceptions.

The scenarios where perceptions on infrastructure support return (**Scenario 4**) and where perceptions on infrastructure inhibit return (**Scenario 5**) both have relatively small effects. Likewise, improving the regular exchange of information with peers (**Scenario 6**) also has a small effect, increasing the probability of return by about 0.12 for medical doctors and academics. Thus improving perceptions on bureaucracy stands out as having the greatest effect on the mean probability of return for medical doctors and academics.

Table 14 presents an additional scenario that combines the changes for improving perceptions on bureaucracy, perceptions on infrastructure, and regular exchange of information. In this case, the mean counterfactual probabilities are very high, ranging from 0.835 for academics to 0.954 for information technology professionals. The mean probability of return increases by 0.475 for medical doctors and increases by 0.511 for academics. These results indicate there could be a much greater effect on the likelihood

of return by addressing institutional factors than by changing the tradability characteristics of the sectors.

Table 14. Counterfactuals for combined improvement scenario

	Information Technology (P=0.713)		Medical Doctor (P=0.370)		Academic (P=0.324)	
Scenario	CFP	CFP-P	CFP	CFP-P	CFP	CFP-P
Combined improvement in bureaucracy, infrastructure, and information exchange	0.954	0.241	0.845	0.475	0.835	0.511

P – probability; CFP – counterfactual probability

Table 15 then uses the counterfactual probabilities from the combined scenario, represented in Table 14, to recalculate the emigration rates for each sector, reported in Table 1. It assumes that the current stocks incorporate the mean probabilities of return, then reduces these stocks by the factors corresponding to the increases in the mean counterfactual probabilities. The resulting counterfactual emigration rates for medical doctors and academics are reduced to levels that would mitigate a brain drain from India to the U.S. This benefit to India may come at the expense of the U.S., however, given that this scenario still assumes the services of medical doctors and academics are nontradable. Thus, though they may return to India at higher rates, they are taking their skills and the associated benefits with them.

Table 15. Counterfactual emigration rates based on data from Table 1

Sector	Emigration Stock in U.S.	Emigration Rate	Counterfactual Emigration Stock in the U.S.	Counterfactual Emigration Rate
Information Technology	317,380	11.3%	240,891	8.8%
Medical Doctors	69,000	7.8%	36,225	4.2%
Academics	53,859	7.2%	26,337	3.6%

Note that the magnitude of these predictions cannot be viewed as conclusive. As described in Chapter 2, use of purposive sampling that matches to population characteristics can minimize selection bias and preserve correlations of interest. Further, when the population characteristics do not correlate with the relationships of interest, statistical analysis can support significance testing of these relationships, but they are not as useful for the purpose of predictive generalizations. Thus it can be stated that the above analysis verifies the relationships between the sector (classified as tradable and nontradable), as well as the transnational community factors, to the migration outcomes are significant—and substantial for this sample.

Generalizability of Results

Given the findings to this point on highly-skilled immigrants in the information technology, medical, and academic sectors between India and the U.S., this research next considers whether the findings are generalizable beyond the immediate case study. In the

case study methodology, generalizability (or external validity) is not readily established statistically, as done in the prior section for internal validity. Rather, analytic generalization is used to logically extend the results found in a given case to the broader hypothesis (Yin, 2009). The approach used here is to seek to replicate the pattern of results found in the India – U.S. case to other cases. The extent to which the patterns match across the cases provides further support for the hypothesis.

In the current case, there is a pattern of substantial emigration of highly-skilled individuals, working in information technology (classified as a tradable service) and as medical doctors and academics (classified as nontradable services), from a developing country to the developed world. Often, these immigrants come to the U.S. seeking advanced education, then stay to pursue their careers. India, in this case, has established a comparative advantage in the information technology sector that is integral to a global production network. The diaspora, in and out of this network, maintains relations with their home country. The highly-skilled information technology immigrants circulate at higher rates with their home country as they pursue professional opportunities. Further, the immigrants in the information technology sector are twice as likely to return to their home country as the immigrants in the medical and academic sectors.

Medical doctor and academic immigrants are also active in their professional associations, but have weak and informal ties to their peers in India. They are more likely to travel to India for social purposes, which may include a professional activity. They might consider returning to India, but are deterred by conditions in their home country, such as bureaucracy and corruption, while shortages of individuals with these

skills persist. Immigrants in both sectors also have a dimmer view on their professional opportunities in India. If they do return to India, it is more likely due to family obligations. The medical doctors and academics differ in some of the specific deterrents pertaining to opportunities, infrastructure, and bureaucracy. The medical doctors are concerned with licensing for subspecialties, lack of medical records, and the lack of medical diagnostic labs. While the academics are concerned with the lack of a research culture, data collection practices, lower salaries, and lack of a merit system for advancement.

One case to examine for generalization is that of the Philippines. The Philippines is notable as a leading source of nurses, another form of nontradable service, to the OECD countries and the fourth largest source of doctors (OECD, 2007). In the U.S., the Philippines is the third largest source of immigrants behind Mexico and China (OECD, 2007). Many Filipinos go overseas to pursue higher education and then work in a wide range of sectors (Mitra, 2011). They are also a source of highly-skilled immigrants in both the tradable and nontradable services. In 2010, there were an estimated 36,712 information technology professionals working in the U.S (Ruggles et al., 2011). There were also 18,343 physicians, 6,254 academics, and 148,448 nurses.

