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# INGINEUS
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*Dedicated to Jo Lorentzen.*

# Table of contents



**BACKGROUND PAPERS**

# Synthesis paper on HRD and MNC subsidiaries

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## Table of contents

# 1. Introduction

The 1990s saw the reform of many developing countries' economies and political systems, enabling participation on a global platform. With more open economies, firms in countries such as China, India, Brazil and South Africa can collaborate with workers around the globe. The rapid spread and advancement of information communication technology has lowered the cost of communication, thereby facilitating workforce interaction worldwide. Collaboration has taken on many forms, including production, education, research and innovation. The geographical proximity of collaborators matters much less than it did a few decades ago. Hundreds of millions more people have now joined the knowledge pool that can be tapped by individuals, groups, companies and universities worldwide. There are greater opportunities for talented people in developing countries to work in global production and global innovation networks (GINs). The division of labour can also apply to knowledge intensive activities such as research and development (R&D), and innovation; given that workers are provided with adequate infrastructure, governance and education (Friedman, 2006).

Human capital is a basic input for innovation. Education systems contribute to the knowledge and research bases of countries and build the competencies required for innovation. A basic education system can produce fundamental competencies that allow firms to absorb new technologies. However the creation of new knowledge and technologies requires a first-rate education system to produce high-level competencies. GINs, by their very nature, rely on skilled human capital. The output of a country's education system is therefore a crucial consideration for GINs. Education is also an investment in human capital that is important for economic development. Few, if any, countries have achieved sustained economic development without substantial investments in education (Becker, 1993 and OECD 2010a).

This paper examines and compares education indicators for 7 developed countries in Europe - Germany, Italy, Estonia, Denmark, Sweden, Norway and United Kingdom, and four developing countries- Brazil, India, China and South Africa. The selection of these countries is guided by the INGINEUS project. Tertiary education is the main focus of the report, although primary and secondary education systems are also taken into account. This report focuses on the four developing countries in particular; exploring the growth in human capital and the quality of the human capital output.

# 2. Key country indicators

Key statistics for the eleven INGINEUS partner countries are shown in Table 1. Gross domestic product (GDP) comparisons of the eleven countries places China at the top, with a 2009 GDP of almost 5 trillion US$; followed by Germany, the UK and Italy. Developed countries (highlighted in blue) all have considerably higher GDP per capita figures than the developing countries (highlighted in red). The three Nordic countries have the highest GDP per capita values, however their combined populations make up less than 1.5% of China's population. It is difficult to make cross country comparisons when population and output figures vary so greatly. The two countries with the highest populations, China and India, also have the lowest GDP per capita values. GDP purchasing power parity (PPP) figures, as a percentage of the world total, better reflect the economic output of each country on a global scale. Using this measure India notably moves to second on the list of 11 countries.

**Table 1:** Key indicators 2009

| Country | GDP (US$ billions) | Population (millions) | GDP per capita (US$) | GDP (PPP) as share (%) of world total |
|---|---|---|---|---|
| China | 4909.0 | 1345.8 | 3678 | 12.52 |
| Germany | 3352.7 | 82.2 | 40875 | 4.03 |
| UK | 2183.6 | 61.6 | 35334 | 3.10 |
| Italy | 2118.3 | 59.9 | 35435 | 2.51 |
| Brazil | 1574.0 | 193.7 | 8220 | 2.87 |
| India | 1236.0 | 1198.0 | 1031 | 5.06 |
| Sweden | 405.4 | 9.2 | 43986 | 0.48 |
| Norway | 383.0 | 4.8 | 79085 | 0.37 |
| Denmark | 309.3 | 5.5 | 56115 | 0.29 |
| South Africa | 287.2 | 50.1 | 5824 | 0.70 |
| Estonia | 19.1 | 1.3 | 14267 | 0.04 |

**Source:** World Economic Forum Global Competitiveness Report 2010-2011

Table 2 shows the public expenditure on education in 1999 and 2007. Three countries show growth in expenditure as a percentage of GDP, China (from 1.91% to 3.22%), Brazil (from 3.88% to 5.21%) and the United Kingdom (from 4.60% to 5.56%). China and India display low public education expenditure as a percentage of GDP. Stark differences are apparent between all the developed and developing countries when public expenditure on education is viewed per capita. These figures do not include private education expenditure and it must be noted that the private sector plays a central role in many of the developing countries' education systems.

**Table 2:** Public sector education expenditure

| Country | as % of GDP (1999) | as % of GDP (2007) | per capita (2007) |
|---|---|---|---|
| Denmark | 8.11 | *7.92 | *3188.61 |
| Norway | 7.11 | 6.75 | 5550.82 |
| Sweden | 7.30 | 6.67 | 3373.96 |
| UK | 4.60 | 5.56 | 2551.81 |
| South Africa | 6.03 | 5.34 | 316.82 |
| Brazil | 3.88 | 5.21 | 374.27 |
| Estonia | 6.74 | 4.96 | 791.00 |
| Germany | 4.47 | *4.41 | *1561.57 |
| Italy | 4.70 | 4.32 | 1538.63 |

| | | | |
|---|---|---|---|
| China | 1.91 | **3.22 | **231.35 |
| India | 4.47 | *3.18 | *27.21 |

**Note** *=2006
**Note**** China 2007 figure for education expenditure source: People's Daily 2009
**Source:** World Bank 2010, UNESCO 2010a

The three Nordic countries have the highest public expenditure on education when viewed as a percentage of GDP, or per capita. In all three countries there are no tuition fees at government tertiary institutions and the number of private institutions is very low. Data from the World Bank (2010)shows that private enrolments in tertiary education in 2007 were 2% in Denmark, 8% in Sweden and 14% in Norway (World Bank 2010). There is evidence of some growth in the private sector market in Western Europe, but a much stronger growth of private institutions has been observed in Asia, the US, Latin America and Eastern Europe. Notably the share of private tertiary enrolment in 2007 was 84% in Estonia, 73% in Brazil and 52% in India (World Bank 2010 and FICCI 2009).

The Chinese education system has undergone radical shifts over the past few decades. The Cultural Revolution from 1966-1976 and the destruction of all culture perceived to be 'middle class' left the whole Chinese education system in ruins. By mobilising community resources China was able to rebuild and expand schools. By 1986 the government enacted a law requiring nine years of compulsory education for all (OECD 2010b). A move from public to private funding is associated with most of the expansion in higher education, in China and other developing countries, over the last decade. The private sector has demonstrated a better ability to serve a mass clientele. Rather than being selective the private sector is demand absorbing. Many East Asian and Latin American countries have encouraged expanded participation by shifting costs to parents and students, whilst keeping public sector education small and selective (Altbach et al. 2009). China's public expenditure on education has remained low through a remarkable expansion of higher education. The higher education system was built up almost from scratch after the late 1970s. Expansion was made possible when the state gave institutions the freedom to generate revenues for themselves in addition to state funding (OECD 2010b). Higher education institutions were allowed to raise funds through services to industries, private donations and (primarily) tuition fees. Fee-charging was a crucial move towards China's higher education reform. In 1994 37 institutions were involved in a pilot study whereby all students were required to pay fees. In 1997 all higher education institutions started paying fees (Zha 2009).

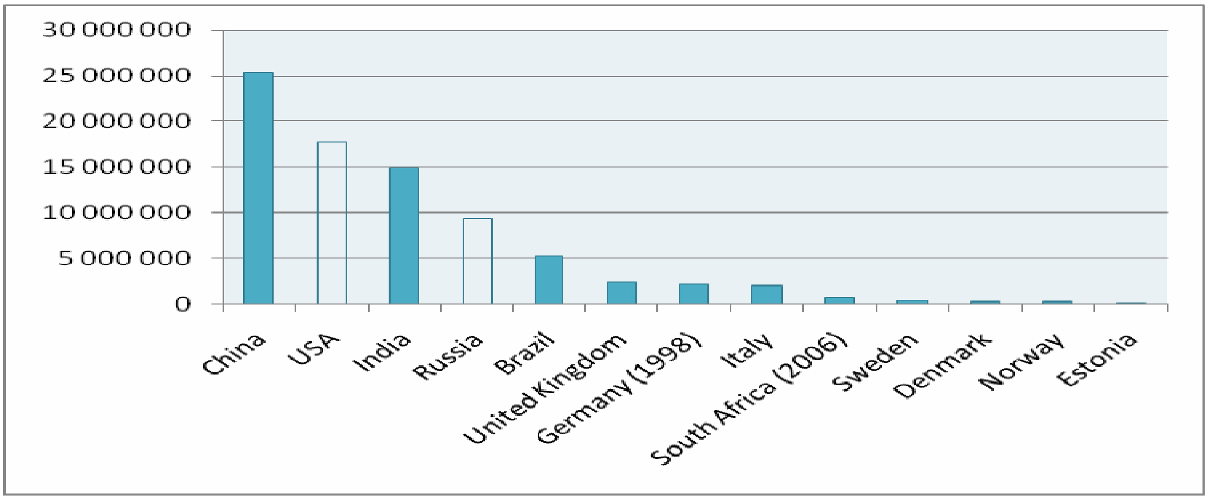
The change in funding structure also had huge implications for the Chinese labour market. Prior to charging fees, enrolment quotas were used to ensure the state could cover the costs of training. The need for quotas disappeared once fees were charged to students and enrolment figures became driven by market demand. The demand for education was then driven by employment prospects and wages, and there was no need for the state to allocate jobs. State job assignment was abolished by 2000 (Zha 2009).

# 3. Higher education enrolment

Looking at tertiary education from a global perspective, between 2000 and 2007 the percentage of the 18-24 age cohort enrolled in tertiary education grew from 19% to 26%. The increase in tertiary education students has not been spread evenly. Most of these gains have been due to the massification of higher education in East Asia and Latin America, whereas low-income countries have seen little growth. In Sub-Saharan Africa, participation in the age cohort is 5%, the lowest in the world.

China has the highest levels of tertiary enrolment worldwide in terms of sheer numbers, followed by the USA, India, Russia and Brazil (see Figure 1 for 2007 figures). This places three of the developing countries in the top five for tertiary education student numbers. China and India have a comparable number of students enrolled in secondary education (102 million in China and 96 million in India in 2007). Yet China's tertiary education system has reached a larger percentage of the 18-24 age cohort (23%) than India's system (12%) (Altbach et al. 2009).

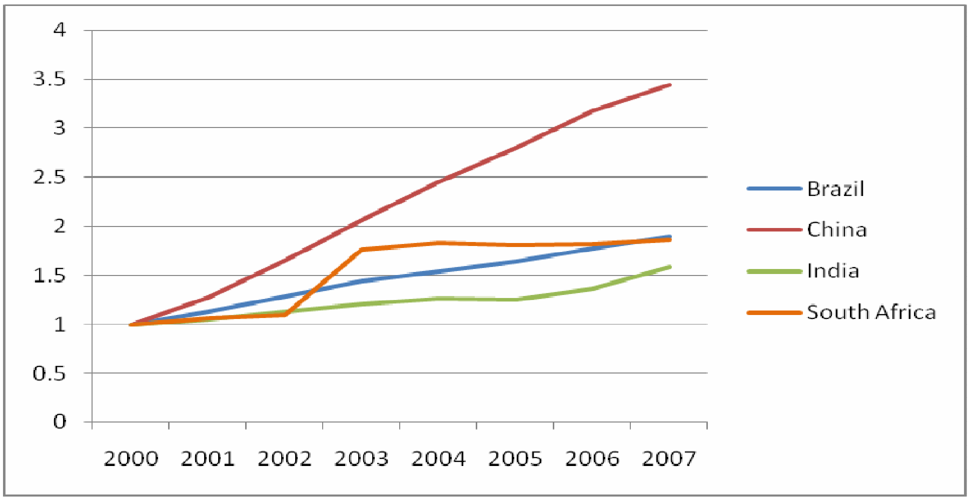
**Figure 1:** Tertiary education enrolment 2007




**Source:** World Bank 2010

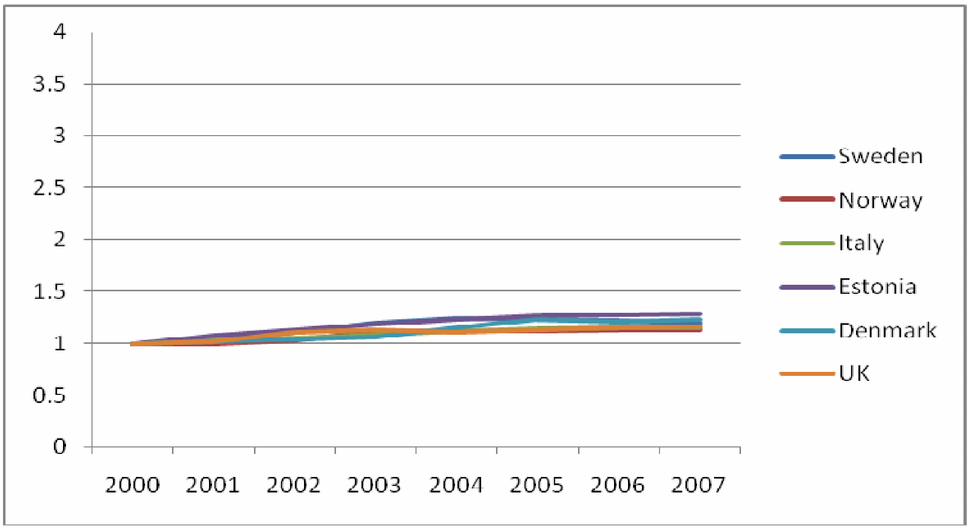
Figures 2 and 3 put the growth of tertiary education in developing countries into perspective. Growth, normalised to unity, in any of the developing countries outstretches growth in any of the developed countries. China is most notably an outlier and has more than tripled tertiary enrolment over a period of seven years. Out of the developed countries Estonia has achieved the highest normalised growth in enrolments.

**Figure 2:** Growth of public and private tertiary enrolment for developing countries (normalised to unity in 2000).




**Source:** UNESCO 2010a

**Figure 3:** Growth of public and private tertiary enrolment for developed countries (normalised to unity in 2000).




**Source:** UNESCO 2010a

Table 3 presents enrolment as a percentage of the total 18-24 age cohort for the 11 focus countries. This measure takes population growth into account at the general tertiary-education-going age. For instance, higher population growth in India is expanding the pool of 18-24 year olds without higher education faster than in China. Countries in Europe generally have better enrolment rates compared to the developing countries. Education infrastructure, access to education, and education policies are some of the factors influencing the enrolment rate. The six countries from Europe all achieved enrolments in tertiary education in excess of 50%. Sweden, Norway and Denmark achieved the highest proportion of student enrolments. Denmark has increased its enrolment rate dramatically, from 58% in 2000 to 80% in 2007. Developing countries have again seen the largest changes. Enrolment in Brazil grew rapidly from 16% in 2000 to over 34% in 2008. China has achieved the highest increase in figures out of any country, moving from single digits to almost triple the percentage of 18-24 year olds in tertiary education over the space of 8 years.

**Table 3:** Gross tertiary enrolment as a percentage of the total 18-24 age cohort

| Country | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| Denmark | 58.00 | 60.00 | 63.00 | 67.00 | 74.00 | 81.00 | 80.00 | 80.00 | - |
| Norway | 69.00 | 70.00 | 74.00 | 79.00 | 79.00 | 78.00 | 77.00 | 76.00 | 73.00 |
| Sweden | 67.00 | 70.00 | 75.00 | 81.00 | 83.00 | 81.00 | 78.00 | 75.00 | 71.00 |
| Italy | 49.00 | 52.00 | 55.00 | 58.00 | 62.00 | 64.00 | 66.00 | 67.00 | - |
| Estonia | 56.00 | 60.00 | 62.00 | 64.00 | 65.00 | 66.00 | 65.00 | 65.00 | 64.00 |
| UK | 58.00 | 58.00 | 62.00 | 62.00 | 59.00 | 59.00 | 59.00 | 58.00 | 57.00 |
| Brazil | 16.00 | 17.77 | 20.13 | 22,28 | 23.77 | 25.46 | 27.50 | 30.01 | 34.44 |
| China | 7.80 | 10.02 | 12.75 | 15.42 | 17.57 | 19.15 | 20.93 | 22.05 | 22.69 |
| South Africa* | 12.90 | 13.90 | 14.50 | 14.70 | 16.10 | 15.9 | 15.90 | 16.20 | - |
| India | 10.00 | 10.00 | 10.00 | 11.00 | 11.00 | 11.00 | 12.00 | 13.00 | - |
| Germany | - | - | - | - | - | - | - | - | - |

**Source:** World Bank 2010, *Department of education 2007 report (20-24year old)

The global picture of higher education has changed dramatically from a decade ago. The majority of graduates now reside in the developing world and this number continues to grow. The growth in higher education begs the question, what opportunities have arisen for global innovation networks? There could be an opportunity for GINs to tap into the talent nurtured by the expansion of higher education. The data presented so far suggests that China is leading the world in terms of sheer numbers of graduates.

# 4. University teacher qualifications

The expansion of higher education in China, India and Brazil has come at a cost. Rapid growth in all three countries has meant that the education systems' infrastructure, university teacher training and university teacher/student ratios are often second-rate. High demand has led to vacancies of 45% for professor positions and 53% for lecturer positions, according to a survey of universities in India. Faculty shortages at universities are also giving faculty less time to focus on research (FICCA 2009). Estimates of the proportion of higher education teachers with a doctorate show a rise from roughly 5% in 1997 to just below 10% in 2006 (Liu et al. 2010). This expanding number of doctorates is still a relatively low proportion. A UNESCO report on trends in global higher education (Altbach et al. 2009) estimates that only 9 % of the academic profession has doctorates in China with 35% in India. Postgraduate programmes have taken a back seat to basic higher education, leaving a dearth of highly qualified academics (Altbach et al. 2009). South Africa has also experienced a larger growth in graduates than academics, increasing the supervisory burden on academics. There has been an 11.1% annual growth in four year degree graduates and a 7.7% growth in doctoral graduates between 2000 and 2005. Growth in the engineering and applied technologies fields has been particularly low at the doctorate level, a 2.2% annual growth rate between 2000 and 2005 (CHE 2009).

In 2008 China became the world's top producer of doctorate holders, ahead of the United States. In the ten years after 1999 the number of PhD students in China increased five fold, reaching 246300 in 2009. The massive enrolment figures created a shortage of qualified professors to supervise students (Dan 2010). The demand for more university teachers led to a decline in the average qualification of academics in many other developing countries, outside of a handful of elite universities. It has also led to an increase in the number of part-time academics and competition for academics across borders. Academic migration tends to follow a pattern of academics moving to higher salaries in developed countries to the disadvantage of developing countries. Higher paying jobs, better research infrastructures, and academic freedom are often draw cards to North America, Western Europe and Australasia. India, for example, loses many scientists and engineers to the west (UNESCO 2010b). The "brain drain" is not limited to flows between developed and developing countries. For example there are significant flows from sub-Saharan Africa to South Africa and from the United Kingdom to Canada and the United States. Table 4 indicates that the developed INGINEUS partner countries experience less human capital losses, with the exceptions of Estonia and Italy. There are however gradual signs of change and some universities in Eastern developing countries are attracting Western academics (Altbach et al. 2009).

**Table 4:** Brain drain

| Country | *Brain drain ranking |
|---|---:|
| Sweden | 6 |
| Norway | 7 |
| UK | 10 |
| Denmark | 23 |
| Germany | 31 |
| India | 34 |
| China | 37 |
| Brazil | 39 |
| Estonia | 57 |
| South Africa | 62 |
| Italy | 92 |

***Note:** A lower ranking indicates greater brain drain

**Source:** World Economic Forum Global Competitiveness Report 2010-2011

# 5. Education quality indicators

To get an indication of labour force skills one also has to look at the quality of education in each country. Quality education and training is seen as a crucial aspect of moving up the production value chain, especially in a globalised economy when rapid adaptation is required. The World Economic Forum (WEF) Global Competitiveness Report 2010-2011 ranks the competitiveness of 139 countries using a number of indicators. Countries were ranked according to the quality of education; as evaluated by the business community. Firms were asked 'How well does the educational system in your country meet the needs of a competitive economy?'. The rankings for the eleven focus countries are shown in Table 5. Sweden and Denmark's educational systems rank in the top 10 out of 139. India has the highest ranking out of the developing countries ($39^{th}$) whereas Brazil and South Africa are both ranked below $100^{th}$. The availability of scientists and engineers to meet firms' needs is also a proxy for education quality and corresponds closely with the quality of the educational system ranking, and the quality of math and science education. By these measures South Africa again ranks very poorly. Remarkably India ranks second out of the 11 INGINEUS partner countries for the availability of scientists and engineers. South Africa's rankings are not poor in all areas. The quality of management schools is ranked $21^{st}$ and the quality of scientific research institutions is ranked $29^{th}$. China is the only developing country out of the four that has relatively good internet access in schools. Sweden scores highly in all six indicators. Overall the three Nordic countries offer superior education systems.

**Table 5:** WEF rankings out of 139 countries

| Country | Quality of educational system | Quality of math and science education | Availability of scientists & engineers | Quality of management schools | Quality of scientific research institutions | Internet access in schools |
|---|---|---|---|---|---|---|
| Sweden | 8 | 20 | 3 | 7 | 5 | 3 |
| Denmark | 10 | 19 | 19 | 14 | 12 | 10 |
| Germany | 18 | 39 | 27 | 31 | 6 | 39 |
| Norway | 19 | 64 | 18 | 19 | 23 | 15 |
| UK | 28 | 55 | 29 | 10 | 3 | 18 |
| India | 39 | 38 | 15 | 23 | 30 | 70 |
| Estonia | 42 | 21 | 58 | 41 | 26 | 2 |
| China | 53 | 33 | 35 | 63 | 17 | 22 |
| Italy | 83 | 82 | 54 | 38 | 65 | 85 |
| Brazil | 103 | 126 | 68 | 73 | 42 | 72 |
| South Africa | 130 | 137 | 116 | 21 | 29 | 100 |

**Source:** World Economic Forum Global Competitiveness Report 2010-2011

On-the-job staff training is important for continual skills upgrading and university industry collaboration better enables universities to meet the needs of firms. The three Nordic countries and Germany rank highly in these areas (see Table 6). South Africa is also ranked well in both indicators and has the better rankings out of the developing countries. Italy performs poorly ranking below all the INGINEUS partner countries. The final indicator in Table 7 shows that there is generally a greater availability of high quality, specialized training services for firms in developed countries than in developing countries.

**Table 6:** WEF rankings

| Country | Extent of staff training | University-industry collaboration in R&D | Local availability of research and training services |
|---|---|---|---|
| Sweden | 1 | 5 | 3 |
| Norway | 3 | 20 | 14 |
| Denmark | 7 | 8 | 8 |
| Germany | 8 | 9 | 2 |
| South Africa | 26 | 24 | 49 |
| UK | 28 | 4 | 12 |
| Estonia | 48 | 36 | 33 |
| Brazil | 53 | 34 | 36 |
| China | 57 | 25 | 50 |
| India | 59 | 58 | 51 |
| Italy | 127 | 70 | 37 |

**Source:** World Economic Forum Global Competitiveness Report 2010-2011

Brazil, China and India have relatively poor on-the-job training. It was also noted earlier that there has been a decline in the quality of overall higher education associated with its rapid expansion. As a consequence GINs may not have access to quality pools of knowledge workers required for innovative activities. A McKinsey 2005 quarterly report found that the number of engineering graduates suitable for work in multinational corporations was only 25 percent and 10 percent, of total engineering graduates, in India and China respectively. Aside from cultural differences a lack of language skills, practical knowledge and conflicting approaches towards the flexible work hours (often required by multinationals) were some of the problems identified. The remote location of many university graduates and distances from international airline connections is also a setback; although this is less of an issue in India. But as small as the percentage of suitable graduates may be, the numbers of graduates in these countries is so large that this still represents a deep pool of talent at a much lower cost; and a pool that is growing rapidly (Farrell et al. 2005).

One of the reasons education costs are lower in developing countries is that class sizes are larger. In mainland China, for example, school class sizes are typically 50 (OECD 2010b). Table 7 shows that on average the developed countries have higher teacher/student ratios and longer periods of compulsory education than the developing countries. The longest duration being 13 years in Germany and the shortest being 8 years in Brazil. Teacher student ratios are very low in developing countries, and may lead to lower individual attention. However the Organisation for Economic Cooperation and Development (OECD 2009) argues that the most essential ingredients of a high quality education system are high quality teachers who are given high quality training. Money is better spent on a small number of excellent teachers for larger classes than a large number of mediocre teachers for smaller classes (The Economist 2010a).

**Table 7:** Teacher/student ratios and the duration of compulsory education

| Country | Teacher/student ratio, secondary (2008) | Teacher/student ratio, tertiary (2008) | Duration of compulsory education (2008) |
|---|---|---|---|
| Norway | 0.1137 | 0.0953 | 11 |
| Estonia | 0.1062 | **0.0931 | 9 |
| Sweden | 0.1033 | 0.0899 | 10 |
| Denmark | ****0.0995 | - | 10 |
| Italy | *0.0990 | *0.0513 | 9 |
| Germany | 0.0755 | - | 13 |
| UK | *0.0714 | 0.0576 | 12 |
| China | 0.0625 | 0.0597 | 9 |
| Brazil | 0.0582 | 0.0630 | 8 |
| South Africa | *0.0362 | - | 9 |
| India | ***0.0306 | ***0.0455 | 9 |

**Note:** *=2007, **=2006, ***=2004, ****=2001
**Source:** World Bank 2010

In 2009 the OECD completed an assessment of 470 000 students (all 15 years old) in 65 countries, large cities and economies. The OECD's Programme for International Student Assessment (PISA) for 2009 consisted of tasks in reading, mathematics and science, carried out over two hours. The reading assessment focuses on the ability of an individual to learn and achieve goals from reading; through interpretation and reflection, rather than simply learning to read. Mathematical literacy focuses on an individual's capacity to formulate, employ and interpret mathematics in various situations. Scientific literacy tests scientific knowledge, understanding and the ability to think scientifically about evidence and apply scientific methods (OECD 2009).

Student performance in reading, mathematics and science are divided into six levels of proficiency. The lowest performers are grouped into level one, moderate performers in level two and three, strong performers in level four, and the top performers into levels five and six. Results from PISA 2009 show that the percentage of students reaching levels five and six is markedly higher in Shanghai-China than in any of the other 65 countries and regions. Most notably in mathematics 50% of the tested Shanghai students reach levels 5 and 6 in proficiency, compared to less than 20% in Germany, less than 15% in Denmark and Sweden, and less than 10% in Norway and the UK. It may not seem fair to compare cities to countries but Shanghai has a population of over 20 million, larger than many of the comparator countries. China’s performance is not however high in all its regions involved in PISA. Macao-China, for example, is ranked 42nd and 34th out of 65 in reading and science, respectively.

Brazil ranks 48th in reading, 56th in Maths and 52nd in science. Although these are very low rankings, they are still a large improvement on PISA rankings in 2000 where Brazil came last. Despite social and economic odds Brazil has made steady progress. In 2001 income subsidies were given to parents who sent their children (between the ages of 7 to 14) to school and got them essential medical checkups. This enabled the upward social mobility of many families at the subsistence level and decreased pupil absenteeism. The subsidies were extended in 2004 to families with children between 7 and 17. Since 2005 all of Brazils 200 000 schools undergo Basic Education Development Index (IDEB) assessments; which hold them accountable for performance and allow schools to be benchmarked against international PISA results.

One of the biggest hurdles still faced by Brazil is teacher quality. Although it is law that teachers have a university education, many are temporary teachers who do not meet these requirements. Teacher salaries have also been increased to 50% more than the average worker to attract more talent, but this is still less than others with a secondary school education or better. Attempts are now being made to increase the quality of teacher training to equip them with the necessary knowledge and skills. (OECD 2010b). Countries such as Finland and South Korea have shown that attracting top talent into teaching posts, and retaining this talent, can help to produce excellent students (The Economist 2010b). Both Finland and South Korea rank very highly in the 2009 PISA results.

