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Saikat Sinha Roy

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Complementarities and Potentials of Intra-regional Transfers of Investments, Technology and Skills in Asia

Saikat Sinha Roy*

Abstract: This paper examines complementarities in merchandise trade and potentials for intra-regional transfers of investments, technology and skills in Asia. The analysis shows that intra-regional trade was substantial and growing, but trade complementarities were limited. Asian countries have also emerged as sources of as well as destinations for investment, technology and skills. In the event of a formal regional integration arrangement in Asia, there is potential for intra-regional trade, investments, technology transfers and skill movements. Substantial gains in regional welfare are also expected.

1. Introduction

Globalisation and regionalisation, paradoxical though it may seem, have proliferated simultaneously during the 1990s and thereafter.[1] These aim at improving long-term efficiency through resource re-allocation and minimising short-term fluctuations in output around a long-run equilibrium trend. Simultaneous globalisation and regionalisation not only result in expanding

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volumes of cross-border movement of merchandise and invisibles, but factor markets get integrated regionally and globally. In the process, countries increasingly play hosts to foreign direct investment (FDI) and derive benefit from the emerging international specialization. There is increasing evidence of countries absorbing spillovers of technology developments, knowledge and skill.[2] As a result, there has been significant industrial restructuring in many middle and low-income countries during the 1990s, and emergence of complementarities in production and trade between countries leading to substantial gains for individual countries in the process of integration.

The evidence of increased flow of global trade and investment during the 1990s was, however, largely on account of greater trade and investment flows within the EU and NAFTA. With growth impulses being internalised by these regional economies, the benefits of globalisation have accrued mostly to countries in these respective regions and bypassed large parts of Asia that have not integrated regionally. This is despite an informal arrangement of a Japan-centred regional bloc in Asia. Most developing countries in Asia, on the other hand, have individually liberalized their trade and investment policy regimes and laid the pre-condition for an "open" regional economy in Asia. Kumar (2002) argues that broader Asian regional bloc – the JACIK[3] – holds greater potential and complementarities can be more pronounced. This initiative is wider in scope than a preferential trading arrangement (PTA), whose benefits remain limited to merchandise trade creation and trade diversion. The success of a regional bloc in Asia lies in identifying complementarity in production and trade, which lies at the core of any regional integration initiative, and mapping out the potentials of intra-regional transfers of foreign direct investment, and technology and manpower. In addition to gains from trade, movement of factors of production across border in a regional integration arrangement leads to reallocation of resources inducing pareto-improvements in the regional economy. This paper examines the complementarities with respect to merchandise and potentials for intra-regional transfers of investments, technology and skills.

The scheme of the paper is as follows. Section 2 discusses in brief the different dimensions of Asian Economic Integration. Section 3 presents certain stylised facts on complementarities in merchandise trade across JACIK countries. Then an attempt is made to find patterns of cross-border investment flows within this region and investment-related industrial restructuring in Asian countries (Section 4). Section 5 finds

complementarities in technology flows and movements in manpower within the JACIK. An estimate of regional economic gains assuming cross-border free movements of capital and skill within the region is provided in Section 6. Finally, in Section 7, the paper summarises the major findings with a note on implications for integration in the JACIK region.

2. Issues in Asian Economic Intergration: Evidence from the Literature

At present, several regional cooperation arrangements exist in Asia, viz. the ASEAN, the SAARC, and the BIMSTEC, and there is an increasing number of subregional economic zones and bilateral free trade agreements. There are several informal cooperation arrangements as well. Most of these existing initiatives of Asian regional integration barely has taken into account the stages of development across countries and the existing complementarities and potentials. As a result, the scale of activity and scope was small. The gains from economic integration with some degree of preferences along natural continental lines such as Western Hemisphere PTA or enlargement of the EC into European Economic Area are found to be substantial (Frankel, Stein and Wei, 1998). Lawrence (1995) also puts forth the case that initiatives for deeper regional integration especially in Europe provide required economies of scale necessary to be competitive. Thus, any comprehensive regional integration effort in Asia based on more pronounced complementarities leads to substantial gains based on the pure economic dimensions of static resource reallocation effects, terms of trade effects, and the dynamic effects of economies of scale and external economies.[4] A regional integration arrangement in Asia can have a much wider scope leading to welfare improvements negating the adverse impact of proliferation in other regional arrangements.

Even though Panagariya (1993) subscribed to a pessimistic view with respect to regionalism in East Asia involving Japan and other East Asian countries, it is evident in the literature that preferential trading arrangement in the ASEAN or in the Asia and Pacific offer potential benefits. Studies find substantial increases in trade in this region,[5] and in particular, the Asia effect is found to be more significant than the effect of PTAs in Western Europe or Western Hemisphere (Frankel, 1997). ESCAP (1998 b) shows a relatively stable trade index for the same region. Agarwala and Prakash (2002) carry the argument forward to a larger economic grouping in Asia and make a case for a formal arrangement on the lines of ASEAN+3. This perception is primarily based on the observation of growing proportion of intra-regional trade for Japan, Korea

and China, which are not involved in any kind of formal regional trading agreement. Even if geographical proximity is found to play a significant role in the success of regional trade (Frankel, Stein and Wei, 1998), similarity in external trade policy followed by Asian countries explains growing intra-regional trade in Asia. Irrespective of whether it is geographical proximity or outward-oriented external sector policies, these evidences build a strong basis for regional integration in Asia. However, the above sets of evidence indicate that the route to regional integration is essentially trade-centric.

The success of a regional integration initiative crucially depends on absorption of cross-border investments. Regional integration by overcoming the market size constraint in developing countries attempts to aid investment inflows and, in turn, adds to the gains through economies of scale, scope and specialization. A regional economy with low intra-regional trade restrictions and high tariff barriers for rest-of-the-world tends to provide enlarged market and thereby plays host to foreign investment.[6] However, it is not global capital, but intra-regional transfers of investment from capital-surplus to capital-deficient countries that assume significance in a regional economic area. Market-friendly policies in terms of low trade and investment barriers within a region provide the facilitating environment for higher intra-regional FDI flows. In addition, granting of national treatment to foreign investors and elimination of differences in national production and product standards are essential ingredients of regional economic integration. Thus, promotion of cross-border investment flows in a regional economic area and, hence the development of regional production systems requires deeper forms of regional integration.

Evidence point to regional integration aiding cross-border investment and financial flows. ESCAP (1998b) and Kumar (2001) point to impressive FDI growth in the Asian region. The East Asian NIEs has also emerged as prominent sources of capital in the region. The surge in intra-regional investment in Asia, mostly in the form of private foreign investment, in the post-1985 period was largely on account of appreciation of yen and the Plaza Accord. In particular, the East Asian investments were directed largely to labour-intensive sectors in the ASEAN countries, reflecting a shift in their comparative advantage. The growing trend in foreign direct investment, as Lawrence (1995) shows, led to informal regional integration in Asia. As a result, as ESCAP (1998b) shows with particular reference to APEC region, countries in the region undergo substantial industrial restructuring. However, in the post-financial crises years, as Kumar (2001) observes, with slow progress of a formal regional integration arrangement

in Asia, the region's share of FDI flows has declined. These dimensions of intra-regional FDI flows make a strong case for a formal regional integration arrangement, which leads to static efficiency gains as well as generates growth potentials within the region.

Going forward, the preferred roadmap to the formation of economic area in Asia is necessarily a market-oriented regional integration leading to significant dynamic gains. ESCAP (1998 a) argues for the necessity initiatives beyond tariff liberalization in order to expand the scope beyond ASEAN-10. The benefits of further trade and investment liberalization are likely to be limited in post-crises Asia (Agarwala and Prakash, 2002). Instead, the dynamic gains under a regional integration arrangement are achieved through technology diffusion and factor (labour) mobility. Such transnational movements of labour and technology aim at expansion of resources and the growth of output in the region rather than the realization of static efficiency gains using existing resources.

