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Competition from China

– *opportunities and challenges for Sweden*

Sylvia Schwaag Serger and Erik Widman



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Foreword

China's economic development leaves few unaffected. In recent years, China has become the world's sixth largest economy (second largest in terms of purchasing power), third largest trading nation and one of the world's largest recipients of foreign direct investment. Exports have trebled over the past five years, and China's enormous appetite for raw materials and competitive manufacturing sector have pushed up prices of input goods. At the same time, China has contributed to historically low, global inflation levels through its exports of textiles and clothing, household appliances, electronics, etc. China has also become more important to Sweden. Today, China is Sweden's biggest trading partner in Asia. China is an important market, purchasing and production base and R&D location for Swedish companies. China's development opens up huge economic opportunities as well as presenting formidable challenges for Sweden.

China is laying the foundations for becoming a serious competitor in sectors that are important to Sweden, such as telecommunications, energy, automotive vehicles and, in the longer term, pharmaceuticals. We are currently witnessing an emerging knowledge base, which will allow China to become a leader in many of these fields within the not too distant future. We also see a government that is determined to try to create internationally competitive companies in these industries. While China is making large strides in terms of economic growth, education and research, significant problems remain in the areas of human rights and corporate social responsibility. The country also faces daunting challenges in the form of accelerating environmental destruction, corruption and widening income gaps. Almost 600 million Chinese survive on less than two dollars per day.

This study looks at China's economic development and its rapidly increasing knowledge resources and its significance for Sweden. The study was motivated by the current debate in Sweden on the country's competitiveness, outsourcing of jobs and its ability to create prosperity in the future. China is frequently mentioned in this context both as a threat and an opportunity, though the discussions are often based on premonitions or prejudice rather than facts. One aim of the study is to contribute to a constructive and more nuanced debate by providing and synthesizing available data and assessments.

This report has been produced by ITPS and the Embassy of Sweden in Beijing, together with contributions from the Swedish Trade Council, ISA and several other authorities and experts. The cooperation across government agencies in this work is a sign of the times. The official Swedish presence in China has expanded strongly in recent years, reflecting Sweden's growing interest in China.

The report was written by Sylvia Schwaag Serger (ITPS in Beijing) and Erik Widman (Embassy of Sweden in Beijing). The authors also had assistance from Sara Yazdanshenas (Swedish Trade Council in Beijing), who provided valuable input.

Östersund, Sweden November 2005

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Summary

China's reforms and its opening to the world have created both a large market and an important global competitor. China has successfully attracted production from other countries, for its own market as well as world export. To conclude from this, however, that China can only compete in low-cost production would be simplistic and ill-advised. In the future, China will rapidly gain ground in knowledge-intensive sectors, and it may become a world leader in some fields of R&D. This could affect Sweden particularly as its export industry depends on technology-intensive goods and services, and its strong sectors are largely the same sectors that China has prioritized in its national science and technology policy.

Chinese economic policy aims to build up domestic industrial and technical capacity within telecommunications, energy, vehicles, pharmaceuticals, etc. One of the policy aims is to have 30-50 Chinese companies among the top 500 in the world. China has successfully utilised its market size to attract international companies to establish knowledge-intensive activities in China that can benefit Chinese companies. At the same time, China and Chinese companies have developed a significant export trade. Chinese companies are now increasingly making direct investments abroad to gain a better foothold in new markets, get access to new technology and secure control over natural resources.

Public investments are also targeted at building up knowledge capacity within the above-mentioned fields. Even if China still has a long way to go to become a knowledge-based economy, the country already has more knowledge resources, quantitatively speaking, than all the other countries in the world except the USA. In addition, strong international knowledge and research environments are developing within some high technology fields, which are of particular relevance to Sweden. The combination of a large and rapidly growing market and an increasing supply of internationally competitive human capital is one of the biggest challenges facing Sweden and other countries wishing to retain a highly qualified labour force and strategic R&D functions.

In the past decade, Sweden's economic relations with China have developed rapidly. China is Sweden's biggest trade partner in Asia, and Swedish industry has invested in China as much as, if not more than, its closest competitors. Swedish exports are dominated by telecoms, products for the energy sector and other engineering industries. Telecommunications, the single most important sector, has become less relevant in terms of exports, while Swedish telecom companies have been very successful at establishing themselves in China. Service exports to China, as well as the presence of small and medium-sized companies, are so far less well developed. Sweden's human capital exchange with China is well developed in terms of companies and research cooperation between individual researchers and institutions. There is no planned approach, however, to the considerable and rapidly growing human capital resources in China. Student exchanges are relatively underdeveloped.

In the future, Sweden will face further challenges from China in the competition for the various industries. Firstly, China's rise as an important knowledge base and large domestic market will make it an increasingly strong contender for R&D. Secondly, China offers substantial economic and industrial policy incentives to Swedish export industries willing to invest in China. Thirdly, small and medium-sized Swedish companies, which could represent the future of export, face a number of special challenges in China.

From a national point of view, Sweden's opportunities may not lie where one might expect, i.e., with large Swedish manufacturing companies. Many of these are already well established in China and will continue to develop their presence through production, R&D and global purchasing to improve their competitiveness. Sweden's new opportunities in China may lie with creative Swedish entrepreneurs, small- and medium-sized companies and in the service sector, e.g., education, tourism and business services. Chinese direct investment in Sweden is another possibility. There is good reason to discuss in more depth how Sweden can best make use of the opportunities offered by China.

Sammanfattning (Summary in Swedish)

Kinas reformer och öppning gentemot omvärlden har skapat både en stor marknad av möjligheter och en betydande konkurrent som utmanar världsmarknaden. Kina har framgångsrikt konkurrerat med andra länder om tillverkning för både den egna marknaden och den internationella exportmarknaden. Den gängse bilden att Kina endast konkurrerar om lågkostnadsproduktion stämmer emellertid inte. Framöver kommer Kina även att konkurrera inom sektorer där kunskapsinnehållet är omfattande. Inom vissa områden kan kinesisk forskning och utveckling bli världsledande. Sverige berörs särskilt eftersom vår exportindustri i stor utsträckning befinner sig i samma sektorer och är beroende av högteknologi.

En aktiv kinesisk näringspolitik syftar till att bygga upp den inhemska industriella och tekniska kapaciteten, inom bl a telekom, kraft, fordon och läkemedel. Ett mål är att ha 30-50 kinesiska företag bland världens 500 största. Kina har framgångsrikt utnyttjat sin marknadsstorlek för att locka internationella företag till landet och bygga upp kunskap som skall komma kinesiska företag tillgodo. Samtidigt har Kina och kinesiska företag med framgång byggt upp en betydande exportverksamhet. För att bättre etablera sig på nya marknader, få tillgång till ny teknik eller säkra kontrollen över naturresurser, börjar nu kinesiska företag i ökande utsträckning även göra direktinvesteringar utomlands.

Fokuserade satsningar görs även för att bygga upp kunskapskapaciteten inom dessa områden. Även om Kina ännu är långt ifrån att vara en kunskapsbaserad ekonomi, så har landet redan idag – kvantitativt sett – mer kunskapsresurser än alla andra länder i världen förutom USA. Dessutom växer internationellt starka kunskaps- och forskningsmiljöer fram inom några, för Sverige relevanta, högteknologiska områden. Kombinationen av en stor och dessutom snabbt växande marknad samt ett ökande utbud av internationellt konkurrenskraftigt humankapital utgör en av de största utmaningarna för Sverige och andra länder som vill behålla både högkvalificerad arbetskraft och strategiska FoU-funktioner.

Under det senaste decenniet har Sveriges ekonomiska relationer med Kina utvecklats snabbt. Kina är vår största handelspartner i Asien och svensk industri har investerat i Kina i lika stor utsträckning, om inte mer, än våra närmaste konkurrentländer. Svensk export domineras av telekom, produkter för kraftsektorn och den övriga verkstadsindustrin. Telekom, den enskilt viktigaste sektorn, har minskat i betydelse för exporten samtidigt som de svenska telekomföretagen har etablerat sig mycket framgångsrikt i Kina. Tjänsteexporten till Kina, liksom närvaron av små och medelstora företag är än så länge mindre väl utvecklad. Sveriges humankapitalutbyte med Kina är väl utvecklat vad gäller företag och forskningssamarbete mellan individuella forskare och institutioner. Samtidigt saknas ett genomtänkt förhållningssätt till de betydande och snabbt växande humankapitalresurserna i Kina. Utbytet av studenter är relativt sett underutvecklat.

Framöver kommer Sverige att möta flera utmaningar från Kina i konkurrensen om de ekonomiska näringarna. För det första skapar Kinas framväxt som betydande kunskapsbas och stor marknad allt större konkurrens om forskning och utveckling. För det andra är stora delar av den svenska exportindustrin utsatta för kraftiga företagsekonomiska och näringspolitiska incitament att investera i Kina. För det tredje möter svenska små och medelstora företag, som kanske representerar framtiden för exporten, en rad särskilda utmaningar i Kina.

Möjligheterna, ur nationell synvinkel, ligger kanske inte där man förväntar sig, d v s hos stora svenska tillverkningsföretag. Många av dessa är redan väletablerade i Kina och kommer att utveckla sin närvaro med tillverkning, forskning och utveckling och globala inköp för att stärka sin konkurrenskraft. Nya möjligheter för Sverige i Kina kan också sökas hos kreativa svenska entreprenörer, samt bland de mindre företagen och i tjänsektorn, t ex utbildning, turism och affärstjänster. Kinesiska investeringar i Sverige är också en möjlighet. Det finns anledning att fördjupa diskussionen om hur Sverige bäst kan ta tillvara de möjligheter som Kina erbjuder.

