

November 2001

# **Diaspora and Development: Highly Skilled Migrants from East Asia**

Robert E.B. Lucas  
(Boston University)

Report prepared for the World Bank

My thanks to Richard Freeman, John Harris, Hal Hill and Shahid Yusuf for a number of useful comments on an earlier draft.

## Contents

Abstract	
1.Introduction	p.1
2.The Brain Drain: A Synopsis of Issues	p.1
3.Migration Transitions in East Asia	p.3
a. China	
b. Hong Kong and Taiwan	
c. Indonesia	
d. Japan	
e. Korea	
f. Malaysia and Singapore	
g. Philippines	
h. Thailand	
i. Vietnam	
4. Evidence on the Skill Content of East Asian Migrations	p.10
a. Migrants in the US	
b. Skill content of other migration streams	
c. How large is the brain drain?	
5. Countervailing Effects	p.21
a. The nature of international networks	
b. Remittances and capital flows	
c. Links between international trade and migration	
d. Technology transfers	
6. Factors Affecting the International Migration of Highly Skilled People	p.32
a. Receiving country policies	
b. Study abroad	
c. Return migration	
7. Future Prospects	p.44

## Abstract

Three principal streams may be discerned among emigrants from East Asia: to the Pacific rim OECD countries, to the Middle East, and to other countries within the East Asian region. The last of these reflects a migration transition that has occurred among the higher income countries within the region: Hong Kong, Korea, Malaysia, Singapore, Taiwan and Thailand have each become significant hosts to migrant populations. In most instances, unskilled migrants dominate these inflows, typically admitted temporarily or illegally. Meanwhile, overall emigration from these relatively affluent countries has diminished, though a significant brain drain continues to the Pacific rim OECD nations. Meanwhile, China, Indonesia, the Philippines and Vietnam have yet to undergo any transition to become hosts to significant numbers of foreign nationals and emigration from these countries is a mix of highly skilled and less skilled workers.

The movement of tertiary educated people from East Asia to North America and Australasia is large in absolute terms. By 2000, 61 percent of East Asian adults in the US had attended college or graduate school, with an estimated 840 thousand, college-educated adults from the Philippines, 480 thousand from China, 440 thousand from Korea, 265 thousand from Taiwan and nearly 300 thousand from Vietnam. From each of the People's Republic of China, the Philippines and Korea more than 200,000 college or graduate school trained adults are estimated to have entered the US alone, net of departures, between 1994 and 2000. Moreover, data from 1997 indicate nearly half a million East Asian born scientists and engineers living in the US. In Canada and Australia in 1996, there were over a million and over half a million people living, respectively, who had been born in East Asia and the skill-based visa system guaranteed that the majority of these were skilled. For countries such as the Philippines, Korea and Taiwan these numbers are large relative to their total stocks of tertiary educated population; for China this is less true though these highly skilled emigrants have been drawn from just a few coastal areas of China where the incidence of departure is consequently quite extraordinary.

The traditional assumption is that loss of the best and the brightest hurts those remaining at home. Yet evidence is emerging that a highly skilled diaspora may play several important roles in promoting development at home. One possibility is that migrants may send home significant remittances, but international remittances have not been an especially large source of foreign exchange for East Asia, relative to exports, with the notable exception of the Philippines. On the other hand, China's diaspora has been a major source of foreign investment, and of investments that generate employment in particular. By 1995, Hong Kong, Macau and Taiwan were the sources of more than two-thirds of China's accumulated direct investments. In part, the influence of emigrants stems from their social networks. These networks have been shown to be as prevalent and active amongst professionals as amongst the less skilled, internationally as well as domestically, operating both informally and formally with government support, and spreading across a divergent range of ethnic communities. More generally, skilled emigrants are well-placed to act as middlemen, enhancing information flows, lowering reputation barriers and enforcing contractual arrangements, resulting in an expansion of capital inflows from foreigners, as well as from the diaspora, and of trade links too. Estimates for Canada suggest that the immigration of skilled workers from East Asia may have had a very large effect indeed in expanding Canadian imports from East Asia. There is also evidence to indicate that presence of a larger Chinese diaspora, in common between two countries, has a major effect in enhancing bilateral trade.

The extent of international mobility of the highly skilled is dictated in part by the immigration policies of the OECD nations, which have been far from open door even for college graduates, while simultaneously competing to attract the most highly skilled among those admitted. The future demographics of the OECD countries may play a key role in their strategies with respect to immigration in the foreseeable future, as concerns with an aging population mount, though to date Japan's tight restrictions on entry have not been relaxed on this account. Japan's own departure rate of highly skilled nationals has accelerated somewhat, though this is largely movement associated with foreign direct investments. Indeed, this latter pattern is one that dominates much of the movement of highly skilled people within East Asia, while movements to the Middle East remain dominated by oil price cycles.

Studying abroad remains a major vehicle of entry into the OECD countries. By the mid-1990s there were more than 400 thousand East Asian college students in the fifty major host countries. The US hosted more than half of these, with the UK a distant second. Most of the undergraduate training of East-Asian-born migrants living in the US is found to be undertaken abroad, whereas graduate training more frequently follows entry to the US. China, Japan, Korea, Taiwan and India have all consciously expanded graduate technical training during the 1990s; by 1997, universities in these five countries together graduated more engineering doctorates than did US universities, and half of the engineering doctorates from US universities were earned by Asians.

Korea, Taiwan and China have introduced policies to encourage the return of these and other highly skilled peoples. In China, these policies incorporated both positive incentives to return and penalties for failing to do so. The combination has not been very effective; 88 percent of Chinese science and engineering doctorates who graduated from US universities in 1990-91 were employed in the US in 1995 and a similar portion was still employed in the US in 1997. For South Korea the corresponding figure was 11 percent in 1995. Interviews with Chinese residents in the US indicate that the political situation in China has played an important role in deterring students and others from returning, though economic differences may be even more important. A key component of the strategy to encourage return to Korea and Taiwan has been the establishment of high technology research centers. In both contexts, a significant portion of returnees has been attracted to these sites, but it is less clear how many of these might have returned anyway, given the rapid economic progress in both settings. More generally, less than 8 percent of East-Asian-born college graduates in the US are estimated to be on temporary visas, indicating little intent to leave the US. Perhaps even this traditional distinction - to return or not - is also becoming outmoded though as terms such as 'brain circulation', 'parachute kids' and 'astronaut migrants' become the norm.

Departure of some of the brightest and most highly skilled young people may well be imposing a net cost on the East Asian countries. Certainly the US appears to be gaining from this transfer. Yet there are mitigating factors: high return rates to Japan and Korea, large remittances to the Philippines, brain circulation and transfer of technology to Taiwan and Korea, and investments from China's diaspora.

## 1. Introduction

Recent literature on the brain-drain has drawn attention to some of the potential benefits of technology transfers, trade and capital flows induced by ‘brain circulation’, opposing the traditional presumption of overwhelming harm to those left behind. The arguments and evidence relating to these issues are summarized here in the particular context of migration of highly skilled migrants from East Asia, a flow that we shall see is large in numbers.<sup>1</sup>

Some of the issues emerging from both traditional and more recent literatures are briefly outlined in section 2. Sections 3 and 4 then present evidence on the country-by-country patterns of international migration within East Asia and on the skill content of those migration flows, drawing upon both existing evidence and fresh analysis of US data. Section 5 turns to consideration of the potential, positive, countervailing effects from departure of highly skilled persons, summarizing evidence from a number of disparate studies and sources. The factors affecting migration flows from East Asia, and of the highly skilled in particular, are examined in section 6, looking at receiving country immigration policies, the role of study abroad and attempts to promote return migration. The paper closes with a few brief thoughts on future prospects, considering, amongst other components, the evolution of graduate school training in East Asia.

## 2. The Brain Drain: A Synopsis of Issues

It is usually presumed that the departure of highly skilled people imposes a cost on those remaining at home. Theories with respect to these impacts are well-developed, though there is a dearth of estimates of any losses imposed. Meanwhile, a newer literature is emphasizing channels through which international movements of highly skilled people may actually benefit those who stay behind.

In the earliest brain-drain literature, the emphasis was on labor market adjustments as skilled workers depart. The out migration of any workers, whether skilled or not, generally lowers the returns on capital and other complementary factors. The overall decline in production thus exceeds

---

1. “In absolute terms, the largest flows of highly educated migrants [*to the OECD countries*] are from Asia”. Carrington and Detragiache (1998) p.6, italics added..

the income previously paid to emigrants, imposing a cost on stayers. Nonetheless, even in this simple view, some stayers can gain - most particularly any direct competitors with the departing workers. In any case, the extent of aggregate costs imposed on stayers depends very much on the nature of local labor markets (such as the prevalence of unemployment among the emigrating category). Moreover, in the longer run, costs may be curtailed by induced tendencies to adjust the mix of industries, adapting to the new realities of remaining factors available.<sup>2</sup>

None of these earlier arguments really addressed the special concern over the emigration of highly-skilled workers, as opposed to workers more generally or indeed capital. At the heart of this special concern is a belief that the presence of educated or highly-skilled persons generates free benefits (positive external effects) among stayers. Indeed, this is ultimately the source of the second traditional concern with the brain-drain, which arises from the subsidization of students and the resulting sense of loss when students subsequently depart. Do highly-skilled people generate positive externalities?

One source of external effects that has attracted a great deal of attention within the new growth theory literature stems from the mutual interaction of highly skilled workers, enhancing each other's productivity and denying the forces of diminishing productivity. There is certainly evidence that highly educated workers receive greater pay where highly educated personnel are geographically concentrated, though disentangling the directions of causality underlying this correlation is not simple. If concentration indeed serves to raise productivity, then any initial concentration of highly skilled personnel serves to attract others, leading to divergent growth experiences. In contrast to the potential for international migration to lead toward factor price equalization, international migration of highly skilled workers may then, instead, become cumulative. (Faini 1996, Haque and Kim 1995).

Other sources of external benefits from the presence of a highly-skilled elite may also prove important to the well-being of stayers. For example, in the recent development literature, the critical roles of institutional foundations and governance have come to the fore. A well educated elite

---

2. For reviews, see Lucas (1981, 1997).

presumably plays a key role in establishing public institutions, including a legal structure and the ability to enforce contracts, and in setting the norms for governance. In this sense, the departure of the highly-skilled postpones establishing the institutional infrastructure that may be a precondition for sustained development. (Kapur 2001).

The traditional views of the brain-drain are thus entirely negative from the perspective of the sending countries. Yet as communications and global interactions mount, a number of factors mitigate these forces. The mere fact that nationals are overseas no longer rules out having any influence at home. Indeed, depending upon the circumstances of departure, the emigrant may be well placed to be a major channel of such influence in his or her home country. The emigrant has far more specific local knowledge than do other residents abroad. The emigrant also has better access to credible new information through family and other networks at home, and to enforcement of informal contracts through threat of social sanctions. Through such channels, the emigrant may influence: capital flows bound for the home country, both through their own remittances and investments, and by affecting those of others; trade, by acting as a middle man; and flows of technology, by returning home or merely through denser interactions with fellow scientists, engineers and business people from the old country. Globalization may also be enhancing the value of foreign training; familiarity with other languages and cultures is increasingly vital in business. Moreover, students traveling abroad can exploit the comparative advantages of different host countries for specific training, either returning infused with new ideas or channeling benefits toward the home country.

Perceptions of the brain-drain are shifting. There may be costs imposed from the departure of the best and brightest, but the extent to which others benefit from their presence remains poorly documented. Add to this the positive, potential contributions of having well placed, skilled nationals abroad and the calculus of net losses becomes murky. Meanwhile, the patterns and composition of international migrations are changing in East Asia.

### **3. Migration Transitions in East Asia**

Very rapid economic growth in much of East and South East Asia has shifted the patterns of

international migrations over the last quarter century. Very little emigration to Europe occurred from East Asia (apart from students), but three other principal streams of emigration may be discerned: to the Pacific rim OECD countries, to the Middle East, and movements between countries within the region. The last of these reflects a migration transition which has occurred in some East Asian countries from net emigration to net immigration,<sup>3</sup> though in most instances this reflects growing immigration of unskilled workers and emigration of the highly skilled.

**a. China.** Skeldon (1996) estimates that international migration from China reached some 300-400 thousand people each year by the early 1990s, with perhaps 100-200 thousand of these being unauthorized migrants smuggled out by organized rings, while another 100 thousand move legally to Australia, Canada and the US. The OECD (2000) reports nearly 900 thousand people born in China living in Australia, Canada and the US. (See Table 1). This OECD figure for the US is, however, based on 1990 census information and by 2000 nearly 900 thousand adults, born in China, lived in the US alone. The absolute numbers of migrants from China are certainly large, and estimates of the total number of Chinese living overseas run as high as 30 million (excluding those living in Hong Kong, Macau and Taiwan)<sup>4</sup>, yet even this figure amounts to less than 2.5 percent of China's population. Nonetheless, as we shall see, the pervasive Chinese diaspora, established over more than a century of emigration, has played a key role in the economic development of China (and elsewhere). Moreover, although China's emigration may be small relative to total population, almost all of this emigration stems from just a few coastal areas in Guangdong, Fujian and Zhejiang provinces and, in turn, these areas have become destinations for large numbers of internal migrants.<sup>5</sup>

**b. Hong Kong and Taiwan** are both areas of substantial in migration as well as out migration. Australia and Canada proved to be major destinations for people leaving Hong Kong during the 1990s, and the US continued to admit significant numbers from Taiwan. Meanwhile, the

---

3. See Fields (1994).

4. IOM (2000).

5. "Changle county in Fujian province is the source of most immigration to the United States, and in one village, Houyu, 80 percent of the population reportedly is now found around New York." IOM (2000) p.68.



number of foreign residents in Hong Kong (even excluding migrants from the mainland) doubled from a quarter of a million in 1991 to more than half a million in 1998 (including approximately 150,000 workers from the Philippines. IOM, 2000). The number of foreign workers reported in Taiwan is somewhat smaller, reaching 270 thousand (1 percent of the population) by 1997, following growth in the number of foreign workers by some 42 percent per year over the prior four years.