Shanghai is the largest municipality in China and its business centre. It is also an education hub in China. For centuries the Chinese have placed a strong emphasis on education as a means of upward social mobility, but there are numerous other factors contributing to the exemplary PISA 2009 results of 15 year old students in Shanghai. The threshold qualifications required for teachers are a diploma for primary school teachers and a degree for secondary school teachers. The Shanghai district also requires continuous professional development for teachers. Schools are rated from A to D levels; an ‘A’ level school having the highest infrastructure and educational quality and a ‘D’ level school having the lowest. Decreasing numbers of school-age children allowed for the closure of many C and D schools. In some instances higher and lower quality schools have also been merged. Lower performing schools have also sometimes benefitted from the transfer of experienced or high performing teachers and leaders from high achieving schools. There has been a move away from ‘rote’ learning to learning with understanding, creative thought and applying knowledge. Greater control by local authorities has also paved the way for curriculum flexibility. Once leaving secondary school in Shanghai, enrolment in tertiary education is over 80% of the city’s higher education cohort, compared to a national figure of 24% (OECD 2010b).

Regions within China such as Shanghai and Hong Kong have primary and secondary schooling systems that match, or even better those in developed countries. Tertiary education systems in these and other large urban areas of China (such as Beijing) are also becoming more prominent in global rankings. The highest ranked universities still remain in developed countries, but Chinese universities are catching up. According to QS world university rankings (2010), the top ten universities worldwide are all from the US and UK. The US is still the dominant force in higher education with 53 universities in the top 200; although more universities from developing countries are now making the top 200 list. Table 8 shows the number of universities in the top 200 for each of the 11 INGINEUS countries. China has nine universities in the top 200, by far the most out of the developing countries. South Africa and India have one each and Brazil and Estonia have none.

**Table 8:** Number of INGINEUS country universities ranked in the top 200 worldwide

| Country | Number of universities rated in the top 200 worldwide |
|---|---|
| UK | 30 |
| Germany | 10 |
| China | *9 |
| Sweden | 5 |
| Denmark | 3 |
| Italy | 2 |
| Norway | 1 |
| South Africa | 1 |
| India | 1 |
| Brazil | 0 |
| Estonia | 0 |

**Note:** *Including 3 from Hong Kong, a former British colony.

**Source:** QS World University Rankings 2010

US 53 in the top 200

One area where China is still falling behind is gender equality. Ranked 61 out of 134 countries, China is failing to promote gender equality in a world where the participation of woman in business is starting to take gain momentum. Multinationals are providing opportunities for women to lead and take on key strategic positions. In addition, the number of women in developing countries attending school has improved in the last few years (WEF Gender Gap Report, 2010). Some countries that are part of the INGINEUS project like South Africa, have introduced legislation to encourage the representation of women in organisations. The WEF Gender Gap World ranking 2010 used four pillars- education, health, politics and economy to calculate the final score and rank countries (see Table 9). The Nordic countries are ranked the highest out of the seven developed countries. Out of the developing countries, South Africa is ranked 12$^{th}$ above Germany.

**Table 9:** Gender gap rankings

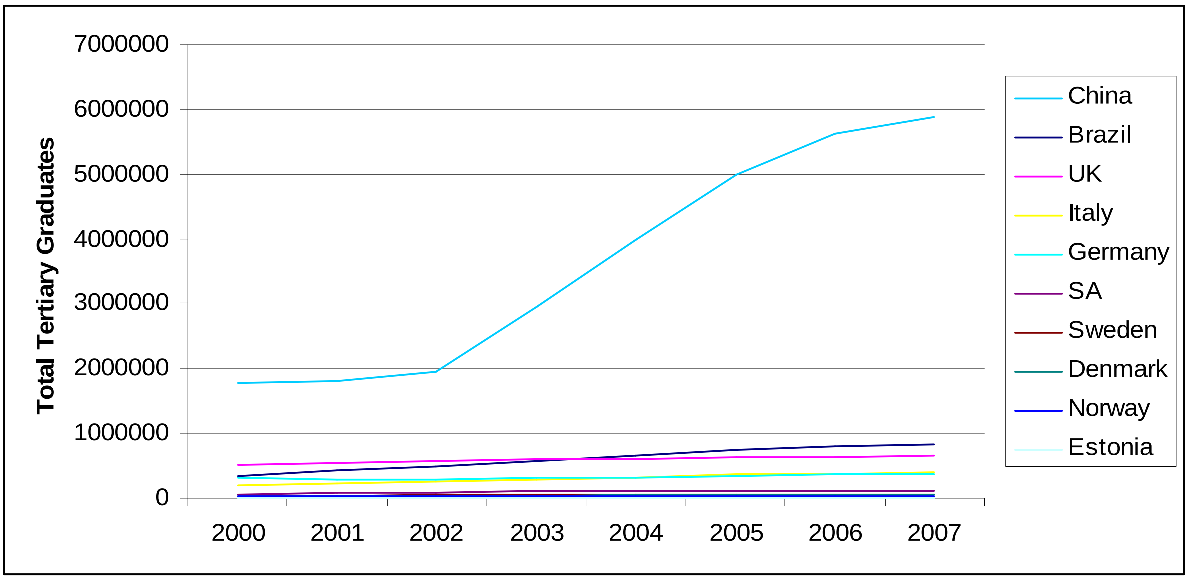
| Country | Overall ranking out of 134 countries | Literacy rate (female to male ratio) | Tertiary education enrolment (female to male ratio) |
|---|---|---|---|
| Norway | 2.00 | 1.00 | 1.62 |
| Sweden | 4.00 | 1.00 | 1.59 |
| Denmark | 7.00 | 1.00 | 1.41 |
| South Africa | 12.00 | 0.98 | 1.21 |
| Germany | 13.00 | 1.00 | 1.00 |
| United Kingdom | 15.00 | 1.00 | 1.40 |
| Estonia | 47.00 | 1.00 | 1.69 |
| China | 61.00 | 0.94 | 1.04 |
| Italy | 74.00 | 0.99 | 1.41 |
| Brazil | 85.00 | 1.01 | 1.29 |
| India | 112.00 | 0.68 | 0.70 |

**Source:** WEF Gender Gap Report 2010

# 6. Graduates

The number of graduates in tertiary education is an important indicator of the current outputs of education systems. Increasing the number of new graduates improves the educational attainment profile of the population, however this measure does not account for the quality of graduates. Additional graduates can improve the overall human capital and talent pool of the nation, provided that education standards do not drop with increased output. Figure 3 again highlights the strong growth in tertiary education graduates in developing countries. China's growth total number of graduates overshadows the comparator countries (UNESCO, 2010a).

**Figure 3:** Tertiary education graduates




**Source:** UNESCO 2010a

The number of science graduates is a key indicator for innovation capability and the quality of graduates in each education system. Table 10 shows how, over a nine year period, there has been an increase in the share of science graduates in Estonia and Germany. The share has fallen in Sweden and the UK, yet the UK's share of science graduates remains joint highest with Germany in 2008. Other countries show stable levels or slight drops in the share or science graduations.

**Table 10:** Graduate in science (% of total graduates, tertiary)

| Country | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| Germany | 10.00 | 9.00 | 9.00 | 9.00 | 9.00 | 10.00 | 11.00 | 11.00 | 12.00 | 13.00 |
| UK | 14.02 | 15.16 | 16.84 | 16.83 | 17.02 | 14.56 | 14.07 | 13.42 | 13.16 | 13.00 |
| Estonia | 4.00 | 6.00 | 6.00 | 6.00 | 8.00 | 9.00 | 11.00 | 9.00 | 10.00 | 10.00 |
| Norway | 7.00 | 8.00 | 8.00 | 8.00 | 9.00 | 8.00 | 8.00 | - | 8.00 | 8.00 |
| Sweden | 8.00 | 10.00 | 10.00 | 10.00 | 10.00 | 9.00 | 8.00 | 8.00 | 7.00 | 7.00 |
| Brazil | - | - | 7.39 | 7.17 | 7.15 | 7.34 | 7.45 | - | 7.03 | 6.77 |
| Denmark | 7.00 | 7.00 | 8.00 | 9.00 | 9.00 | 9.00 | 8.00 | 7.00 | 7.00 | - |
| Italy | 8.00 | 8.00 | 7.00 | 8.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | - |
| South Africa | 4.00 | 4.00 | 6.00 | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| India* | - | 2.62 | 2,62 | - | 3.29 | 3.29 | - | - | - | - |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| China | - | - | - | - | - | - | - | - | - | - |

**Source:** UNESCO 2010a,*Indian National Science Academy 2010

Graduates and graduate quality do not give the full picture of an education system's output. Some developing countries still lack the basic education required for adult literacy. Table 10 provides adult literacy rates over 15 years and youth literacy rates between the ages 15-24 for 11 countries. Literacy rates for some countries are missing. However, estimates based on neighbouring countries with similar characteristics, including life expectancy at birth, enrolment ratio secondary education and fertility rate are some of the indicators that can be used to assign where appropriate (UNESCO 2010a). Norway's rates were assigned to Denmark, Germany and Sweden. The data highlight India as an outlier with an adult literacy rate of only 66%. This indicates a lack of basic education for 34% of the population, although there is a vast improvement in literacy rates in the youth (81.1% for the 15-24 age group).

**Table 10:** Literacy Rates

| **Country** | **Adult (15+) literacy (% of total)** | **Youth (15-24) literacy (% of total)** |
|---|---|---|
| Denmark [1] | 99.9 | 99.9 |
| Germany[1] | 99.9 | 99.9 |
| Sweden[1] | 99.9 | 99.9 |
| UK[1] | 99.9 | 99.9 |
| Norway | 99.9 | 99.9 |
| Estonia | 99.8 | 99.8 |
| Italy | 98.8 | 99.9 |
| China | 93.7 | 99.3 |
| Brazil[3] | 90.01 | 97.8 |
| South Africa | 89 | 96.8 |
| India[2] | 66 | 81.1 |

**Source:** UNESCO 2010a

[1]Information is lacking, estimates based on neighbouring countries with similar characteristics, including life expectancy at birth, enrolment ratio secondary education and fertility rate.[2] 2006,[3] 2007 Data UNESCO 2010

The education systems in developing countries are not equitable by European standards. A very low percentage of the population is able to attain higher education in developing countries. Table 11 shows that even with a large expansion of higher education in China, India and Brazil, the percentage of the overall labour force with tertiary education still remains low.

**Table 11:** Labour force with tertiary education

| Country | % of total with tertiary education (2007) |
|---|---|
| Norway | 34.0 |
| Estonia | 34.0 |
| UK | 32.0 |
| Sweden | 30.0 |
| Germany | 24.0 |
| Denmark | 18.9 |
| Italy | 16.0 |
| South Africa | 13.0 |
| Brazil | *8.6 |
| China | **7.0 |
| India | - |

**Note** *=2006

**Note** **=2009 Source: http://english.peopledaily.com.cn/90001/90782/6994379.html

**Source:** UNESCO 2010a, Eurostat 2004-2006 (for Denmark)

# 7. Research and Development

Research and Development (R&D) conducted by GINs can involve a number of institutions, namely business enterprises, government, higher education and non-profit organizations. Table 12 looks at the share of researchers in each institution. In 2007, Denmark, Germany, Norway, Sweden and China all have more than half their researchers in business enterprises. These countries also rank highly in University-Industry collaboration in R&D (see Table 8) and have a high share of public tertiary education.

Table 12 indicates that the majority of researchers in South Africa and Brazil are employed by universities. Researchers in Brazil are unevenly spread across the country, with a few situated in a handful of top universities. The Brazilian government aims to address this challenge by raising R&D expenditure and augmenting the number of scholarships and fellowships available to university students and researchers (UNESCO 2010b).

**Table 12:** Percentage of researchers in government, higher education, business enterprises and private, non-profit organisations (2007)

| Country | % of researchers in business enterprises | % of researchers in government | % of researchers in higher education | % of researchers in private non-profit |
|---|---|---|---|---|
| Denmark | 63.4 | 4.0 | 32.0 | 0.6 |

| | | | | |
|---|---|---|---|---|
| Germany | 59.9 | 15.0 | 25.1 | - |
| Norway | 50.1 | 15.7 | 34.2 | - |
| Sweden | 64.7 | 4.1 | 31.1 | 0.1 |
| Italy | 35.3 | 18.6 | 41.8 | 4.3 |
| Estonia | 26.0 | 14.8 | 56.5 | 2.7 |
| UK | 36.0 | 3.3 | 59.2 | 1.5 |
| India* | 37.0 | 48.7 | 14.3 | - |
| South Africa | 31.3 | 15.8 | 51.8 | 1.1 |
| China | 66.4 | 16.2 | 17.4 | - |
| Brazil | 37.4 | 5.1 | 56.8 | 0.7 |

**Source:** UNESCO 2010b, *2005 Data provided by UNESCO

Altbach et al. (2009) states that university-industry linkages are becoming more common in Brazil, India and especially in China. In 2005 40% of Chinese patent applications were from public research institutions and universities. Patenting and licensing at universities is growing rapidly, but are still low compared to universities in developed countries. An underdeveloped intellectual-property rights legal environment and fewer technologically mature companies are a hindrance.

Between 2002 and 2007 the world contribution to R&D as a percentage of GDP remained constant at 1.7%; however GDP (PPP US$) grew by 43.3% over this period. In Table 13 the percentage increase in spending on R&D is higher in China, India and South Africa than in the European countries. Brazil’s expenditure, and growth in expenditure, is lower than the other developing countries. China is once again an outlier and stands out with a massive increase of 161.2% in R&D expenditure. In 2007 China accounted for 8.9% of nominal R&D expenditure worldwide although still falls behind the US (32.6%), EU (23.1%) and Japan (12.9%). However the number of researchers in China is on the verge of overtaking the number in the US or EU, and accounted for 19.7% of total researchers in 2007.

**Table 13:** Gross Domestic Expenditure on R&D PPP US$ Billions

| Country | 2002 | 2007 | % increase 2002-2007 | World share of researchers % (2007) |
|---|---|---|---|---|
| China | 39.2 | 102.4 | 161.2 | 19.7 |
| India | 12.9 | 24.8 | 92.3 | 2.2** |
| South Africa | 2.3* | 4.4 | 91.3 | 0.3 |
| Brazil | 13.0 | 20.2 | 55.4 | 1.7 |
| EU | 206.2 | 264.9 | 28.5 | 20.1 |

**Note:** *=2001
**Note:** **= Based on Extrapolations and interpolations
**Source:** UNESCO 2010b

The Thomson Reuters' Science Citation Index (SCI) is commonly used as an indicator of scientific output. A comparison of total publications measured by the index in 2002 and 2008 suggests that the four developing countries have been increasing their scientific output rapidly (see Table 14). China again stands out with a growth in publication output of 174%. China's total publications measured by the SCI were close to 30% of the total publications for the entire European Union in 2008. Other developing countries have also increased scientific publications considerably over the 2002-2008 period. Brazil, India and South Africa increased their publications by 110.6%, 91.7% and 48.3% respectively. Brazil's share of articles publication is partially as a result of a growing number of PhD's awarded annually (UNESCO, 2010b).

**Table 14:** Thomson Reuters' Science Citation Index publications

| Country | Total Publications 2002 | Total Publications 2008 | Change (%)2002-2008 | World Share of Publications (%) 2008 |
|---|---|---|---|---|
| EU | 290184 | 359991 | 24.1 | 36.5 |
| China | 38206 | 104968 | 174.7 | 10.6 |
| India | 18911 | 36261 | 91.7 | 3.7 |
| Brazil | 12573 | 26482 | 110.6 | 2.7 |
| South Africa | 3538 | 5248 | 48.3 | 0.5 |

**Source:** UNESCO 2010b

GINs can cover research and development in any range of scientific fields. The degree of specialisation in scientific fields can be an important consideration when outsourcing knowledge-intensive activities. Publications measured by the SCI in each country can be grouped into particular scientific fields, giving an indication of scientific specialisation. A comparison of the developing countries and the EU shows that China has its highest concentration of publications in the fields of chemistry, engineering and technology, physics and mathematics (see table 15). China also has a much higher number of publications than any of the other developing countries. India has its second highest concentration of publications in chemistry, engineering and technology and physics. South Africa has its highest concentration of publications in biology, and Brazil the second highest, but even in this field these countries have a lower number of publications than China. Importantly, some of the strong scientific fields in developing countries display relatively low scientific output in the EU (such as chemistry, biology and, to a lesser degree, physics) which furthers the case for GINs and global specialisation.

Patents are a "reflection of the strong cumulative and tacit character of knowledge embedded as they are in a formally recognised, long lasting intellectual property right"(UNESCO 2010b). The USA still dominates patents globally. Registering patents can be costly and patenting still remains low in most developing countries, although China has surpassed the UK in its share of USPTO patents (see table 16). Germany leads the EU countries in numbers of USPTO patents.

**Table 15:** Percentage of overall publications and number of publications in each scientific field (2008)

| Country | Biology | | Bio-medical research | | Chemistry | | Clinical medicine | | Earth and space | | Engineering and technology | | Mathematics | | Physics | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EU | 8.20% | 29516 | 12.73% | 45815 | 10.06% | 36221 | 33.12% | 119230 | 7.25 % | 26095 | 12.27% | 44182 | 4.23 % | 15239 | 12.14% | 43693 |
| China | 5.40% | 5672 | 8.67% | 9098 | 21.94% | 23032 | 12.95% | 13595 | 5.47 % | 5746 | 21.72% | 22800 | 5.13 % | 5384 | 18.71% | 19641 |
| India | 9.21% | 3339 | 10.54% | 3821 | 19.75% | 7163 | 20.72% | 7514 | 6.36 % | 2306 | 16.38% | 6108 | 2.69 % | 974 | 13.89% | 5036 |
| Brazil | 20.87% | 5526 | 13.09% | 3467 | 9.02% | 2390 | 33.23% | 8799 | 3.88 % | 1028 | 8.34% | 2209 | 2.67 % | 708 | 8.89% | 2355 |
| South Africa | 22.16% | 1163 | 13.15% | 690 | 7.81% | 841 | 27.69% | 1453 | 9.91 % | 520 | 8.90% | 467 | 4.33 % | 227 | 6.06% | 318 |

**Source:** UNESCO 2010b

**Table 16:** Patent Output (2008)

| Country | USPTO Patents Total | USPTO Patents World share (%) |
|---|---|---|
| EU | 23850 | 15.2 |
| Germany | 9713 | 6.2 |
| China | 7362 | 4.7 |
| UK | 4007 | 2.6 |
| India | 741 | 0.5 |
| Brazil | 134 | 0.1 |
| South Africa | 92 | 0.1 |

**Source:** UNESCO Science Report 2010

# 8. INGINEUS survey

The INGINEUS firm-level survey gives comparable data across 9 of the focus countries. The survey covered predominantly ICT firms (77% of respondents) in India, China, Sweden, Norway and Estonia. 12% of respondents were automotive firms from Brazil, Germany and Sweden, and 11% of respondents were agro-processing firms from Denmark and South Africa. The survey was conducted online in most countries; however surveys were conducted in person or telephonically in Brazil, and China. Surveys in India were carried out in both online and in person. Surveys in Italy followed a different format and data is not included in this analysis. Data was collected between December 2009 June 2010.

Table 17 shows the percentage of firms who offshore product development. Most product development offshoring is still to developed countries, through firm subsidiaries. Firms in all nine countries offshore more product development to developed countries than to developing countries. The percentage of firms offshoring product development is highest in India, Brazil and South Africa. These countries also have the highest percentages of firms in offshoring to developing countries. 24.53% of German firms offshore product development, but only 1.89% of these firms are making use of developing countries. Chinese firms offshore very little research, design and engineering to any foreign countries. This finding is backed up by survey results in Table 18.

Table 18 shows that the highest percentage of firms producing technological inputs in-house is in China. More than two thirds of firms in China, Germany and Sweden source technologies in house. These countries also rely very little on technological inputs from other firms, multinational corporations (MNCs) and public sector organisations. 14.5% of firms in South Africa rely on public sector organisations for technological inputs, far more than those in the other countries. Less than a quarter of firms in Denmark, Brazil and Estonia source their technological input in-house, mainly sourcing them from other firms and MNCs with which they are not connected.

**Table 17:** Product development (research, design and engineering) offshoring

| Country | Percentage of firms outsourcing product development to a foreign country. | Percentage of firms outsourcing product development to a foreign developed country. | Percentage of firms outsourcing product development to a foreign developing country | Percentage of firms who do product development: | | | |
|---|---|---|---|---|---|---|---|
| | | | | At subsidiaries of firm in a developed location(s) | At subsidiaries of firm in a developing location(s) | Outsourced to a partner outside your country in a developed location | Outsourced to a partner outside your country in a developing location |
| India | 34.88% | 18.21% | 16.67% | 16.36% | 15.74% | 1.85% | 0.93% |
| Brazil | 31.88% | 18.84% | 13.04% | 14.49% | 10.14% | 4.35% | 2.90% |
| South Africa | 29.41% | 20.59% | 8.82% | 14.71% | 5.88% | 5.88% | 2.94% |
| Germany | 24.53% | 22.64% | 1.89% | 18.87% | 1.89% | 3.77% | 0.00% |
| Denmark | 16.32% | 14.28% | 2.04% | 10.20% | 2.04% | 4.08% | 0.00% |
| Sweden | 14.36% | 10.77% | 3.59% | 8.72% | 2.05% | 2.05% | 1.54% |
| Norway | 6.07% | 3.87% | 2.20% | 2.21% | 1.10% | 1.66% | 1.10% |
| Estonia | 5.88% | 5.88% | 0.00% | 5.88% | 0.00% | 0.00% | 0.00% |
| China | 4.93% | 2.88% | 2.05% | 2.06% | 0.82% | 0.82% | 1.23% |

**Source:** Own calculations from INGINEUS survey 2010

**Table 18:** Technological input sources: Percentage of firms using each source in nine countries.

| Country | We produce most technological inputs in-house | We buy most of our inputs from other branches of our own MNC | We buy most of our technological inputs from non-MNC firms | We buy most of our inputs from MNCs with which we are not formally connected | We buy most of our inputs from public-sector organizations, e.g. research institutes, universities etc. |
|---|---|---|---|---|---|
| China | 76.5% | 14.9% | 6.3% | 0.5% | 1.8% |
| Germany | 75.0% | 2.5% | 5.0% | 12.5% | 5% |
| Sweden | 69.8% | 7.1% | 9.9% | 13.2% | 0.0% |
| Norway | 58.4% | 4.0% | 15.2% | 21.6% | 0.8% |
| India | 56.5% | 12.3% | 9.7% | 19.0% | 2.6% |
| South Africa | 40.0% | 10.9% | 18.2% | 16.4% | 14.5% |
| Denmark | 22.0% | 12.2% | 31.7% | 34.1% | 0.0% |
| Brazil | 22.5% | 15.0% | 32.5% | 30.0% | 0.0% |
| Estonia | 21.4% | 14.3% | 28.6% | 35.7% | 0.0% |

**Source:** Own calculations from INGINEUS survey 2010

The survey results suggest that few firms in developed countries are taking the opportunity to establish GINs in developing countries. Developing countries are still seen more as an opportunity for global production networks than GINs. Firms in the developed countries are more likely to offshore production than innovation. These finding are supported by Schmiele and Mangelsdorf (2009), who argue that the main reason for German MNEs establishing R&D units in Asia is to 'exploit knowledge' and adapt to local demand. Their study finds no statistically significant positive relationship between firms's R&D in Asia and product innovation in other countries. This would therefore suggest that the German companies are not driven by a motive to augment their knowledge, or innovate in global markets, when establishing R&D units in Asia. The main motivation to establish R&D units in Asia is to adapt to Asian markets. R&D units are established near to production facilities and large markets under this strategy. An OECD report on the internationalisation of R&D has similar findings. Multinationals prefer to carry out research that is aimed at improving existing products and services rather than developing new technologies aimed at new markets (OECD 2008). Firms in developing countries, on the other hand, are much more prepared to use resources in other developing countries for innovation, with the exception of China. The Chinese ICT firms appear to be keeping most of their technological development and innovation in house and within their country. Suggesting that, at least in the ICT sector, they have a sufficient quantity of the skilled human capital available in China for their innovative activities.

# 9. Conclusions

The market for human capital has undergone rapid changes over the last decade. The massification of higher education in India, Brazil and China has increased the global pool of talent to the point where the large majority of graduates reside in developing countries. Most of these graduates have paid for their own education at fee-charging or private education institutes. The rapid education expansion has put strain on education quality and the level of university teacher training and experience. When comparing the 11 INGINEUS partner countries, the Nordic countries, with largely public education, show a high quality of education, research and on-the-job training; although it is difficult to make comparisons between the massive populations of China, India and Brazil, and the other INGINEUS countries. South Africa's population is considerably smaller and a high quality education still only reaches a small portion of the population. China, India and Brazil offer greater prospects for GINs because the large scale of human capital upgrading has produced a sizeable cohort of adequately skilled graduates. The graduates were trained at a lower cost than in developed countries and command lower salaries. The number of graduates in China, India and Brazil still represents a small percentage of the overall population, but is a sizable number. Opportunities for GINs to use skilled human capital in developing countries are especially strong in large urban areas of China, such as Shanghai, Hong Kong and Beijing. The number of students who have received a quality education in China is large and growing. China has reformed its education system particularly well in regional education hubs such as Shanghai and Hong Kong. These regions have top ranking universities, producing highly capable graduate students. There is growing potential for GINs in developing countries, and human capital in China appears to have especially high absorptive potential. Despite this the INGINEUS survey suggests that few firms in developed countries have draw on human capital in these countries for GINs and continue to focus on production only.

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# Foreign Direct Investment in China

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# Table of contents

# 1. Introduction

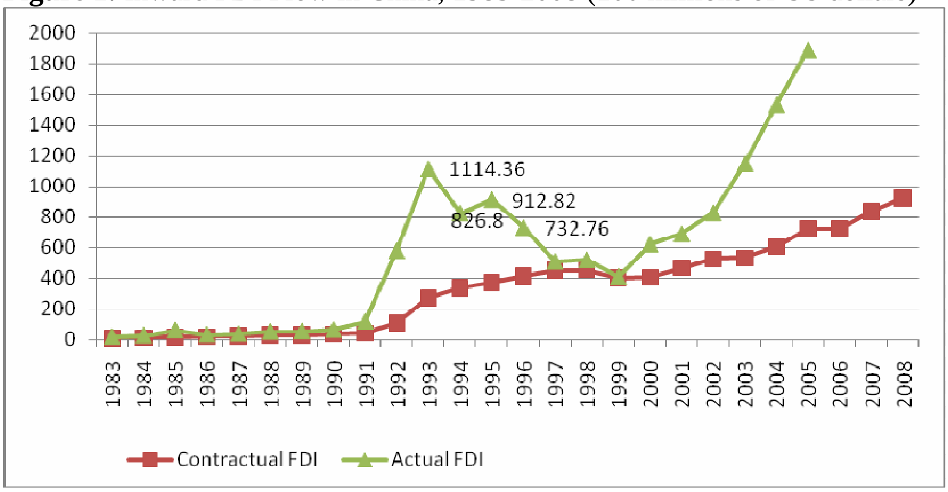
Since the reform and opening-up policy in 1978, China has witnessed significant economic development with the promotion of foreign direct investment (FDI) having a crucial role in the process. Indeed, recent years have seen a tremendous growth in FDI, exceeding both world output and world trade growth.

In 2004, China became the largest recipient of FDI (overcoming the US) and FDI totaled US$ 90.0 billion in 2009 (China National Bureau of Statistics). Foreign enterprises account for 28 percent of China's industrial added value and one-fifth of taxation. Their exports take up about 57 percent of the country's total goods and services and they are responsible for 11 percent of local employment. China's preferential foreign investment policies, relatively low-cost labor, growing purchasing power and improving investment environment, especially the entry into WTO in 2001, have made the country a favorite destination for global investment (Yunshi and Jing, 2005).

This paper identifies the crucial features of this phenomenon to provide the contextual elements to the in-depth cases and analysis carried out in WP6.

# 2. History of FDI in China

**Figure 1:** Inward FDI Flow in China, 1983-2008 (100 millions of US dollars)




**Source:** National Bureau of Statistics

FDI in China can be traced back to the 1950s, when the major country of origin was Soviet Union. However, it was not until 1978 that China began to open up to the rest of the world and embrace FDI inflows in a gradual manner. In that year, China announced a dramatic program to reform economic system and open up to the outside world. Starting from 1978, FDI in China became desirable and began to contribute its due share to the development of China's economy. In general, the development of FDI in China can be divided into four stages.