1 Background

1.1 Introduction

Globalisation and an increased pace of change are leading to extensive shifts in world trade patterns and economic relations. The emergence of China on international markets is a dramatic challenge because of its sheer size and rapid industrialisation.

China is characterized by enormous contrasts and an astounding pace of change in some areas, making it difficult to assess the general direction of where economic development is headed. While China is making large advances in education, research and economic growth, big problems remain with regard to extreme and widespread poverty and a lack of basic human rights. China is also facing new challenges from increasingly serious environmental pollution, growing corruption and income inequalities. A large share of China's society has been steamrolled by, or excluded from the benefits of, the country's rapid economic growth with almost half of the population still living under or hovering just above the international poverty level.

Views on what China's development means for Sweden are divided. On the one hand, there is the impression of Swedish industry moving its production to China with negative consequences for jobs and growth at home. On the other hand, economic theory indicates that increased trade with China offers opportunities for Swedish industry to specialise in what it, comparatively, does best in Sweden with positive effects on wealth. This report aims to map how competition from China is affecting Sweden and Swedish companies and point out challenges and opportunities that follow from this. Chapter two provides an overview of China's economic development and national innovation system. It also touches on the issue of corporate social responsibility. The third chapter analyses China's effect on the world economy. The current phenomenon of offshoring, in particular, is studied. The fourth chapter shows how Sweden's economic relations with China have developed. We look at trade, Swedish companies in China, and vice versa, and human capital flows. The fifth chapter identifies some important challenges and opportunities facing Sweden as a result of China's development.

1.2 Methodology

The approach chosen for this report is firstly to analyse China's innovation system and secondly to survey Sweden's economic relations with China. The dramatic pace of change in China, the extreme regional differences, the lack of reliable and comparable statistics and a certain political control of the collection and dissemination of information make it difficult to gain an accurate picture of China's economic development. In order to be able to form an opinion of what China looks like today and where it is headed, it is therefore necessary to supplement official statistics with other information sources.

Some of the statistical sources that have been used are the Swedish National Board of Student Aid (CSN), the Energy Information Administration (EIA), the European Commission, the Swedish Migration Board, the National Bureau of Statistics of China, the Organisation for Economic Development (OECD), the State Intellectual Property Office (SIPO), Statistics Sweden (SCB), the Swedish Tourist Authority, the United Nations Conference on Trade and Development (UNCTAD), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the Swedish Research Council, the

World Bank, the World Health Organisation (WHO), the World Intellectual Property Organisation (WIPO) and the World Tourism Organisation (WTO).

Articles and books on research and development in China have provided another source of information. Some valuable examples worth mentioning are Freeman (2005), Schaaper (2004), von Zedtwitz (2004) and Walsh (2003). Periodicals and newspapers such as *The Economist*, *Business Week* and *China Daily* have provided further important input for an up-to-date description of China's economic development and an understanding of which subjects and issues are seen as important in China right now.

A number of discussions and interviews (so-called "semi-structured" interviews) have also been conducted with representatives of some 30 companies in connection with the study. The companies included small and medium-sized companies (SMEs) as well as large companies, manufacturing firms and service companies, and companies with as well as without significant business in China. Approx 40 representatives of chambers of commerce, employers' organisations, trade associations, universities and colleges, other government authorities, international organisations, professors, journalists and other experts (see appendix) were also interviewed. The aim of the interviews was to supplement the frequent lack of written statistics on China and Swedish-Chinese economic relations, and to gain a realistic picture of the activities of Swedish companies in China. Some of the key questions in the company interviews concerned what it is like for Swedish companies to set up operations in China and why they choose to do so. To gain an idea of how much strategic R&D is conducted by foreign companies in China, we have looked in the main at annual reports and press releases, and interviewed experts and company representatives.

2 China: the economy and innovation system

China is emerging as an important economic power. Since the reforms began at the end of the seventies, growth has remained at approximately nine per cent per year in real terms. Within a short period, China has become the world's sixth largest economy, third largest trading nation and one of the biggest recipients of foreign direct investment (FDI). Wealth is very unevenly distributed, however, and China is currently characterised by large and growing gaps between rich and poor, in terms of income but also access to education and healthcare. Inadequate protection of workers' rights and of the environment are serious problems. The regime aims to maintain strong economic growth with the quadrupling the size of the economy between 2000 and 2020. This requires continued reform of state-owned enterprises (SOEs), the financial sector and the legal system. The ambition is to make Chinese companies globally competitive within sectors such as telecoms, automotive vehicles and energy, and to encourage foreign companies to expand their manufacturing and research and development (R&D) in China.

The capacity to innovate is created by a country's ability to generate and disseminate knowledge, and by its ability to transform knowledge into economic growth and welfare. Nowhere else in the world has the ability to create knowledge grown as quickly as it has in China in recent years. There are still great weaknesses and challenges in China's innovation system but, despite these, China is well on the way to building internationally strong research and knowledge environments within areas of relevance to Sweden (telecoms, nanotechnology, electronics, pharmaceuticals, etc). Technology policy has high priority for the Chinese Government, whose target-oriented approach is aimed at turning Chinese researchers and companies into world leaders within certain sectors. The Chinese authorities have identified many of the weaknesses in China's national innovation system and are working to tackle these. In addition, China already has a large and rapidly growing supply of highly qualified labour at its disposal, which, together with a rapidly growing economy, makes China an attractive place for some corporate R&D activities that were previously located in Sweden and other more developed economies. Even if China's knowledge resources are still small in relation to its population, they are starting to become big enough in absolute figures to play an important role in the global knowledge economy. Overall, there are clear signs that China has started to make use of its knowledge resources to increase its international competitiveness.

2.1 China's economic growth

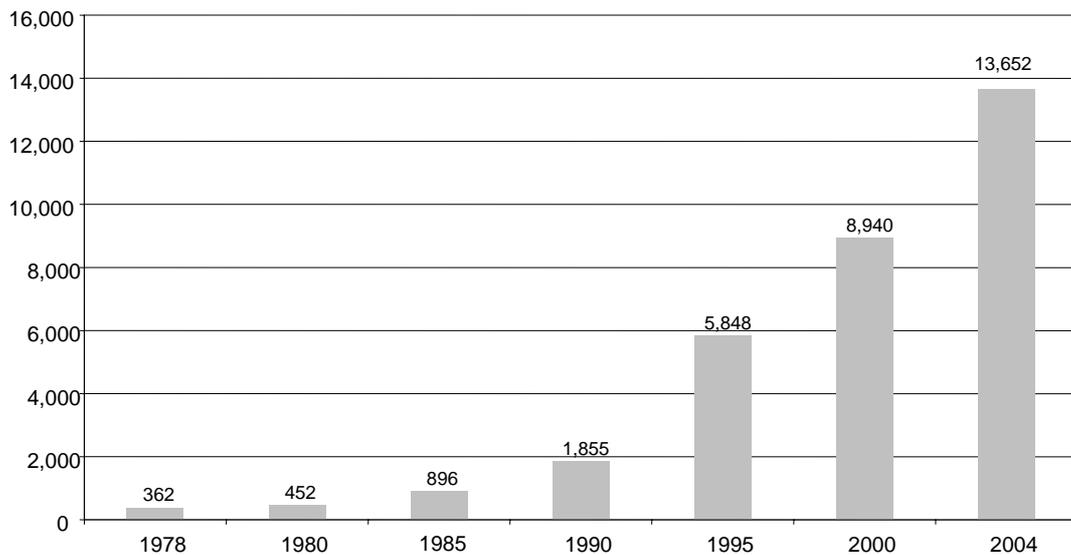
The economic reforms introduced at the end of the 1970s laid the foundations for very rapid economic growth in China. The reforms initiated a process of gradually liberalising the economy and allowing private enterprise. China's borders were, again gradually, opened to trade with the outside world and many state-owned companies were privatised or restructured to operate under market conditions. Laws and the judicial system were developed within the commercial field.

The reform work began with experiments in so-called special economic free zones, e.g., in Shenzhen on the border to Hong Kong. Economic growth has so far been heavily concentrated in the cities and the areas that were first to adopt the reforms. The country's largest industrial centres are located by the Pearl River Delta in southern China near the cities of Canton, Shenzhen and Hong Kong, by the Yangtze River Delta

in eastern China around the City of Shanghai, and in northern China around the cities of Beijing and Tianjin (sometimes known as Bo Hai Rim).¹

The World Bank estimates that almost 400 million people have been lifted out of extreme poverty as a result of economic growth. In 2004, GDP per capita was just over 1,200 US dollars.² As a comparison, Sweden's GDP per capita was almost 36,000 US dollars. China's total GDP in nominal terms amounted to 1,650 billion US dollars, which can be compared with approx 350 billion US dollars for Sweden in 2004 (World Bank). Wealth is unevenly distributed. The so-called Gini coefficient, a measure of income distribution, was 0.46 in 2004, which means that income distribution was more even than in, for example, Brazil, but less even than in the USA and India (Ljunggren, 2004). The well-to-do middle class consists of almost 250 million people (*People's Daily Online*, 3 Sept 2005). At the same time, almost half of the population survives on less than two US dollars a day, one in four people does not have access to clean running water, and one in ten is undernourished (UNDP Human Development Indicators). In 2003, the number of people living in extreme poverty increased again for the first time since the reforms were introduced at the end of the 1970s (Ljunggren, 2004). Wealth is greatest in the cities. In 2004, the average annual disposable income for households in cities was 9,422 yuan, which was three times that in the countryside of 2,935 yuan (*China Monthly Statistics*).