**Table 1. Stock of Foreign and Foreign-Born Population  
Select OECD Countries**  
(Thousands of people)

Country of	Foreign-born population			Foreign population			Population 1998
	Australia	Canada	USA	USA	Japan	Korea	
	1996 Birth	1996 Birth	1990 Birth	1990 Birth	1998 Nationality	1998 Nationality	
<b>China</b>	111.0	231.1	529.8	296.4	272.2	30.9	1255700
<b>Hong Kong</b>	69.4	241.1					6690
<b>Taiwan</b>						22.9	21743
<b>India</b>	77.5	235.9	450.4	293.2	8.7		970930
<b>Indonesia</b>					15.0	9.7	204420
<b>Japan</b>				208.3		13.0	126410
<b>Korea</b>			568.4	337.5	638.8		46430
<b>Malaysia</b>	76.2				6.6		22180
<b>Philippines</b>	92.9	184.6	912.7		105.3	8.0	75150
<b>Thailand</b>					23.6	1.6	61200
<b>Vietnam</b>	151.1	139.3	543.3	311.5	13.5	8.1	77600.0
<b>Total foreign</b>	3908.3	4971.1	19767.3	11770.3	1512.1	147.9	
<b>Total population</b>	18310.0	29670.0	249950.0	249950.0	126410.0	46430.0	
<b>Percent foreign</b>	21.3	16.8	7.9	4.7	1.2	0.3	

Source: OECD (2000)

Notes: For Australia and Japan, China includes Taiwan.

Data for Canada refer to immigrant population only.

'Foreign population' excludes foreign-born people who have become nationals.

**c. Indonesia.** The number of Indonesians moving to the OECD countries remains small, especially relative to Indonesia's population. But, as Table 2 indicates this is only a part of the picture in terms of emigration from Indonesia. By 1997, Indonesia deployed more than half a million workers overseas under a contract labor system. Of these, over 375 thousand were deployed within Asia, principally in Malaysia, and another 126 thousand in the Middle East. In Malaysia alone,

Kassim (1998) estimates a stock of 716 thousand Indonesian workers, including undocumented workers, and IOM (2000) reports a total Indonesian community in Malaysia of some 1.4 million people.

**Table 2. Deployed Overseas Workers:  
Indonesia, Philippines and Thailand 1997**

	Indonesia	Philippines	Thailand
<b>Brunei</b>	2426		17671
<b>Hong Kong</b>	2019		3960
<b>Japan</b>	3245		10101
<b>Korea</b>	8390		
<b>Malaysia</b>	317685		8860
<b>Singapore</b>	31928		17770
<b>Taiwan</b>	9445		100916
<b>Other Asia</b>	245		
<b>Asia Total</b>	375383	235129	
<b>Middle East</b>	126347	221047	17403
<b>Africa</b>		3517	
<b>Americas</b>	736	7058	
<b>Europe</b>	577	12626	
<b>Oceania</b>		7250	
<b>Other</b>		72600	6992
<b>Total</b>	503043	559227	183673

Sources: IOM (2000) and *Key Statistics of Thailand 2000*.

**d. Japan.** Both the foreign population in Japan and the number of Japanese nationals abroad remain small, relative to Japan's population, despite significant expansion of both categories during the 1990s. As Table 1 shows, peoples of Chinese and Korean descent form the largest groups of longer term residents in Japan, though more recently the numbers of Filipinos has expanded too. By 1999, Japan's foreign nationals also included nearly a quarter of a million Brazilians -- principally ethnic Japanese from among the roughly one million ethnic Japanese living outside of Japan. Intra-corporate transfers have resulted in rapid growth in Japanese nationals as long-term stayers abroad during the 1990s. By 1999, Japanese embassies and consulates registered more than half a million Japanese long-term stayers in foreign countries. (See Table 3). The portion of these on business assignments was by far the greatest within Asia (nearly 70 percent), though more than 57 percent were also on business in North America, despite the significant number of Japanese students also in North America.

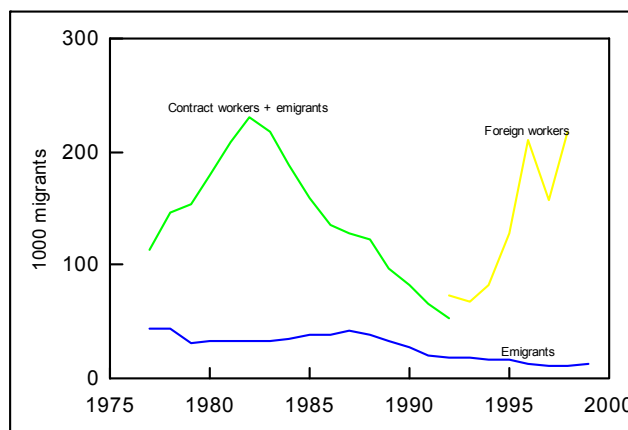
**Table 3. Japanese Long-Term Stayers in Foreign Countries (1000 persons)**

	1995	1999	
			For business
<b>Asia</b>	129.0	152.5	106.1
<b>North America</b>	175.9	198.7	113.5
<b>West Europe</b>	109.4	113.4	52.8
<b>Oceania</b>	19.0	24.4	8.6
<b>Other</b>	27.2	26.3	11.3
<b>Total</b>	460.5	515.3	292.3

Source: Iguchi (2001) Table 21.

e. **Korea's** migration transition is brought out clearly in Figure 1, which shows both the total number of contract workers and permanent emigrants leaving Korea and the number of foreign workers in Korea.

**Figure 1. Contract Labor and Permanent Emigrants from Korea and Foreign Workers in Korea**



Sources: IOM (2000), Yoo and Uh (2001), *Korea Statistical Yearbook 2000*

China has become by far the largest source of foreign workers in Korea, particularly Chinese of Korean decent, but smaller streams of migrant workers have also arrived from Indonesia, Vietnam, Bangladesh and the Phillipines since the late 1980s. Unskilled workers may not enter Korea for legal employment, except as a trainee. However, by 1999, 32 percent of foreign workers were in Korea as trainees and a further 62 percent were undocumented. (See Table 4 and Yoo and Uh, 2001).

**Table 4. Foreign Workers in Korea by Category**

	1992	1993	1994	1995	1996	1997	1998	1999
<b>Skilled workers total</b>	3,395	3,767	5,265	8,228	13,420	14,655	11,143	12,590
<b>Language teacher</b>		1,136	2,241	4,230	7,473	7,607	4,927	5,009
<b>Other teacher</b>	500	465	511	647	793	862	790	821
<b>Entertainer</b>	400	418	563	598	1,017	1,444	1,133	2,265
<b>Researcher</b>		61	125	290	539	657	591	522
<b>Technician</b>	400	320	396	599	918	997	471	347
<b>Other professional</b>		72	145	198	254	267	339	360
<b>Other</b>	2,095	1,295	1,284	1,666	2,426	2,821	2,892	3,266
<b>Trainees</b>	4,945	8,644	28,328	38,812	68,020	90,369	64,214	98,410
<b>Over-stayers total</b>	65,528	54,508	48,231	81,866	129,054	148,107	99,542	135,300
<b>China</b>	27,842	22,659	19,149	36,462	50,620	57,772	55,628	68,798
<b>Bangladesh</b>	1,512	5,868	5,244	5,547	9,610	9,033	7,462	10,884
<b>Mongolia</b>					3,457	7,644	5,555	10,613
<b>Philippines</b>	12,946	8,831	7,614	10,323	14,602	13,909	6,404	9,213
<b>Vietnam</b>					4,410	6,398	3,713	5,127
<b>Pakistan</b>	1,743	1,511	2,276	2,952	5,455	5,935	3,098	4,286
<b>Sri Lanka</b>	150	712	1,305	2,071	1,649	2,171	1,127	1,272
<b>Others</b>	21,335	14,927	12,643	24,511	39,251	45,245	16,555	25,107
<b>Total</b>	73,868	66,919	81,824	128,906	210,494	253,131	174,899	246,300

Source: Ministry of Justice

During the 1998 financial crisis, an amnesty was announced permitting undocumented workers to leave the country without paying a fine. The Ministry of Justice estimates that from December 1997 to June 1998 the number of undocumented workers fell by 53,000, though almost no Chinese workers left under this program. By June 1999, the Ministry estimated that 56 percent of undocumented workers were from China, nearly half of whom were of Korean decent. As Korea has emerged from the crisis, the number of foreign workers has again climbed sharply, and the total number of foreign workers exceeded a quarter of a million by August 2000. Nonetheless, despite this transition to being a host to immigrant labor, the OECD reports that on average from 1990 to 1998 21 thousand Koreans were registered as long-term arrivals in Japan and more than 19 thousand settled permanently in the US each year. Although the contract labor system ended after 1991 and the number emigrating has declined, the number of departures for employment purposes averaged some 230 thousand per year from 1994 to 1999.

**f. Malaysia and Singapore** are now principally countries of in-migration. By 1997 Hui (1998) estimates the foreign population of Singapore comprised nearly 17 percent of the total; moreover about a fifth of the foreign workforce commutes in, mostly from Johore state in Malaysia. By 1998, at least an eighth<sup>6</sup> of Malaysia's labor force was in turn foreign, nearly two-thirds from Indonesia and an additional 28 percent from Bangladesh. Nonetheless there remains a significant stock of people in Australia who were born in Malaysia, amounting to some 76 thousand persons in 1996. (See Table 1).

**g. Philippines.** The Philippines clearly possesses the highest rate of out-migration (relative to population) of any country in East or South-East Asia. "The Government of the Philippines estimates that about 7 million Filipinos work abroad" (IOM, 2000, p. 96), about a quarter of the number of people employed within the Philippines. In part, this reflects the Philippines early development of a labor contracting system, sending workers elsewhere in Asia, to the Middle East and beyond. By 1997, the Government of the Philippines reported more than half a million overseas workers on contract, with nearly a quarter of a million in the Middle East and nearly another quarter of a million elsewhere in Asia. (See Table 2). More generally, IOM (2000) estimates that there may be 350 thousand Filipinos living elsewhere within South-East Asia alone (in Sabah and Brunei, Singapore and Peninsular Malaysia) and the OECD reports over 900 thousand people born in the Philippines and living in the USA and a further 185 thousand in Canada. (See Table 1).

**h. Thailand.** The fact that Thailand developed a labor contracting system much later than did the Philippines, combined with rapid economic growth in Thailand prior to the crisis in 1997, meant that Thai workers deployed abroad never reached similar numbers to those from the Philippines. Nonetheless, even just before the crisis in 1997, Thailand reported more than 180 thousand workers overseas and by 1999 this had risen to over 200 thousand. (See Table 2). In the late 1980s, Thailand sent significant numbers of workers to the Persian Gulf, especially to Saudi Arabia. However, with the change in economic conditions in the Gulf and a diplomatic dispute with

---

6. This is the estimate by Kassim (1998, 2001). However, Athukorala and Manning (1999) estimate a stock of two million migrant workers in Malaysia in 1997, or 24 percent of the workforce.

Saudi Arabia in 1991 the pattern of labor contracting shifted to the South-East Asia region. The largest portion of Thai workers went to Taiwan in the 1990s, followed by smaller flows to Malaysia, Singapore, Hong Kong and Israel. Meanwhile, labor migration into Thailand has also evolved on a significant scale in the 1990s, with perhaps 80 percent of the approximately one million foreign workers in Thailand coming from Myanmar.<sup>7</sup>

**i. Vietnam.** Between 1975 and 1996 some 755 thousand Vietnamese refugees were resettled abroad. As a result, by 1990, the US had over half a million persons born in Vietnam, Australia had another 150 thousand and Canada nearly 140 thousand. (See Table 1). In addition, from 1980 to 1991, Vietnam had an agreement to send approximately 300 thousand workers to the Soviet bloc countries. Following the collapse of the Soviet bloc and changing conditions inside Vietnam, workers from Vietnam are now looking elsewhere, particularly to Thailand and more recently to Taiwan.

#### **4. Evidence on the Skill Content of East Asian Migrations**

Three principal streams of international migration from East Asia have been identified: to the Pacific rim OECD countries, to the Middle East and to other countries within East Asia. Even among the flows to the OECD nations, only for the US are systematic data available to indicate the skill content of migration and this evidence is therefore reviewed first, before attempting to summarize some of the other available evidence on other migration streams.

##### **a. Migrants in the US.**

The part of the US population that is born in East Asia has much higher levels of education, on average, than either the native population or other foreign born residents. By 2000 more than 63 percent of Asian-born adults in the US had attended college, (61 percent from East Asia and 69 percent from the remainder of Asia), in contrast to about a third of other foreign born adults and half of the native-born. (See Table 5).