The dynamic impact of an open regional integration arrangement is on account of cross-border technology and knowledge transfers. These are primarily trade- and FDI-induced transfers as against arm's-length transactions of acquiring technology resulting from low or non-existent barriers to trade and investment.[7] The theoretical framework by Grossman and Helpman (1991) and the following empirical studies throw light on this aspect. Coe and Helpman (1995), and Coe, Helpmand and Hoffmaister (1997), and Schiff, Wang and Olarreaga (2002) show that there is significant trade-related foreign technology diffusion within North-South as well as South-South countries. In addition, technology transfers take place along with increasing foreign direct investments. The scenario is no different in Asia (Kumar, 1998). Despite its declining importance, arm's length transfers of disembodied technology have taken place on a significant scale from the three major source countries, the USA, the EU and Japan to the respective regional partners. For instance, as Kumar (1998) shows, the largest technological receipt of Japan is from the Asian NIEs. Irrespective of the mode of transfer, technology transfers have benefited the recipient countries in terms of an outward shift in their technology frontier. More substantial dynamic gains to technology recipient countries are in terms of quantum jump in productivity. The dynamic gains from technology transfer are more apparent for countries under regional integration arrangements. For instance, in case of Mexican manufacturing, Schiff and Wang (2003) show that technology embodied in imports from regional trading partners is found to have greater impact on productivity improvements than technology from rest of the world. With emergence of some Asian countries

as innovators and sources of technology (Kumar, 1998), there is a possibility of technology transfer from within the region leading to a positive impact on productivity with significant policy implications for regional integration arrangements.[8]

Cross border movement of labour is the other dimension of factor mobility. Theoretically, labour moves to those areas where it can fetch the highest possible return. In practice, labour moves from economies with surplus labour to labour deficient areas characterized by high wages. In a regionally integrated economy, the pattern is no different. In Asia, the two major labour surplus countries are the Philippines and India with the latter possessing a large pool of skilled manpower. Japan and Malaysia followed by Hong Kong, Korea, Singapore and Thailand are identified as major importers of labour in Asia. Agarwala and Prakash (2002) thus show that some countries in Asia are thus overtly dependent on labour from labour surplus countries and there can be thus gainful exchange of skilled manpower within the region. With liberalization of labour movements under the regional integration arrangement in Asia, as Agarwala and Prakash (2002) perceive, the gains that accrue to the region are likely to be very large given the differences in labour prices and the age-structure of population across Asian countries.

3. Complementarities in Trade in the JACIK

Complementarity lies at the centre-stage of any regional integration arrangement. An exercise on trade complementarities will enable to assess the extent of gains to be realised following a formal regional integration arrangement among JACIK countries. In this section an attempt is made to map out the complementarities in production and trade among JACIK countries. *A priori* it can be said that JACIK countries, being in different stages of industrial development, have significant complementarities in trade.

Merchandise exports grew at high rates in most JACIK countries except Japan during the 1990s (see Table 1). Despite a fall in export growth on account of economic crises during 1997-98,[9] the average rate of export growth for most Asian countries is above 10 per cent during 1991-2000. High export growth evident till the mid-1990s declined sharply during 1996-2000, except in Japan where it revived to around 4.5 per cent. The decline in export growth during this period had been the sharpest in most ASEAN countries and Hong Kong. On the whole, sharp increases in exports from the JACIK region during the period makes it one of the largest exporting regions in the world after EU (15).[10]

Table 1: Growth of Merchandise Exports in JACIK countries, 1991-2000

(in per cent)

Period	India	China	Hong Kong	Singapore	Malaysia
1991-95	14.18	17.33	14.28	16.82	16.43
1996-2000	10.32	13.46	5.28	7.02	10.30
1991-2000	12.25	15.39	9.78	11.92	13.36
	Indonesia	**Thailand**	**S. Korea**	**Japan**	
1991-95	10.08	15.20	12.77	1.41	
1996-2000	8.13	7.72	17.45	4.51	
1991-2000	9.11	11.46	15.11	2..96	

Source: RIS based on UNCTAD and IMF databases.

Underlying the high, but varying, export growth of JACIK countries is the changing structure of exports.

A large proportion of this growing trade from the JACIK countries is within the region (see Table 2).[11] Intra-JACIK trade is substantial at above 50 per cent for most JACIK countries. Intra-JACIK trade for India, Japan, and China has

Table 2: Intra-Regional Trade of JACIK Countries during the 1990s

(in per cent)

	Exports		Imports		Total Trade	
	1992	**2000**	**1992**	**2000**	**1992**	**2000**
Japan	27.56	33.38	27.97	36.75	27.73	34.86
Brunei	82.17	78.55	48.72	69.15	65.67	75.64
Cambodia	73.94	26.73	90.81	75.11	87.77	51.44
China: Mainland	66.67	46.98	50.84	43.44	58.93	45.30
China: Hong Kong	44.43	49.31	67.80	71.71	50.31	60.82
India	20.31	22.67	16.02	29.92	17.92	26.50
Indonesia	58.16	54.64	43.04	48.73	51.42	52.57
S. Korea	38.72	40.63	39.17	39.92	38.95	40.29
Lao P.D.R.	57.28	53.38	86.43	89.52	78.12	75.57
Malaysia	53.32	52.45	55.42	57.14	54.36	54.59
Myanmar	63.03	38.16	80.51	83.42	73.62	63.85
Philippines	31.13	40.30	42.32	48.86	37.81	44.18
Singapore	43.38	52.04	51.06	54.15	47.46	107.46
Thailand	38.72	47.91	51.98	60.49	46.09	53.77
Vietnam	62.37	46.25	52.49	70.66	57.34	59.67

Source: RIS based on IMF database.

contributed to the growth of the region's trade even if their individual share is below the threshold of 50 per cent. The ASEAN countries except Singapore[12] have played a relatively insignificant role in the expansion of JACIK trade. Even though Ng and Yeats (2003) found an increase in share of intra-regional trade in East Asian trade, evidence shows declining share of intra-regional trade for some new ASEAN countries. China's growing dependence on extra-regional countries is also a notable exception.[13] A significant potential thus exists for expansion of intra-regional trade, especially for Japan, Korea, China and India, if these countries are integrated in terms of a regional trade pact. The magnitude of potential increase in intra-regional trade depends, to a large extent, on the items being traded and the complementarities in bilateral export structures.

Manufactures increasingly accounted for exports, estimated to be above 90 per cent in 1999, in most JACIK countries except of India and Indonesia (see Table 3). While Japan and East Asian countries increasingly exported manufactures since the 1960s, it picked up in Southeast Asia and China from around the 1980s. Asian exports of manufactures consisted largely of non-traditional items such as chemicals and machinery and transport equipment.[14] This is much in tune with the recent pattern of growth in world trade.[15] The shares of traditional manufactures such as textiles and clothing and other low-technology manufactures are less in proportion for some JACIK countries like Japan, the first tier NIE's and Malaysia in 1999. For other countries in the region, however, the share of textiles, etc. exports remained relatively high. These latter countries in the JACIK, thus, export standard technology products as well as those with technology of recent vintage.[16] However, India's changing export commodity composition did not conform to any other JACIK countries.[17]

The above evidence provide ample indications on the differing pattern of comparative trade advantage across Asian countries in the late 1990s. Table 4 shows that Malaysia and Singapore have comparative advantage in a narrower range of products as compared to other JACIK countries. While Japan, Korea, Singapore, and Malaysia have revealed comparative advantage in proportionately larger number of machinery and transport equipment exports, other countries in the region have advantage in relatively more number of such traditional exports as textiles, leather and gems and jewellery. India, Indonesia and China are also found to reveal comparative advantage in chemicals exports. The above pattern has emerged with shifting comparative advantage within the region.[18] In the process, new industries with advantage replaced old ones in each country and the replaced industries have moved cross-borders resulting in

Table 3: Structure of Exports of JACIK Countries during 1990s

(in per cent)

	Japan		S. Korea		China		Hong Kong		India	
	1995	1999	1995	1999	1995	1999	1995	1999	1995	1998
Agriculture	0.2	0.3	1.4	1.1	4.5	3.2	1.1	1.0	10.2	10.6
Manufacturing	99.7	99.6	98.5	98.7	92.0	94.7	98.0	98.0	71.9	72.3
Food, Bev, Tobacco	0.4	0.4	1.2	1.1	5.1	3.6	2.5	1.7	9.6	8.0
Textiles	1.8	1.7	16.8	13.2	31.1	27.2	26.6	25.7	31.1	32.1
Wood & Paper Products	0.7	0.7	1.2	1.5	1.7	1.6	2.2	2.5	0.6	0.5
Chemicals	10.2	10.5	12.4	14.3	10.6	10.6	11.7	9.9	11.7	11.2
Non-metal minerals	1.3	1.1	0.6	0.6	2.0	1.9	1.0	0.7	1.2	1.0
Basic metals	5.0	4.3	5.4	5.6	5.0	3.1	2.5	2.2	3.8	3.2
Metal Manufactures	77.0	75.8	58.9	60.7	29.1	39.3	41.3	44.8	10.2	10.4
Machinery & Transp. Eq	70.1	68.5	52.7	54.2	21.0	30.1	32.3	34.8	7.5	7.1
Other Manufactures	3.3	5.1	1.9	1.6	7.5	7.5	10.2	10.5	3.8	5.9
	Malaysia		**Indonesia**		**Thailand**		**Philippines**		**Singapore**	
	1995	**1999**	**1995**	**1999**	**1995**	**1999**	**1995**	**1999**	**1995**	**1999**
Agriculture	4.5	2.5	11.3	8.2	11.4	7.1	5.7	2.5	2.0	1.2
Manufacturing	89.6	91.9	62.5	67.9	86.0	91.2	92.2	97.0	97.6	98.5
Food, Bev, Tobacco	8.5	7.2	4.8	5.7	12.8	12.5	8.2	2.4	2.7	2.0
Textiles	4.9	4.1	17.5	17.2	15.0	11.5	9.1	4.7	2.7	2.3
Wood & Paper Products	5.7	3.8	14.2	12.5	1.8	2.1	1.5	0.7	1.4	1.2
Chemicals	5.7	5.7	8.3	9.2	10.1	9.1	3.4	1.8	14.0	17.3
Non-metal minerals	0.8	0.7	0.8	1.4	1.3	1.7	0.6	0.4	0.5	0.3
Basic metals	1.7	1.7	3.0	2.9	1.1	1.5	3.0	1.0	2.4	1.5
Metal Manufactures	59.4	66.7	11.9	15.3	38.3	46.8	25.1	33.5	70.3	72.0
Machinery & Transp. Eq	55.1	62.3	8.4	10.8	33.6	41.9	22.2	31.7	65.6	66.2
Other Manufactures	2.8	2.0	2.0	3.8	5.5	6.0	41.2	52.3	3.6	1.9

Source: RIS based on UNCTAD database.