Figure 1 GDP in China (billions of RMB in current prices)



Source: China National Statistical Bureau

¹ A good review of the growth in these three regions is given in Sigurdsson (2005a).

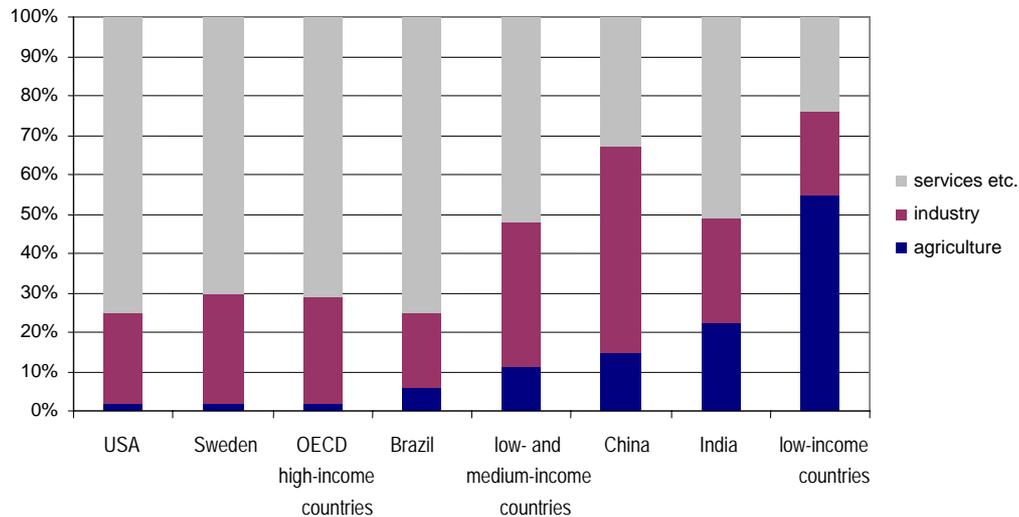
² At the same time, however, Ljunggren points out that a large proportion of the population, 47 per cent in 2001, lives just above the international level for extreme poverty. In 2003, the number of people living in extreme poverty increased again for the first time since the reforms were introduced at the end of the 1970s (Ljunggren, 2004).

The pace of China’s economic transformation has been very rapid and, according to some, unprecedented. In 1998, for example, there were 24 million mobile telephone subscriptions, which corresponded to less than 2 per 100 inhabitants. Today, there are approx 335 million, which is 14 times more and corresponds to one per four Chinese. As a consequence of this rapid development, China became the world’s biggest mobile telephone market in 2001.

The economic reforms have freed China’s enormous supply of labour through, among other things, rapid urbanisation from rural areas to city industries. According to official estimates, 18 per cent of the population lived in the cities in 1978. In 2005, the proportion had grown to 43 per cent. If the so-called floating population of 131 million, which has left rural areas for temporary work in the cities, is included, the degree of urbanisation rises to more than 50 per cent (Hokenson, 2005 and Boyd, 2005).³ While official Chinese statistics show unemployment at approximately four per cent, the real level of unemployment is estimated to be more than 20 per cent in total, and between eight and ten per cent in the cities (“No Right to Work”, *The Economist*, 9 September 2004). Underemployment is widespread in rural areas.

The industrial sector dominates the economy and accounted for 53 per cent of GDP in 2003, which is higher than for most developed countries. The service sector accounted for 32 per cent, which is considerably less than for the developed countries (see Figure 2).⁴ The agricultural share has fallen sharply during the reform period, from approx one third of GDP at the end of the 1970s to 16 per cent in 2004.

Figure 2 An international comparison of China’s economic structure, 2003 (added value, share of GDP)



¹ The figures for the USA and the high-income countries are from 2001.

Source: World Bank Development Indicators (2005)

³ See *China Economic Quarterly (Q3 2005)* on migrant workers in China.

⁴ The service sector is generally difficult to define and measure and, in China’s case, the problem appears to be even greater. All statistics on China’s service sector should therefore be interpreted with some scepticism (Xu, 2004). In late 2005, China’s official GDP figures were revised indicating that services account for around 40 per cent of GDP and thus for a larger share of than previously assumed. However, even at the new revised figure, China’s service sector remains a relatively small part of the economy compared with other countries (see Figure 2).

The importance of the industrial sector to China's economic structure reflects China's position in what is sometimes known as the second industrial revolution. This term is used to refer to a stage in which economic growth is strongly driven by the build-up of physical infrastructure⁵. Large investments in fixed assets play an important role in building up physical infrastructure and industry, and are a driving force in the economy.

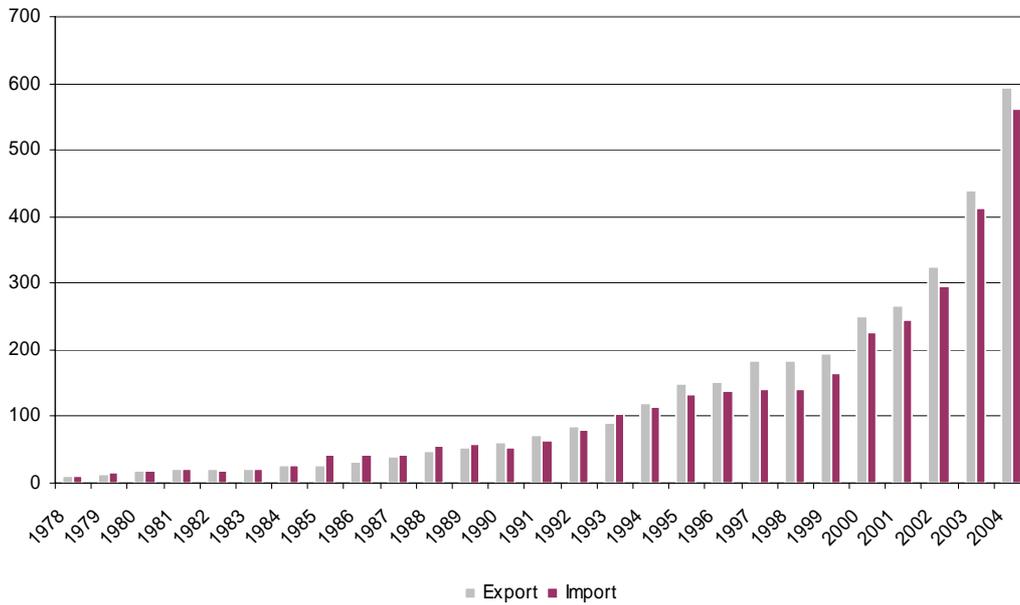
Demand has consequently been driven by very large investments. Investments in fixed assets represented 49 per cent of GDP in the first six months of 2005, which is higher than for nearly all OECD countries and so-called "emerging markets". The high level of investment has largely been financed by domestic funds and has been possible due to the Chinese people's strong propensity to save. In recent years, the savings rate has amounted to 40-45 per cent of GDP, which far exceeds the international average of 21 per cent (Kuijs, 2005). Foreign direct investment (FDI) account for less than one-tenth of total investment.

Exports also represent a comparatively large share of total demand and corresponded to 42 per cent of GDP in the first six months of 2005. China is an open economy, especially compared with other large countries. Total foreign trade, that is imports plus exports of goods and services, accounted for 75 per cent of GDP in 2004 ("From T-shirts to T-bonds", *The Economist*, 30 July 2005). China is thereby close to other traditional open economies such as Sweden (approx 80 per cent), Germany (70 per cent) and the UK (55 per cent), but differs greatly from other large economies where foreign trade plays a much smaller role (measured as a share of GDP). In the USA, Brazil, India and Japan, foreign trade only represents between 25 and 30 per cent (the World Bank) (See Figure 4).

The big increase in trade has turned China into the world's third largest trading nation after Germany and the USA, with approx seven per cent of the world's exports in 2004, according to the WTO.

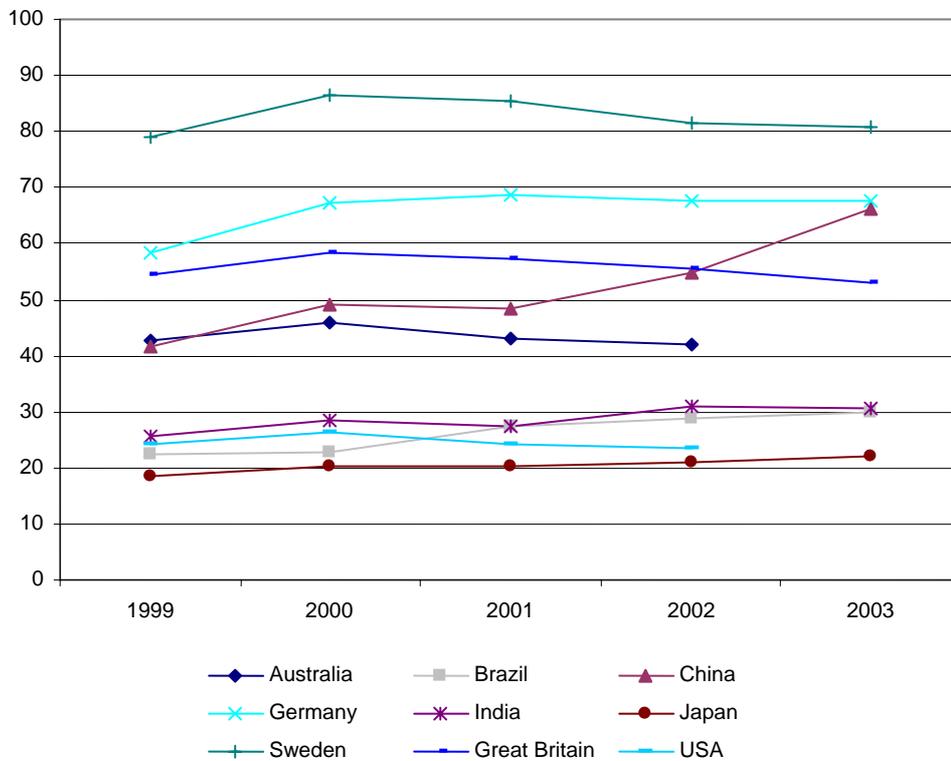
⁵ *The first industrial revolution is defined as the transition from an agricultural society to a society of mass production. The third industrial revolution denotes the increasing importance of electronic communication (see, for example, Schön, 2000 and Rune and Sadegh, 2005).*