---

7. See IOM (2000) and Chalamwong (2001). Once again, Athukorala and Manning (1999) estimate a considerably larger stock of 1.7 million migrant workers in Thailand by 1997, or 6 percent of the workforce.

Among the source countries within East Asia there are, however, sharp contrasts. From Cambodia, Laos and Vietnam the portion of college educated adults is well below the US native-born average. Yet there are an estimated 840 thousand, college-educated adults from the Philippines in the US, 480 thousand from China, 440 thousand from Korea, 265 thousand from Taiwan and nearly 300 thousand from Vietnam (despite their low proportion within the Vietnamese total).

**Table 5. US Adult Population by Place of Birth and Category of Education (2000)**

	Adults (1000)	Percent in Education Group			
		Primary	High School	College	Post Graduate
<b>Place of Birth</b>					
<b>East Asia</b>	4857.4	9.3	30.1	48.8	11.8
<b>Other Asia</b>	2213.6	5.7	25.6	43.7	25.0
<b>Other Foreign</b>	20882.1	24.1	41.7	28.2	6.1
<b>US</b>	181759.7	4.2	46.0	42.7	7.1
<b>Cambodia</b>	115.4	29.1	42.7	26.1	2.0
<b>China</b>	876.7	15.8	29.6	32.5	22.1
<b>Hong Kong</b>	188.9	4.3	29.2	55.6	11.0
<b>Indonesia</b>	90.7	0.0	17.8	67.8	14.4
<b>Japan</b>	377.6	2.3	25.8	59.9	12.0
<b>Korea</b>	687.1	4.1	31.6	52.8	11.4
<b>Laos</b>	75.6	24.2	41.6	34.1	0.0
<b>Malaysia</b>	29.0	6.9	23.7	47.0	22.3
<b>Philippines</b>	1224.3	6.7	24.7	62.0	6.6
<b>Singapore</b>	22.9	0.0	23.3	67.7	9.0
<b>Taiwan</b>	330.0	1.8	17.9	51.6	28.7
<b>Thailand</b>	119.8	14.8	36.7	40.7	7.8
<b>Vietnam</b>	719.4	15.3	43.8	37.1	3.8

Data source: US Current Population Survey, 2000

Notes: Primary refers to grade 8 or less as the highest grade attended.

High school refers to having attended or graduated from high school.

College includes attending or graduating from any associate degree program as well as a BA-BS program.

Post graduate includes MA and professional programs and doctorates.

Adults are ages 16 and over.

During the latter half of the 1990s, almost all of the population growth in the US has derived from in-migration. (Camarota, 2001). Moreover there are distinct differences in educational profiles of the native born population as opposed to the migrant population. From 1994 to 2000, the Current

Population Survey data indicate that the absolute number of US native-born adults without a college education shrank. In contrast, nearly a half of the increment to the foreign-born adult population possessed less than a college education. However, nearly three-quarters of the net increase in adults born in East Asia are college educated. (See Table 6).

**Table 6. Increment to US Adult Population by Place of Birth and Category of Education (1994-2000)**

	Increment to Adult Population	Increment by Education Group			
		Primary	High School	College	Post Graduate
<b>Place of Birth</b>					
<b>Cambodia</b>	16473	1224	12251	1841	1156
<b>China</b>	334871	34053	76830	117889	106099
<b>Hong Kong</b>	51815	-5239	9204	46150	1700
<b>Indonesia</b>	90258	-426	16181	61444	13059
<b>Japan</b>	48204	2672	-3588	41345	7774
<b>Korea</b>	239087	3324	28797	166620	40347
<b>Malaysia</b>	28576	1576	6878	13646	6476
<b>Philippines</b>	282933	10009	60044	190799	22081
<b>Singapore</b>	22194	-676	5330	15486	2054
<b>Taiwan</b>	86447	1993	12030	52528	19896
<b>Thailand</b>	23047	6959	2064	13645	379
<b>Vietnam</b>	213598	31992	100079	73286	8240
<b>East Asia Total</b>	1390191	64072	304428	795137	226553

Data source: US Current Population Surveys, 1994 and 2000

From the People's Republic, the Philippines and Korea more than 200,000 college or graduate school trained adults entered the US, net of departures, between 1994 and 2000 according to these estimates. From Vietnam, Indonesia and Taiwan the numbers exceeded 70,000 each. Clearly this movement to the US alone represents a significant flow of highly-skilled people and many came to stay.

An indication of this is obtained from Table 7, which is derived from a sample of college graduates residing in the US as of 1993. Less than 8 percent of those college graduates born in East Asia are estimated to be temporary residents, indicating little intent to leave the US. Indeed two-thirds of



East-Asian-born, college-educated people in the US were citizens in 1993. Once again, however, these averages hide some significant variations by country of birth. Only tiny portions of college-educated persons born in Vietnam, Hong Kong, the Philippines and Thailand have temporary residence status; the fractions from Malaysia, Japan, China and Singapore are somewhat greater, though this may mask aspirations to transfer to permanent resident status. (See section 6a).

**Table 7. Asian-Born College Graduates in US 1993  
By Place of Birth, Gender and Residence Status**

Place of Birth	Total college graduates	Percent Female	Percent			
			US Citizens		Residents	
			Native	Naturalized	Permanent	Temporary
<b>East Asia</b>	854369	49.1	5.3	61.1	26.0	7.6
<b>India</b>	228424	36.6	2.2	50.7	42.1	5.0
<b>Other South Asia</b>	46439	29.8	2.1	64.6	29.0	4.3
<b>Other Asia</b>	158287	29.5	4.5	60.2	29.5	5.8
<b>China</b>	120647	39.4	3.6	58.2	22.6	15.6
<b>Hong Kong &amp; Macao</b>	51561	43.5	2.9	73.7	20.6	2.8
<b>Indonesia</b>	10894	35.6	1.1	62.9	26.6	9.4
<b>Japan</b>	76758	48.0	27.8	25.2	29.4	17.6
<b>Korea</b>	105449	43.7	1.8	62.3	28.3	7.6
<b>Malaysia</b>	9568	38.2	4.4	38.1	39.3	18.2
<b>Philippines</b>	300486	60.2	3.6	67.8	25.8	2.9
<b>Singapore</b>	4470	39.2	15.1	33.4	39.0	12.5
<b>Taiwan</b>	108225	46.8	2.3	56.9	30.8	9.9
<b>Thailand</b>	15969	45.7	3.2	41.5	51.4	3.9
<b>Vietnam</b>	46496	38.7	3.0	89.4	7.5	0.1
<b>Other East Asia</b>	3846	22.8	4.0	76.9	17.5	1.6

Data source: US National Survey of College Graduates, 1993.

Table 7 also indicates that almost exactly a half of all East Asian-born, college educated adults in the US were female as of 1993, though this was not true from other parts of Asia. From Indonesia, Malaysia, Singapore, China and Vietnam the portions of college-educated women was lower, off-set by a very large number of college-educated Filipino women.

Most of the undergraduate training of East-Asian born migrants to the US is undertaken abroad,

whereas graduate training more frequently follows migration. This is illustrated in Table 8, which displays some indications of the highest degree obtained as well as where these Asian-born US residents and citizens obtained their higher educations. Nearly two-thirds of college-educated East Asians possessed a bachelor's degree as their highest qualification - 22 percent with US bachelor degrees and 43 percent with a college degree from abroad (though not necessarily from their home country). Most of those who possess a Master's degree or doctorate received these from US universities, (though this is not true for professional degrees). On the other hand, 59 percent of those with a US post-graduate degree (MA or above) had received their bachelor's degrees abroad. (See the last column of Table 8).

**Table 8. Asian-Born College Graduates in US 1993:  
Highest Degree Held (Percent)**

Highest Degree	BA		MA		Professional		Doctorate		Total	Of US Post Grads % with Non-US BA
	No	Yes	No	Yes	No	Yes	No	Yes		
<b>East Asia</b>	42.9	22.3	3.7	18.4	4.2	2.2	1.0	5.2	100.0	58.7
<b>India</b>	29.3	8.6	11.9	25.5	9.2	3.6	3.7	8.2	100.0	78.4
<b>Other S Asia</b>	31.4	17.8	10.8	19.1	11.3	1.5	2.4	5.6	100.0	63.5
<b>Other Asia</b>	15.9	34.9	4.8	23.5	5.8	4.4	2.3	8.5	100.0	34.3
<b>China</b>	25.8	18.2	5.9	29.3	2.7	2.2	1.9	14.0	100.0	65.4
<b>HK + Macao</b>	6.5	52.8	1.3	26.0	0.8	5.4	0.8	6.3	100.0	21.7
<b>Indonesia</b>	22.5	32.2	4.3	27.1	5.5	4.7	2.2	1.6	100.0	22.4
<b>Japan</b>	28.7	39.1	4.7	17.5	1.6	3.4	1.9	3.1	100.0	31.1
<b>Korea</b>	45.2	21.7	7.4	14.1	3.8	2.5	1.1	4.2	100.0	58.8
<b>Malaysia</b>	11.0	42.8	4.4	25.7	3.5	3.9	1.3	7.4	100.0	34.4
<b>Philippines</b>	73.5	10.2	2.4	5.0	6.9	0.7	0.8	0.5	100.0	58.8
<b>Singapore</b>	18.9	31.4	1.3	39.8	4.1	1.7	0.0	2.8	100.0	48.1
<b>Taiwan</b>	23.8	13.7	2.9	42.9	2.2	2.4	0.2	12.1	100.0	80.2
<b>Thailand</b>	29.0	23.4	1.9	32.7	6.7	1.8	1.1	3.5	100.0	72.6
<b>Vietnam</b>	13.0	60.4	1.8	13.4	3.3	4.5	0.9	2.8	100.0	29.4
<b>Other E Asia</b>	23.1	51.5	4.0	8.4	4.8	5.5	1.3	1.3	100.0	0.0

Data source: US National Survey of College Graduates, 1993.

From both China and Taiwan the fraction of adults with doctorates is notable, almost all whom received their doctorates in the US based on foreign undergraduate training. At the opposite end of

the spectrum, some 84 percent of college-educated Filipinos had a bachelor's degree as their highest qualification, overwhelmingly obtained abroad; even the majority of Filipinos with higher degrees received these abroad and most of the US-trained higher degree recipients completed their BA elsewhere.

**Table 9. Employment Status and Major Occupational Groups:  
Asian-Born College Graduates in US (1993)  
(1000 Graduates)**

	Employed				Other	Not Employed
	Scientists and Engineers					
	Mathematical & Computer Scientists	Life, Physical and Social Scientists	Engineers	Total Scientists and Engineers		
<b>East Asia</b>	51.9	38.3	74.1	164.3	553.4	136.7
<b>India</b>	18.4	16.9	31.5	66.7	130.7	31.0
<b>Other S Asia</b>	2.1	2.1	5.8	10.0	27.5	8.9
<b>Other Asia</b>	9.9	7.0	21.5	38.4	93.4	26.5
<b>China</b>	8.5	14.1	16.0	38.7	57.1	24.9
<b>HK + Macao</b>	6.0	1.9	5.7	13.7	31.2	6.7
<b>Indonesia</b>				2.4	6.1	2.4
<b>Japan</b>	3.2	3.8	5.3	12.3	52.8	11.7
<b>Korea</b>	3.8	4.9	7.6	16.2	69.0	20.2
<b>Malaysia</b>				2.9	5.6	1.0
<b>Philippines</b>	7.4	4.0	13.5	24.8	233.7	42.0
<b>Taiwan</b>	14.7	6.8	12.4	33.9	55.3	19.0
<b>Thailand</b>				2.3	12.1	1.6
<b>Vietnam</b>	5.7	1.0	8.9	15.6	25.6	5.3
<b>Other E Asia</b>				1.4	4.8	2.1

Data source: US National Survey of College Graduates, 1993.

In the generation of technical progress and technology transfer, particular attention is frequently paid to the role of scientists and engineers. (Eaton and Kortum, 2000). Of the employed East-Asian-born college graduates in the US, 23 percent were in science or engineering occupations - about 45 percent of these being designated as engineers. The absolute numbers of scientists and engineers from China, Taiwan and the Philippines (principally engineers) are largest (though small relative to the number from India. See Table 9).

**Table 10. Asian-Born Scientists and Engineers in the US 1997:  
Employment Status and Major Occupational Groups**  
(1000 Persons)

	Total	Employed						Not Employed
		Computer Scientists	Life Scientists	Physical Scientists	Social Scientists	Engineers	Non S&E Occup.	
<b>East Asia</b>	467.8	71.4	16.6	16.8	6.6	88.0	207.7	60.7
<b>India</b>	188.5	33.8	7.8	6.8	3.1	37.2	78.0	21.9
<b>Other S Asia</b>	32.9	4.5				6.2	16.2	
<b>Other Asia</b>	112.9	13.5	2.9	3.4	2.5	24.9	52.6	13.1
<b>Other foreign</b>	713.9	63.4	25.4	24.1	22.2	95.3	371.9	117.4
<b>US</b>	11014.7	852.8	269.0	233.7	314.6	1122.8	6489.8	1732.0
<b>China</b>	102.0	20.5	8.0	7.4	1.7	22.0	26.7	15.7
<b>Hong Kong</b>	35.0	7.6				7.0	15.5	
<b>Indonesia</b>	6.7							
<b>Japan</b>	37.9					5.0	21.8	
<b>Korea</b>	53.5	5.4	2.0			7.7	26.2	9.9
<b>Malaysia</b>	7.1	2.1						
<b>Philippines</b>	93.1	5.1				12.4	59.0	11.7
<b>Taiwan</b>	70.8	16.0	1.9	2.0		14.3	27.8	8.0
<b>Thailand</b>	8.1							
<b>Vietnam</b>	45.5	9.3				13.1	17.6	
<b>Other E Asia</b>	8.1							

Source: National Science Foundation, Division of Science Resources Studies, 1997 SESTAT.  
Special unpublished tabulation prepared by N. Kannankutty, 5/1/01.