Like India, the Philippines has grown its business process outsourcing sector. As noted earlier, IBM Global Business Services (2010) reported that the Philippines surpassed India as a global leader in business process outsourcing in 2009. Likewise, the Philippines is gaining a comparative advantage in the computer and information services sector (Yi, 2012). Furthermore, the Philippine Software Industry Association credits the

growth of the information technology and business process outsourcing sectors, accounting for US$9 billion in revenue, with reversing the trend of Filipino information technology workers emigrating to other countries and the return of many Filipino information technology workers from overseas (Singh, 2011; Torres, 2013). This is a claim of government officials, analysts, and executives. Data on the magnitude of this trend is not available. Currently, the Philippine government has no procedures in place that returning immigrants are required to pass through (IOM, 2013). Note that most higher-skilled jobs available in the Philippines are for outsourced information technology and telecommunications jobs (Clausen, 2010). Like India, multinational corporations are establishing operations in the Philippines and prefer to send their Filipino employees back to the Philippines to work with the local personnel. Further, the large Filipino diaspora plays a significant role in facilitating business relations between the Philippines and the U.S. in this sector (Mitra, 2011).

Also like India, the positive effect of immigration and return migration in the information technology sector has not materialized in other sectors classified as nontradable. A study conducted by the Philippine Department of Science and Technology found that 23 percent of their scientists were working overseas and contributing to the gap in the supply of human resources (Science Education Institute, 2011). The chief reason cited for this emigration is poor working conditions resulting from government apathy and corruption.

Nurses comprise 19 percent of the professional emigrants due to the high demand in other countries where there are better opportunities for skill development, higher pay,

and better working conditions (Dimaya, McEwen, Curry, & Bradley, 2012; Perrin, Hagopian, Sales, & Huang, 2007). The Philippine nursing education program has focused its efforts on providing nurses with the skills needed by other countries, while falling short on producing nurses to satisfy the local demands. Filipino doctors are also retraining as nurses with the intention of migrating overseas—the Philippines Hospital Association estimated that 80 percent of public sector physicians have retrained as nurses (Lorenzo, Galvez-Tan, Icamina, & Javier, 2007). Dimaya, McEwen, Curry, & Bradley (2012) and Perrin, Hagopian, Sales, & Huang (2007) report that the higher-skilled nurses are the most likely to emigrate. Perrin, Hagopian, Sales, & Huang (2007) also reports that two-thirds of nurses who completed post-graduate training were expected to migrate to other countries.

The resulting effect of this migration is a shortage of skilled nurses and an abundance of unemployable, student nurses. Lorenzo, Galvez-Tan, Icamina, & Javier (2007) also note that most nurses who migrate do not return. The predominant reasons cited for those nurses who do return to the Philippines are family related (e.g., getting married, raising children). The migration of nurses is also affecting the Philippine health care system. The Philippine Hospital Association reported that 200 hospitals closed in a two-year period due to the shortage of doctors and nurses (Lorenzo et al., 2007). In addition, 70 percent of Filipino deaths are unattended by a nurse. The Philippine government is trying to address these issues by deploying the pool of unemployed nurses to underserved areas (Dimaya et al., 2012). They are also attempting to attract overseas

Filipino nurses to return temporarily to provide training support at educational institutions.

It should be noted that the Philippines represents a special case with respect to emigration in that the government actively supports the rights of overseas Filipino workers through the Philippine Overseas Employment Administration (POEA, 2010). They also recognize that these workers are the source of substantial remittances amounting to US$18.76 billion in 2009—10 percent of GDP. Nevertheless, the patterns of results in the Philippine case fairly replicate the patterns observed in the India case for the services classified as tradable and nontradable, thus providing further support for the findings in this case and the hypothesis. The Philippine case is necessarily a high-level characterization of a complex environment. An in-depth study of highly-skilled Philippine immigrants working in the tradable and nontradable services would establish a better understanding of their motives and intentions with respect to circulation and return migration. Furthermore, other potential cases, such as Malaysia, Colombia, and South Africa, where their technology sectors seek to engage the diasporas in facilitating growth, offer further opportunities for analytic generalization.

This research may be further extended by examining cases focused on other services classified as tradable, such as business management, financial services, and legal services (Blinder, 2006; Jensen & Kletzer, 2006). Beaverstock (2012) characterizes the transnational migration of high-skilled executives, managing partners, accountants, and lawyers among the financial centers of the world. High-skilled migrants in these professions frequently move between world centers pursuing opportunities and advancing

their careers, particularly in the banking, finance, and professional services sectors. Beaverstock (2012) also describes mobility programs in the accounting sector whereby the top accounting firms circulate accountants and other professionals around the world and estimates that 10-15 percent of these professionals are working outside of their home country. In 2011, there were an estimated 43,577 accountants from India working in the U.S. (Ruggles et al., 2011). This would be an area for further research to verify whether immigrant behavior in this sector, classified as tradable, is comparable to the behavior of Indian immigrants in the information technology sector.

Findings and Conclusion

Prior chapters reported and contrasted the views and intentions of Indian information technology, medical doctor, and academic immigrants on their participation in host communities, access to home-country resources, institutional factors inhibiting or supporting their return, and their intentions on returning to India. Key variances between the groups exist on these factors, particularly in that information technology professionals are twice as likely to indicate their intentions to return to India as the medical doctors and academics. This chapter assesses whether there is a significant relationship between the sector of the immigrants and these outcomes, or whether other factors explain these variances. That is, through a combination of regression analysis, counterfactual analysis, and analytical generalization, this chapter determines the internal validity and external validity of the case study results.