Table 4: Frequency of Revealed Comparative Advantage in JACIK Countries, 1998

	Korea	Singapore	Hong Kong	Indonesia	Thailand	Malaysia	India	China	Japan
Chemicals	4(12.1)	2(10.5)	2(5.3)	10(28.6)	3(7.7)	1(7.1)	8(21.6)	6(12.8)	2(5.1)
Machinery and Transport Equipments	11(33.3)	12(63.2)	9(23.7)	7(20.0)	15(38.5)	9(64.3)	2(5.4)	11(23.4)	28(71.8)
Textiles, Leather, Gems & Jewellery	8(24.2)	1(5.3)	19(50.0)	16(45.7)	17(43.6)	3(21.4)	20(54.1)	20(42.6)	0(0.0)
Iron and Steel	5(15.2)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	6(16.2)	2(4.3)	3(7.7)
Other Manufactures	5(15.2)	4(21.1)	8(21.1)	2(5.7)	4(10.3)	1(7.1)	1(2.7)	8(17.0)	6(15.4)
Total	33	19	38	35	39	14	37	47	39

Note: Figures in the parentheses show the percentage of the total.
Source: RIS based on UNCTAD database.

a flying geese formation in Asia.[19] The evolving pattern of advantage across countries, *prima-facie*, is indicative of the presence of complementarities in export advantage in the JACIK.

In what follows is a measurement of complementarity in industry and trade of JACIK countries. Often complementarity in trade structures is established in terms of a cosine measure, *a la* Linnemann (1966). Other studies, such as Drysdale (1988) and Ng and Yeats (2003) suggested an alternate measures of trade complementarity. In this exercise, another measure of bilateral complementarity is attempted at in terms of Spearman rank correlation coefficient calculated between RCA index of different commodities for a pair of JACIK countries. A negative rank correlation would signify complementarity in trade structures and vice versa.[20]

Table 5 shows that Japan has negative rank correlation coefficient with most other JACIK countries, while India's exports are complementary with two JACIK countries other than Japan. These results for Japan and India make sense in the context of the distinct structure of their respective exports and comparative advantage. The rank correlation coefficients are, however, found to be positive for Korea, ASEAN countries and China. The positive correlation coefficient indicates that these countries tend to compete with each other in third country markets and there might be a limit to which bilateral trade can be realised among these Asian countries.[21]

The above result on complementarity is not surprising as most of the JACIK countries, over time, have tried to create an export niche in medium and high technology items. The incidence of low rank correlation coefficients is indicative of the insignificance of a similar pattern of export advantage across countries. For instance, as is evident from Table 5, the structure of advantage weakly match between Singapore and Korea, China and Singapore, China and Indonesia, Japan and Malaysia or India and Thailand. The existing complementarities in export advantage would undoubtedly lead to gains from intra-regional trade. However, on the balance, due to limited trade complementarities, intra-JACIK trade has not manifested its full potential. The potential gains from intra-regional trade will be substantially larger if JACIK countries are able to recreate their respective export niche. Further, any regional trading arrangement in JACIK will expand the scope of such gains.[22] This is possible especially when factor endowments such as human capital investment and technology differ across countries in the region. Possibilities of strengthening complementarities in the

Table 5: Rank Correlation Matrix of RCA Index of Merchandise Exports in Some JACIK Countries

1992	Korea	Singapore	Hong Kong	India	Indonesia	Thailand	Malaysia	China	Japan
Korea	1.00								
Singapore	0.22	1.00							
HKong	0.42	0.39	1.00						
India	0.18	-0.27	0.25	1.00					
Indonesia	0.46	0.21	0.62	0.50	1.00				
Thailand	0.39	0.41	0.71	0.22	0.60	1.00			
Malaysia	0.39	0.56	0.47	-0.07	0.44	0.60	1.00		
China	0.45	0.12	0.60	0.50	0.67	0.52	0.42	1.00	
Japan	-0.05	0.43	-0.14	-0.54	-0.35	-0.20	0.10	-0.40	1.00
1995	**Korea**	**Singapore**	**Hong Kong**	**India**	**Indonesia**	**Thailand**	**Malaysia**	**China**	**Japan**
Korea	1.00								
Singapore	0.17	1.00							
HKong	0.42	0.37	1.00						
India	0.13	-0.27	0.26	1.00					
Indonesia	0.41	0.20	0.65	0.44	1.00				
Thailand	0.31	0.33	0.74	0.19	0.59	1.00			
Malaysia	0.31	0.57	0.45	-0.12	0.42	0.54	1.00		
China	0.41	0.07	0.59	0.46	0.62	0.51	0.28	1.00	
Japan	0.06	0.44	-0.15	-0.54	-0.24	-0.23	0.16	-0.36	1.00
1998	**Korea**	**Singapore**	**Hong Kong**	**India**	**Indonesia**	**Thailand**	**Malaysia**	**China**	**Japan**
Korea	1.00								
Singapore	0.17	1.00							
HKong	0.35	0.36	1.00						
India	0.16	-0.28	0.17	1.00					
Indonesia	0.38	0.31	0.60	0.36	1.00				
Thailand	0.32	0.41	0.76	0.12	0.61	1.00			
Malaysia	0.30	0.61	0.44	-0.18	0.42	0.51	1.00		
China	0.31	0.12	0.60	0.34	0.51	0.54	0.32	1.00	
Japan	0.15	0.38	-0.20	-0.38	-0.16	-0.16	0.21	-0.33	1.00

Source: RIS based on UNCTAD database.

pattern of export advantage through export-oriented FDI, transnationalisation of production within the region, technology acquisition and specialisation have to be explored.

A caveat exists in the above analysis. The analysis on export advantage done using trade data at 3-digit SITC level of disaggregation can be inadequate in capturing the nuances of trade complementarity existing in the region. Trade within each 3-digit commodity group among these JACIK countries is a possibility with widespread existence of splitting up of commodity value chain across borders. This phenomenon of complementarily might not get adequately captured at this level of data disaggregation. Further disaggregated trade data might qualify the results on the observed pattern of complementarities in trade structures across JACIK countries.

4. Patterns of Intra-JACIK Foreign Direct Investment Flows: Do Complementarities Exist?

Global FDI flows grew at over 25 per cent during the 1990s, which is much higher than the average growth of exports during the same period.[23] In this phase of globalisation, the Asian developing countries increasingly played hosts to rising global FDI flows.[24] Of these, the JACIK countries accounted for a substantial proportion (see Table 6). Figure I shows, barring fluctuations after the Asian crises during late 1990s, FDI inflows to JACIK region increased from

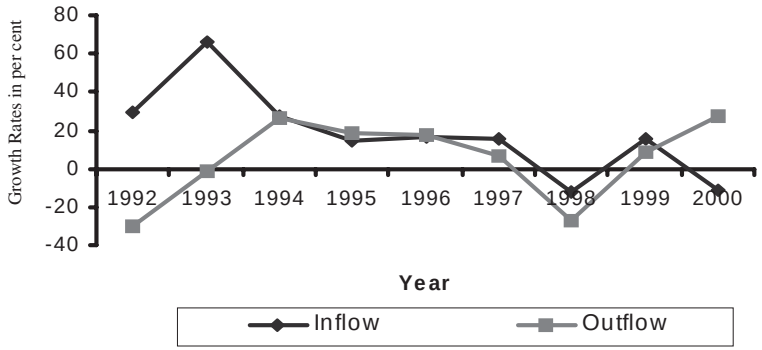
Table 6: Total FDI Flows into/ from JACIK, 1991-2000

(in US $ million)

	Inflows		Outflows	
	Total	As % of Asian Total	Total	As % of Asian Total
1991	20831 (13.1)	83.8	35091 (17.7)	89.0
1992	26979 (15.3)	83.3	24657 (12.3)	68.2
1993	44766 (20.4)	81.5	24245 (09.8)	53.5
1994	57033 (22.3)	82.0	30711 (10.9)	57.3
1995	65093 (19.7)	86.4	36382 (10.2)	57.2
1996	76163 (19.8)	80.6	42703 (10.9)	56.7
1997	88024 (18.3)	78.4	45657 (09.6)	60.7
1998	77394 (11.3)	75.0	33161 (04.9)	62.6
1999	89591 (08.3)	73.9	36029 (03.3)	58.0
2000	79323 (05.7)	52.7	45912 (03.8)	39.7

Note: Figures in the parentheses are percentages of global FDI flows.
Source: RIS based on UNCTAD database.

