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Is China the New Centre for Offshoring of IT and ICT-Enabled Services?

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IS CHINA THE NEW CENTRE FOR OFFSHORING OF IT AND ICT-ENABLED SERVICES?

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FOREWORD

This report was presented to the Working Party on the Information Economy (WPIE) at its meeting in December 2006, as part of its work on global value chains and ICT-enabled offshoring. It was recommended to be made public by the Committee for Information, Computer and Communications Policy in March 2007.

The report was prepared by Desirée van Welsum, of the OECD Secretariat, and TengTeng Xu. It is published under the responsibility of the Secretary-General of the OECD.

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IS CHINA THE NEW CENTRE FOR OFFSHORING OF IT AND ICT-ENABLED SERVICES?

1. Summary

Rapid advances in ICTs (information and communication technologies) are increasing the tradability of many business services and are also creating new tradable services. Continuing efforts to liberalise trade and investment in services are further enhancing the tradability of services. IT and ICT-enabled offshoring[1] of services activities to China is a recent development in the ongoing globalisation of services. As services are becoming more tradable and increasingly independent of location, firms are starting to offshore certain business functions, such as administrative support units and research and consultancy services, to countries with relatively lower labour costs and a talented workforce in order to focus on their core activities and increase their competitive advantage. Due to the wage-cost advantage and the large pool of English-speaking skilled labour, India has become a prime location for IT and ICT-enabled services offshoring in recent years.

This paper examines the question whether, as a relative new-comer, China will be able to catch up and become the new centre for IT and ICT-enabled services offshoring. In order to succeed in this, the main question for China is whether it will be able to move up the value chain and evolve from a manufacturing powerhouse and the world's largest exporter of ICT goods (see OECD, 2006c), to a global services exporter. It is argued that this is unlikely to happen unless it improves the skills and quality of its graduates: despite a large labour pool, there may be a shortage of graduates suitable to work in globally engaged activities in IT and ICT-enabled services as they lack the relevant language, cultural and corporate culture skills.

The paper analyses current developments in IT and ICT-enabled services offshoring to China and addresses its growth potential. It examines human resources indicators, including the number of science and engineering graduates and English language competencies, and ICT infrastructure indicators, including personal computer and broadband availability, to assess the scope for ICT-enabled services offshoring. R&D activities are analysed in some detail as an example of China's potential to supply more highly skilled ICT-enabled services in general and move up the value chain.[2] There are a whole range of other upper-end value chain activities apart from R&D services, such as software and IT consultancy, technical testing and analysis services, marketing and advertising, management consultancy, human resource

1. Offshoring includes both international outsourcing (where activities are contracted out to independent third parties abroad) and international insourcing (to foreign affiliates). The cross-border or geographical aspect is the distinguishing feature of offshoring, *i.e.* whether services are sourced abroad – not whether they are sourced within the same company (insourcing) or from external suppliers (outsourcing). There tends to be a time aspect to this definition with offshoring often referring to activities which were previously carried out in the domestic economy. Offshoring includes trade, the movement of production not financed by domestic sources (*i.e.* borrowing abroad) and FDI, but FDI can also include activities that were never previously undertaken in the home country, so FDI and offshoring overlap only partially.

2. We do not differentiate between different types of R&D, *e.g.* low cost-adaptive R&D or cutting edge innovative R&D, and do not take into account whether these centres are effectively controlled by foreign companies or not, although there is considerable evidence that the major share of advanced ICT R&D is within foreign companies rather than within Chinese indigenous firms as foreign firms seek R&D resources as part of their global strategies.

management and labour recruitment services. Many of these services are ICT-related or ICT-enabled and they are analysed where data is available (*e.g.* software and IT services), but for many, data is not available.

The idea that China is a "lumpy destination" is also emphasised: not all regions in China are currently suitable and capable of receiving IT and ICT-enabled services offshoring. Offshoring activities are currently concentrated in the coastal economic zones and major cities in China, which are more developed economically. However, with economic policies promoting growth in the western regions of China, it can be expected that locations further inland will increasingly enter the picture.

The large volume of trade in IT and ICT-enabled services, growing FDI and the increasing number of R&D centres set up by multinationals suggest that although China is not yet a major supplier of these offshored services, there is high potential for growth in supply of these services. This will require China to put in place the right conditions: human resources, ICT-related infrastructure and encouraging framework conditions including the macroeconomic and business climate. Offshoring of services is not a "one-way street" though. While it is increasing in China, Chinese firms are also starting to offshore some of their activities abroad. Chinese manufacturing multinationals have already started to offshore some of their R&D centres and sales services abroad to enter foreign markets and be closer to their customers. It is likely that these activities of Chinese firms abroad will continue to grow in the future.

To the extent that data is available this paper also compares China with India, widely considered as the leader in the market for offshored services, other emerging economies and OECD countries to assess their potential as destinations for offshored activities, and analyses relative strengths and weaknesses.

Overall, this analysis suggests that China has the right economic conditions and the pre-requisites to grow as a potential supplier of offshored IT services and ICT-enabled services, including a large and rapidly growing highly skilled labour supply, a large stock of ICT infrastructure, rapidly increasing engagement with multinational firms and a supportive policy environment, but it has not yet developed the specialised firms and human resources, including foreign language resources, or the stock of inward services investment to supply these services globally. Offshore services supply from China is growing, for example towards Japan, where China constitutes the main offshoring destination, but if China is to follow India into supplying offshored services globally this will take some time. Furthermore, India has developed a comparative advantage in language-dependent services offshoring, while China may catch up faster in high value-added services offshoring, such as R&D. Nevertheless, concerns about IPR protection in China could slow the international sourcing of R&D and other business services in China. Furthermore, future developments will not only depend on the evolution of economic factors in China, but also on how the political and social climate evolve, and on developments in other offshoring destinations, such as India and other countries in the region. China's compliance with international rules governing issues such as IPR, trade and labour standards could also become increasingly important, especially for those in the country of origin worried about a backlash against offshoring.

In sum, the answer to the question "Is China the new centre for the offshoring of IT and ICT-enabled services?" is: no, not yet, but there is a potential for China to grow and gain importance as a supplier of these services.

2. Introduction

Services now account for around two-thirds of output and foreign direct investment (FDI) in most developed countries and for up to 20-25% of total international trade. This share of trade is comparatively

modest because many services have only recently become tradable and many others remain non-tradable.[3] The first part of this section uses data on trade in services to look at the types of services and business functions that can be traded with the help of ICTs and can be produced and supplied from any location, and examines the current importance of China and India. Survey data are used to show the potential for moving up the value chain and to compare China's overall attractiveness as a location for foreign companies. The second part of this section illustrates China's economic development and highlights the "lumpy" aspect of this destination in the wider context of the rapid development of foreign direct investment: only a very small part of the country, the coastal strip, is currently engaged in globalised services activities. The development of FDI is taken up further in section 4.4.

2.1. Globalisation of ICT-enabled services

Trade

Trade in services with India has received particular attention in recent years in the context of ICT-enabled offshoring of services, but attention is now turning to China. The offshoring of services activities from one country (the country of origin) to another (the country supplying services) should result in a return flow of services to the country of origin and should figure in the balance of payments statistics on trade in services. Despite this conceptual clarity, concerns have been raised about the reliability and coverage of export figures reported by India and by China and for services trade in general (OECD, 2006b, see also Annex Box 1).[4]

The globalisation of services activities and their increasing tradability can be measured in part by international trade in services. The extent of international trade in ICT-enabled services is approximated by summing the IMF balance of payments categories "Other business services" (shortened to "business services" in this analysis) and "Computer and information services" (Annex Table 1 lists these services). Data on computer and information services are not available for all countries. For some, such as India, they are included under "Other business services".[5] The shares of IT and ICT-enabled services in the "Other business services" category are variable in different countries. As the data are reported in current USD, they may also be affected by currency movements.

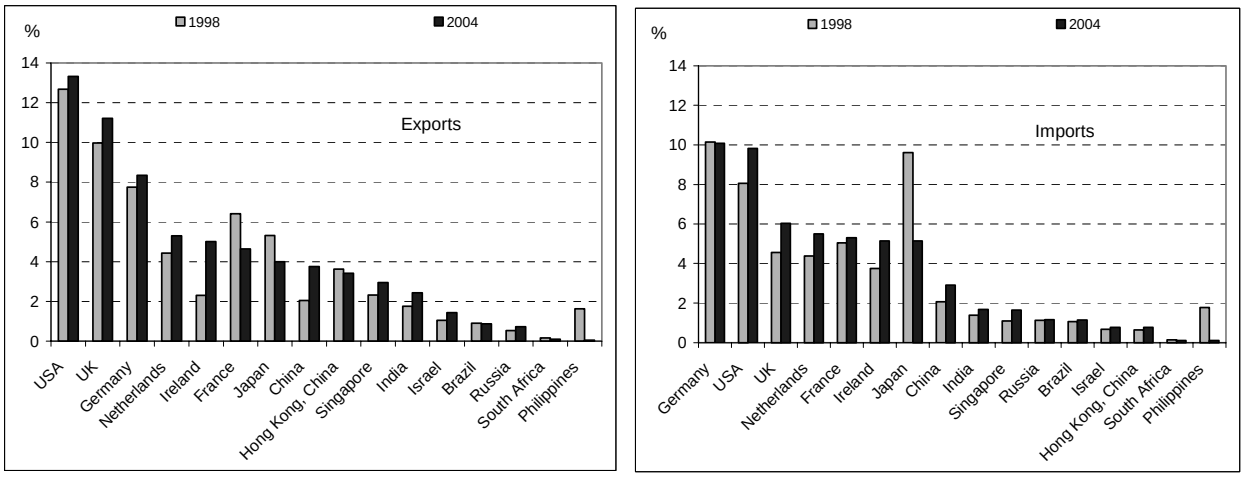
Most exports and imports (around 80%) of business services and computer and information services (grouped as "ICT-enabled services" in Figures 1-3) originate in OECD countries, and OECD countries account for the largest shares of exports and imports of these services in current USD. But other countries, especially China and India, are also accounting for a significant and increasing share (Figure 1).

3. Another reason is that many services are traded internally within firms and not captured in international trade in services.

4. Potential sources for the observed data discrepancies for the Indian data have already been identified (OECD, 2006b; GAO, 2005) and the Chinese data also shows discrepancies (OECD, 2006b). Despite improvements, there are general concerns with the need for further improvement in services trade data.

5. For India, the category "Other business services" includes all services except travel, transport and government services. However, Indian firms now extensively export ICT-enabled services and business process services, and the other services in the category are likely to be small in comparison. Furthermore, annual reports on overseas revenues of top Indian export firms show patterns similar to IMF data.

Figure 1. Share of total exports and imports of ICT-enabled services, selected countries, 1998 and 2004[1]

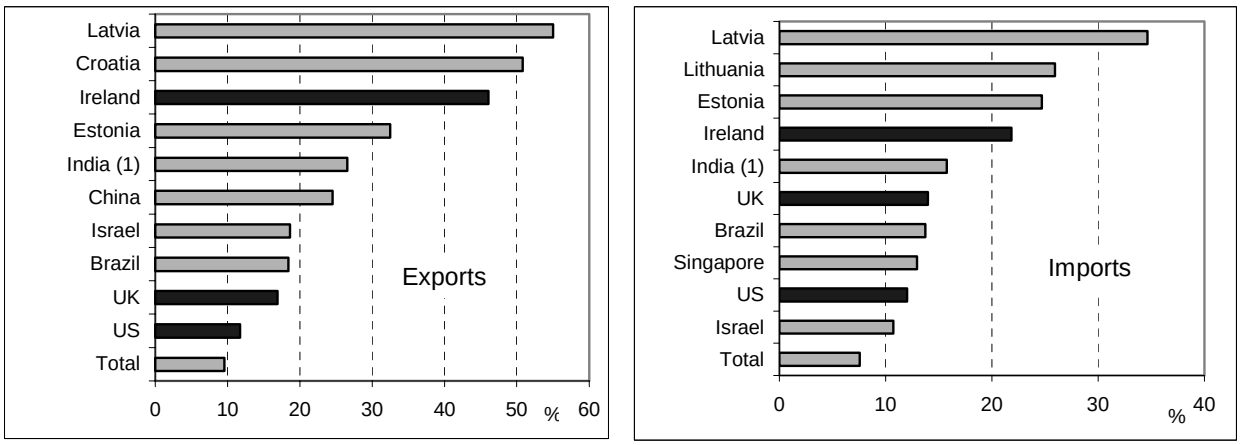


1. Except Hong Kong (China) and India, 2003. Note: 1998 is used in this graph to enable comparison with Hong Kong (China).