### 2.1 Experimental Stage (1979 – 1983)

In the late 1970s and early 1980s, government policies are characterized by setting new regulations to permit joint ventures using foreign capital and setting up. The Chinese government started with an experimental approach, which they called "cross the river by feeling the stones under the water". FDI was permitted to enter into China in a step-by-step manner.

One key action at this stage was the establishment of the four Special Economic Zones (SEZs), namely Shenzhen, Shantou, Zhuhai and Xiamen in July 1981. These SEZs were designated for the absorption and utilization of foreign investment. They provided foreign investors with preferential treatment for their businesses. As China's "window to the world", these SEZs not only succeeded in attracting FDI, but also served as a buffer for those who were afraid that foreign investment might cause bourgeois spiritual pollution. At the same time, China started to improve its legislative system. In particular, the Equity Joint Venture Law (the Law of the People's Republic of China on Joint Ventures Using Chinese and Foreign Investment) was enacted in July 1979, which both validated the existence of FDI in China and guaranteed the rights and benefits of foreign investors.

Another important policy initiative taken at this stage was the Regulation for the Implementation of the Law on Chinese - foreign Equity Joint Ventures.

### 2.2 Growth Stage (1984 – 1991)

Up to 1982, China's restraints on FDI outside the SEZs remained rigid. Laws and regulations limited foreign ownership and their domestic sales in China. FDI projects often encountered a long and drawn-out approval process even though they provided sufficient materials and explanations. The lengthy process to approve FDI projects was simplified gradually but steadily between 1983 and 1985.

The year of 1984 witnessed two historic policy changes. First, in the spring of that year, Deng Xiaoping remarked that China needed to open wider instead of checking upon the opening process (Zheng, 1984). In the fall, the Chinese government announced the "Decision on Reform of the Economic Structure", and called for the construction of a "socialist commodity economy" by assigning a larger role to the market in domestic economic system (People's Daily, October 21, 1984). Second, impressed by the success of FDI in SEZs, the Chinese government took a further step to give FDI access to other parts of the country besides SEZs. In 1984, fourteen coastal cities were opened to the outside world (Dalian, Qinhuangdao, Tianjin, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang and Beihai). Compared with SEZs, these cities enjoyed more autonomy in making economic decisions. The local government could give permission to FDI projects with capital investment up to a certain level. For example, Shanghai could approve all FDI projects under 30 million USD (Yuan, 2006). They were also given the right to keep and spend locally the foreign currency yielded by local FDI. The approval procedures and processes for FDI projects were also greatly simplified.

In the following years, other laws and regulations further relaxed China's restriction in promoting FDI with measures for enterprise autonomy, profit remittances, labor recruitment and land use. In 1986, the Law of the People's Republic of China on Wholly Foreign-owned Enterprises (WFOEs) was published providing a protection to the profits and interests of foreign investors when they founded WFOEs in China. The importance of the 1986 Provisions is that it provided incentives for FDI rather than merely permitting it. This more proactive approach was furthered by the adoption on April 12, 1986 of the Law of the People's Republic of China on Enterprises Operated Exclusively with Foreign Capital at the fourth Session of the Sixth National People's Congress. This explicitly linked the establishment of wholly foreign-owned enterprises to the development of China's national economy, and required such enterprises either to be export-oriented or to use advanced technology and equipment.

In 1987, China made Hainan, the second largest island of the country, the biggest SEZ and a separate province (Before that, Hainan belonged to Guangdong province). Meanwhile, more parts of China, including the Yangtze River Delta surrounding Shanghai, the Pearl River Delta surrounding Guangzhou, the Southern Fujian Triangle, as well as Liaoning and Shandong peninsulas, were designated to FDI. FDI in these areas received much of the preferential treatment as in SEZs and the fourteen open coastal cities.

In December 1990, the central government promulgated "Detailed Rules and Regulations for Implementation Concerning Joint Ventures with Chinese and Foreign Investment." The regulation aimed to encourage joint ventures that adopted advanced technology or equipment, saved energy and raw materials and upgraded products. The regulation also permitted non-Chinese to act as Chairman of the Board of Directors, allowed extensions to the terms of operation of joint ventures, and removed the upper limit to the proportion of the registered capital (minimum not less than 25%) contributed by the foreign partner.

### 2.3 Peak Stage (1992 – 2000)

China's proactive policies toward FDI resulted in increasing inflow of foreign capital in the late 1980s and, in particular, early 1990s. From the mid 1990s, while maintaining favorable environment for foreign businesses, government policies began to focus more on linking FDI promotion to domestic industrial objectives. In April 1994, the State Council outlines new proposals to attract FDI into agriculture, hydropower, communications, energy and raw material sectors through favorable tax policies and selective financial support. Other sectors opened to foreign investors included: wholesaling and retailing, accounting and information consultancy, banking and insurance. At the same time, governmental procedures for FDI administration were greatly simplified. On November 3, 1994, the State Administration for Industry and Commerce and the Ministry for Foreign Trade and Economic Co-operation issued a Circular on Issues Relating to Strengthening the Examination and Approval of Foreign-funded Enterprises. This tightened the procedures regarding the approval of contracts and the registration of foreign enterprises, and enhanced the penalties if agreements were not fulfilled.

At the same time, China was also seeking to direct FDI into the country's inner regions which were less developed and industrialized. Deng Xiaoping's historic tour of the South in early 1992 and his remarks on the necessity to roll out more radical economic reforms brought China's opening up and FDI development to a new and higher stage.

This stage saw the rise of Shanghai as China's economic center with the opening up of Pudong New Area. The Chinese government sought to develop Shanghai into an international hub for finance, economy and trade. The intention was also to experiment here new policies to be applied then in the rest of Shanghai and across the country (Financial Times, 1991; Financial Times Survey: China, April 24, 1991). Given Shanghai's location (in Southeast China), the move signaled the Chinese government's shifting emphasis to the area, in order to avoid overly concentration of FDI in South China. Hi-tech enterprises, established manufacturers and financial companies were encouraged to set up their China operation at Pudong with various preferential treatments from central and local governments.

Following FDI rapid growth over 1992-1994, the growth rate leveled off after 1994, signaling a new stage. Figure 1 shows that the contract value of FDI inflows increased from 82.68 billion USD in 1994 to 91.28 billion USD in 1995, and fell to 73.27 billion in 1996. Chinese government began to guide FDI to meet its goals set for economic development. According to the 1995 Provisional Guidelines for Foreign Investment Projects, enterprises in various industries were provided with different preferential treatment. The guiding directory of the Guidelines categorized all the FDI projects into four types: encouraged, restricted, prohibited and permitted (Yuan, 2006). The projects in infrastructure or underdeveloped agriculture, and those with advanced technology or manufacturing under-supplied new equipment to satisfy market demand fell into the first category. Those whose production exceeded domestic demand and those who engaged in the exploration of rare and valuable resources were treated as restricted. The third category included projects that would jeopardize national security or public interest, or those using sizeable amounts of arable land, or those endangering military facilities and so on. The rest of the projects were classified as permitted.

## 2.4 Post-WTO Stage (2001 - present)

On November 11, 2001, China became an official member of WTO, after a 15-year negotiation marathon. Upon its accession to WTO, China started to fulfill its obligations regarding WTO non-discrimination, pro-trade, pro-competition policies. In return, China also began to enjoy the privileges as a member of the WTO family.

This historic event also exerted significant impact on FDI inflows to China. Specifically, China's accession to WTO provided incentives to more export-oriented FDI, as the export market became larger and more predictable. At the same time, China's domestic market started to attract FDI in industries with a relatively larger market potential. As a consequence, industries such as telecommunication, banking and insurance (previously dominated by relatively inefficient state-owned enterprises), started to attract foreign investors, especially large multinational companies.

Becoming a member of WTO bestowed upon China the opportunity to further its economic reforms and restructure its legal framework. This, in consequence, helped to improve China's business environment and attract foreign investment. Yuan (2006) shows that China gradually reduced its industrial tariffs in a wide range of sectors and areas. More encouragingly to FDI, foreign firms were granted direct trading rights (ie, the possibility of importing and exporting without going through a Chinese state-owned trading firm as the middleman) for the first time in the history.

Tables below shows the main changes in policies and legislation.

**Table 1:** Transition of Chinese FDI Policies

| | **Period** | **Policies** | **FDI source** | **Targeted sectors** |
|---|---|---|---|---|
| **1979-1985** | Tentative opening | Gradually opening, accumulating | Hong Kong Macao | Services, light industry such as textiles, and garments |

| | | | | |
|---|---|---|---|---|
| | | experiences | | |
| **1986-1991** | Aggressive opening | Encourage exports and import of know-how | Taiwan, Japan, South Korea | Large and medium-sized energy, transport, metallurgy, electronics and machinery |
| **1992-2000** | Monitored opening | Industrial adjustment for FDI, focus on technology, talent and management | Large TNCs from Asia, the United States, Europe | Infrastructure, base industries, technology-intensive sectors and some financial sectors |
| **2001 to date** | Full opening | Promote own innovation via FDI as well as learning and digestion | Major TNCs from Asia, the United States, Europe | Fully opened apart from a few sectors (like railway transport) |

**Source:** the author

**Table 2:** Main Chinese FDI Policies in the Last 20 Years

| Year | Policies | Key contents |
|---|---|---|
| **1979** | The Law on Sino-Foreign Equity Joint Ventures | Give legal status of joint ventures in China |
| **1986** | Law on Foreign-funded Enterprises | |
| **1986** | Provisions for Encouragement of Foreign Investment | Offer preferential treatment to foreign-funded businesses in terms of tax, foreign exchange use and approval procedures |
| **1987** | Provisional Regulations on Direction Guide to Foreign Investment | Touch on the issue of improving FDI industrial structure |
| **1988** | Law on Chinese-Foreign Contractual Joint Ventures | Encourage production cooperative companies with exports orientation and advanced technologies |
| **1991** | Income Tax Law for Enterprises with Foreign Investment and Foreign Enterprises | Provide tax breaks to foreign-funded enterprises |
| **1995** | Guiding the Direction of Foreign Investment Provisions; Catalogue for the Encouragement of Foreign Investment Industries | Encourage investment in agriculture, energy, port, raw material and hi-tech sectors, as well as investment in central and western regions |
| **2001** | Joined World Trade Organization | |
| **2002** | Revise Catalogue for the Encouragement of Foreign Investment Industries | Open telecom, gas and heating sectors, open further financial sectors, encourage FDI flows into western China |
| **2004** | Revise Catalogue for Foreign Investment Industries | Open broadcasting, sectors with great domestic demand |
| **2007** | Revise Catalogue for Foreign Investment Industries | Encourage service outsourcing, recycle economy, no longer encouragement for property, traditional manufacturing and energy-intensive products, adjust export orientation policies |

| | | |
|---|---|---|
| **2008** | Revise Corporate Income Tax Law | Cancel preferential income tax for foreign-funded companies for fair play between domestic and foreign businesses |

**Source:** the author

# 3. In-depth analysis of inward FDI

## 3.1 Origin of inward FDI

Prior to 1990, FDI inflows originated mainly from the neighbouring countries and regions (especially Hong Kong, Macao and Taiwan). After 1990, FDI from developed countries (including EU and US) started to increase considerably, and represent now a larger share of total FDI inflows. Over the same period, FDI were becoming more concentrated, with the share of the top 10 investors passing from 44 percent in 1995 to 85 percent in 2008 (see Table 3).

**Table 3:** Top 10 Investors in Mainland China, 1995 and 2008 (%)

| Countries/Regions | 1995 | 2008 |
|---|---|---|
| Hong Kong | 24.4 | 44.4 |
| Japan | 3.9 | 3.95 |
| United States | 4.0 | 3.17 |
| Virgin Islands | 1.5 | 17.27 |
| Taiwan | 3.8 | 2.05 |
| South Korea | 1.4 | 3.4 |
| Singapore | 2.3 | 4.8 |
| UK | 1.2 | 1.0 |
| Germany | 0.8 | 1.0 |
| Cayman Islands | - | 3.4 |
| Macao | 0.6 | 0.6 |
| Total | 43.9 | 85.0 |

**Source:** National Bureau of Statistics

## 3.2 Industry Distribution of inward FDI

The industry distribution of FDI inflows changed considerably over time. In the 1980s, the consumption capability and market scale were relatively limited in China, while human resources were abundant at low costs. At this time, the investment of transnational corporations (TNC) were in manufacturing industries with a low technology level, low labor costs, and low value added. TNCs took China as a machining and assembling base. After mid-1990s, along with the increase of domestic consumption capability and market scale, manufacturing TNCs began to invest in capital-intensive or technology-intensive industries. Since the entry into 21st century, the TNCs increased their investment in service industries, especially in real estate sector which has higher profit and a shorter investment cycle and has become the second largest invested sector besides manufacturing industry.

Focusing on manufacturing, one can identify the following hot areas. First, TNCs invest in capital and technology-intensive industries (such as iron and steel and the petrochemical industry). Up to 2005, FDI in iron and steel industry reached 1.17 billion US dollars. Secondly, investment in high-tech and equipment manufacturing industries is increasing (see Table 4 and Table 5). Third, in some sectors such as beverage and cosmetics, the TNCs have large control of the market. For instance, FDI in detergent and cosmetic industry cumulated to $300 million US to 2005 and the number of foreign invested enterprises was more than 450. Similarly, FDI in the beverage industry was 4.145 billion US dollars.

**Table 4:** Inward FDI by Sector, 1979-2003 (%)

| Year | Primary | Secondary | Tertiary |
|---|---|---|---|
| 1979-90 | 1.10 | 62.44 | 36.46 |
| 1991 | 2.11 | 82.02 | 15.87 |
| 1992 | 1.26 | 59.66 | 39.08 |
| 1993 | 1.07 | 49.4 | 49.53 |
| 1994 | 1.18 | 55.99 | 42.83 |
| 1995 | 1.90 | 69.64 | 28.46 |
| 1996 | 1.55 | 71.63 | 26.82 |
| 1997 | 1.39 | 71.75 | 26.87 |
| 1998 | 1.37 | 68.91 | 29.72 |
| 1999 | 1.76 | 68.90 | 29.34 |
| 2000 | 1.66 | 72.64 | 25.70 |
| 2001 | 1.92 | 74.23 | 23.85 |
| 2002 | 1.95 | 74.83 | 23.23 |
| 2003 | 1.87 | 73.23 | 24.90 |

**Source:** National Bureau of Statistics

**Table 5:** Inward FDI in Manufacturing sector, by industry, 2003 (%)

| Sub-sector | % | Sub-sector | % |
|---|---|---|---|
| Electrical and electronic equipment | 19.68 | Non-metallic mineral products | 3.29 |
| Motor vehicles and other transport equipment | 7.52 | Machinery and apparatus | 3.26 |
| Electrical machinery and apparatus | 6.42 | Food manufacturing | 3.05 |
| Chemical and chemical products | 5.27 | Leather | 2.94 |
| Clothing | 4.48 | Beverages | 2.54 |
| Textile | 4.32 | Pharmaceuticals | 2.41 |
| Metals and metal products | 3.52 | | |
| Rubber and plastic products | 3.48 | | |

**Source:** China foreign investment report (2003-2004)

In general, manufacturing industries are still the main domain for FDI. In 2005, contractual FDI in manufacturing industries accounted for 65 percent of the total, while the real estate industry accounted for 16.63 percent (Table 4).

**Table 6:** Inward FDI, by Industry, 2005 (100 million of US dollars)

| Industry | Contractual FDI | | Project | |
|---|---|---|---|---|
| | **Value** | **%** | **number** | **%** |
| Manufacturing industries | 8374.91 | 65.14 | 398266 | 73.02 |
| Real estate | 2137.85 | 16.63 | 44828 | 8.11 |
| Trade | 454.93 | 3.54 | 21080 | 3.81 |
| Wholesale and retail | 356.86 | 2.78 | 27867 | 5.04 |
| Transport, storage and communications | 314.1 | 2.44 | 6607 | 1.19 |
| Construction | 285.84 | 2.22 | 10908 | 1.97 |
| Agriculture, hunting, forestry and fishing | 251.44 | 1.96 | 15521 | 2.81 |
| Resident service and other services | 182.28 | 1.42 | 10913 | 1.97 |
| Total | 12358.21 | 96.13 | 535990 | 97.92 |

Source: **China's Ministry of Commerce**

## 3.3 Typology of inward FDI

There are five major types of FDI in China, namely, (1) Equity Joint Venture (EJV), (2) Contractual Joint Venture (or Cooperative Joint Venture, CJV), (3) Wholly Foreign-owned Enterprises (WFOE), (4) Share Company with Foreign Investment (SCFI), and (5) Joint exploration. The definition of each type is as below:

### 3.3.1 Equity Joint Venture (EJV)

An EJV refers to a company with limited liability, whose equity and management are shared between foreign investors and Chinese sides in proportion to their equity shares. EJV used to dominate the forms of FDI in China, as shown in Table 7. China's Joint Venture Law and its Amendment Provisions set the percentage of a joint venture's capital contributed by a foreign investor between 25 percent and 99 percent.

**Table 7:** Cumulative FDI by different types as of 2006 (100 million of US dollars)

| Form | No. of Projects | Share % | Realized FDI Value | Share % |
|---|---|---|---|---|
| Total | 594,445 | 100 | 703.9 | 100 |
| Equity Joint Ventures | 270,640 | 45.53 | 251.40 | 35.72 |
| Contractual Joint Ventures | 58,570 | 9.85 | 93.50 | 13.28 |
| Wholly Foreign-owned Enterprises | 265,288 | 44.62 | 328.46 | 46.66 |
| FDI Shareholding Inc. | 207 | 0.034 | 3.67 | 0.52 |
| Joint Exploration | 191 | 0.032 | 7.51 | 1.06 |
| Others | 62 | 0.01 | 19.43 | 2.76 |

**Source:** Foreign Investment Department of the Ministry of Commerce of China, 2007

### 3.3.2 Contractual Joint Venture (or Cooperative Joint Venture, CJV)

As indicated by its name, a CJV is established with a preset arrangement between foreign investors and their Chinese counterparts. The arrangement lays down the terms and conditions as stipulated in the venture contracts. It also clarifies the liabilities, rights and obligations of each cooperative side.

Grub and Lin (1991) shows that, differently than in EJVs, the investors in CJVs do not assume the risk or receive profits in proportion to their capital shares but as pre-set in the venture agreement.

### 3.3.3 Wholly foreign-owned enterprises (WFOE)

A WFOE is an enterprise founded entirely by a foreign company with its own capital. Hence the risks, gains and losses of a WFOE are absorbed by the firm itself. This type of enterprise is under the coverage of the Law on Enterprises Operated Exclusively with Foreign Capital (1986) and its Enforcement Regulations (1988). The number of WFOEs gradually caught up with EJVs and CJVs from the late 1990s when China further relaxed its restraints on FDI.

### 3.3.4 Share Company with Foreign Investment (SCFI)

SCFI is a stock limited company established by foreign companies, enterprises, or other economic organizations with their Chinese counterparts. The company is set up according to the principle of stock. The specific responsibilities assumed by each stockholder depends on the amount of stocks he/she purchases.

### 3.3.5 Joint exploration

Joint explorations often pertain to natural resources such as oil. They show features of both CJVs and compensation trade. Risks and outputs are distributed according to agreed shares. This type of FDI offers China access to advanced equipment and technical assistance from foreign companies. The foreign investors, in return, receive a portion of the output.

From Table 8, we can see that EJVs and WFOEs are the most important types of FDI, which accounted for 90% of the total FDI projects and 82.38% of total realized FDI value in China by the end of 2008.

**Table 8:** Major FDI Types in China

| | No. of Projects | Share % | Realized FDI Value | Share % |
|---|---|---|---|---|
| Total | 27514 | 100 | 952.53 | 100 |
| Equity Joint Ventures | 4612 | 16.76 | 173.18 | 18.74 |
| Contractual Joint Ventures | 468 | 1.70 | 19.03 | 2.06 |
| Wholly Foreign-owned Enterprises | 22396 | 81.40 | 723.15 | 78.27 |
| FDI Shareholding Inc | 38 | 0.14 | 8.59 | 0.93 |

# 4. In depth analysis of Chinese outward FDI

## 4.1 Destination industries and countries of Chinese outward FDI

According to Commerce Department of China, China's outflows increased by 111% to $56 billion in 2008, and its outward FDI stock reached $183 billion, the 2nd largest in the developing world. Part of this overseas expansion involves considerable investment in other emerging and transition economies.

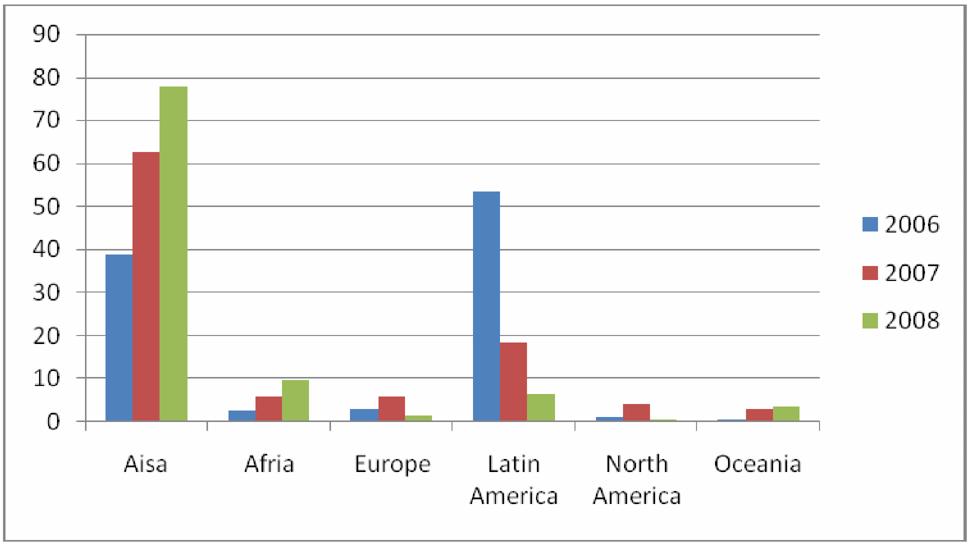
**Table 9:** Developing Stages of Chinese TNCs

| Stage | Industry/ Sector | Recipient economy | Policy |
|---|---|---|---|
| Initiating stage 1979-1985 | Trading, service sector | Mainly in Hong Kong & Macao | Strict regulation, restricting outward FDI of non-trade companies |
| emerging stage 1986-1991 | Resource exploitation, assembling & processing, transport | Mainly in South-east Asia, expanded to some developed countries | Decentralized approval authority from the central government to local governments removed lots of sectoral restrictions on FDI |
| Positive expansion 1992-2001 | Trade -related services, assembling, agriculture, resource exploitation | Mainly in South –east Asia, some in North America and Europe, expanded to Africa | Promoted offshore assembling and processing |
| Rapid expansion 2002-- | Manufacturing, construction, oil exploitation & extraction, resource exploitation, transport, electronic communication, trade-related services, agriculture | Mainly in Asia some in North America and Europe, expanded to Africa & Latin America | "Going out "strategy, industry guideline for outward FDI |

**Source:** the author

Looking at destinations, Figure 2 shows that emerging countries are the main destinations of Chinese FDI. Asia's share has been constantly increasingly, accounting for 60% of outward FDI stocks after 2006. On the contrary, the share of Latin America is steadily decreasing, down to 6.6% in 2008. As to the recipient country or region, Hong Kong, USA, Russia, Japan, Vietnam, Germany, Australia absorb about 50% of outward FDI. Hong Kong accounted for 72.3% in the outward FDI stocks in 2008 and part of these outflows can be attributed to round tripping (see Table 8).

**Figure 2:** Chinese Outward FDI, by Destination, 2006, 2008 (%)




**Source:** Chinese outward FDI statistical communique (excluding financial investment), 2006-2008

**Table 10:** Top 24 Destinations of Chineses Outward FDI, Cumulative, up to 2008 (100 millions of dollars)

| Rank | Country/ Region | Value | Share (%) |
|---|---|---|---|
| 1 | Hong Kong, China | 386.40 | 72.72 |
| 2 | South Africa | 48.08 | 9.05 |
| 3 | British Virgin Islands | 21.04 | 3.96 |
| 4 | Australia | 18.92 | 3.56 |
| 5 | Singapore | 15.51 | 2.92 |
| 6 | Cayman Islands | 15.24 | 2.87 |
| 7 | Macao, China | 6.43 | 1.21 |
| 8 | America | 4.62 | 0.87 |
| 9 | Russia | 3.95 | 0.74 |
| 10 | Germany | 1.83 | 0.35 |
| 11 | Indonesia | 1.74 | 0.33 |
| 12 | Nigeria | 1.63 | 0.31 |
| 13 | Vietnam | 1.20 | 0.23 |
| 14 | Korea | 0.97 | 0.18 |
| 15 | Sudan | 0.63 | 0.12 |
| 16 | Madagascar | 0.61 | 0.12 |
| 17 | Japan | 0.59 | 0.11 |
| 18 | Bahamas | 0.56 | 0.11 |
| 19 | Thailand | 0.45 | 0.09 |
| 20 | Algeria | 0.42 | 0.05 |
| 21 | France | 0.31 | 0.06 |
| 22 | Guinea | 0.08 | 0.02 |
| 23 | New Zealand | 0.06 | 0.01 |
| 24 | Mexico | 0.06 | 0.01 |
| Total | | 527.62 | 100.0 |

**Source:** Chinese outward FDI statistical communique (excluding financial investment), 2008

In terms of industrial distribution, Chinese investments are particularly concentrated in business activities, trade and natural resources. In recent years, FDI in leasing and business services, finance, wholesale and retail, and mining has grown especially fast, accounting for 78% of total Chinese FDI outflows in 2008 (see Table 11). In general, because of the lack of core technology, Chinese FDI in foreign countries tend to focus on trading and assembling and compete in low value-added products.

**Table 11:** Outward FDI by Industry, up to 2008 (100 million of dollars)

| | Industry | Value | Share |
|---|---|---|---|
| 1 | Leasing and Business Services | 545.83 | 29.67 |
| 2 | Finance | 366.94 | 19.95 |
| 3 | Wholesale and retail | 298.59 | 16.23 |
| 4 | Mining | 228.68 | 12.43 |
| 5 | Transport and storage | 145.20 | 7.89 |
| 6 | Manufacturing | 96.62 | 5.25 |
| 7 | Real estate | 40.98 | 2.23 |
| 8 | Construction | 26.81 | 1.46 |
| 9 | Scientific research, technological service and geological exploration | 19.82 | 1.08 |
| 10 | Electricity, gas and water production supply | 18.47 | 1.00 |
| 11 | Information transfers, computer and software | 16.67 | 0.91 |
| 12 | Agriculture, hunting, forestry and fishing | 14.68 | 0.80 |
| 13 | Water conservancy, environment, public facilities management | 10.63 | 0.58 |
| 14 | Resident service and other services | 7.15 | 0.39 |
| 15 | Accommodation and catering services | 1.37 | 0.07 |
| 16 | Culture, sports and entertainment | 1.07 | 0.06 |
| 17 | Education | 0.17 | 0.01 |
| 18 | Health, social security and social welfare | 0.04 | 0.00 |

**Source:** Chinese outward FDI statistic communique (excluding financial investment), 2008

## 4.2 Chinese outward FDI to other emerging and transition economies

As shown above, China's overseas expansion involves considerable investment in other emerging and transition economies. For example, China is establishing the first group of eight overseas economic and trade cooperation zones in the following countries: Nigeria, Mauritius and Zambia in Africa, Mongolia, Pakistan and Thailand in Asia and Kazakhstan and the Russian Federation in South-East Europe and the CIS. With a total investment of $250 million, for example, the zone in Pakistan is a joint venture between Haier (China) and Ruba Group (Pakistan). According to China's Ministry of Commerce, 50 similar zones will be established over the next few years, facilitating more FDI from China into other emerging and transition economies.