Figure I: Growth of FDI Flows in the JACIK Region



Source: RIS based on UNCTAD database.

US $20.8 billion in 1991 to US $79.3 billion in 2000. As emerging home countries of FDI,[25] outflows from the JACIK increased from US $35.1 billion to US $45.9 billion during the same period. A sharp downturn after 1997 notwithstanding, growth of FDI outflows from the region during 1999 and 2000 is most striking, especially when inflows continued to fluctuate. A changing pattern of FDI inflows in the Asian countries is thus observed during the 1990s [see Kumar (2001) for a detailed exposition on this issue]. Further, as will be seen later, a significant proportion of FDI flows has originated in the JACIK region with the emergence of these countries as new sources of global capital.

With respect to FDI flows, there are inter-country variations within the JACIK. While the importance of Japan as an FDI host declined, China's share improved among the Asian countries in the early 1990s. Since then, however, China has not been able to maintain its share. The share of Asian NIEs, viz. South Korea, increased almost throughout. Despite a decline in the share following the Asian crises, the ASEAN countries also remained important hosts of FDI in the 1990s. Even though FDI into India grew, the share continued to remain below 1 per cent. On the other hand, Hong Kong, Taiwan, Singapore, China, South Korea and Malaysia remained major home countries of FDI in the 1990s.[26] This is in addition to Japan being an important source of FDI in Asia since the 1960s, when it liberalised its FDI policy.[27] For India, despite an increasing evidence of investment in some ASEAN countries, the country has remained an insignificant source of global capital.

In tune with the changing relative importance of the source countries with regionalization of FDI worldwide, it also changed within the JACIK. FDI flows into the JACIK, to a large extent, were increasingly sourced from within the region. While China and Thailand hosted relatively higher proportion of their total FDI from within the region, India, in sharp contrast, was the host to much lower proportions of regional investments (see Table 7 and Figure II). However, the proportion of intra-regional flows declined for most JACIK countries except Malaysia and India during the 1990s. The extent of intra-JACIK FDI outflows was also substantial and growing (see Table 7 and Figure III), which is after a decade of moderate but steady growth till the mid-1980s.[28] Figure III also shows, despite remaining low, Japanese investments to other Asian countries were in rising proportions. The rising trend of intra-regional investments was also evident across most JACIK countries. Even though small in magnitude, the intra-regional FDI outflows from India were found to be rising, the destinations being the ASEAN in particular.

The JACIK countries, thus, have depended on investment more from within the region and, capital surplus and relatively more developed JACIK countries have tended to invest by relocating production across the border within the region. Evidence also point to capital outflows from these Asian countries being primarily directed to large trading partner countries. Kumar (1998c, 2001a) argue that this emerging trend of outward foreign investment from developing Asia is a tool adopted to improve competitiveness in major markets. All these observations do indicate complementarities in foreign direct investment among the JACIK countries. These emerging trends tend also to show better prospects of intra-regional investment flows with a formal regional integration agreement in Asia. With the assessment of higher FDI flows within the JACIK region, industrial restructuring and emergence of newer comparative advantage are likely outcomes.

Cross border investments and consequent relocation of industries across borders take advantage of international factor price differentials, liberal policy environment and regional integration arrangements. Such restructuring of industries in developing countries is irrespective of whether FDI is market seeking or export-oriented. In instances of export-oriented FDI, the relocated firms export either to the home country or to third countries leading to higher intra-industry and intra-firm trade. Thus, FDI flows often lead to complementarities in production and trade. With rising volume of cross-border investments within the JACIK region, there were changes in geography of

Table 7: Intra-Regional FDI Flows of JACIK Countries

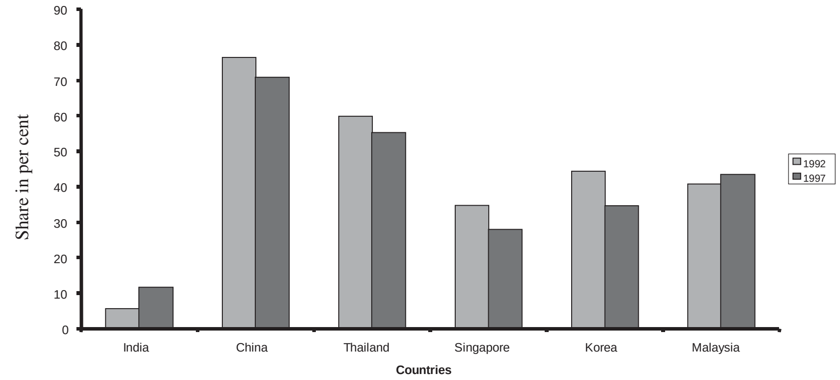
(in per cent)

	Japan		S. Korea		China		Singapore		India	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
1990	—	11.47	51.90	—	72.07	17.25	33.98	44.96	4.88	—
1991	—	13.16	46.75	—	72.36	13.80	32.91	43.85	5.57	—
1992	—	17.62	44.29	—	76.32	15.34	34.73	46.82	5.55	10.13
1993	—	17.53	43.52	—	77.18	16.08	33.72	49.50	8.06	—
1994	—	22.63	42.97	—	76.15	16.57	33.10	54.61	10.09	—
1995	—	22.90	42.53	43.07	74.66	18.27	32.19	55.22	11.55	—
1996	—	22.96	41.67	42.54	72.75	—	31.52	52.24	—	—
1997	—	21.11	34.46	42.76	70.70	—	27.95	47.67	—	—
1998	—	15.18	31.34	42.53	—	—	—	—	—	—
1999	—	10.28	—	—	—	—	—	—	—	—

	Thailand		Malaysia		Philippines		Indonesia	
	Inflow	Outflow	Inflows	Outflows	Inflow	Outflow	Inflow	Outflow
1990	58.85	53.57	44.37	64.36	22.73	—	—	—
1991	60.34	53.35	46.93	64.69	27.39	—	—	—
1992	59.77	53.68	40.60	63.44	30.49	—	53.55	—
1993	56.57	54.82	40.91	59.24	24.78	—	52.15	—
1994	55.94	57.05	40.36	58.17	28.28	—	49.03	—
1995	55.33	56.18	41.18	58.26	34.21	—	51.49	—
1996	54.45	60.26	43.93	54.78	36.60	—	—	—
1997	55.18	60.34	43.32	52.32	37.81	—	—	—
1998	—	—	—	50.78	36.76	—	—	—

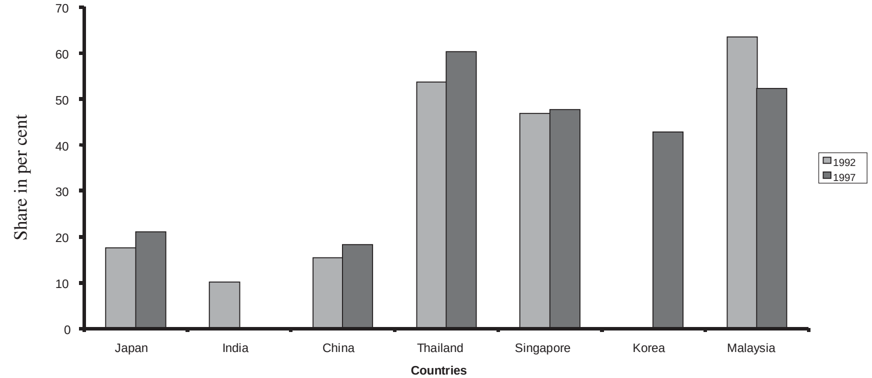
Source: RIS based on UNCTAD data.

Figure II: Intra-Regional FDI Inflows in Some JACIK Countries



Source: RIS based on Table 10.

Figure III: Intra-Regional FDI Outflows in Some JACIK Countries



Source: RIS based on Table 10.

production facilitating significant industrial restructuring across countries. Recent data on industrial production growth in these countries provide evidence on this.