The National Science Foundation 1997 Scientists and Engineers Statistical Data System presents a slightly different perspective, incorporating both college graduates with science and engineering degrees and persons working in science and engineering occupations without such qualifications. Based on these data, Table 10 indicates that the portion of East Asian scientists and engineers actually working in science and engineering occupations is much greater (56 percent) than for non-Asian, foreign scientists and engineers or those born in the US (48 and 41 percent respectively).<sup>8</sup> On

8. I am extremely grateful to Nirmal Kannankutty of the National Science Foundation for preparing this and other tables and to Mark Regets for his support in this process.

the one hand, this could reflect a particularly high level of aptitude among East Asian scientists leading to employment in their chosen field. On the other hand, the high proportion of East Asians actually working as scientists and engineers could reflect a glass ceiling effect -- failure to promote Asian scientists and engineers to managerial positions. Saxenian (1999) notes that assertions about a glass ceiling are common, though she finds no evidence to support this in terms of salaries among Silicon Valley's Asian immigrants. Certainly the fraction working in science and engineering occupations is notably high among scientists and engineers from China and especially low from the Philippines. In the latter case, many of the Filipino graduates are trained outside of the US and it seems likely that these qualifications do not receive the same level of recognition among US employers.

It is apparent that the skill content of migration from East Asia to the US is extremely high on average, involving a significant transfer of tertiary educated people to the US and of scientists and engineers in particular. But unfortunately less is known about the skill content of other migration streams from East Asia.

#### **b. Skill content of other migration streams.**

A major component of permanent settlement in both Canada and Australia is subject to a skill-base point system with the result that immigrants to both countries tend to be highly skilled. Moreover, there are at least some indications in Australia that a greater proportion of Asian settlers are professionals than among settlers from other parts of the world<sup>9</sup>. (See Table 11). In 1996-97, some 56 percent of the employed, Asian settlers were in highly skilled occupations (managers and administrators, professionals or para-professionals), whereas for non-Asian arrivals the figure was only 42 percent. However, these Asian averages mask significant differences between countries; in particular, the Filipino settlers once again are an outlier, with a fairly low employment rate and more

---

9. The absolute flow of Asian permanent settlers into Australia is fairly small, relative to flows into the US and Canada, though these flows are large relative to Australia's population and an additional 36 thousand people from Asia were admitted on temporary permits annually into Australia, on average from 1990-98.

than 60 percent of those employed were in less highly skilled occupations.<sup>10</sup>

**Table 11. Australian Settler Arrivals by Occupation  
1996-1997**

	Total		Occupation of those employed				Total
	Number	Percent Employed	Managers +Admin.	Professionals	Para-Professionals	Others	
<b>Total</b>	85752	52.5	13.6	27.7	6.3	52.4	100.0
<b>Asia</b>	32084	51.4	18.7	32.7	5.2	43.3	100.0
<b>India</b>	2681	55.6	9.7	50.0	4.5	35.8	100.0
<b>China</b>	7761	59.0	16.8	39.0	7.0	37.2	100.0
<b>Hong Kong</b>	3894	53.3	29.7	42.7	5.1	22.6	100.0
<b>Indonesia</b>	1750	41.0	49.4	13.0	1.9	35.7	100.0
<b>Philippines</b>	2808	44.1	5.4	21.8	12.2	60.6	100.0
<b>Taiwan</b>	2177	42.4	63.0	21.3	1.1	14.6	100.0

Source: Iredale (2000) Table 2.

The skill intensity of the other two main migration streams, to the Middle East and within the East Asia region, is generally lower than for permanent settlers in the OECD countries, though these other two movements are not devoid of highly skilled people either. Within the region, much of the movement of highly skilled people is associated with direct investments. (Pang 1994, Iredale 2000). From Hong Kong, Japan, Singapore and Taiwan, managers and other professionals are transferred to overseas branches throughout Southeast and South Asia as well as southern China.

Otherwise, much of the labor movement within the region and to the Middle East is operated by recruiters who organize movement of workers on fixed term contracts. Contract workers are normally required to depart the receiving country upon completion of the contract and are not permitted to bring family members with them. From China and Indonesia it seems most of this contract labor is fairly unskilled. From the Philippines this is less true, as Table 12 suggests. Nearly a quarter of Filipino contract workers were in professional occupations (though half of these are listed as entertainers). On the other hand more than a third are service workers, nearly half of whom

---

10. Just over half of the Asian permanent settlers arriving in Australia were employed in 1996-97, which indicates an average dependency ratio in line with Australia's settlers from other parts of the world.

are maids, but many quite highly qualified Filipino women are under-employed in such tasks.

**Table 12. New Hires of Filipino Overseas Workers  
by Occupation: 1997**

	<b>Percent</b>
<b>Professional</b>	23.1
<b>Admin., Clerical +Sales</b>	3.0
<b>Service</b>	34.5
<b>Laborers</b>	38.0
<b>Other</b>	1.4
	100.0

Source: IOM (2000) Table 14.

### **c. How large is the brain drain?**

Carrington and Detragiache (1998) estimate the extent of the brain drain from a wide range of developing countries to the OECD. Given data limitations, these estimates are founded on the assumption that the educational content of migration to non-US OECD countries is identical to migrations to the US. As noted in the introduction, on this basis, Carrington and Detagriache (1998) conclude that the largest absolute flow of educated migrants to the OECD countries is from Asia. Nonetheless these flows vary considerably in magnitude relative to the stock of educated persons in the countries of origin. Carrington and Detagriache find that migration rates clearly increase with level of education. Indeed, from East Asia the migration rates to the OECD countries of people with only primary education or less is negligible. To a large extent this reflects restrictions on legal migration imposed by the receiving countries, to which section 6.a returns, though limited ability to finance legal or illegal moves also restricts movements from poorer settings. Table 13 reproduces Carrington's and Detragiache's estimates of migration rates, relative to the stock of educated adults in the home country, among people with a secondary or tertiary education. As of 1990, Carrington and Detragiache estimate that Malaysia had the highest brain-drain of tertiary educated population, followed by Korea. Both of these are likely to have declined during the 1990s, as the college educated base expanded and a migration transition occurred. Although China has supplied large absolute numbers of college educated migrants, to the US in particular, these numbers remained

comparatively small, measured against the huge stock of college-educated persons remaining in China in 1990. Although the departure of tertiary educated people from China has almost certainly accelerated, it seems likely that the incidence is still relatively small. From Taiwan, the migration rate of college-educated people was relatively greater by 1990 (almost 10 percent of all such persons), and from the Philippines there has been a significant brain-drain of both secondary and tertiary educated people.

**Table 13. Migration Rates to OECD Countries 1990:  
Migrants as Percent of Home Country Population, by Education Level**

	Schooling Level	
	Secondary	Tertiary
<b>India</b>	0.3	2.7
<b>China</b>	0.2	3.1
<b>Indonesia</b>	0.1	1.6
<b>Korea</b>	3.4	17.6
<b>Malaysia</b>	1.2	29.4
<b>Philippines</b>	6.4	9.9
<b>Taiwan</b>	0.8	9.2
<b>Thailand</b>	1.8	1.6

Source: Carrington and Detragiache (1998) Table 3.

These estimates suggest that the brain-drain has thus been fairly substantial from several of the East Asian countries. Moreover, these estimates may be low compared to the total brain-drain. Most importantly, the estimates in Table 13 refer only to migration to the OECD, omitting significant flows within the East Asia region, to the Middle East and elsewhere. Moreover, even the OECD estimates may be biased downwards, by the inclusion only of migration from the largest source countries, and by the omission of all short term and many illegal movers.

The higher income countries within the region have experienced a migration transition: Hong Kong, Korea, Malaysia, Singapore, Taiwan and Thailand each became significant hosts to migrant populations. In most instances, unskilled migrants dominate these inflows, typically admitted temporarily or illegally. Meanwhile, overall emigration from these relatively affluent countries has



diminished though a significant brain drain continues to the Pacific rim OECD nations. China, Indonesia, the Philippines and Vietnam have yet to undergo any transition to become hosts to significant numbers of foreign nationals and emigration from these countries is a mix of highly skilled and less skilled workers. China has experienced the largest absolute outflow of highly skilled personnel, though the numbers are not large relative to the educated population. Countries such as the Philippines, Korea and Taiwan have experienced high brain drain rates even relative to the overall stock of human capital. In both circumstances, the brain-drain assumes an additional importance once one takes into account the likelihood of positive selection of the brightest as movers.

## **5. Countervailing Effects**

The brain-drain from East Asia has been significant and this phenomenon has most probably imposed some significant direct costs on those who have remained at home. However, there are a number of routes through which the departure of highly skilled people can also benefit stayers. Most of these routes operate through the influence of international social networks, and this section therefore first takes up some issues pertaining to the nature of these networks, before turning to the role of networks in promoting remittances, capital flows, foreign trade and technology transfers.

### **a. The nature of international networks**

Kotkin (1993) attributes a major role in the process of economic globalization to “Global Tribes”, which he describes as groups defined by their ethnic identity, global dispersion and open-mindedness. Measurement of the contributions of such networks remains largely illusive, yet there is growing agreement as to the substantive roles played by the Chinese, Indian and Jewish diaspora. In contrast, there is far less mention of a Filipino, Malaysian or Vietnamese diaspora and it would seem important to hone our understanding of the conditions under which networks are less dense. Moreover, the nation state may not be the relevant unit to consider in analyzing the evolution and role of networks; for instance, Saxenian (1999, p.31) documents exclusionary ethnic divisions within the Chinese technology community in Silicon Valley and alumnae relationships also appear to be important, such as those among graduates of India’s Institutes of Technology or Taiwan’s elite

engineering universities.

Among less-skilled immigrants, “Scholars have documented non-market mechanisms, or ‘ethnic strategies’, ranging from information sharing and labor pooling to rotating credit associations”.<sup>11</sup> “Silicon Valley’s new immigrant entrepreneurs, by contrast, are highly educated professionals.. It might appear that the ethnic strategies used by less-skilled immigrants would be irrelevant to these university graduates who possess the language and technical skills as well as the credentials needed to succeed as individuals.”<sup>12</sup> Yet Saxenian proceeds to document the evolution of a plethora of ethnic based associations among these professionals. “As their communities grew during the 1970s and 1980s, these immigrants responded to the sense of professional and social exclusion by organizing collectively”.<sup>13</sup> In Silicon Valley, Chinese and Indian immigrants form the largest groups and are best organized, though more recently Korean, Japanese, Filipino and Singaporean organizations have also evolved.

The initial roles of such networks are typically local, providing immigrants with labor market information, professional contacts and a safety net. “Many of these associations have become important forums for cross-generational investment and mentoring as well... Individuals within these networks often invest individually or jointly .. acting as ‘angel’ investors who are more accessible to immigrants than the mainstream venture capital community”.<sup>14</sup> However, as the networks evolve their international roles and activities expand too.

One key international role of diasporic networks is in the transmission of information. For instance, the Chinese Institute of Engineers in the US organizes an annual seminar in collaboration with their counterpart organization in Taiwan and provides consultative services to the Government of Taiwan. Other transmission mechanisms are far less formal. In addition, however, as Kapur (2001)

---

11. Saxenian (1999) p.27. See, for example, the accounts in Portes (1995).

12. Saxenian (1999) p.28.

13. Saxenian (1999) p.21.

14. Saxenian (1999) p.32.

emphasizes, networks also play a key role in enhancing the credibility of information thereby reducing reputation barriers to entry. As a result, the evolution of international networks impacts capital flows and trade, as well as the transfer of technology.

### b. Remittances and capital flows

Remittances from either skilled or unskilled emigrants may serve to counter some of the potential negative impacts of emigrant departure, particularly in contexts where foreign exchange has a high social value. (Lucas, 1981). In practice, however, there is little evidence to indicate high levels of remittances being received by most countries in East Asia, with the notable exception of the Philippines.

**Table 14. Workers' Remittances, Migrants' Transfers and Compensation of Employees on Current Account**

	Million US Dollars							
	1992	1993	1994	1995	1996	1997	1998	1999
China	228	108	395	350	1672	4589	344	530
Indonesia	229	346	449	651	796	725	959	1109
Japan	580	780	870	1150	1250	1340	1240	1110
Korea	1114	1112	1038	1080	947	852	542	666
Malaysia	153	176	119	116	164	194	190	322
Philippines	2538	2587	3452	5360	4875	6799	5130	6918
Thailand	445	1112	1281	1695	1806	1658	1424	1460
	Percent of Merchandise Exports							
	1992	1993	1994	1995	1996	1997	1998	1999
China	0.33	0.14	0.39	0.27	1.11	5.54	0.44	0.63
Indonesia	0.68	0.95	1.12	1.37	1.59	1.29	1.90	2.16
Japan	0.17	0.22	0.23	0.27	0.32	0.33	0.34	0.28
Korea	1.59	1.44	1.16	0.94	0.82	0.70	0.47	0.52
Malaysia	0.39	0.38	0.21	0.16	0.21	0.25	0.27	0.38
Philippines	26.25	22.85	25.73	30.84	23.79	27.00	17.41	40.52
Thailand	1.39	3.06	2.88	3.06	3.32	2.93	2.70	2.57

Source: IMF Balance of Payments Statistics Yearbook 2000.