Based on the data presented, this research finds the following:

- With respect to the sampling frame, the correlations between the reference population characteristic and the key migration outcomes are weak. Thus the analysis can have some confidence that the correlations of interest are preserved and support testing of these relationships.
- A weight is used to adjust for some overrepresentation and under-representation against the reference population in the sample. However, a sensitivity analysis examining both weighted and unweighted regressions found little effect on the results.
- The sector (tradable versus nontradable) is significant for the likelihood of returning to India when controlling for the factors that influence transnational communities. It shows that working in the information technology sector increases the odds by 140 percent that an immigrant is somewhat likely or quite likely to return to India.
- Participation in professional associations is significant and, unexpectedly, more frequent attendance at meetings of professional associations reduces the odds of returning to India.
- Infrastructure in India is significant with respect to the migration outcomes, but only has a small effect. Note that 30 percent of respondents who indicated the infrastructure somewhat inhibits or inhibits return to India also indicated they were still somewhat likely or quite likely to return.

- Being a medical doctor reduces the odds by 59 percent that one is somewhat or quite likely to return to India relative to information technology immigrants; being an academic reduces those odds by 58 percent.
- Being a medical doctor reduces the odds by 95 percent of knowing six or more colleagues who have returned to India relative to information technology immigrants; being an academic reduces those odds by 58 percent.
- Exchanging information with colleagues in India, perceptions on infrastructure in India, family ties in India, and improved perceptions of bureaucracy in India all significantly improve the odds of an immigrant returning to India.
- Regular exchange of information with peers in India increases the odds by 92 percent that one will invest once or more than once in business or social ventures in India.
- The probability that an information technology immigrant is somewhat likely or quite likely to return (0.713) is approximately twice that for medical doctors (0.37) and academics (0.324).
- Improving perceptions on infrastructure in India and increasing regular exchange of information with peers have comparable effects on the mean probability of return with an increase of approximately 9-12 percent. Improving perceptions on bureaucracy has the greatest effect on the mean probability of return with an increase of 29 percent for medical doctors and academics.

- The patterns of results in the Philippine case fairly replicate the patterns observed in the India case, whereby Filipino information technology professionals are more likely to return to the Philippines in pursuit of opportunities in a robust technology sector, while the emigration of scientists and nurses continues to drive a brain drain.

Overall, the regression analysis, counterfactual analysis, and analytical generalization support the internal validity and external validity of the findings. That is, while controlling for factors relating to transnational communities, working in information technology (a tradable service) versus working as medical doctors and academics (nontradable services) has significant relationships with key migration outcomes pertaining to circular migration. In addition, the results show that the factors influencing transnational communities, identified by Saxenian, are also significant.

Chapter 8: Conclusion

The concept of brain drain contends that the migration of high-skilled individuals benefits receiving countries at the expense of sending countries. While high-skilled migrants and receiving countries derive the greatest benefit, sending countries are losing the people they need to build a productive society (Kapur & McHale, 2005a; Winters et al., 2003). Over 27 million such high-skilled migrants reside in OECD countries (OECD, 2012). Notable are the cases in some African and Caribbean countries that lost many medical personnel, leaving behind severe shortages of doctors and nurses while experiencing high incidents of disease (OECD, 2007). However, cases in Taiwan, China, India, and Ireland document migration scenarios whereby both sending and receiving countries benefit from brain circulation (O'Riain, 2004; Saxenian, 2006). In these cases, returning migrants bring with them the social capital and human capital gained abroad while maintaining relationships in both countries. These successes have led others to recommend that developing countries foster brain circulation to promote economic growth (Dayton-Johnson et al., 2007).

Saxenian (2006) attributes the success of these cases to the formation of transnational communities where immigrants gain skills and experiences in the receiving country that they transfer to the sending country upon return. Saxenian further identifies factors that influence the formation of transnational communities, including participation

in host communities, access to home-country resources, and institutional factors, such as infrastructure and bureaucracy, that may inhibit or support return. This research begins with the observation that success cases, documented by Saxenian and O'Riain, are all in the technology sector (information technology and engineering), and questions whether the nature of the service provided by the high-skilled immigrants is a significant factor that influences circular migration. The services provided by high-skilled immigrants in the technology sector can be characterized as tradable—domestic activities that can be traded internationally and thus open to offshoring (Jensen & Kletzer, 2006). By definition, it is feasible that a high-skilled immigrant working in a tradable service could return to his or her home country and continue to provide services to the host country. On the other hand, a high-skilled immigrant working in a nontradable service, such as the medical services, would, by definition, be expected to provide services locally in the home country if they return. This leads to the question of whether the latter services would also be able to experience the benefits of transnational communities and circular migration, or if these immigrants would be less likely to return, and thus contribute to a brain drain effect.

The research presented herein seeks to understand the extent of the relationship between the nature of a service (those classified as tradable or nontradable) and the formation of transnational communities of high-skilled immigrants leading to circular migration or whether the factors of host communities, home-country resources, infrastructure, and institutions are more significant. The hypothesis is that the tradability of the service provided by an occupation affects the net brain gain through migration

(tradable services enable positive-sum accumulation; nontradable services inhibit this accumulation).

A case study approach is presented that compares and contrasts the factors of host communities, home-country resources, infrastructure, and institutions across a range of high-skilled immigration scenarios involving services classified as tradable and nontradable with varying results in net brain gain in sending and receiving countries. The study focuses on the migration relationship between India and the United States—one of the world's largest high-skilled flows. Further, the study is conducted at the sectoral level, including the information technology sector (classified as tradable), and the medical services and post-secondary education sectors (classified as nontradable). To gain a rich understanding of the migration relationships, the field research is based on 50 personal interviews and 512 survey responses of high-skilled immigrants and subject matter experts across the United States.