Industrial growth rates varied across JACIK countries during the 1990s. The moderate to high growth in index of industrial production till the mid-1990s in some countries of developing Asia turned negative in 1998. Table 8 shows that industrial growth recovered thereafter. There are, however, two exceptions to this pattern: while Japan's industrial growth remained low or

Table 8: Growth in Index of Industrial Production in Some JACIK Countries

(in per cent)

	Japan	India	Korea	Indonesia	Thailand	Singapore
1991	2.00	-1.00	10.00	11.00	10.00	5.00
1992	-5.88	2.02	5.45	10.81	10.00	2.86
1993	-5.21	6.93	4.31	11.38	7.44	10.19
1994	1.10	8.33	10.74	17.52	6.92	12.61
1995	3.26	14.53	12.69	11.18	8.63	10.45
1996	2.11	7.46	7.95	6.70	7.95	3.38
1997	4.12	6.25	4.29	13.09	0.00	4.58
1998	-6.93	4.58	-6.47	-36.57	-10.43	-0.63
1999	0.00	6.88	25.16	1.46	12.33	13.84

Source: RIS based on UNIDO database.

negative through the decade, India's industrial growth remained positive during the crises years. Along with changing growth path, the industrial structure of most JACIK countries changed through the 1990s. The industrial structure of Japan, which essentially comprised of high technology manufactures, has been restructured towards production of more services in the 1990s (Ono, 2001). The emerging pattern of industrial restructuring in Japan thus differs from other JACIK countries.

In the process of industrial restructuring, with scarcity of labour and rising wage cost, Japanese corporations attempted to rationalize by relocating production to East Asian countries and subsequently to Southeast Asian countries. In particular, China and Malaysia have emerged as major hosts of export-oriented investments by Japanese MNEs. High FDI growth in JACIK during the 1990s deepened the process of corporate consolidation and carried forward the process of restructuring of industries in these economies. Relocation of production and consequent industrial restructuring evolved into similar industrial structures across most JACIK countries.[29] Such industrial restructuring is quintessentially in terms of splitting commodity value chain across borders, identifying and refocussing on core competencies, increasing the strategic alliances between corporations, vertical specialization instead of horizontal national operations, among others (see Kumar, 2001a). All these led to rise in Asian MNE operations. In what follows, we provide an account of the contours of industrial restructuring and emerging production complementarities in these countries following movements of investments cross-borders.

Table 9 shows that industrial production of most other JACIK countries predominantly comprised of food, beverages and tobacco; manufactures of textiles and leather; chemicals; and machinery and equipment. In particular, machinery and transport equipment accounted for a high proportion of total manufacturing value-added with its share rising in most of these countries except India and Korea. In particular, Thailand, Malaysia and China diversified to the production of electronic items,[30] while Singapore and India have witnessed significant growth in IT industries.[31] Transport equipment emerged as the fastest growing segment in India supported by the growth of the auto components sub-sector. Evidence shows large share of chemicals in total manufacturing in some of these countries. The emergence of chemicals industries in Singapore, Indonesia and India is worth mentioning.[32] Similarly, in China, chemicals has emerged predominant and one of the most dynamic sectors (Lemoine, 2003). In India, the phenomenal growth of pharmaceuticals production and exports has

Table 9: Structure of Manufacturing Value-added in Some JACIK Countries

(in per cent)

	Korea		China		Hong Kong	
	1992	1999	1992	1999	1992	1999
Food, Bev., & Tobacco	10.59	8.84	—	15.51	10.09	9.91
Textiles & Leather Products	13.28	8.41	—	11.45	34.68	22.17
Wood & Paper Products	6.97	5.43	—	4.59	11.03	17.88
Chemicals	17.18	17.47	—	19.00	0.00	6.94
Non-metallic Mineral Products	5.43	3.93	—	6.03	0.00	4.22
Metal & Metal Products	12.21	10.56	—	12.17	6.80	4.05
Machinery, Transport and other equipments	32.95	38.63	—	29.91	26.33	31.77
Other Manufactures	1.38	1.72	—	1.36	3.34	3.60
	The Philippines		**Indonesia**		**Malaysia**	
	1992	**1998**	**1992**	**1999**	**1992**	**1997**
Food, Bev., & Tobacco	31.33	23.15	25.09	19.69	10.71	8.37
Textiles & Leather Products	9.92	6.77	16.60	19.58	5.98	4.89
Wood & Paper Products	5.95	4.11	15.27	13.08	11.06	10.63
Chemicals	26.71	19.79	14.44	16.50	21.07	19.63
Non-metallic Mineral Products	4.52	3.89	3.79	0.03	5.54	5.55
Metal & Metal Products	5.92	3.18	9.83	6.78	7.96	7.40
Machinery, Transport and other equipments	14.66	22.97	13.98	17.45	36.30	42.80
Other Manufactures	0.99	1.61	0.99	2.58	1.38	0.74
	India		**Singapore**		**Thailand**	
	1992	**1998**	**1992**	**1999**	**1992**	**1998**
Food, Bev., & Tobacco	11.39	13.78	4.37	2.95	—	24.81
Textiles & Leather Products	12.57	10.84	2.64	0.85	—	12.36
Wood & Paper Products	3.95	2.88	7.33	4.63	—	3.35
Chemicals	27.42	30.95	19.35	22.92	—	5.97
Non-metallic Mineral Products	4.49	3.32	2.06	1.44	—	11.43
Metal & Metal Products	13.28	14.85	7.71	5.45	—	3.26
Machinery, Transport and other equipments	26.20	22.05	55.79	60.97	—	24.43
Other Manufactures	0.69	1.32	0.74	0.80	—	3.90

Source: RIS based on UNIDO database.

led to the emergence of chemicals as a predominant manufacturing sub-sector.[33] High share of metal and metal manufactures was also evident in Korea, China and India. While the share of 'metals and manufactures' has lowered for Korea of late, it remained relatively high in China and India.

The pattern of growth of labour-intensive industries stands in contrast to the emergence of knowledge-based industries across these countries. The share of textiles and leather manufactures was either low or declining for most JACIK countries during the 1990s indicating phasing out of relatively labour-intensive production of textile and leather manufactures (Table 9). The share of food, beverages and tobacco has declined in most JACIK countries except China.[34] Nonetheless, agribusiness has remained predominant in Indonesia and the Philippines.

With cross-border investments, the industrial sector restructured across Asian countries and newer comparative advantage emerged. Similar industrial structures emerged across Asian countries and left little room for complementarity in manufacturing production.[35] However, such analyses in terms of broad manufacturing sub-sectors need not accurately capture the nuances of industrial restructuring resulting from the splitting of the value chain and vertically integrated production structure across borders. Further, as some of these countries have diversified to the production of large range of services, so an analysis of complementarity has to take into account this emerging sector along with manufacturing. Deeper understanding of the process shows that the extent of industrial restructuring has varied across JACIK. While Japan's industrial structure changed towards services, Singapore has moved fast towards knowledge-based industries. However, Korea and China continue to exploit manufacturing opportunities by producing more value-added products rather than diversifying to knowledge-based industries as in other JACIK countries.[36] India has diversified towards knowledge-based industries, but the spread of industrial restructuring was relatively lower in India than in other JACIK countries. This might be on account of lower levels of cross-border investment flows in India. The home countries, through outward investment and relocation of industries across border, have undergone significant industrial restructuring. For instance, the Korean industry has used Southeast Asian countries as export platform for relocating production and in the process, the Korean industry has significantly restructured itself.[37]

Further, the gains in terms of export expansion may not be automatic even with FDI inflows from within the region. Evidence show that despite FDI being

export-oriented, multinational enterprises are selective about relocating export-oriented investments (Kumar, 1998 a). As a result, inter-country distribution of export-oriented FDI inflows is highly uneven. For instance, Japanese investments in India are often not export-oriented even they were so in other Asian countries.[38] Nonetheless, formal economic integration in the JACIK is expected to aid higher volumes of intra-regional FDI flows, improve complementarities in industrial structure and export advantage, and generate potentials for higher growth potentials. The gains from regional integration will be higher depending on technology transfers and cross-border movements of availability of manpower.

5. Establishing Complementarities in Technology and Skills in the JACIK

Apart from arm's length purchases, technology – often frontier technology – comes bundled with FDI inflows. Such technology spillovers of foreign capital lead to gains in host countries. Irrespective of the mode, technology transfers take place from technology endowed countries to those that do not possess technological capability. While acquiring technological capability requires a facilitating science and technology policy environment with a strong patent regime, technology importing countries require an enabling environment for transfer of technology and its consequent adaptation. For generation as well as diffusion of technology, skilled manpower is essential. Like technology, skilled labour also moves from skill surplus economies to the skill deficient ones provided services trade policies in general, and outsourcing laws in particular, are liberal and immigration rules are flexible. In a regionally integrated area, with the adoption of a liberal policy framework, technology transfer and cross border movement of manpower take place at a greater ease. The JACIK combines economies with varying endowments of technology and skilled human resources. Gainful transfers of technology and exchange of manpower among these countries can result in fundamental changes in terms of knowledge intensity of production and exchange.