**Table 12:** Typical Outward FDI Case Deals by Chinese TNCs to emerging and Transition Economies

| Year | Chinese TNCs | Invested project | Host economy | Entry mode | FDI value |
|---|---|---|---|---|---|
| 1997 | Huayuan Group | Textile Dyeing | Niger | JV, 80% share | $3 million |
| 1996-1999 | Haier Group | Household electronic | Indonesia, the Philippines, | Wholly owned, JV | |

| | | | | | |
|---|---|---|---|---|---|
| | | appliances | Malaysia, Jugoslavia | | |
| 2001 | CNOOC | Oil exploitation | Indonesia | M&A | $0.585 billion |
| 2001 | Shanghai Bao Steel Group | Mining | Brazil | JV | |
| 2003 | BOE | TFT-LDC | Korea | M&A | $0.38 billion |
| 2004 | Shanghai Automotive Industries Corporation | Auto manufacturing | Korea | M&A, 48.9% | US$500 million |
| 2005 | CNPC | Oil exploitation | Kazakstan | M&As | $41.6 billion |

In addition, China established in 2007 a government investment company to manage a $200 billion fund drawn from the country's huge foreign currency reserves. This follows the example of the proactive approach to reserves management implemented in countries such as the Republic of Korea and Singapore. Although the investment strategy and policy of this company has not yet been clarified, it is expected to invest in foreign companies, partly through direct investment. In May 2007, for example, the company, though not yet formally established, invested $3 billion for a 9.9% stake in the private-equity firm Blackstone (United States).

## 4.3 Chines outward FDI to developed countries

M&A (merger and acquisition) has become a major mode of entry into developed-country markets by TNCs from China. In recent years, an increasing number of mega deals have been undertaken in the United States and Europe by Chinese TNCs.

The Lenovo-IBM M&A deal in December 2004 is an important example. With an acquisition value of 12.5 billion US dollars, the deal yielded to the third computer manufacturing TNC in the world. Acquisition of foreign firms has helped not only to acquire brand reputation but also to gain an access to international R&D networks. The new Lenovo now has R&D centers in China, Japan, and the United States. Similarly, China's largest auto parts manufacturer Wanxiang Group established 30 companies through M&A in eight countries, including the United States, the UK, and Germany.

**Table 13:** Typical Outward FDI Case Deals by Chinese TNCs to Developed Economies

| Year | Chinese TNCs | Invested project | Host economy | Entry mode | FDI value |
|---|---|---|---|---|---|
| 1986 | CITIC | Wood and wood products | U.S. | JV | 40 millions of RMB |
| 1986 | CITIC | Paper and paper products | Canada | M &As, 50% share | 60 millions of Canada dollars |
| 1987 | CMIEC | Mining | Australia | JV | |
| 1999 | Haier Group | Household electronic appliances | U.S. | Wholly owned | |
| 2001 | Huali Group | Mobile communication | U.S. | M &As | $1 million |
| 2003 | CNOOC | Natural gas | Great Britain | M &As | $0.615 billion |
| 2003 | TCL | TV, DVD | France | M &As | 0.3 billion Euros |
| 2004 | Lenovo | Personal computer | U.S. | M &As | $ 12.5 billion |

# 5. FDI in China: The institutional and legislative context

## 5.1 Incentives

China has many country specific advantages that are believed to be particularly significant to attract FDI. Swain and Wang (1997), Liu et al (1997), Zhang (2000), Wei and Liu (2001), Zhang (2002) and others have argued the incentives of FDI inflows into China identified by FDI theories can be classified into three categories, Micro-, Macro, and strategic determinants. Micro-factors concern firm ownership specific advantages such as product differentiation and the size of the firm. Macro-determinants of FDI emphasize the market size and the growth of the host country, which is measured by GDP, GDP per capita, GNP, or GNP per capita, as rapid economic growth may create large domestic markets and businesses. Other macro factors include taxes, political risk, exchange rates, and so on. Strategic determinants refer to those long-term factors such as to defend existing foreign markets, to diversify firms’ activities, to gain or maintain a foothold in the host country, and to complement another type of investment.

### 5.1.1 China’s market size and economy growth

With the largest population in the world and the fastest growing economy, China shows increasingly large demand and expanding market for domestic consumption. As a consequence, market-oriented FDI from Europe and USA are attracted into China to produce and serve China’s markets. Indeed, Cheng and Kwan (2002), Liu et al. (1997), Zhang and Markusen (1999) found a strong positive correlation between GDP and FDI inflows in China, both at national and provincial level. Also, they indicate that market size has been more important as a determinant of FDI from Europe and USA than for FDI from Hong Kong and Taiwan, as the latter tend is more export-oriented.

### 5.1.2 Abundant labour supply and lower labour cost

China is widely referred to as a “World Factory” or “labor-intensive manufacturing country”. China has taken advantage of its large supply of cheap labor to attract foreign investment, as foreign investors were looking to lower their manufacturing costs. Empirical research, for instance Moore (1993), shows that the lower the labor cost in the host country, the more attractive the host country. Consistently, Chen (1996) and Liu et al. (1997) found that FDI are higher where wages are lower. More recently, however, wages have tended to increase, reflecting increasing productivity, particularly in those provinces where FDI were high.

### 5.1.3 Infrastructure

Infrastructures are important to attract FDI. Chinese infrastructure have been improved greatly in the past 30 years. The infrastructure in transportation, communication, and the supply of water, electricity and natural gas has been almost completed in the coastal area. The ability of supply and quality of energies, raw materials and components has also improved obviously, providing foreign investors with excellent external conditions in production and operation. Cheng and Kwan (2000) and Head and Ries (1996) provide evidence that provinces in China with more developed infrastructure have tended to receive more FDI.

#### 5.1.4 Favourable policies and stable political environment

Favourable government policy has been found to be effective in attracting foreign investors (Janeba, 1995; Shapiro and Globerman, 2003). From 1980 to 1993, policies targeting FDI included tax incentives, including income tax exemption and reduction, tariff-free treatment. From 1994, the same tax system was applied for domestic and FDI firms. However in order to encourage more FDI and international trade, a five-year tax refund program was introduced, and tariff-free treatment was extended. Specifically, high-technology or export-oriented enterprises could receive a full refund. Besides these provisions, the Chinese government improved the legal system for absorbing foreign investment and maintained the steadiness, consistency, predictability and feasibility of the policies and laws for foreign investment.

#### 5.1.5 Other incentives

Observations made by Tseng and Zebregs (2002) indicated the importance of "scale effects" for FDI. They pointed out the greater the amount of investment, the greater the confidence of others to invest. For example, in Guangdong, Fujian, Zhejiang and other parts of the east area, economies of scale make investors share information and facilities, like schools, bank services, and hospitals. Also, in these areas, the economy chain and transportation is quite extensive and convenient. Tseng and Zebregs (2002) argue that China's success in attracting FDI is unique because of the large Chinese Diaspora. The fact that Hong Kong, Taiwan and Singapore, have accounted for more than half of the FDI flows to mainland China is usually used to support this argument. Zhang (2002) also indicates that investors from these areas prefer to invest in mainland China, because they could share the cultural background rather than comparative wage rates within China. On the contrary, non-Chinese investors have to overcome culture barriers, like language, which may imply a cost.

### 5.2 Barriers

#### 5.2.1 The change of exchange rate

The real exchange rate fluctuations alter relative production cost (Yuan, 2006). When the real exchange rate goes up in the home country, firms face higher production costs and they tend to relocate their production facilities to a country where there are lower production costs, i.e., China. However, by the end of Oct, 2010, the exchange rate was 1 USD to 6.64 RMB, and RMB cumulatively appreciated over 21.45% to US dollars since Oct, 2005. This implies that the appreciation of Chinese Yuan to US dollars directly hurts export-oriented firms' profit.

### 5.2.2 Increasing price of raw materials

Increasing raw materials prices push up the cost of production in China. Many small manufacturers serving Original Equipment Manufacturing (OEM) are forced out of business under the pressure of escalating production costs. All these changes resulted in decreased profits for manufacturers.

## 5.3 Research and development

At present, China has become an important R&D base for TNCs. According to recent surveys, China is now the most promising R&D investment destination for TNCs, topping the United States and India (Kearney, 2006; UNCTAD 2005). The wave of R&D investment in China started from the establishment of Institute of Canadian Nortel in Beijing in 1994, and many Fortune 500 companies followed. GE alone plans to build upwards of thirty R&D centers in China by 2010, while IBM, Microsoft, Intel, Sony, Philips, and other foreign giants are investing in their own research sites. Beijing and Shanghai are the preferred locations, but more recently Guangdong, Jiangsu and Tianjin have appeared in the map of foreign R&D investors.

In 2005, 130 auto and parts companies, including industry leaders like General Motors and Volkswagen, had built up R&D facilities in China. There are two main reasons for this. First, companies use the large and growing pool of skilled engineers and technicians to cut their research expenditure. Second, government is making pressure on foreign companies requiring multinational corporations to set up at least one R&D center in their regional headquarter in China.[1] Notably, to get approbation, foreign investors need to undergo a screening process and have to make concessions, for example, committing themselves to invest in R&D and to share technologies. The fruits of R&D centers are public, and R&D centers are required to cooperate with the local universities and disseminate ideas and research findings.

Figures from China’s Ministry of Commerce shows 1,160 R&D institutions in China in 2006, compared with the less than 200 in 2001. Although supportive R&D was still the mainstream of foreign R&D activities in China, many TNCs have transferred their innovative R&D facilities to China. A recent study by Serger and Breidne (2007) found that about 40 TNCs have established 70 institutions in China for innovative R&D. The R&D input by TNCs was mainly made in hi-tech sectors, and the input in communications equipment, computer and electronics manufacturing, transport vehicle manufacturing and machinery and mechanical manufacturing, universal equipment manufacturing accounted for 69 percent of the total manufacturing industry.

**Table 14:** Some R&D Centers Invested in China by TNCs, 2006

| ICT industry | Biopharmaceutical industry | Automobile industry |
|---|---|---|
| IBM | AstraZenenca | Shanghai GM |
| Sun | Novo Nordisk | Shanghai Volkswagen |
| Nokia | Eli Lily | Nissan |
| Ericsson | Roche | Daimler Chrysler |
| Microsoft | DSM | Honda |
| Fuji | Lonza | Toyota |
| Motorola | GE | Hyundai |

[1] The provisions of foreign investment on investment companies, China’s Ministry of Commerce, http://www.mofcom.gov.cn/aarticle/b/g/200412/20041200312789.html

| HP | Siemens | |
|---|---|---|

One function of foreign R&D centers is to do research according to Chinese market demand and their R&D activities are more and more active and senior in recent years. Many of them have become important branches of TNCs global R&D networks. In a systematic point of view, the growing R&D operations in China by TNCs will have impacts on development, improvement, promotion and application of technology and management as well as institutions and potentially important implications for the national innovation system.

Wholly owned affiliates are the main ownership mode of foreign R&D centers. The more technology leading TNCs, the more likely to choose wholly owned ownership. For example, there are 18 R&D centers of Motorola in China, all of which are wholly owned by Motorola. Foreign R&D organizations established by multinational firms are highly concentrated in the information and communication technology (ICT) industries (including software, telecommunication, semiconductors and other IT products). However equipment and components, biotechnology and drugs as well as automotive industries also attract a significant amount of foreign R&D investment. Beijing and Shanghai are the preferred locations, but more recently Guangdong, Jiangsu and Tianjin have appeared on the map of foreign R&D investors.

**Table 15:** Top 7 Industries by R&D Expenditure, 2000, 2004 (100 millions of RMB)

| | **2000** | | **2004** | |
|---|---|---|---|---|
| **Industry** | **R&D expenditure** | **Percent in whole sector** | **R&D expenditure** | **Percent in whole sector** |
| Communications, computer and other electrical and electronic equipment | 38.56 | 38.3 | 119.30 | 39.8 |
| Motor vehicles and other transport equipment | 11.8 | 11.9 | 43.55 | 14.5 |
| Electrical machinery and apparatus | 8.24 | 8.3 | 26.01 | 8.7 |
| General machinery | 4.01 | 4.0 | 14.43 | 4.8 |
| Textile | 0.85 | 0.9 | 9.03 | 3.0 |
| Chemical and chemical products | 5.74 | 5.8 | 13.83 | 4.6 |
| Cultural and office machines | 1.90 | 1.9 | 8.26 | 2.8 |

**Source:** China's Ministry of Science and Technology

Compared with TNCs' global R&D investment, the share of China remains small. According to a survey to Motorola R&D academy by the author in 2008, the share of Motorola's R&D investment in China is only about 3%. However Motorola did not perform R&D initially in China. Its research began in 2001 aiming at responding to the demand of Chinese Speech Understanding System.

## 5.4 Systems of innovation

### 5.4.1 The evolution of NIS in China

#### *5.4.1.1 National Innovation System in Planned Economy Era (1949-1978)*

China’s national innovation system had copied the Soviet model in the early years of the People’s Republic due to historical conditions, which highlighted central planning and resources allocation through administrative ways. The national innovation system of this era was developed upon a central planned system and built up on functional and divisional arrangements. The government was the key investor in innovation and innovation relied heavily on the fiscal system for funding with resources being allocated according to plans. Enterprises were regarded solely as production units with little involvement in research or development and there were little connections between enterprises and research institutes or universities. Under the system, enterprises shared no benefits created by new developments and did not shoulder any losses stemmed from experiment failures. As a result, enterprises had no enthusiasm to innovate. In this era, the Chinese economy was largely closed to Western countries, and the national innovation system was also closed to the outside world with no participation of TNCs in the local innovation system.

#### *5.4.1.2 National Innovation System on Early Stage of Reform (1979-2000)*

China started to tiptoe towards a market-based system in 1978. Following the step of the policy of FDI in China, the government launched a series of opening-up policies in the following years, changing China’s innovation system into an open one from a closed one. From Table 14 we can get that all the elements of National Innovation System such as Economic System, Innovation Decisions, Innovation Resource Allocation and so on had started changing from that stage.

#### *5.4.1.3 National Innovation System in Post-WTO and Full Opening (2001 to date)*

As mentioned above, China formally became a WTO member in November 2001. China promised to open its financial, telecom, petrochemical, retail, transport, tourism and entertainment sectors to foreign investment — China has entered the stage of “full opening”. At present, with the exception of few sectors (like railway transport), most of the sectors are opened to foreign capital. Foreign investments in financial, retailing and petrochemical sectors are particularly aggressive. With lowered market entrance threshold and improvement of investment environment, the size of China investment by TNCs has been expanding continuously.

**Table 16:** The Evolution of Chinese National Innovation System

| | **Closed 1949 - 1978** | **Gradual Opening 1979 - 2000** | **Full Opening 2001-** |
|---|---|---|---|
| Economic System | Planned economy | Moving towards market-based system | Market economy with macro-control |
| Innovation Decisions | Government plans | Government plans and supervision | All forms of innovators with guidance from government |

| | | | |
|---|---|---|---|
| Innovation Resource Allocation | Government | Government + Market | Market + Government |
| Innovation Investors | Government | Government, universities and research institutes | Increasingly companies |
| Connection among innovators | Little | Growing | Active |
| Status of corporate R&D | Production unit without R&D | R&D with weak capabilities | Strive to be innovative, focus on R&D with foreign resources |

**Source:** the author

However, China has started to rethink its opening policy largely of “exchange market for technology”, and many researchers argued that China’s technology development was far behind its economic development. In 2006, the central government started a long-term nationwide plan to boost independent innovation and to regard innovation abilities as the key in adjusting economic structure, changing growth models and lifting national competitiveness. China’s national innovation system is in face of new tasks and challenges in this new full-opening era.

Along the development of China’s national innovation system, the R&D expenditure to GDP ratio started to increase at an accelerated rate, passing from from a 0.6 percent in 1995 to 1.42 percent in 2005 (the Ministry of Science and Technology, 2006). In 2005, China was the largest investor in R&D among non-OECD countries, accounting for about half of total R&D expenditures by non-OECD countries (OECD, 2005). In the last five years, expenses on R&D have grown at an annualized rate of about 20 percent.

The key change in China’s innovation system is, firstly, about the adjustment in R&D expense structure. At present, about two thirds of R&D expenses are invested by commercial entities. This percentage was less than 30 percent in the early 1990s. This shows a significant change from an institute-based innovation system to a company-based one. The process will create a new innovation system, under which market mechanism plays its role in promoting application R&D and accelerate the commercialization of research results. Meanwhile, fundamental and strategic R&D tasks will continue to be shouldered by research academies and universities.

**Table 17:** R&D Expenditure, by Main Actors (%)

| Participants | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|
| Research institutes | 50 | 42 | 29 | 21 |
| Universities | 12 | 12 | 9 | 10 |
| Companies | 27 | 44 | 60 | 68 |

**Source:** Yearbook of China Science and Technology Statistics 2001, 2004, and 2006

### 5.4.2 The role of local universities and research institutes for TNCs innovation

The higher education system has expanded considerably over the last decade. Unlike many Western countries that have experienced a transition in science policy from curiosity-driven to use-driven, the Chinese government has been advocating a use-driven science policy since its establishment, requiring research institutes and universities to serve the national economy by solving practical problems for industry (Hong, 2006). This science policy essentially divides technological R&D from industry production, with universities and research institutes actively engaged in downstream industrial projects and enterprises focusing on fulfilling assigned producing quota. Compared with developed countries where firms are a major source of innovation, the extensive involvement of public research in industry R&D in China constitutes an important character of the National Innovation System. Promoting the development of industry-science relationships is an important policy which is hoped to construct China's innovation system. Therefore, industry heavily relies on universities and research institutes for technology improvement while contributing little to scientific research. As a result, university–industry interactions in China are often unidirectional, with the knowledge flowing from university to industry.

The industry also plays an important role in national innovation system to support universities. The collaboration pattern of innovation alliances between industry and academia is that the industry offers funds, equipment and demands, while the university offers human resource and technology. Some support plans of China also encourage the innovation collaboration between industry and university. For example, the projects with clear product goal and industrial prospects must be applied for by industry and university together.[2] So university–industry collaborations embodied in joint patent applications is increasing, which reflects the growing importance of university in China's national innovation system.

**Table 20:** Patents Jointly Applied for by Higher Education Institutions and Industrial Entities from January 1, 1985 to July 10, 2005

| | University | College | School |
|---|---|---|---|
| Company | 4265 | 1288 | 81 |
| Factory | 411 | 261 | 32 |
| Group | 504 | 100 | 4 |
| Enterprise | 36 | 22 | 2 |

**Source:** Wei (2008).

Chinese universities and research institutes have been up to or close to international leading levels, and the talent base and social influence of Chinese schools have great appeal for TNCs. TNCs have conducted frequent know-how sharing with local schools and institutes as an important part of their participation in the local innovation system. According to studies by Xue (2005), 97 TNCs from 14 countries have set up 202 joint labs with 36 key Chinese universities by the end of 2005, and most of the labs were in the IT sector with R&D input ranging from 1 million to 5 million RMB. TNCs funded half of the labs, and the rest were funded jointly or by the third partners.

TNCs had greatly varying performance in relationship with local schools and institutes. In the survey on 38 Beijing-based R&D institutes by Liang et al. (2008), only 53 percent of the respondents had active relationship with local universities and academies while 34 percent of them had no relationship with local schools at all. It was closely related to the strategy of TNCs as companies with "new product development strategies" are likely to team up with local universities and research institutes than those with "technology support and improvement strategies". Lundin et al. (2006) studied the technology outsourcing by local and foreign firms in China and found that most of the outsourcing activities were targeted at companies rather than at universities. However

[2] National science and technology support plan interim measures for the administration, Ministry of Science and Technology, Ministry of Finance.

local firms are most likely to outsource R&D tasks to universities and research academies than to their foreign competitors.

The knowledge flow between TNCs and local universities is mainly through talent development, job change and spillover in joint programs. The cooperation forms include equipment and capital donation, joint research programs as well as joint labs.

Leading TNCs like to cooperate with top Chinese schools. For instance, IBM has donated an accumulative amount of 1.5 billion RMB in computers, software, training, budget and scholarship since 1995 to more than 50 Chinese schools. It has also launched 50 joint research projects with 22 Chinese universities through its Shared University Research Program. The Asia R&D Academy of Microsoft has built up five joint labs with five Chinese schools, under which 40 research projects were conducted and more than 240 academic papers were published.

For instance, the Tsinghua University has set up a “university-company cooperation committee” whose task is to develop joint R&D activities with firms. TNCs such as Intel, Toyota, BP, Mitsubishi, AREVA and Motorola all have joint R&D centers with Tsinghua University. Japanese TNCs are most outstanding in this endeavour.

**Table 21:** Some Joint R&D Organizations of Tsinghua University with TNCs

| Joint R&D organizations | TNCs | Home country |
|---|---|---|
| Qinghua-BP Clean Energy Research and Education Center | BP | Great Britain |
| Freescale Singlechip and DSP Applying and Development Research Center | Motorola | U.S. |
| Qinghua-Toyota Research Center | Toyota | Japan |
| Qinghua-Daikin Research Center | Daikin | Japan |
| Qinghua-AREVA Controlling Research Center | AREVA | France |
| Qinghua- Mitsubishi Joint R&D center | Mitsubishi | Japan |
| Qinghua- Renesas Integrate Circuit Designing research institute | Renesas Technology | Japan |
| Qinghua-Intel Joint R&D Center | Intel | U.S. |
| Delphi-Qinghua Auto System Research Center | Delphi | U.S. |
| Qinghua-Tianshi Software R&D Center | Hong Kong Tianshi | Hong Kong, China |

**Source:** the author

Joint R&D centers pick up domestic and foreign subjects. For example, the subjects of Qinghua-BP Clean Energy Research and Education Center come from BP, Chinese government and Japanese TNCs. Talent development and training is an important function of joint centers by setting scholarship, providing experiment equipment and practicing opportunities. Joint centers also send researchers to their partners’ locations to learn and practice. With the development of cooperation between universities and firms, the number of patents jointly applied is increasing (it was 77 in 2001 and reached 168 in 2004).

**Table 22:** Patents Jointly Applied by Tsinghua and Companies and Research Institutes, 1996-2006

| Joint applier | Number of patents | Share in whole |
|---|---|---|
| Domestic companies | 758 | 80.30% |
| Domestic universities and research institutes | 145 | 15.40% |

| | | |
|---|---|---|
| TNCs | 33 | 3.50% |
| Foreign universities and research institutes | 8 | 0.80 |
| Total | 944 | 100% |

**Source:** Chinese Patent Office

### 5.4.3 Other local factors

*5.4.3.1 IPR*

Since China joined the WTO and signed the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS agreement), the Chinese patent system is in line with international standards and conventions. Applications to the Chinese Patent Office have picked up considerably since then. Nevertheless, the situation still falls short of the needs of both domestic and foreign-owned innovative enterprises operating in China. Infringement of intellectual property rights, particularly of copyright and trademarks, remains a concern.

With quite sophisticated IP regulations in place, the current level of infringement mainly points to weaknesses in the enforcement of IPR regulations. Both judicial and administrative decisions are difficult to enforce owing to the lack of appropriate infrastructure and mechanisms as well as of manpower. Although the top leaders of Chinese government have been aware of the importance of building a sound legal framework for IPR protection, which has already been much improved, the enforcement of laws, especially at local levels, need to be substantially improved. The Chinese Patent Office has conducted an active campaign to distribute information on IPR.

*5.4.3.2 Education and Human Resources for Science and Technology*

China has made tremendous and largely successful efforts to mobilize its abundant human resources in order to upgrade the technological level of its economy and more recently to enhance the creativity of the labor force. The lack of comparability of available statistics is an obstacle to international benchmarking in this area. However, some main trends and issues can be highlighted.

Since the early 1990s China has made substantial progress in emerging S&T human resources. Undergraduate and postgraduate enrollments in science and engineering remain stronger than in OECD countries. However, as the formation of the ideal of employment that the work in S&T is harder, lower income and lower social status than that of finance and economy, the share of science and engineering degrees in the tertiary education system has been falling since 2000, which may affect China's ambitions in the area of R&D.

**Table 23:** The Stock of Chinese HRST and Researchers

| year | Percentage of HRST in all graduates (%) | The stock of Chinese HRST |
|---|---|---|
| 1997 | 48.14 | 399,087 |
| 1998 | 48.36 | 401,303 |
| 1999 | 49.15 | 416,575 |
| 2000 | 47.64 | 452,491 |
| 2001 | 44.86 | 464,926 |
| 2002 | 44.22 | 591,336 |

| | | |
|---|---|---|
| 2003 | 43.52 | 817,137 |
| 2004 | 42.64 | 1,019,638 |
| 2005 | 40.93 | 1,255,853 |
| 2006 | 40.77 | 1,538,955 |
| 2007 | 40.76 | 1,825,013 |
| 2008 | 40.93 | 2,0954,13 |

**HRST:** persons who have successfully completed higher education in S&T fields

**Source:** web of Chinese Education Department

**Table 24:** Development of Chinese Education Fund 1993-2003 (Billion of RMB)

| | Total education investment | Percent in GDP | Fiscal education fund | Percent in GDP |
|---|---|---|---|---|
| 1993 | 105.99 | 3.06 | 86.78 | 2.51 |
| 1994 | 148.88 | 3.18 | 117.47 | 2.51 |
| 1995 | 187.80 | 3.21 | 141.15 | 2.41 |
| 1996 | 226.23 | 3.33 | 167.17 | 2.46 |
| 1997 | 153.17 | 3.40 | 186.25 | 2.50 |
| 1998 | 294.91 | 3.76 | 203.25 | 2.59 |
| 1999 | 334.90 | 4.08 | 228.72 | 2.79 |
| 2000 | 384.91 | 4.30 | 256.26 | 2.86 |
| 2001 | 463.77 | 4.77 | 305.70 | 3.14 |
| 2002 | 548 | 5.21 | 349.14 | 3.32 |
| 2003 | 620.83 | 5.29 | 385.06 | 3.28 |

**Source:** China Statistical Yearbook, 2005

# 6. Signs of movement towards Global Innovation Networks

### 6.1 Productivity spillovers

The role of TNCs remains controversial in China. Notably, empirical evidence on whether FDI facilitates technology spillovers is ambiguous. Evidence is mixed.

Positive productivity spillovers have been found from foreign firms to local suppliers in upstream sectors (Buckley et al., 2002). Using a large panel of Chinese manufacturing firms, Liu (2008) finds that an increase in FDI in the industry (four-digit level) lowers the short-term productivity level but raises the long-term rate of productivity growth of domestic firms, and backward linkages seem to be statistically the most important channel through which spillovers occur. The effect of TNCs on the development of domestic productive capability can be seen in many industries and the semiconductor sector is typical. In 1995 China was unable to mass-produce any type of semiconductor device (memory, logic chips, micro-processor). By 2006 several Chinese companies had begun to compete with their Taiwanese, U.S., Japanese, and South Korean counterparts in manufacturing standardized memory and logic chips. These same companies have begun to consider themselves as custom-order “foundries” that will make chips according to a customer’s specifications.

## 6.2 Research spillovers

Although research shows a positive relationship between productivity and FDI, when it comes to the effect on domestic innovative technological development, findings are not so positive. Wang (2004) has conducted research on TNCs and local firms in Beijing, Shanghai, Dongguan and Suzhou and found that most R&D activities by TNCs in China were supportive to their home countries, or the local operations of TNCs were more of recipients and users of technologies instead of innovators. The connection between TNCs and local firms and research institutes was weak with insufficient spillover effects. Many researchers also attributed the weak spillover effects to the absorption abilities of local firms, industrial structure and transnational strategy. It is argued that the more frequent the linkages between TNCs and local firms, the more opportunities for technology spillovers (Rodriguez, 1999). However, after more than 20 years since the entrance of foreign companies in China, the linkages between foreign and domestic companies remain weak (Wang, 2004). Due to the characteristics of TNCs and learning ability of local companies, the relationship could vary greatly.

TNCs have entered China mainly for the vast Chinese market and low labor cost, and most of the investments were made in manufacturing sectors making many places in China process trade bases. These exclusively foreign-funded or joint venture plants purchase equipment and key components from abroad, and local suppliers can only take the lower-end of the supply chain. Local suppliers just provide low-end parts to TNCs without know-how tripling down along the value chain. For instance, the Seagate plant in Wuxi City is just a localized production of facilities from the United States with most of the components being directly imported from the States (the percentage was 64 percent in 2004), and local suppliers can only sell the plant small and standard components and they were not included in the supplier system of Seagate.

