The Global Dynamic of High-Skill Migration:

The Case of U.S./India Relations

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Abstract

As governments and interest groups debate migration caps and enforcement to promote or deter migration flows, the nature of these flows may be changing. With the advent of globalization, advances in technology, and liberalization of developing economies, it becomes increasingly possible for highly-skilled individuals to migrate to where they can best achieve their potential. Likewise, firms and countries recognize the contributions of these individuals to their competitiveness and economies. Further, sending countries see the potential for exploiting relationships with their expatriates. These dynamics foster a global market for ideas and the talent to pursue them.

This paper examines the changing global context of high-skill migration, its effects on migration flows, and the implications for policy through a case study of U.S. and India relations. The study focuses on the specific sectors of information technology, medical professionals, and graduate education to better understand the varying conditions that contribute to high-skill migration.

Key Words: high-skill migration, international governance, India/U.S. relations

Introduction

Concerns in the U.S. over declines in the quantity and quality of high-skilled individuals, the coming retirement of baby boomers, rapid growth in 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 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. These nationalistic and protectionist views may be natural reactions to an increasingly global competitive environment. Nationalistic measures that view the developments in other countries as a threat to innovation and growth overlook the changes in international production whereby highly-skilled individuals are a global resource that can be capitalized globally. The introduction of protectionist measures to limit high-skill migration and offshoring may be a reaction to the perception that foreign workers available in a global market are taking away jobs from native workers.

As governments and interest groups debate migration caps and enforcement in order to promote or deter migration flows, the nature of these flows may be changing. With the advent of globalization, advances in technology and telecommunications, and liberalization of

developing economies, it becomes increasingly possible for highly-skilled individuals to travel and migrate to where they can best achieve their potential and pursue opportunities. Likewise, firms and countries recognize the contributions of these individuals to their firms and economies. Further, sending countries see the potential for establishing and exploiting relationships with their expatriates—going as far in some case to court their return. These dynamics are fostering a global market for ideas and the talent to pursue them. There is no reason to think that the present system of governing migration is optimal. Migration is a dynamic process, while the migration policy-making machinery is slow and cumbersome. The possibility that policy-makers will fail to capitalize on opportunities for mutual gain among sending and receiving countries is especially large for high-skill migration.

This paper examines the changing global context of high-skill migration as hypothesized above, its potential effects on migration flows, and the implications for policy through a case study of U.S. and India relations, between whom high-skill migration is a dominant pattern. The study focuses on the specific sectors of information technology, medical professionals, and graduate education to better understand the varying conditions that contribute to high-skill migration. In addition to basic statistics on the relationship between the U.S. and India, the data includes interview results of key parties to migration, including government and non-governmental organizations, U.S. and Indian firms, subject matter experts, and immigrants in each sector.

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. Since the concept of brain drain was first used in the 1960s, a chief concern has been the gain of talent, and their contributions, by receiving countries at the expense of the sending countries due to high-skill migration. This is especially the case whereby developed countries benefit from immigration of talent from the developing countries. In 2005, 20 million highly-skilled immigrants resided in OECD countries (Docquier and Marfouk 2005). Research by Winters et al. (2003) showed that the migrants themselves and the receiving countries derive the most benefits while leaving the sending countries worse off. Kapur and McHale (2005) further argue that high-skill migration strips the sending countries of their institution builders—the very people needed in developing countries to build a productive society.

Contrary to the theory of brain drain, high-skill migration may not be strictly a win-lose prospect. Indeed, there may be winners and losers in both receiving and sending countries. Despite the productive contributions of highly-skilled individuals in receiving countries, their presence also have the potential to depress wages and displace domestic workers. Likewise, individuals in sending countries may experience gains in wages. Those remaining behind in sending countries also benefit as recipients of remittances sent home by their expatriates. Stark (2004) argued further that the prospect of emigration to a developed country induces investment in sending countries (known as brain gain). Schiff (2005) counters that the benefits of brain gain only exceed the costs of brain drain at low levels of migration.

Despite the potential losses of high-skill migration to sending countries, Saxenian (2006) documents cases in Taiwan, South Korea, and India, whereby a win-win scenario evolved between both sending and receiving countries. This theory, known as brain circulation, argued

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 lead others to recommend that developed countries foster brain circulation with developing countries as a means to promote economic growth (Dayton-Johnson et al. 2007).