An analysis of cross-country technological capability and skill endowment is often not possible on account of lack of comparable data across countries. Alternate measures of technological capability and stock of skill are used for such analysis. In the absence of data on technological balance of payments across countries in the JACIK,[39] technology and skill-related data are obtained from the US National Science Foundation and US Patent and Trademark Organization database. Meaningful comparison across JACIK countries is done by benchmarking indicators with respect to the US data.

On the technology front, JACIK has a growing technology generation capability measured in terms of R&D intensity and proportion of US patents. Its share of US patents rose from about 14 per cent in the pre-1988 period to about 22 per cent in 2001. However, technological capability varies across countries. Japan is the major source country of scientific and technological innovations in the region with high R&D intensity as well as ownership of US patents (see Tables 10 and 11). R&D expenditure as a proportion of Gross National Income for Japan is above 2.8 per cent and the country's patents account for about 20 per cent of total US patents during the 1990s. This is much higher than for any other countries in the JACIK.

Some other JACIK countries have also emerged as important sources of technology during the 1990s. Korea has shown significant improvements in terms of rising R&D intensity and ownership of US patents during the 1990s. Korea's R&D intensity rose from 1.87 per cent in 1990 to about 2.7 per cent in 1997. Evidence shows improvements in these indicators for China PRC, Hong Kong, India, and Singapore, but to a much lesser extent. While Singapore's R&D intensity was high during the period, that for China and India was found to be growing. All these countries also showed growing innovative capacity in terms of rising share total US patents (see Table 11). However, ASEAN countries except Singapore lack significant innovative capacity, and thus, remain dependent largely on foreign technology. These Southeast Asian countries are perhaps at the lower end of the technology generation chain. Despite an increase in the number of US patents during the 1990s, India continued to depend on imported technology in a big way for product and process upgradation.

An understanding of the process of acquiring technological capability in a JACIK country such as Singapore will be insightful. Singapore's tryst with technological capability began with the introduction of National Technology Plan in 1991, when the country depended on FDI for introducing advanced technology and know-how. This Plan gave thrust to R&D in private sectors and a human resource plan to complement the needs of technology development. In 1995, Innovation Programme was introduced to enhance awareness for innovation among firms, expand infrastructure for the purpose and introduce a national system of innovation. As a result, private sector contributed a significant proportion to the gross expenditure on R&D in Singapore, which remained concentrated primarily in sectors like electronics, IT and communications, chemicals, biotechnology and medicines. Along side, the National Science and Technology Board was building knowledge infrastructure through research

Table 10: Research and Development Expenditure as Percent of GNI

	Japan	Korea	China	India	Singapore	Malaysia	Thailand
1990	..	1.87	..	0.74	..	..	..
1992	2.86	2.03	..	..	..	0.39	..
1995	2.87	2.51	0.70	0.64	1.13	..	0.13
1997	2.80	2.70	..	..	..	..	0.10

Source: RIS based on World Bank database

Table 11: Trends in JACIK Ownership of US Patents, 1990-2001

Country	Pre-1988	%	1988-90	%	1991-95	%	1999-01	%
U.S.	456779	59.15	152465	53.24	306656	55.56	519809	55.39
Japan	109346	14.16	58838	20.55	115365	20.90	180695	19.25
S. Korea	341	0.04	599	0.21	4113	0.75	17808	1.90
Hong Kong	668	0.09	389	0.14	1018	0.18	2462	0.26
Singapore	52	0.01	46	0.02	224	0.04	1031	0.11
China P.R.	48	0.01	148	0.05	257	0.05	730	0.08
India	123	0.02	52	0.02	144	0.03	603	0.06
Thailand	15	0.00	9	0.00	39	0.01	149	0.02
Indonesia	17	0.00	9	0.00	32	0.01	54	0.01
Malaysia	27	0.00	10	0.00	67	0.01	225	0.02
Philippines	56	0.01	20	0.01	25	0.00	92	0.01
Brunei	1	0.00	0	0.00	0	0.00	1	0.00
Vietnam	0	0.00	0	0.00	0	0.00	3	0.00
Myanmar	2	0.00	0	0.00	0	0.00	1	0.00
JACIK	110696	14.33	60120	21.00	121284	21.98	203854	21.72
Total	**772237**		**286349**		**551902**		**938441**	

Note: Patents granted during the period, and percentage share in US total.
Source: RIS based on USPTO database.

centres, joint ventures in R&D, manpower training etc. Eventually Singapore focused on the development of information technology and position itself as an IT hub in the Asia-Pacific region.[40] Similarly, Singapore has also emerged as a hub of biotechnology through a National System of Biotechnology Innovation.[41]

On the whole, a sharp divide is noticed in case of technology generation in JACIK countries. While Japan, Korea, Hong Kong and Singapore are technologically capable countries, China and India have acquired technological capability in certain key areas. Most ASEAN countries, on the other hand, lack technological capability. The brief on Singapore shows that alliances among firms and between firms and R&D institutions have become critical in the development of frontier technology. However, Singapore's case of technology acquisition is unlikely to be feasible in many JACIK countries due to large investments involved. Technology transfers can thus take place within the JACIK from technologically endowed countries such as Japan, Korea and Singapore, or even China and India. Within the framework of a formal regional integration arrangement in the JACIK, some ASEAN countries can gain by acquiring transferred technology from across the border. China and India can also benefit from technology transferred by other JACIK countries.

The demand for skills in the JACIK countries has gone up in tune with acquiring technological capability and industrial restructuring towards knowledge based industries. Despite a growth in the stock of manpower in the JACIK region during the 1990s, its distribution across countries remained however skewed. While some JACIK countries are rich in skilled human resources, others lack human resources for technology generation and also for putting acquired technology to use. Stock of manpower measured in terms of doctorates earned by each of these Asian countries brings out this contrast. Table 12 shows evidence that China, Korea and India account for larger number of Asian doctorates in the fields of science and engineering, especially natural sciences. It is also evident that generation of skills in terms of earning a doctorate in the US is in relatively lower proportions for ASEAN economies. Among these graduates from the US universities, larger proportions of Chinese and Indians have plans to stay back in the US. Thus, China and India can be identified as sources with relatively plentiful skills in the fields of science and engineering in comparison to other JACIK countries like Japan, Korea and Singapore that are relatively major sources of technology generation. This indirect measure of stock of skill across countries shows the possibility of outmigration of manpower from skill surplus countries to the deficient ones.

Table 12:An Indicator of Asian Skills: Asian doctoral recipients (from U.S. universities) who plan to stay in United States, 1991–99

Region/country of origin	1991 Total Ph.D.	1991 Firm plans to stay (%)	1993 Total Ph.D.	1993 Firm plans to stay (%)	1995 Total Ph.D.	1995 Firm plans to stay (%)	1997 Total Ph.D.	1997 Firm plans to stay (%)	1999 Total Ph.D.	1999 Firm plans to stay (%)
All fields										
East/South Asia	6,181	36.4	7,063	33.1	7,922	35.2	6806	45.3	6,081	49.0
China	1,939	47.7	2,430	44.4	2,992	44.9	2480	56.3	2,400	59.7
Taiwan	1,321	27.8	1,456	20.9	1,485	19.7	1251	32.3	981	32.6
Japan	164	27.4	182	23.6	233	29.6	218	33.0	238	30.7
South Korea	1,396	20.4	1,409	16.7	1,306	18.7	1110	24.8	1,017	34.5
India	924	56.1	1,139	50.7	1,425	52.4	1427	59.4	1,077	64.8
Other	437	25.2	447	22.4	481	20.0	320	26.9	368	28.8
S&E fields										
East/South Asia	5,224	37.9	5,935	34.7	6,688	37.2	5764	48.1	4,957	52.5
China	1,809	47.8	2,240	45.1	2,763	45.1	2290	57.0	2,187	60.5
Taiwan	1,123	30.3	1,213	23.2	1,240	22.2	1025	36.1	732	36.7
Japan	125	28.0	132	20.5	155	31.0	149	32.9	156	34.6
South Korea	1,107	22.0	1,118	18.0	1,000	21.0	842	29.2	738	40.2
India	752	54.3	932	49.6	1,206	52.4	1211	59.5	888	64.6
Other	308	28.9	300	24.7	324	22.5	247	32.4	256	33.6
Natural sciences										
East/South Asia	2,589	45.7	3,006	43.1	3,427	44.3	3009	54.2	2,687	56.9
China	1,238	53.0	1,516	49.7	1,807	48.9	1513	59.2	1,460	60.4
Taiwan	421	36.1	514	31.9	502	27.9	474	46.4	322	45.0
Japan	46	37.0	48	31.3	51	37.3	37	54.1	54	42.6