Figure 3 China's exports and imports 1978-2004 (billions of US dollars)



Source: WTO

Figure 4 Imports and exports of goods and services as a share of GDP (%)



Source: World Bank

Consumption still plays a relatively small role for a large economy. Retail trade sales accounted for 44 per cent of GDP in the first six months of 2005. In more developed countries, consumption represents a much larger share of demand in the economy.

2.1.1 Continued reform for high growth

The Chinese regime intends to maintain the current strong economic growth. The aim is to build “Xiaokang”, a so-called relatively prosperous society in time for the centenary of the People’s Republic in 2049. An important intermediate goal is to quadruple GDP between 2000 and 2020 and to reach a GDP of 3,000 US dollar per capita. This requires growth of just over seven per cent per year.

Continued economic market reform is necessary. There are approx 150,000 state-owned enterprises (SOEs) with a great need for further reform and privatisation, the financial sector needs to be developed to operate on commercial terms, competition and bankruptcy legislation is still inadequate and intellectual property protection must be improved.⁶ Tax revenues also have to be better distributed to ensure that more citizens have basic access to education, health care and other social services.

The Government must also manage a number of potential threats to China’s continued economic development. The functioning of the financial system is threatened by extensive so-called bad debts, which, according to some analysts, correspond to almost half of China’s GDP. The rapid urbanisation places high demands on working conditions, accommodation, health care and education. In the countryside and in some cities, there is growing discontent with the lack of compensation for land and housing taken over by the authorities for infrastructure and new construction. This dissatisfaction was expressed in some 87,000 so-called mass incidents, protests and demonstrations, which took place in China in 2005 and which represent a dramatic increase over previous years. Serious environmental problems, including pollution and water and energy shortages, threaten health and growth. Corruption is another big problem and potential threat to future growth. In the “Corruption Perceptions Index” compiled annually by *Transparency International*, China is ranked 71st out of a total of 145 countries.⁷ The OECD recently published a study on “Governance in China”, which discusses, among other things, the growing problem of corruption in China (OECD, 2005a).

2.1.2 Economic policy to build domestic capacity

One of the aims of Chinese economic policy is to build up an internationally competitive industry and technological capacity under domestic control. So-called “strategic” sectors include energy, telecoms, automotive vehicles, finance, steel, aeronautics, some electromechanics and the defence industry. The aim is for 30-50 companies to be globally competitive within 10-15 years and qualify for the list of the world’s top 500 largest companies. In 2004, there were 15 Chinese companies in the list. All but two of these are owned to 50 per cent or more by the Chinese Government.⁸ While privatisation and reform

⁶ *Estimates of the real number of state-owned companies vary between 50,000 and 180,000. According to the State-Owned Asset Supervision and Administration Commission (SASAC), the government authority responsible for state-owned companies and, to some extent, their reform and privatisation, there were 159,000 state-owned or state-controlled companies in China (Green, 2004; see also Boyd, 2003) at the end of 2002. According to information from SASAC, there are currently approx 150,000 state-owned companies.*

⁷ *The index can be found at www.transparency.org*

⁸ *See also the special edition on China in *Veckans Affärer* No. 38, 19 September 2005.*

of state-owned companies is a central component of economic policy, the Government is likely to continue to own much of the so-called “strategic” sectors.

To achieve increase China’s competitiveness, foreign companies are given incentives to set up manufacturing in China and transfer technological knowledge to Chinese partner companies. The bait is the large Chinese market. As an example, foreign automotive firms seeking to sell in China face high import duties and requirements for joint venture manufacturing companies. The energy sector is under pressure to transfer technology in exchange for commissions. Telecom companies have been encouraged to move production and increasingly R&D to China. Local procurement is encouraged by offering significant tax rebates, among other things.

Chinese companies within these sectors are protected from competition in a number of different ways. One form of support is cheap loans from the state-owned banks. Another is that Chinese companies, e.g., in the energy sector, are openly given priority in public procurement. Some companies have also received large subsidies, e.g., in the form of land on which to build factories and housing.

Attempts to establish local standards, especially within telecoms (TD-SCDMA) and consumer electronics (next-generation DVD), reflect the aim to create intellectual property rights for Chinese companies to help them climb the value chain. China’s efforts to set up local standards is leading to suspicion and growing concern over Chinese “techno-nationalism” (Breidne, 2004 and Suttmeier and Yao, 2004).

Extensive government research programmes complement economic policy and are aimed at establishing international excellence within semiconductors, telecoms, vehicles, biotechnology, among others. Some programmes that should be mentioned here are China’s high-technology research and development programme, the so-called 863 Programme (named after the year and month in which it was started, i.e., in March 1986), the Torch Programme, which started in 1988, and the national programme for basic research from 1997 called 973.⁹

In many sectors, the possibilities for foreign companies to compete are restricted in different ways. Foreign companies have long been prevented from establishing a presence in the service sector, especially in banking and insurance. Even if the service sector is due to open fully from 2007, stringent requirements will continue to limit the scope for foreign banks and insurance companies to carry out business.

The growth of Chinese companies has led to increased interest in international expansion. The Government is encouraging some companies to invest abroad under the motto “Go abroad!” (OECD, 2005c). So far, Chinese investments abroad have not been extensive compared with foreign investment in China. In 2003, Chinese companies invested approximately four billion US dollars abroad, which can be compared with approximately 21 billion US dollars of Swedish foreign direct investment abroad. However, China’s outward direct investments are increasing. Thus, in the first six months of 2005, Chinese foreign investment was already at 3.4 billion US dollars. The main recipients so far have been Hong Kong, the USA, Japan, Australia and Germany. An estimated 1000 Chinese companies have branch offices or direct investments in Germany.

⁹ A good overview of these research programmes and the growth of China’s technology policy are given in Sigurdsson, 2005. A well-structured summary and evaluation of China’s science and technology systems (S&T systems) is found in Hsiung, 2002.

Chinese purchases abroad are partly aimed at controlling natural resources (OECD 2005c). Large purchases of oil and gas sources have been made in Kazakhstan, Australia and Indonesia. They also provide a way for large companies to expand abroad and gain access to distribution channels, trademarks, industrial management and in some cases technology. Purchases include the computer manufacturer Lenovo's purchase of IBM's PC division, the TV manufacturer TCL's purchase of the French Thomson TV operations, Shanghai Automotive's purchase of the Korean vehicle manufacturer Ssangyong, and Nanjing Automobile's purchase of the British car manufacturer MG Rover. All of these deals exceeded one billion US dollars.

A number of instruments – such as fiscal incentives (for technology transfers), regulations for foreign company investment and production (e.g. “local content rules”), state-controlled strategies for foreign investment (through state-owned companies), the development of local standards, R&D investment, etc – converge in China's economic policy which is driven by an overall, high-priority aim to create internationally competitive and technology-intensive Chinese companies and research environments.

2.2 China's innovation system: far from a knowledge society, but important global knowledge centre

2.2.1 Introduction

China is still far from being a knowledge economy in terms of knowledge investment or knowledge input (R&D information as a share of GDP), or in terms of knowledge production or knowledge output (e.g. number of patents). In addition to having few knowledge resources in relation to size, China's knowledge assets are also very unevenly distributed between regions, people and social classes, and thematic areas. However, even if China's knowledge base is small in relation to GDP and total population, and even if knowledge-intensive goods and services, especially “homemade” ones, only account for a negligible part of China's economy, China still has significant knowledge resources compared with most other countries. China's strengths lie within a number of thematic areas or knowledge pockets where China is establishing internationally competitive research environments. It also has a rapidly growing number of people with tertiary education, especially within areas of technology and natural science. A significant share of these academics can compete with most engineers and scientists in the developed countries.

After decades of isolation from, above all, the Western world, the Cultural Revolution and a Soviet-inspired model for economic management and technology policy, the start of the 1980s saw the introduction of a new science and technology policy with an explicit focus on competitiveness and economic growth.¹⁰ Among the central decisions in principle that have allowed China's advances within economy, technology and science in the past 20 years, is the reform of China's S&T (science and technology) system from 1985 (Walsh, 2003, pp. 42-44). While previously science and technology resources were in essence monopolised by China's military sector, these resources were now declared crucial to economic development. It was therefore decided that science and technology, in policy and practice, should have a stronger link to the productive sector (Walsh, 2003). Before this watershed decision, industrial production had essentially been completely uncoupled from R&D.

¹⁰ A good summary of China's technology policy since 1978 is found in Walsh (2003).