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

The disparity between the few win-win migration relationships versus the many win-lose relationships highlight the need to understand the conditions and actions that lead to positive-sum versus zero-sum outcomes due to high-skill migration. Taiwan, South Korea, 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 factors such as supply and demand, business models, infrastructure, technology, foreign direct investment, remittances, government policies and actions may be significant.

The research proposed herein seeks to understand the conditions, actions, and policies that contributed to a win-win relationship between sending and receiving countries of high-skilled migrants. The proposed approach is to conduct a case study to compare and contrast the conditions, actions, and policies across a range of positive-sum and zero-sum migration scenarios. To control for possible country effects, the case study will focus on the migration relationships between India and the U.S. High-skill migration between these two countries is probably the world's largest bilateral flow, while a wide development gap creates the type of opportunity for economic development proposed by Dayton-Johnson et al. (2007). Moreover, to analyze variation in conditions and outcomes, the case study will be conducted at the sectoral level, including the information technology, medical services, and graduate education sectors. Whereas the information technology sector experienced significant growth in conjunction with high levels of migration, the medical services and graduate education sectors have not had the same success. Over 50,000 Indian-born doctors and 15,000 medical students/residents live in the U.S. (AAPI 2009); while there were 6 doctors to every 10,000 inhabitants in India (OECD 2007). Likewise, 103,260 Indian nationals were enrolled in U.S. universities in 2008-09; while India's tertiary gross enrollment ratio was only about 12%, far less than the U.S.'s 82% (Institute for Statistics 2009).

Data sources for the case study will include documented histories and detailed statistics on the U.S./India migration relationship and economic outcomes in each sector. This data will be extended by firsthand information gained through expert interviews. Interviews will be conducted with key stakeholders, including firms, government agencies, NGOs, and migrants.

The U.S./India Case

With a population over one billion, India is the second most populous country in the world with approximately 17% of the world's population (Office of the Registrar General 2001). Of this population, over 467 million are illiterate; approximately 42 million possess a post-secondary diploma or degree, and approximately 5 million possess a technical degree or diploma. According to the United Nations millennium indicators approximately 28.6% of the Indian population lives in poverty (less than one dollar purchasing power parity per day) and 55.5% of the urban population live in slums (UNSTATS 2008). In contrast, the population in the U.S. in 2000 was 281.4 million people (Perry and Mackun 2001). Of this population, 52% of the population completed some college and 24% had completed at least a bachelor's degree. Further, less than 1% of the U.S. population had less than one dollar purchasing power parity per day.

These statistics suggest that India has significant challenges to overcome in advancing the quality of life of its citizens. However, they should not obscure the significant progress that has been made. Since the early 1990s India has experienced rapid economic growth—averaging over 7 percent GDP growth since 1997 and ranked fifth in the world in GDP (purchasing power parity) (CIA 2009). Further, India has grown to become the seventeenth largest export market for the U.S. and the eighteenth largest source of imports (Office of the United States Trade Representative 2009). U.S. foreign direct investment in India was $13.6 billion in 2007; Indian firms invested $3.0 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 U.S. Census Bureau (2000), there were more than a million Indians

living in the U.S.—55% of whom entered the U.S between 1990 and 2000. The effect of the Indian high-skill migration has been significant on the U.S. as well as on India. According to the U.S. Census 2000, there were 1,022,550 residents in the U.S. of Indian origin. Of this group, approximately 80% had completed some college and over 69% had completed at least a bachelor's degree.

In 2008, India had the highest level of H-1B and L-1 admissions for high-skill employment (Monger and Barr 2009). 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 third highest individuals accepted for legal permanent residence. According to the Ministry of External Affairs (2000), the per capita income of Indians in the U.S. was $60,093 compared to the U.S. average of $38,885. About 300,000 work in Silicon Valley technology firms and accounted for 15% of high-tech start-ups; their average salary was over $200,000; and there were about 700 Indian-owned companies. 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. also were notable for the relations they maintained 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, had shown significant growth with a compounded annual growth rate of 55 percent from 1992 to 2000. In 2008-2009 the revenue of the information technology and business process outsourcing industry in India was estimated at US $71.7 billion with an annual growth rate of 12 percent (MCIT 2009)—

directly employing 2.23 million individuals and indirectly employing another 8 million individuals. Moreover, their export market was estimated at US $40.4 billion with the U.S. accounting for 60 percent of exports.