Such phenomenon appears in many Chinese manufacturing industries. Regarding the Chinese automotive industry, industry analysts agree that domestic innovation capabilities still lag far behind leading nations, although production capabilities have grown rapidly. While two decades ago China did not have any relevant automobile industry, it is now the fourth-largest producer in the world. And China’s companies have recently developed their own car brands and started exporting these to low-end markets. All this, however, shows improved and expanded production capabilities rather than innovation capabilities. Auto production is almost fully carried out under license from foreign manufacturers. Most product development is based on reverse engineering, and no significant indigenous technological development has yet occurred.

The picture is not completely bleak. Local companies with strong R&D abilities have enhanced cooperation and union with TNCs in recent years, and many have carried joint programs with TNCs (like Huawei, Haier, Chang’an and Little Swan) to form positive and interactive know-how exchange. In addition, Chinese companies have also built up union with TNCs to seek win-win results, including the G4 union between China Mobile and Vodafone and Docomo, the joint labs between Huawei Technologies and Motorola, IBM, Intel, Alcatel and SUN. However the knowledge share of TNCs with local companies is selective.

### 6.3 Training spillover

TNCs typically train local employees at all levels of the organization, providing formal training courses in the subsidiary or elsewhere in the network of the multinational enterprises, as well as on-the-job training in close contact with expatriates or trained local staff (Estrin and Meyer, 2004). TNCs build local human capital through training local employees, yet these highly skilled individuals may move to locally owned firms or start their own entrepreneurial businesses. Within TNCs, even rank and file staff acquires skills, attitudes and ideas on the job through exposure to modern organization forms and international quality standards. If these employees then move to local firms, they can take some of this tacit knowledge with them, thus enhancing productivity throughout the economy.

Mobility of trained labor is a very important channel for spillover in China. As argued by a manager of Motorola R&D institute, the main channel of multinational's technology diffusion is the mobility of human resources. Many senior Chinese managers who have worked in TNCs came into domestic firms for development, and others are operating their own start-ups. Such mobility of senior human resources promoted outflow of tacit knowledge from TNCs.

# 7. Conclusions

This paper shows that China did a successful job in attracting FDI since 1979. The average growth rate of FDI in China has been about 10% in recent years. This trend will not continue unless the world economies get better, or China's legal system and governance become more effective in enforcing contracts, especially in western China.

Several determinants have motivated FDI in China. First, FDI investors are attracted by the large and growing Chinese domestic market. Second, investors are seeking ways to lower production costs, and China has a large supply of cheap labour. Third, China's quality of infrastructures is important to investors. The good infrastructure helps TNCs to enhance technology levels and reap economies of scale and scope. Fourth, China's political leadership imposed a vision for the path of growth and development of the country.

FDI contributed substantially to China's economic development. First, FDI inflows have raised the GDP growth by adding to capital formation, increasing total factor productivity, and establishing foreign-funded enterprises (FFEs). Second, FDI inflows played a major role in increasing China's export, resulting in the huge trade surplus of China. Third, FDI inflows created vast job opportunities. However, FDI also widened the income gap between eastern and western China.

The two-way penetration of inward and outward FDI in China facilitates the emergence and development of global innovation networks. On the one hand, due to the spillover and demonstration effect of TNCs, Chinese local firms can learn modern management approaches and grasp how to organize R&D activities fast, which makes them more open in their innovation. On the other hand, through R&D internationalization TNCs can get access to the large Chinese market, obtain low-cost technical human resources, and reduce R&D costs. Meanwhile, they can form strategic alliances with Chinese corporations to share R&D costs and risks.

Overall, FDI accelerate the global flow of knowledge, technology and human capital, thus promoting the constitution of GINs. In this process, some prospective regions (eg, Beijing and

Shanghai), with a large pool of low-cost qualified human resources and good research infrastructure, have become hubs of GINs.

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# Education and training systems in China

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# Table of contents

# 1. Introduction

Education and Training Systems in the People's Republic of China is a state-run system, which requires that all citizens attend school for at least 9 years. The government provides primary education for six years, starting at age six or seven, which is followed by three years of secondary education for ages from 12 to 15(compulsory education). Some provinces implement the policy of five years of primary school but four years for middle school. After finishing the compulsory education, one should finish the three years' high school education (non-compulsory education) before taking the higher education. The Ministry of Education reported a 99 percent attendance rate for primary school and an 80 percent rate for both primary and middle schools. In 1985, the government abolished tax-funded higher education, while requiring university applicants to compete for scholarships based on academic ability.

The number of undergraduates and graduates (including students with master degree and doctor degree) in the recent 10 years. There are over 100 National Key Universities, such as Tsinghua University and Peking University. Chinese educational spending has grown by 20% per year since 1999, and now reached more than $100 billion. There were 1.5 million graduated students studying science and engineering in Chinese universities in 2006. Besides, 184,080 papers were published by Chinese in 2008.

There are several laws regulating the system of education, including the Regulation on Academic Degrees, the Compulsory Education Law, the Teachers Law, the Education Law, the Law on Vocational Education, and the Law on Higher Education.

In what follows, the main trends and policy changes in the system for education and training in China are discussed in details.

# 1. The evolution of education policy

For a long period before liberation, China's education system had a strong feudal color, only the upper class has the right to be educated. Since PRC was founded in 1949, all Chinese people gradually got the equal chance to be educated, and the reform of China's education system has also made tremendous achievements, during which time the structure of China's education system continues to be improved. For example, in the year 1949, the number of enrolled elementary school students, junior middle school students, senior middle school students and college students were only 24,000,000, 952,000, 315,000 and 117,000 respectively (Data source: Research report of China's education system ,2005; http://www.china.com.cn/zhuanti2005/node_5158231.htm). The enrollment ratio of school-age children was only about 20%, and 80% of the Chinese population were illiterate at that time. However, in the year 1977, the number of enrolled elementary school students and junior middle school students had reached a historically high level of 151,000,000 and 49,900,000, which is respectively 6.2 times and 52.5 times of those in 1949. The number of enrolled senior middle school students also reached about 19,000,000, which is 60 times of that in 1949 (Data source: Research report of China's education system, 2005; http://www.china.com.cn/zhuanti2005/node_5158231.htm).

Until 1980s, the development of China's education system had been influenced to some extent by former Soviet Union. For example, for a long time, China's charging system had followed the "free education" system of Soviet Union. During the 1980s, important changes were introduced. In 1985, The Decision of the CPC Central Committee on Education Reform promoted the expanding of enrollment, with the long-term goal of achieving universal primary and secondary education. In 1985, the commitment of modernization was reinforced by the plans of nine-year compulsory education and providing good quality higher education.

Deng Xiaoping's far-ranging educational reform policy, which included all levels of education system, aimed to narrow the gap between China and other developing countries. Academically, the goals of reform were to improve and popularize the elementary and junior middle school education; to increase the number of schools and qualified teachers; and to develop vocational and technical education. A number of wide-ranging reforms were introduced. First, as China was transitioning from planned economy to market economy, the notion of "free education" as the basic feature of socialistic education was subject to many queries and an in-depth reform of the charging system was gradually implemented. The scope of education charge was gradually extended and the amount of education charge was continually increased. Higher education made her farewells to free education and elementary education also transformed from gratuitous education to paid education. Second, devolution of educational management from the central to the local level was chosen to improve the education system. Third, a unified standard for curricula, textbooks, examinations, and teacher qualifications (especially at the middle-school level) was established, and considerable autonomy and variations in and among the autonomous regions, provinces, and special municipalities were allowed. Finally, the system of enrollment and job assignment in higher education was changed, and the excessive government control over universities and colleges was reduced.

At the turn of the new century, a new wave of reforms took place. Chinese government proposed to expand university enrollment of professional and specialized graduates, and to develop world-class universities. Integration, through consolidations, mergers and shifts among the authorities which supervise institutions, was implemented to solve the problems of small size and low efficiency. Higher vocational education was also restructured, with increasing attention to élite institutions.

## 2. The Structure of the education system

China's education system could roughly be classified into 4 levels, namely preschool education, primary/elementary education, secondary education and higher education (Table 1), which are comparable with the International Standard Classification of Education – ISCED (UNESCO, 2006). The first one, preschool education (equivalent of ISCED 0 – Pre-primary education) commonly consists of a stage of 3 years' nursery education and a stage of 1-year preparatory education, but its successful completion does not mean that any level of education has been attained, and it is not compulsory. Primary/elementary education (equivalent of ISCED 1 – Primary education) is the first full-sense stage of compulsory education in China. Both 5-year and 6-year systems have co-existed for a long time. By now, however, almost all primary schools provide 6 years' education. A successful completion of this level is sufficient to acknowledge that the primary/elementary education has been attained. The next stage —secondary education is somewhat more complex than that of most Western countries. China's system has two stages: junior middle-school education (equivalent of ISCED 2 – Lower secondary education) and senior middle-school education (equivalent of ISCED 3 – Upper secondary education). The 3 years' junior middle-school education is the second part of compulsory education, while the 3 years' senior middle-school education is not. For the senior middle-school education, both general senior middle-school and vocational school education (equivalent of ISCED 5B – Tertiary-type B education) exist. A successful completion of this level is sufficient to acknowledge that the secondary education has been attained. After this grade students can continue their learning of higher education (equivalent of ISCED 5A – Tertiary-type A education), which provides possibility of obtaining postgraduate education (ISCED 6 – Advanced research programs). Besides these levels of education, there are also students enrolled in other forms of programs, such as employed people enrolled in doctoral and master's degree programs, etc.

**Table 1** China's Education System

| Higher education | Secondary education | Primary/elementary education | Preschool education |
|---|---|---|---|
| 1. Postgraduates (master's program 3 years, Doctor's program 3 years)<br>2. Undergraduates in Regular HEIs (bachelor's course 4 years, short-cycle course 3 years)<br>3. Undergraduates in Adult HEIs (bachelor's course, short-cycle course)<br>4. Employed People Enrolled in Doctoral and Master's Degree Programs | 5. General middle school<br>6. Junior middle-school: 3 years, *equivalent of ISCED2 ,compulsory education*<br>7. Senior middle-school: 3 years, *equivalent of ISCED3*<br>8. Vocational school (3 years)<br>9. Specialized secondary schools (senior 3 year, *equivalent of ISCED 3 – Upper secondary education*)<br>10. Skilled worker school (senior 3 years, *equivalent of ISCED 3 – Upper secondary education*) | 5-year elementary school;<br><br>6-year elementary school<br><br>*equivalent of ISCED 1 – Primary education*<br>***compulsory education*** | 1. Nursery school (3 years)<br>2. Preparatory education (1year)<br><br>*equivalent of ISCED 0 – Pre-primary education* |

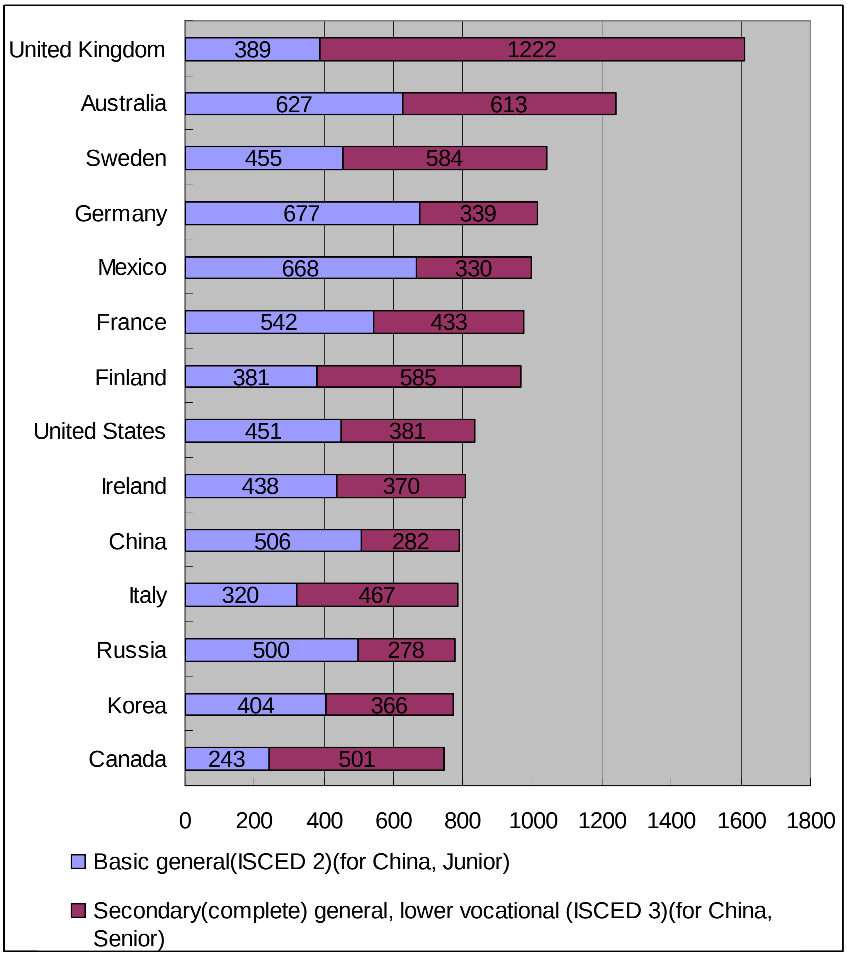
# 3. Basic and secondary education

China's enrollment in junior (equivalent of ISCED 2 – basic general education, lower secondary) and senior (equivalent of ISCED 3 – Upper secondary education) education is not high (this certainly has something to do with the demographic structure of China). In 2004, it accounted for 788 students per 10,000 populations (Figure 1). The difference between junior and senior enrollment in China shows a certain demographic decline. The similar trends can be also seen in many other countries such as Russia, Mexico, Germany, etc. At the same time some countries perform a reverse proportion (e.g. Canada or Finland).

Looking back to today, the achievements are obvious (the below-mentioned data sources in this paragraph are from online "Annual Education Statistic Reports of China, 2007"; www.moe.gov.cn):

the 9-year compulsory education has basically become universal; the net enrollment ratio[1] of school-age children in primary schools has reached 99.49%; the gross enrollment ratio[2] of junior middle school students has reached 98%; the promotion rate of senior school graduates has reached 75.1%; the facilities conditions of primary and secondary schools are further improved, for example, their building area has reached 1,353,200,000 square meters, which are also full equipped with physical, musical, art and natural science educational instruments.

**Figure 1:** Enrollment in China and some OECD countries: basic general and secondary (complete), per 10000 population: 2004




**Source:** Indicators of Education in China, 2004.

Performance of the basic education in China can be illustrated by PISA survey. In 2006 China occupied the 16th position of 56 by reading, 1st by mathematics and 4th by natural science (OECD, 2007). These are in very high positions, which mean that China’s basic education system is one of

[1] The net enrollment ratio refers to percentage of students 6 years old in Grade 1 against number of population in age (6 yrs) in the middle of the year.

[2] The gross enrollment ratio gives a rough indication of the level of education from kindergarten to postgraduate education amongst residents in a given jurisdiction. It is calculated by expressing the number of students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels.

the world’s best. Therefore PISA results are an exciting signal for the Chinese government and people.

**Table 2:** PISA 2006 results comparison: China and other countries

| | Natural Science | | Reading | | Mathematics | |
|---|---|---|---|---|---|---|
| | Average score | Position | Average score | Position | Average score | Position |
| Finland | 563 | 1 | 547 | 2 | 548 | 2 |
| China | 532 | 4 | 496 | 16 | 549 | 1 |
| Germany | 516 | 13 | 495 | 18 | 504 | 20 |
| France | 495 | 25 | 488 | 23 | 496 | 23 |
| United States | 489 | 29 | - | - | 474 | 35 |
| Italy | 475 | 36 | 469 | 33 | 462 | 36 |
| Russia | 479 | 35 | 440 | 39 | 476 | 34 |
| Mexico | 410 | 49 | 410 | 43 | 406 | 48 |
| Brazil | 390 | 52 | 393 | 49 | 370 | 54 |

**Source:** OECD, 2007

# 4. Higher education

In China, a higher education institution (referred to as HEIs hereinafter) is defined as an organization providing higher professional education in accordance with the state accreditation. There exist three types of HEIs: universities (multidisciplinary HEIs performing education programs and research in multiple domains of knowledge), academies (focused on particular areas, such as natural sciences, social sciences, agriculture etc.), and “institutes” (providing education services in certain narrow areas, such as Chinese traditional medicine, music etc.) (Table 3). Some key universities and institutes are directly under the Ministry of Education or other state ministries, while the others usually under local government. In May 1998, China’s former president, Jiang Zemin, put forward the famous “985 Program” at the 100th anniversary celebration of Peking University. The programme aims at developing a number of world-class universities in order to achieve modernization. By now, there are 34 universities including Tsinghua University and Peking University on the “985 Program” list.

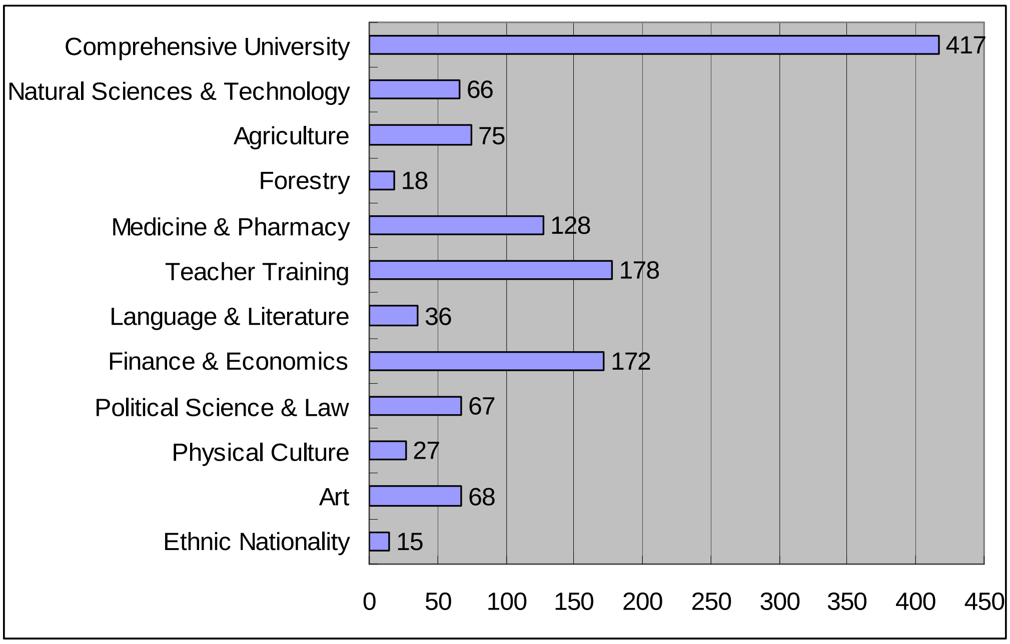
China has 1867 HEIs (Table 3), of which 1591 are state-owned and 276 are private (Indicators of Education in China, 2007). From the discipline distribution of all HEIs (Figure 2), we can see that the HEIs in natural sciences & technology accounted for more than 40% of all, while the HEIs in social sciences (art, political science and law, finance & economics, language & literature) accounted for less than 20%. This reflects the policy emphasis put on science & technology education in the last several decades (see also Figure 3).

**Table 3:** Number of regular higher educational institutions (unit: institution)

| | Total | Universities & colleges | Short-cycle colleges | Tertiary vocational technical colleges |
|---|---|---|---|---|
| **Total** | **1867** | **720** | **1147** | **981** |
| Comprehensive university | 417 | 150 | 267 | 261 |
| Natural sciences & technology | 666 | 193 | 473 | 444 |
| Agriculture | 75 | 33 | 42 | 40 |
| Forestry | 18 | 6 | 12 | 11 |
| Medicine & pharmacy | 128 | 77 | 51 | 11 |
| Teacher training | 178 | 122 | 56 | 5 |
| Language & literature | 36 | 14 | 22 | 21 |
| Finance & economics | 172 | 50 | 122 | 103 |
| Political science & law | 67 | 20 | 47 | 31 |
| Physical culture | 27 | 14 | 13 | 12 |
| Art | 68 | 29 | 39 | 39 |
| Ethnic nationality | 15 | 12 | 3 | 3 |
| Of which: non-state/private colleges | 276 | 29 | 247 | 241 |

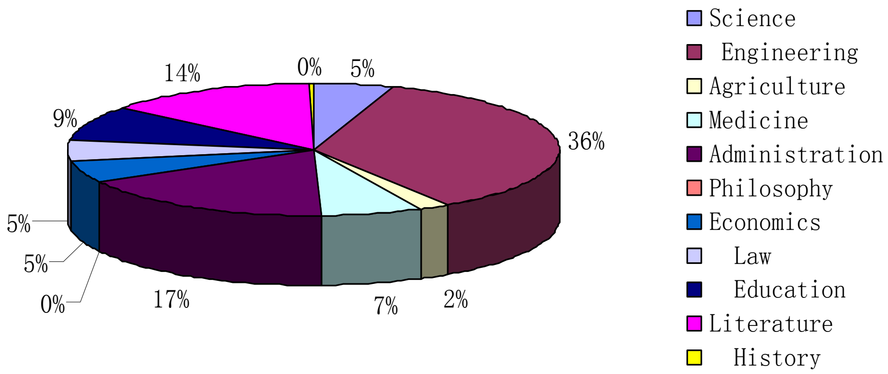
**Source:** Indicators of Education in China, 2006. Online data: http://www.moe.gov.cn/

**Figure 2:** Discipline distributions of HEIs in China




**Source:** Indicators of Education in China, 2006. Online data: http://www.moe.gov.cn/

**Figure 3:** Graduates from regular higher educational institutions by major, 2006




**Source:** China S&T Statistics Data Book on line www.most.gov.cn

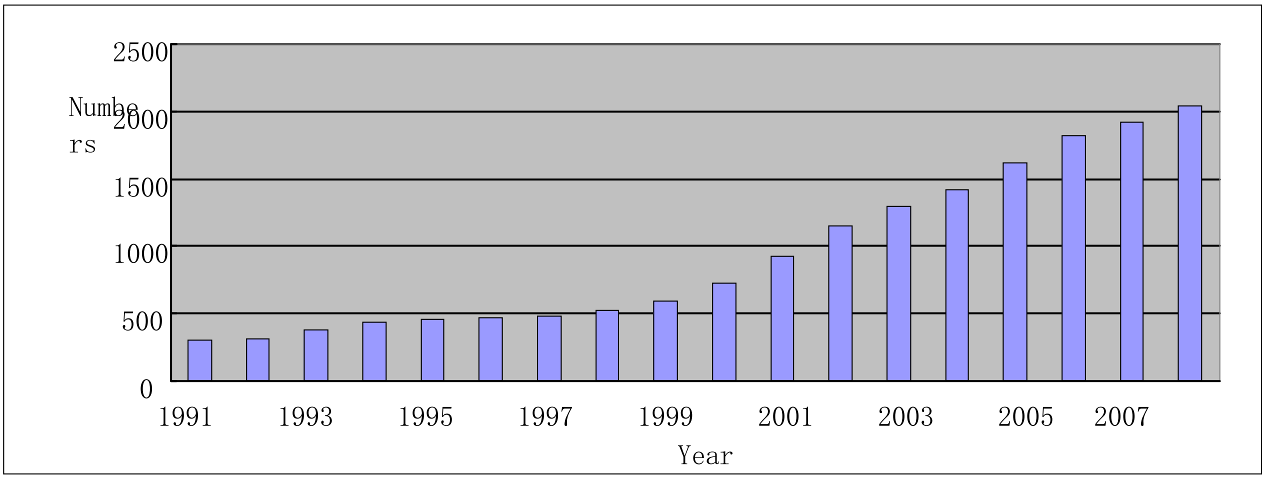
In 2007, the total number of HEI students was 25.29 million (23.66 million and 1.63 million in governmental and private HEIs respectively). The scale of higher education in China is now among the biggest in the world.

Student access higher education after obtaining a Certificate of Complete Secondary Education through an entrance exam with a university or an institute (college). There are three different degrees that are conferred by Chinese universities: The first degree is the bachelor's degree. Bachelor's programs regularly last for 4 years of full-time university-level study except medical students (who need 5 years). The programs include professional and special courses in science, the humanities and social-economic disciplines, professional training, completion of a research paper/project. The bachelor's degree is awarded in all fields. Some students who don't pass the higher education entrance exam can choose to attend adult HEIs (which need only 3 years) and pass the final exam for another 2 years' study to apply for bachelor's degree.

Holders of the bachelor's degree are admitted to enter the master's degree programs after passing the entrance exam, and only a very small number of bachelor students who have got excellent performance during their undergraduate studies can be admitted to master's degree programs without examination. The master's degree is awarded after successful completion of two or three years' full-time study (some of HEIs' master program is still 3 year's while some have transformed into 2 years' education, depending on different HEIs and different disciplines). Students must carry out 1-year research including practice, prepare and defend a thesis which constitutes an original contribution. Often students have to release at least one academic paper before they can get their master's degree.

From 1991 to 2008, the Average Number of Undergraduate per Million Population was increasing steadily, and reached 2042 in 2008 (Figure 4). In 2009, there were 6.39 million undergraduate entrants, 5.24 more than the previous year; the enrollment was 21.44 million, 6.12% more than the previous year; graduates were 5.31 million, 3.74% more than the previous year.

**Figure 4:** Average number of undergraduate per million populations




**Source:** Indicators of Education in China, various years. Online data: http://www.moe.gov.cn/

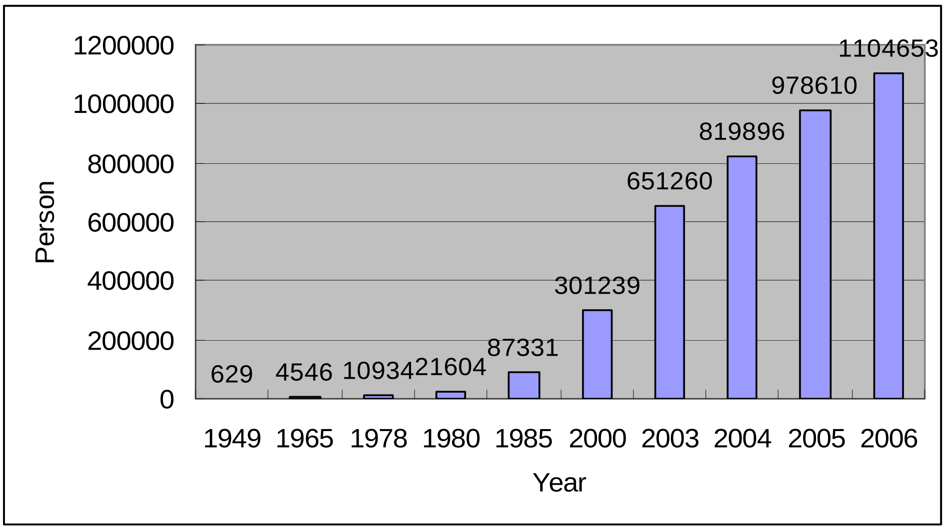
# 4. Higher education. Focus on Post-graduate courses

After the bachelor's degree or master's degree, a student may enter a university or a scientific institute to achieve postgraduate education. Students who have got the master's degree could apply for doctor's program and usually they need to take an exam just like the higher education entrance exam and master's degree program entrance exam. Apart from the main subjects of the applied major, the English exam is usually required. Only very small number of master's degree students can be admitted to doctoral degree programs without examinations for their good performance and great academic potential in their master degree program.

The seeker of PhD student should participate in 1.5 or 2 years' course study, pass the quality exam, publish at least three or four scientific articles in top peer-reviewed journals, obtain important scientific results, write a thesis and defend it, the Doctor of sciences degree can be awarded. The time between obtaining candidate and Doctor degrees is about 3~5 years or more, and the requirements to get a PhD degree are more and more stringent in China. Doctor of sciences may hold the position of assistant professor in universities or researcher in scientific institutes, and some of them also enter industries.