This chapter summarizes the findings of the research, reviews its limitations, and identifies the policy implications and future research.

Summary of Findings

The research finds support for the hypothesis. That is, while controlling for factors relating to transnational communities, working in information technology (a tradable service) versus work as medical doctors and academics (nontradable services) has significant relationships with key migration outcomes. Approximately 64 percent of the Indian information technology professionals indicate they are somewhat likely or quite

likely to return to India to pursue professional opportunities, versus 31 percent of medical doctors and 29 percent of academics who indicate the same. The regression analysis finds that being an Indian immigrant working in information technology increases the odds by 140 percent that they intend to return to India; whereas being an Indian medical doctor reduces those odds by 59 percent relative to information technology immigrants and being an Indian academic reduces those odds by 58 percent. Further, it finds that being an Indian medical doctor reduces the odds by 95 percent of knowing six or more colleagues who have returned to India relative to information technology immigrants and that being an Indian academic reduces those odds by 58 percent. These results indicate that the information technology immigrants are returning to India at much higher rates than the medical doctors and academics. However, with respect to the frequency of investment by the immigrants in Indian business or social ventures, there is no significant difference between the three sectors. Rather, it is the extent of regular exchange of information with peers in India that has a significant and positive relationship—increasing the odds by 92 percent that one will invest once, or more than once, in Indian ventures.

In addition to work in the information technology sector, the research finds that the factors influencing transnational communities, identified by Saxenian, are also significant. These include participation in host communities, access to home-country resources, and institutional factors that may either inhibit or support immigrant circulation, such as bureaucracy and family ties. With respect to participation in host communities, it finds that immigrants in all three sectors are much more active in

professional associations than social organizations for Indian immigrants. Indian academics have the highest participation rate in professional associations with 81 percent indicating they attend meetings two or more times per year. The research also finds that frequency of participation in professional associations has a significant negative relationship on an immigrant's likelihood of returning to India—reducing the odds by 21 percent. Given the low participation in social organizations and the stronger ties established in professional associations, participation in host communities is creating stronger ties to the host country.

With respect to access to home-country resources, the research finds that the Indian medical doctor and academic immigrants regularly exchange information with peers in India at much lower rates than the information technology professionals. Whereas 44 percent of information technology professionals exchange information with peers on technology, only 20 percent of academic immigrants regularly exchange information on research, and only 15 percent of medical doctor immigrants regularly exchange information on medical practices. As described by the medical doctors and academics, their exchange of information is largely informal with their undergraduate cohorts. Though nearly 75 percent of the academics indicated that they lecture in Indian universities and colleges, usually in conjunction with family visits. Furthermore, the regression analysis shows that regular exchange of information with peers in India has a significant positive relationship to the likelihood of return, knowing colleagues who have returned, and the frequency of investment in Indian ventures. Regular exchange of information increases the odds of returning by 81 percent.

Among the institutional factors that may inhibit or support an immigrant's return to India, Saxenian highlighted infrastructure and bureaucracy as deterrents, and noted that returnees had to be willing to overcome these challenges in order to succeed. This research finds that a minority of information technology professionals (35 percent), medical doctors (28 percent), and academics (19 percent) have a favorable view of the infrastructure in India. Yet the regression analysis finds that infrastructure, though significant, has a small effect on the migration outcomes. Approximately 30 percent of respondents who indicated the infrastructure somewhat inhibits or inhibits their return to India also indicated they were somewhat likely or quite likely to return—suggesting a willingness to overcome inadequacies with infrastructure in order to pursue professional opportunities.

In relationship to professional opportunities in India, much fewer academics (28 percent) and medical doctors (31 percent), than information technology professionals (51 percent), view their professional opportunities in India as supporting their return. Key factors for the medical doctors, with respect to their professional opportunities in India, are the lack of recognition of their specialty certifications and equivalency without requiring training. In fact, it is the specialty training and advanced education that attracts many medical doctors and academics to the U.S. For academics, the issues are the lack of a research focus in higher education and lower salaries in India. Both groups shared that it is easier to advance in one's career, based on merit, in the U.S. rather than India.

Contrary to a merit-based system, most of the respondents view bureaucracy and corruption as an inhibitor to their return to India. Approximately 73 percent of medical

doctor and academic immigrants, and 59 percent of information technology immigrants, indicated that bureaucracy and corruption inhibit their return. Both the medical doctors and academics consider the quota reservation system based on caste to be a significant factor in determining who gets promoted and rewarded, and that this results in the promotion of poor competencies. Information technology respondents, likewise, shared that there is a mindset that nothing can be done unless you are corrupt or pay bribes. A counterfactual analysis shows that improved perceptions on bureaucracy would have the greatest effect on an immigrant's likelihood of returning to India. It improves the mean probability of return for medical doctors and academics by 29 percent.

Family ties in India are a significant positive factor affecting an immigrant's likelihood of return—increasing the odds of return by 84 percent. Yet this factor does not affect everyone in the same manner. Approximately 76 percent of the information technology participants indicated that family ties in India support their return, whereas about 50 percent of medical doctors and academics indicated the same. Most participants expressed the importance of family relationships in making their decisions. However, it is mostly the younger information technology immigrants who are just beginning to start families in the U.S., who see the benefits of a supportive family structure in India. Whereas the older medical doctors and academics, who have established families in the U.S., consider moving their families to India as a barrier. Rather, many of these individuals are coping with the difficulties of supporting aging parents in India, which in some cases necessitates their return.