In concept, a win-win 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 win-win 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 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% 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. 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%. Thus India experienced a net gain in highly-skilled individuals of 4.2%.

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 2.4% based on 578,515 immigrants--well below India's annual growth rate. 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. Table 1 provides such emigration rates for the information technology, medical services, and graduate education sectors.

Table 1. U.S./India Emigration Stocks and Rates by Sector

Sector	*Emigration Stock in U.S.*	*Emigration Rate*	*Annual Growth Rate in India*
Information Technology	217,828	8.9%	10.9%
Medical Services			
Doctors	50,313	6.5%	2.4%
Registered Nurses	21,716	1.4%	4.2%
Graduate Education			
All graduate students	71,043	7.3%	6.9%
Doctoral Degrees Conferred	2,228	10.0%	7.5%

Sources: US Census Bureau (2009), Ministry of Communications & Information Technology (2009), Central Bureau of Health Intelligence (2008), Institute of International Education (2008), Ministry of Human Resource Development (2008), National Science Foundation (2007)

The data shows that the annual growth rate of information technology professionals in India easily exceeds the rate of such professionals emigrating to the U.S.—constituting a brain gain scenario relative to India's relationship to the U.S. (recognizing that Indian IT professionals emigrate to other countries as well). However, a quite different picture emerges when examining the medical and graduate education sectors, especially in the cases of medical doctors and doctoral degree recipients. Medical doctors from India emigrating to the U.S. far exceed the growth rate of doctors in India with a net loss of 4.1%. Doctoral degree recipients constitute a net loss of 2.5%.

In the aggregate the migration relationship between the U.S. and India, and its outcomes, appear to be of mutual benefit. Yet when examining that relationship at the sectoral level there is significant variation. While the information technology sector exhibits a net gain in skilled individuals and economic growth, the medical sector exhibits a net loss and a high incidence of disease amongst India's citizens. Likewise, the graduate sector shows a net loss in advanced students while the country experiences very low enrollments. The next section draws on theory to identify possible factors that contribute to the variation in high-skilled migration outcomes.

Contributing Factors in High-Skill Migration Outcomes

Building on the early work of Solow, Lucas (1988) developed a model of economic growth that explicitly accounted for human capital and its externalities. Unlike Solow's model, which cannot account for the diversity of economic growth across countries, Lucas' model allowed 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 person, 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. Alternatively, Krugman and Obstfeld (2009) depict the behavior in neoclassical economic terms. They note that as individuals move from sending to receiving countries, the real wages in the sending countries will increase while those in receiving countries decrease—leading to a convergence of wages. They also indicate that though world output increases, it does so at the expense of the sending country. Like emigration stocks, wages may serve as a proxy for characterizing the flow of high-skilled individuals in a way that links that flow to economic output.

Stark (2004) went further to argue that one need not emigrate to affect the economy. Rather, the prospect of emigration can have a positive influence. Stark noted that in an economy with low average human capital, individuals would underinvest in their own human capital. 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. Stark's theory relies on the uncertainty of emigration, thus having some probability that individuals obtaining higher skills remain at home. Kapur and McHale (2005) tempered this positive outlook by considering that rich countries actively screen for the best talent—noting that individuals that understand this process can invest in their human capital with a higher certainty of emigration. Kapur and McHale noted further that this process increases the likelihood of lost spillovers from human capital accumulation; more detrimental may be the loss of institution builders. These theories point to the need to understand both individual and public investment in

human capital of migrants and non-migrants, as well as and their potential spillover effects and ties to institution building.

Easterly (2001) criticizes the emphasis placed on education 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. Further Easterly 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 argument points to the need to understand the demand for the high-skilled individuals at home as well as home country investments that enable those skills to be leveraged.

