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Globalization, Development, and Mobility of Technical Talent

India and Japan in Comparative Perspectives

Anthony P. D'Costa*

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Abstract

The objective here is to understand how the mobility of technical talent might be changing the structural relationship between rich and poor countries. This paper examines the under-researched relationship between India and Japan in the context of globalization, migration, and developmental impact with demographic, immigration, and innovation policy issues as key themes. By focusing on the export of technical talent, I argue that India could tap its overseas 'brain bank' by diversifying IT export markets, create epistemic networks, meet impending skill shortages in Japan, and induce long-term innovative capability. Immigration reforms and freer movement of talent will be critical.

Keywords: international migration, technical talent, IT industry, innovation and development, 'brain bank', India, Japan

JEL classification: F22, J24, O19, O57

* Comparative International Development, South Asian and International Studies Programs, University of Washington; email: dcosta@u.washington.edu

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1 Introduction

The primary objective of this paper is to understand how the mobility of technical talent might be changing the structural relationship between rich and poor countries. It examines the under-researched relationship between India and Japan in the wider context of globalization, migration, and developmental impact. There are demographic, immigration, and development policy issues surrounding this relationship. Broadly, there are three dimensions addressed in the paper. The first is an assessment of the movement of highly skilled technical professionals in the world economy, a little discussed part of the process of globalization. Second, the paper links the skilled labour mobility to the innovation process. Third, it projects the kind of interaction that might arise with Japan's growing dependence on foreign technical workers and India's increasing ability to supply skilled professionals to the global economy.[1]

Globalization discussions are usually centred around the process and impact of economic integration, focusing on the movement of goods and services, capital, and technology (Dicken 1998). While new opportunities from integration are recognized, there is a consensus on the structural dependence of developing economies on the OECD economies (Hoogvelt 2001). Roughly two-thirds of global trade and foreign direct investment (FDI) take place among the OECD members (Held *et al.* 1999). Much progress has been made in acknowledging the contemporary process of global migration and related asylum issues (Boswell and Crisp 2004). In recent years, the benefits of migration for both poor and rich countries have been also recognized. The growing magnitude of remittances from overseas workers, both temporary and permanent, and the availability of foreign exchange for productive economic activities have been noted (Nayyar 1994, 2002; Khadria 2001). What has not been adequately examined is the increasing movement of technical personnel in the globalization process and the impact it has on both the sending and receiving countries.[2] It was only recently that the OECD sponsored several studies that attempted to document the extent of mobility of human resources in science and technology (HRST) (OECD 2001; Khadria 2004a, 2004b). Most other studies have been concerned with international migration of workers generally, the challenges receiving countries face in integrating migrants, and identifying some conventional forms of economic impact (Roseveare and Jorgensen 2004; Coppel, Dumont and Visco 2001).

While the contribution of foreign HRST to receiving countries has been acknowledged, there is little discussion as to how the mobility of HRST could result in long-term benefits such as innovative capability for sending countries (see Borjas 2001). For the purposes of this study only HRST relevant to the information technology (IT) industry is examined because of the industry's dynamism and India's growing presence in it. The available discussion does not link well the intellectual and entrepreneurial contribution brought about by the mobility of technical talent for home country development. There is also a tendency to focus on permanent migrants and thus overlook the significance of temporary workers, who are critical to information technology. Moreover, in the attempt to provide a generalized understanding of migration of HRST, little analysis has been of

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1 The empirical basis for this third dimension is left for a separate investigation, which will be carried out during 2005 and 2006.

2 In an otherwise excellent treatment of information technology and globalization, Castells (1998) does not dwell on the mobility of technical talent.

country-specific details. For example, little is known about the global mobility of highly skilled technical professionals to Japan (OECD 2003a, 2003b). Consequently, there are significant gaps in our understanding of how Japan fits into the contemporary process of talent movement and how its competitiveness in high-tech industry might be impacted in the future.

Nowhere is the labour shortage more serious than in Japan. Given that Japan is facing labour shortages and it has a tight and ill-designed immigration policy in place, there is a greater need to assess the Japanese situation (Kuwahara 1998; Iguchi 1998; Cohen and Zaidi 2002: 28-9). Discussions by economists and other social scientists on labour mobility have been largely concerned with the movement of *unskilled* workers and migrant remittances. Thus, nearly all research on immigration to Japan examines low-wage workers in construction, small manufacturing industries, and the 'entertainment' sectors from China, the Philippines, Thailand, Bangladesh, and Iran (Ahmed 2000). There are references to western professionals in the Japanese business services but not to technical professionals (Sassen 1998; Fuess 2003). Virtually all research on Indian (and Chinese) professionals abroad (often referred to as a technical diaspora) is focused on immigration to the US (Saxenian 1999, 2002; Leng 2002). At the same time, countries such as India and China have become important suppliers of workers and technical talent. If progress is made on Mode 4 trade in services under the General Agreement on Trade in Services (GATS) negotiations, we can anticipate higher temporary flows of high technology service workers (World Bank 2004; OECD 2003c). Mode 4 is a pending proposal under the WTO, which is designed to enhance exports of services by allowing temporary migration of workers from the developing world to the rich countries. The question is how could developing countries such as India, that create and contribute HRST for the world economy, benefit from the mobility of their talent?

This paper is divided into four main sections. The first section briefly documents the movement of workers in the globalization process. The discussion is centred around the economic impact of international migration on both sending and receiving countries, particularly the former in terms of remittances. The second part establishes the possible favourable impact of mobility of technical talent on development in the sending country, despite contrarian brain-drain arguments. The significance of social networks and the associated 'brain circulation' on innovation and entrepreneurialism is highlighted. The next part briefly presents the Japanese case to highlight the particular demographic and policy dilemmas that place Japan in a difficult situation. The final part, in the absence of firm-level data, hypothesizes the benefits both Japan and India could reap with the generation of technical talent and its circulation to Japan's currently underserved IT labour market.

2 Globalization and labour mobility

2.1 Migration patterns

Globalization, as a process of economic integration, entails increased trade in goods and services, flows of capital and technology transfers, and mobility of talent associated with the global integration of production. Global migration has been historically driven by income and wealth differences and professional opportunities as well as wars and political and ethnic strife. At the same time, economic integration has exacerbated the mismatch between the talent generated and the absorptive capacity of local economies,

thereby spurring the contemporary movement of HRST. In the sections below the migration process is briefly reiterated.[3] Although the data on migration are not strictly comparable due to varying national systems of documentation, the table below provides rough magnitudes of global flows of migrants.

Table 1
Inflows of foreign population into selected OECD countries

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Inflow data based on population registers:										
Austria	–	–	–	–	–	–	–	59.2	72.4	66.0
Belgium	54.1	55.1	53.0	56.0	53.1	51.9	49.2	50.7	68.5	68.6
Czech Republic	–	–	–	–	5.9	7.4	9.9	7.9	6.8	4.2
Denmark	17.5	16.9	15.4	15.6	33.0	24.7	20.4	21.3	20.3	–
Finland	12.4	10.4	10.9	7.6	7.3	7.5	8.1	8.3	7.9	9.1
Germany	920.5	1,207.6	986.9	774.0	788.3	708.0	615.3	605.5	673.9	648.8
Hungary	23.0	15.1	16.4	12.8	13.2	12.8	12.2	12.3	15.0	–
Japan	258.4	267.0	234.5	237.5	209.9	225.4	274.8	265.5	281.9	345.8
Luxembourg	10.0	9.8	9.2	9.2	9.6	9.2	9.4	10.6	11.8	10.8
Netherlands	84.3	83.0	87.6	68.4	67.0	77.2	76.7	81.7	78.4	91.4
Norway	16.1	17.2	22.3	17.9	16.5	17.2	22.0	26.7	32.2	27.8
Sweden	43.9	39.5	54.8	74.7	36.1	29.3	33.4	35.7	34.6	33.8
Switzerland	109.8	112.1	104.0	91.7	87.9	74.3	72.8	74.9	85.8	87.4
Inflow data based on residence permits or on other sources:										
Australia										
Permanent inflows	121.7	107.4	76.3	69.8	87.4	99.1	85.8	77.3	84.1	92.3
Temporary inflows	–	–	93.2	115.2	124.4	130.2	147.1	173.2	194.1	224.0
Canada										
Permanent inflows	230.8	252.8	255.8	223.9	212.9	226.1	216.0	174.1	189.8	227.2
Temporary inflows	67.3	60.5	57.0	58.9	60.4	60.9	63.7	68.1	75.5	86.2
France	109.9	116.6	99.2	91.5	77.0	75.5	102.4	139.5	108.1	119.3
Greece	–	–	–	–	–	–	–	38.2	–	–
Ireland	–	–	–	13.3	13.6	21.5	23.5	20.8	21.6	24.1
Italy	–	–	–	–	–	–	–	111.0	268.0	271.5
New Zealand	27.2	25.5	28.9	36.5	46.7	58.6	52.0	38.7	36.2	38.8
Portugal	–	13.7	9.9	5.7	5.0	3.6	3.3	6.5	10.5	15.9
United Kingdom	–	203.9	190.3	193.6	206.3	216.4	236.9	258.0	276.9	288.8
United States										
Permanent inflows	1,827.2	974.0	904.3	804.4	720.5	915.9	798.4	654.5	646.6	849.8
Temporary inflows	1,269.6	1,334.5	1,355.4	1,468.0	1,432.6	1,636.5	–	2,141.4	2,363.3	2,740.6
EU[1]	–	1,756.5	1,517.1	1,309.5	1,296.4	1,224.9	1,178.7	1,238.7	1,312.5	1,310.6
EEA[1]	–	1,885.7	1,643.3	1,419.1	1,400.7	1,316.4	1,273.5	1,340.4	1,430.5	1,425.8