Overall, these findings support the hypothesis that tradability of the service, provided by an occupation, affects the net brain gain through migration. That is, while controlling for factors relating to transnational communities, working in information technology (a tradable service) versus working as medical doctors and academics (nontradable services) has significant relationships with key migration outcomes pertaining to circular migration. However, it shows that the factors relating to transnational communities are also significant. This suggests that should those factors be addressed, such as perceptions on bureaucracy, that return rates of medical doctors and immigrants could improve as well. Though this may be a zero-sum gain, assuming that transnational relationships for these groups remain weak.

Limitations of the Research

This research seeks to understand the role that tradability of a service has on high-skill migration, transnational communities, and circular migration between source and host countries, particularly between the developing and the developed countries. There is very little detailed data available to provide this understanding; thus a case study approach focused on the high-skill migration relationship between India and the U.S. This is the first major limitation given the dynamic movement of high-skilled individuals around the globe; and these movements are not strictly bilateral. Nevertheless, this is a practical limitation to manage time and costs of the research. It also allows the research to focus on large migration flows that cover both tradable and nontradable services and controls for country effects in contrasting migration for these services

The second major limitation is the focus on one tradable service (information technology) and two nontradable services (medical and post-secondary education). High-skilled immigrants work in many tradable and nontradable services. The information technology sector is included due to the previously documented success cases regarding transnational communities and circular migration. It also represents the largest high-skilled flow between India and the U.S. Likewise, medical doctors and academics are among the largest flows. Further, it sets up the case study as a crucial case—given the positive-sum relationship exhibited in the tradable service, the best chance for such a positive relationship in a nontradable service would also be between India and the U.S—giving the case the best chance of supporting the null hypothesis.

A third limitation is the sample frame for the research. There are no comprehensive directories of Indian immigrants working in information technology, as medical doctors, or as academics in the U.S. from which a representative random sample could be drawn. Rather, the samples were drawn from public directories where individuals either self-identified (LinkedIn) or were identified by their institutions (teaching hospitals and universities). This limits the ability to make predictive generalizations from the results. To improve representativeness and mitigate bias, a purposive sampling technique is used, matched to population characteristics not tied to migration outcomes, in order to preserve correlations of interest in support of hypothesis testing.

Each of these limitations also represents opportunities to extend this research. It can be extended to include other country relationships, like the Philippines, characterized

at a high level in Chapter 7. It can be extended to include high-skilled immigrants in other tradable and nontradable services such as engineers, managers, accountants, and marketing. It could further be extended to semiskilled and unskilled labor. Last, it can be extended by conducting repeated samples.

Implications for Policy and Future Research

A key message that can be drawn from the findings presented above is that developing countries experiencing a brain drain in the high-skilled, nontradable professions such as medical doctors and academics, should not expect the type of transnational model exhibited with information technology services to come to fruition on its own accord. Rather, for the greatest effect, these countries need to address the factors that inhibit the circulation of these emigrants and strengthen ties with the diaspora. Nevertheless, the classifications of tradable and nontradable services are not absolute, nor are they static (Jensen & Kletzer, 2006). Changes in technology enable services that previously could only be provided locally to now be offered remotely, such as online education, remote review of lab test results, and online doctor visits. Thus actions to further, or exploit, this evolution remain viable policy options. This section revisits the higher education, health care, and information technology services in light of these findings to identify possible policy implications and areas in need of further research.

Higher Education

Chapter 6 characterizes the dual challenge that India faces in its higher education system where they must continue a program of massification to provide access to a large population while improving the quality of that education. India's stated goals are to achieve a GER of 30 percent by 2020, increase full-time research and development personnel in five years, and to increase the output of doctorates awarded to 12,500 per year. The Indian academics who participated in this research expressed concerns over the lack of a merit-based system, lack of a research focus and infrastructure, insufficient institutional support of joint research, low salaries, and described their own ties to academic peers in India as informal. India may consider policies in their higher education program that focus on merit for promotion, increase salaries for high performers, and devote more research funding to higher education institutions. Actions taken by the UGC to improve hiring standards and adjust salary scales are steps in the right direction. However, changing the ingrained culture of these institutions will take time. An additional strategy would be to adopt a merit-based, research focused, professional compensation model at the outset when opening new universities. The Lok Sabha has currently tabled the Foreign Educational Institutions Bill that would enable foreign institutions to create franchise universities in India. Should this bill go forward, India may consider giving flexibility to these institutions to bring in their own personnel management and compensation models. Some level of commitment to conducting research from local revenue and government grants, and encourage joint research initiatives with their sister universities in the U.S. would be required, which might attract

U.S.-funded research as well. This strategy has the potential to more quickly establish higher education programs that address the inhibitors identified by participants in this research while strengthening ties to the academic diaspora. Given the existence of franchise universities in other countries, this also offers an area for further research—examining franchise universities, their effects on the diaspora, and their effectiveness in developing countries.

According to Indian academics participating in this research, the U.S. is the preferred destination for advanced education, the collegiate atmosphere of U.S. universities is very attractive, there is an abundance of high-quality doctoral students, and one can conduct world-class research in the U.S. For these reasons, many Indian academics come to and stay in the U.S. However, the participants also reported limited joint research with peers in India. Further, those who are doing joint research often do so at their own expense. The U.S. and India have many common interests that could benefit from joint research, such as the need for energy efficiency, pollution control, accessibility to clean water, and halting the spread of infectious diseases. U.S. universities, governments, and nongovernmental organizations could strengthen ties between Indian academic immigrants and their peers in India by sponsoring or expanding Global Studies programs and providing grants that facilitate joint research.