Given the loss of high-skilled individuals from sending countries, investments in technology and capital at home may not be sufficient. Thus countries like China and South Korea actively courted the return of their expatriates. India also actively sought to capitalize on its diaspora through their remittances. Saxenian (2006) studied the resulting 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 countries, 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; 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. Saxenian's research suggests that not only the flow of high-skilled migrants be understood, rather it is the relationships they establish and maintain between sending and receiving countries that facilitates economic activity.

Complementary to Saxenian's networks of individuals, the context and models of business may also be a factor. The concept of value chains, the practice of fragmentation along those chains, and the flow of foreign direct investment have implications for sourcing of highly-skilled individuals (Porter 1985; Jones and Kierzkowski 1990; Gereffi 2005). 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. The research presented above does not explicitly address high-skill migration as that was not their objective. However, it is suggestive that the evolution of international production could have an impact on the flows of highly skilled individuals. Given the substantial number of individuals that now have opportunities within their own countries and the ability of firms to consider the use of high-skill resources in foreign locations, then it may also be that the dynamics that influence migration decisions are changing as well. As Manning, Massini, and Lewin (2008) assert, immigration policies based on assumptions associated with older models of production may be negated by the new reality. These arguments suggest the need to understand

international business models as a factor influencing high-skill sourcing, migration, and economic growth.

Underlying Saxenian's networks and changes in global production may be the evolution of sending and receiving countries toward a Ricardian model of comparative advantage. This may be the case with the growth of information technology offshoring in India while many Indians skilled in information technology continue to emigrate to the U.S. Freeman (2005) contended there was a loss of comparative advantage in the U.S. in high technology and viewed it as a harbinger for a long adjustment period to a less dominant position. Freeman partly attributed 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. Blinder (2006) argued that the past notion of comparative advantage in tradable goods among countries has become increasingly obsolete as technology advanced and made more goods, i.e., services, tradable. Blinder 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. Specialization in information technology services, which are suitable for offshoring, may affect or be affected by high skill migration in the information technology sector. Further, it may be more suitable in the information technology sector as impersonal services, whereas, the personal services of medical care and education may be less appropriate.

In addition to exploring the factors cited above for their effects on high-skill migration and win-win outcomes, two rival explanations need to be considered. One is that the successes exhibited in the information technology sector are unique to the period of rapid growth in information technology, and thus the conditions may not present themselves in other sectors at

this time. The other scenario is that there is no relationship between high-skill migration in the information technology sector and the economic outcomes exhibited in this sector. Exploring these rival explanations will aid in the interpretation of any findings regarding the contributing factors in high-skill migration outcomes.

In the next portion of the paper, variation across the three key sectors: information technology services, medicine and nursing, and graduate education are explored.

Information Technology Services

The information technology services sector is the hottest flashpoint in the bilateral relationship. Many of the Indians who flowed into U.S. graduate education in natural sciences and engineering in the 1970s and 1980s were snapped up by American industry. They had little incentive to return home, thanks to the so-called "license Raj," which stifled entrepreneurial energy, and the U.S. immigration regime accommodated them, albeit often with much bureaucratic sleight-of-hand. The Indian presence in Silicon Valley and elsewhere in the U.S. high-technology industry grew rapidly. A noticeable proportion of new ventures in the U.S. were founded by Indian-born high-tech entrepreneurs (Hart, Acs, and Tracy 2009). Some Indians were also quite successful in climbing the career ladder within large multinational IT firms (Saxenian 2006).

The technology boom of the 1990s increased the dependence of the U.S. high-technology industry on Indian talent. In addition to recruiting Indian students out of U.S. universities, the industry brought trained professionals from India to the U.S. under the H-1B visa program. And when that supply grew tight, it advocated and won a temporary tripling of the size of that program in 1998. Although the H-1B visa covers a wide range of occupations and professions,

Indian computer professionals dominated this category from the mid-1990s on (Lowell and Martin 2008).