In recent years, China's technology policy has been characterised by a clear aim to strengthen China's domestic innovation capacity ("independent innovation") to reduce current dependence on foreign companies in the national innovation system.

2.2.2 China's knowledge resources (knowledge inputs) are growing fast

China's investments in knowledge have grown at a remarkable pace in the last ten years. The pace of development shows great determination to become an internationally competitive knowledge economy. China's human capital is becoming stronger, both in terms of quantity and quality. China's "homemade" human capital is further supplemented by people of Chinese origin who have been educated abroad and are now increasingly starting to return to mainland China.

Even if China's R&D expenditure is difficult to measure and compare, there is no doubt that China is among the world's leading countries in terms of absolute R&D investments. Furthermore its R&D expenditure, unlike that of most other top countries, is growing fast both in absolute figures and in relation to GDP. Between 1999 and 2003, China's R&D expenditure increased by approx 130 per cent or an average of 24 per cent per year. This can be compared with the traditional big investors in R&D (in absolute figures), Germany, the USA and Japan, whose expenditure grew by only 15-20 per cent in the same period, or an average of between three to five per cent annually (see Table 1 below). It should also be mentioned that R&D figures for India, which is often compared with China, are considerably lower than for China, in terms of volume – 19 billion US dollars, adjusted for spending power, in 1999 compared with 36 billion for China – as well as in terms of growth rate and share of GDP (approx 0.8 per cent in 2000). Since 1999, China has overtaken countries such as the UK, France and Germany and is now the world's third largest country measured in total current PPP values and R&D expenses, behind the USA and Japan (OECD). Estimates of China's total R&D expenditure vary greatly, however, depending on whether the expenditure is measured in purchasing power values or in nominal terms. According to Eurostat, China's R&D expenditure only totalled approx 16.5 billion euros in 2003, compared with 252 billion euros for the USA and 120 billion euros for Japan. This puts China behind Germany (54 billion euros), France (32 billion euros) and Great Britain (30 billion euros) according to Eurostat's calculations. While the OECD figures could be considered to overestimate China's R&D expenditure slightly (Schaaper, 2005), Eurostat's estimates significantly underestimate China's R&D expenditure.

Table 1 Investment in R&D, 1999-2003

	share of GDP (%)		current PPP \$ (m)		increase (%)	
	1999	2003	1999	2003	Total 1999-2003	Average annual increase
USA	2.63	2.6	243,548	284,584	16.85%	3.97%
EU-15	1.88	1.93	162,500	204,000	25.54%	5.85%
Japan	2.99	3.15	94,723	114,009	20.36%	4.74%
Germany	2.49	2.5	47,625	54,449	14.33%	3.40%
China	1.00	1.31	36,097	84,618	134.42%	23.74%
France	2.18	2.19	31,823	37,514	17.88%	4.20%
Great Britain	1.85	1.89	25,440	33,579	31.99%	7.19%
Sweden	3.65	3.98	7,700	10,364	34.60%	7.71%

Source: OECD, Eurostat, Germany's Federal Ministry of Education and Research (BMBF)

A number of factors mitigate China's impressive R&D record. Firstly, China still invests comparatively little of its R&D expenditure in basic research. Basic research accounted for less than six per cent of the total R&D expenditure compared with almost 20 per cent for the USA and 13 per cent for Japan (OECD). This is an important fact, bearing in mind that basic research plays a crucial role in a country's future innovation capacity (OECD, Stipp, 2005). In addition, R&D still accounts for a much smaller share of the total added value in high-technological branches – such as the aerospace industry, medicines, computers and office equipment, and electronics and communication equipment – than for OECD countries on average (OECD and the Ministry of Science and Technology). Finally, it is worth mentioning that the business sector accounts for a lower share of R&D, both in terms of investments and implementation of R&D, than, for example, in the USA, Japan, Germany or Sweden (Schaaper, 2005 and Eurostat, 2005). In 2003, 62 per cent of R&D was carried out in the private sector compared with 70 per cent in the USA and Germany, 75 per cent in Japan and 78 per cent in Sweden. The Chinese business sector's share of R&D is however much higher than in many of the new EU countries such as Poland, Hungary and the Baltic States, where the figures are between 20 and 40 per cent.

China's human capital is still smaller than in the USA and the EU but the gap is narrowing fast in terms of quantity and, though to a lesser extent, quality (Freeman, 2005, Sigurdsson 2004). Today, China is the second largest country in the world in terms of the number of researchers, behind the USA. China is at about the same level as the EU and the USA in absolute numbers of students (see Table 2). Almost half of all Chinese students study subjects within natural science and technology, which is a much higher proportion than in the USA.

China has far fewer students in advanced research programmes than the EU and the USA however. Measured in number of researchers, the EU and the USA are still ahead of China with approximately 40 per cent more researchers. In addition, far fewer researchers work in industry (just over half of all researchers) than in the USA (80 per cent) and Japan (63 per cent) (Schaaper, 2004). Even if China still trails the USA and the EU, an increasing number of experts believe that China will quickly catch up with the other countries' S&T resources. For example, Freeman estimates that China will have more doctors within science and technology than the USA in 2010 (Freeman, 2005).

Table 2 Human resources in China compared with other countries/regions

	researchers	students in higher education ("tertiary education")		students in research programmes		Ph.D. science and technology
	2003	2002/2003 as a proportion of persons of the relevant age group (%)	2002/2003	2002/2003 as a proportion of the total number in higher education (%)	2002/2003 absolute figures	2003
China	862,100	16	15,200,000	0.7	106,400	9,100
USA	1,178,237	81	15,900,000	2.2	349,800	18,000
EU-25	1,261,227	52 ¹	16,800,000	2.8	470,400	25,200
Japan	675,330	49	4,000,000	1.6	64,000	..
India	..	12	11,300,000

¹: 2001.

Sources: UNESCO (2005), EU (2005), Freeman (2005), Ministry of Science and Technology (MOST)

2.2.3 Knowledge outputs are also increasing

China's knowledge outputs have also increased significantly in recent years, and within a short period, China has become an internationally important producer knowledge. There are clear indications that China is building up internationally recognised research centers within certain thematic areas such as IT and electronics, materials technology, nanotechnology and life sciences. However, China's role as a global knowledge producer does not yet match the size of its R&D expenditure. Particularly when it comes to patenting, China's returns on its rapidly growing R&D investments are still modest.

The number of international scientific articles is one measure of knowledge production. Here, China has made impressive advances and growth has been rapid. In 2003, articles written by Chinese authors represented approximately five per cent of the total number of international scientific articles. The corresponding figures for the USA and the EU were just over 30 per cent and 40 per cent respectively. China's share may appear small, however, the gap between China and the developed nations is much smaller and narrowing much faster than in patenting activity (see below). In 2003, China was in sixth place for scientific articles, behind the USA, Great Britain, Japan, Germany and France, compared with 13th place between 1994 and 1998. China has thereby overtaken countries such as Canada, Australia, the Netherlands and Sweden. This development is described as "spectacular" by some experts (Leydesdorff and Zhou, 2005, p. 625):

The exponential growth rates [of Chinese publications and their contribution to world publications] indicate a self-reinforcing growth pattern which is possible because of a virtually unlimited reservoir of human resources with scientific competences that seems to flow into the world system with increasing speed (ibid., p. 629).

Table 3 Scientific articles (share and international position)

	1994-1998		2003	
	share	position	share	position
USA	33.5%	1	31.1%	1
Great Britain	8.9%	2	8.5%	3
Japan	8.0%	3	9.6%	2
Germany	7.4%	4	8.4%	4
France	5.7%	5	6.1%	5
Russia	3.4%	8	2.4%	11
Sweden ¹	1.8%	12	1.9%	15
China	1.7%	13	5.0%	6
India	1.7%	14	2.1%	13

¹ Sweden's position is an estimate.

Note: The shares for Russia and India are taken from a different source to that of the other countries, which means that there may be compatibility problems. This could affect the rankings for Sweden, Russia and India.

Source: European Commission (2005), Leydesdorff and Zhou (2005) and NOWT (2000).

China still lags far behind Europe, the USA and Japan in international patents. Even if the number of Chinese patent applications has grown quickly in recent years – by an average of 37 per cent per year between 1995 and 2004 – in 2004, they still only totalled 1.4 per cent of the total number of international patent applications (see table below) (World Intellectual Property Organization, WIPO).