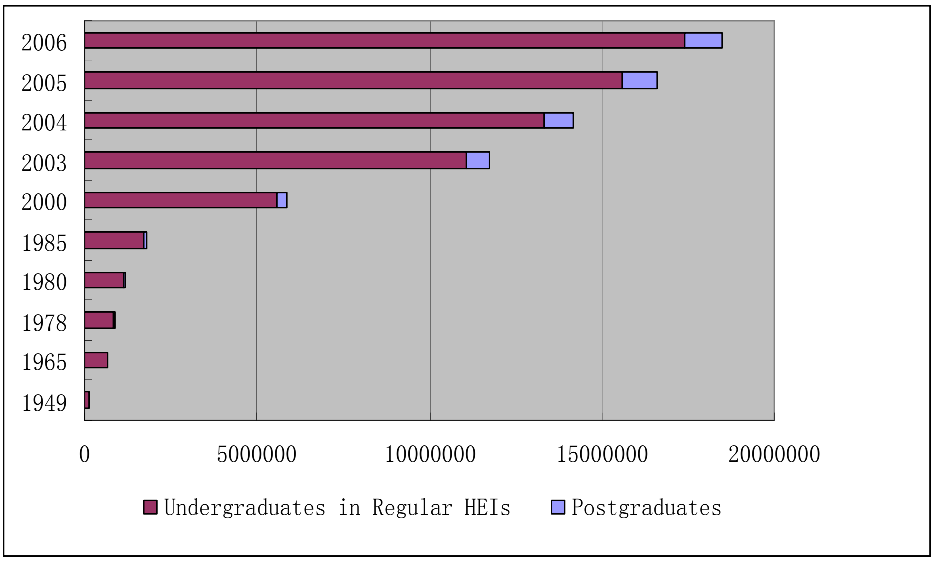
China's postgraduate education started from 1981, and has grown very fast, and the enrollment number of post-graduate education is continuously increasing (Figure 5). In 2006, the total enrollment number of post-graduation students was 1,104,653, of which 208,038 are PhD students. Although generally the relative proportion of post-graduation students to undergraduate students is still low (Figure 6), the absolute number of post-graduate students is still rapidly increasing, which provides China's social construction and development with tremendous advanced talents. Especially in some research-oriented comprehensive universities, such as Tsinghua University, Peking University, University of Science and Technology China, the proportion of graduate students has nearly surmounted undergraduate students.

**Figure 5:** Enrolment scale of postgraduate education in China




**Source:** Indicators of Education in China, 2006.

**Figure 6:** Enrolment number of undergraduates in regular HEIs and postgraduate

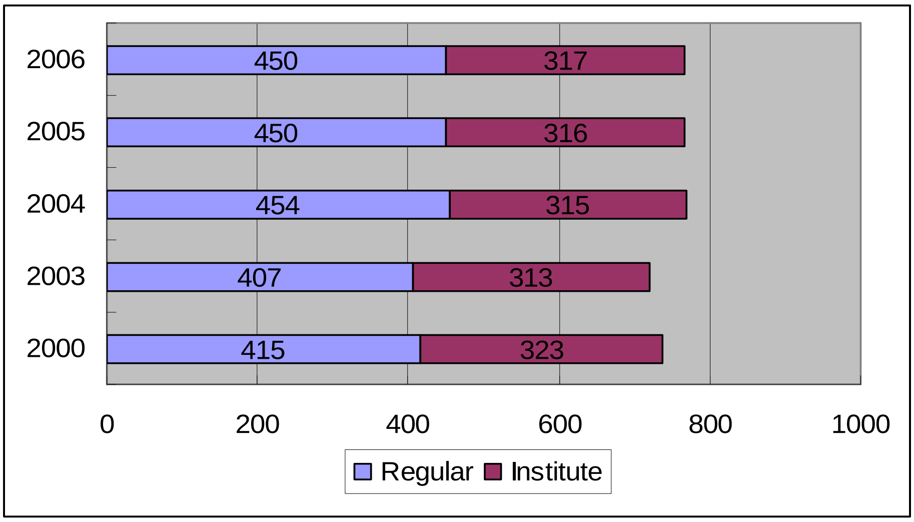



**Source:** Indicators of Education in China, 2006.

In 2009, there were 510,900 post-graduate entrants, 14.45% more than the previous year, including 61,900 doctoral students and 449,000 master students; the enrollment was 1.4 million, 9.50% more than the previous year, including 246,300 doctoral students and 1.2 million master students; the graduates were 371,300, 7.69% more than the previous year, including 48,700 doctoral students and 322,600 master students.

Besides regular HEIs, research institutes are another force providing post-graduate programs in China (Figure 7), and Chinese Academy of Sciences (CAS) is a typical one. The Graduate University of Chinese Academy of Sciences (GUCAS) is known as the biggest post-graduate education institution in the world. By now, GUCAS has more than 30 thousand enrolled post-graduate students who account for more than 3% of all the post-graduate students in China, and of which the PhD students account for more than 8% of all PhD students in China).

**Figure 7:** Institutions providing postgraduate programs in China




**Source:** Indicators of Education in China, 2006.

Besides the government-owned educational system, there are also many private schools in China. In 2007, there are 95,200 private schools in China ranging from preschool education to higher education as well as vocational schools.

# 5. Vocational education

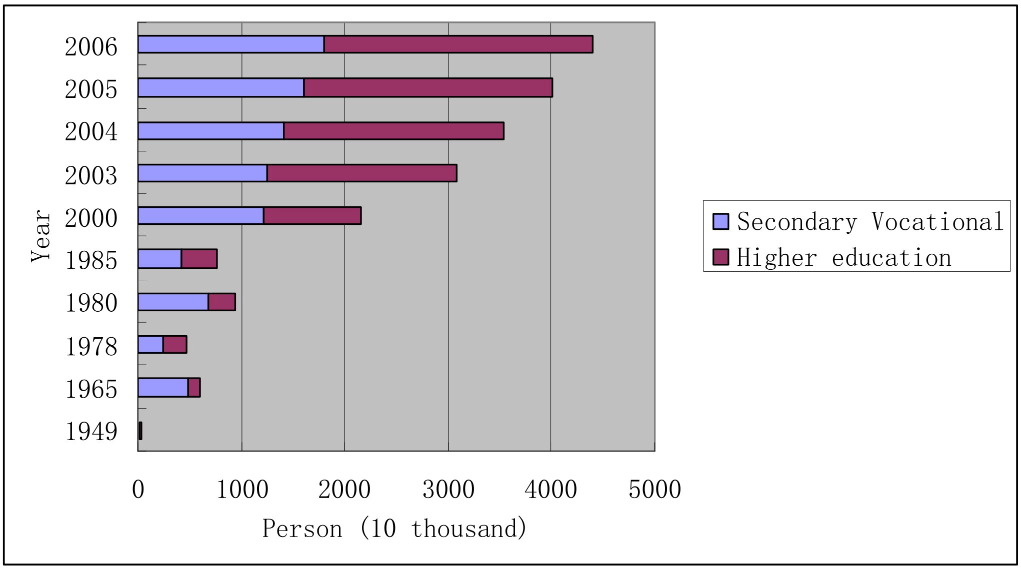
Vocational education has a key role in Chinese education system. There are two levels of vocational education: secondary vocational education and the more recently introduced higher vocational education.

### 5.1 Secondary vocational education

Secondary vocational education includes Regular Specialized Secondary Schools, Adult Schools, Vocational High Schools and Skilled Workers Schools. In the 1980s and 1990s, the social and economic development in China was very rapid; labor force was well in need. At that time, secondary vocational education was glorious in China. Many students would rather go to these schools than senior general schools because it was easy for them to find a job after secondary vocational education. At the time, the enrollment rate in secondary vocational education was higher than in senior general education or in higher education.

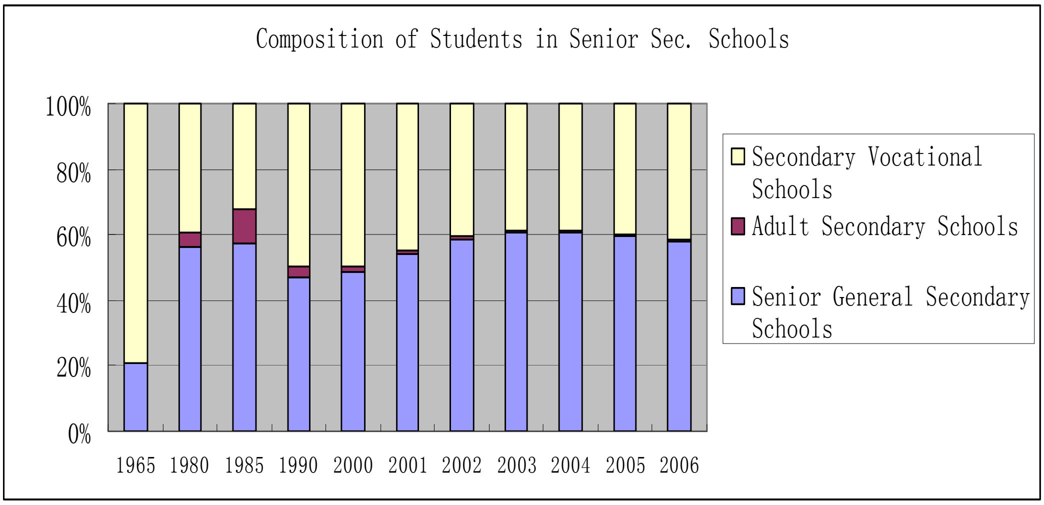
However, at the turn of the new century, with the competition in the labor market becoming more and more fierce, vocational graduates are finding more difficult to find a job. College students are no longer the "unusually favorite person" in the society, and some of them are hunting blue-collar job, previously searched only by vocational graduates. As a consequence, the enrollment rate of vocational schools has been decreasing and it is now lower than in higher education (Figure 8 and Figure 9).

**Figure 8:** Enrollment number of secondary vocational and higher education in China




**Source:** Indicators of Education in China, various years. Online data: http://www.moe.gov.cn/

**Figure 9:** Composition of students in senior secondary schools




**Source:** Indicators of Education in China, various years. Online data: http://www.moe.gov.cn/

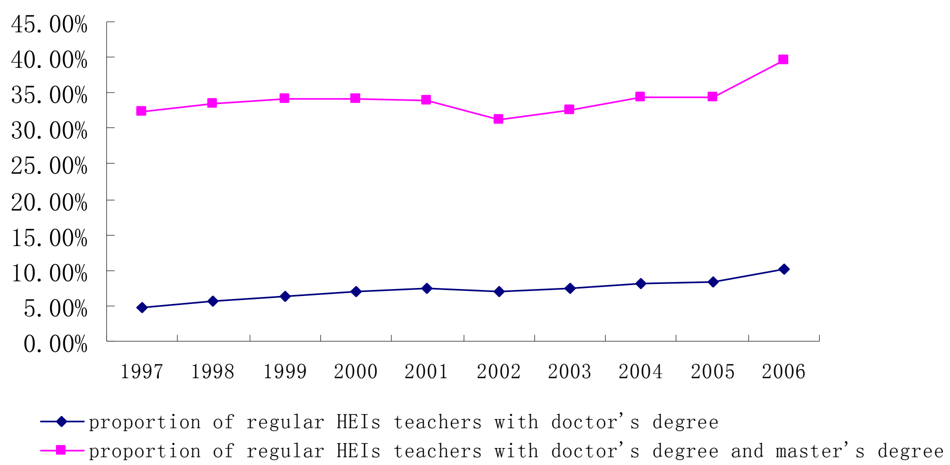
### 5.2. Higher vocational education

In recent years, a system of higher vocational education has been introduced and developed rapidly over the last five years. The higher vocational education is part of the 3-year short-cycle higher education. The aim of this level education is to cultivate higher technical workers. Higher vocational education colleges are now partly replacing the role of secondary vocational schools. From recent years' statistic data, we found that the employment rate of higher vocational education colleges (especially in some hot specialty such as Medicine, Management, Techniques, and Sports) is growing year by year and had nearly exceeded the employment rate of general colleges' 4-year bachelor students. Compared with general colleges, more practical skills are taught in these schools, which enable students to quickly adapt to working environment. These schools offer in-depth training, which is directly related to the real work task and requirements, reducing the need for on-the-job training and thereby lowering learning time and costs, and increasing students motivation. Besides, much of the training can be conducted in real organizations, where staff and equipment are available conveniently.

## 6. Teaching staff and quality

With the development of higher education, the quality of college professors in China has also increased. Figure 10 shows that the proportion of regular HEIs professors with a doctor's degree and a master's degree has been continuosly increasing over the past decade. In 2006, professors with a doctor's degree in general HEIs accounted for 10% of all general HEIs professors, reflecting growing competition between HEIs  for talent professors. Besides teaching, research ability has gradually been brought into consideration. More and more HEI professors perform R&D besides teaching affairs especially the professors in HEIs with postgraduate education (Table 4). In these post-education HEIs, graduate students and young professors are the main R&D labor force.

**Figure 10:** Academic qualifications of full-time professors in general HEIs in China




**Source:** Indicators of Education in China, various years. Online data: http://www.moe.gov.cn/

**Note:** The teachers with doctor's degree are the teachers who hold the PhD degree, which implies he or she has been authorized a master degree before. The teachers with a doctor's degree and a master's degree are the overall amount of teachers with a master degree and above.

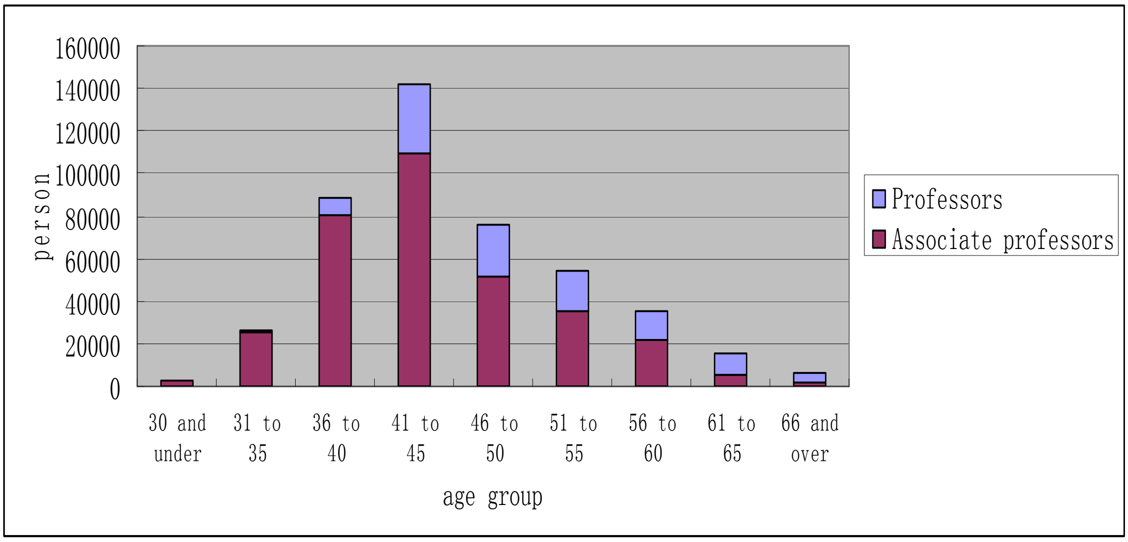
**Table 4:** Chinese college professors performing R&D in recent years

| Indicators | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| Staff Performing R&D (in 10 thousand) | 38.3 | 41.1 | 43.6807 1 | 47.09 | 50.8711 |
| R&D Expenditure (100 million RMB) | 130.5 | 162.3 | 200.939 2 | 242.3 | 276.811 3 |
| Number of Released Papers | 541390 | 612738 | 668520 | 728082 | 830948 |
| Number of Patent Applications | 6778 | 10770 | 14888 | 20094 | 24490 |
| Number of Authorized Patents | 2251 | 3954 | 6399 | 8843 | 12043 |

**Source:** China Statistic Year Book Online, 2007. http://www.stats.gov.cn/

With the development of higher education, the age structure of college professors is also changing (Figure 11). In 2006, HEI teaching staff younger than 30 years accounted for 30% of the staff. Professors and associate professors older than 60 years only accounted for 14% and the age of most professors and associate professors was between 30 to 50 years (especially around 41-45). This implies the young energy of Chinese higher education compared, for example, with Russia, where the young professors (younger than 30 years) accounted only for 16% and more than half of professors were older than 60 years.

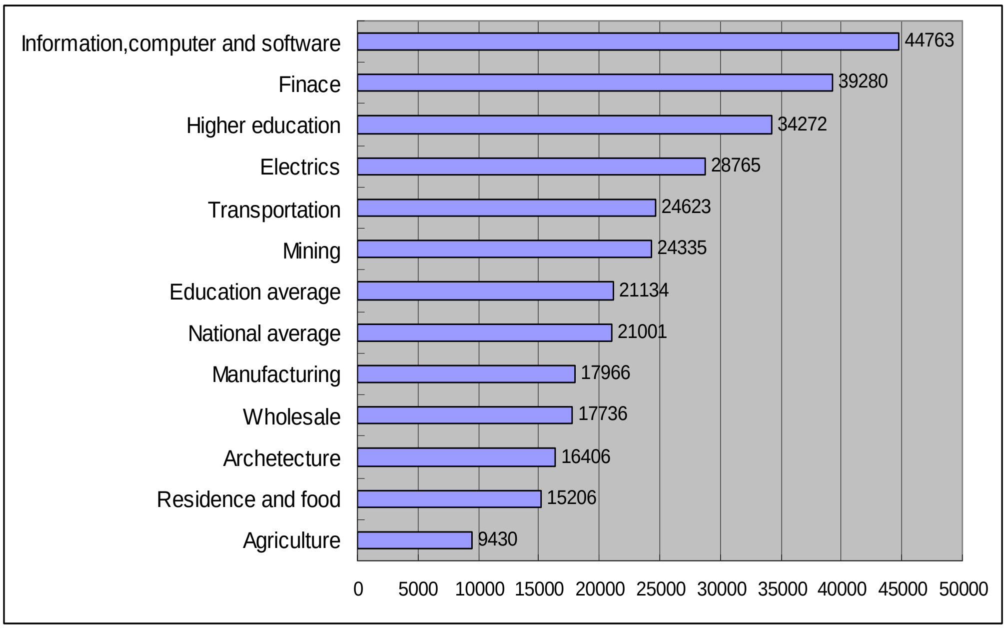
**Figure 11:** Breakdown of full-time professors and associate professors by age




**Source:** Indicators of Education in China, 2006.

Higher education sector is relatively a high paid sector in China. In 2006, the average annual salary was 63% higher than in the national economy average level. Figure 12 shows that only the information, computer and software sectors and the finance sector had higher average salaries. On the contrary, the salary level in primary education and secondary education is lower than the national average level. This is why State Council of China has recently promulgated some measures to increase the salary level of primary and secondary education to promote social equity.

**Figure 12:** Average annual salary by sector in China, 2006 (Unit: RMB)




**Source:** China Statistic Year Book Online, 2007. http://www.stats.gov.cn/

The high salary level of the higher education sector is partly the result of high expenditure on higher education. In 2005, the total education expenditure was 255 billion RMB, however, the expenditure on higher education per student in China was only 559 RMB (calculated according to indicators of education in China), which was much lower than developed countries such as United States, United Kingdom, France, Canada, and also was much lower than Russia which is about 3.6 thousand $ PPP in 2005. (If calculated with only general HEIs students, the expenditure on higher education per student in China is 15,364 RMB, which is still much lower than developed countries and lower than Russia). Chinese college professors also earn money from R&D projects. The total R&D fund raised by HEIs had attained 619.67 billion RMB in 2006 and the growth rate of R&D fund maintained 20% in the last five years (Table 13). However, there is an obvious inequity among college professors in earnings from performing R&D. "Big professors" have both social resources and academic ability raising R&D fund and undertake national R&D projects, and thus could earn a lot from R&D projects while young professors/lecturers often lead a "simple" life.

**Table 13:** R&D fund in Chinese general HEIs, 2002-2006

| Indicators | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| R&D fund raised (100 million RMB) | 2938 | 3459.1 | 4328.326 | 5250.8 | 6196.7 |
| Of which: | | | | | |
| Government fund | 776.2 | 839.3 | 985.5191 | 1213.05 | 1367.8 |
| Enterprise fund | 1676.7 | 2053.5 | 2771.206 | 3440.29 | 4106.9 |
| Loans from financial institutions | 201.9 | 259.3 | 265.0049 | 276.84 | 374.3 |

**Source:** China Statistic Year Book Online, 2007. http://www.stats.gov.cn/

# 7. Conclusions. The Chinese education and training system into the 21st century

Although the Education and Training System of China is quite complex, it appear to deliver on its mission of promoting Chinese knowledge and acknowledging level for the nation’s sustainable development. In general, China is forming a multi-level education and training system which is more consistent with the demands of social development.

The system seems also to adapt to the new challenges. With the economic development of China, a private school system has gradually built up and many private schools began to use bilingual teaching. Furthermore, some public colleges or universities to operate private schools in cooperation with foreign and domestic private investors. The rapid development of higher vocational education will also help the transition. Overall, the system cultivated much more outstanding talents in various fields in the last decade than in the previous.

In 2010, important reforms were introduced. On January 31, the Education Department of Guangdong Province began to implement parallel voluntary admission in college entrance recruiting process, enabling a student to have more application options (thereby reducing the risk being rejected). On November 20, the Ministry of Education of China canceled the additional Olympics Points in College Entrance Exam. It is more equal for the high school students, and efficiently reduces the heavy academic burdens of them.

In the next two decades, the challenge is to optimize educational and training system by making better resource allocation between higher education and vocational education, and promote them to be more customer-oriented.

# FDI in India: changing institutional arrangements and its outcome

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## Table of contents

# 1. Introduction

The extent of participation by firms in the developing countries in the GIN is governed by a host of factors as articulated in the INGINEUS project. Among them the institutional arrangements, including policies, laws and rules, that govern FDI inflow in the host country is an important factor. Hence as noted by UNCTAD (2000) there exists competition among the developing countries for attracting FDI through policy measures that are more liberal than ever before. The competition is intense not only among countries, but also among sub-national authorities within countries, including individual cities. It has also been shown that in a context wherein low labour cost and incentives by developing countries are taken for granted, the ability of the developing countries to participate in global production network/global innovation network is governed by their ability to provide certain specialized capabilities that the TNCs need in order to complement their own core competence. Countries, which cannot provide such capabilities, are kept out of the circuit of international production network despite their liberal trade regime (Ernst and Lundvall 2000).

In this paper we highlight the trends and patterns in FDI inflows and its select outcomes against the backdrop of changing institutional arrangements that govern FDI inflows both at the national and regional level.

# 2. Changing institutional arrangements for FDI inflow

The approach towards FDI as well as the institutional arrangements, especially manifested in policies governing the inflow of FDI into the country, has undergone major changes over the years. Scholars (eg. Subrahmanian et al 1996) have identified four different phases in the evolution of India's approach towards FDI. This indeed had its reflections on the policies especially in response of the government to external balance of the economy. True, other factors did influence the changes in the approach over the years.

The first phase, beginning with 1948 to mid 1960s was marked by 'Cautious welcome" as evident from the Industrial policy resolution of 1948. Such an approach was further reinforced in the Prime Minister's Statement of 1949 on foreign investment that acknowledged the importance of foreign capital as a source of industrial technology for the rapid industrialization of the country but called for carefully regulating the conditions under which they may participate in the national interest. As FDI was considered important, foreign investors were assured of a treatment on part with the local enterprises, provided for the repatriation of profits and compensation in the event of compulsory acquisition. But it was also laid down that as a rule, the controlling interest and ownership should be with the Indian hands.

The second phase, which was marked by a selective and regulatory approach, was set in by the mid 1960s and almost lasted till the late 1970s. The shift in policy stance needs to be viewed against the fact that by the mid 1960s the external balance of the country became highly unfavourable and as FDI acted as a catalyst in the outflows from the economy *inter alia* in the form of transfer payments. The Foreign Exchange Regulation Act (FERA) 1973 became the key to guiding controlling FDI inflows. This period, thus witnessed the winding up of the operations of leading TNCs like IBM and Coco Cola in the country.

The various committees that were appointed in the seventies in context of industrial stagnation since the mid 1960s were unanimous about the view that the various controls evolved over the years have been bridling the overall growth of the economy and called for liberalizing the policy regime in general and also the FDI. Hence by the late 1970s the country entered the third phase marked by partial liberalization. According to the Industrial policy 1977 foreign firms were allowed in financial and technological collaboration with Indian firms and fully owned foreign firms were permitted in export oriented and sophisticated technology areas. Industrial policy 1980, among others, focused on the need for promoting competition in the domestic market, technological up gradation and modernization. The policy laid the foundation for an increasingly competitive export based investment and for encouraging foreign investment in high-technology areas. A number of policy and procedural changes were introduced in 1985 and 1986 under the leadership of Shri Rajiv Gandhi, then Prime Minister of India, and aimed at increasing productivity, reducing costs and improving quality. The emphasis was on internal liberalization and there was also the beginning of opening up the domestic market to increased international competition. With the New Industrial policy of July 1991 India entered the current phase marked by greater integration with world market with emphasis on globalization.

## 2.1 FDI policies since 1991

Economic reforms of 1991 *inter alia* included removal of entry barriers to investment in general and FDI in particular by abolishing industrial licensing system (except where it is required for strategic/environmental grounds), and introducing a more liberal trade policy regime besides reforms of capital market and exchange controls. The New Industrial Policy announced on July 24, 1991 marked a major departure with respect to FDI policy. The "permit raj" that ruled the pre-liberalisation policy period and blocked FDI entry changed. A system of automatic clearances (here the clearance from the Reserve Bank of India needs to be obtained within 30 days) of FDI proposals guided by the commercial interest of the firms concerned, fulfilling certain minimal conditions was introduced. Clearances of other cases were considered by the Foreign Investment Promotion Board (FIPB route) but removed much of the hurdles for entry of FDI into India. Also, some of the earlier restrictive conditions [e.g. phased manufacture programme, dividend balancing conditions, export obligation, general ceiling of 40 per cent foreign equity, prohibition of the use of foreign brand name in local market (see Rao Chalapati, 1999 for details)] disappeared over time. In the main, measures designed to liberalize the FDI regime included: expansion of the list of industries open to FDI, enhanced list of industries eligible for automatic approval, expansion of the list of industries open to 100 per cent foreign equity participation, offer of national treatment to companies with more than 40 per cent foreign equity share, and relaxation of trade-related investment measures (Kumar, 2005a). India thus liberalised her FDI policy regime considerably since 1991 and the liberalisation policy is found accompanied by increasing FDI inflows into India. [for detailed discussion see Bhattacharyya (1994) Kumar Nagesh (1998, 2005); Nagaraj (2003); Balasubramanyam and Mahambare (2003), Balasubramanyam and Sapsford ( 2007 )] Specific details with respect to different aspects of FDI are as follows.

## 2.2 Remittances of dividend and royalty

There are no restrictions on remittances for debt service or payments for imported inputs. Dividend remittances are permitted without approval from the Reserve Bank of India (RBI). There are no delays beyond 60 days on remittances for dividends, lease payments, etc. It only requires income tax clearance to ensure that taxes, if any, have been paid before the transaction is concluded. The RBI's approval is required to remit funds from asset liquidation. Foreign partners may sell their shares to resident Indian investors.

Foreign Institutional Investors (FIIs) may transfer funds from rupee to foreign currency accounts and vice versa at the market exchange rate. They may also repatriate capital, capital gains, dividends, interest income, and any compensation from the sale of rights offerings, net of all taxes without approval.

Indian companies having technology transfer agreements with foreign companies may remit royalties; but recurring royalty payments, such as patent licensing payments, are normally limited to maximum of eight percent of the sales. Royalties and lump sum payments are taxed at 20 to 30 percent. Payment of royalty up to two percent on exports and one percent on domestic sales is allowed under the automatic route on the use of trademarks and brand names of the foreign collaborator without technology transfer.

## 2.3 Performance requirements

Local sourcing is generally not required. In some consumer goods industries, the GOI requires the foreign party to ensure that the inflow of foreign exchange and foreign equity covers the foreign exchange requirement for imported goods. In 2002, the GOI removed measures previously requiring local content and foreign exchange balancing in automobile industry.

**Plant location**: industrial undertakings are free to select the location of a project; in case of cities with population of more than a million, the proposed location should be at least 25 kilometres away from the standard urban area limits of that city. Electronics, computer, and printing as well as other non-polluting industries are exempt from such location restrictions.