Note: Data from population registers are not fully comparable because the criteria governing who gets registered differ from country to country. Counts for the Netherlands, Norway and especially Germany include substantial numbers of asylum seekers.

1) Above countries only (excluding Austria, Greece and Italy).

Source: OECD Migration Data Set.

3 International migration is currently being documented despite the fact that a good part of such mobility takes various clandestine forms (see country reports compiled by International Organization for Migration, available at: www.iom.int) and data provided by the World Bank on various brokerage fees paid to traffickers (Ratha 2003: 170).

The US and Germany absorb the largest share of the flows. For most countries it is not clear if the inflows are permanent or not, although registrations to a large extent imply a permanent change in status. The data for Australia, Canada, and the US are disaggregated into temporary and permanent inflows. The German data include a significant number of asylum seekers. The US reported a very large number of temporary inflows, exceeding two million a year in the latter years of the 1990s. These temporary flows include workers, professionals, and students, which comprise a subset of HRST. For the US, both Chinese and Indians visibly represent the high technology sector.

Migration to Japan is relatively low but it is on the rise. The sources of migration vary by destination. While the US attracts Mexicans, Chinese, and Indians, among other nationalities, Japan attracts mainly Chinese, Philippinos, and Brazilians (of Japanese ancestry). In Japan most foreigners enter labour-intensive industries in small and medium enterprises such as manufacturing, construction, and entertainment sectors. The key difference between Japan and most other OECD countries is that permanently immigrating to Japan and acquiring Japanese citizenship is highly restrictive (Hanami 1998; Brody 2002). For example, the US had nearly 900,000 citizenship conversions in 2000, while Japan had a mere 15,000 cases.

It must be stressed that the migration flow is not unidirectional—from the poor to the rich countries. Rather migrants also move within rich and within poor countries. For example, the US in 2000 had 100,000 permanent settlers from Europe, excluding Russia and Ukraine, representing nearly 12 per cent of total settlers. Similarly, the UK had 39 per cent of its inflows of its foreign population from the US, Australia, New Zealand, Canada, and Japan (Table 2). EU members also receive foreign citizens from other member countries. Similarly, there are considerable regional flows of people within the developing world. Thus South East Asia, South Asia, and Africa have internal migrations of their own.

Table 2
United Kingdom, inflows of foreign population by nationality (thousands)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
United States	43.9	37.3	38.2	39.4	43.2	42.5	44.2	44.8	47.0
Australia	25.0	21.5	27.2	26.6	25.1	26.5	30.1	33.4	31.3
India	9.2	8.9	9.9	11.6	13.0	16.1	18.4	19.6	19.9
South Africa	2.3	2.6	5.6	11.1	12.9	13.0	19.1	24.1	19.5
New Zealand	10.6	9.3	12.1	12.0	11.0	12.1	14.3	15.8	13.7
Pakistan	8.3	7.5	6.6	7.2	7.8	9.6	13.2	8.9	12.4
Philippines	2.6	3.3	5.2	6.5	6.8	7.5	7.3	8.1	11.0
Canada	6.4	5.8	6.7	6.7	7.4	8.3	9.6	10.8	10.7
Japan	10.4	9.4	10.4	10.1	10.8	10.4	10.3	10.7	9.6
Poland	3.5	3.5	3.5	3.5	3.6	5.4	5.9	5.7	5.5
Russian Federation	–	–	3.5	4.2	3.6	4.0	4.1	4.9	4.6
Bangladesh	3.2	3.2	3.2	2.8	3.3	4.0	3.9	3.4	4.2
Somalia	3.1	4.2	2.0	1.9	1.9	1.3	1.5	0.5	4.1
China	1.8	2.3	2.7	3.2	3.2	2.5	3.1	3.4	4.0
Sri Lanka	4.1	4.6	1.7	1.7	1.9	2.2	2.5	2.5	3.2
Other countries	69.5	66.9	55.1	58.1	61.0	71.6	70.5	80.4	87.9
Total	203.9	190.3	193.6	206.3	216.4	236.9	258.0	276.9	288.8

Note: Passengers, excluding European Economic Area nationals, admitted to the UK. Data exclude visitors, passengers in transit or returning on limited leave or who previously settled. Students and au pair girls are excluded.

Source: OECD Migration Data Set.

Contemporary global migration is largely driven by economic compulsions. At the individual and household levels, failure of agriculture, the lack of steady employment, and ethnic and civil strife force people to migrate. For professionals, the mismatch between the absorptive capacity of the local economy and the diffusion of modern education and associated economic aspiration among the young is the main reason for contemporary economic migrants. The wage and salary gap between actual earnings at home and potential incomes abroad is a major incentive for emigration of the more educated and better trained. Increasingly, professional networks, driven by industry and college alumni, have become important sources of information for would-be migrants. There are also social and family reasons for migration. Family and ethnic connections abroad attract potential migrants as social networks ease the flow of information and subsidize initial costs of moving and settling in. Also, developing countries continue to exhibit growing dependency ratios, whereby high fertility rates combined with declining birth rates are contributing larger numbers of non-workers relative to workers. Structurally, a slow-growing economy and this demographic shift towards a higher dependency ratio are the preconditions for young job-seekers to migrate.

2.2 Migration, remittances, and development

One of the most studied economic aspects of global migration is the flow of remittance income by migrants to their home economies (Table 3). Low-income and small economies tend to benefit the most from remittances as they contribute substantially to national income, complement sparse foreign direct investments, and in general provide a large amount of foreign exchange, which could be used for economic development purposes. Larger and richer developing countries receive higher remittances due to the greater number of migrants representing such nations. However, their relative affluence also reduces the relative significance of remittances when measured against FDI and total private capital inflows. In contrast, as richer developing countries receive less foreign aid, their remittances tend to be several times more than official flows (Ratha 2003).

The inflow of remittances received by developing countries is highly uneven. Just as the share of trade, FDI, and technology transfers for developing countries tend to be centred in a handful of economies, most of the remittances to developing countries are also received

Table 3
Remittances received by developing countries, 2001
(billions of US dollars)

	All developing	Low income	Lower middle income	Upper middle income
Total remittance receipts, as % of	72.3	19.2	35.9	17.3
GDP	1.3	1.9	1.4	0.8
Imports	3.9	6.2	5.1	2.7
Domestic investments	5.7	9.6	5.0	4.9
FDI inflows	42.4	213.5	43.7	21.7
Total private capital inflows	42.9	666.1	44.9	20.2
Official flows	260.1	120.6	361.7	867.9
Other current transfers	27.2	6.1	14.0	7.1
Total remittances and other transfers	99.5	25.3	49.9	24.4

Source: IMF (2001), World Bank (2001), quoted in Ratha (2003: 157).

by a small number of them. The national central bank data show that in 2000, India, Mexico, Philippines, China, Turkey and Egypt secured the bulk of remittances to their corresponding regions (Orozco 2003 in Sorensen 2004). Together they received 50 per cent of all remittances, with India capturing 15 per cent of the global share and 73 per cent of South Asia's remittances. Mexico received 34 per cent of the regional share and 8 per cent of the global share, while Egypt received 35 per cent and 5 per cent, respectively. The distribution of remittances within Africa shows that in 1999 Morocco received nearly one quarter of the continent's remittances, while Egypt secured nearly 46 per cent (Sorensen 2004: 13). For some of the smaller Latin American countries such as Dominican Republic, El Salvador, Haiti, Cuba and Nicaragua, remittances as a share of exports exceeded 25 per cent (Sorensen 2004: 9). For Mexico it was 6.5 per cent, a substantial value given its high absolute level of exports under NAFTA.