The feedback effect to India was powerful. A new industry emerged there in which Indians who had migrated to the U.S. played a key role. Multinational firms, such as Microsoft, IBM, and Intel, opened research and development centers in India, often with former expatriates as their leaders. More important, a network of IT contractors and subcontractors grew up to support clients in Silicon Valley and elsewhere in the U.S. Spurred by the Y2K "bug," the Indian information technology sector grew at a compounded annual rate of 55% from 1992 to 2000 (Ministry of External Affairs 2000). In this decade, firms such as Wipro, Infosys, and Tata Consultancy Services (TCS) have become large and powerful players in the global IT industry. These firms now account for a large fraction of H-1B visas (and, increasingly, L-1 visas as well).

There is some evidence that IT professionals have invested in institution-building beyond the IT industry. The Indian Ministry of External Affairs (2000), for instance, describes programs that include the establishment of a polytechnic school for women, the founding of a children's orphanage, and the development of a hospital. In addition, non-resident Indians are working to create a non-profit network to foster Indian entrepreneurship that would raise $500 million in capital.

Of course, there have been costs as well as gains in this relationship. Hira (2007) shows that large users of H-1B visas often flout the intent of the law by using it to bring in relatively poorly-paid, low-skill workers, who may sometimes be directly responsible for transferring work to India. Although Kirkegaard (2007) demonstrates that the skill level and pay of U.S. computer professionals remain high, he, too, acknowledges abuses in the program. Hira (2007) points out

that stricter enforcement of the H1-B visa has encouraged some firms to expand their use of L-1 visas, which in turn has led to a growing debate over that program.

The changing nature of this sector, with its emphasis on "anytime, anywhere" services may call for new forms of cooperation. For the industry to thrive in both countries, policy should help to create a context that permits firms to acquire the right skills, at the right time, in the right location. To that end, India could institute programs to mitigate abuses by Indian employers, such as those cited by Hira, rather than rely on a program of U.S. enforcement. Likewise, the U.S. could establish special H-1B visas, as it did with Chile and Singapore, to better provide Indian access to U.S. labor markets, rather than manipulate existing caps that favor smaller countries.

Beyond the direct effects of the growth of the ICT sector and its demand for talent, advances in ICT also contribute to an evolving global business model that is integrated, distributed, multi-skilled, and multicultural (Caine 2009). Firms in this evolving model global seek to deploy resources with maximum freedom of action—deploying skills closer to demands. In this environment physical migration may become less important and H-1B admissions become a secondary concern as more firms migrate to this model. IBM, as a case in point, has about 400,000 R&D personnel worldwide; 80,000-85,000 of which are in India. This is not all labor arbitrage. Rather it is necessary to understand the context of foreign markets and capture booming domestic demand.

This model does not, however, negate the demand for, or mobility of, talent within the U.S. It may though make it more difficult to develop and attract the talent to meet changing demands. Bilateral cooperation is needed to support and capitalize on this evolving global dynamic. Such cooperation needs to facilitate the movement of knowledge and talent to/from

partner countries while seeking to enable the capture of benefits for home markets. Failing to do so could witness a decline in U.S. comparative advantage with the proportional rise in other nations.

Medicine and Nursing

High-skill migration in medicine and nursing poses a different set of challenges than in IT services. Primary medical care is a personal service that requires the presence of skilled professionals. The essential nature of health care services means that the loss of doctors and nurses from developing nations to developed nations has significant negative consequences. Many Indian health care needs are not met. The country still suffers from epidemic diseases that have been eradicated in most of the rest of the world, while treatment of chronic conditions is highly uneven. In 2004, there were 6 doctors to every 10,000 inhabitants in India. This ratio is about a quarter of that in the U.S., which is a major destination of Indian doctors.

OECD (2007) reports that approximately 18% of doctors employed in OECD countries were foreign born. The foreign-born share in the U.S. is higher than the OECD average at 25%. About half of all foreign-born doctors in the OECD are working in the U.S., which has by far the largest health sector of any country. India was the largest source country of foreign-born doctors working in the OECD. Over 50,000 doctors and 15,000 medical students/residents live in the U.S. (AAPI 2009). Although the rate of doctor expatriation from India is not high, the density of doctors in India is still low. In 2004, there were 6 doctors to every 10,000 inhabitants in India; in 2000, there were 26 doctors to every 10,000 inhabitants in the U.S. The U.S. is far less reliant on foreign-born nurses than doctors. Only 3.5% of nurses working in the U.S. were born outside the

country, but international recruitment of nurses is growing rapidly. India is a major target for nursing recruitment (Pittman, Aiken, and Buchen 2007).