Source: OECD calculations based on IMF (March 2006). Values are in current USD.

Some countries often mentioned as potential locations to supply offshored services, including China and India, are experiencing rapid growth of exports of ICT-enabled services (Figure 2) which is one indication of their emergence as "offshore locations". However, the exports of some of these countries are growing from a relatively low base, OECD countries are also experiencing strong growth, and most countries also experience growth of their imports of these services, reinforcing the idea that services globalisation is a two-way street.

Figure 2. Growth of the reported value of exports and imports of ICT-enabled services, selected countries, CAGR 1995 - 2004[1]

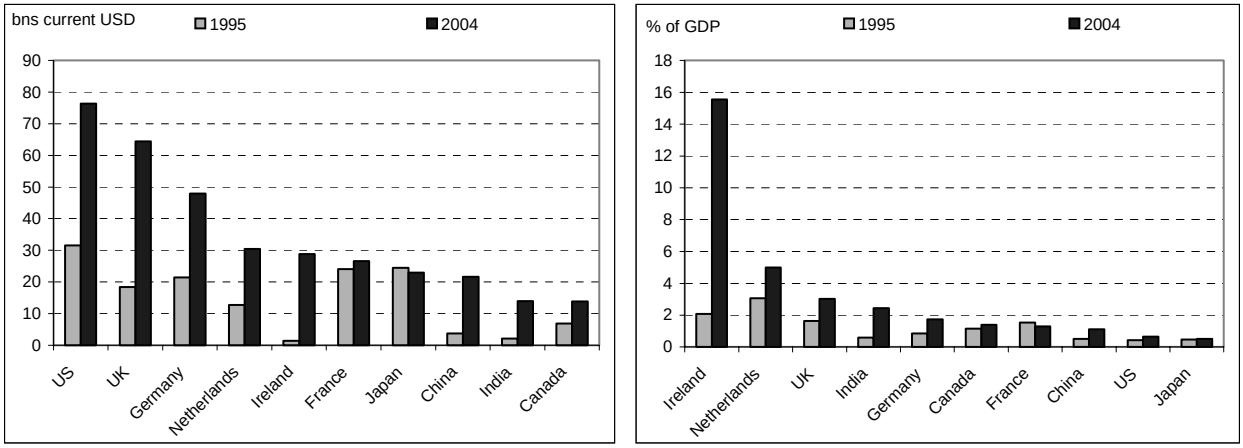


1. Except India, 2003.

Source: OECD calculations based on IMF (March 2006). Values are in current USD.

Nevertheless, for most countries trade in these services still represents only a small percentage of GDP (Figure 3). Even though the reported value of these exports is currently larger in China, as a percent of GDP they are more important in India. Note also that the absolute value of these exports from China is not necessarily indicative of the amount of IT and ICT-enabled services exports alone as other services may be counted in this category, and these numbers should not be over-interpreted. There are also some methodological problems of comparability between Indian and Chinese data (see Annex Box 1).

Figure 3. Exports of ICT-enabled services, selected countries, 1995-2004[1]
billion current USD and as a % of GDP



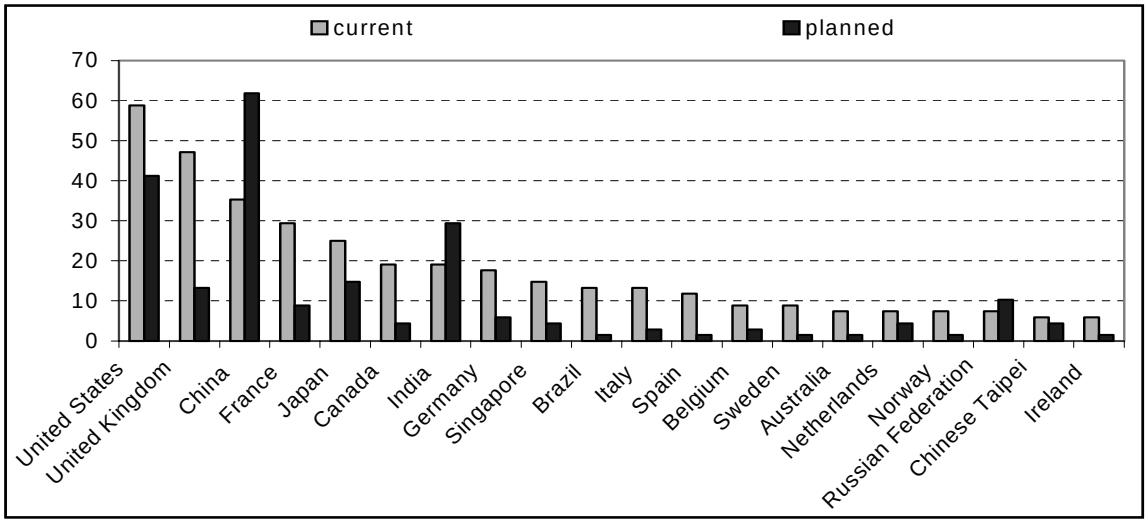
1. Except India, 2003.

Source: OECD calculations based on IMF (March 2006).

Moving up the value chain

Offshoring of ICT-enabled services to countries such as China and India does not concern only relatively low-skilled services such as call centres and back-office administration, but also more highly skilled services, including R&D services, much of which is ICT-enabled. This is illustrated by the responses from firms asking them where their R&D investments currently take place and where they are planning to invest in future (Figure 4). China and India were the prime locations with the highest increases in planned investments. The share of ICT R&D services or ICT-enabled R&D services in these R&D investments is not known, but the indicator suggests the general shift into more highly skilled services activities.

Figure 4. Current and planned R&D investment locations
% of responses



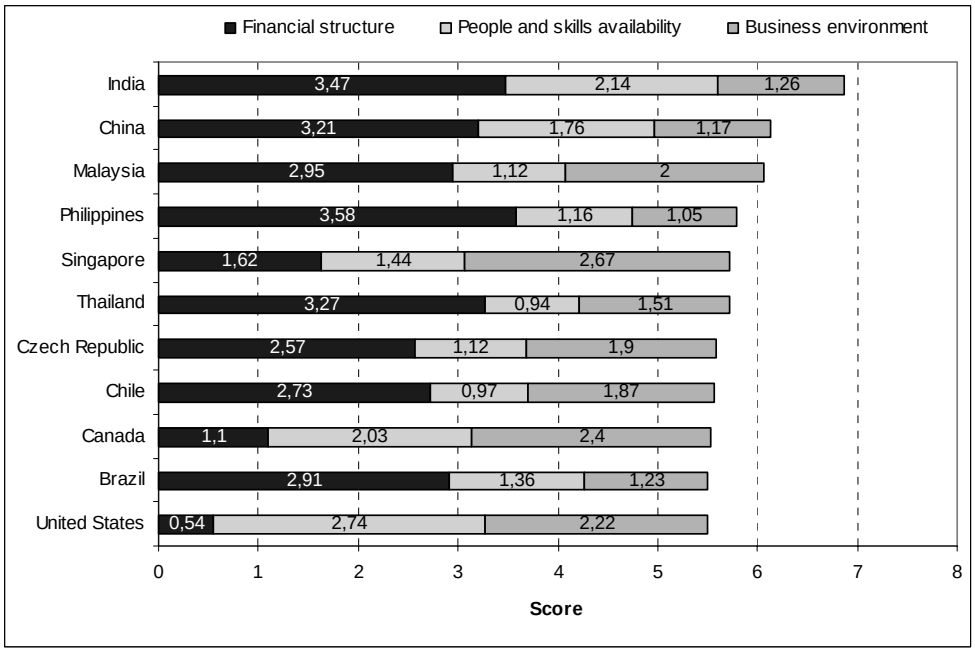
Note: “current” refers to 2004, “planned” refers to the period 2005-2009.

Source: UNCTAD Survey, UNCTAD, 2005.

The importance of locations such as China and India is also illustrated by the A. T. Kearney's annual ranking of the most attractive locations for "offshoring" of service activities such as IT services, business processes and call centres (Figure 5). Canada and the United States also rank highly in the 2005 report, having a favourable business environment and a skilled labour force. Compared with previous rankings, improved infrastructure and enhanced skills have increased the attractiveness of China as a relatively low-cost location. However, China scores relatively low in the business environment indicator, which could reflect some concerns about differences in corporate culture, but also about IPR protection, or uncertainties about other business-related factors. Offshore attractiveness in Europe continues to move eastward, for example to the Czech Republic and other eastern European countries.

A different survey of offshore location preferences between China and India shows that India was still clearly leading in terms of IT services and ICT-enabled back office services (Table 1). However China was almost level with India in the location of industry-specific R&D offshoring. This suggests overall the importance of English-language skills and the lead of India in certain kinds of IT and back-office offshoring, but that China has attributes that attract R&D activities.

Figure 5. A.T. Kearney 2005 ranking for top services offshore locations



Note: The weight distribution for the three categories is 40:30:30. The financial structure is rated on a scale of 0 to 4, and the categories for people and skills availability, and business environment are on a scale of 0 to 3. "Financial structure" comprises compensation costs (80%), Infrastructure costs (10%) and tax and regulatory costs (10%).

Source: A.T. Kearney (2005).

Table 1. Offshore destination of choice
Survey respondents' current or planned offshoring centres by country, %

	India	China
IT	68	7
Call centre help-desk	55	7
Business research analytics	43	4
Finance and accounting	43	8
Human resources	45	10
Industry specific R&D	24	21

Source: McKinsey Global Institute Survey, as reported in NASSCOM, 2006.

The Economist Intelligence Unit ranks China 38th, and India 40th, in their Business environment rankings 2004-2008 (EIU, 2004), which take into account the political environment, the macroeconomic environment, market opportunities, the policy stance towards private enterprises and competition, foreign investment related policies, foreign trade and exchange controls, taxes, financing, labour market conditions, and infrastructure. China is ranked 1st under the market opportunities component, and 3rd for the macroeconomic environment. Canada is ranked first in the overall ranking. Other Asian economies highly ranked include Hong Kong (China) 9th, Chinese Taipei 18th, South Korea 24th, and Japan 26th.