**Employment:** There is no requirement to employ Indian nationals. Restrictions on employing foreign technicians and managers have been eliminated, though companies complain that hiring expatriates involves bureaucratic process and also expensive. The RBI has raised the remittable per-diem rate from $500 to $1000, with an annual ceiling of $200,000 for services provided by foreign workers payable to a foreign firm. Employment of foreigners in excess of 12 months requires approval from the Ministry of Home Affairs.

**Taxes:** The GOI provides a 10-year tax holiday for knowledge-based start-ups. Most state governments also offer fiscal concessions. All foreign firms are allowed to participate in government financed or subsidized research and development programs on a national treatment basis.

## 2.4 Capital markets and portfolio investment

FIIs may invest in all securities traded on India's primary and secondary markets, in unlisted domestic debt securities, and in commercial paper issued by Indian companies. The ceiling of an investment by FIIs is equal to the sector-specific FDI limits. Indian mutual funds may invest in rated securities in other countries. Disinvestments and repatriation of dividends are permitted after payment of capital gains taxes. Securities and Exchange Board of India (SEBI) regulates all market intermediaries. The takeover regulations require disclosure on acquisition of shares exceeding five percent of total capitalization. In case of acquisition of over 10 percent, the buyer must make a public offer for a minimum of 20 percent from the remaining shareholders at a fixed price. Companies may buy back their shares in the market to make inter-corporate investments. RBI and FIPB clearances are required to acquire a controlling stake in Indian companies.

## 2.5 Foreign trade zones/free ports

Special Economic Zones (SEZs) are designated duty-free enclaves with developed industrial infrastructure. These zones are regarded as foreign territory for the purpose of duties and taxes, and are excluded from the domain of the custom authorities to enjoy full freedom for the in and outflow of goods. SEZ units enjoy a tax exemption for seven years: 100 percent exemption in first 5 years, and 50 percent in the remaining 2 years. They have the facility to retain 100 percent foreign exchange earnings in Export Earners Foreign Currency Exchange accounts. All SEZ units are free to sell goods in the domestic tariff area (DTA) on payment of applicable duties.

EPZ/STP units may import intermediate goods duty-free. The minimum net foreign exchange earnings as a percentage of exports by EPZ/STP units is required to be at least 3 percent. EPZ/STP units may sell up to 50 percent of their exports on the domestic market after payment of taxes. Export Oriented Undertakings (EOUs) are industrial companies established anywhere in India that export their entire production. There are about 2,300 fully operational EOUs in India. They are allowed to import intermediate goods duty-free; have a ten-year corporate income tax holiday; are exempt from excise tax on capital goods, components and raw materials; and are exempt from sales taxes. EOUs may sell up to five percent of "seconds" on the domestic market after paying appropriate taxes.

## 2.6 Outward FDI

Yet another aspect of policy reforms with bearing on India's participation in global production and innovation network related to the outward FDI. Needless to say, prior to 1990s the policy towards Outward FDI was highly restrictive. During this period, government policy towards overseas investment by Indian companies was formulated on the basis of the foreign exchange earning capacity of proposed ventures. As part of the highly restrictive foreign exchange monitoring process, every proposal had to be placed before an inter-ministerial committee on joint venture for approval. Overseas investment was permitted only in minority-owned joint ventures, unless the foreign government and foreign party desired otherwise. As regards the mode of financing of the proposed project, the government severely restricted cash remittances for equity participation and only encouraged the export of capital equipment from India for that purpose. It was stipulated that all service fees and royalties, and 50 percent of declared dividends, should be remitted to the parent companies in India. All project proposals were screened on a case-by-case basis and only those that promised quick payoffs in the form of exports were approved. Some liberalization of trade and investment policy regime, however, took place during the period 1975–1991. This included progressive loosening of import controls and increase in subsidies to exporters of manufactured goods. The approval criteria also were somewhat liberalized in the 1980s, but the basic rationale remained largely unaltered until 1992 (Athukorala 2009).

The liberalization-cum-structural adjustment reforms initiated in 1991 marked a clear departure from the dirigiste economy. As part of the new policy emphasis, relaxation of restrictions on overseas investment began in 1992. The first step was to introduce an automatic route for overseas investment up to $4 Million. The authority for approval of proposals up to $15 million was vested in the Reserve Bank of India, but proposals of more than $15 million still had to be approved by the Minister of Finance. In 2002, the upper limit for automatic approval was raised to $100 million per annum, of which 50 percent could be obtained from any authorized dealer of foreign exchange. In 2004, firms were allowed to invest up to 100 percent of their net worth under the automatic route. In 2005, this limit was raised to 200 percent of net worth, prior approval from the Reserve Bank of India was dispensed with, and firms were permitted to remit transfer funds through any authorized foreign exchange dealer. Indian firms’ access to international financial markets was also progressively liberalized and they were granted permission to use special purpose vehicles in international capital markets to finance acquisitions abroad (FICC I 2006).

## 2.7 Policies at the State level

While the FDI policy at the national level governs the inflow of FDI into the country, the decision of the TNCs with respect to the location of their investment is guided to a great extent by the policies and practices adopted by the state governments. Thus, while the regional governments do not have an FDI policy of their own, they do have various policies with respect to industry, labor, infrastructure including power and other related issues that in turn have a crucial bearing on the location decision of TNCs. This is because India has a federal system of government with clear demarcation of powers. The states deal with subjects of law & order, agriculture, sales tax, minor minerals, electricity, health, education, irrigation, water supply, minor ports, roads, etc. From time to time the states have been liberalising their policies to attract investment in both private and public sector. Since many of these areas act as determinants of location of FDI, states do compete among themselves to attract FDI using these policy instruments. Some states provide special packages to foreign investors and representatives of some states visit investors’ country to give information regarding the state policy preference to foreign investors. With liberalization and decentralization of Indian economy, both domestic and foreign investors now mainly require interacting with state governments and local bodies for seeking various regulatory approvals and for getting land and necessary infrastructure.

Table 1 depicts polices of different states, such as the policy relating to Information Technology (IT) having bearing on FDI inflow. The fact that most of the states have such policies specifically relating to IT needs to be seen in terms of the immense scope for employment generation through IT. Through this policy, all the states intend to generate large-scale employment and attract FDI. The states like Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Delhi are known as IT hubs as these states have given high priority towards the IT. Apart from IT policies these states have Biotechnology polices (exception is Delhi), which is considered as next revolution in Knowledge based industries. One interesting observation from table 1 is that the states formulate their polices according their assets/resource base and development perspectives. The states like Chattisgarh, Orissa, which are rich in minerals, have separate policy on minerals. Gujarat, which is considered as a highly industrialized state and with longest coastline aims at exploring the oil resources and therefore they are concentrating on Interim Policy for Gas Distribution and Port Policy. Haryana gives special preference to Web Policy[1] and Education Policy. The state of Kerala has special policy on fisheries, tourism, and others. Madhya Pradesh has special policy with regard to captive power generation, environment and tourism. Rajasthan, which is one the major exporter of granites has their own policy with regard to granite.

**Table 1:** Different State policies and special policies

| **States** | **Polices** | **Special policy** |
|---|---|---|
| Andhra Pradesh | Information Technology Policy<br>Infrastructure Policy<br>Port Policy<br>Roads Policy<br>Policy for Small Scale Enterprises<br>Tourism Policy | Biotechnology Policy |
| Arunachal Pradesh | Agricultural policy | |
| Assam | Information Technology Policy | |
| Bihar | No | No |
| Delhi | Transport policy<br>Information Technology policy | Transport policy |
| Gujarata | Port Policy<br>Information Technology policy<br>Roads Policy<br>Policy on Special Economic Zone<br>Interim Policy for Gas Distribution<br>Tourism Policy<br>Agro policies | Interim Policy for Gas Distribution |
| Haryana | Information Technology policy<br>Export policy<br>Food processing policy<br>Education policy | Education policy,<br>Food processing policy,<br>Web policy,<br>ROW policy, |
| Himachal pradesh | Information Technology policy<br>Tourism policy<br>Township policy | |
| Karnataka | Policy on Special Economic Zone<br>Export Promotion policy<br>Information Technology policy | Biotechnology Policy<br>Millennium BPO policy |
| Kerala | Energy Policy | Urban Policy |

[1] The IT Policy 2000 of the State emphasizes the use of Web Technology to disseminate the information across the world and to enhance the citizen-IT interface. Also, the Policy recognizes the need of using Web Potential in bridging the gap between the Government and the Citizen.

| | | |
|---|---|---|
| | Information Technology policy<br>Tourism policy | Draft Fisheries Policy<br>Labor policy |
| Madhya Pradesh | Information Technology policy<br>Eco & Adventure Tourism Policy<br>Tourism Policy<br>Labour Policy | Women Policy<br>Environment policy<br>Trade Policy<br>Captive Power policy |
| Maharshtra | Information Technology policy<br>IT and ITES Policy<br>Policy Regarding Setting up of SEZ | Grapes Processing Industry Policy<br>Biotechnology Policy |
| Orrisa | Agricultural policy<br>Tourism Policy<br>Information Technology policy | |
| Rajasthan | Information Technology policy<br>Tourism Policy<br>Agro-Processing Policy<br>New Road Policy, | Land allotment policy<br>Mineral policy<br>Granite policy<br>Captive Power Plant Policy |
| Tamil Nadu | Biotechnology Policy<br>Captive Power Generation Policy<br>Environment Policy<br>Information Technology Policy<br>Textile Policy | Floriculture Policy<br>Housing Policy |
| Uttar Pradesh | Agriculture Policy<br>Export Policy<br>Information Technology Policy<br>Mineral Policy<br>Road Development Policy<br>Tourism Policy | Film Policy |
| West Bengal | Information Technology Policy | |

To attract the investors, including FDI, the states are providing various forms of incentives such as investment subsidy, capital subsidy, power subsidy, exemption from sales tax and sales incentives and others. Apart from that, special incentives for small-scale industries and special packages for mega projects are also provided. All these incentives are not provided by all the states, some states are providing investment subsidy and some others power subsidy and sales tax exemption. Infrastructure facility in a special economic zone is a common policy initiative by almost all the states. Moreover, the rate of subsidy given to investors differs across region and sectors. It is also fund that Subsidy varies across different zones within the states. In general, investments the less developed zones receive more incentives as compared to those in the more developed zones. The motive being the development of underdeveloped regions and bring about regional balances within the states.

In the present scenario most of the states are setting up industrial area or industrial park or special economic zones or growth center or export processing zones with necessary infrastructure for power, water, roads, etc. Investors could take land on lease or purchase from the state level corporations for setting up their units. These industrial parks have been developed either by State Industrial Development Corporations (SIDCs), State Infrastructure Development Corporations (SIDCs) or by private sector or in joint sector. Many states have started to provide single window clearance for many regulatory approvals and for getting infrastructure for units being setup in these industrial parks. Some of these parks are also for specific sector such as Information Technology, biotechnology, food processing, garments, export oriented etc. The overall changes in the policy seem to have led to competition among states to attract the investors (see the annexure various policy instruments employed by the states to attract investment)[2].

# 3. Trends in foreign collaboration and FDI inflows

To begin with, we shall undertake an examination of the trends in foreign collaboration approvals in the country using the data obtained from Department of Scientific and industrial Research. Though this data is available only up to 2001, the trend is revealing in terms of its response to policy changes in the country outlined earlier. From table 2 it is

evident that the total number of foreign collaborations increased substantially to reach a level of 738 in the early phase of liberalization (1980-90) and their number more than doubled (1928) as we move towards the last phase. More importantly, the number of cases involving foreign equity accounted for only about 12 per cent of the total number of foreign collaborations in 1980 but increased substantially to reach a level of over 86 per cent in 2001 (see table 2).

**Table 2:** Trend in foreign collaboration approvals

| | **Total number of collaboration approvals** | **Cases involving foreign investment** |
|---|---|---|
| 1980 | 526 | 65 |
| 1981 | 389 | 56 |
| 1982 | 588 | 113 |
| 1983 | 673 | 129 |
| 1984 | 740 | 148 |
| 1985 | 1041 | 256 |
| 1986 | 960 | 256 |
| 1987 | 903 | 259 |
| 1988 | 957 | 289 |
| 1989 | 639 | 212 |
| 1990 | 703 | 201 |
| 1991 | 976 | 298 |
| 1992 | 1520 | 736 |
| 1993 | 1476 | 762 |
| 1994 | 1854 | 1054 |
| 1995 | 2337 | 1355 |
| 1996 | 2303 | 1555 |
| 1997 | 2325 | 1690 |

[2] Apart from state incentives the center has been sponsoring some special scheme like the Transport subsidy scheme for the North-Eastern states. Industries located in the growth centres are also eligible for capital investment subsidy at the rate of 15% of their investment in plant and machinery, subject to a maximum ceiling of Rs. 30 lakhs (3 million). An interest subsidy of 3% on the working capital loans is also provided for a period of ten years after the commencement of production.

| | | |
|---|---|---|
| 1998 | 1786 | 1186 |
| 1999 | 2224 | 1708 |
| 2000 | 2144 | 1716 |
| 2001 | 2270 | 1971 |

Not only that the share of the number of cases involving foreign equity increased, but also the share of cases involving higher equity participation also increased. From table 3 it is evident that the number of cases involving more than 75 per cent equity participation accounted for only a little more than 3 per cent in 1990. But as we move towards 2001 their share increased to more than 58 per cent (see table 3).

So far our discussion has been on the number of approvals of foreign collaborations and those cases involving foreign equity (FDI). Though the number of collaborations provides a broad indication of the trends, what really matters is not the number but actual inflow of FDI. Hence let us now proceed to examine the actual inflow of FDI into the country.

**Table 3:** Number of approvals at different foreign equity ranges

| | Up to 50 % | 50-74% | Above 75 % | Total |
|---|---|---|---|---|
| 1990 | 174 | 10 | 6 | 190 |
| 1991 | 248 | 32 | 10 | 290 |
| 1992 | 492 | 177 | 51 | 720 |
| 1993 | 467 | 175 | 99 | 741 |
| 1995 | 842 | 249 | 260 | 1351 |
| 1996 | 781 | 350 | 419 | 1550 |
| 1997 | 635 | 421 | 609 | 1665 |
| 1998 | 304 | 190 | 627 | 1121 |
| 1999 | 423 | 249 | 680 | 1352 |
| 2000 | 464 | 188 | 601 | 1253 |
| 2001 | 471 | 160 | 891 | 1522 |

Table 4 indicates FDI inflows clearly show a definite upward trend since 1991. While

**Table 4:** Trend in inward FDI to India and its share in global FDI

| YEAR | FDI inflow (million US $) | FDI as % to total world FDI | FDI as % % of GDP | FDI as % % of GFCF |
|---|---|---|---|---|
| 1970 | 45.46 | 0.34 | 0.07 | 0.47 |
| 1980 | 79.16 | 0.15 | 0.04 | 0.21 |
| 1990 | 236.69 | 0.11 | 0.07 | 0.29 |
| 2000 | 3587.99 | 0.26 | 0.77 | 3.27 |
| 2005 | 7621.77 | 0.77 | 0.94 | 2.91 |
| 2006 | 20327.76 | 1.39 | 2.23 | 6.61 |
| 2007 | 25001.15 | 1.19 | 2.19 | 6.23 |
| 2008 | 40418.39 | 2.28 | 3.22 | 9.40 |
| 2009 | 34613.15 | 3.11 | 2.81 | .. |

**Source:** UNCOMTRADE (2008)

India's share in global FDI was only 0.3 per cent in 1970 and declined to 0.1 per cent by 1990 reflective of the restrictive policy regime, its share more than doubled by 2000. By 2009, the share of FDI inflows to India increased nearly 12 times to reach a level of 3.1 per cent. Similar trend could be seen in terms of the share of FDI in GDP that remained less than one per cent until 1990 and today it is as high as 3.2 per cent. From the perspective of FDI contribution to filling the saving investment gap, it is evident that its share in gross fixed capital formation increased from a very low level of 0.5 per cent in 1970 to over 9 per cent today.

### 3.1 Regional pattern of FDI Inflows

Table 5 provides the distribution of FDI into different states. It indicates that one of the states, Maharashtra, accounts for as high as over 36 per cent of the total FDI into the country during 2006-10. The table also indicates increasing regional concentration as the share of Maharashtra was only 22 per cent during 2000-05. More specifically, while the share of four leading states was about 59 per cent during 2000-05 it increased to 66 per cent during 2006-10.

**Table 5:** Regional distribution of flow of FDI in India

| | **Cumulative Inflows** | | | **percentage shares** | | |
|---|---|---|---|---|---|---|
| **State/region** | **2000-05** | **2006-10** | **2000-10** | **2000-05** | **2006-10** | **2000-10** |
| Maharashtra | 17,799.75 | 168,276 | 186,076 | 22.1 | 36.4 | 34.3 |
| Delhi, part of UP and Haryana | 21,777.83 | 88,689 | 110,467 | 27.0 | 19.2 | 20.4 |
| Karnataka | 6,344.23 | 29,005 | 35,349 | 7.9 | 6.3 | 6.5 |
| Gujarat | 2,727.07 | 26,990 | 29,717 | 3.4 | 5.8 | 5.5 |
| Tamil Nadu, Pondicherry | 4,847.31 | 21,407 | 26,254 | 6.0 | 4.6 | 4.8 |
| Andhra Pradesh | 2,533.98 | 20,554 | 23,088 | 3.1 | 4.4 | 4.3 |
| West Bengal, Sikkim, Andaman & Nicobar islands | 1,089.80 | 4,964 | 6,054 | 1.4 | 1.1 | 1.1 |
| Chandigarh, Punjab, Haryana, Himachal Pradesh | 1,476.44 | 2,675 | 4,151 | 1.8 | 0.6 | 0.8 |
| Goa | 477.19 | 2,801 | 3,278 | 0.6 | 0.6 | 0.6 |
| Madhya Pradesh, Chattisgarh | 157.75 | 2,611 | 2,769 | 0.2 | 0.6 | 0.5 |
| Rajastan | 17.79 | 2,261 | 2,279 | 0.0 | 0.5 | 0.4 |
| Kerala, Lakshadweep | 293.11 | 1,234 | 1,527 | 0.4 | 0.3 | 0.3 |
| Orissa | 261.66 | 929 | 1,191 | 0.3 | 0.2 | 0.2 |
| Uttar Pradesh, Uttranchal | 0.03 | 668 | 668 | 0.0 | 0.1 | 0.1 |
| Assam, Arunachal Pradesh, Manipur, Meghalaya, | 41.74 | 238 | 280 | 0.1 | 0.1 | 0.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mizoram, Nagaland, Tripura | | | | | | |
| Bihar, Jharkhand | 2.74 | -1 | 2 | 0.0 | 0.0 | 0.0 |
| Region not Specified | 20,857.01 | 88,767 | 109,624 | 25.8 | 19.2 | 20.2 |
| Total | 80,705.43 | 462,069 | 542,774.00 | 100.0 | 100.0 | 100.0 |

**Source:** SIA Newsletter, Ministry of Commerce and Industry, Government of India

Having highlighted the overall trend and regional pattern of FDI Inflows, it is instructive to explore the bearing of incentives offered by the states on actual inflow of FDI. We find that the states that offer higher subsidies are not necessarily the ones that attract maximum investment. This is further corroborated by the estimated the correlation coefficient between investment subsidy and cumulative FDI Inflows during the period from 2000 to 2010 (**–0.25465** ) is found to be negative and statistically significant at 10 per cent level. To the extent that there are empirical evidences to suggest that the MNCs in selecting their destination, consider tax incentives and subsidies as taken for granted, and therefore search for locations that are capable of complementing their own capabilities, it is instructive to examine the regional innovation system in those states that managed to attract more FDI. Our background paper (Joseph & Vinoj 2011) has provided evidence to suggest that there is significant variation across different/states in terms of their education and skilled development system that in turn has its implications in terms of the vibrancy of regional innovation system and the ability to participate in global innovation network. The evidence presented in table 6, in terms of the select indicators of regional innovation system in the states that managed to attract more FDI , tend to suggest that these states, in addition to being more industrially developed, also have relatively more vibrant regional innovation system in terms of the presence of higher education and research institutes along with infrastructure.

**Table 6:** Illustrative indicators of regional innovation system in states attracting more FDI

| **Type of NIS Infrastructure** | **Maharshtra Mumbay** | **Karanataka Bangalore** | **Delhi** | **Andhra Pradesh Hyderabad** |
|---|---|---|---|---|
| Institutions of Higher Technical Education and Excellence | IIT-B;<br>Bombay University;<br>SNDT Women's University;<br>Bajaj Institute of Management and several other engineering and management institutes | IISc;<br>University Visvesraya College of Engineering;<br>SKSJ Technology Institute; and 28 private engineering colleges;<br>Indian Institute of Management-B | IIT-D;<br>Delhi College of Engineering;<br>Delhi University Department of Computer Sciences,<br>Roorkee University of Engineering (within 200 kms.);<br>J.N. University;<br>Jamia Milia Islamia Engineering College; | J.N. Technological University;<br>Hyderabad University;<br>Osmania University;<br>Kakatiya University; |

| | | | | |
|---|---|---|---|---|
| | | | FMS; IIFT; plus several private insttns. | |
| Public Funded Research Laboratories and Institutions | TIFR; NCST; BARC; UDCT; SAMEER | ISRO; NAL, CMTI; Electronics and Radar Development Establishment Aeronautical Development Establishment;Gas Turbine Research Establishment; Centre for Aeronautical Systems Studies and Analysis;ER&DCI | NIC; NPL; Institute for Systems Studies and Analysis; SPL; C-DOT; | National Remote Sensing Agency; RRL; NGRI; IICT; Defence Electronic Research Laboratory;DRDL |
| Local Software Champions | TCS; PCS; Tata Infotech; Mastek; L&T ITL; APTECH; COSL; Datamatics; Silverline | Infosys Technologies Ltd.; WIPRO Information Technologies | HCL Technologies; NIIT Ltd.; CMC Ltd. | Satyam Computer Services Ltd. |
| High Speed Data Communication Facilities | Earth Station of STPI | Earth Station of STPI | Earth Station of STPI | Earth Station of STPI |
| High Technology Enterprises, mostly public sector | L&T; Godrej; Tata group and a large number of engineering and electronics enterprises | ITI; BEL; HAL | Central Electronics Ltd.; NRDC; EIL; RITES; ET&T;TCIL | ECIL; BHEL |

**Source:** Kumar and Joseph (2006)

## 3.2 Pattern of FDI Inflow

In the light of the policy changes discussed, it may also be instructive to examine the pattern of FDI inflows. The relevant data is presented in table 7. Few inferences could be made from the table; First, unlike in China where it is reported that 80 per cent of inbound FDI in the 1980s came from overseas Chinese (Ramamurti Ravi 2004), the contribution of Non Resident Indians to the FDI Inflows steadily declined over the years. Of course, India also has a large Diaspora but by nature they are mainly professionals and not businessmen like the overseas Chinese and hence do not take risk with industrial investment. The point for emphasis is this: Indian Diaspora has not been contributing to FDI inflows; though of-late they play a useful role in global outsourcing of services.

Secondly, inflow through the Foreign Investment Promotion Board (through detailed examination by the state) has steadily declined over the years and much of the investment (more than 50 percent) is coming through the automatic route (based on the commercial, consideration of India firms)

Finally, there is an increase in the share of FDI taking place through mergers and acquisitions. In recent years two-fifths of all FDI inflows took the form of M&As (mergers and acquisition) as compared to virtually all FDI inflows for greenfield ventures earlier (Kumar Nagesh, 2000). Clearly, the liberalised policy framework since the early 1990s has led multinational enterprises (MNEs) to increasingly use the M&A route to enter and strengthen their presence in India. Interestingly, the bulk of the deals relating to MNEs has materialised since 1996 (after WTO) and has involved acquisitions rather than mergers (PL, Beena, 2004; Kumar Nagesh 2000). Obviously, a strategic issue for research on FDI in India is the trend of growing M&A, and its impact on market concentration, ownership and control which in turn has impact on MNEs' performance and contribution of FDI to economic development of India.

**Table 7:** FDI inflow to India through different channels

| | **Govt. approval route (FIPB, SIA)** | **Automatic Route** | **Inflows through acquisition of existing shares** | **RBIs various schemes for NRIs** | **Total** |
|---|---|---|---|---|---|
| 1991 | 54.09 | 0.00 | 0.00 | 45.91 | 100 |
| 1992 | 71.00 | 6.85 | 0.00 | 22.15 | 100 |
| 1993 | 55.93 | 12.95 | 0.00 | 31.11 | 100 |
| 1994 | 51.55 | 11.65 | 0.00 | 36.80 | 100 |
| 1995 | 61.17 | 8.17 | 0.00 | 30.65 | 100 |
| 1996 | 65.89 | 7.08 | 3.47 | 23.56 | 100 |
| 1997 | 77.97 | 6.68 | 7.35 | 8.00 | 100 |
| 1998 | 62.10 | 4.60 | 30.59 | 2.71 | 100 |
| 1999 | 66.83 | 8.22 | 21.18 | 3.77 | 100 |
| 2000 | 60.69 | 16.26 | 19.71 | 3.34 | 100 |
| 2001 | 59.98 | 20.17 | 18.43 | 1.43 | 100 |
| 2002 | 43.13 | 24.19 | 32.62 | 0.07 | 100 |
| 2003 | 44.91 | 24.47 | 30.62 | 0.00 | 100 |
| 2004 | 32.82 | 36.68 | 30.50 | 0.00 | 100 |
| 2005 | 26.09 | 35.78 | 38.14 | 0.00 | 100 |
| 2006 | 13.79 | 64.04 | 22.17 | 0.00 | 100 |
| 2007 | 16.24 | 55.83 | 27.93 | 0.00 | 100 |
| 2008 | 9.72 | 71.61 | 18.68 | 0.00 | 100 |
| 2009 | 17.31 | 70.46 | 12.23 | 0.00 | 100 |
| 2010 | 16.51 | 73.91 | 9.58 | 0.00 | 100 |
| TOTAL | 24.79 | 54.14 | 19.09 | 1.98 | 100 |

**Source:** Reserve Bank of India, Mumbai

## 3.3 Sectoral distribution

The sectoral composition of FDI in India has undergone significant change under the liberalized policy regime. Studies have noted that during the pre-liberalization period the bulk of FDI was directed to manufacturing sector but in the post liberalization period FDI inflows have been received by services and infrastructure sectors (Kumar 2005). But during the recent years the service sector including housing, construction, telecom and software put together accounted for nearly 57 per cent of the total FDI into the country (see table 8). The dynamics of housing and construction on the one hand and that IT and software needs to be seen differently. When it come housing and construction, much of it could be attributed to the heavy demand arising from the income from service exports and remittances from abroad increasingly from the software professionals. Also real estate and construction has been liberalized only recently. In case of IT and software, observed incidence of increased FDI needs to be seen in the context of the sectoral system of innovation in this sector. It has been shown that since 1970s there has been systematic effort at the instance of the state towards evolving a vibrant sectoral innovation system for IT and software. These include development of a

**Table 8:** Sectoral distribution of FDI during 1991 to 2010

| | **Million Rupees** | | | **Percentage distribution** | | |
|---|---|---|---|---|---|---|
| Sector | 1991-99 | 2000-05 | 2006-10 | 1991-99 | 2000-05 | 2006-10 |
| Service sector | 40443 | 77389 | *977632* | 8.1 | 8.1 | 23.9 |
| Housing & Real Estate | 0 | 2086 | *371607* | 0.0 | 0.2 | 9.1 |
| Construction activities | 0 | 17554 | *339660* | 0.0 | 1.8 | 8.3 |
| Telecommunications | 40377 | 72565 | *334597* | 8.1 | 7.6 | 8.2 |
| Computer software & hardware | NA | 122234 | *317277* | NA | 12.8 | 7.7 |
| Fuels (power & oil refinery) | 36434 | 70419 | *255705* | 7.3 | 7.4 | 6.2 |
| Miscellaneous industries | 55027 | 93368 | *154906* | 11.0 | 9.8 | 3.8 |
| Automobile industry | 0 | 64919 | *148597* | 0.0 | 6.8 | 3.6 |
| Metallurgical industries | 6333 | 18069 | *116826* | 1.3 | 1.9 | 2.9 |
| Trading | 6714 | 8048 | *85215* | 1.3 | 0.8 | 2.1 |
| Hotel & tourism | 3043 | 10154 | *82127* | 0.6 | 1.1 | 2.0 |
| Chemicals (not fertilizers) | 39861 | 32221 | *81047* | 8.0 | 3.4 | 2.0 |
| Electricals & electronics | 46425 | 17098 | *80016* | 9.3 | 1.8 | 2.0 |
| Broadcasting &print | 0 | 9016 | *73290* | 0.0 | 0.9 | 1.8 |
| Agriculture services | 0 | 2485 | *69274* | 0.0 | 0.3 | 1.7 |
| Ports | 0 | 6764 | *59911* | 0.0 | 0.7 | 1.5 |
| Consultancy services | 220 | 20117 | *50532* | 0.0 | 2.1 | 1.2 |
| Cement and gypsum products | 1664 | 30649 | *44693* | 0.3 | 3.2 | 1.1 |
| Drugs and pharmaceuticals | 8222 | 32277 | *43723* | 1.6 | 3.4 | 1.1 |
| Non-conventional energy | 0 | 275 | *28886* | 0.0 | 0.0 | 0.7 |
| Hospital & diagnostic centers | 0 | 5280 | *28464* | 0.0 | 0.6 | 0.7 |
| Textiles (include dyed, printed) | 8293 | 8570 | *28206* | 1.7 | 0.9 | 0.7 |
| Mining | 0 | 2547 | *27840* | 0.0 | 0.3 | 0.7 |
| Industrial machinery | 3628 | 4604 | *26427* | 0.7 | 0.5 | 0.6 |
| Food processing industries | 23677 | 23121 | *25115* | 4.8 | 2.4 | 0.6 |
| Miscellaneous mechanical & eng | 8511 | 10767 | *24774* | 1.7 | 1.1 | 0.6 |
| Sea transport | 0 | 7095 | *24298* | 0.0 | 0.7 | 0.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fermentation industries | 805 | 9477 | *23637* | 0.2 | 1.0 | 0.6 |
| Education | 0 | 283 | *16957* | 0.0 | 0.0 | 0.4 |
| Ceramics | 1719 | 1776 | *16110* | 0.3 | 0.2 | 0.4 |
| Paper and pulp,& paper product | 8659 | 5388 | *14048* | 1.7 | 0.6 | 0.3 |
| Medical and surgical appliances | 866 | 3603 | *12545* | 0.2 | 0.4 | 0.3 |
| Machine tools | 1615 | 5016 | *12436* | 0.3 | 0.5 | 0.3 |
| Electronics | 0 | 24336 | *12029* | 0.0 | 2.6 | 0.3 |
| Diamond, gold ornaments | 0 | 2026 | *10587* | 0.0 | 0.2 | 0.3 |
| Air transport | 0 | 538 | *9556* | 0.0 | 0.1 | 0.2 |
| Others | 155905 | 130114 | 65410 | 31.3 | 13.7 | 1.6 |
| Total | 498443 | 952250 | 4093959 | 100.0 | 100.0 | 100.0 |

**Source:** SIA Newsletter, Ministry of Commerce and Industry, Government of India

system of higher education in engineering and technical disciplines, creation of an institutional infrastructure for S&T policy making and implementation, building centres of excellence and numerous other institutions for technology development, among other initiatives. The Indian government recognized the potential of the country in computer software way back in the early 1970s and started building necessary infrastructure for its fruition, in particular, for training of manpower. The government also facilitated technological capability building with investments in public funded R&D institutions and supporting their projects, by creating computing facilities, and developing infrastructure for data transfer and networking. Thus the presence of a relatively more vibrant sectoral innovation system (Joseph 2009 Kumar and Joseph 2006), could therefore be postulated as one of the key factors that explains focus of FDI into these sectors by the MNCs to complement their own capabilities. However, this is an area that needs further exploration.