Table 14 combines the gross inflow of workers' remittances and credited compensation of employees on income account with other migrant transfers on capital account from 1992 to 1999. By far the largest absolute average inflows during this period were into the Philippines, amounting

to nearly 7 billion US\$ during 1999 or over 40 percent of merchandise export earnings. Remittances to mainland China spiked in 1997 at 4.5 billion US\$, though more generally remittances have been less than 1 percent of merchandise export earnings. Remittances to Indonesia show a clear upward trend and it is noteworthy that these transfers increased significantly during the 1998-1999 crisis when foreign exchange became particularly valuable. From Japan, outflows of workers' remittances now dominate the gross inflows shown in Table 14. Moreover, gross inflows to Korea show a clear downward trend and now approximately match outflows. Thus, it seems that in most of East Asia remittances from overseas migrants are not a major factor, with the clear exception of the Philippines.

However, networks established by emigrants may serve to enhance capital flows in other ways too. First, emigrants may be relatively likely to invest in their own country of origin, because they are better placed to evaluate investment opportunities and possess contacts to facilitate this process. Not all such investments from the diaspora are reported as migrants' transfers on capital account. Second, emigrants may also encourage investments in their country of origin by foreigners. Successful direct investment frequently demands a local facilitating partner. Emigrants are well-placed to identify more trustworthy and competent partners. Moreover, returned migrants, known to the foreign investor, may even take on this role of being the local counterpart.<sup>15</sup> In addition, exposure to nationals from a particular country may alter perceptions of doing business with that country, again encouraging foreign investment.<sup>16</sup>

The role of networks in promoting international capital flows presumably assumes greatest importance in dynamic industries, where information commands the highest premium. As Saxenian (1999, pp. 54-55) notes, "The scarce resource in this new environment is the ability to locate foreign partners quickly and to manage complex business relationships across cultural and linguistic boundaries. This is particularly a challenge in high-technology industries in which products,

---

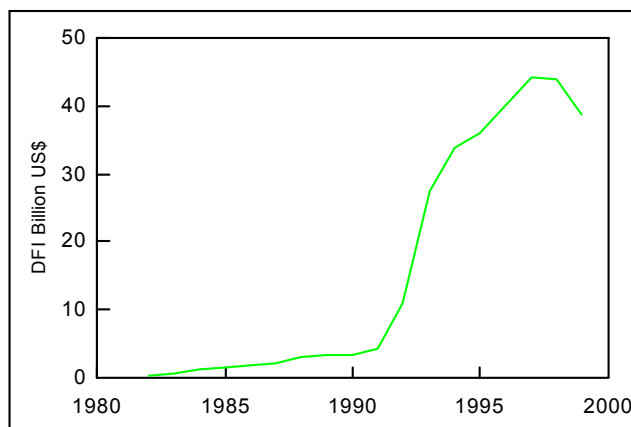
15. See the case study of Hewlett-Packard in India described in Saxenian (1999) pp. 62-63.

16. Kapur (2001) describes the mentoring role that TIE (a group of Indian IT entrepreneurs and professionals) has played, boosting "confidence of overseas investors about India's potential despite India's innumerable problems" (p. 16).

markets, and technologies are continually being redefined - and where product cycles are routinely shorter than nine months.” Given the importance of high-technology industries in East Asia, the role of international networks in stimulating investments potentially assumes a special importance.

The magnitude of network effects on international capital flows remains to be estimated, though there are clear indications of the importance of a diaspora in promoting foreign investment in both mainland China and Taiwan. Investments throughout Southeast Asia by the Chinese diaspora have a long history. (Gambe 2000). However, from the revolution in 1949 until Deng Xiaoping’s ‘open door’ policy initiative in 1978, mainland China remained closed to foreign investors. Since 1978, direct foreign investment in China has accelerated to an unprecedented scale, as may be seen in Figure 2. By 1995, 58.8 percent of the accumulated foreign direct investment in China came from Hong Kong and Macao, and a further 8.7 percent from Taiwan.<sup>17</sup> Indeed, this role for the Chinese diaspora has led some observers to suggest that their influence has also been critical in promoting economic reform within China. (Lever-Tracy *et al.* 1996).

**Figure 2. Direct Foreign Investment in China  
(Billion US Dollars)**



Source: IMF, International Financial Statistics.

Both in mainland China and elsewhere throughout Southeast Asia, in the transnational activities of the Chinese diaspora, “Kinship ties are extremely important and family control over firms is the

17. See Li and Li (1999) and data in the *China Statistical Yearbook*. Note though that all foreign investments arriving from Hong Kong (or elsewhere) do not necessarily originate from Hong Kong.

rule”.<sup>18</sup> “The massive cross-investments among these nations are evidence of a new but poorly understood economic power.. The bamboo network”.<sup>19</sup>

Foreign investments in China have been largely concentrated in the coastal plain areas. In part this was because of the location of the initial four Special Economic Zones followed by fourteen Open Coastal Cities. However, the focus of investments also reflects the origins of much of the Chinese diaspora. Kinship links with people in these areas remain important; repeated transactions within the family assume a special importance when legal enforcement of contracts remains rudimentary. Economic growth in these coastal regions has far exceeded that of the interior, yet the benefits of this development have been shared through expanded internal migration into the coastal areas, in which the job creation from Chinese diaspora investments played a key role. As Li and Li (1999, p.40) note, in contrast to direct investments in China from the industrialized nations, those from the diaspora “were mostly labour intensive production geared towards export, the average size of each investment was often smaller, and few of them brought new technologies”.

The investments in China originating from the diaspora did stem from highly skilled, entrepreneurial emigrants. (See Gambe, 2000). Yet it seems most of these investments stem from such migrants from a prior generation, rather than from the on-going brain drain. In particular, “Although ethnic Chinese trading circles have existed on a cross-border basis for many centuries, the exodus of millions of Chinese citizens during and after the Communist Revolution of 1949 was responsible for the rapid expansion of this entrepreneurial network”. (Weidenbaum and Hughes, 1996, p. 8). This fact, combined with the opening of China to foreign investments after 1978 and the availability of huge, low-wage labor reserves, has led some observers to suggest that the Chinese experience in attracting vast investments from its diaspora may prove unique. (See Lever-Tracy *et al.*, 1996). Yet the experience of Taiwan denies this uniqueness.

During the 1990s, Taiwan experienced a net debit of direct investments amounting to more than 20

---

18. Weidenbaum and Hughes (1996) p.53.

19. Weidenbaum and Hughes (1996) p.8.

billion US dollars.<sup>20</sup> However, this net outflow occurred despite significant direct investments in Taiwan of nearly 1.5 billion US dollars on average annually. As Saxenian (1999) notes, these two way flows also characterize the investment relationships between Silicon Valley and the Hsinchu-Taipei region in Taiwan. Moreover, Saxenian (1999, p.61) quotes one Taiwanese investor as saying, “When we invest we are also helping bring entrepreneurs back to Taiwan. It is relationship building ...” Chinese and Indian run firms remain relatively small in Silicon Valley, with an average of 21 employees in 1998,<sup>21</sup> but they have also become important contributors to trading relationships.

### **c. Links between international trade and migration**

Anthropologists, sociologists and geographers have long recognized and documented the role of social networks in enhancing trade. More recently, economists have turned their attention in this direction, in part to explain the ‘mystery of the missing trade’ - why “Nations appear to trade too much with themselves and too little with each other”.<sup>22</sup> Two major explanations dominate the economics literature to date: the roles of social networks in enforcing contracts and in overcoming inadequate information about trading opportunities.

Rauch and Trindade (forthcoming) note the different policy implications of these two potential roles and hence attempt to disentangle them in the context of ethnic Chinese networks. In particular, Rauch and Trindade examine global, bilateral trade patterns, in 1980 and 1990, using an extended gravity model. The cross-product of ethnic Chinese population shares, in each pair of trading partner countries, is found to increase trade more in differentiated goods than in homogeneous goods.<sup>23</sup> The authors argue that any contract enforcement effect of networks should be common to all commodity groups. Hence the result of a greater impact on differentiated goods trade is interpreted as indicating

---

20. Source: *Statistical Yearbook of The Republic of China, 2000*.

21. Saxenian (1999) p.24. Saxenian characterizes the relationships between Silicon Valley and the Bangalore-Hyderabad nexus in India as more arms length than the link with Taiwan. Nonetheless Indian immigrants in the US have become significant sources of venture capital for software startups in India too.

22. Rauch (forthcoming) p.1. See, for example, Trefler (1995) and the recent survey by Rauch (forthcoming).

23. The following control variables are included in the regressions: ratio of GNP and populations of the bilateral pair, distance between principal cities, whether pair share a land border, an index of remoteness of both countries, extent to which pair share common language and colonial tie, membership in EEC or EFTA.

a considerable quantitative effect of networks on informational barriers, in addition to any contribution through contract enforcement. “For trade between countries with ethnic Chinese population shares at the levels prevailing in Southeast Asia, the smallest estimated average increase in bilateral trade in differentiated products attributable to ethnic Chinese networks is nearly 60 percent, providing evidence that the informal trade barriers these networks help to overcome are economically important.” (Rauch and Trindade, forthcoming, abstract).

Rauch and Trindade proxy for the existence of social and business networks by measuring the total co-ethnic population shares in each pair of countries. The extent to which migration thus enhances trade, or whether trade enhances migration is difficult to discern. Moreover, Saxenian (1999) indicates that migrations of the highly skilled may play a more critical role in trade expansion than do other migrations.

In their examination of the links between the bilateral country patterns of Canadian trade and the origins of Canadian immigrants, Head and Reis (1998) indeed find that skilled migrants have a larger impact. In particular, Head and Reis estimate an extended gravity model of Canadian import and export patterns using panel data from 1980 to 1992 on bilateral trade with 136 trading partners. Their point estimates suggest that a 10 percent increase in the accumulated stock of permanent immigrants from a typical country is associated with a 1 percent increase in Canadian exports to that country and a 3 percent increase in imports from that country.<sup>24</sup> Head and Reis then proceed to interact these responses of trade to immigration with the type and region or origin of the immigrant. The elasticity of response of trade to skill-based migration (independents) proves significantly greater than for family based, refugee or business immigrants and the import response proves largest for immigrants from East Asia. Combining these two additive effects, the estimates suggest that “East Asian independent immigrants have an export elasticity of 0.29 and an import elasticity of 0.74”.<sup>25</sup> In other words a doubling of skilled immigration into Canada from East Asia is estimated

---

24. In a prior, similar study of US trade and immigration, Gould (1994) estimates the effect of immigration on US exports to be larger than on US imports, but this study does not distinguish types of immigrants or regions of origin as in Head and Reis (1998).

25. Head and Reis (1998) p.59.



to be associated with a 74 percent increase in Canadian imports from East Asia. This point estimate is clearly very large indeed, though as Head and Reis note the estimate is probably biased upward by spurious correlation between rising immigration and trade integration which could not be fully represented in the model.<sup>26</sup>

Saxenian (1999) argues that Asian-born, US-based engineers and scientists play a key role by acting as middlemen in the high-tech world. Yet the principles of comparative advantage do not vanish in the process: “Silicon valley remains the center of new product definition and design and development of leading-edge technologies, whereas Taiwan offers world-class manufacturing, flexible development and integration, and access to key customers and markets in China and Southeast Asia...However, these economic gains from specialization and trade would not be possible without the underlying social structures and institutions provided by the community of Taiwanese engineers, which insures continuous flows of information between the two regions.” (Saxenian, 1999, p.62).

#### **d. Technology transfers**

Technical progress stems from the generation of new ideas and implementation of those ideas by firms, followed by diffusion to other firms at home and abroad. New ideas encompass both products and processes, and may be generated by basic research or through commercial research and development. However, rapid diffusion of ideas also serves to discourage commercial research, unless patent protection effectively limits implementation. (Krugman, 1979).

A series of empirical papers has shown that total factor productivity growth in the OECD countries is empirically related to the stock of scientists and engineers available and to the rate of expenditures on research and development, both within the respective OECD country and within other member countries.<sup>27</sup> In other words, significant international diffusion of new technologies is observed.

---

26. On the other hand, it seems that the figure implied by the estimates is actually much large still (some 110 percent rather than 74 percent), once an appropriate interpretation of the dummy variables is applied.

27. Coe and Helpman (1995), Eaton and Kortum (1996, 2000).

This diffusion process may be accelerated through several mechanisms: multinational enterprises transfer their own technologies to subsidiaries; technologies may be licensed for royalties; or ideas may simply be reverse engineered, perhaps facilitated by trade in goods embodying new technologies. However, to this list must be added the role of international migration of scientists and engineers.