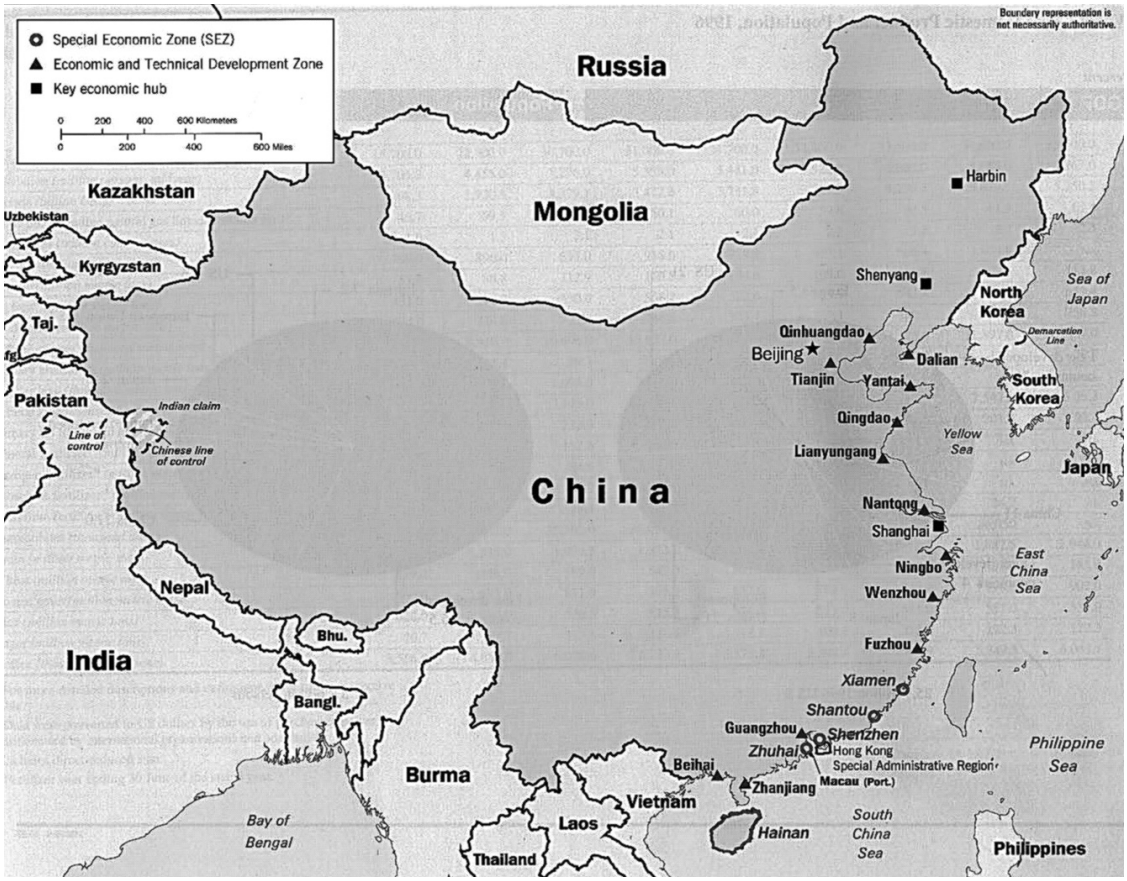
2.2. Economic development

Special Economic Zones (SEZs) have played an important role in the economic reforms that have taken place in China over the past 25 years. SEZs have been established in Shenzhen, Zhuhai and Shantou in Guangdong province, Xiamen in Fujian Province and the entire Hainan Island. SEZs tend to be

concentrated on the southern coast of China, to facilitate trade with Hong Kong (China), Chinese Taipei and other regional economies as well as facilitating China's global trade. Primarily geared to exporting processed goods, the SEZs are foreign-oriented areas which integrate science, industry and trade, and which benefit from preferential policies and special managerial systems. A further 14 coastal cities have been opened to overseas investment as Economic and Technical Development zones (see Figure 6).[6]

Economic zones have also been extended from the coastal cities to open coastal belts and to inland cities. To date, 15 free trade zones, 32 state-level economic and technological development zones, and 53 new- and high-technology industrial development zones have been established in large and medium-sized cities throughout China. Due to preferential policies including tax incentives, these open economic areas are designed to play an important role in exporting goods and services and importing advanced technologies, and promoting inland economic development. Despite concerns about the distortionary effects of SEZs, India also decided to establish them, adopting the Special Economic Zone Act in February 2006 which covers both goods and services. At the start of October 2006, plans for some 267 SEZs had been approved (*Financial Times*, 2006).

Figure 6. China: Special Economic Zones and Economic and Technological Development Zones, 1997



Source: University of Texas Library, Map of China Special Economics Zones, http://www.lib.utexas.edu/maps/middle_east_and_asia/china_specialec_97.jpg (last accessed 21 October 2006).

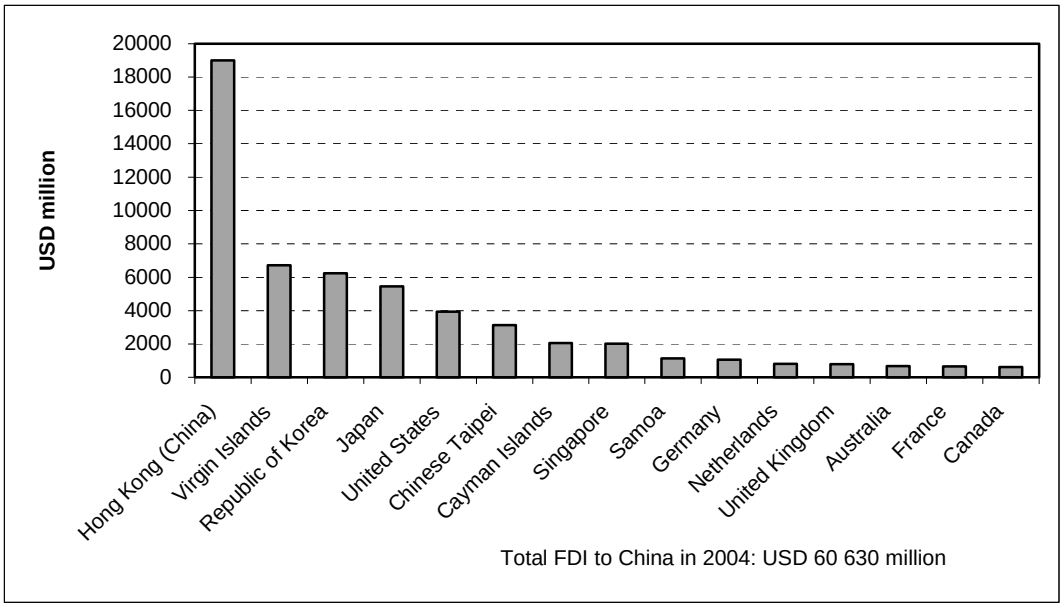
6. See "China in Brief – Opening to the Outside World" http://www.china.org.cn/e-china/openingup/sez.htm.

Inward and outward FDI flows illustrate China's opening up to the outside world. Total FDI inflows in 2005 were estimated at USD 60.3 billion, and even after deducting intra-Chinese investment via Hong Kong (China), China is among the world's foremost recipients of direct investment, with inward FDI increasing consistently year-on-year (OECD, 2006e, 2006f). In comparison inflows into India have only been about one-tenth of this amount, USD 6.6 billion in 2005 (OECD, 2006f), but recent sectoral liberalisation measures have ensured that an increasing proportion of India's inward FDI arrives unscreened, and India receives far more equity investment than China due to its more developed capital markets.

Foreign investment into China has been overwhelmingly focused on manufacturing, and the reported sector distribution of FDI inflows is still 70% into manufacturing in 2005 (OECD, 2006e, based on data from MOFCOM). But with services liberalisation, there are reports that investment may be swinging towards services, *e.g.* in banking, insurance and securities (OECD, 2006f). Despite the large flows of FDI into Indian IT and ICT-enabled services, FDI into India also went into automobile manufacturing and mining.

FDI flows into China in 2004 by country of origin are shown in Figure 7.[7] The largest inflows of FDI came from Asia, with Hong Kong (China) ranked first. Among OECD countries, Korea, Japan, the United States, Germany, the Netherlands, the United Kingdom, Australia, France and Canada had the highest FDI flows into China. Hong Kong (China) has consistently been the most important source of FDI inflows, although this share is declining, and the share from the European Union, Japan and Korea has grown since the early 1990s when inward FDI began to boom. However these data still need to be interpreted carefully. For example there are significant discrepancies between the data drawn from the China Statistical Yearbook and the equivalent national figures for outward investment into China (UNCTAD, 2005), as shown in Table 2, some of which may be due to flows passing via intermediate destinations (Virgin Islands, Cayman Islands, Samoa).

Figure 7. FDI flows into China by origin, 2004



Source: China Statistical Yearbook 2005.

7. This picture can be somewhat misleading as much of this FDI is likely to have been mediated through tax havens and financial centres making it difficult to know who the ultimate beneficial owner is.

Table 2. FDI flows into China as reported by China and the investing country, 2002
million USD

	As reported by China	As reported by investing country
France	576	563
Germany	928	887
Hong Kong (China)	17 861	15 938
Japan	4 190	2 608
Netherlands	572	156
UK	896	1 135
US	5 424	924

Source: UNCTAD, 2005.

Incoming FDI into China mainly goes to coastal regions, which also tend to have higher GDP per capita (Table 3). The Top 10 FDI receiving regions in 2003 were coastal provinces and major cities in China, such as Guangdong, Fujian, Beijing and Shanghai. The lowest 10 FDI receiving regions are western inland provinces, such as Ningxia and Xinjiang where GDP per capita is much lower. The very high share going into Eastern coastal regions was maintained in 2005, with 89% of total FDI going into East China, 8% into Central China and only 3.2% into West China (OECD, 2006e).

Table 3. FDI receiving regions, 2003

Highest ten			**Lowest ten**		
Region	**FDI**	**GDP per capita**	**Region**	**FDI**	**GDP per capita**
	USD million	Yuan		USD million	Yuan
Jiangsu	10 564	16 825.7	Shanxi	214	7 412.1
Guangdong	7 823	17 130.4	Jilin	191	9 330.3
Shandong	6 016	13 628.4	Inner Mongolia	89	9 036.8
Shanghai	5 468	36 533.1	Yunnan	84	5 634.2
Zhejiang	4 981	20 076.7	Guizhou	45	3 504.5
Liaoning	2 824	14 257.8	Qinghai	25	7 310.0
Fujian	2 599	15 000.5	Gansu	23	5 011.3
Beijing	2 191	25 151.7	Ningxia	17	6 640.4
Jiangxi	1 612	6 653.3	Xinjiang	15	9 708.7
Hubei	1 569	9 000.3	Tibet		6 829.0

Source: China Statistical Yearbook (2005).

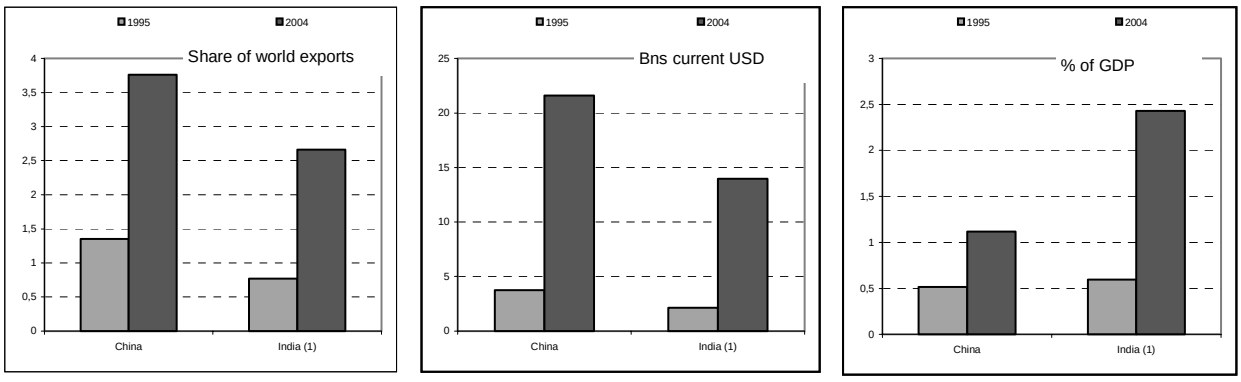
Outward investment from China has increased rapidly and was estimated to be at least USD 7 billion in 2005, a sharp rise from 2004. This is probably an underestimate of outward investment as there is evidence of widespread evasion of the burdensome approval and registration procedures particularly in the non-state-owned sector (OECD, 2006f). This outward investment used to be mainly in natural resources particularly in Africa, but is now also going into high-technology sectors, with one example being Lenovo's acquisition of IBM's PC manufacturing operations. In terms of Chinese outward FDI, the top six recipients of approved cumulative FDI for the period 1979-2002 were: 1. Hong Kong (China), 2. United States, 3. Canada, 4. Australia, 5. Thailand, and 6. Russian Federation (UNCTAD, 2003), and Hong Kong (China) remained the top destination in 2004 (OECD, 2006e). India is also becoming a significant source of outward investment, although there is also under-reporting of total flows (OECD, 2006f). Much of this is in the form of cross-border mergers and acquisitions, and the large Indian offshore outsourcing services firms have also become active in investing in OECD countries.