Care needs to be taken in asserting cause and effect in this migration relationship. The rate of medical expatriation in India is very low, although there is good evidence that international destinations attract many graduates of the country's most prestigious medical schools. But it is not at all clear that if the migration option was removed that these professionals would provide services to the most needy Indians. Indeed, it seems likely that many would draw their clients from among the urban elite, who are already relatively well provided-for. On the other hand, many foreign-born doctors in the U.S. work with populations that are underserved by U.S. standards. The U.S. immigration system provides visa waivers for medical professionals willing to work with such populations. The Conrad 30 program has placed 8,500 non-immigrants doctors in rural communities since its inception in 1994 (Conrad 2009).

Concern about the possibility of a "medical brain drain" has provoked the World Health Organization to publish a draft code on ethical recruitment practices of medical professionals The code is the product of a large multi-stakeholder dialogue that involved NGOs and businesses as well as states and international organizations and was led by Mary Robinson, the former President of Ireland. The code focuses more on the individual rights of workers being recruited than on the impact of their departure on their home countries. However, it does call on receiving countries to reduce their reliance on migration flows in this area and to support return migration and the transfer of technology.

The WHO encourages its members to use the draft as a model for bilateral agreements. Perhaps the best developed bilateral arrangement on medical professional migration exists between the U.K. and South Africa. This arrangement regulates the recruitment process for the

National Health Service, which is the dominant employer in the U.K. Follow-up research suggests that the flows of medical professionals into the U.K. leveled off after the NHS code was put in place.

As the world's largest recipient of medical professionals, the U.S. is well-positioned to be a leader in fostering brain gain and brain circulation among doctors and nurses. India, the largest source country, is a natural partner. The WHO suggests, among other things, the twinning of health facilities among partner countries and programs that support the return of migrant professionals, either temporarily or permanently. As the technology for the provision of health services by electronic means improves, programs that would allow the virtual return of medical professionals from the U.S. to India might be developed.

Graduate Education

Graduate education provides a third lens through which to understand the U.S.-India high-skill migration relationship. Like medicine, education requires personal presence for the process to have its intended effect. This is particularly true at the graduate level, where students are picking up the tacit, craft skills that will be critical for them to practice their professions. Like IT services, higher education is seen as a critical input to economic development and a strategic resource for national competitiveness. In examining U.S. Patent data, Chellaraj, Maskus, and Mattoo (2004) found a significant positive relationship between foreign graduate students and patent applications—noting that a 10% increase in foreign graduate students would raise patent applications by 3.3%. International migration in this domain is less controversial than the other two that have been considered, but perhaps more consequential, as countries seek to retain more of their foreign graduate students through preferential immigration policies.

The U.S. higher education system has long been reliant on foreign graduate students to populate its courses and work in its labs. The National Science Board (2008) reports that students on temporary visas earned more than a third (36%) of all science and engineering doctorates awarded in the United States in 2005. Many of these students stay in the U.S. permanently. Holding a student visa for education in the U.S. does not entitle a student to do so, but it provides access to employers who can sponsor an application for a long-term work visa, such as an H-1B, or legal permanent residence. About one-third of full-time faculty in research organizations in the U.S. were born in other countries.

Almost 95,000 Indian nationals were enrolled in U.S. universities in 2007-08, 12.8% more than the previous year (Institute of International Education 2008). Most of these students were graduate students and, of these, the vast majority were in science and engineering fields (National Science Board 2008). Given the aging of the U.S. population, the sheer size of the school-age cohort in India (nearly a half-billion under the age of 20), and the appetite of U.S. educational institutions for students, the flow seems certain to continue to grow, unless policy barriers arise.