Certainly transnational movements of scientists and engineers can affect the initial location of idea generation (particularly so, if scale economies are important in research). But in addition, the movements of scientists and engineers may alter the pace of international diffusion, both through any return migration of persons endowed with new ideas, and to the extent that foreign-born scientists and engineers interact more frequently with their counterparts at home.

The latter is difficult to document, but Table 15, derived from the NSF's 1995 Survey of Doctorate Recipients, is perhaps suggestive.<sup>28</sup> This survey represents some 542 thousand individuals age 75 or less, who earned a science or engineering doctorate in the US through academic year 1994. Table 15 reports responses to the question:

How much does (or would) your work benefit from  
 Long distance communications with colleagues outside the US  
 (e.g. by letter, telephone, e-mail, fax etc.)  
 Short-term visits to non-US locations  
 Long-term visits to non-US locations (6 months to 1 or 2 years in duration)?

Respondents born in the US are more likely to report that they would not benefit at all from visits (either short or long term), or from long distance communication with foreign colleagues, than are foreign-born respondents. However, responses of doctorate recipients from South Asia are more typical of those of other foreign-born doctorates than are the responses of East Asians. Indeed, on average the responses of East Asians do not differ markedly from those of their US-born counterparts, but these averages mask some strong national differences among the East Asians.

---

28. Once again I am grateful to Nirmal Kannankutty of the NSF for preparing this table. Regets (2001) also notes the strong positive correlation between the number of US doctorates received by natives of a country and the percentage of that country's internationally co-authored articles that are with a US based author. A number of interpretations of such a correlation are feasible, but it may suggest a role for returned students as vehicles of contact and hence information transmission.

Malaysian doctorate recipients are particularly prone to report both communications and visits to be important, followed by the Japanese, Filipinos and Koreans (for visits only).

**Table 15. Benefit from Contacts Outside of US  
1995 Survey of Doctorate Recipients**

Place of birth	Long distance communication			Short term visits			Long term visits		
	A great deal	Somewhat	Not at all	A great deal	Somewhat	Not at all	A great deal	Somewhat	Not at all
<b>US</b>	26.1	39.6	34.3	17.7	37.9	44.4	7.9	19.0	73.1
<b>Non-US</b>	29.4	40.4	30.1	23.3	40.1	36.6	12.3	24.2	63.4
<b>East Asia</b>	23.3	40.1	36.7	17.5	39.8	42.7	9.0	22.1	68.9
<b>India</b>	28.1	44.1	27.8	23.5	43.1	33.4	12.2	27.7	60.1
<b>Other S Asia</b>	32.2	40.6	27.2	26.3	33.2	40.5	12.4	22.1	65.5
<b>Other Asia</b>	24.9	40.6	34.5	21.9	37.6	40.5	12.5	24.6	62.9
<b>Other Non-US</b>	37.5	39.3	23.2	29.5	40.3	30.2	15.9	25.2	58.9
<b>China</b>	21.3	39.8	38.9	16.6	39.0	44.4	8.0	21.5	70.5
<b>Hong Kong</b>	27.7	41.4	30.9	18.1	43.3	38.6	6.7	23.1	70.1
<b>Japan</b>	34.0	47.6	18.4	27.5	38.7	33.8	15.6	27.0	57.4
<b>Korea</b>	25.0	42.2	32.7	19.7	44.9	35.4	12.5	22.7	64.8
<b>Malaysia</b>	47.1	41.4	11.4	28.3	47.3	24.4	20.4	31.5	48.1
<b>Philippines</b>	31.1	42.0	26.9	20.1	43.6	36.3	13.8	28.2	58.0
<b>Taiwan</b>	19.8	38.1	42.0	14.7	38.7	46.7	7.4	21.1	71.5
<b>Thailand</b>	21.5	38.7	39.8	16.5	41.9	41.6	2.7	30.5	66.8
<b>Other E Asia</b>	36.2	34.4	29.4	24.9	31.3	43.8	16.4	12.9	70.7

Source: National Science Foundation, Division of Science Resources Studies, 1995 Survey of Doctorate Recipients  
Special unpublished tabulation prepared by N. Kannankutty, 5/1/01.

The responses of Taiwanese doctoral recipients in Table 15 suggest that communications with Taiwan (or elsewhere) are not abnormally intense. However, Saxenian (1999, p.60) notes “This transnational community has accelerated the upgrading of Taiwan’s technological infrastructure by transferring technical know-how and organizational models as well as by forging closer ties with Silicon Valley... management practices in Hsinchu companies are more like those of Silicon Valley than of the traditional family-firm model that dominates older industries in Taiwan.”

Informal contacts through visits and communications, as well as return migration, provide channels through which migrants transfer technology. More formal contacts, resulting from various associations and international meetings, established as a result of the presence of migrants, offer another channel. For example, in 1999 Singapore was chosen as the venue for the permanent secretariat of the World Chinese Entrepreneurs Convention which meets biennially. The Chinese Institute of Engineers and the Indus Entrepreneur offer other examples.

Empirical work on total factor productivity indicates that the prior level of technology positively affects speed of progress from given research inputs. If, in addition, innovation in one country has a greater impact on countries at a similar level of technology, this would suggest that migration of scientists and engineers is both less likely to reduce new know-how generated at home and less likely to transfer back useful foreign technologies to the lower income countries, though this remains to be tested. Kapur (2000, p 25) also raises the intriguing question, “To the extent that diasporas have a greater knowledge of their countries of origin, are the technologies transferred more appropriate? While this seems intuitively likely, caution is warranted.” Systematic evidence does not exist, but it may be reiterated that the Chinese diaspora’s investments in mainland China have been more labor intensive and hence, perhaps, more appropriate. (Li and Li, 1999).

## **6. Factors Affecting the International Migration of Highly Skilled People.**

Many factors are well-known to affect migration propensities and patterns. The economic returns to relocation, shaped by differences in earning and employment opportunities as well as the costs of moving, dominate much of the economics literature. Geography matters, for migrants generally move comparatively short distances and to neighboring areas in particular. (Lucas, 2001). Demographic patterns matter; most migrants are young adults and the dependency ratio of initial movers is a critical factor in determining migration rates when family migrations occur. Not all migrations are voluntary: Southeast Asia has seen significant numbers of refugees in recent decades as well as apparent growth in trafficking. (IOM, 2000). For the highly skilled, research and educational opportunities may prove to be important factors too. However, in contrast to internal migration in most countries, international migration is profoundly restricted and shaped by state

policies. These policies will be the focus of this last section, turning first to receiving country policies, followed by a look at the role of study abroad, then issues of return migration and sending country policies.

### **a. Receiving country policies**

Movement to Europe from East Asia is largely ruled out, to date, in part by the deterrent role of distance, though this could change. Among the remaining OECD countries, the admissions policies of Australia, Canada, Japan and the US have therefore had the most profound effect in shaping migration streams of highly skilled persons from East Asia. To some extent Australia, Canada and the US (plus New Zealand) may be characterized as competing for these highly skilled migrants. (Iredale, 2000). However, this competition is clearly tempered by concerns with the impact on employment conditions of indigenous professionals.

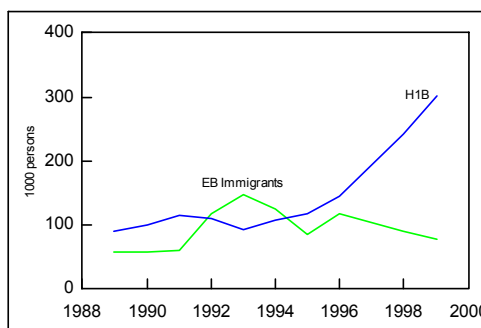
Two categories of US visa are intended to permit entry of skilled workers -- those entering as employment-based permanent immigrants and temporary workers with specialty occupations (H-1B).<sup>29</sup> The 1990 Immigration Act eased employer access to professional foreign non-immigrants, initially imposing a cap of 65,000 H-1B visas per year though this cap was again raised several times and the number entering on H-1B visas has expanded rapidly. (See Figure 3). Yet, despite this significant expansion in the cap on H-1B visas, these quotas have been consistently over-subscribed. The 1990 Immigration Act also increased the number of permanent immigrant visas for those entering the US for economic or employment reasons from 54,000 to 140,000. Since then, the number of people entering the US on employment-based permanent immigrant visas has consistently remained below the maximum permissible number, yet there have been significant waiting times for applicants from China and India, even under the priority worker, persons of exceptional ability, and employment-creating investor preferences. Moreover, "Most foreigners seeking to enter the United States as immigrants for economic or employment reasons must obtain an offer of permanent full-

---

29. In addition, however, a number of persons entering under such temporary visa categories as treaty traders (E visas) and intra-company transfers (L1) are also highly skilled. (Martin *et al.*, 2000).

time employment from a United States employer... Most immigrants admitted for economic or employment reasons are already in the United States and adjust their status from that of illegal or non-immigrant ... In {Fiscal Year} 96, about 90 percent of the principals ‘admitted’ under economic and employment preferences were already in the United States”.<sup>30</sup>To a large extent, permanent entry to the US for highly skilled people is thus constrained by ability to first enter temporarily, legally or otherwise.

**Figure 3. US Employment Based Immigrant and H-1B Visas**



Source: US Immigration and Naturalization Service

“In Australia, there has been a gradual tightening of criteria to enable entry only to those who ‘have skills or outstanding abilities..’”<sup>31</sup> A points basis selection system is deployed, including assessment of English language skills, as well as spouse’s skills. There is some attempt to match specific skill needs, with special schemes targeted at high-skilled IT and business people. In 2000-2001 52 percent of immigrants were skilled workers and their dependents, but Iredale (2000) notes that the number of skilled migrants may actually be larger, given the skills of refugees, temporary workers and spouses. Canada also uses a points-based system to identify skilled-workers for preferential entry, with points according to age, education, experience and occupation, though there is a proposal to remove the occupational criterion (given difficulty in interpreting and monitoring prior occupation). Foreign workers in Japan fall into three main groups: professional and technical

30. Martin *et al.*, 2000, p.5, italics added

31. Iredale (2000) p.890.

workers (19% in 1999), workers of Japanese descent (33%) and over stayers (38%). (Iguchi, 2001, table 24). Gaining permanent resident status in Japan (especially for those not of Japanese descent) is extremely difficult, even for the highly skilled. As a result, illegal entry has accelerated, “organized mainly by ‘Snake Heads’ from China” (Iguchi, 2001, p.11) but also through abuses of the Technical Intern Traineeship Program.<sup>32</sup> Nonetheless, recommendations with respect to a Fundamental IT Strategy in November 2000 included acceptance of 30,000 highly skilled foreign workers.

While the Pacific-rim OECD countries may be competing to attract the very brightest of Asian immigrants, there is hardly an open-door policy for the highly skilled from East Asia; the extent of the legal brain-drain to these OECD nations is constrained by admission criteria. Mounting illegal movements have occurred, but it remains unclear how much of this clandestine migration involves highly skilled workers.

Within the East Asian region, much of the movement of skilled workers has been to service direct investments and the flow of such investments has thus been the principal determining factor. Singapore has also shown a clear preference to attract highly skilled foreign workers, imposing a levy on employers of less skilled workers (though it seems most of the incidence fell on migrant workers according to IOM, 2000) and offering a tax break to employers on the recruitment and relocation costs of the highly skilled (Iredale, 2000). However, Singapore’s size limits its role in any overall brain drain and other major movements within the region tend to involve less skilled workers. Meanwhile migration in general (of both professional and unskilled workers) to the Middle East (and to Brunei) has been dictated largely by oil price changes.

Immigration policies in the OECD countries, foreign direct investments within the region and oil prices all play key roles on the demand side of the brain drain from East Asia. An additional, key factor, on the supply side is educational policy which shapes both the pool of highly skilled, potential migrants and the extent of study abroad

---

32. In 1999, 46 percent of foreign trainees accepted were from China. Iguchi (2001) table 32.

## b. Study abroad

The education of foreign students plays an important part in the ability of the industrialized countries to attract the brightest immigrants, and the number of East Asians studying abroad has swollen. By the mid-1990s there were more than 400 thousand East Asian college students in the 50 major host countries. (See Table 16).

**Table 16. East Asian, Tertiary-Level Students in Major Host Countries  
(1000 students)**

	US	UK	Japan	Australia	Germany	Canada	Total 50 Host Countries
	1996	1996	1995	1993	1996	1994	
<b>Total E Asia</b>	214.0	51.7	47.7	28.5	16.4	13.4	417.1
<b>China</b>	72.3	5.5	24.9	2.7	5.4	3.2	121.4
<b>Hong Kong</b>	12.0	11.3	0.3	6.8	0.0	5.7	36.5
<b>Indonesia</b>	12.8	0.9	1.1	2.7	2.1	0.5	22.1
<b>Japan</b>	45.5	4.2		0.7	1.6	0.8	64.3
<b>S Korea</b>	36.2	1.4	17.8	0.7	4.8	0.3	71.7
<b>Malaysia</b>	14.0	18.5	2.1	7.8	0.1	1.4	49.4
<b>Philippines</b>	3.1	0.2	0.4	0.4	0.1	0.1	5.1
<b>Singapore</b>	4.1	6.8	0.1	5.4	0.0	1.0	18.1
<b>Thailand</b>	12.2	1.7	0.8	0.9	0.3	0.2	17.1
<b>Other E Asia</b>	1.7	1.1	0.2	0.5	1.9	0.2	11.4

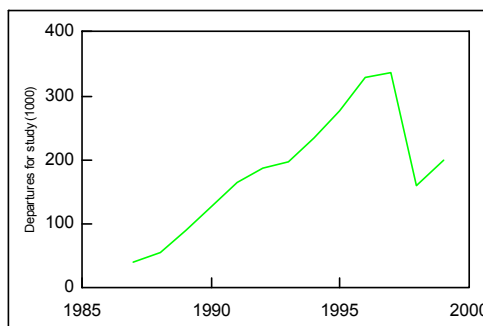
Source: UNESCO Statistical Yearbook, 1998.