3. IT and ICT-enabled services offshoring

This section examines the importance of current IT and ICT-related services offshoring in China and draws comparisons with other countries where possible. Trade in services data suggest that China is rapidly becoming an important supplier of business services and computer and information services, accounting for over 3.5% of total world reported exports of these services in 2004. While not all of these exports are necessarily related to offshoring, it does suggest that China may also be gaining importance in attracting offshored services activities and supplying offshored services.

Comparing China and India (Figure 8), China's exports appear to be larger in absolute terms, while they are more important in India as a share of GDP. The data also suggest that India is a bigger exporter of computer and information services, while China's exports of business services are more important. However, there are quality concerns with data on trade in services reported by both China and India (see OECD, 2006b, GAO, 2005, and Annex Box 1). Furthermore, although India has a number of major globally recognised ICT services firms in the OECD global top 250 ICT firms, including Tata Consultancy Services, Wipro and Infosys, all of which have grown rapidly and which collectively increased their revenues by a factor of 8 over the period 2000-05, there are no Chinese ICT services firms in the OECD top 250 ICT firms (see OECD, 2006a).

Figure 8. Comparison: Exports of business and computer and information services: China and India, 1995 and 2004



1. India, 2003.

Source: OECD calculations based on IMF (March 2006).

There are no official data on the extent of offshoring and outsourcing, so the following section uses unofficial data sources for the IT and software services market, which includes the supply of offshored IT and ICT-enabled services.

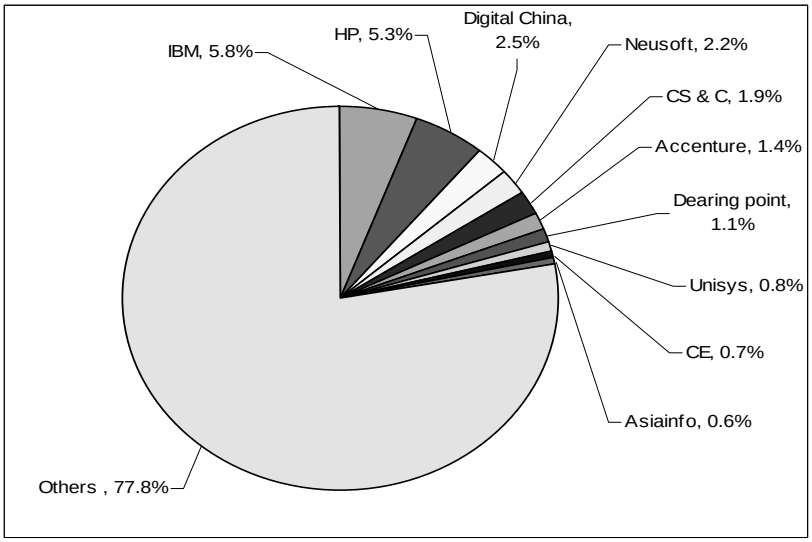
3.1. IT services

According to Analysys International (2006), the market size of IT services in China is growing rapidly and reached RMB 12.1 billion in the second quarter of 2006 (*i.e.* around USD 1.5 billion).[8] This is relatively small compared to India, where total revenue in IT services in 2005 was USD 13.5 billion, 64% of which from exports, and is expected to grow to USD 17.5 billion in 2006 (NASSCOM, 2006). The top 5 vendors in China's IT services market are identified as IBM, HP, Digital China, Neusoft, and CS&S, with a

8. http://english.analysys.com.cn/ (last accessed 20 October 2006).

market share of 5.8, 5.3, 2.5, 2.2 and 1.9% respectively. Thus, the top 5 vendors accounted for only 18% of the market, illustrating that supply side concentration in China's IT services market is relatively low.[9] These vendors could be supplying offshored services, both insourced and outsourced.

Figure 9. Chinese IT services market breakdown by vendor, 2006 Q2



Source: Analysys International (2006).

"System integration" IT services is the largest single market segment, accounting for over 40% of the total Chinese IT services market (Table 4), followed by offshore software development (over 20%).

Table 4. Chinese IT services market structure, Q2 2006

Functions	Size in RMB bn *(USD bn)*	Market segment (%)
IT consultancy	1.8 *(0.2)*	15.1%
IT management outsourcing	1.1 *(0.1)*	8.8%
System integration	5.3 *(0.7)*	44.2%
Offshore software development	2.7 *(0.3)*	22.0%
Product maintenance	1.2 *(0.1)*	9.8%

Source: Analysys International (2006).

Although there are currently very few examples of successful indigenous IT consultancies in China, the IT consultancy market is showing rapid growth along with IT management outsourcing. IT consultancy grew from RMB 0.8 billion in 2004Q4 to RMB 1.5 billion in 2005Q4, and IT management grew from RMB 0.6 billion to RMB 0.9 billion over the same period. However, the small and medium-sized enterprise outsourcing market is not growing as fast as had been expected. Possible explanations for the slower growth in the SME segment include that this is a relatively new phenomenon in China and may need some time, and some successful examples, to take off.

9. See also OECD (2006c), *Information Technology Outlook 2006*, Chapter 4, "China, information technologies and the Internet", for an overview of Chinese software industry revenue and exports.

China's IT consultancy market is highly concentrated in terms of sector of use. The telecommunications industry occupied the top position in IT consultancy use, followed by the finance and energy industries. These three industries accounted for 74% of the total market. China's IT management outsourcing market also concentrated on the finance and telecommunications industries, but manufacturing and the retail/wholesale industry are also significant users, and user concentration was not as high as in the IT consultancy market. According to Analysys International (2006) both China's IT consultancy and IT management outsourcing suppliers are dominated by overseas vendors. According to neoIT (2006), China's ITO competencies lie in CAD, quality assurance/testing, systems intergration/EAI and software localisation. As far as technology is concerned, China is focusing on embedded technology, multimedia and animation, web-based applications and wireless technology.

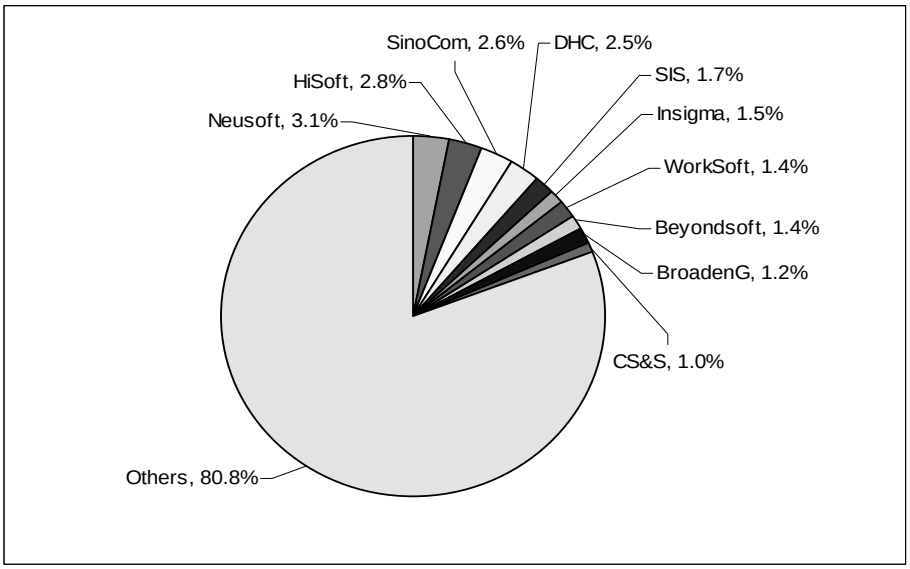
3.2. Software services outsourcing

China's software services outsourcing market reached RMB 2.6 billion (*i.e.* around USD 0.3 billion, see "offshore software development" in Table 4 above) in the first quarter of 2006. It is growing rapidly, but from a relatively small base. Neusoft, Hisoft and SinoCom are the top three Chinese software services outsourcing companies.[10] See Box 1 for a brief description of Neusoft, the largest software services outsourcing supplier. The total market share of the top ten software offshoring and outsourcing companies is only 25%, and the Chinese software outsourcing industry is highly fragmented and lacks large firms dedicated to outsourcing (IFC, 2005). The largest Chinese software firms often engage in a wide variety of other business activities in addition to supplying software outsourcing services, such as software development and hardware distribution.

Despite rapid growth of Chinese software services suppliers, they remain small relative to the top Indian firms. The top three Chinese software firms had combined revenues of around USD 500 million in 2005 from all activities, with around one-fifth coming from providing outsourced services, some of which are offshored outsourcing services to foreign customers. This compares with USD 5.5 billion for the three top Indian software and IT consulting firms (Tata Consultancy Services, Wipro and Infosys) the major share from providing outsourced services, giving a good indication of the relative strengths of ICT services firms from the two countries. The large Indian firms are reaping economies of scale and establishing global strategies to both export their services and locate close to their customers in their main markets. (See OECD, 2006a for an overview of the global top 250 ICT firms; and OECD, 2006c for an analysis of Chinese software industry revenues and exports.)

10 Analysys International (2006), "China's software outsourcing market reached RMB 2.592 billion in Q1 2006".

Figure 10. Supplier shares of the software outsourcing market in China



Source: Analysys International (2006).

By sector of demand, high-technology products, consumer electronics, telecommunications and finance account for 95% of the software outsourcing market. High-technology is the most important, accounting for 60% of the market for software outsourcing. The next is consumer electronics, accounting for 25%. Most software outsourcing services go to Japan (59% in the first quarter of 2006). The United States and Europe account for 23% and Hong Kong (China) for 11%. Japan has also moved some of its software development work to China. China currently has six software-export bases: Beijing, Shanghai, Tianjing — the largest municipalities in China; Dalian (in Liaoning Province), Shenzhen (in Guangdong Province), and Xi'an (in Shaanxi Province).

The process of moving up the value chain in the market for offshored services activities is illustrated by the fact that many international companies (including Microsoft, GE, SAP, Dell and HP) have set up R&D centers in China. The survey in UNCTAD (2005) also shows that many more companies see China as a prime location for R&D investment (see Figure 4 and Table 1 above).

Box 1. Neusoft

Neusoft Group is the largest listed Chinese software provider. Founded in 1991 and headquartered in Shenyang, Neusoft has 8 000 staff and provides software and services, medical systems and IT education and training. It has a sales and service network covering over 40 cities in China, and has branches in the United States and Japan. It has set up software parks in Shenyang, Dalian, Chengdu and Nanhai for R&D and HR development. Neusoft offers products and services to over 8 000 customers, including telecommunications (*e.g.* GSM and China Unicom's Java platform), government (*e.g.* social security and tax management systems), enterprise and e-commerce, communications, education and finance.

Neusoft is the largest Chinese offshore outsourcing software service provider. It is estimated that Neusoft's international software outsourcing sales exceeded USD 60 million in 2005.

Source: OECD, adapted from http://www.neusoft.com

4. Assessing the potential for future growth of IT and ICT-enabled offshoring

A number of conditions need to be in place in order for the offshoring of ICT-enabled services activities to grow. These include the availability of a sufficient pool of skilled workers, ICT infrastructure, and facilitating framework conditions such as low cost and ease of setting up a business. This section examines to what extent these conditions are satisfied, or their scope for expansion and improvement where possible. Other factors, such as the social and political climate and respect and enforcement of IPRs also play an important role but are not developed here.

4.1. Human resources

Two key indicators of a suitable labour force for offshored services are the availability of human resources with tertiary level education, especially in science and technology, and adequate English language skills.

1) Students and graduates in science, engineering and IT

China has an extremely large pool of science and engineering students in absolute terms, with over 5 million students enrolled and over one million graduates in 2004 (Table 5). For comparison, the United States counted 476 000 students enrolled in science and engineering in 2004 (NSF, 2006). While all Chinese students may not necessarily be equipped with the right skills to work in companies receiving offshored ICT-enabled services activities, the potential for finding highly trained workers is large.