Remittances have several benefits (see Lucas 2004). At the macroeconomic level remittances add to the flow of foreign exchange, which can be used for a variety of international payments including sustaining critical imports. It is plausible that a rapid of rate of foreign exchange accumulation could lead to an appreciation of the local currency and thus reduce international competitiveness (the Dutch disease syndrome). However, few countries are in such an envious position.[4] Their development problems stem less from excessive foreign exchange reserves and more from uncompetitive industries due to poor technology, education and skills. At the household level, remittances have a significant impact on the standard of living. Consumption expenditures increase, which include children's education and better health care (Raihan 2004). Remittance income could also contribute to local entrepreneurship, especially when migration of un- and semi-skilled workers is temporary and on a fixed-time contract basis. The substantial savings gained from overseas employment could provide the necessary capital for small business investments. For example, in both Mexico and Egypt savings from remittance income have contributed to local business development (Latapi 2004; Wahba 2003). However, these activities are likely to remain small, scattered, and inconsequential beyond the immediate households, their extended families, and local markets. The downside could be increased consumerism and inequality relative to those who do not have remittance earnings from abroad (D'Costa 2003a; Ratha 2003). They could also result in localized inflation, especially for housing.

Migration of workers could have a favourable impact on local wages if the local labour market is already tight. This is generally atypical in labour-abundant developing countries. However, particular regions and sectors could face labour shortages if the rate of worker outflow is high. Thus outmigration of workers from certain villages in Kerala (India) and Bangladesh illustrate pressure on local labour markets. In the case of South Africa, the emigration of nurses is a good example of the negative impact it might have on the provisioning of health services to AIDS patients. The exodus of young Indian engineers to the US and other OECD economies and the massive demand for such professionals in India and abroad could put an upward pressure on wages and salaries, even beyond the specific IT sector. Nayyar (1994) argues that the macroeconomic impact of emigration from India is insignificant due to the large number of educated unemployed. However, the growth of the IT sector in the context of talent supply

4 Lucas (2004) suggests that the Dutch disease was in operation for countries such as Albania and Moldova due to large inflows of remittances during their transition to market economies. D'Costa (2003c) hints at this possibility with India's success with IT service exports.

bottlenecks suggests that the wider economy encompassing highly trained professionals could be negatively impacted. The high demand for technical and managerial talent in the world market, compounded by emigration, contributes to several externalities.[5] On the positive side, the overall economic activities increase from the demand side. On the negative side, not all sectors or social groups participate with the same intensity, thereby experiencing unequal outcomes (D'Costa 2003b).

3 The mobility of technical talent and innovative capability

3.1 The significance of technical talent

The key difference between migrants who send large remittances home and those who gain considerably from upward movement of wages and salaries in the local economies is in education and skills. Here, skill is equated with what is popularly called 'knowledge workers' or 'intellectual capital' and does not refer to manufacturing skills, which are less dependent on tertiary education. Unlike traditional skills acquired through vocational training and work experience, knowledge workers require several years of tertiary education, especially in the sciences and technical fields. Broadly, such workers could be seen as professionals who, armed with college and university degrees, also possess specific knowledge or expertise that places them at an economic advantage. The possession of specific expertise is not a guarantee of jobs or income. Demand for such professionals is a necessary condition. For example, while doctors in developing countries have not had difficulties in finding employment, engineers, scientists, and management professionals have not always had it easy. What is profoundly different for knowledge workers today is that demand for skills need not be driven by local or national demand alone. With increased economic integration, professional workers can serve international markets (D'Costa 2003a).

At one level this is no different from the employment impact of the export drive of the East and South East Asian economies, by which a large number of workers was absorbed in meeting global demand. However, unlike manufacturing, technical professionals offering their services are subject to greater geographical mobility. Since many services must be provided at the point of consumption, it is necessary for such workers to be mobile. Hence, they share the characteristics of typical unskilled migrants in that they must provide the service at the point of production and consumption. But because of their skills and tertiary educational background, they tend to have far greater economic returns than unskilled migrant workers.

There is another major difference between unskilled migrants and professional workers. While both earn incomes abroad and send back remittances, with considerable payoff to the broker or labour recruiter, professional workers have greater opportunities to migrate permanently. Hence, the difference between temporary and permanent migration could have significant implications for remittances (Lucas 2004). Today, migrants embodying greater marketable skills compared to their un- and semi-skilled

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5 While labour markets for skilled workers are not as globalized as capital markets (Brown 2001: 26-9), nevertheless there is increasing evidence of a global pool of technical professionals, who begin their overseas experience as temporary migrants (students) and later as permanent, often circulating, workers.

counterparts tend to be readily absorbed permanently by the receiving country. This means that temporary migrants in general, who are less skilled, tend to contribute more to the sending country in terms of remittance income relative to investments made for their education and training compared to skilled professionals. However, it remains to be determined empirically whether unskilled temporary migrants or permanently settled skilled professionals send more income back or not. After all, the duration of overseas stay, the compensation earned, and the nature of family connections back at home would influence the magnitude of the remittance flows for the two types of workers. Because permanent skilled workers tend to come from relatively well-off families and they are joined by their immediate relatives in the receiving counties, they are unlikely to have significant financial obligations to family members in their home countries. But, because of the higher productivity of professionals, their remittances could be higher, at the initial phases, even if they have a greater propensity to settle abroad permanently.

Perhaps what is most distinctive about the mobility of technical professionals is the intellectual capital that knowledge workers possess. The key question framed around this issue has been the existence of brain drain. In the postcolonial era, when newly independent nations pursued their strategy of national development through import-substitution industrialization (ISI), considerable investments were made in technical and tertiary educational infrastructure. For a variety of reasons the ISI strategy did not yield the intended results. What it did do, however, was contribute to the growth of national technical and professional elite whose limited absorption by their respective economies ultimately led to the outflow of talent. This so-called brain drain was seen as a heavy cost to the sending economies and a significant source of economic and technological benefits for receiving countries. This perspective presumes the counterfactual, that is, local welfare is reduced by the absence of such talent through forgone output, while the gains of public investment accrue to the receiving country (see Kar and Beladi 2003: 38). Critics of the brain drain argument point out that the opportunity costs of such workers is close to zero, hence investment should be considered only as sunk costs. However, they are silent on what could be done to stem the outflow of workers, other than to recommend that removing labour market distortions through greater market forces would create opportunities for such talent at home. The debates have spilled over not only on the merits of the ISI strategy but also on the inherent class bias of higher education in developing countries, which comes at the expense of universal education.

The merits of past policy are today moot. It is difficult to ascertain what could have been done to prevent talent outflows in the first place other than to ensure local economic development and provide strong incentives for talent to remain at home. Even with hindsight, it is difficult to say what would have been the appropriate development strategy, given that domestic market development through industrialization was the received wisdom in the immediate post-Second World War period. In the absence of opportunities at home, affluent middle-class families would have in any case sought educational and professional outlets abroad. Politically, the middle class is in a better position to work the system to their benefit.