Table 12 continued

Table 12 continued

Region/country of origin	1991 Total Ph.D.	1991 Firm plans to stay (%)	1993 Total Ph.D.	1993 Firm plans to stay (%)	1995 Total Ph.D.	1995 Firm plans to stay (%)	1997 Total Ph.D.	1997 Firm plans to stay (%)	1999 Total Ph.D.	1999 Firm plans to stay (%)
South Korea	422	31.3	402	31.1	414	35.5	341	43.1	314	53.5
India	304	57.2	382	52.4	499	56.3	515	57.3	406	63.8
Other	158	32.3	144	27.8	154	30.5	129	41.9	131	38.9
Social sciences etc.										
East/South Asia	649	24.0	748	21.7	820	23.2	692	28.0	649	34
China	88	35.2	179	34.1	177	39.0	140	49.3	144	56
Taiwan	105	23.8	107	12.1	122	7.4	118	13.6	108	11
Japan	50	24.0	61	18.0	74	33.8	75	30.7	72	31
South Korea	251	13.1	232	5.6	242	7.0	200	13.5	160	18
India	91	47.3	102	52.0	135	43.7	109	47.7	114	60
Other	64	18.8	67	16.4	70	15.7	50	14.0	51	24
Engineering										
East/South Asia	1,986	32.3	2,181	27.4	2,441	31.9	2063	45.8	1,621	52.6
China	483	36.9	545	36.1	779	37.9	637	53.5	583	61.9
Taiwan	597	27.3	592	17.7	616	20.5	433	30.9	302	37.1
Japan	29	20.7	23	4.30	30	13.3	37	16.2	30	30.0
South Korea	434	18.0	484	13.00	344	13.4	301	23.9	264	37.9
India	357	53.5	448	46.70	572	51.0	587	63.5	368	67.1
Other	86	30.2	89	25.80	100	15.0	68	27.9	74	31.1

***Source*:** RIS based on US National Science Foundation database.

The movement of skilled human resources from the JACIK countries can be identified from the pattern of obtaining H1-B visa in the US economy in 2000. A significant proportion of H1-B US visas acquired was by residents of the JACIK countries (see Table 13). Evidence points to inter-country variations. Among the JACIK residents, it is evident that the Indians have acquired the largest proportion of US H1-B visa. The residents of China, the Philippines, Korea have also acquired relatively higher number of visas.

The skill distribution of this pattern of outmigration from JACIK countries is skewed. Most of these migrants are service related rather than in manufacturing. Computer, and managerial professionals account for about 80 per cent of the JACIK residents who have acquired US H1-B visa. However, the above information on all JACIK countries conceals more than it reveals. It is to be noted that skilled Indians acquiring US visa are qualitatively different from other JACIK countries. Most Indians who get a US visa are computer professionals (around 82 per cent) and around 10 per cent of Indians are engineers and scientists (including social scientists). Even though most Chinese residents acquiring US visa are computer professionals, they are in much lower proportion than the number of Indians. Chinese managerial and technical professionals have also acquired US visas in large proportions, but relatively much lower proportion is trained engineers and scientists. Even though larger proportions of computer professionals have acquired US visas by residents of other countries as well, the distribution across different skill categories varies across countries. Thus, there is a clear dichotomy across countries with some countries being surplus in computer and other service related professionals, while some other countries have relatively larger proportions of skilled resources in manufacturing related activities. These facts tend to show that there exists complementarities is skilled human resources across JACIK countries. With freer cross border movements of skills in the JACIK following liberal migration laws, dependence on extra-regional skills will be minimised and there will be a balance of skills in the region. Further, skill deficient countries would be able to adapt better technologies transferred from within the region. With imported manpower, some JACIK countries can even move up the technology generation chain through innovation. On the whole, competitiveness of JACIK countries will improve and result in the growth of intra-regional trade, thus leading to overall economic welfare of the region.

Table 14: An Indicator of Skilled Labour Mobility in JACIK: Country-wise Continuing H1-B Visa Acquired in the US, 2000

Country	Total Number	Computer-related	Managerial, Administr., Professional & Technical	Architect., engineer., and surveying	Medicine & health	Art, Education Life Sc., Phy Sc., Maths Soc. Sc.	Writing, Museum, Library & Archival Sc.	Law and Jurispr.	Others
Brunei	3 (0.002)	66.7	0.0	0.0	0.0	0.0	33.3	0.0	0.0
Cambodia	11 (0.01)	45.5	18.2	0.0	0.0	18.2	18.2	0.0	0.0
China	10,237 (8.5)	47.3	9.7	18.7	2.3	12.2	9.1	0.2	0.5
Hong Kong	1,146 (1.0)	35.7	26.7	17.1	4.2	8.0	7.0	0.5	0.8
India	63,940 (52.9)	82.8	3.9	8.2	2.0	1.7	1.1	0.1	0.4
Indonesia	588 (0.5)	41.5	20.9	22.1	1.7	6.3	6.5	0.0	1.0
Japan	2,114 (1.8)	13.6	33.2	10.1	2.7	12.1	24.8	1.2	2.2
Korea	1,655 (1.4)	23.8	15.0	22.9	3.9	11.9	20.5	1.0	1.1
Laos	3 (0.002)	33.3	33.3	0.0	0.0	33.3	0.0	0.0	0.0
Macau	15 (0.01)	53.3	26.7	13.3	0.0	6.7	0.0	0.0	0.0
Malaysia	914 (0.8)	43.5	18.9	20.0	4.4	6.5	5.9	0.2	0.6
Philippines	3,394 (2.8)	49.3	12.4	8.2	21.5	2.3	5.5	0.2	0.8
Singapore	407 (0.3)	39.8	23.1	15.7	3.4	4.7	12.3	0.0	1.0
Thailand	400 (0.3)	48.5	18.5	14.5	2.0	5.8	9.3	0.0	1.5
Vietnam	86 (0.1)	48.8	10.5	18.6	3.5	9.3	8.2	0.00	1.2
All JACIK	84,913 (70.3)	72.5	6.7	10.2	2.9	3.6	3.5	0.1	0.5
Asia	93639 (77.5)	69.7	7.4	11.1	3.5	3.9	3.8	0.2	0.5

Note: "Others" include "Fashion model", "entertainment and recreation", "religion and theology" and "unknown". Figures in the parentheses are percentage of total Continuing H1-B visa granted by the USA.

Source: RIS based on US Government database.

6. Gains from Intra-Regional Movements of Investments and Skill

With substantial complementarities in trade and production and potentials for intra-regional transfers of investments, technology and skills in the JACIK, a regional economic integration arrangement will amount to accrual of substantial gains to the region. In addition to a scenario with complete elimination of tariff and non-tariff barriers on trade leading free trade in merchandise, a regional economic integration in the JACIK would mean free cross-border mobility of capital, technology transfers and movement of skilled resources within the region.

With the establishment of a free trade area, the volume of intra-regional trade is likely to increase through trade creation and diversion of trade to the region from the rest-of-the world. Hence, the economic integration of the region would mean realization of gains of a much larger proportion than is envisaged in case of an ordinary regional trading arrangement. Investment liberalisation within the JACIK along with an agreement of free trade will result in further improvements in economic gains. With free cross-border movements of technology and skills, along with investments and trade, the gains to the JACIK region will be strengthened. Mohanty *et al*. (2004) provide the computable general equilibrium estimates of welfare gains in the JACIK following a formal regional integration arrangement in terms of movements of merchandise, capital, technology and skills.

It is estimated that with trade liberalisation within the JACIK region, the increase in the welfare gains in the region is to the tune of US $ 147.4 billion. If investment liberalisation is coupled with regional trade liberalisation, the gains in welfare would rise by US $ 153.2 billion. The most significant gains are when the regional economy allows free cross-border movement of skills along with liberalisation of regional trade and investments. In such a scenario, the welfare gains of about US $ 210.4 billion is more than 3 per cent of GNP of the JACIK region.

The countries in the JACIK region that tend to gain maximum in terms of change in welfare as a percentage of GDP in the process of the regional economic integration are Thailand, Japan, Indonesia and Korea. It is important to understand that all the ASEAN countries, India and China gain in terms of changes in welfare. However, the increases in welfare for China are much more substantial in absolute terms than many other JACIK countries. The above

analysis shows that synergies that exist in the region in terms of investments and skills tend to increase the gains that result from a mere regional trade liberalization. It is important understand that the welfare gains for the JACIK region are much higher in a scenario of complete liberalisation of all goods and factors than only with trade liberalisation or even liberalisation of trade and investments.