Online, distance education is a rapidly growing phenomenon in both the U.S. and India, which more recently, is being offered internationally (Harvard University, 2013; OECD, 2009). In this aspect, higher education is transforming from a nontradable service to a tradable service. Based on the counterfactual analysis results, this

transformation may not have as great an effect on circular migration; however, there is still an opportunity for policies that strengthen the ties with the academic diaspora. Based on the participants in this research, Indian academics often take advantage of family visits to India to give guest lectures. Indian and U.S. universities could strengthen this relationship by fostering programs where lectures and courses are offered remotely, which in turn may strengthen collaboration on research. This phenomenon is still in its nascent phase internationally, but warrants more research to understand how it might affect higher education accessibility and costs.

Health Care

In the area of health care, India faces the challenges of providing universal access to quality care while controlling costs in an environment where many people, mostly in the large rural areas, have little or no access to care and no health insurance—yet India is the largest provider of doctors overseas. Participants in this research expressed concern over the limited slots for specialty training, the inability to have their specialty credentials recognized without requiring training, insufficient clinical testing facilities, inadequate medical recordkeeping, corruption, and the need for a focus on quality care. As noted in Chapter 5, the Medical Council of India has taken steps to increase the supply of medical doctors by raising the ceiling on the number of students in a medical class. However, they risk losing these students unless they also raise the number of slots available for specialty and subspecialty training. Likewise, the council should consider reviewing its requirements for recognizing doctors with subspecialty expertise gained overseas.

Attractiveness and availability of specialty and subspecialty training may also be enhanced by the considerations identified above for higher education, which could further promote medical research and increase opportunities in teaching hospitals.

As the largest recipient of Indian doctors and nurses, the U.S. should focus on this flow as it pursues the Global Code of Practice on the International Recruitment of Health Personnel (WHO, 2010). Yet based on medical doctor responses in this research, recruitment is not a factor in their decision to emigrate to the U.S., thus bilateral agreement on recruiting practices may have little effect. However, the Code of Practice also promotes health workforce development and sustainability through measures such as training, technical assistance, and twinning of health facilities. Similar to the policies under consideration for granting U.S. universities the ability to operate in sending countries, India could consider policies that would enable U.S. teaching hospitals to operate in India. Further, given that some Indian hospitals are already marketing their services to U.S. citizens, it is in U.S. interests that its citizens receive quality health care, not only in India, but upon their return. Ethical practices are a major concern in this environment. Bilateral agreements and twinning of U.S. and Indian hospitals could enable these practices to evolve for mutual benefit and lead to greater circulation of medical personnel in both countries.

Despite the creation of more medical schools in the U.S. and the influx of many foreign medical graduates, the Association of American Medical Colleges (AAMC) estimates there will be a shortfall of 91,500 physicians by the year 2020 (AAMC, 2013). The AAMC asserts that this shortfall is not due to the lack of doctors graduating from

U.S. medical schools, but it is due to the lack of residency training slots supported by Medicare, which was capped at 1996 levels by Congress. The U.S. already has a policy for sponsoring foreign medical graduates in residency on J-1 visas in return for service in shortage areas (Health Resources and Services Administration, 2013). Much like India's Rural Health Mission (Ministry of Health and Family Welfare, 2010), the U.S. should consider policies to increase Medicare-supported residency training slots offered to U.S. medical graduates in return for service in shortage areas, which may also reduce the demand for foreign medical graduates.

Online doctor visits, remote diagnosis of lab test results, and medical tourism are also transforming some aspects of medical services from nontradable to tradable. Again, this may not have the greatest effect on circular migration, but there are already cases where Indian doctors in the U.S. are being recruited to support medical facilities in India (Lunt et al., 2012). Also, private hospital chains in India are already aggressively seeking to establish their credentials in pursuit of the medical tourism market—to the extent they apply for accreditation according to the same standards in U.S. hospitals. The U.S. has an interest to ensure that policies and practices are in place to ensure ethical and safe treatment of its citizens. Further, this practice creates a risk of a dichotomous health care system in India where higher quality care standards are used for overseas patients versus the local population. India may consider policies to encourage the establishment of hospitals that provide the same quality of care for the local population. Medical tourism is a growing phenomenon, but little is yet known about its effects on the overseas clients, the diaspora, and the local population. This is an area of potentially significant research.

Information Technology

The information technology sector is included in this research as a basis for comparison to the nontradable sectors. It represents the case where a mutually positive relationship evolved between the host and home countries. However, over the course of this research several indications of potential problems are identified that merit further investigation. As the information technology sector has grown in India, the participants noted that salaries and costs have risen and expectations for a higher quality of life has increased among information technology professionals. The research participants shared that this has affected the management and work culture that is counterproductive, a loss of competitive advantage compared to other emerging countries, and a growing number of unemployed and unemployable information technology workers. These indications support the claims by others, identified in Chapter 4 that the Indian information technology sector needs to move up the value chain in order to compete and remain prosperous. They also point to the slow diffusion of technology across India, leaving in place the technology enclaves that Saxenian identified more than a decade ago. The evolution and diffusion of technology are of interest to both Indian and U.S. firms as areas of unrealized trade opportunities. India needs to continue its efforts to expand its technology infrastructure and multinational firms and associations could play a leadership role in diffusing technology-based services.