Table 5. Chinese students and graduates in science, engineering and IT, 2004

Number of Science & Engineering students			
	New enrolment	**Total enrolment**	**Graduates**
Undergraduate courses	1 823 529	5 532 280	1 019 638
Postgraduate courses	161 817	420 444	73 614
Internet-based courses	82 269	279 585	39 207
Adult education institutions	510 279	1 026 529	412 947
Number of Information Technology students			
	New enrolment	**Total enrolment**	**Graduates**
Secondary vocational schools	1 156 166	2 961 554	766 995

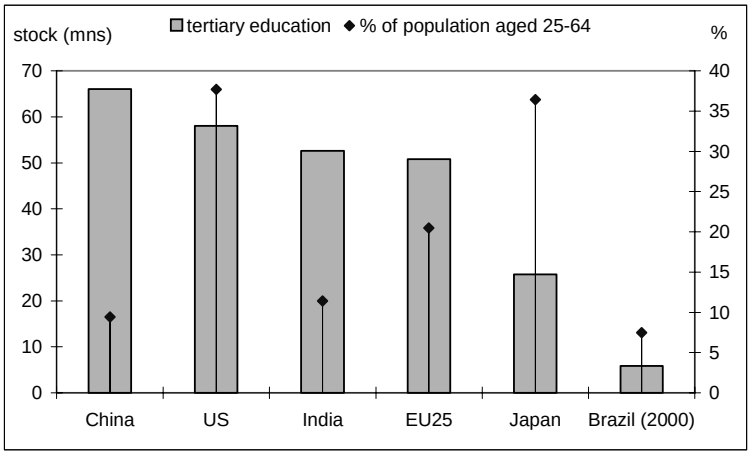
Source: China Statistical Yearbook (2005).

The issue of suitability for employment in foreign multinationals, or in offshored services activities more generally since domestic firms and multinationals need to be capable of producing these services for export, has often been raised. For example, Farrell and Grant (2005), on the basis of interviews, report that foreign multinationals in China find that fewer than 10% of Chinese graduates have the skills to work for them in the services occupations studied (engineers, finance workers, accountants, quantitative analysts, generalists, life science researchers, doctors, nurses, and support staff). They suggest that the university system in China may be geared too much towards theory, and therefore engineering graduate applicants, for example, lack more practical and team working skills. On the other hand anecdotal evidence suggests that Chinese students have good ICT skills and problem-solving capabilities. NASSCOM (2006) estimates that the suitable graduate talent pool of IT and ICT-enabled services in China constituted over 727 000, compared to 1.7 million in India (in 2003), and where "suitable" meant those with skills to be directly employed, without considering willingness or accessibility of talent (NASSCOM, 2006 based on NASSCOM-McKinsey (2005)). Therefore, while there is great potential in China, it has not yet attained the same scale of a suitable labour force pool to draw from for supplying offshored services as India, even

though in India too some concerns have been voiced about the numbers actually suitable to work in multinational companies.

The potential for growth in the supply of skilled workers is illustrated in Figure 11. China has a very large number of tertiary education graduates, but this number is still relatively low as a percentage of the population of working age. If this percentage were to increase to the level in the United States or Japan, the absolute numbers would approximately quadruple. This is also the case in India.

Figure 11. Tertiary education attainment, 2003



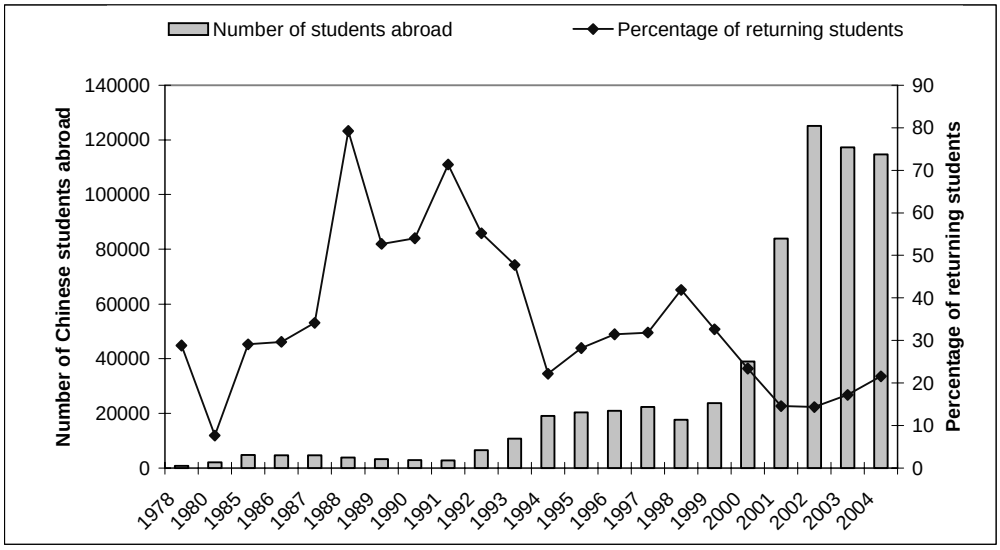
Source: Schaaper, M. (2005) based on OECD education database, Eurostat NewCronos Database, China: MOST (China S&T Indicators 2004), India: NCAER, India Science Report, Brazil: Census data.

2) Chinese students studying abroad and their return

According to data from Chinese sources the number of Chinese students abroad in 2004 was around 120 000, 113 times that in 1978 when China first adopted the "open economy" policy (Figure 12). The percentage of returning students peaked in 1988 at around 80% of those who had gone to study abroad, but this was a relatively low absolute number at the time. By 2004 this return rate had fallen to around 20%, but of a much larger number of students.

Increasing return of students trained abroad could be an indication of Chinese economic development, making it more attractive for Chinese students to stay at home and also for students abroad to return. A rise in the number of returning students can increase the scope for more IT and ICT-enabled services offshoring to China, as a large percentage of the Chinese students in foreign universities major in Science and Engineering so they would add to the pool of highly trained workers. Returning students have played an important role in India's development as a supplier of offshored services. For those who returned, it also gives some indication not only of language skills, but also other skills such as working with people of a different background, western corporate cultures, and establishing and maintaining networks of contacts.

Figure 12. Number of Chinese students studying abroad and their return rate



Source: China Statistical Yearbook (2005)

The above chart suggests that the number of Chinese students abroad declined somewhat from 2002, while according to the OECD education database (Table 6), the number of Chinese tertiary students abroad increased substantially in the five years from 1998 to 2003. Furthermore, the number of Chinese students studying abroad reported in the OECD Education database is much larger than in the Chinese data (Figure 12). There are several possible explanations for these differences in the data. The official Chinese figures for the number of Chinese students studying abroad include those on Chinese government scholarships and those who registered with Chinese embassies abroad. This may not account for all privately funded students, especially since not all students register with foreign embassies. At the same time, the number of Chinese funded by private sources is also increasing. Increasingly, students also go abroad for high schools (pre-tertiary education) in order to study at foreign universities (those students are mostly private funded), while the traditional pattern was to go abroad for post-graduate studies (mostly on government scholarships or provided by receiving universities). Furthermore, although since 1999 China has greatly expanded enrolment in its own universities, including in post-graduate studies (Wyckoff and Schaaper, 2005), the two sources of tertiary education are complementary as overall tertiary student numbers have risen rapidly both at home and abroad.

In terms of the destination of Chinese students, due to tighter visa procedures in the United States there has been a relative shift to Europe (and Australia), although the United States is still the most popular destination for Chinese students and numbers have continued to increase significantly there (Table 6).

Table 6. Students[1] from BRICS countries studying abroad, 1998 and 2003

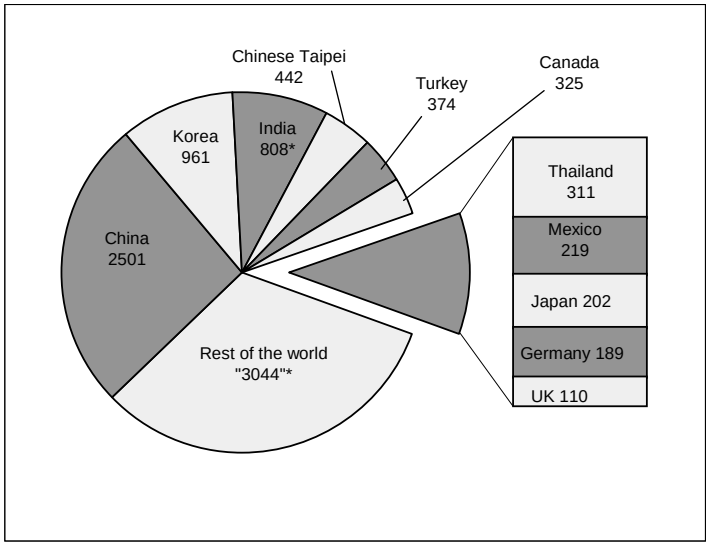
	Country of origin (BRICS)				
1998	Brazil	Russian Federation	India	**China**	South Africa
Australia	91	344	3 613	**4 132**	858
Japan	368	240	180	**25 418**	9
United States	6 249	5 750	30 270	**42 031**	1 619
EU-19	4 423	8 218	4 605	**10 988**	1 511
Total OECD	11 695	16 142	39 629	**86 332**	4 101
2003					
Australia	445	661	12 384	**23 448**	1 636
Japan	412	332	240	**51 656**	20
United States	8 388	6 238	74 603	**92 774**	2 095
EU-19	8 425	18 892	16 070	**68 796**	1 885
Total OECD	17 977	28 157	104 973	**258 281**	5 721

1. Total tertiary education.

Source: OECD Education database (January 2006).

Among the BRICS, China has the largest absolute number of tertiary level students abroad, followed by India. For students from each of these countries, the United States is the most popular destination. Chinese students also received the most doctorates in the field of science and engineering among foreign students in the United States (Figure 13).

Figure 13. Number of doctorates in science and engineering awarded to foreign citizens in the US by citizenship, 2003[1]



1. The number for India is for 2001. The total number for 2003 is 9 486. * The rest of the world number for 2003 is distorted by the amount of the difference between India 2001 and India 2003, which is unknown.

Source: OECD calculations based on US National Science Foundation, 2004.

3) Language competencies

The lack of English language skills is often mentioned as a constraint on the growth of Chinese offshoring services. In addition to students returning from abroad, who are likely to have acquired good language skills, China is also making efforts to improve the English language skills of the domestic labour pool. It is increasing its emphasis on English training at schools and since 2001 the Ministry of Education has required English to be taught from Third grade onwards at around the age of 8 (Farrell and Grant, 2005). There are also more than 100 000 English teachers in IT colleges (Global Services Media, 2006).

Another indicator is given by TOEFL results (Test of English as a Foreign Language; test results from non-native English speakers) (Table 7). Also included in this table is the percentage of managers who see labour skills as a major constraint in the country in question. China performs relatively poorly compared to India and the other BRICS in the computer-based TOEFL exam results, although around average in the paper-based TOEFL exam results, but still considerably behind India.[11] Combined with the labour skills indicator this suggests that China needs to address these areas to realise its potential for supplying offshored services.

Table 7. Language competencies and labour skills

	TOEFL Total Score Mean[1] Computer based test	TOEFL Total Score Mean[1] Paper based test	Labour skills (% of managers surveyed ranking as a major constraint)[2]
Brazil	230	549	39.6
Russia	231	544	9.9
India	244	578	12.5
China	**215**	**559**	**30.7**
South Africa	256	x	na
Philippines	234	555	11.9
Sri Lanka	225	546	na
Poland	203	568	12.2
Czech Republic	238	573	9.1
Hungary	236	x	12.5
France	237	569	na
Germany	253	597	na
Japan	191	495	na
United Kingdom	240	x	na
United States	226	570	na

Note: These are test results from non-native English speakers.

Source: 1. ETS (2005). Based on non-native English-speaking examinees by native country, based on 554 942 examinees who took the test between July 2004 and June 2005. Results are suppressed when the sample size is less than 30 examinees (indicated by "x").
2. World Development Indicators (World bank, http://devdata.worldbank.org/dataonline/, last accessed 15 February 2006). Brazil, China, India, Philippines, Poland 2003; Czech Rep., Estonia, Hungary, Latvia, Lithuania, Romania, Russia 2002.

The CET (College English Test) is also used in China to test for English language skills. Some 153 637 people registered for the exams in June 2006. Furthermore, the PETS (the Public English Test

11 The computer-based test has not consistently been available in China which may explain the relatively poorer results for this test compared with the paper version where students may have had more practice.