7. Conclusion

In this paper the complementarities in merchandise trade and production has been mapped out along with measuring the potentials of intra-regional transfers of investments, technology and skills in the JACIK. The analysis showed that intra-regional trade was substantial and growing, and there have been trade complementarities among the JACIK economies, but to a limited extent. Significant potentials exist for intra-regional trade through re-creation of trade advantage within the region. Industrial restructuring and cross-border capital flows, transfer of technology and movement of skills will add to regional economic gains.

The JACIK region has witnessed substantial FDI flows and cross-border movement of industries leading to substantial industrial restructuring. The process of investment liberalization following a formal regional integration agreement is expected lead to further growth in intra-regional investments with capital moving from capital surplus countries to deficient ones. Intra-regional investments on the lines of vertical integration of production across countries is likely deepen the process of industrial restructuring and lead to improvements in complementarities in trade advantage patterns across JACIK countries.

The region has also emerged as a growing source of technology and skills. While Japan, Korea and Singapore have emerged as technology-generating countries in the JACIK, India and China are surplus skilled human resources. There is thus potential for intra-regional transfers of technology and skills from the technology and skill endowed countries to the deficient ones. In the event of a formal regional integration agreement in the JACIK, there is potential for substantial gain not only in terms of intra-regional trade and investments, but more so in terms of welfare improvements for individual countries as well as for the region.

Endnotes

1 There is ample evidence in the literature showing that these are not mutually exclusive phenomena. The increasing evidence of regionalisation since 1980s, as Bhagwati (1993) shows, is largely on account of a turnaround in U.S. policy towards regionalism. The apprehension that growing regionalisation will undermine the globalization process is however misplaced. Rather, as Vernon (1994) suggests, regionalisation is a halfway step in the process of globalization with initiatives for regional integration being followed by multilateral ones.

2 However, evidence shows that incidence of migration of manpower globally during the 1990s is not as high as trade and investment (see Ghose, 2003).

3 JACIK includes Japan, ASEAN-10, China, India and South Korea.

4 The resource reallocation effects are beneficial provided trade creation and trade diversion is positive on balance for the region. Further, these effects being static are once-and-for-all changes in the allocation of resources (see El-Agraa, 1989). The effects of terms of trade being unpredictable a priori, the benefits of economic integration clearly hinges on the dynamic gains from scale economies on account of an increase in market size. In regionally integrated markets, participating countries also gain by spreading their fixed cost of innovation.

5 See Frankel (1997), ADB (2002), Clarete, Edmonds and Wallack (2002), among others, for instance.

6 Caves (1996) provides evidence on the FDI attractiveness of a regionally integrated area such as the European Community. It is found that US investments to European Community increased with preferential tariff arrangements.

7 Caves (1996) has discussed in details the pros and cons of technology transfer through foreign direct investment as against licensing.

8 This conjecture is significantly drawn from Schiff, Wang and Olarreaga (2002). The study finds the positive impact of North-South and South-South technology flows on productivity and dynamic comparative advantage. Further, North-South flows are found to benefit high technology industries, while South-South flows impact low R&D-intensive industries. The study also draws policy implications for the dynamics of North-South and South-South regional integration, both of which are combined in case of Asian regional integration.

9 Duttagupta and Spilimbergo (2000).

10 Trade in East Asia alone increased significantly during the 1990s. As a result, as Ng and Yeats (2003) show, the share of the East Asian region in world trade in 2001 is comparable to that of NAFTA. If the entire JACIK is taken into consideration, the share in world trade would have been much higher.

11 Ng and Yeats (2003) and Chand (2004) arrive at similar conclusions. Ng and Yeats (2003) show that East Asian intra-regional trade is highly intense. Even though US is the single most important trading partner for most Asian countries, as Agarwala and Prakash (2002) show, its share is insignificant in relation to the combined Asian market.

12 High share for Singapore in 2000 includes large volume of entrepot trade.

13 However, China emerged as an important destination for regional exports during the 1990s. This is largely on account of, as Ng and Yeats (2003) show, China's maintenance of a stable exchange rate as against the large devaluations in many East Asian countries.

14 This finding is similar to Ng and Yeats (2003), who find that the product composition of intra-East Asian trade changed significantly with the share of machinery and transport equipment rising by 26 percentage points between 1985 and 2001. There is a similar change in the composition of non-regional trade.

15 High technology and skill-intensive export items are the dynamic products in world trade in 1990s, especially in East and Southeast Asia. Lall (2000), Mayer *et al* (2002), and Ng and Yeats (2003) provide such evidence. Mayer *et al.* (2002) find electrical and electronic items to be the dynamic exports from most Asian countries.

16 This is in contrast to large and rising proportion of electrical machinery exports, especially electronic microcircuits, and office machinery and equipment in East Asian regional exports (see Ng and Yeats, 2003).

17 See Sinha Roy (2001).

18 An earlier ESCAP (1998b) study finds that Japan shifted its comparative advantage away to technology and capital intensive items. NIEs gained comparative advantage in labour intensive products and ASEAN and China eventually emerged as important exporters of labour intensive items.

19 Agrawal *et al.* (2000) provide some evidence on such formation.

20 Statistical significance of rank correlation coefficients is however not attempted.

21 However, ESCAP (1998b) observes a strong complementarity in the pattern of trade advantage in the Asia-Pacific region. Ng and Yeats (2003) show significant improvements in trade complemenatrity index of most East Asian countries between 1985 and 2001.

22 Mohanty *et al.* (2004) has estimated the possible gains of RTA in JACIK.

23 UNCTAD (2002). This is indicative of factor markets, especially that of capital, being integrated at a faster pace than goods market in this phase of globalisation. However, cross-border mergers and acquisitions (M&As) accounted for a large proportion of this increase in FDI, rising from US $ 80.7 billion in 1991 to US $ 1143.8 billion in 2000. Such surging global FDI flows witnessed a decline in 2001.

24 The share of developing countries in global FDI inflows peaked in 1994 and remained high till 1997. Even though the proportion declined thereafter, developing countries continued to remain as major hosts to global FDI flows accounting for over a fifth of global capital. The distribution of global capital flows, however, remained concentrated in a handful of high and middle-income countries during the decade.

25 Though FDI flows out of developing countries were first observed during the 1970s, FDI outflows witnessed phenomenal growth during 1990s. Kumar (1998c) provides evidence on higher growth of outward FDI stock from Asian developing countries than the corresponding global stocks during the first half of the 1990s.

[26] Kumar (1998c) finds that while Hong Kong and Taiwan remained predominant sources of FDI, the importance of other Asian developing countries also increased.

[27] Tokunaga (1992). Also refer Jomo (2001) for a brief account of Japanese investment abroad and relocation of production in Asia.

[28] See Kumar (1998c, 2001a).

[29] Timmer (2000) finds convergence of similarity index for industrial structures across some JACIK countries benchmarked against the US during 1950-93 signifying similarity in industrial structure across these countries.

[30] While the growth of variety of electronic items emerged in the manufacturing production basket of Thailand and Malaysia (see Poapongsakorn and Tangkitvanich, 2001; Kanapathy, 2001), electronic goods along with machinery and transport equipment are found to be registering most dynamic growth in China (Lemoine, 2003).

[31] See Yue (2001) for an account of IT growth in Singapore. Singh (2003) and Kumar and Joseph (2004) provide accounts of IT growth and capability in India.

[32] See Yue (2001) and Abhimanyu (2001) for details on Singapore and Indonesia respectively.

[33] However, as Dhar and Rao (2002) show, the growth in pharmaceuticals in India is not necessarily FDI induced, but is a result of a policy framework facilitating successful technology transfers.

[34] Lemoine (2003) shows that food and beverage, garments, and leather and shoes have recorded above average growth rates in China.

[35] Even though the industrial structures are broadly similar along with high levels of investment, export and growth, the industrialization process in Southeast Asian countries differ from Korea and Taiwan with respect to initial conditions in terms of resources and the nature of Government intervention (Booth, 2001).

[36] See Zhengzhang (2001) and Woo (2001). Even though Dahlman and Aubert (2001) show that China's knowledge-based sectors are in the initial stages of development, the significant industrial restructuring that has taken place in China is a result buoyant foreign investment inflows in different sub-sectors of manufacturing (Lemoine, 2003).

[37] See Nicolas (2003) for evidence.

[38] Kumar (2001 b).

[39] Technological capability in the OECD countries is usually measured in terms of technological balance of payments.

[40] Kumar and Joseph (2004) provide an exposition on India's National Innovation System with regards to IT capability.

[41] See Chaturvedi (2003) for a detailed account of this evolutionary process.

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