There are recent examples of countries that have encouraged their talent to remain at home. For example, in Japan a strong nationalist (homogenous) culture in the context of a state-led development strategy created professional opportunities at home. However, the absence of colonial links clearly has been to Japan's advantage, despite migration of many Japanese nationals (mainly farmers) to North and South America in the early

twentieth century. Its special post-Second World War relationship to the US also worked to its benefit. Another recent example is the Taiwanese government's policy to attract Taiwanese Chinese back to the island. Unlike mainland China, which had a nationalist government and restricted the movement of people, Taiwan recognized its vulnerability and encouraged students to go overseas. At the same it realized the significance of technical talent to economic development and hence encouraged its engineers to return home. The government instituted a wide range of incentives, including housing, to its students and engineers who had gone to the US and resettled. By setting up industrial and science parks in Taiwan with a host of start-up incentives, the Taiwanese government has been successful not only in creating well-trained professionals for the world market, which results in remittances and international respect but in bringing them back from abroad to further their economic development (Saxenian 2003). Obviously state efforts to bring back its promising well-educated workers would not have been successful if the Taiwanese economy was faltering to begin with. Hence, it is not clear whether incentives or economic and professional opportunities contribute to the migrants' decision to return. Nevertheless, it does pose the question as to why Taiwan and other countries place so much importance on talent that has already emigrated due to lack of opportunities in the first place.

3.2 Technical networks and development

What the Taiwanese government recognized without labelling it as such are network externalities. Economic externalities are those effects that are either not intended or anticipated or which do not result directly from the activity itself. For example, the spending on individual education may have the favourable impact on the children of the educated; or, increased spending on automobiles could worsen air quality. There are both positive and negative externalities associated with economic activities, many of which only show up considerably later. Network externalities refer to economic impact based on the number of users, consumers, or producers and their integration. Thus, as more people use personal computers, the easier it becomes to design a variety of software programmes for PCs. There is not only a scale effect but there is also a 'network' effect as connections established between users allow information to be shared and solve collective problems (Meyer 2001). The establishment of a 'dominant design' introduces standardization and hence facilitates the diffusion of knowledge. This gives rise to an 'epistemic community' (Cowan 2004: 8). The growth of an industry could be predicated on the 'density' of networks. The links between users, suppliers, manufacturers, research and development (R&D) centres, and universities could theoretically support a gamut of interrelated industries that tap into the knowledge pool. For example, interlocking corporate directorships, representing a high density of networks, contribute to knowledge transfer (O'Hagan and Green 2004: 131-2). Networks thus have a 'social' dimension to them as they tend to generate knowledge that spills over from the immediate economic activity and multiplies both within this and across other economic activities (Maskell and Malmberg 1999).[6]

6 There is a growing recognition that technical networks are important to innovative capability, and bringing back expatriate scientists are perceived to enhance national competitiveness (see Carvajal 2004).

Here lies the key difference between migration of un- and semi-skilled workers and skilled professionals. While both groups could share the temporary nature of their migration, thereby generating remittances for the sending country, there is a high probability that skilled professionals, on their return, are likely to bring back high-value professional and technical expertise. This is especially the case in the context of an expanding economy, with new economic opportunities, which foster greater entrepreneurial propensity among returned professionals. Under economic globalization, in addition to the technical knowledge necessary to compete, considerable market knowledge is critical to successful product and process development. Technical and professional workers embody formal knowledge while work experience adds to tacit knowledge (D'Costa 2002a). Returned professionals are expected to contribute to development largely through their technical expertise to the national economy. Working through networks they are likely to generate a stream of economic benefits which could presumably exceed the initial investments made for their education. Network externalities would arise as more professionals return and establish links with not only the receiving economy they left but also the wider sending economy. These links are of course contingent on several factors, the principal one being an expanding economic base, including structural change and industrial upgrading.

It is of course not entirely apparent why returning professionals would have more expertise to contribute than professionals who never left their home country. Here again the notion of network externalities has a bearing. The more dense the networks and the larger the number of nodes in the network, the greater is the overall production of knowledge within the network and the greater the possibility of its diffusion through the numerous channels linking the various nodes. The access to both volume and high quality of knowledge is critical to network externalities. An integrating economy is likely to have more links to the various knowledge nodes representing technical, organizational, market, and infrastructural information at the global level. However, it is possible that the links to the nodes are weak, as is often the case with economies that suffer from structural dependence and confront adverse terms of trade of their primary exports. In the case of technical and professional workers who have worked abroad, the access to knowledge nodes need not be of higher quality if such workers provide peripheral services to the more knowledge-intensive projects carried out at the principal nodes. For example, the Indian IT industry, despite its global prominence, still suffers from weak innovation links (D'Costa 2002a; Lema and Hesbjerj 2003). Only under certain favourable conditions, such as substantial learning-by-doing and by interacting at home and abroad could an upward movement in the value chain be possible (D'Costa 2003c).

Two types of flows could make this possible. First, when skilled workers and professionals go abroad temporarily, they not only embody particular forms of academic training and technical expertise but their mobility exposes them to specific types of technical work abroad. This experience complements the individual and team skills and presumably enhances social interaction between migrant professionals and their hosts. On their return, the temporary migrants are likely to embody enhanced understanding of certain knowledge-intensive sectors, which is greater than what they left with in the first place. This added expertise could contribute to the national economy if the demand for

such expertise materializes.[7] With this circular flow the link between sending and receiving countries is maintained and the contribution of returning professionals to knowledge-intensive sectors in the sending country is expected to be substantial.

The second is comprised of students, who also embody specific technical knowledge and whose mobility is dictated by the desire to upgrade knowledge. This movement has several implications. First, there is increased social interaction within the science and engineering peer groups that contributes to technical knowledge at the individual and collective level. Second, as a high percentage of students tend to remain in the receiving countries, their contribution to the host economies is substantial (Burrelli 2004). This permanent migration adds to the stock of knowledge in the host country, which in static terms is seen as brain drain for the sending country. However, this stock today can be seen as a 'brain bank' to be tapped to benefit sending countries. As economies expand and the demand for technical services increases globally, sending countries become viable sites for off-shore development of such services. In this scenario, migration of talent is accompanied by an expanding pool of technical professionals in the sending country, most of whom find new opportunities at home. Conversely, many erstwhile permanent migrants find expanding opportunities attractive enough in the sending country to return home permanently or temporarily.

The idea of return migrants offering a brain bank has not been adequately addressed in part because these student migrants do not conform to the temporary flow of professionals. Furthermore, since the flow of technical students, who often become permanent migrants, is to the economic advantage of receiving countries, there is an implicit policy to encourage such flows among certain countries. Structurally, the receiving countries also exert influence over this flow because of superior technical institutions, research and development opportunities, and professional advancement. However, for sending countries this brain drain (a flow) is now perceived as a brain bank (a stock), especially by those countries whose economies are poised to take advantage of the collective expertise of this overseas reservoir of talent. If indeed such talent flows back to the sending countries, then the initial outflows of technical talent in the form of students from the developing countries need not altogether have an adverse impact, especially if they return with new knowledge. In fact one could make the argument that in the long haul such outflows of talent could have a favourable impact on the sending country. Under globalization, as economies become linked, the circulation of talent becomes an essential feature to organize production (Davenport 2004). By stimulating national economies, research and expatriate networks become actively involved in linking talent in both sending and receiving countries (Meyer and Brown 1999; Saxenian 1999). Students are also part of networks as they seek admission to universities abroad through various institutional channels (Tremblay 2001: 61). Sending countries thus stand a better chance today to attract such talent from their overseas brain bank, even if temporarily, and stand to gain permanently from the talent that stays at home but becomes part of a wider epistemic community.

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7 Lucas (2004) finds mixed evidence on the relevance of skills acquired overseas for local economies. However, it is crucial to distinguish not only the types of workers who return but also identify any accompanying knowledge networks.