System) was introduced in China in 1999 to develop a framework of publicly available English tests beyond the school and college system. In 2004, over 300 000 people took the PETS tests in China.

While China is clearly improving the English language capabilities of its current and future workforce, India still has a large comparative advantage in this field and it may take China some time, both in fact and by reputation, to reach India's levels of English language proficiency and availability (but see also Box 2).

Box 2. The importance of language skills: Offshoring from Japan to China

While English is generally considered the main "foreign" language for doing business with most countries, Japan has a special advantage in dealing with China because of Japanese language skills in China. In fact, China is the major offshoring destination from Japan, as show in the Table below. Reasons for this include geographical proximity, the promise of a large and growing market in China, because Chinese characters are used in Japanese (kanji), and many Chinese speak Japanese. China has the second largest number of Japanese learners abroad after Korea (The Japan Foundation, 2004).

Table: Offshoring from Japan (YPY million, 2004)

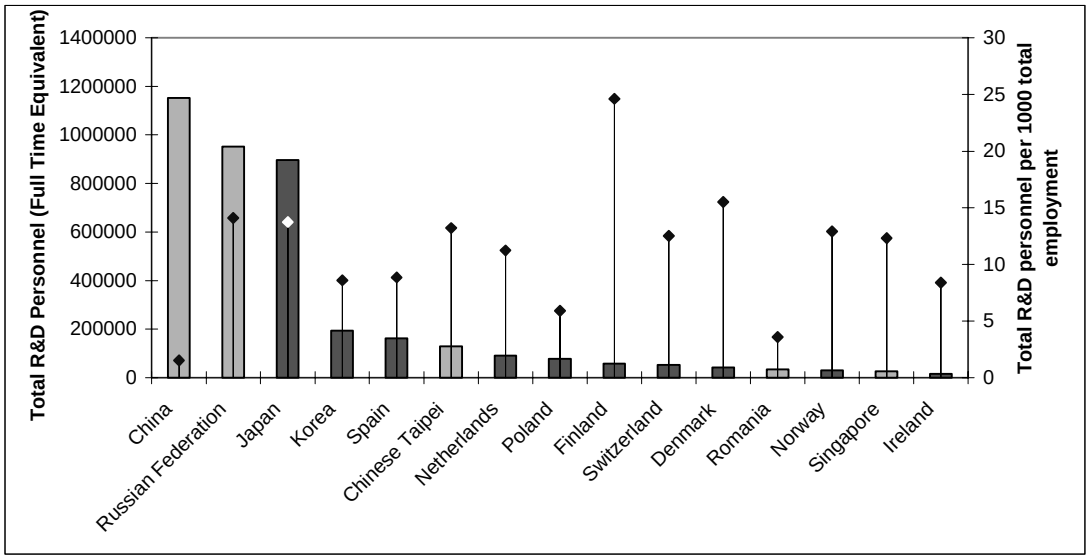
	2002 (FY)	2003 (FY)	2004 (FY)
1 China	9 833	26 280	33 241
2 United States	3 260	4 988	5 147
3 India	1 908	6 312	4 255
4 Australia	0	2 626	3 133
5 United Kingdom	20	1 827	2 126
6 Philippines	1 864	2 494	2 117
7 Korea	1 952	1 871	1 415
8 France	0	834	548
9 Canada	496	616	262
10 Vietnam	30	30	216
Other	888	1 082	237
Total	20 251	48 960	52 697
Sample size	n=58	n=58	n=77

Source: Survey of actual condition concerning external transactions and foreigner employment in computer software field 2005', conducted in 2005, jointly by JISA (Japan Information Technology Services Industry Association), JEITA (Japan Electronics and Information Technology Industries Association) and CSAJ (Computer Software Association of Japan), http://www.jisa.or.jp/statistics/download/Findings2005.pdf (last accessed 20.03.2007).

4) R&D personnel

R&D personnel numbers provide a further indicator of the availability of a pool of highly-skilled labour, and of the potential to move up the value chain and supply more advanced offshored services. The absolute stock of R&D personnel is very large in China. However, when scaled to the labour force (per thousand employed) the number is still relatively small, indicating a very large potential for further growth (Figure 14). For example, if the per thousand employed level of China was that of Ireland (a major exporter of IT and ICT-enabled services), the absolute number in China would be over 6 million, rather than the 1.15 million actually, showing the potential for further growth.

Figure 14. R&D personnel, selected countries, 2004
bars in full time equivalents (LH scale), lines per 1 000 total employment (RH scale)



Note: OECD countries in dark shading. See pages 12, 22 and 57 of the *OECD Main Science and Technology Indicators*, Volume 2006-1 for information on the international comparability of the data.

Source : OECD, *Main Science and Technology Indicators*, June 2006.

5) Labour costs

Wage differentials are often mentioned as a driver for offshoring of services and they can constitute a factor in the location decisions of firms, although other factors, such as skills and talent also count. However, wage differentials to some extent reflect differences in productivity and therefore wage differentials between China and OECD countries are likely to be bigger than overall unit labour cost differentials. Furthermore, in addition to direct labour costs, the offshoring of services activities also involves other types of costs, including overhead, organisational and transactions costs.

China has relatively low wages compared with many OECD countries, although wages in the ICT sector have been approximately equivalent to wages in other lower-cost countries providing ICT services (Table 8). Furthermore Chinese wages have been rising. According to the Economist Intelligence Unit (2004), between 2001 and 2004, the annual increases in wages were around 7.5% for management, 8% for professional, technical and support jobs, and 7% for clerical and manual jobs. However, according to neoIT Offshore and Nearshore ITO/BPO Salary Report 2006 (neoIT, 2006), the current wage differential between professionals in China's ITO and BPO industries and those in the United States is still about 88%. This does not however take into account productivity differences, and other management, organisation and transactions costs associated with offshoring of IT services to China, so the overall labour cost differences are somewhat (and probably considerably) lower. Furthermore, China and India face competition from other relatively low wage cost countries, and pressure is mounting on China in particular to comply with core labour standards to reduce criticism of unfair competition.

Table 8. Average annual salaries of software programmers, 2002

Country	Salary range (USD)
Poland and Hungary	4 800 – 8 000
India	5 880 – 11 000
Philippines	6 564
Malaysia	7 200
Russian Federation	5 000 – 7 500
China	8 952
Canada	28 174
Ireland	23 000 – 34 000
Israel	15 000 – 38 000
USA	60 000 – 80 000

Source: *CIO* magazine, November 2002, Smart Access Survey, Merrill Lynch, as reported in Bardhan and Kroll (2003).

4.2. ICT infrastructure and economy-wide framework indicators

1) ICT infrastructure indicators

The availability and quality of basic ICT-related infrastructure are very important for determining the location of globalised services activities and, therefore, the possibility for Chinese based activities to be part of the global supply of services. The quantity and quality of infrastructure and their prices vary greatly across countries. Some countries have large absolute stocks of infrastructure, which is one indication of national capacity for supplying ICT-enabled offshored services (OECD, 2006b). For example, China has more PCs than Germany and more Internet subscribers than the United States. Brazil, India and Russia each have about as many PCs as Canada or Italy, and Brazil and India have slightly fewer Internet subscribers than Canada. However, apart from China, these countries' broadband subscriber numbers are much lower, and broadband costs are much higher than in most OECD countries (OECD, 2006b). Furthermore, while some of the numbers appear very favourable for some countries, including China, when they are scaled to the population it is obvious that the potential for growth in the diffusion of ICTs and ICT infrastructure is very large (Table 9). For example, in 2004 China had only 4 computers per 100 population (and India only 1.2 computers), compared to over 60 and over 70 computers per 100 population in the United Kingdom and the United States, respectively.

Overall the stock of ICT-related infrastructure in China and India, and in other countries often seen as potential suppliers of offshored services activities, suggests great potential, but there is still a long way to go before these countries can match OECD countries in terms of the intensity and quality of infrastructure. Furthermore, India, the major supplier of ICT-enabled services, has neither the largest stock of ICT-related infrastructure nor the cheapest broadband costs among the BRICs, illustrating the importance of other sources of comparative advantage such as the availability of ICT-trained engineers, entrepreneurial domestic firms, linguistic skills, global ties, economic liberalisation, etc. (OECD, 2006b).

Table 9. ICT infrastructure related indicators: The BRICS and selected other countries, 2004[1]

	PCs per 100 inhabitants[1]	Internet subscribers per 100 inhabitants[1]	BB subscribers per 100 inhabitants[1]	International Internet bandwidth (Mbps) [2]	International voice traffic (out and in, millions of minutes) [2]	Secure Internet servers[2]	Telephone faults (per 100 mainlines) [2]	Telephone mainlines (millions) [2]
Brazil	10.7	*4.4*	*1.2*	27449	2072.2	2001	1.6	42.4
Russia	13.2	*1.3*	*0.5*	14365	2224.6	297	35.2	37.0
India	1.2	0.5	*0.0*	12300	3100.0	462	126.0	44.0
China	**4.0**	**5.5**	***2.0***	**74429**	**8179.8**	**293**	**n.a**	**312.4**
South Africa	8.3	*2.2*	*0.1*	882	1822.0	909	48.2	4.8
Philippines	4.5	1.5	*0.1*	3215	2348.0	161	n.a.	3.4
Sri Lanka	2.8	0.5	*0.0*	324	374.4	30	6.8	1.0
Poland	19.1	6.5	*2.1*	21380	2315.3	565	17.2	12.3
Czech Republic	24.0	*22.3*	*0.7*	25000	1666.4	316	6.8	3.5
Hungary	15.0	7.6	*3.8*	10000	492.9	210	8.7	3.6
France	48.7	19.8	11.2	200000	12697.0	3855	n.a.	33.9
Germany	56.1	*27.9*	8.4	566056	15683.0	13847	n.a.	54.6
Japan	54.2	*26.5*	14.9	132608	4634.0	20465	n.a.	58.8
United Kingdom	60.4	26.6	10.5	781554	15600.0	21034	11.0	33.7
United States	74.1	*21.5*	12.8	970594	58338.4	198098	12.5	177.9

Source: 1. ITU (2005). Numbers for 2004; numbers in italics are estimates or refer to years other than 2004.
2. World Development Indicators, World Bank, Online Database (last accessed 25 April 2006).

2) Framework indicators

Economy-wide framework conditions are important factors in firms' decisions about where to locate their services activities. These include the cost and ease of setting up a business, and the procedures for enforcing contracts (Table 10). They paint a picture broadly similar to indicators of the availability and quality of infrastructure, with the countries often mentioned as possible suppliers of offshored services activities, including China and India, lagging somewhat behind the higher-income OECD countries. Nevertheless, most have a large catch-up potential, so their competitiveness, which also resides in other inputs, such as relatively lower costs for the factors of production (land, capital and labour), different time zones, pool of skilled labour, language skills, etc. can be expected to increase in future (OECD, 2006b). In addition to economic indicators, factors such as the social and political context are also important but are not treated here.