Table 4 International patent applications (Patent Cooperation Treaty), number of applications and share per country, 1995-2004¹

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Brazil	number	67	72	95	113	115	178	173	201	219	282
	share	0.17%	0.15%	0.17%	0.17%	0.15%	0.19%	0.16%	0.18%	0.19%	0.23%
China	number	103	123	166	348	277	784	1731	1017	1295	1708
	share	0.26%	0.26%	0.29%	0.52%	0.36%	0.84%	1.60%	0.92%	1.12%	1.40%
EPC Countries	number	16847	19486	23118	26973	30557	35857	40633	42447	43223	43909
	share	42.11%	40.41%	40.51%	40.22%	40.02%	38.46%	37.54%	38.45%	37.52%	35.89%
India	number	0	4	13	14	101	190	295	525	764	724
	share	0.00%	0.01%	0.02%	0.02%	0.13%	0.20%	0.27%	0.48%	0.66%	0.59%
Japan	number	2775	3942	4965	6102	7473	9567	11904	14063	17389	20186
	share	6.94%	8.18%	8.70%	9.10%	9.79%	10.26%	11.00%	12.74%	15.10%	16.50%
Korea	number	196	306	305	510	870	1580	2324	2520	2949	3554
	share	0.49%	0.63%	0.53%	0.76%	1.14%	1.69%	2.15%	2.28%	2.56%	2.90%
US	number	17114	20828	24190	27952	31255	38007	43053	41293	41030	43400
	share	42.78%	43.20%	42.39%	41.68%	40.93%	40.76%	39.78%	37.41%	35.62%	35.47%

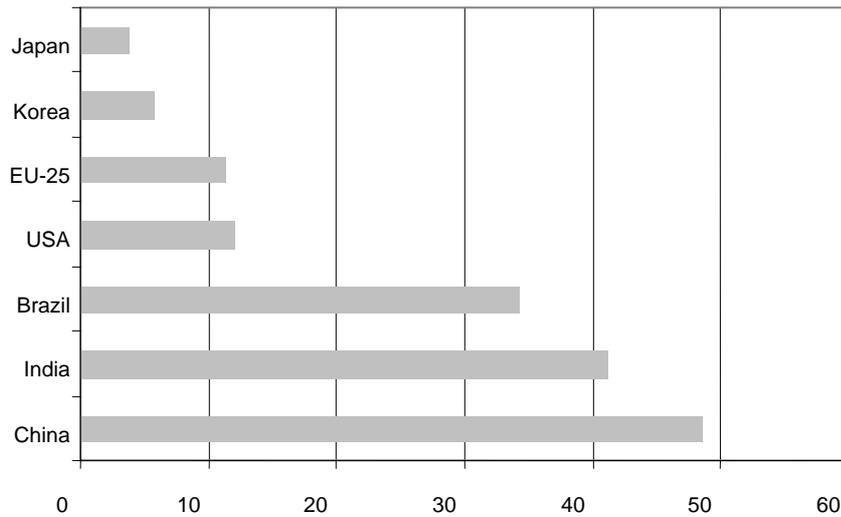
¹ country of origin according to the country in which the first-mentioned person on the patent application resides.

² 30 European countries that belong to the European Patent Convention (EPC).

Source: WIPO, July 2005

Chinese companies and organisations only accounted for 0.3 per cent of all approved patents at the European Patent Office (EPO) in 2001 and 0.1 per cent of the approved patents at the US Patent and Trademark Office (USPTO) (OECD Patent Database). In 2004, China had fewer patents in the USA than, for example, Denmark (USPTO). Patent activity in China is also dominated to a greater extent by foreign companies than in other countries. Between 1999 and 2001, on average almost half of all domestic inventions were foreign-owned (see Figure 5).

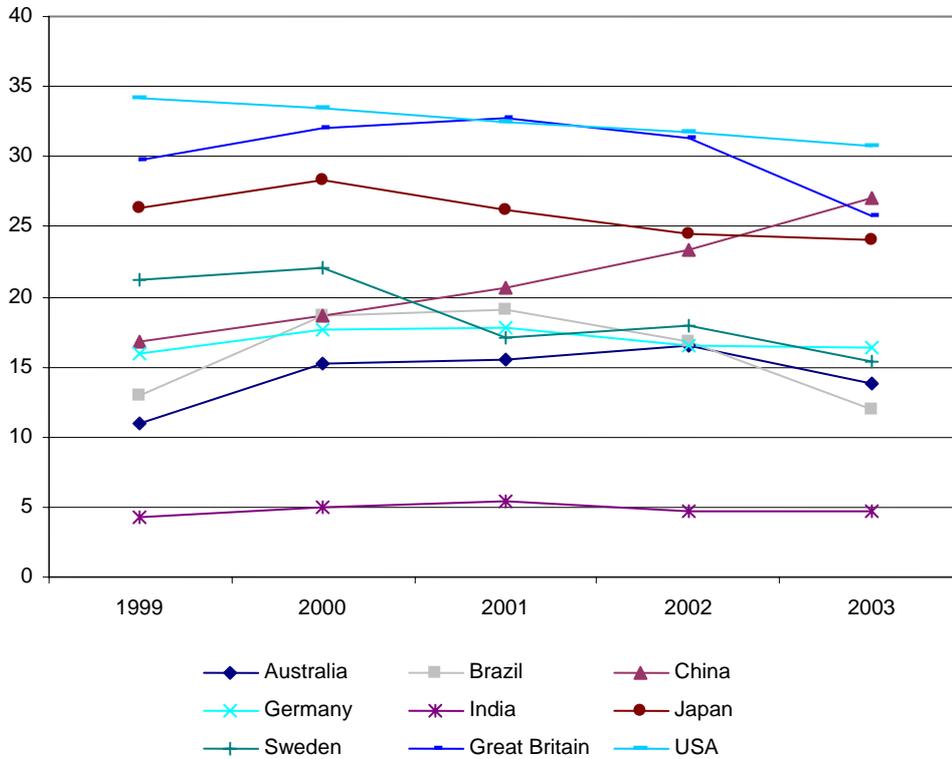
Figure 5 Share of foreign-owned patents, 1999-2001 (%)



Source: OECD Patent Database

High-technology exports make up a large proportion of China's trade, 27 per cent of industrial exports and 25 per cent of total exports in 2003 (Ministry of Science and Technology; see also Figure 6). This figure should be compared with China's huge imports of high-technological goods, which accounted for 35 per cent of the industrial exports and 29 per cent of the total imports. The conclusion is that a significant proportion of China's trade can be explained by China importing high-tech components that are then assembled in China before being re-exported (e.g. computers) (Braidne, 2004 and Schaaper, 2004). This impression is confirmed by the fact that China's large trade surplus within computers and telecoms is matched by an equally large trade deficit within areas of electronic goods (Ministry of Science and Technology). Foreign-owned companies in China also accounted for almost 85 per cent of the exports of high-technological products in 2003 (ibid.).

Figure 6 High-technological exports as a share of total industrial exports (%).



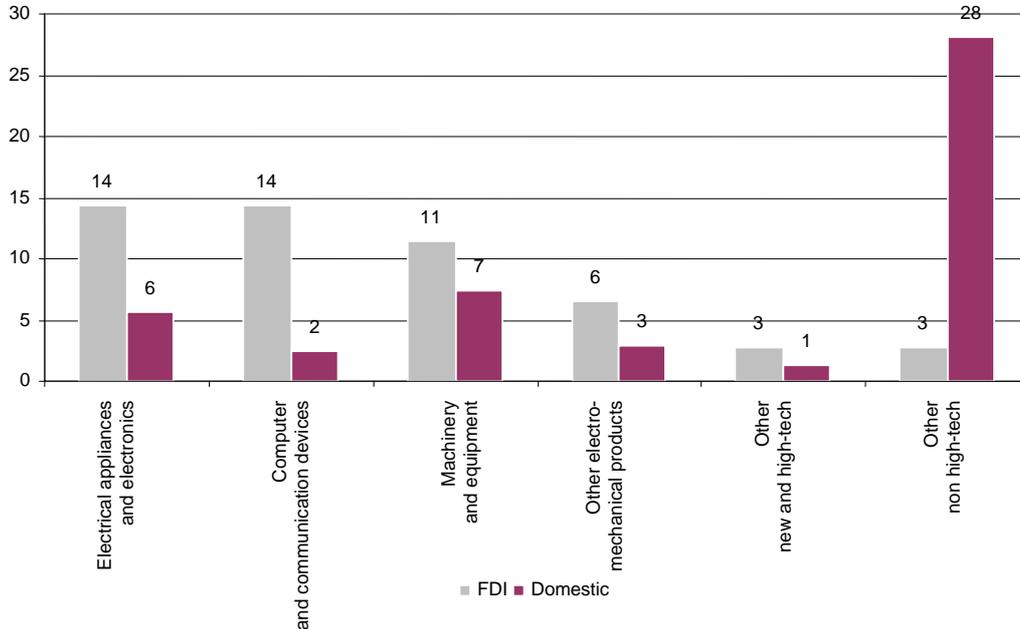
Source: World Bank

Despite its large share of high-tech exports, it would therefore be hasty to conclude that China’s comparative advantage lies within high technology:

Interestingly, despite the surge in exports of high-technology goods, China still has a strong comparative advantage in low-technology industries...Chinese comparative disadvantage [in high-technology] actually increased during the past decade (Schaaper, 2004, pp. 18-19).

Foreign companies also dominated exports in the so-called high technology categories (see also Cao, 2004a). In 2002, exports by foreign companies within computer- and communication equipment were seven times greater than those of domestic companies. The large presence of foreign companies in processing trade and the so-called high tech categories reflects the Chinese policy of encouraging foreign investment in these sectors. Chinese companies dominate non-high-technology categories including the textile and clothing industry, other composite goods and raw materials.

Figure 7 Share of Chinese so-called high-technology exports generated by foreign direct investment and domestic companies 2002 (per cent)



Source: China Foreign Investment Report 2003, Embassy calculations

2.2.4 Significant weaknesses remain in China’s national innovation system

A country’s ability to convert knowledge into growth and welfare is dependent on the interplay between several factors that are sometimes collectively referred to by the term “national innovation system”. In addition to R&D investments and the number of researchers and highly skilled workers, a number of institutional factors and conditions also affect the will and ability to create, diffuse and convert knowledge. As this section has shown, China’s ability to create knowledge, measured in the growth of knowledge investments, is increasing fast. There are still several factors that weaken China’s ability to use its knowledge resources effectively however. Some of these were mentioned in previous sections, e.g., that China invests relatively little in basic research and less than developing countries in high technology sectors.