Table 4
Japan's demographic shifts in a global context

	Total population			Average annual growth rate (%)		Population age composition, 2001 (%)			Dependency ratio		Crude DR per 1,000	Crude BR per 1,000
	1980	2001	2015	1980-2001	2001-2015	0-14	15-64	65+	Young	Old	2001	2001
World	4,429.6	6,130.1	7,093.9	1.5	1.0	29.6	63.4	7.0	0.5	0.1	9	21
Low income	1,613.4	2,505.9	3,090.9	2.1	1.5	36.4	59.2	4.4	0.6	0.1	11	29
Middle income	1,988.8	2,667.2	3,001.1	1.4	0.8	27.1	66.0	6.9	0.4	0.1	8	17
Lower middle income	1,626.4	2,163.5	2,413.0	1.4	0.8	26.7	66.4	6.9	0.4	0.1	8	17
Upper middle income	362.4	503.6	588.1	1.6	1.1	29.0	64.4	6.6	0.4	0.1	7	20
Low & middle income	3,601.6	5,172.3	6,091.9	1.7	1.2	31.6	62.7	5.7	0.5	0.1	9	23
East Asia & Pacific	1,359.4	1,822.5	2,041.3	1.4	0.8	26.8	66.8	6.4	0.4	0.1	7	17
Thailand	46.7	61.2	66.3	1.3	0.6	23.6	70.1	6.3	0.3	0.1	8	15
Philippines	48.0	78.3	98.2	2.3	1.6	36.9	59.2	3.9	0.6	0.1	6	26
China	981.2	1,271.8	1,392.6	1.2	0.6	24.8	68.1	7.1	0.4	0.1	7	15
Japan	116.8	127.0	124.1	0.4	-0.2	14.5	67.9	17.6	0.2	0.3	9	9
Europe & Central Asia	425.8	474.6	476.6	0.5	0.0	21.4	67.6	11.0	0.3	0.2	12	12
Latin America & Caribbean	359.9	523.6	625.7	1.8	1.3	31.3	63.2	5.5	0.5	0.1	6	22
Middle East & North Africa	174.0	300.6	387.7	2.6	1.8	36.2	59.8	4.0	0.6	0.1	6	26
South Asia	901.3	1,377.8	1,680.0	2.0	1.4	34.6	60.8	4.6	0.6	0.1	9	26
India	687.3	1,032.4	1,227.9	1.9	1.2	33.1	61.9	5.0	0.5	0.1	9	25
Sub-Saharan Africa	381.7	673.9	880.6	2.7	1.9	44.0	53.0	3.0	0.8	0.1	17	39
High income	827.4	957.0	1,001.9	0.7	0.3	18.4	67.3	14.3	0.3	0.2	9	12
Europe EMU	286.7	306.7	306.0	0.3	0.0	16.2	67.3	16.5	0.2	0.2	10	10

Notes: Estimate does not account for recent refugee flows. DR: death rate; BR: birth rate.

Source: World Bank Development Indicators.

Whether the reverse flow of talent back to the sending countries is temporary or permanent is difficult to predict. However, both outcomes suggest the necessity to foster a dynamic economy in which the absorption of returning professionals becomes possible (Lucas 2004: 18). In the case of a temporary return, it suggests the circulation of talent as professionals from their adopted country return home to set up globally linked operations making use of their social networks and their links to specific knowledge nodes. Familiarity with sending countries becomes a critical condition for the return of talent and establishment of technical and entrepreneurial links with the receiving countries. Exploiting such connections is intrinsically beneficial to the sending country as professionals and entrepreneurs take advantage of the knowledge links they have been part of while being residents of the receiving country.

4 The demographic dilemma and impending talent shortage in Japan

4.1 Japan and regional population pressures

It is not difficult to appreciate why people move globally. Wars, famines, labour needs, and economic compulsions are the usual reasons. Where technical workers are concerned, demand appears to play a significant role in their mobility, especially when local economies are unable to retain them due to slow growth and low compensation. While demand for such workers is generally driven by economic expansion and structural change, the mobility of professionals is driven by their technical expertise needed by new sectors which are not adequately developed at home. Shortages in the receiving countries arise because demand outpaces the supply of skilled workers. However, contemporary shortages may be deliberately overestimated by employers so as to employ temporarily less expensive foreign workers. At the same time, shortages need not be fictitious, given the number of foreign students who study and then remain in the host economy permanently to work. For example, in 1998 for every 1,000 students enrolled in an OECD country, there were 113 non-OECD students enrolled (Tremblay 2001: 48). Students from Latin America, Africa, and the Middle East preferred EU countries, while Asians preferred non-EU countries, mostly the US and Japan. Nearly 70 per cent of foreign PhD recipients in the US had plans to remain there (Guellec and Cervantes 2001: 92).

There are at least two reasons for shortages of highly skilled technical professionals. The first is a shrinking pool of students who are willing to pursue technical studies in the developed (or OECD) economies. Second, the demographic trends are contributing to this shortage. The population growth rate is low in the OECD economies, while they remain high in the developing countries. Population is also ageing in the OECD economies, thereby raising the dependency ratio, while the bulk of the population in developing countries is young, which also contributes to high dependency ratios. However, the rapid decline in mortality rates is also creating an ageing problem in developing countries (Cohen 2004: 38-9). In the absence of social security and fewer employment opportunities in developing countries, their dependency ratios are more precarious. It is this mismatch of population trends that systemically contributes to the mobility of people in general, and, under globalizing conditions, creates pressures for technical workers to be mobile.

Some of these demographic trends can be seen in Table 4. While global population has increased by nearly 40 per cent since 1980, the share of population of the high-income

countries fell from 19 per cent to 16 per cent. Conversely, the share of the low-income countries increased from 36 per cent to 41 per cent. There is considerable disparity in the population growth rates of rich and poor countries, 0.7 per cent versus 2.1 per cent, with the former declining below replacement rate compared to poor countries' growth rate of 1.5 per cent over the next decade. Similarly the dependency ratio varies between rich and poor countries, with high-income economies having a much higher proportion of people aged 65 and over, compared to poor economies. Since technical workers typically come from the upper- and middle-income households from poor and middle-income countries, such aggregate data do not necessarily convey the nature of skilled labour migration. To better tease out the demographic pressures operating on the mobility of skilled workers in Japan, data for Thailand, the Philippines, China and India are included (see Table 4).

4.2 Japan and the looming immigration question

By 2015 Japan is expected to witness an absolute decline in its population, with its average annual rate of population growth falling to minus 0.2 per cent. Currently it has the highest proportion of people in the 65 and over age group (Asia Program Special Report 2003). The demographic data for some of the low- and middle-income countries such as India, Thailand, China and the Philippines show that although population growth rates are expected to decline considerably by 2015, their absolute population growth will keep their dependency ratios high. One-quarter to one-third of their population is currently under 14 years of age, which makes the dependency ratio high by OECD standards. At the same time the population group between 15-64 years old, classified as the labour force, will continue to rise. China and India are expected to increase their work force by 7 per cent and 18 per cent, respectively, over 2001-10, with a combined labour force of 1.4 billion. For Japan the labour force has been predicted to shrink absolutely from 68.2 million in 2001 to 66 million by 2010, a decline of over 3 per cent (World Bank 2003). This suggests that as more people become dependent on those who have jobs and as the number of job seekers itself increases in the developing countries, the pressure to find employment will mount drastically. Under such a situation, international migration will be one outlet for venting 'excess' labour, assuming that these economies will not be able to absorb all of the growth in the working age population.

Japan is in an unenvious position. It has exhausted alternative sources of labour. For example, institutionally it is impractical in the medium term to tap rural residents, it has automated its industries considerably, and there is reluctance to induct women into the more male-dominated economic sectors. Under this predicament there are two medium-term complementary options. One is allowing more foreign workers into Japan and the other is to increase outsourcing of production of goods and services from abroad. Selectively Japan has already exercised both options. Throughout the 1980s Japanese firms farmed out production to South East Asian economies. Rising cost of business, especially wage costs, the appreciation of the yen, massive foreign exchange revenues, and greater environmental consciousness pushed Japanese businesses to invest overseas. A good part of this outsourcing relies on inexpensive industrial labour in mature industries using standardized technologies. High volume production is critical in such outsourcing practices. Furthermore, a high share of Japanese FDI production has been geared towards third-country markets rather than the Japanese market. However, as labour shortages mount, it is plausible that more overseas production by Japanese firms

will be aimed for the home economy. As manufacturing technologies mature, outsourcing will be largely driven by low-wage production.

Outsourcing is expected in emerging technologies and in sectors that demand high skills and technical expertise. Thus far the Japanese government has relaxed somewhat its immigration laws to allow foreign workers to work temporarily in Japan. Acutely aware that the small and medium firms in Japan were becoming uncompetitive, the government permitted them to import labour. Workers from Thailand, China, Philippines, Brazil, Peru and Bangladesh are employed in low-wage factory work, construction, and entertainment sectors in Japan.[8] Many of these workers have become permanent—and illegal—migrants by overstaying their visas. It is evident that both the Japanese government and businesses have addressed only the immediate labour shortage problem through outsourcing and immigration policy reform. They have not tackled the anticipated more long-term problem of Japanese demographic shifts nor have they adequately addressed the human capital needs of emerging sectors such as the information and communication technology industries.