One such barrier is the U.S. security clearance process, which was strengthened after the terrorist attacks of September 11, 2001. Wait times for visas rose, as did their costs. Some students were unable to enroll due to delay or rejection. The security clearance process is not transparent, and the fields of study or other characteristics that lead individual visa applicants to be subject to special scrutiny are not always obvious. Though the State Department responded to protests from the scientific research community in streamlining the Visas Mantis requirements, scholars and researchers still have problems for short-term trips to attend conferences or professional gatherings (National Research Council 2009). An anecdote of an Indian official

planning a two-week tour in the U.S. to meet with scientific scholars that could not obtain visa clearance in time and chose to travel to Russia instead illustrates the potential costs of deterring mobility. As the strategic relationship between India and the U.S. continues to warm, as evidenced by the nuclear cooperation agreement signed in 2008, bilateral cooperation on this issue might be fruitful.

Another important area of cooperation relates to the rapidly increasing cost of education, who pays for it, and who benefits. India makes a significant investment in undergraduate education, such as that provided by the IIT's, which feed U.S. graduate institutions. Some in India see this as an investment lost. On the other hand, many Indian graduate students receive support from U.S. federal R&D funds, which domestic students and their elected representatives may view as unwelcome competition. A program of cooperation that facilitates brain circulation and research-oriented collaboration between the U.S. and India might head off any backlash that might arise due to these frictions. In 2008, The U.S. and India signed a bilateral agreement for strengthening educational exchanges (U.S. Embassy 2008). The agreement superceded the Fulbright Agreement and doubles the number of scholarships for student exchanges with financial support contributed by India, as well as the U.S. Another potential avenue for bilateral cooperation is through the Foreign Educator Providers Bill currently before the Indian Parliament to allow entry of foreign universities in India. It provides an opportunity to tap into the large education market in India and establish channels for exchange. Universities from the U.S., including Duke University, the United Kingdom, and Australia have already approached the Indian government (Singh 2009).

Conclusion

With the advent of globalization, advances in technology and telecommunications, and liberalization of developing economies, it becomes increasingly possible for highly-skilled individuals to travel and migrate to where they can best achieve their potential and pursue opportunities. Likewise, firms and countries recognize the contributions of these individuals to their prosperity and well-being. Further, sending countries see the potential for establishing and exploiting relationships with their expatriates—going as far in some case to court their return. These dynamics are fostering a global market for ideas and the talent to pursue them. Yet government policies vary greatly from hands off strategies to complete control over resident movements in and out of their countries. While some countries actively seek immigration of highly-skilled individuals, others are turning them away; and while some countries pay no heed to who is leaving their country, others are investing in their home countries to retain individuals or seek their return. The competition among nations for these people, or "war for talent," may impose costs on the countries of emigration. However, the distribution of costs and benefits that result from their mobility is not necessarily zero-sum or fixed. It may be altered through international cooperation, producing a self-reinforcing "win-win" scenario for sending and receiving countries.

There is no reason to think that the present system of governing migration is optimal. Migration is a dynamic process, while the migration policy-making machinery is slow and cumbersome. The possibility that policy-makers will fail to capitalize on opportunities for mutual gain among sending and receiving countries is especially large for high-skill migration. At first glance, the case of India – U.S. relations would appear to contradict this point. As noted, both India and the U.S. have experienced significant benefits from migration and circulation. Yet

many Indians still live in poverty and many Americans see India, its immigrants and offshore services, as a threat to their jobs and wages. Thus there is a growing tension between these countries that could impede, if not derail, further progress. Absent a program of cooperation, and perhaps exacerbated by the economic downturn, there is a risk that each country would be inclined to act unilaterally in pursuit of its own interests. However, these typically protectionist or nationalistic actions may impede the flow of immigrants, but it could impede the flow of ideas, reduce knowledge spillovers, and ultimately inhibit innovation and growth.

Cooperation on migration offers an opportunity for countries to address the tensions that arise from immigration while opening avenues for pursuing common objectives and mutual prosperity. Though it may be desirable to consider a common system of migration across countries that transcend bilateral arrangements, such a system may not be able to address the unique dynamics that exist between countries. Nor should these relationships be viewed uniformly. Differences exist between sectors, such as technology services and medical services that call for their own strategies. This paper represents only a beginning point for understanding these ideas. Further research is planned to explore high-skill migration, the conditions that distinguish sectoral and country characteristics that contribute to the diverse nature of migration, and the varying governance mechanisms and their abilities to produce win-win results for high-skill migrants, domestic workers, firms, and countries.

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