Table 10. Framework indicators: The BRICS and selected other countries, 2004

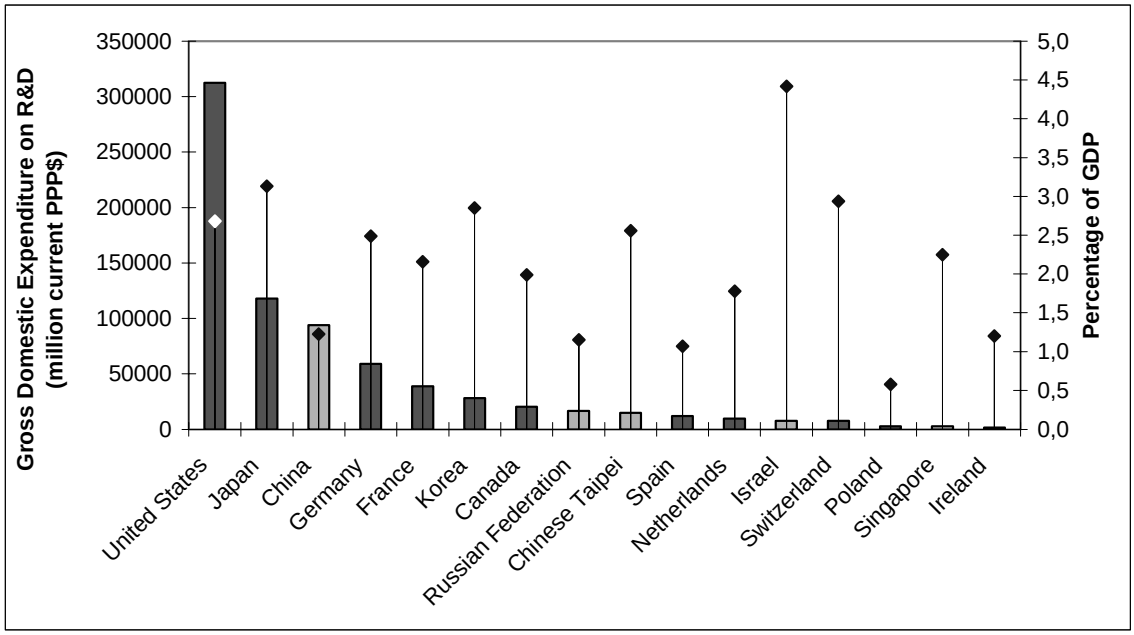
	Cost of business start-up procedures (% of GNI per capita)	Procedures to enforce a contract (number)	Start-up procedures to register a business (number)	Time required to enforce a contract (days)
Brazil	11.7	25	17	566
Russia	6.7	29	9	330
India	49.5	40	11	425
China	**15.8**	**25**	**13**	**241**
South Africa	9.4	26	9	277
Philippines	19.4	25	11	380
Sri Lanka	10.7	17	8	440
Poland	20.6	41	10	1000
Czech Republic	10.8	22	10	300
Hungary	22.9	21	6	365
France	1.1	21	7	75
Germany	5.8	26	9	184
Japan	10.6	16	11	60
United Kingdom	0.9	14	6	288
United States	0.5	17	5	250

Source: World Development Indicators, World Bank, Online Database (last accessed 25 April 2006).

4.3. R&D and technology development

R&D related activities are one indicator for the potential to move up the value chain in services activities. China's gross domestic expenditure on R&D is relatively high. However, it is much lower as a percent of GDP compared to some of the major OECD countries (Figure 15). A large share of R&D in China is financed by industry (67%), as in many major OECD countries, including Japan and Korea (Figure 16). Note however that the R&D expenditure data for China need treating with caution and are very sensitive to whether current PPPs or current exchange rates are used (Schaaper 2004).

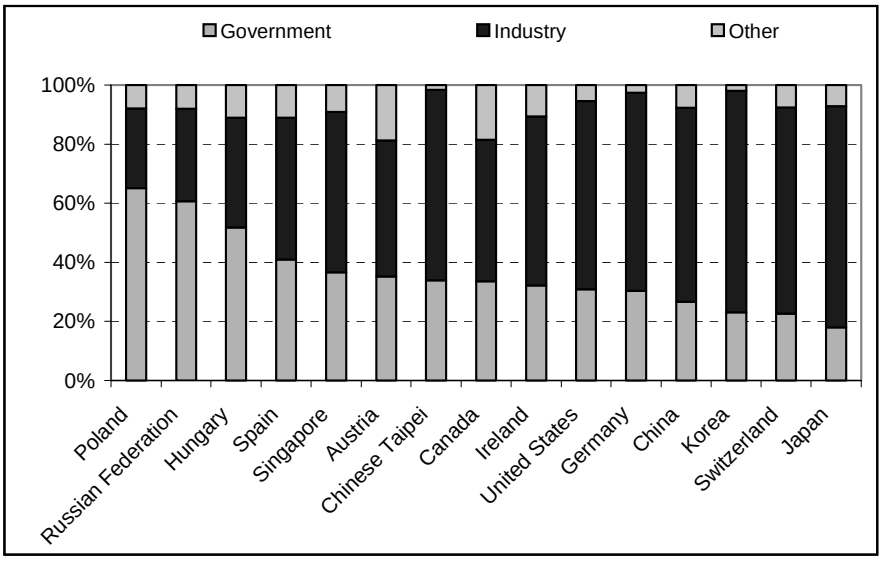
Figure 15. Gross Domestic Expenditure on R&D in selected countries, 2004
bars in million current USD (LH scale), lines as % of GDP (RH scale)



Note: OECD countries in dark shading. See page 12, 18 and 57 of the *OECD Main Science and Technology Indicators*, Volume 2006-1 for information on the international comparability of the data.

Source: OECD, *Main Science and Technology Indicators*, June 2006.

Figure 16. Percentage of Gross Domestic Expenditure on R&D financed by Government and Industry, selected countries, 2004



Note: See page 12, 24 and 58 of the *OECD Main Science and Technology Indicators*, Volume 2006-1 for information on the international comparability of the data.

Source : OECD, *Main Science and Technology Indicators*, June 2006.

Domestic patent applications can be considered an indicator of the output from R&D activity. China has a large absolute number of patent applications, by far the largest among the BRICS (Table 11). The share of total patent applications from residents is much higher compared with other developing economies except Russia which is comparable. Although over three-quarters of applications come from non-residents, indicating particularly the activities of MNCs, the resident share compares favourably with many OECD countries, including major technology developers. This suggests that China has considerable potential to develop technologies. However total applications are relatively small when compared with total population, indicating the scope for increased R&D activities leading to patentable outputs. The share of patent applications in ICT-related areas is over 10% of the total and appears to be rising (12% of applications examined in 2003, and 14% in 2004).[12] This is associated with the considerable focus on ICT hardware production and exports in the Chinese economy and the development of China as the world's leading exporter of ICT goods.

Table 11. Patent applications: The BRICS and selected other countries, 2004

	Patent applications, nonresidents	Patent applications, residents
Brazil	95 225	6 521
Russia	96 315	24 049
India	91 704	220
China	**140 910**	**40 346**
South Africa	90 471	184
Philippines	81 697	n.a.
Sri Lanka	89 759	n.a.
Poland	92 176	2 324
Czech Republic	158 592	608
Hungary	91 497	962
France	160 056	21 959
Germany	230 066	80 661
Japan	115 411	371 495
United Kingdom	251 239	33 671
United States	183 398	198 339

Source: World Development Indicators, World Bank, Online Database (last accessed April 2006).

The lumpy destination aspect of Chinese development is illustrated again by the location of the Top 10 high-technology development areas (Table 12), which include the SEZs Shenzhen, Zhuhai and Xiamen and some of the major economic hubs and costal cities with special technology zones. Exports from these Top 10 high-technology development areas account for a large share of total technology-related exports from China.

12 Data from *China Statistical Yearbook 2005*. Data are for reported ICT patent applications examined for 2003 and 2004. The share of "ICT" patent applications examined is the sum of the following four classes: "Computing, calculating, counting", "Information storage", "Basic electronic circuitry" and "Telecommunications techniques" as a share of "Total" applications examined.

Table 12. Top ten high-technology development areas by exports and number of employees

Development area	Number of employees	Exports Million USD
National Total	**4 484 387**	**82 382**
Shanghai	150 507	13 644
Suzhou	191 900	12 071
Shenzhen	93 390	7 165
Wuxi	126 105	5 441
Beijing	557 213	5 359
Zhuhai	93 151	5 045
Nanjing	84 042	3 705
Huizhou	69 577	3 529
Zhongshan	70 726	3 059
Xiamen	38 912	2 932
Top 10: Percent of total	32.9%	75.2%

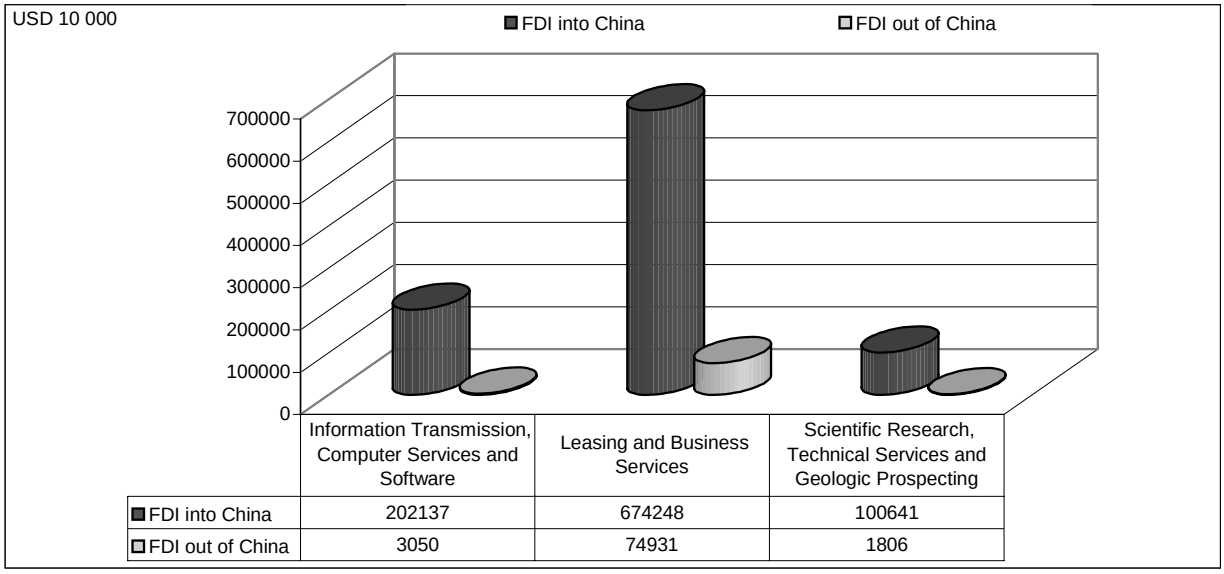
Source: China Statistical Yearbook (2005).

4.4. FDI and foreign funded companies in IT and ICT-enabled services sectors

1) FDI

China is a major global destination of FDI with inflows of USD 60.3 billion in 2005, 10 times the value of outflows (OECD, 2006e). IT and ICT-enabled services have accounted for a relatively small share of total Chinese FDI, around 6% and 15% of inward and outward FDI respectively in 2004 (China Statistical Yearbook, 2005, defined as leasing and business services, computer services and scientific research services see Figure 17). Around 70% of inward FDI goes into manufacturing, often for export, but manufacturing has a much smaller share of outward investment, around 14% in 2004. FDI in IT and ICT-enabled services has often been directed towards relatively smaller value projects, as services account for over 11% of the number of inward FDI projects. “Leasing and business services” were the dominant component in the category IT and ICT-enabled services and accounted for 70% of inward and 94% of outward services FDI in 2004. “Information Transmission, Computer Services and Software” accounted for 20% of inward and 4% of outward FDI in these services in 2004, and “Scientific Research, Technical Services and Geologic Prospecting” for 10% and 2% (Figure 17).

Figure 17. Services FDI into and out of China, 2004



Source: China Statistical Yearbook (2005).

2) Foreign funded enterprises

Foreign-funded enterprises (essentially majority foreign-owned enterprises) in ICT-enabled services sectors accounted for 6.4% of the total number of foreign funded enterprises (leasing and business services accounting for most). ICT-enabled services sectors accounted for 4.5% of total investment in foreign-funded enterprises (but here Information transmission, Computer Services and Software accounted for most). The share of registered capital accounted for by foreign investors is larger in ICT-enabled services sectors than for the total of the economy or the manufacturing sector (as much as 92% in Information, Transmission, Computer Services and Software).

Table 13. Foreign-funded enterprises by sector, 2004

Sector	Number of enterprises (unit)	%	Total investment (billion USD)	% of total	Registered capital (billion USD)	Foreign investors	Foreign (%)
Total	**242 284**	100	**1 311**	100	**728.5**	**5 580**	**76.6%**
Manufacturing	170 654	70.4	791	60.3	455.6	3 523	77.3%
Information, transmission, computer services and software	4 453	1.8	22.2	1.7	11.9	109	92.0%
Leasing and business services	6 468	2.7	15.2	1.2	10.0	82	81.4%
Scientific research, technical service and geologic prospecting	4 504	1.9	20.7	1.6	12.1	99	82.2%

Source: China Statistical Yearbook (2005).