Japan has historically looked unfavourably upon foreigners. Cultural homogeneity, linguistic barriers, and the nationalist sentiments of Japanese firms have precluded large-scale inflows of immigrants. Particular forms of corporate governance and inter-firm arrangements such as the *kereitsu* have effectively kept foreign firms out of the Japanese economy.[9] Long-term employment, subcontracting relations, and reliance on internal labour markets have made the employment of foreigners virtually impossible for firms. However, Japan's very success in exports and subsequent internationalization of its economy has compelled businesses and the government to seek cost-reducing outsourcing arrangements and gradual reforms in immigration policies. This shift is evident in the stocks and flows of highly skilled labour (Table 5). Four categories of entrants by resident status reflect the inflows of technical talent: professor, researcher, engineer, and college student. Foreign students in Japan tend to pursue technical studies rather than humanities, social sciences, or management degrees due to Japanese government initiatives and Japan's manufacturing reputation. While the share of these four groups to total new entrants has been about one-half a per cent throughout the 1990s, these legal migrants represent a greater share of migrants roughly belonging to skilled workers. In 1992 the share of these workers was 14.8 per cent, which rose to 20.2 per cent in 1994, and 20.8 per cent in 1997. The number of foreign college students, which represents future technical talent, fell marginally in the mid-1990s and rose to nearly 12,000 by 1997. In 1998, 45.6 per cent of foreign students in Japan came from China, followed by 33 per cent from South Korea, and 3.7 per cent from Malaysia (Tremblay 2001: 53). However, the data on change in residence status suggest that few college students either remained in Japan or were given permission to be employed. For example, in 1997 only 2,624 permissions were granted to students to change residency status for employment, of which only 945 were classified as engineers, professors, and

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8 The lop-sidedness of Japanese policy toward foreign workers is evident from the fact that Japan is quite open to the entry of 'entertainers' but highly restrictive toward the much-needed nurses and health care givers (Ito 2004). In 2002 there were 123,000 entertainers (or 85 per cent of total foreigners allowed to work) compared to 4 'medical service professional' (Ito 2004).

9 Kereitsu is a corporate governance structure in which firms such as manufacturers, suppliers, trading companies, and banks are interlinked by cross-equity holdings. Although no majority control is exercised by any one firm the ties that bind these firms are inclusive and hence exclude non-members.

researchers (Kobayashi 2001: 121). The remaining applicants were grouped under humanities and international services.

Japan provides an interesting window to the demographic dilemma and immigration policy constraints (Papademetriou and Hamilton 2000; Douglass and Roberts 2000). More high skilled Japanese citizens go abroad compared to foreigners coming to Japan. Intra-company transfers, presumably highly skilled professionals, ranged from 5,000 to 6,500 foreigners in the 1990s, compared to nearly 53,000 Japanese nationals going abroad to take up posts (Kobayashi 2001: 121-2). Similarly, nearly 200,000 Japanese citizens went abroad for studies and technical training and over 100,000 for research. The stock of foreign technical talent in Japan is growing but the flows remain small. Similarly, foreign students are increasing in Japan. While nearly four million persons enter Japan annually, only a small percentage of them are considered to be high skilled technical professionals. Similarly, the relatively visible enrolment of over 12,000 foreign college students does not appear to result in permanent migration. A tiny fraction of students converted their residency status after completion of their study programme. The stock of engineers continues to outnumber professors and researchers, suggesting the importance of Japanese manufacturing.

What is noteworthy is the near-absence of IT industry workers entering Japan. There were fewer than 2,000 newly entering specialists grouped under computer service. While precise estimates of the Japanese market are difficult to obtain, given the size of the Japanese hardware industry one can easily infer the market to be very large. In 2001 the Japanese IT market was estimated to exceed US$100 billion (*Hindu* 2001). A survey by the Japan Information Service Industry Association revealed that Japan in 2001 needed 800,000 IT workers. Some of these positions were being filled by Chinese engineers (*Hindu* 2001). Only about 400 Indian engineers were present in the Japanese IT industry. Given Japan's global lead in the information and communications technology (ICT) sector, the low inflows of foreign workers to Japan remains an anomaly. This anomaly is evident from the Japanese share of India's software exports (Table 6).

Table 5
Number of new entrants in Japan by residence status

Status/year	1992	1993	1994	1995	1996	1997
Total	3,251,753	3,040,719	3,091,581	2,934,428	3,410,026	3,809,679
Professor	843	1,045	1,187	1,296	1,309	1,463
Researchers	860	812	862	870	1,080	1,251
Instructors	2,573	2,635	2,506	2,963	2,847	3,068
Engineers	2,979	1,758	3,194	3,717	4,426	5,128
Humanities and international services	5,703	5,265	5,198	4,982	6,144	6,709
Intra-company transferees	4,639	4,438	3,076	3,074	2,831	3,354
Skilled labour	2,441	1,768	2,071	2,210	3,336	2,833
College students	10,368	10,722	10,337	10,155	11,717	12,408
Pre-college students	27,367	18,127	11,947	9,928	9,436	11,755
Trainees	43,627	39,795	36,612	40,591	45,536	49,594

Source: *Legal Migrants (*1998) quoted in Kobayashi (2001: 121).

Table 6
India's position in the global and Japanese IT industry

	IT services spending (US$ billion)	India's exports (US$ million)	India's market share (%)	Relative dependence ratio	Share in India's exports
North America	171.1	6,685	3.92	1.4	67.7
Western Europe	109.6	2,103	1.92	0.7	21.3
Japan	34.9	193	0.55	0.2	2.0
Latin America & rest of the world	17.5	583	3.33	1.2	5.9
Asia Pacific	16.0	311	1.94	0.7	3.2
Total	349.1	9,875	2.82		100.0

Note: Relative dependence measures the region's share in Indian exports vis-à-vis the region's share in world IT services spending.

Source: NASSCOM, available at: www.nasscom.org (accessed 09/08/2004).

The National Association of Software and Service Companies (NASSCOM) estimated that of the nearly US$10 billion software service exports by India, only 2 per cent went to Japan in 2002-03, whereas nearly two-thirds went to the US (NASSCOM 2004). Poorer regions of the world imported more software services from India than Japan. The relative dependency ratio, computed by taking the share of Indian exports to Japan (2 per cent) and divided by the region's share in world IT services spending (US$34.9 billion/US$349.1 billion) was 0.2. Among all the regions, Japan had the lowest dependency ratio, which suggests India's penetration of the Japanese market to be extremely low at this time. Given Japan's large IT spending, there are other factors that are responsible for this outcome. Japanese institutional and corporate structures limit outsourcing arrangements to familiar, local firms. There are also social and cultural differences between India and Japan, especially at the corporate level. Most importantly, however, it is the particular trajectory of the Japanese IT industry that has imposed limits on outsourcing. The highly competitive Japanese hardware producers have always bundled their software, hence the development of an independent software industry in Japan has been discouraged (Anchordoguy 2000). However, this development also suggests that the Japanese are strong in hardware-intensive software development, which for technical reasons has its own entry barriers. Japanese are reputed for their design and embedded software, areas which the Indian industry is only beginning to develop. The absence of foreign skilled workers in Japan is also indicative of alternative destinations for technical professionals. As observed earlier, the US and UK, Australia, and Canada are more receptive to skilled, often English-speaking professionals than Japan. Projects from these countries entail customized software services that are technically different and perhaps less challenging than Japanese manufacturing-based software needs (D'Costa 2002a).

5 Tapping the Indian brain bank

At this time India's export of IT services to Japan is small. The presence of Indian technical talent in Japan is also low. For example, in 1997-98 only 2.2 per cent of the Indian students going abroad under government programmes went to Asia as a whole (Khadria 2004a: 28). It is amply evident that there is a relationship between IT exports

and the mobility of talent as borne out by the stock and flow of Indian talent to the US. For example, in 2001, nearly 47,000 Indian students went to the US, accounting for 78 per cent of all Indian students enrolled in OECD countries (Khadria 2004a: 29). However, while Indians represented only 4 per cent of all foreign students in the OECD group, they represented 10 per cent of foreign students in the US. Indians had the largest number of science and engineering degree holders among foreigners in the US and 30,000 science and engineering doctorates in 1999. Over 50 per cent of science and engineering students of Indian nationality plan to remain in the US, suggesting a growing stock of talent in the US. Additionally, as Indians are prominent in higher education establishments in the US, it also suggests a visible and influential talent pool (Table 7). Indians (and Chinese) are known for their entrepreneurship in Silicon Valley as well (Saxenian 1999).