The research participants also pointed to potential problems in the U.S. They reported that in some cases where the employer holds the visa of an Indian information

technology professional, these immigrants are expected to work excessive hours on multiple projects, which effectively reduces their cost to the employer while increasing profit margins. In some cases, these individuals believe they cannot leave the employer that holds their visa. They indicated that they feel trapped, and cannot advance their technical skills, move up into management, or start their own companies. It is not clear how widespread these practices are or whether they truly represent abuses of the immigration system. However, if one believes it is in the best interest of the U.S. to attract the best and brightest from across the world, it begs the question of whether U.S. policies are inhibiting the success of these lawful immigrants.

Since the term 'brain drain' was first used in the 1960s, there has been substantial research on high-skilled migration, its flows, and its effects on sending and receiving countries. Much has been learned in the past 50 years, more has been learned through this research, and yet there remains more to be learned.

Appendix A: Survey Protocol

RESEARCH PROCEDURES

This research is being conducted to understand the nature of the service provided by a highly-skilled immigrant and the prospects for circular migration and growth in human capital in home, as well as host, countries. If you agree to participate, you will be asked to participate in an online survey. Online surveys are conducted with highly-skilled immigrants and can be completed in 10 minutes.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no benefits to you as a participant other than to further research in high-skill migration.

CONFIDENTIALITY

The data in this study will be confidential. As a participant in the survey you will not be requested to identify your name, address, phone number, or employer. You will be given an option to provide an email address should you volunteer for a follow-up interview. The email address will not be retained on the survey response; (2) a code will be placed on the survey response; (3) through the use of an identification key, the researcher will be able to link your response to your email address; and (4) only the researcher will have access to the identification key. The email address will be maintained in a password protected or locked file. All data submitted via the survey will also be encrypted during transmission and storage. Further, only aggregated data will appear in any publication. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT

[Redacted]

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

The George Mason University Human Subjects Review Board has waived the requirement for signing the consent form. However, if you would like to sign a consent form prior to beginning the research, please contact Ted Davis at [redacted].

Q1 I have read this form and agree to participate in this study.

☐ I agree ☐ I do not agree

Q2 Please specify your age (years):

☐ 18-25 ☐ 26-35 ☐ 36-50 ☐ >50

Q3 Please specify your gender:

☐ Male ☐ Female

Q4 Were you born in India?

☐ Yes ☐ No

Q5 When did you settle in the United States?

☐ Before 1980 ☐ 1980-1989 ☐ 1990-1999 ☐ 2000 or later

Q6 What best describes your current status in the United States?

☐ U.S. citizen

☐ Permanent resident (green card holder)

☐ Foreigner with H1-B visa

☐ Foreigner with L-1 visa

☐ Foreigner with other visa

Other (please specify)

Q7 What is your highest level of educational attainment?

- 10th-12th grades or first 3 years of vocational education
- Community or junior colleges or vocational technical institutes (non-university) leading to an associate's degree
- University or other 4-year education institution leading to a bachelor's degree
- A University or professional institute leading to a master's or doctor's degree

Other (please specify)

Q8 Please select your current occupation:

Q9 What industry does your company belong to?

Q10 What is the nearest city to your current place of work?

Q11 How often do you attend meetings of immigrant associations?

- Never
- Once a year
- 2-3 times a year
- 4-6 times a year
- Once or more a month

Q12 How often do you attend meetings of professional associations (not specifically for immigrants)?

- Never
- Once a year
- 2-3 times a year
- 4-6 times a year
- Once or more a month

Q13 Have you ever served as an officer or a board member for any of these associations?

- Yes
- No

Q14 How often have you traveled to India for professional purposes on average during the past three years?

☐ Never ☐ Once a year ☐ 2-4 times a year ☐ 5+ times a year

Q15 How often have you traveled to India for social purposes on average during the past three years?

☐ Never ☐ Once a year ☐ 2-4 times a year ☐ 5+ times a year

Q16 How often do you exchange the following information with friends, classmates, or professional associates in India?

	Regularly	Sometimes	Never
Jobs or professional opportunities in the United States	☐	☐	☐
Jobs or professional opportunities in India	☐	☐	☐
Research	☐	☐	☐
Technology	☐	☐	☐

Q17 Have you ever helped others arrange professional relationships in India?

☐ Yes ☐ No

Q18 Have you ever helped others in India migrate to the U.S. to obtain a technology position?

☐ Yes ☐ No

Q19 Have you ever helped to arrange business contracts in India?

☐ Yes ☐ No

Q20 Have you served as advisor or consultant for companies in India?

☐ Yes ☐ No

Q21 How often do you meet with government officials from India?

☐ Regularly ☐ Sometimes ☐ Never

Q22 Would you consider returning to live in India in the future?

☐ Quite likely ☐ Somewhat likely ☐ Somewhat unlikely ☐ Quite unlikely ☐ Don't know

Q23 Please rate the extent to which the following factors would either support or inhibit whether you would return to India:

	Supports Return	Somewhat Supports	Somewhat Inhibits	Inhibits Return	N/A
Professional opportunities in India	☐	☐	☐	☐	☐
Professional relationships with peers in India	☐	☐	☐	☐	☐
Technology infrastructure in India	☐	☐	☐	☐	☐
Culture and lifestyle in India	☐	☐	☐	☐	☐
Bureaucracy or corruption in India	☐	☐	☐	☐	☐
Favorable government treatment of returnees in India	☐	☐	☐	☐	☐
Limits on professional advancement in the United States	☐	☐	☐	☐	☐
Desire to contribute to the welfare of India	☐	☐	☐	☐	☐
Family relationships in India	☐	☐	☐	☐	☐
Family relationships in the U.S.	☐	☐	☐	☐	

Other inhibitors (please specify)

Q24 How many of your technology friends and/or colleagues have returned to India to conduct research or business?