The US hosted more than half of all East Asian college students studying abroad. This may have been a key factor in US ability to attract and select the very brightest of East Asians. Yet it is interesting to see that the UK had the second largest contingent of East Asian college students and Germany had a significant number too, though the number of East Asians reported by the OECD as residing in these two countries is tiny. A part of the difference may lie in the country origin of students; the largest contingent in the UK is from Malaysia, from where the Bumiputera generally return home, but more generally these differences would seem worthy of closer attention in future analysis. Students from Hong Kong, Malaysia and Singapore are well spread between the US, UK,



Australia and Canada.<sup>33</sup> In contrast, Indonesian, Japanese and Thai college students are predominantly in the US, while from Korea and China, large numbers of students travel to both Japan and the US.<sup>34</sup> Prior to the crisis in 1998, the departures of Korean residents for study and training abroad had grown rapidly to exceed 330,000 during 1997, though this number dropped by more than 50 percent in 1998. (See Figure 4).

**Figure 4. Korean Resident Departures for Study and Training Abroad**



Source: *Korea Statistical Yearbook 2000*.

During the 1980s, there was rapid growth in the number of students in the US from a number of the East Asian countries. (See Table 17). However, during the 1990s the picture has been more mixed. The number of students from Hong Kong and Malaysia declined by about a third from 1990 to 2000, while the total from Taiwan also fell slightly. Meanwhile, a rapid expansion continued in the number of students from Japan, Korea and China.<sup>35</sup>

---

33. Data on the number of students in Canada from Hong Kong show wide variations during the 1990s, apparently as a result of naturalization of significant numbers of residents. Skeldon (1997).

34. In addition, UNESCO reports some 8,500 Japanese and 6,500 Korean college students in China in 1993-4, though it is unclear how many of these are in Taiwan.

35. Note, however, that in 1987, there were 78.7 thousand Chinese college students in the US (UNESCO Statistical Yearbook 1989), which is greater than the total reported in Table 16 for 1995-96.

**Table 17. Stock of International Students in the US**

	1981	1990	1995	2000
<b>China</b>	2770	33390	39400	54466
<b>Japan</b>	13500	29840	45280	46872
<b>Taiwan</b>	19460	30960	36410	29234
<b>Korea</b>	6150	21710	33600	41191
<b>Hong Kong</b>	9660	11230	12940	7545
<b>Malaysia</b>	6010	14110	13620	9074
<b>Indonesia</b>	3250	9390	11870	11300
<b>Thailand</b>	6550		10890	10983

Sources: *Open Doors*, Institute for International Education, New York, various years and [http://www.opendoorsweb.org/Lead%20Stories/international\\_studs.htm](http://www.opendoorsweb.org/Lead%20Stories/international_studs.htm)

From mainland China, the departure of students for continued training has followed a tortuous history. (Engelsberg, 1995). During the 1950s, China's engineers and scientists traveling abroad were confined largely to the Soviet bloc. Almost all of these trainees returned home, but this pattern was discontinued after the Sino-Soviet rift in the early 1960s. China's education was then largely disrupted, both at home and abroad, following the cultural revolution in 1966. Deng Xiaoping's modernization strategy, initiated in 1978, included foreign training as a key component. Until 1983, most foreign trainees under this program were in their early 30s and traveled as visiting scholars, financed largely by US universities, without studying for a degree. After 1983, there was a shift in emphasis to training of graduate students, financed by the World Bank and other foreign donors as well as some privately financed students. Moreover, some provinces started their own study-abroad programs (Guangxi being the first). Following the demonstrations in Tiananmen Square in June 1989, exit of students initially became more restricted<sup>36</sup>, though study abroad resumed its upward trend later in the 1990s as relations were normalized. The failure of students to return, particularly after the initial switch to study for foreign degrees in 1983, appears to have rather taken China's authorities by surprise.

---

36. Following the Tiananmen confrontation, several countries eased visa entries for Chinese students. For example, under the 1992 US Chinese Student Protection Act, at least 53,000 Chinese nationals became US residents.

### **c. Return migration**

Migrants may return (or move on to a third location) either because the option to remain is not open to them, having failed to find employment or to obtain an appropriate visa, or as a matter of choice. They may well freely choose to leave, either because their circumstances or opportunities alter or as part of a preconceived plan (such as having accumulated sufficient savings to enjoy returning home).<sup>37</sup>

The data to evaluate the many potential factors that may contribute to return migration remain scant. (UNFPA, 1998). In part this reflects the difficulty in obtaining data on emigrants in general (Lucas, 2000), in part it also reflects the low propensities to return. For example, Reagan and Olsen (2000) examine the probability of re-emigration among foreign-born individuals in the US National Longitudinal Surveys of Youth, finding 65 residence spells that ended in emigration from a total of 571 such spells. Despite the fairly small sample, Reagan and Olsen find (pooling all person-years of observation) no difference between males and females in the likelihood of re-emigration but that migrants who are older at the time of arrival are more likely to return home (which is interpreted as reflecting greater attachment to the home setting). Reagan and Olsen also find no correlation between re-emigration and scores on the AFQT aptitude test, which they interpret as indicating no skill-bias in return migration. However, this interpretation is not entirely consistent with the finding that individuals with a higher potential wage in the US are less likely to re-emigrate, suggesting that more highly skilled workers are indeed biased toward staying. In common with a few other studies, Reagan and Olsen also note that the probability of re-emigration declines with duration of stay, though it is not clear whether this reflects growing attachment to the new setting or simply progressive selection of those inherently more likely to stay.

Some of the complexities in the decisions whether to return home are brought out in the interviews conducted among medical doctors returned to Hong Kong and analyzed in Findlay et al. (1994). The duration of employment abroad, among doctors returned to Hong Kong, was found to be greater

---

37. For a recent contribution on accumulation and return migration (in Egypt) see McCormick and Wahba (2001) and references therein. Kwok and Leland (1982) suggest another component, which may serve to retard the propensity to return, namely that employers at home may lack sufficient information to interpret qualifications earned while abroad.

among those who also held a foreign passport, had trained outside of Hong Kong, and first worked in Canada or the UK. However, as the authors emphasize, these correlates probably, really reflect part of a larger strategy - those who intend to stay abroad (for longer) may well select destinations conducive to doing so and train accordingly.

**Table 18. Foreign, 1990-91, Science and Engineering Doctorate Recipients from US Universities Working in US in 1995**  
(Percent of Doctorates)

Country of origin	Percent working in US 1995
Overall	47
India	79
China	88
Japan	13
South Korea	11
Taiwan	42

Source: Finn (1997)

Table 18 reproduces estimates by Finn (1997) of the percent of the 1990-91 cohort of foreign recipients of science and engineering doctorates from US universities, who were working in the US in 1995. These estimates indicate very considerable differences in stay rates by country of origin, ranging from 88 percent from China to less than 15 percent from Japan and Korea. Tracking this cohort over time, Finn does not discern any decline in the stay rate; indeed the overall rate actually rose from 48 percent in 1994 to 53 percent in 1997, apparently in part because some graduates are required to leave the US as a condition of their visa entry, but then subsequently reenter the US.<sup>38</sup> Preliminary results for the 1999 US employment rate of this same 1990-91 cohort show about the same stay rate as 1997, among doctorates from China, and a slight increase in the stay rate among other East Asian doctorates. Finn has also begun tracking a new cohort from the class of 1997, and these show sharply higher stay rates overall than did the 1990-91 cohort at a comparable time span

---

38. Regets thus addresses an apparently conflicting result from NSF data: "However, another data source, the NSF's Survey of Doctorate Recipients, suggests that *those* who do stay in the U.S. leave after a period of time. This seeming contradiction may be reconciled through a complex pattern of migration - while some individuals who earned a U.S. doctorate leave each year, some others return." Regets (2001), pages un-numbered, italics added.

after graduating.<sup>39</sup>

The factors involved in return migration, and the policies adopted to encourage return, vary considerably from country to country. During the 1960s, both Korea and Taiwan experienced a low return rate of students graduating from US universities. In both contexts the government reacted by initiating programs to encourage a reverse brain drain. The rates of return have increased,<sup>40</sup> and indeed in Korea there were even complaints about a glut of US PhDs by the late 1980s. (Yoon, 1992). Yet it remains unclear how much of the additional return is attributable to these government programs as opposed to the rapid economic developments in Korea and Taiwan.

Efforts to encourage repatriation have been coordinated by the Ministry of Science and Technology (MOST) in Korea and the National Youth Commission (NYC) in Taiwan. In both contexts, government support for development of research centers and high tech clusters has played a key role in this strategy. In Korea, this initiative really began in 1966 with the establishment of the Korea Institute for Science and Technology followed by several other R&D institutes and engineering schools, concentrated in the Seoul Science Park and Daeduk Science Town. In Taiwan too, the government set out “to improve and strengthen the institutions of higher learning”<sup>41</sup> and to support such facilities as the Hsinchu Science Park. In both contexts such facilities have succeeded in attracting repatriates: “In 1996, 82 companies in the Hsinchu Science Park (or 42 percent of the total) were started by returnees from the United States, primarily from Silicon Valley, and there were 2,563 returnees working in the park alone.”<sup>42</sup> Nonetheless it remains unclear to what extent employment of repatriates in these facilities merely attracted those who would have returned anyway. Moreover, there is an issue as to whether the R&D generated in the public research

---

39. I am extremely grateful to Mike Finn for a personal communication with respect to these preliminary results. Finn’s measures of the stay rates are derived by matching social security numbers of foreign doctorate recipients with those from employment records.

40. “In the 60s, whereas 21,248 students left Taiwan for advanced study, only 1,172 returned to Taiwan, a mere 5 percent retention rate” (Chang, 1992, p.28). By 1985 the return rate to Taiwan exceeded 25 percent (Chang, 1992, table 7).

41. Chang (1992) p.38.

42. Saxenian (1999) p.58 fn.9. Yoon (1992) reports 908 repatriates employed in public R&D institutes in Korea between 1968 and 1989.

institutes proved as productive as that in the private sector, though Yoon (1992) asserts that there were considerable spillover effects from the public R&D, even to the extent of being critical in instigating serious private R&D in Korea. Within the Korean public research institutes, repatriates have been offered premium salaries, though this has also led to internal problems of resentment. (See Yoon, 1992). Taiwan's NYC has also been able to offer some financial incentives to returnees, in the form of travel subsidies, as well assistance with job placement and business investments (obtaining loans, production locations and facilities).

Perhaps equally importantly, however, both MOST in Korea and NYC in Taiwan have been instrumental in promoting contact between scientists and engineers at home and those abroad. The Korean Government has subsidized and supported professional associations of Korean scientists in the US, Europe, Japan, Canada and China. The Monte Jade Science and Technology Association is a private organization dedicated to "the promotion of business cooperation, investment, and technology transfer between Chinese engineers in the Bay Area and Taiwan... Monte Jade's Silicon Valley offices are in the same suite as the Science Division of the Taipei Economic and Cultural Office and the local representatives of the Hsinchu Science-Based Industrial Park. The proximity intentionally supports close and ongoing interactions, but there are no official or financial connections between Monte Jade and the Taiwanese government."<sup>43</sup>

On the mainland, the Government of the People's Republic has been less concerned with networking issues than with attempts to induce the return of nationals.<sup>44</sup> Engelsberg (1995) reports that by 1992 some 100,000 self-financed students had left China, most studying in the US, but almost none had returned. Moreover, the Chinese Academy of Science "sent over 7,500 of its personnel as visiting scholars and graduate students from 1978 to 1991, approximately 50 percent of whom had returned

---

43. Saxenian (1999) p.59. Saxenian goes on to note (p.65) "In contrast to the close collaboration between Taiwan's policymakers and the US-based engineers, there has been almost no communication at all between the Silicon Valley engineering community and India's policymakers".

44. Missions have, however, been set up to stay in touch with students abroad, where cadres on campus liaise with consuls.

by 1991".<sup>45</sup> In consequence the PRC Government introduced a series of incentives to return, including a new service center for returnees set up in 1989, allocations for housing of returnees and duty free purchases of computers and automobiles, and offers of return air-fares for self-financed students. In addition, in 1984 ten post-doctoral research stations were established, growing to 145 stations by 1989, yet as of June 1989 these had attracted only 140 returnees in total (40% of all returned PhDs at that stage). Nonetheless the various incentives gave rise to mounting 'study-abroad fever' and to resentment among those unable to study abroad. (Chang and Deng, 1992). Offering increased incentives became difficult and policy makers resorted to sticks as well as carrots in designing incentives to return. For example, some provinces and institutions have introduced fines imposed on families of students failing to return on time. Moreover, attempts have been made to restrict departure to categories of students more likely to return, including a minimum of five years work experience prior to departure for certain categories of students and imposing training fees on those departing before meeting work requirements. In the Special Economic Zones, employers have been better placed to offer greater financial incentives to returnees, in part because of the greater competition in these zones. But in 1989, tighter controls were also introduced on job assignments of returnees, and Engelsberg (1995) notes that this clearly discouraged return.