India's exports of IT services to the US have entailed two forms of production: on-site services and off-shore development (D'Costa 2002b). The former involves the geographical movement of talent to the actual site of service delivery, while the latter mostly involves development of services remotely in India. However, off-shore development entails temporary mobility of talent, from both sending and receiving countries, some of whom remain in the respective host economies for several years. Both on-site and off-shore development induces temporary migration because of the professional need to be physically present to implement projects, maintain them, and deliver customized services. Because of their temporary nature, there is return migration of talent. Students going abroad to study may stay as temporary migrants or become permanent ones, as some return and others stay back in the host countries. With off-shore development it becomes possible for some of the technical talent from the stock of professionals in the receiving country to return to the countries of their origin. Furthermore, as the global demand for technical talent increases relative to national supplies, immigration reforms—both systematic and ad hoc—create additional possibilities for increasing flows from sending countries and thereby contributing to the potential return of migrants. Guest worker programmes as well as the US H1B visa programme are illustrations of such immigration measures. The dynamics of return migration is shown in Figure 1.

There is no doubt that the Indian IT industry is heavily dependent on the US market. What is overlooked is how dependent India is on the temporary movement of its talent to the US through its on-site services (Hira 2004). Indian firms have successfully

Table 7
Indian faculty in US science and engineering fields, 1997

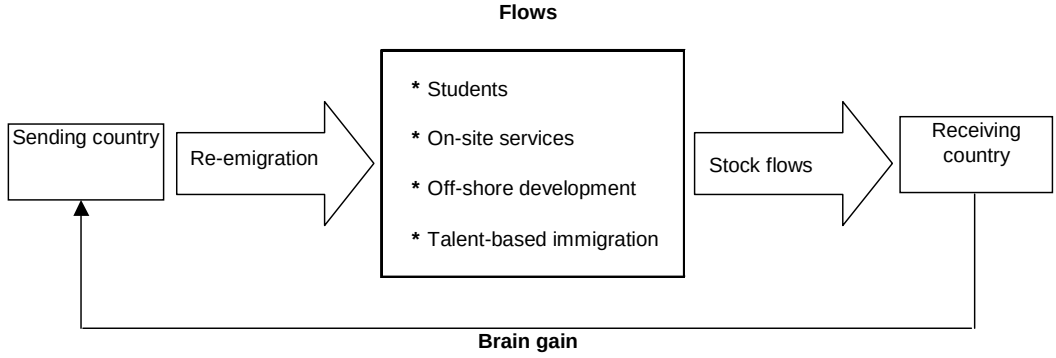
	Total S & E in US	Indian origin	% of Indians to:	
			Total	Foreign
Total science and engineering	224,707	6,876	3.1	15.3
Physical sciences	37,020	688	1.9	9.3
Life sciences	53,055	1,014	1.9	13.4
Math. & comp. sciences	44,375	2,086	4.7	18.3
Social sciences	65,509	1,491	2.3	15.5
Engineering	24,748	1,597	6.5	17.8

Source: National Science Foundation quoted in Khadria (2004a: 33).

leveraged the US immigration system, exporting talent in large numbers. Of the 331,206 H1B visas approved in 2001, 49 per cent went to Indian professionals, and of these 92 per cent were IT related (Hira 2004: 842). Furthermore, Indian firms in the US as well as US firms created by Indian entrepreneurs facilitated the temporary movement of talent. The implication of this is that previous talent flows, in the form of students and temporary workers, become permanent stocks, which in turn pull in more temporary workers. This brain bank acts to foster more on-site and off-shore work in IT services. Clearly India benefits from the temporary movement of talent and so do US clients, who receive competitively-priced services. However, India's success in the US could also lead to new challenges. While perceived and real labour shortages in the US could be met from India, the current technology slump is a reminder that high demand is not always durable. Employer abuses also have led to a critical examination of the various visa programmes to bring in Indian IT workers and today much lower visa caps are in place. This clearly points to the necessity of reducing India's dependence on the US market and especially on on-site services provided through the temporary movement of workers.

The reduction has already begun but only in a limited way. As more work is done off-shore in India, there is less need for worker mobility. Between 1999 and 2003, the share of off-shore delivery of services increased from 35 per cent to 58 per cent, while on-site services fell from 57 per cent to 39 per cent (NASSCOM 2004). However, there was an absolute increase in the volume of on-site services during this period of nearly 90 per cent, implying the continued importance of the temporary movement of workers. Since visa approvals are capped in absolute terms, the increasing volume of off-shore work does not necessarily reduce the temporary movement of workers. Even if the share of India's exports to the US IT industry as a whole is marginal, nevertheless the absolute visa limits and popular anti-foreign workers sentiment are likely to go against temporary migrants. Besides, there will always be a need for face-to-face interaction and some presence of Indian workers even for those projects that have been created off-shore. This means that visa caps under the H1B programme will immediately impact on the mobility of Indian IT workers and Indian and US firms may have to utilize other programmes. However, as a long-term strategy, India will have to diversify its IT export markets.

Figure 1
Tapping the brain bank



It is evident that the flows and stocks of Indian talent will continue to expand. As India's IT exports rise and India's software engineers find lucrative employment at home and abroad, the government sees it as an important source of economic growth, employment, and foreign exchange. Similarly, foreign firms in their quest for cost-efficiency will continue to outsource services from India. This virtuous loop is expected to be met by additional investments in technical training and the propensity of Indian households to educate their children in technical fields. There is already an expansion in the growth of the technical labour force in India. Since 1990 India's employment of IT professionals has increased from 56,000 to 522,250, a nearly ten-fold growth (NASSCOM 2002: 63). Technical education in India has consistently expanded throughout the 1990s, with engineering admissions increasing five-fold between 1992 and 2004. The number of IT admissions based on capacity increased from 73,000 in 1992 to 342,000 in 2004, while the number of professionals with an engineering degree is expected to increase from 43,000 in 1997 to nearly 100,000 in 2004. Such growth is a major contributor to the stock and flow of Indian talent. The question is how such talent will be employed.

If the growth rate of the Indian IT industry is any indication, then it is plausible that such talent will be absorbed quite easily. However, when the size of the Indian IT industry is disaggregated into domestic and export segments, it is evident that it is the latter that is driving the sector's expansion. This means that the Indian industry will exhaust the immigration quotas imposed by the US, even with increased off-shore development. The Indian industry foresees shortages of IT workers in India and growth of the global IT industry. Hence it has aggressively targeted human capital expansion specifically for this sector (NASSCOM 2003). Furthermore, there are many other countries with well-endowed human resources, which could challenge India's first-comer advantage. Russia and the former East European countries as well as China and the Philippines are potential competitors. Hence, the expansion of the Indian domestic market will be critical not only for its intrinsic developmental impact but to help stem the flow of talent in large numbers to the US. However, at this time most Indian firms are keen to exploit the more lucrative US market. Alternatively, and complementary to the current export pattern, Indian firms will have to diversify their export markets.

It has been already established that India exports very little to Japan, the Japanese dependence on Indian output is negligible, and the Japanese are confronted by demographic challenges. There are indications that the Japanese economy is beginning to rely on foreign workers. In order to maintain their lead in the IT-related high technology industries, Japanese firms will be compelled to rely on foreign technical talent. While there are many countries, especially China, that could meet this need, the Chinese economy itself is becoming heavily dependent on its own talent. Hence, for India there is a historic opportunity to reorient its IT industry. To successfully make the transition, both India and Japan will have to collaborate in the broader area of immigration and industry-specific areas of technical education.