☐ None ☐ 1-5 ☐ 6-9 ☐ 10 or more

Q25 Have you invested your own money in professional or social ventures in India?

☐ Yes, more than once ☐ Yes, once only ☐ No

Q26 Would you be willing to participate in a confidential interview to discuss your responses to this survey? The interview will last approximately 20 minutes and may be done via a telephone call.

☐ Yes ☐ No

Q27 If 'yes', please provide an email address where the researcher can contact you:

Q28 Please provide any comments on this survey and your responses here:

Appendix B: Regression Analysis Supplement

Table 16. Definition of regression variables

Name	Description	Coding
SECTOR	Sector	1=Information technology, 2=Medical, 3=Academic
REGION	Census region	1=Northeast, 2=Midwest, 3=South, 4=West
LRETURN	Likelihood of return to India	0=Don't know, 1=Quite unlikely, 2=Somewhat unlikely, 3=Somewhat likely, 4=Quite likely
CRETURN	Number of colleagues who returned to India	1=None, 2=1-6, 3=6-9, 4=10 or more
INVEST	Invested money in ventures in India	1=No, 2=Yes, once only, 3=Yes, more than once
TRADABLE	Tradable service	0=Nontradable service, 1=Tradable service
NONTRADABLE	Nontradable service	0=Tradable service, 1=Nontradable service
TECHNOLOGY	Dummy variable	1 if SECTOR=1
MEDICAL	Dummy variable	1 if SECTOR=2
ACADEMIC	Dummy variable	1 if SECTOR=3
AGE	Age group	1=18-25, 2=26-35, 3=36-50, 4=51+
MALE	Gender	0=Female, 1=Male
PROFESSIONAL	Frequency attending professional associations	1=Never, 2=Once a year, 3=2-3 times a year, 4=4-6 times a year, 5=Once or more a month

Name	Description	Coding
EXCHANGEDOM	Frequency information is exchanged with associates in India for sector's domain	1=Never, 2=Sometimes, 3=Regularly
OPPINDIA	Extent professional opportunities in India support return	0=N/A, 1=Inhibits return, 2=Somewhat inhibits, 3=Somewhat supports, 4=Supports return
INFRASTRUCTURE	Extent infrastructure in India supports return	0=N/A, 1=Inhibits return, 2=Somewhat inhibits, 3=Somewhat supports, 4=Supports return
BUREAUCRACY	Extent bureaucracy in India supports return	0=N/A, 1=Inhibits return, 2=Somewhat inhibits, 3=Somewhat supports, 4=Supports return
FAMILYINDIA	Extent family relationships in India support return	0=N/A, 1=Inhibits return, 2=Somewhat inhibits, 3=Somewhat supports, 4=Supports return

Table 17. Linear regression for simple models

	Likelihood of Return			Colleagues Returned			Investment Frequency		
Variable	Coef.	t	P>|t|	Coef.	t	P>|t|	Coef.	t	P>|t|
Medical Doctor	-0.644	-4.28	**0.000**	-0.748	-6.87	**0.000**	-0.162	-1.50	0.135
Academic	-0.787	-5.20	**0.000**	-0.447	-3.94	**0.000**	-0.106	-0.96	0.336
Age group	-0.215	-2.91	**0.004**	0.040	0.76	0.446	0.134	2.21	**0.027**
Male	0.214	0.62	0.534	0.209	3.19	**0.002**	-0.011	-0.12	0.907
N	438			485			489		
R^2	0.140			0.158			0.013		
Mean VIF	1.64			1.61			1.61		
Shapiro-Wilk	0.953			0.954			0.717		

Information Technology is reference; significant relationships highlighted in bold

Table 18. Correlation matrix of independent and control variables

	SECTOR	AGE	MALE	PROFESSIONAL	EXCHANDOM	OPPINDIA	FAMILYINDIA	INFRASTRUCTURE	BUREAUCRACY
SECTOR	1								
AGE	**0.3872**	1							
MALE	-0.0621	0.0148	1						
PROFESSIONAL	0.2318	0.178	0.0893	1					
EXCHANGEDOM	-0.1596	0.0121	0.1354	0.0739	1				
OPPINDIA	-0.2491	-0.1865	0.1341	-0.0396	0.2231	1			
FAMILYINDIA	-0.1904	-0.2211	0.0377	-0.0375	0.1276	**0.3282**	1		
INFRASTRUCTURE	-0.2703	-0.1039	0.0973	-0.0722	0.1647	**0.7454**	0.2469	1	
BUREAUCRACY	-0.1286	-0.1506	-0.032	-0.029	0.0821	**0.3124**	0.153	0.3035	1

Table 19. Ordered logistic regression for professional opportunities in India

	Professional Opportunities		
	OR	z	P>|z|
Professional Associations	0.996	-0.03	0.977
Exchange Information	1.457	2.68	**0.007**
Family in India	1.633	5.10	**0.000**
Infrastructure	6.048	11.74	**0.000**
Bureaucracy	1.458	2.36	**0.018**
N	425		
Pseudo R^2	0.320		

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Curriculum Vitae

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