Another ‘weak point’ of China’s innovation system is the service sector. The service sector and, above all, business services, which form an important source of innovation and future competitiveness, are still undeveloped. Services account for a small share of GDP compared with many other countries with more and less developed economies.¹¹ In addition, the service sector and innovation in the service sector have so far attracted little attention in China. Many of the Government’s policy initiatives, and most analyses of China’s innovation ability, focus on the manufacturing industry (see, for example, “Are you being served?” *The Economist*, 14 January, 2006).

¹¹ Recent revisions of China’s official GDP figures indicate that China’s service sector is considerably larger than originally thought, accounting for 41 per cent of the economy in 2004, rather than the previous 32 per cent.

A third obstacle to China's efforts to improve its innovation system is the still inadequate protection of intellectual property rights (Zhang, 2005 and OECD, 2005). According to many experts whom the authors have consulted, China has a good legal basis for protecting intellectual property rights, at least on paper. The problem is that the law is rarely upheld or enforced in practice. Individuals and companies face great difficulties when they try to invoke these laws to defend themselves against breaches of IPR (Intellectual Property Rights).

China's widening gaps within and between urban and rural areas constitute a fourth serious problem and threat to China's future innovative capability and competitiveness. Gaps are not only increasing in terms of income, but also between the people who create or have access to knowledge and the overwhelming majority of the population who does not. One sign of regional gaps is the strong concentration of R&D to a few cities (Schaaper, 2004). Analysts are starting to talk of a "dual" innovation system to describe the increasing contrast between, on the one hand, rapidly growing knowledge resources and considerable scientific advances within a few institutions, locations and subjects and, on the other hand, the overwhelming majority of the population with a low level of education and no connection to or visible benefits from China's knowledge investments. These knowledge gaps are reducing the effectiveness, returns and dissemination effect of the knowledge that is generated and could even pose a serious threat to the future political, social and thereby economic stability of China.

China's underdeveloped financial sector is a fifth obstacle to converting knowledge into economic returns (OECD, 2005b and the European Commission, 2004). The banking sector is generally conservative and not particularly inclined to lend to small and medium-sized companies or risky projects. The Chinese venture capital market is still undeveloped and many venture capital companies are run by government official with little or no competence to evaluate the technical and marketing potential of knowledge-intensive projects. In addition, venture capitalists have few opportunities to sell their ownership rights in a company ("exit opportunities"). Thus, there is no well-established stock market for knowledge-intensive small and medium-sized companies (similar to NASDAQ).

Other challenges to China's innovation system are more difficult to pinpoint and measure. The first is the issue of the quality of China's human capital and, more generally, whether China has the necessary framework conditions for enabling the growth of internationally outstanding knowledge environments. A number of observers point to academic corruption, which is said to be more widespread than in more developed countries. *The Economist* identifies China's political system and, more tangibly, limitations in freedom of expression, as possibly an even more serious obstacle to creating world-leading academics and universities.¹²

Another potential problem could be possible over-focusing on science and technology at the expense of other subjects ("soft sciences") and the lack of exchanges between "soft and hard sciences", which are instrumental to creativity, innovation and competitiveness. Interdisciplinary studies and activities, as well as links and exchanges between different sectors or actors – yet another important condition for a functioning innovation system – appear to be weak and/or have low priority. China has very limited or no experience of, for example, including different actors or "stakeholders" in the policy and decision process. Whether China has the competence to formulate, implement and follow up effective policy

¹² An interesting analysis of China's scientific elite, from a sociological and historic perspective, can be found in Cao (2004b).

measures and a possible lack of processes for “policy learning” should also be mentioned as possible areas in which China can be expected to meet challenges in its efforts to create a strong national innovation system. Finally, Chinese companies have so far shown a low pace of and/or readiness for innovation (Cao, 2004a).¹³

Chinese authorities have identified many of the weaknesses in China’s national innovation system and are actively working to tackle them. One example is the current national work to produce a strategy to promote “independent innovation”. This refers to efforts to strengthen China’s domestic innovation capacity in order to reduce its dependence on foreign innovative ability. The government has identified innovation, and a strong science and technology base, as a guarantor of future competitiveness and prosperity but also as the solution to many of the challenges facing China today, such as pollution, the threat of epidemics, water and energy shortages, etc. As a result, innovation has high priority on the policy agenda (see, for example, “China vows to become a nation of innovation”, *People’s Daily Online*, November 25, 2005).

2.3 Corporate social responsibility of Chinese enterprises

The serious situation in China in terms of environmental issues and human rights, together with inadequate implementation and follow-up of national legislation, is a complicated reality for Swedish and other international companies wishing to observe Chinese legislation and, at the same time, comply with international rules and standards in these areas.

Amnesty reports on poor working conditions at places of work around China that violate international standards and cause serious accidents and deaths. Overtime is the most common problem in factories: it is frequently unpaid and often mandatory. Reports show that workers are also exposed to hazardous chemicals and explosive materials, and that they have to carry out dangerous work without the necessary safety measures. The mining sector is particularly perilous. Worker protests, strikes and other expressions of dissatisfaction have increased sharply in recent years.

There is a lack of organizational freedom and formalised collective wage negotiations. Apart from union rights, China’s labour legislation is more extensive in many areas than that of many European countries but there is a lack of capacity and systems to ensure it is enforced.

China’s rapid development combined with a lack of knowledge and insight into its environmental consequences has led to extensive pollution and damage to the environment. Environmental work has low priority at companies and the onus is on the companies themselves to conduct effective environmental work.

Chinese authorities are taking a growing interest in what corporate responsibility means in practice for the country’s stability and economic development. The country’s standing in the eyes of the outside world is becoming more important, especially in view of the 2008 Olympics in Beijing. Several scandals in recent times have made the public examine food hygiene, consumer rights, working conditions and environmental issues. Recent examples of labour shortages, where companies were unable to fill vacancies due to low wages and poor conditions, can also affect development in the long run.

¹³ *It has so far not been possible to measure innovation in companies in China in a reliable and comparative way, but the researchers to whom the authors have spoken claim that the propensity for innovation is low in the overwhelming majority of Chinese companies.*

Issues surrounding the corporate social responsibility in China are also attracting more international attention. Concurrently with China becoming increasingly integrated in world trade and manufacturing being moved to China, it is likely that these questions, especially matters of labour legislation, will become even more topical.

3 China's influence on the world economy

China's growth has far-reaching consequences for prices, wages, interest rates and currencies all over the world. China's increasing importance to labour supply, international currency flows and rates, raw material markets and world trade is changing the global economic – and thereby also political – balance of power.

Concurrently with an increasing number of foreign companies choosing to purchase and manufacture in China, the country has become known as “the shop floor of the world”. Through its exports and by attracting foreign direct investment, a large amount of added value is created in China. Today, China is the world's third largest recipient of foreign direct investment with almost one tenth of the world's total foreign direct investments. Chinese companies have also used China's comparative advantages well and taken relatively large shares of world exports.

While companies initially located production, purchases and/or sales offices in China, an increasing number of companies are now also establishing R&D activities in China. The trend of offshoring R&D to China is increasingly driven by the growing strategic importance of the Chinese market and the access to good and inexpensive human capital.

3.1 China is influencing prices and shifting the economic balance of power

3.1.1 China is increasing the demand for natural resources

China's rapidly growing economy has led to a dramatic increase in its demand and consumption of raw materials and energy. China is now the world's largest consumer, and in some cases also largest producer, of steel, coal, copper and aluminium, among other things. China accounts for 30 per cent of the world's steel consumption (International Iron and Steel Institute) and 30 per cent of the world's coal production (Energy Information Administration, EIA). In recent years, the consumption of metal resources has grown faster than China's GDP (UNCTAD, 2005a).

China's rapidly growing demand for oil is seen as one reason why oil prices are expected to remain high into the foreseeable future. *The Economist* recently observed that China's enormous demand for oil, together with that of the USA, in practice amounts to a tax for all other countries through oil prices being pushed up (“The oiloholics”, *The Economist*, 27 August 2005). China's huge demand for oil is partly explained by its dynamic economic growth, but also by its control of domestic petrol prices. This has meant that prices have not increased at the same rate as world prices for crude oil. It should also be pointed out that in 2004, China's oil consumption per inhabitant, still only corresponded to about one fifteenth of that of the USA. China's demand for natural resources such as oil, steel and coal and its share of world consumption can therefore be expected to continue to rise significantly in the future.

The expansion of China's physical infrastructure is likely to continue for some time, and industrial production continues to grow rapidly. In addition, household consumption can be expected to increase significantly. As an example, in 2002, China had only about 15 cars per 1000 inhabitants compared with almost 500 per 1000 inhabitants in the EU, and the number of privately owned cars has increased by an average of almost 25 per cent per year in the last five years (*China Statistical Yearbook* and the European Commission).

China's growing demand for natural resources is not limited to minerals and energy. Concurrently with the rise in living standard, China's demand for provisions is also expected to increase dramatically. China already consumes more staples and meat than the USA (Brown, 2005). China has so far been more or less self-reliant when it comes to food, but as poverty decreases and welfare increases, China's demand for agricultural products is expected to grow faster than its production, which in turn will affect prices of different provisions on the world market (UNCTAD, 2005a).