### 3.4 FDI in R&D

A cross-section analysis of R&D behaviour of firms in India in 2002 (post WTO year) as compared to 1991 (pre-WTO year) has revealed the increasing interest of MNEs in locating R&D activities in India (Subrahmanian and Subramanian, 2006). The quantitative analysis (Kumar N, 2001) of the factors explaining the locational pattern of overseas R&D by U.S.and Japanese MNEs suggests that countries that are characterized by a large scale technological activity and abundant cheap but qualified R&D manpower are most likely to play host to MNE's overseas R&D activity. In this context it must be noted that Indian government has built up centres of excellence in different branches of science and technology and set up cumulatively various elements of a national innovation system. Besides, India has relative abundance of qualified R& D manpower. All these tend to attract MNEs to locate their R&D centers in India, which incidentally has now a strong intellectual property protection system by virtue of TRIPS.

The only available data on this related to a survey of cases involving FDI in R&D conducted by Technology Information, Forecasting and assessment Council of the Department of Science and Technology for the period 1998-2004. Though 160 firms were surveyed information on investment and employment could be gathered only from 100 cases. Information on the areas of activity and other information could be gathers from 135 cases. It was found that during the period 1962-90 only 6 six cases of FDI in R&D was reported. But during 1990-2000 the number increased to 49 and within four years since 2000 46 more cases got established.

In terms of the country-wise distribution of FDI in R&D it is found that while the US accounted for 53 per cent of the number of units their share in actual investment (71.6%) and employment (69%) is much higher ( see table 9). Going by all the four indicators, USA is followed by Germany. It is worth noting that China has a notable position in terms of both employment (2.2%) and actual investment (5.3%)

**Table 9:** Country-wise wise distribution of FDI in R&D (up 2004) (%)

| **Country** | **Number** | **Planned** | **Actual** | **R&D employment** |
|---|---|---|---|---|
| USA | 53 | 60.59 | 71.59 | 69.20 |
| UK | 7 | 0.54 | 2.14 | 4.15 |
| SWITZERLAND | 2 | 0.14 | 0.67 | 0.74 |
| Sweden | 2 | 0.46 | 0.10 | 0.35 |
| South Africa | 1 | 3.71 | 0.06 | 0.22 |
| Norway | 1 | 0.01 | 0.00 | 0.00 |
| Netherlands | 3 | 3.49 | 1.62 | 2.31 |
| Mauritius | 2 | 1.13 | 1.01 | 1.15 |
| Korea | 3 | 2.40 | 6.86 | 2.83 |
| Japan | 7 | 3.66 | 0.83 | 0.87 |
| Germany | 7 | 18.34 | 6.78 | 8.92 |
| France | 5 | 4.75 | 1.84 | 4.22 |
| Denmark | 1 | 0.00 | 0.00 | 0.02 |
| China | 2 | 0.65 | 5.31 | 2.22 |
| Canada | 3 | 0.16 | 1.00 | 2.58 |
| Australia | 1 | 0.00 | 0.20 | 0.22 |
| Total (%) | 100 | 100.00 | 100.00 | 100.00 |
| Total (actual Rs Million) | | 209167.9 | 50989.2 | 22979 |

In terms of the location of such R&D ventures in India it is found that 45 per cent of them were in Bangalore, followed by Delhi (10%) and Mumbai (8%). While the state of Maharashtra (Mumbai and Pune) accounted for 17% of the number of units, three southern states Karnataka (mostly Bangalore) Andhra Pradesh (Hyderabad 7%) and Tamil Nadu (Chennai 4%) together accounted for 56 per cent of the total number of ventures. Here it needs to be noted that in terms of regional concentration FDI in R&D depicts more or less the same picture as that of general FDI indicating that, the presence of a vibrant regional innovation system is an important factor that governs the location decision.

It is evident that software is an area that attracted maximum FDI in R&D that accounted for nearly 23 per cent of the cases. If we include IT hardware and communication, the share increases to over 39 per cent. This evidence tends to suggest that the India's IT sector that is known during the early years for it comparative advantage in operating in the low end of the value chain of software is moving up the value chain. In addition, in tune with what we have already argued, the relatively vibrant sectoral innovation system in India's IT and software sector evolved over the years should have been instrumental inducing foreign firms in the IT and software sector to establish their R&D units in India.

**Table 10:** Area of specialization of FDI in R&D

| Area of R&D | No of companies | % |
|---|---|---|
| Software | 31 | 22.96 |
| Computer Hardware, Chip Design etc | 7 | 5.19 |
| semiconductors analog | 3 | 2.22 |
| Internet OS development | 4 | 2.96 |
| Wireless development | 6 | 4.44 |
| optical net work | 3 | 2.22 |
| Auto Design | 9 | 6.67 |
| Drug Design, Agro Chemicals, Leather Chemicals, Dyes | 16 | 11.85 |
| Others ( aerospace, engineering, bioinformatics etc Medical, Engineering, Power, Aerospace) | 56 | 41.48 |
| Total | 135 | 100.00 |

In terms of the nature of activities undertaken by the units, it is found that 53 per cent of the cases involved shifting of in-house R&D activities from the home country to offshore locations. Needless to say, it is with a view to take advantage of the availability of needed manpower at a relatively low cost as compared to the home country. These units are found entirely catering to the needs to the home country requirements. There are no cases reported wherein R&D services are exported to multiple clients through open market system. However in case of engineering, chemicals and agriculture there are many cases that cater to the domestic market as well. In terms of equity/ownership, 51 percent of the companies never had any partnership with the local firms as they work only for the parent company. About 43 per cent are found having partnership with local firms. The local firms are found to be well established large firms like Infosys, Wipro, HCL with very little presence of small firms as local partners. About six per cent of the companies started with a local partner but did not have a local partner as on 2004 when the survey was undertaken.

The incidence of FDI in R&D is reported to have increased many fold since 2004. However, there is hardly any systematic analysis of the implications of such increased incidence of FDI in R&D on the national and sectoral innovation system in general and the innovation capability building on the other. To some extent the answer depends also upon the nature of knowledge-spill over and other externalities that would have profound influence on productivity and output growth. Studies (e.g. Basant Rakesh 1996) on the effect of foreign technology purchases, domestic R&D and spill overs on productivity of Indian firms during the earlier period do not reveal an encouraging tend.

However, results of such analysis are likely to be different under the new regime and therefore calls for more detailed inquiries.

### 3.5 Outward Foreign Direct Investment (OFDI)

We have seen that the policies governing outward investment by Indian firms have become increasingly liberal over the years as part of India's effort to integrate with the rest of the world. The conventional idea of acquiring technology and market access from foreign sources has been through FDI or technology purchases from abroad. During the recent past Indian firms are investing abroad which gives them access to wider market, intangible assets like technology.

The evolution of Indian Multinationals could be dived into three phases according to policy stance of the government and the geographical destination and industrial composition. While 1970 to 1991 is considered as first wave, 1990 to 2001 is considered as second wave and 2001 till recently it is considered as third wave Table 11 indicates that, in response to the policy changes outlined already, the number of Indian firms investing abroad increased substantially during recent years i.e. from 1990 and onwards. The number of approved Indian Joint Ventures (JVs) and Wholly Owned

**Table 11:** Indian OFDI stock (in $ million), 1976 to 2006

| | Year | Number of Approvals | OFDI Stock ($ million) | | | |
|---|---|---|---|---|---|---|
| | | | Approved | | Actual | |
| | | | Value | Percentage Change | Value | Percentage Change |
| First Wave | As on 1.1.1976 | 133 | 38 | -- | 17 | -- |
| | As on 1.1.1980 | 204 | 119 | 213 | 46 | 171 |
| | As on 1.1.1986 | 208 | 90 | -24 | 75 | 63 |
| Second Wave | As on 31.12.1990 | 214 | NA | -- | NA | -- |
| | As on 31.12.1995 | 1016 | 961 | -- | 212 | -- |
| | As on 31.3.2000 | 2204 | 4151 | 332 | 794 | 275 |
| | As on 28.2.2006 | 8620 | 16395 | 295 | 8181 | 930 |

**Source:** Pradhan 2007

Subsidiaries (IJVs/WOSs) as on end of February 2006 stood at 8620, nearly 41-fold increase from the number of IJVs/WOSs as on 1st September 1986 at 208. If we look into the regional distribution of this investment during the first wave, we see that destination of greater part of these investments is in developing countries like Africa, South Asia and Latin American countries. However, during the second and third phase, we see that investments from Indian firms are directed towards the developed countries like Europe, North America and other developed nations.

**Table 12:** Three phases of OFDI in India- geographical destination

| Period | Developing nations | Developed nations |
|---|---|---|
| Phase-I (1975-1990) | 72 | 28 |

| | | |
|---|---|---|
| Phase-II (1990-2001) | 45.9 | 54.1 |
| Phase-III (2001-2007) | 22.5 | 76.4 |

**Source:** Pradhan (2008)

Table 12 shows that over the years developed countries are becoming the preferable choice of destination for the Indian firms to invest. Much of this diversification has resulted from acquisitions rather than Greenfield investment (investment in newly established firms). Developed economies accounted for over 76 percent of the total number of Indian acquisitions during the period 2000–2006, a share much higher than that in total FDI. One third of these acquisitions were in the United States (US) and two thirds were in Europe, with the United Kingdom alone accounting for about half of European acquisitions (Athukorala 2009).

There has also been change in the sectoral composition of the Indian OFDI deals. Phase-I was dominated by the low and medium-low technology industries like Food & Beverages, textiles, leather, paper and paper products, rubber products. During the first phase nearly 87 percent of the OFDI deals were in manufacturing sector, which is again dominated by low and medium-low technology industries. The second wave of OFDI deals were dominated by service sector and the share of OFDI deals in manufacturing sector came down to 58.1 percent. At the same time the number of deals in service sector increased from 9 percent during 1975-80 to 65 percent in 1990-01. However, third phase it is again dominated by the manufacturing sector which comprises of nearly 55 percent of the deals where as service sector comprises of on an average 40 percent of deals. Unlike the first phase, investment by domestic firms is in medium-high and high-technology industries like chemicals, transportation, pharmaceuticals etc. Apart from the traditional motives like access to wider market, raw material OFDI deals are also made to develop trade-supporting networks, to gain access to intangible assets, managerial expertise etc (Pradhan and Abraham, 2005).

# 4. Conclusions

Following observations emerge from the discussion so far made; First, since 1991 the institutional arrangements governing FDI into the country as well as the FDI from the country became much liberal than ever before. As a result, there has been unprecedented increase in both inflow and outflow of FDI from the country. Though different regional governments have been competing among each other through package of incentives and subsidies, much of the FDI into the country has been concentrated in select regions (states) characterized by relatively more vibrant regional innovation system. In terms of sectoral composition much of the FDI has been focused towards the service sector like IT and software that are known for their relatively vibrant sectoral innovation system.

The period since 1991 especially after 2000 India has emerged as a major player in the R&D outsourcing. Going by the available data on FDI in R&D it was observed that much of these initiatives have been in sectors where India is known for its competence like IT and software and select regions. This point towards the relevance of local capabilities as manifested in the presence of regional/sectoral innovation systems in attracting such R&D investments. Most of these ventures took the form of offshoring of in-house R&D activities to locations with cost advantage and access to other technological complementarities. As these units cater entirely to the needs of the parent firms there is only limited partnership with the local firms. The implications of the presence of such firms on the sectoral/national innovation system in general and the technological/innovation capability building in particular call for detailed inquiries.

Finally, taking advantage of the liberal policy regime and with a view to enhance their access to knowledge, skill and market Indian firms have been investing heavily in developed countries. Here again there has been a shift away from the manufacturing sector in the earlier period to service sector in the recent past. Thus viewed, both in terms of FDI and OFDI India's focus has been in service sector, which of late have been India's growth engine, and is known for its human capital intensity. Hence the root to India's better economic performance in the recent past in general and its participation in global production and innovation network in particular lies in its success in building high quality human capital and relatively lower cost.

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# 6. Annex 1: Incentives for attracting investment

### Investment subsidy

Investment subsides are provided on capital investment on land, building, plant and machinery. Investment subsidy is provided under different classifications and under different rates. Backward regions are provided with higher rate of subsidy and developed regions are provided lower rate of investment subsidy. Investment subsides also differ across sectors. Sector like IT and Small Scale Industries are provided more investment subsidy. Tables 2 presents information on investment subsidies different states.

**Table 2:** Investment subsidies across States: an overview

| State | Special Policy on Investment Subsidy |
|---|---|
| Andhra Pradesh | 1) 20% Investment Subsidy, 50% up to a maximum of Rs.10 lakhs will be given as cash subsidy. |
| Assam | @30% to a ceiling of Rs. 20.0 lakhs |
| Gujarat | *ARDP & RS, assistance will be provided rate of 50% limited to Rs. 5 lakhs for patent/ IPR |
| Karnataka | 5% to a ceiling of Rs.1.00 lakh for SC/ST entrepreneur and women entrepreneur SSI/tiny sector |
| Kerala | Priority sector, State Investment Subsidy of 15% FCI, subject to a maximum of Rs.15 lakhs, whereas non-priority sectors will be eligible for 10%. |
| Madhya Pradesh | Industrial units in the cooperative sector with a minimum investment of Rs. one crore in plant and machinery and a membership of a minimum of one hundred persons, will also be eligible. |
| Manipur | State Capital Investment subsidy is given @ 15% on the fixed capital investment on plant & machineries, subject to a maximum of Rs. 15 lakhs to units set up in Manipur. |
| Meghlay | 20% of the capital cost of investment on land, building, plant and machinery subject to a ceiling of Rs. 25.00 lakhs shall be provided for all tourism related activities including drawl of Water Supply.<br>2) Additional subsidy like Publicity Subsidy, Maintenance And Up Keep Subsidy at 20 % of 5.00 lakh and 10 % of 2.00 lakh |
| Mizoram | 15% of total capital investment in plant and machinery for all Investments |
| Nagland | 15% Capital Investment Subsidy on Plant & Machinery subject to a maximum of Rs. 30.00 lakh and 90% Transportation Subsidy |

| | |
|---|---|
| Orrisa | Venture capital for technical entrepreneurs (belonging to Electronics and Computer disciplines) up to 50% of the equity requirements, subject to a limit of Rs. 25 lakhs (either singly or jointly) and equity participation for other categories of entrepreneurs up to 25%, subject to a limit of Rs. 25 lakhs will be provided and travel assistance to technical entrepreneur |
| Punjab | Investment Incentive @ 20% of Fixed Capital Investment to the Small, Medium and Large scale Information Technology units, subject to maximum of Rs 30 lacs, in 'B' Category<br>Investment Incentive (Capital subsidy) @ 30% of the Fixed Capital Investment (FCI) to the SSI, Large & Medium units subject to maximum of Rs 50,000 lacs shall be available to the Information Technology in developed region |
| Tamil Nadu | To attract mega projects into the State, attractive capital subsidies have been introduced as hereunder to industries set up in the State (Subject to specified locational restrictions).<br>For project with an investment of Rs.50.00 crores Rs.25.00 lakhs<br>crores and above but below Rs.100.00 crores<br>For projects with an investment of Rs.100.00 crores Rs.50.00 lakhs<br>crores and above but below Rs.200.00 crores<br>For projects with an investment of Rs.200.00 Rs.100.00 lakhs<br>crores and above |
| West Bengal | Capital Subsidy of 15% or Rs. 1.5 million whichever is less in Group-B, 20% or Rs. 2 million whichever is less in Group-C and 30% or Rs. 3 million whichever is less in Group-D |

From the table 2 it is evident that states like Himachal Pradesh, Karnataka, Tamil Nadu, West Bengal, Maharashtra and Kerala are providing capital investment subsidy but the rate of capital investment subsidy varies. While other states like Rajasthan, Uttar Pradesh, Haryana are not providing capital Investment subsidy to the investors, some other states like Karnataka and Gujarat are concerned about the development of backward community entrepreneur (SC and ST) and are providing additional capital investment subsidy for backward community development. These two states are providing investment subsidy for women entrepreneurs also. To attract investment in SSI/Tiny sector, especially to backward areas, the state is providing special incentives as well. Gujarat, one of the highly industrialized state in the country, is providing special capital subsidy for research units. Assistance for Research and Development and Patent Registration are provided at the rate of 50% limited to Rs. 5 lakhs. In addition to capital subsidy other incentives like interest subsidy, energy subsidy and various tax exemptions are also offered

States are providing interest rate subsidy on loan taken from the financial institutions to modernize their activities by small-scale industries, sectors like services, medium & large industries, and industrial units established in the backward region. Interest rate subsidy policy is followed in some states like Arunchal Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan and West Bengal. The interest rate at 5 per cent level is for a period of 5 year but the ceiling level changes across sectors. The states like Arunchal Pradesh is keeping interest subsidy at 4 per cent level for a period of 5 years.

Table 4 indicates the state level variation in the interest subsidy, the states are providing interst subsidy for modernization of industrial unit, development of small-scale industrial unit. These incentives are provided to a selected a sector, where the state finds that investment is needed for the development of that sector.

**Table 4:** Interest subsidy across different States

| | |
|---|---|
| Arunchal Pradesh | • 4% subsidy on interest charged by Financial Institutions on term loans for a period of 5 years from the date of commissioning of their industrial unit |
| Gujarat | • Any small scale unit set up with the loans from financial institution or any existing small scale unit going for modernization program can avail of 5% subsidy on the applicable interest over the loan period, limited to Rs. 5 lakhs per annum totaling to Rs. 25 lakhs. In the case of backward region the interest subsidy is increased to 25%<br>• Service industries shall be given interest subsidy at a rate of 5 % up to a maximum of Rs. 5 lakhs on applicable rate of interest of term loan taken by the service industry. E.g. if bank charges 12 % interest on finance, the amount thereof at the rate of 5 % up to a maximum of Rs. 5 lakhs shall be considered eligible for incentives under the scheme |
| Madhya Pradesh | Interest subsidy up to a maximum of 5.5% of interest rate, on capitalised basis corresponding to moratorium period including 1.0% for speedy approval/sanction and release of first installment of loan within the stipulated period of 90 days from submission of TEFR/DPR shall be applicable for payment to/through the major/leading financial institutions/intermediary. |
| Maharastra | New textile, hosiery and knitwear small-scale industries set up in different parts of the State will also be eligible for Interest Subsidy on the interest actually paid to the financial institution/bank on the term loan for creating fixed capital assets, equal to the interest payable at 5% per annum |
| Rajasthan | • Interest subsidy of 5 per cent will be given on loans sanctioned by RIICO/RFC to approved Heritage Hotel Projects at all places in Rajasthan.<br>• An interest subsidy of 5 per cent will be given on loans sanctioned by RIICO/RFC to approved 1-, 2- and 3-star hotel projects in special areas (e.g., Jaisalmer, Jodhpur, Biknaer, Barmer).<br>• In other areas/ places, the interest subsidy of 3 per cent will be given. 100-per cent exemption from entertainment tax for amusement parks, water parks, etc. for five years. |
| West Bengal | Industrial unit for its approved project will be entitled to Interest Subsidy to the extent of 50% of the annual interest liability on the loan borrowed from a Commercial Bank / Financial Institution / NBFC approved by Reserve Bank of India, for implementation of the approved project, subject to a limit of Rs.100.00 lakhs per year depending on the location of the unit as follows. |

## Energy subsides

Inability to provide uninterrupted power is major hurdle for many states. Hence many states provide power subsidy, which is one of the important incentives given by the states to investors. In this category two kinds of states can be seen; one provides subsidy at the slab rate especially for captive (inhouse) power generation by own generators, and others provide 100 % power tariff exemption. This exemption is also applicable to the industrial area and special economic zones.

**Table 5:** Energy subsidy and power subsidy across different States

| States | Power Generating subsidy and Power Subsidy/ |
|---|---|
| Arunchal Pradesh | Drawl of power lines from the main line to the factory site will be subsidised to the extent of 50% of the cost incurred by the entrepreneur or Rs.50,000.00<br>Subsidy on power supply will be provided to all the industrial units excepting (a) medium and large scale units and (b) the Plywood/veneer and saw mills irrespective of their size. For a period of three years |
| Harayana | Exemption of payment of electricity duty for 5 year period |
| Himachal Pradesh | New industrial unit(s) in priority sector shall be exempted from payment of electricity duty for a period of 8 years in the industrially backward areas and for 5 years in industrially developing areas |
| Kerala | Exemptions from Electricity Duty for five years to new industrial units from the date of commencement of their commercial production |
| Madhya Pradesh | Electricity duty exemption for five years.<br>Plant and machinery installed for generation of power shall be exempted form State sales tax.<br>Demand cut up to 30 per cent of the installed capacity of non-conventional energy unit if the generation party is a consumer of MPEB and establishes the unit for its own use. |
| Orissa | Payment of electricity duty for a period of 5 years from the date of power supply. For new industrial units located in Zone- B and C, this exemption shall be respectively 35 per cent and 25 per cent for 5 years. |
| Punjab | The New Agro-based units set up in the State shall be exempted from the payment of Electricity Duty, for a period of 5 years. Selective 11 Agro based Industries shall,however, be exempted from the payment of Electricity Duty for 7 years.<br>Generator set subsidy @ 30% of the cost of Captive Generator set, subject to maximum of Rs. 10.00 lacs, shall be allowed.<br>Generator set subsidy @ 50% of the cost of Captive generator set subject to maximum of Rs. 15.00 lacs, |
| Tamil Nadu | Subsidy for installation of new generators for captive use to the extent of 15% of cost up to a ceiling of Rs. 5.00 lakhs is also extended.<br>Full exception from electricity consumption tax will be given for 3 years for all the new units |

| | |
|---|---|
| West Bengal | Subsidy of 25%, up to Rs. 1.25 million, on purchase and installation of generating sets<br>Electricity consumed for its production / operation activity for a period of 5 years from the date of commercial production / operation |

The states are concentrated in two major mechanisms to attract the investors; by providing subsidy to captive power generation and by exempting from electricity duty. However the period of exemption differ from 3 years in the case of Tamil Nadu to 8 years in Himachal Pradesh. The second way is to attract investors in power generation and the state provides subsidy on the investment.

## Other Incentives

Another common measure to attract investment adopted by the states is to either exempt from or offers reduced sales tax rates (see table 6). In addition, there are other incentives like provision of land either as free of cost or facilitating land acquisition at market price or at lower rates.

**Table 6:** Sales tax exemption, entry tax emption and sales tax incentives

| State | Sales Tax Exemption | Entry Tax exemption | Sales tax incentives |
|---|---|---|---|
| Bihar | Sales Tax Exemption" on purchase of raw materials within the State. The period of exemption for new units will be limited to 10 years for category 'A' and 8 years for Category 'B' Districts<br><br>**Sale tax exemption** on finished goods for a period of 10 years for category 'A' and 8 years for category 'B' Districts from the date of production of the unit with a ceiling of 100% of the fixed investment made by the unit. The ceiling for deferment linked to the fixed investment in regard to Telecommunication, Computers, Software/Hardware & electronics Industries would be 300% of the fixed investment made by the unit | | . |

| | | | |
|---|---|---|---|
| Karnataka | | On commencement of commercial production [during the operational phase], on raw materials, components, semi-finished goods, sub-assemblies, consumables [excluding petroleum products like petrol, diesel, furnace oil, naphtha and LSHS used as consumables or for captive power generation units]. ***Entry Tax exemption*** will be available as indicted below: Developing area 3 years, Backward area 5 years and highly Backward area 8 years. | |
| Madhya Pradesh | **Exemption form payment of sales** tax and commercial tax for different region with in the states. For developed the benefit is 125% for 3 years and for the Backward region benefit varies from 150%, 200 %, 250% eligibility period form 5 years to 7 years | | |
| Maharashtra | Sales tax incentives are providing on the basis of pioneer unit, Non-pioneer unit and SSI unit. Percentage of Fixed Capital Investment ranges from 20 to 45 % in Non-pioneering industries, in pioneering industry 80 for developed to 130 backward and for SSI 100 to 130 | | |

On the whole different states are providing incentives according to their requirement or objective. First the states are formulating polices according to their comparative advantages. Second, the incentives are differing among the states and within the state. The main motive behind the different rate of subsidy among the states and within the state is to attract the investors to selected regions/sectors and to bring regional equality. Third, all the major states are not providing any sort of incentives to developed region, but they are providing special packages such as investment subsidy, exemption from power cut, exemption from payment of entry tax and sales tax on purchase of raw material to 100% the Export Oriented Units, special economic zones and Growth centers/Industrial area. Thus the states are competing according to their comparative advantages and providing incentives according to their economic strength.