The combined result of both carrots and sticks is very limited return to the People's Republic. For instance, the US National Science Foundation (2001) reports that of 16,550 Chinese recipients of doctorates in science and engineering from US universities between 1988 and 1996, 85 percent planned to stay in the US at the time of receiving their doctorate (of these, 20 percent had firm offers of employment in the US, 36 percent had firm offers of post-doctorates, and the remaining 44 percent planned to stay despite having no firm offer). As Zweig (1997) finds, based on 273 personal interviews with former residents of China in the US in 1993, economic factors are part of the reason for this failure to return, including housing as well as earnings and lack of job mobility in China. But, even four years after Tiananmen, politics, human rights violations and the fear of not being able to leave China again were also important motives for not returning.

---

45. Engelsberg (1995) p.114.

With increasing ease of international transportation and communication, representing the issue as whether to return home or not is rapidly becoming outmoded, at least in some contexts. As Saxenian (1999, p.vi) notes, “Recent research suggests that the ‘brain drain’ may be giving way to an accelerating process of ‘brain circulation’”, including such phenomena as “astronaut” migrants (in which spouse and family are settled at the destination while the principal migrant returns home) or “parachute kids” (in which the children remain at the destination while both parents return home).

### **7. Future Prospects**

Global migration has not only grown it has outstripped growth in population, at least since 1985. (IOM 2000). This growth is likely to continue. All of the OECD countries face declining population growth, raising the burden of supporting an aging populace. To the extent that migration is seen as a potential solution to this prospect the preference is to attract highly skilled workers. The external benefits from concentration of more highly skilled people is a major attraction, but in addition the net fiscal contribution of the highly skilled tends to be greater than from the unskilled. A competition is already underway to attract the brightest of potential immigrants, even though admission remains tempered by concerns to protect the indigenous elite. As a result, highly-skilled workers are typically offered permanent residence and their families are often permitted to accompany them, limiting the odds of such people returning home. To date, Japan has remained largely closed to immigration, despite a serious aging problem, preferring to export capital rather than import labor (other than ethnic Japanese). This is unlikely to change. Europe to date has not admitted many East Asians, whether this will change as the stock of highly skilled, potential immigrants from the former Soviet bloc is exhausted remains to be seen. But the immigration of highly-skilled East Asians to the US, Canada, Australia and New Zealand shows little sign of slowing down.

Several East Asian countries have already experienced a transition in migration, becoming net importers of workers. No doubt more East Asian countries will follow. However, for the most part the immigrants are unskilled and a brain-drain of the highly skilled continues even after the transition. Economic growth in East Asia may limit continued departure and accelerate return, but the gap in incomes remains substantial between those of engineers in much of East Asia versus those in North America. Moreover, it seems that the concentration of the highly skilled in North America



may actually serve to widen the income gap by raising the productivity of such workers.

The comparative advantage of universities in North America, Europe and Australasia continues to attract large numbers of East Asian students, particularly to graduate schools. In turn this training serves as a vehicle of exit from East Asia. China, Japan, Korea and Taiwan, together with India, have responded during the 1990s by investing in the development of their own graduate schools<sup>46</sup>. By 1997, universities in these five countries together graduated more engineering doctorates than did US universities and half of the doctorates from US universities were earned by Asians. (NSF 2000, chapter 4). In that same year, Chinese students earned twice as many science and engineering doctorates from Chinese universities as from US universities.

This trend may well serve to diminish the exodus of highly skilled peoples. However, it seems probable that positive selection will continue; the brightest of the bright will still study abroad. Moreover, there appear to be strong countervailing benefits to this process. For some of the East Asian countries, trade with and foreign investment in them is now so large that reputational barriers are largely dismantled; for other East (and South) Asian countries this is not yet true and the role of highly skilled people abroad in penetrating these barriers remains critical. For a wider range of East Asian countries, the role of the highly skilled in surmounting information and cultural barriers to trade and investment is still key. Moreover, without sojourns abroad, Asian scientists and engineers would lack vital integration with new technologies being developed elsewhere. Whether these highly trained people return home or not, the international networks that result channel information toward the country of origin, accelerating the diffusion of technical progress.

---

46. "In Chinese Hong Kong and in South Korea, the establishment of S&T universities has been supported primarily by private industry. Chinese (People's Republic) research universities are expanding through more self-support from close alliances with, or ownership of, high-technology industries and through international loans". (NSF, 2000, ch.4, p.25).

## References

- Athukorala, Prema-Chandra and Chris Manning, *Structural Change and International Migration in East Asia: Adjusting to Labour Scarcity*, Oxford University Press, Melbourne, 1999.
- Camarota, Steven A. "Immigrants in the United States-2000: a snapshot of America's foreign-born population", Center for Immigration Studies, January 2001.
- Carrington, William J. and Enrica Detragiache, "How big is the brain drain?", *IMF Working Paper*, WP/98/102, July 1998.
- Chalamwong, Yongyuth, "Country report: recent economic development, labor market and international migration in Thailand", paper presented to the Workshop on International Migration and Labour Markets in Asia, February 1-2, The Japan Institute of Labour, Tokyo, 2001.
- Chang, Shirley L., "Causes of brain drain and solutions: the Taiwan experience", *Studies in Comparative International Development*, 27, 27-43, Spring 1992.
- Chang, Parris and Zhiduan Deng, "The Chinese brain drain and policy options", *Studies in Comparative International Development*, 27, 44-60, Spring 1992.
- Coe, David T. and Elhanan Helpman, "International R&D spillovers", *European Economic Review*, 859-887, May 1995.
- Eaton, Jonathan and Samuel Kortum, "Measuring technology diffusion and the international sources of growth", *Eastern Economic Journal*, 401-410, Fall 1996.
- \_\_\_\_\_ "Technology, geography and trade", mimeo, Boston University and NBER, 2000.
- Engelsberg, Paul, "Reversing China's Brain Drain: The Study-Abroad Policy, 1978-1993", in John D. Montgomery and Dennis A. Rodinelli (eds.) *Great Policies: Strategic Innovations in Asia and the Pacific Basin*, Praeger: Westport CT, 1995.
- Faini, Riccardo, "Increasing returns, migrations and convergence", *Journal of Development Economics*, 49, Special Issue, April 1996: 121-136.
- Fields, Gary S., "The migration transition in Asia", *Asian and Pacific Migration Journal*, 3, 7-30, 1994.
- Findlay, A.M., F.L.N. Li, A.J. Jowett, M. Brown and R. Skeldon, "Doctors diagnose their destination: an analysis of the length of employment abroad for Hong Kong doctors", *Environment and Planning*, 26, 1605-1624, October 1994.

- Finn, Michael G., *Stay Rates of Foreign Doctorate Recipients from U.S. Universities*, Oak Ridge Institute for Science and Education, Oak Ridge TN, 1997.
- Gambe, Annabelle R., *Overseas Chinese Entrepreneurship and Capitalist Development in Southeast Asia*, St. Martin's Press, New York, 2000.
- Gould, David M., "Immigrant links to the home country: empirical implications for US bilateral trade flows", *Review of Economics and Statistics*, 76, 302-316, May 1994.
- Haque, Nadeem Ul and Se-Kik Kim, "Human capital flight: impact of migration on income and growth", *IMF Staff Papers*, 577-607, 1995.
- Head, Keith and John Reis, "Immigration and trade creation: econometric evidence from Canada", *Canadian Journal of Economics*, 31, 47-62, February 1998.
- Hui, Weng-Tat, "The regional economic crisis and Singapore: implications for labor migration", *Asian and Pacific Migration Journal*, 7, 187-218, 1998.
- Iguchi, Yasushi, "The East Asian recovery and the international migration in Japan", paper presented to the Workshop on International Migration and Labour Markets in Asia, February 1-2, The Japan Institute of Labour, Tokyo, 2001.
- International Organization for Migration, *World Migration Report 2000*, United Nations, 2000.
- Iredale, Robyn, "Migration policies for the highly skilled in the Asia-Pacific region", *International Migration Review*, 34, 882-906, Fall 2000.
- Kapur, Devesh, "Diasporas and technology transfer", Background Paper Prepared for the *Human Development Report*, January 2001.
- Kassim, Azizah, "The case of a new receiving country in the developing world: Malaysia", Paper presented to the Technical Symposium on International Migration and Development, June 29- July 3, The Hague, 1998.
- \_\_\_\_\_, "Country report: trends in economic development and international migration in Malaysia", paper presented to the Workshop on International Migration and Labour Markets in Asia, February 1-2, The Japan Institute of Labour, Tokyo, 2001.
- Kotkin, Joel, *Tribes: How Race, Religion and Identity Determine Success in the New Global Economy*, Random House, New York, 1993.
- Krugman, Paul, "A model of innovation, technology transfer, and the world distribution of income", *Journal of Political Economy*, 253-266, April 1979.

- Kwok, Viem and Hayne Leland, "An economic model of the brain drain", *American Economic Review*, 72, 91-100, March 1982.
- Lever-Tracy, Constance, David Ip and Noel Tracy, *The Chinese Diaspora and Mainland China: An Emerging Synergy*, MacMillan Press, London, 1996.
- Li, Feng and Jing Li, *Foreign Investment in China*, Macmillan Press, London, 1999.
- Lucas, Robert E.B., "International migration: economic causes, consequences and evaluation", in *Global Trends in Migration*, eds. M. M. Kritz, C. B. Keely, S. M. Tomasi, Center for Migration Studies: New York, 1981.
- \_\_\_\_\_, "Internal migration in developing countries", in *Handbook of Population and Family Economics*, eds. M. Rosenzweig and O. Stark, North-Holland, Amsterdam, 1997.
- \_\_\_\_\_, "Migration", in Margaret Grosh and Paul Glewwe, eds., *Designing Household Survey Questionnaires for Developing Countries: Lessons from Ten Years of LSMS Experience*, The World Bank, Washington DC, 2000.
- \_\_\_\_\_, "The effects of proximity and transportation on developing country population migrations", *Journal of Economic Geography*, 1, 323-339, 2001.
- Martin, Philip, Richard Chen and Mark Madamba, "United States policies for admission of professional and technical workers: objectives and outcomes", *International Migration Papers*, No. 35, International Migration Branch, International Labour Office, Geneva, 2000.
- McCormick, Barry and Jackline Wahba, "An econometric model of temporary international migration and entrepreneurship", paper presented to the IZA Workshop on The International Mobility of Highly Skilled Workers, IZA Bonn, March 25-26, 2001.
- National Science Foundation, *Science and Engineering Indicators 2000*, NSF, Washington DC, 2000.
- \_\_\_\_\_, "Human resource contributions to US science and engineering from China", NSF Division of Science Resources Studies, Issue Brief, January 12, 2001.
- OECD, *Trends in International Migration*, SOPEMI, Paris, 2000.
- Pang, E.F. "Labour migration, economic development and regionalisation in the Pacific Asian Region", *Migration and Economic Development: New Partnerships for Co-operation*, OECD, Paris, 1994.
- Portes, Alejandro, (editor), *The Economic Sociology of Immigration: Essays on Networks, Ethnicity, and Entrepreneurship*, Russell Sage Foundation, New York, 1995.

- Rauch, James E. "Business and social networks in international trade", *Journal of Economic Literature*, forthcoming.
- Rauch, James E. and Vitor Trindade, "Ethnic Chinese networks in international trade", *Review of Economics and Statistics*, forthcoming.
- Reagan, Patricia B., and Randall J. Olsen, "You can go home again: evidence from longitudinal data", *Demography*, 37, 339-350, August 2000.
- Regets, Mark C., "Research and policy issues in high-skilled international migration: a perspective with data from the United States", paper presented to the IZA Workshop on The International Mobility of Highly Skilled Workers, IZA Bonn, March 25-26, 2001.
- Saxenian, Anna-Lee, *Silicon Valley's New Immigrant Entrepreneurs*, Public Policy Institute of California: San Francisco, 1999.
- Skeldon, Ronald, "Migration from China", *Journal of International Affairs*, 49, 434-455, 1996.
- \_\_\_\_\_, *Migration and Development: A Global Perspective*, Addison Wesley/ Longman, Harlow, 1997.
- Trefler, Daniel, "The case of the missing trade and other mysteries", *American Economic Review*, 85, 1029-1046, 1995.
- UNFPA, *Report of the UN Technical Symposium on International Migration and Development*, United Nations, New York, 1998.
- Weidenbaum, Murray and Samuel Hughes, *The Bamboo Network: How Expatriate Chinese Entrepreneurs are Creating a New Economic Superpower in Asia*, Martin Kessler Books, New York, 1996.
- Yoo, Kilsang and SooBong Uh, "Immigration and labor market issues in Korea", paper presented to the Workshop on International Migration and Labour Markets in Asia, February 1-2, The Japan Institute of Labour, Tokyo, 2001.
- Yoon, Bang-Soon L., "Reverse brain drain in South Korea: state-led model", *Studies in Comparative International Development*, 27, 4-26, Spring 1992.
- Zweig, David, "To return or not to return? Politics vs. economics in China's brain drain", *Studies in Comparative International Development*, 32, 92-125, Spring 1997.