For India, the Japanese market provides both challenges and opportunities. Aside from the institutional barriers such as lack of Japanese business receptivity to foreign partners, cultural distance, and a restrictive immigration policy, the Japanese high technology market is driven significantly by manufacturing and hardware development. Both are areas in which Indian firms have had poor exposure to international competition, hence it would take considerable technical competence and commercial wherewithal to make a dent in the Japanese market. For example, of the US$60 billion

IT services market in Japan, only 5 per cent is outsourced from abroad. There are 70 Indian firms present in Japan but their contribution to the Japanese market has been paltry, with India's total exports to Japan being US$190 million (Silicon India 2004a). Most Indian firms are currently ill-prepared or uninterested in tackling this dynamic market. One exception is WIPRO, one of India's largest and most successful IT firms. Its background in hardware development and sales places it in good stead to work with Japanese firms (D'Costa 2002b). Yet, it is precisely the qualitative difference between the Japanese and the US market that offers an opportunity to reduce its dependence on the US market and make a pre-emptive switch before the US economy becomes a limiting factor (D'Costa 2002a).

Complementing the market diversification argument, India's potential engagement with the Japanese market also sets up an alternative brain bank. Assuming Japanese firms increase outsourcing software services from India, conditional on Japanese immigration reforms, the flows of technical talent to Japan are likely to increase. Depending on the length of the projects, the temporary flows of talent could result in a Japan-based brain bank, which like its US counterpart could facilitate the transfer of a qualitatively different kind of technical and commercial knowledge. The net result is the expected overlapping of epistemic communities straddling two different markets, which over time is likely to lead to greater interaction and reduced vulnerability on exogenous factors for the Indian IT industry. The development implications are varied: not only will export revenues come from a different market but more importantly the technological spillovers through network externalities are likely to be massive. For the Japanese, a substantial adjustment towards accepting technical workers is involved. But the presence of foreign workers is no longer a new phenomenon in Japan. It is already present in various sectors both formally and clandestinely. What is necessary is a pre-emptive strategy by Japan to tackle its demographic imbalances, integrate itself more fully with Asia and thereby contribute to Asia's development in some measured way, and help cushion some of the global pressures on the US economy.

6 Conclusion

It is evident that there are both global and industry-specific developments that warrant a critical examination of the mobility of technical talent to Japan. First, uncontrolled immigration is neither politically feasible nor socially acceptable. Yet, with globalization, states are now less effective in regulating flows of people (Bhagwati 2003). Transnational economic forces independently influence labour flows. The challenge is how to induce inflows of skilled professionals without overt disruption to either the receiving or sending country. Second, regulated immigration is consistent with the desire of the global community to maintain global economic openness. If, however, economic integration results in further global inequality, then rich countries must responsibly address this on behalf of poor countries. In fact, in an era of foreign aid fatigue, there is greater reason to promote development in labour-abundant countries so that 'brain drain' is transformed to 'brain gain' for these countries, making migration over the long haul a temporary process. This can be accomplished if sending countries can tap, for their own development, the technical and entrepreneurial skills from the global talent pool to which they are currently contributing. Third, the liberalization of trade under WTO and the urgency of resolving severe global inequalities have prompted some poor countries to demand liberalization of the services sector so that they can

benefit from the export of skilled labour. In practice, this is well under way in information technology (IT) and health services in the US and elsewhere (Khadria 2004b).

The number of technical professionals returning to India is still low. However, small surveys indicate that return migrants could rise in the future (Khadria 2004b). The movement of talent today has a large temporary component to it mainly because of on-site projects. Also, many students are increasingly going abroad with the intent to return home. This is especially because of strong family ties and growing professional opportunities at home. The real question is whether the return migrants would contribute to the innovative capability of Indian firms. There are some grounds to believe that the mere return of talent would not necessarily raise the technological competence of the Indian IT industry. Some studies have shown that the nature of Indian exports has tended to remain at the lower end of the value chain due to the types of software services demanded by customers (Heeks 1996; D'Costa 2002a). Other studies have shown the lack of integration of the Indian software industry to the domestic economy, including the lack of a hardware industry, as a serious structural bottleneck to its development (D'Costa 2003c). The weak cooperative links among Indian firms also suggest limited innovative capability, which demands sharing information (Lema and Hesbjerj 2003). Lastly, the lack of a coherent government policy to bring back Indian talent suggests that tapping the brain bank will not be easy (Saxenian 2000). Nevertheless, there are grounds to believe that new opportunities will arise due to demographic and skill needs in the world economy.

By examining the process of international migration and some of the economic benefits of the movement of technical talent, this study, in broader way, provides a window to the working of the economy and how the structural relationship between rich and poor countries might be altered. The mediating variable is the mobility of technical talent and other high skilled professionals. The flexibility of the global economic system creates opportunities and imposes heavy costs on national economies. Only those countries that have a well-educated workforce, high quality physical and technological infrastructures, and relatively pragmatic policymaking capabilities tend to integrate well (UNDP 2001). Global competition in the information age calls for flexibility and technological capacity to increase productivity. This means that high-value service providers such as doctors, computer scientists, geneticists, managers, accountants, engineers, chip designers, etc. must be quickly mobilized in sufficient numbers to exploit emerging opportunities. As some of the OECD economies, such as Japan, experience declining fertility rates and an ageing population, labour shortages are likely to emerge in a variety of manufacturing and service sectors. Japan's IT industry suffers from the dominance of the hardware sector and its dedicated software suppliers, thereby limiting the growth of a dynamic, independent software industry. Japan could benefit enormously from the new generation Indian IT talent, which has been exposed to the rigors of US competition. A recent report indicates that Indian students and those already in the US, the UK, and other European countries are in high demand in the IT industry (Silicon India 2004b). Hence, the initial static losses of 'brain drain' could be dynamically recouped, first, by the outflows of Indian talent and, second, if such talent were 'gained' back by India and deployed for national production.

The developmental implication of brain circulation and a brain bank is significant. Outflows of skilled labour need not be a permanent loss. Instead, government incentives to lure professionals back and the rapid development of the home market can contribute

to the return flow of talent. Many other professionals, though settled abroad, could 'circulate' between sending and receiving countries, not just between India and the US but between India, the US, and Japan, thereby creating multiple nodes of global epistemic communities and transferring knowledge gained overseas to their home economies. A substantial responsibility will have to be placed on sending and receiving country governments to create dynamic national economies, which are expected to absorb skilled professionals by creating, retaining, and gaining back talent.

This policy implication is often overlooked in the discussions of labour migration as attention is directed towards the economic and political costs of migration and immigration in sending and receiving countries respectively. A more balanced global economic governance policy recognizes that labour mobility cannot be contained but skilled labour can be retained or encouraged to return. This 'circulation' of talent will be critical for future innovative capability. The receiving countries will have to revisit their immigration policies to ensure that the gains of economic integration also accrue to the poor economies that send them skilled labour. Japan and India provide a rich transnational case that is expected to capture not only the dynamics of skilled labour mobility and its competitive and development implications but also sheds light on the larger transformation of the structural relationship between rich and poor countries.

Future institutional research following from this basic investigation on the mobility of technical talent must be directed towards obtaining industry and firm level data from countries that are on the threshold of relying on foreign workers. Japan is an under-researched country in this respect. There are, however, other cases where foreign talent is used but not much information is available in terms of the types of technical talent relied on and what is the extent of dependence on foreign workers. For example, Singapore, despite its small size, is a significant user of foreign workers in a variety of sectors but increasingly in the IT sector as well. As it begins to diversify its economy away from manufacturing and regionalizes its economy with China, India, and other Asian economies, its engagement with foreign technical talent will increase. Germany is another case, where there has been a go-stop approach towards temporary movement of foreign technical talent. Yet there are impending sector-specific worker shortages. Even countries such as Taiwan and South Korea, not known for labour shortages, are at a juncture where the need for information processing and software development is likely to rise. A more systematic analysis of the nature of labour shortages and the future growth of IT-related industries will be crucial to understand exactly what kind of technical talent will be needed and who can best provide it. This would entail obtaining data on technical education in each of these countries, especially Japan and assess possible matching of talent between the changing IT industry and education systems across different sending and receiving countries.

Countries such as India and China are faced with a historic opportunity to generate the kind of technical talent that will be demanded by the IT sector as a whole. As the mobility of labour increases, the pressures to open up OECD economies under GATS will also increase. Rather than simply lose the talent permanently or rely on remittances, sending countries must rethink their development and education strategies. Receiving countries will need to be more receptive to poor countries with immigration reforms as they utilize technical talent temporarily and permanently from non-OECD economies. Only then can we manage global flows of skilled labour and pragmatically address global inequality associated with an unregulated form of global economic integration.

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