4.5. Multinational companies in China

Results from a survey by the Economist Intelligence Unit in early 2004 among senior decision-makers of multinational companies (MNCs) in China indicated that most of the MNCs in the survey were seeking to benefit from the booming Chinese domestic market as well as from exports. Some 23% considered the domestic market to be the main market (Table 14). Few companies solely served exports markets (less than 4%). The survey results also suggested a shift towards more exports by those focussing on the domestic market. The sectoral split shows that Technology, Telecoms and IT services represented 5.1%, 3.2% and 1.4%, respectively, of the primary industries among the MNCs interviewed.

Table 14. MNCs in China intend to increase export shares
% of responses

Export/domestic sales ratios	Current ratio	Expected ratio in 5 years' time
0:100	23.1	12.1
25:75	23.6	23.3
50:50	5.6	20.9
75:25	7.9	6.0
100:0	3.7	1.9
N/A	36.1	35.8

Source: The Economist Intelligence Unit (2004).

4.6. The internationalisation of Chinese companies

This section focuses on Chinese companies that are internationalising. Globalisation and offshoring are not a one-way street: Chinese companies are also reaching out to other countries and are offshoring some of their activities. This section briefly shows the two main examples in the ICT-related area, which also included the software companies Haier, ZTE, TCL, and UTStarcom, for example, but Chinese companies are increasingly reaching out more generally. With global ties increasing, the potential for offshoring of services, in both directions, also increases.

1) HuaWei Technologies

Huawei Technologies is a leader in providing next generation telecommunications networks, and serves 28 of the world's Top 50 operators, as well as over one billion users worldwide. Huawei's products and solutions include wireless products, core network products, network products, application and software, as well as terminals. Major products are based on Huawei's self-designed ASIC chips and shared platforms to provide high-quality and cost-effective products and solutions with quick response.

Huawei has over 44 000 employees, 48% of whom are dedicated to R&D activities. Outside of China, Huawei's global R&D centres are located in Bangalore (India), Silicon Valley and Dallas (US), Stockholm (Sweden), and Moscow (Russia). Its domestic R&D centres are in Beijing, Shanghai, Nanjing, Shenzhen, Hangzhou and Chengdu.

2) Lenovo

Lenovo Group Limited, formerly known as Legend Group Ltd and New Technology Developer Incorporated, is the largest PC manufacturer in China, and the third largest in the world after acquiring IBM's PC Division in 2004. It has an annual revenue of approximately USD 13 billion. Along with desktop and laptop computers, Lenovo sells servers, handheld computers, imaging equipment, and mobile

phone handsets. Lenovo also provides information technology integration and support services, and its QDI unit offers contract manufacturing.

Lenovo's executive headquarters are in Purchase (New York, US) with principal operations in Beijing (China), and Raleigh (North Carolina, US) and an enterprise sales organisation implanted worldwide. The company employs more than 19 000 people worldwide, and has established R&D centres in China, Japan and the US.

5. Policy initiatives in China aimed at stimulating offshoring of ICT-enabled services

This section reports some existing policy initiatives in China to encourage services offshoring and exports, as well as IPR protection. The latter is an important framework condition for attracting business with foreign companies.

1) Policies that encourage services offshoring and exports

According to China's National Development and Reform Commission (NDRC), policies facilitating software offshoring are expected to be put in place soon. They will focus on three areas: *i*) supporting and encouraging public R&D; *ii*) promoting the development of the software industry through taxation and financing channels, effective intermediary services and training schemes; and *iii*) improving the structure of software industries.

The Chinese government has also announced plans to increase the number of software bases from 6 to 15 by 2010. According to the Ministry of Information Industry, software exports are expected to grow at an annual rate of 30% to reach USD 12.5 billion by 2010, from USD 3.6 billion in 2005. The government also expects growth in software outsourcing.

The Ministry of Information Industry also aims to increase the number of software companies with sales revenues of over CNY 5 billion (USD 625 million). Among the top 100 Chinese software companies, Huawei, Haier, ZTE and UTStarcom have reported revenues above CNY 5 billion and 26 companies have reported revenues above CNY 1 billion (USD 125 million).

In 2004, the Ministry of Science and Technology introduced a programme called "China offshore software exports to European and American markets", to encourage software service providers to sell products overseas. The Ministry provides financial and trade support to such providers.

According to the IFC report on the ICT landscape in China, the Chinese government actively supports the software industry through tax breaks and administrative measures, such as quicker approval to secure international investment. Software companies are not required to pay taxes during their first two years of operations and receive 50% tax breaks in the next two years.

2) Policies concerning Intellectual Property Rights (IPR) protection

In 2001, the Ministry of Information Industry issued a document to encourage the use of copyrighted software in government sectors. A similar campaign for business sectors is expected.

In April 2006, the Ministry of Information Industry and National Copyright Administration announced that all computers being made and sold in China are required to have authentic operating systems installed.

IPR is high on the government's agenda more generally. Currently, China's IP legislative framework conforms to TRIPS (Trade-Related Aspects of Intellectual Property Rights), which is the WTO standard for IP law.

In comparison, India has had less-focused central government initiatives to support the IT and ICT-enabled services industries. A major initiative was the Information Technology Act, 2000 which focused very largely on secure electronic records, digital signatures and authentication issues (see http://www.mit.gov.in/it-bill.asp), and which is planned for updating. The initiatives in the Special Economic Zone Act in February 2006 will also have very major impacts on IT and ICT-enabled services, helping this kind of activity to spread more widely. The general stance towards liberalisation of the economy over the last few years and state-level initiatives have also been major policy factors aiding the growth of the Indian industry, apart from firm and human-resource-specific factors.

6. Conclusions

This paper analyses the extent of current IT and ICT-enabled services offshoring to China, and its potential for future growth. It analyses indicators on the quantity and quality of available human resources, such as the number of science and engineering graduates, and examines the extent of English language competencies. The paper also looks at ICT infrastructure indicators, such as personal computer and broadband availability, to examine the scope for ICT-enabled services offshoring. It looks at indicators on R&D in China as a proxy measure for more highly skilled ICT-enabled services to examine China's potential for moving up the value chain.

Trade in IT and ICT-enabled services is growing rapidly, as is aggregate FDI and the number of R&D centres set up by multinationals. Other indicators are also favourable for growth of ICT-enabled services offshoring to China, if it puts in place the right conditions. In particular, the quality of its human resources needs improving, including the English language skills of the labour force. Infrastructure needs to be available, of high quality and at relatively low cost. IPR enforcement needs to be strengthened as IPR infringement poses a threat to China's moving up the value chain as companies will be reluctant to transfer high value-added activities and R&D into China. Finally, the macroeconomic conditions and the business climate need to be favourable in order to attract offshored services activities to China. However, future developments in services offshoring to China will not only depend on economic factors, but also on the social and political climate in China in the continuing transition to a market-based economy, developments in other countries, in particular in India, and India's strategies to maintain and strengthen its role as a key destination for offshored IT and ICT-enabled services.

Thus, some offshoring of services to China is already taking place, but on a relatively small scale. However, if China manages to improve the skills of its workforce (language, but also business culture skills) to be readily available to work in ICT-related and ICT-enabled services activities there is very large potential for growth, particularly if specialised services supplying firms develop and inward investment swings towards services. Weak IPR enforcement, administrative interference in business activities, a lack of knowledge of "Western" corporate culture and managers with a global vision and the management skills to put into place global sourcing strategies also need to be addressed as they can also hamper growth of services sourcing in China.

Overall, the answer to the question "Is China the new centre for the offshoring of IT and ICT-enabled services?" is: no, not yet, but providing China addresses the points raised in this analysis there is a great potential for growth of services sourcing from China.

However, further work needs to be carried out to improve understanding of the process of offshoring of service supply activities in China, as well as the potential for further growth. For example, it would be

very useful to determine the composition of offshoring of services to China: how much is coming from the affiliates of foreign companies (international insourcing) and how much is from domestic companies (international outsourcing). Thus, it would be useful to analyse not only the current extent of services activities of foreign companies in China, but also their role in the process. Perhaps other companies will follow the path of multinationals to China? Company case studies, *e.g.* of Microsoft or IBM, would show where companies choose to locate their various types of services activities, and would perhaps provide some insight into what factors determine locational choices. Another area could be the quality of services in China, and in particular information security and privacy related issues. The internationalisation of Chinese companies and the offshoring of activities from China to other countries also needs to be examined further, in particular the implications of offshoring to and from China for OECD countries. In depth analysis of IPR law enforcement and compliance with trade and labour standards in China also merits further study. Finally the policy implications of this ongoing and intensifying restructuring of the global economy need further examination and elaboration.

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ANNEX

Annex Table 1. IMF balance of payments categories

7.	**Computer and information services**
7.1	Computer services
7.2	Information services
7.2.1	News agency services
7.2.2	Other information provision services
9.	**Other business services**
9.1	Merchanting and other trade-related services
9.1.1	Merchanting
9.1.2	Other trade-related services
9.2	Operational leasing services
9.3	Miscellaneous business, professional, and technical services
9.3.1	Legal, accounting, management consulting, and public relations
9.3.1.1	Legal services
9.3.1.2	Accounting, auditing, bookkeeping, and tax consulting services
9.3.1.3	Business and management consulting, and public relations
9.3.2	Advertising, market research, and public opinion polling
9.3.3	Research and development
9.3.4	Architectural, engineering, and other technical services
9.3.5	Agricultural, mining, mining, and on-site processing services
9.3.5.1	Waste treatment and depollution
9.3.5.2	Agricultural, mining and other on-site processing services
9.3.6	Other business services
9.3.7	Services between related enterprises, n.*i.e.*

Annex Box 1. Chinese and Indian data on trade in services – A statistical challenge?

This box highlights some of the discrepancies found in the balance of payments data for China, and compares them to those for India (See OECD, 2006b, Chapter 3, Box 3.2 and Box 3.3). Overall the evidence is not very clear and the issues set out here warrant further study.

IMF and OECD trade in services data show that in 2003:

- China's services exports were twice India's.
- Transport, travel, and a variety of manufacturing-related services are more important in China's services exports than in India's.
- India's "computer and information services" exports were ten times China's.
- China's "other business services" exports were nearly seven times India's.
- China's combined "other business services" and "computer and information services" were 30% higher than India's.
- China overtook India in combined "other business services" and "computer and information services" exports, with China recording a large step increase.

Also:
- OECD countries report more "computer and information services" imports from India but more "other business services" imports from China.
- It is likely that there are methodological problems of comparability between China's and India's balance of payments data in services.
- A relatively higher proportion of China's exports are probably reflected in OECD + Hong Kong (China) + Russia imports (see table below) than in India's as Korea, Japan, Russia and Hong Kong (China) are geographically close to China but not to India, bearing in mind that relatively few data for Russia and Hong Kong (China) are available for checking.
- China's reported services exports grow at a faster pace than the mirror imports reported by OECD + Russia + Hong Kong (China).

Differences in exports reported by China and India and imports reported by OECD countries + Russia + Hong Kong (China), 2000 and 2003

	% Exports reported by China accounted for by imports reported by OECD countries, Hong Kong, China and Russia		% Exports reported by India accounted for by imports reported by OECD countries, Hong Kong, China and Russia	
	2000	2003	2000	2003
Total services	70.1	56.6	29.6	26.2
Other business services (OBS)	31.8	18.4	12.9	24.2
Computer and information services (CIS)	32.6	11.3	2.7	2.7
OBS taking unaffiliated business, professional and technical services less CIS for the US into account	33.1	19.1	14.6	27.6
CIS taking unaffiliated CIS for the US into account	35.0	11.9	5.5	5.7

1. The category "Other business services" includes both some trade-related and technical services (engineering and design types of services).
2. US import data for "Other business services" and "Computer and information services" are based on that for unaffiliated trade only.

Source: OECD (2006b, Chapter 3, Box 3.3).