Table 5 Consumption of selected raw materials, 2004

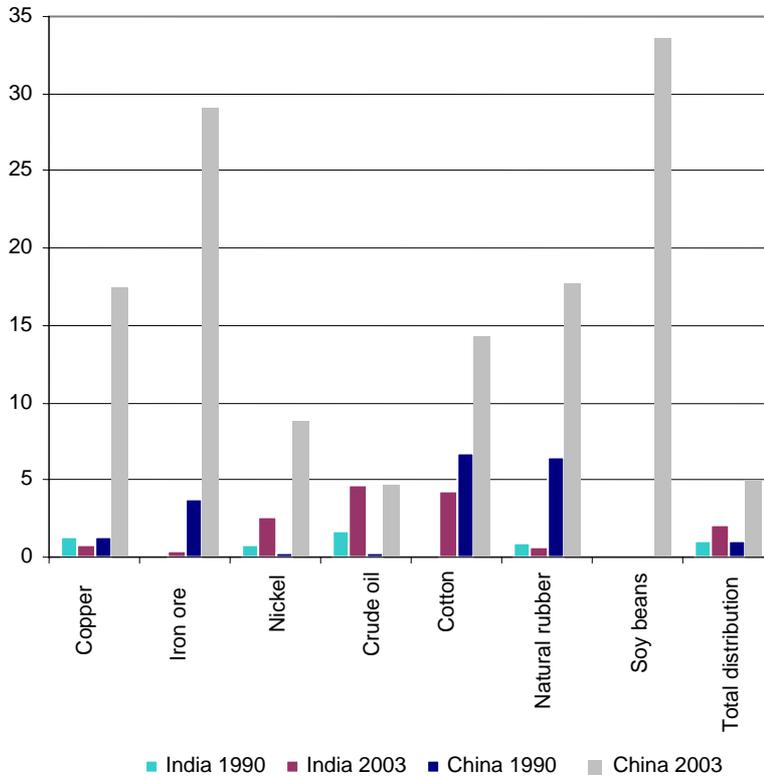
	China	USA	EU ¹	India	Brazil	The World	China's share	Source
Oil (m barrels per day)	7	21	15	2	2	82	9 %	EIA
Steel (m tons)	258	99	160	25	16	904	29 %	OECD
Coal (m short tons)²	1531	1094	815	431	24	5439	28 %	EIA
Meat (m Tons)	71	37	42	6	15	257	28 %	FAO
Cereal³ (m tons)	382	278	230	188	54	1994	19 %	USDA
Population (m inhabitants)	1300	295	456	1080	186	6400	20 %	

¹ Figures for the EU-25; the authors' estimates; ² Figures for 2003³ also include rice.

China already accounts for a significant share of the world's consumption of different natural resources (see Table 5). China's consumption pattern therefore has a considerable effect on the prices of important raw materials on the world market. In addition, China's demand for important raw materials is also expected to grow faster than its domestic production in the future. Figure 8 compares China's share of world imports of selected raw materials between 1990 and 2003 with that of India. A similar trend, though not as strong, is discernible for India. The size of the economies in India and China means that their increasing demand for raw materials exerts upward pressure on the prices of these goods. In its latest *Trade and Development Report* UNCTAD states that

... import demand by China and India for a number of primary commodities (...) can be expected, in the near future, to keep international prices for a limited number of products at levels above those experienced over the past decade or so (UNCTAD, 2005a, p. 43).

Figure 8 China's and India's shares of raw material imports



Note: India's imports of soybeans was very small

Source: UNCTAD (2005a).

3.1.2 ... and increasing the supply of cheap products

US inflation rates are estimated to have been one percentage point lower in recent years due to cheap textile and electronics goods from China (*The Economist*, 30 July 2005, p. 66). In Norway, where textile quotas were abolished and duties phased out five years earlier than in Sweden and the EU¹⁴, the import of cheap clothes, primarily from China, is estimated to have led to price levels for clothing that are almost 40 per cent lower today than in 1995 and thereby at the same level as in 1986. To state it simply, cheap clothes from China have resulted in inflation being approximately half a per cent lower in 2002 and 2003 than it would otherwise have been (Nordea, 2004). Nordea estimates that the abolition of restrictions on textile imports from China could mean that inflation in Sweden is between 0.2 and 0.4 per cent lower than it would otherwise have been. In its latest report on inflation, the Swedish Central Bank estimates that China's exports have contributed significantly to keeping down prices of consumer goods in the world and in Sweden:

In recent years, the price inflation for consumer goods on the international markets has slowed down... Concurrently with the increase in world trade and countries such as, for example, China and India having been integrated into the world economy, there has been ...a continuous shifting of Swedish imports

¹⁴ Sweden abolished all textile quotas in 1991 but re-introduced the quota system in connection with its entry into the EU.

towards ever-cheaper countries, which has also contributed [to the slower price increases for consumer goods]. (The Swedish Central Bank, 2005, p. 43).

The integration of China's manufacturing industry into the world economy has put downward pressure on the prices of consumer goods in a number of areas such as textiles, household goods, toys, etc. As a result, consumers in Sweden, and other countries, have significantly greater spending power than they would have had without the "China effect".

3.1.3 China is increasing the global supply of labour ...

With China, India and Russia opening their doors to the world economy, the global supply of labour has doubled. China accounts for most of this increase (Freeman, 2005). The increase in cheap labour, without a corresponding increase in capital, has led to a lower return on labour the world over and can be seen as one explanation for the low growth in wages in real terms in the USA, Europe and Japan in recent years compared with earlier periods, while company profits are growing fast:

*The entry of China's vast army of cheap workers into the international system of production and trade has reduced the bargaining power of workers in developed economies. Although the absolute number of jobs outsourced from developed countries to China remains small, the threat that firms could produce offshore helps keep a lid on wages. ... China's emergence into the world economy has made labour relatively abundant and capital relatively scarce, and so the relative return to capital has risen ("From T-shirts to T-bonds", *The Economist*, 30 July 2005, p. 66).*

China does not allow free trade unions, and its labour legislation system is underdeveloped. China's increasing importance as a source of cheap labour on the global market, together with the relatively poor negotiating position of employees in China, has consequences for the relations between workers and employers the world over.

3.1.4 ... and influencing exchange rates and interest rates

China's currency reserves are the second largest in the world, after Japan, with approximately 711 billion US dollars in June 2005 (IMF and *The Economist*). These reserves give China, at least in theory, significant influence over the dollar rate. If China were to start selling these reserves to any greater extent, it would put noticeable pressure on the dollar and thereby force up interest rates in the USA. In practice, however, China's economy and political stability is today greatly dependent on exports, especially to the USA. China therefore has little interest in and, actually, cannot afford to force the dollar down and thereby push up interest rates, which in turn would lead to a fall in American growth and demand for Chinese goods.

According to *The Economist*, China's integration into the world economy has so far led to a slowing-down of prices and inflation. China's ability to produce cheap goods has thus as of yet had a greater impact than its demand for natural resources. As a consequence, interest rates in Europe and the USA have been lower than they would have been without the "China effect". In turn, the low interest rates have made a dramatic increase in property prices possible in large parts of the Western world ("From T-shirts to T-bonds", *The Economist*, 30 July 2005).

3.1.5 Is China changing the economic balance of power?

A number of US commentators have begun to worry about China's increasing power over the world economy and thereby also in the political arena. Some economists estimate that the USA will lose its world leadership in science and technology to China within a few years (Freeman, 2005; see also Sigurdsson, 2005), while others claim that China, and not the USA, already determines international interest rates and exchange rates. Questions such as "Who Owns the Dollar" (Roberts, 2005), which reflect a growing concern in the USA, are appearing more frequently in magazines and periodicals.

China will not take over the USA's role in the world economy within the foreseeable future. However, China's increasing importance to labour supply, international currency flows, exchange rates, raw material markets, etc, is changing the relative global economic – and thereby political – balance of power.

Given their large size of the Chinese and Indian economies, and their specific patterns of demand, changes in the two countries' level and structure of supply and demand will tend to have a much larger impact on the composition of world trade than those of Japan and Korea during their economic ascent (UNCTAD, pp. 42-3).

One example of the way China is changing the geopolitical map is its strategy to safeguard access to natural resources by seeking cooperation or entering alliances with countries known for their large natural resources (Zweig and Bi, 2005). In its search for natural resources, China has created international headlines by sometimes approaching countries that are otherwise criticised or isolated from the surrounding world, so-called "rogue states". China's increasing economic importance and its strong growth, compared with the USA, Europe and Japan, has also contributed to the much larger volume and thereby importance of trade between developing nations ("South-South trade"). While world trade has so far been characterised by developing countries exporting staples to the industrialised countries in exchange for production goods, UNCTAD now identifies a fundamental change in the world "geography of trade", which in turn leads to developing countries becoming more important on world markets (UNCTAD, 2005a).

3.2 China competes for the world's manufacturing

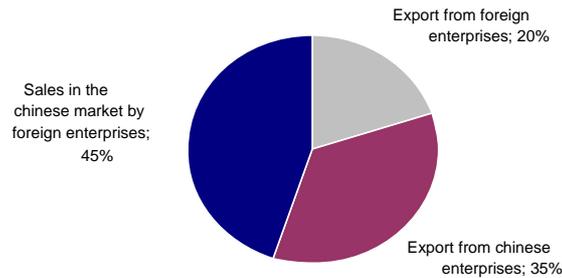
Concurrently with the increasing number of foreign companies choosing to buy and manufacture goods in China, it has come to be known as "the shop floor of the world". Many countries fear that their manufacturing industry will move production and jobs to China. In 2002, a report from the American Congress claimed, for example, that almost 100,000 jobs disappeared to China every year as a result of American companies moving their production there (Strothman, 2002).

One of the most hotly debated topics is about where, geographically speaking, economic added value will be created in the future. By establishing itself as an important export base and by attracting significant foreign direct investment, a large amount of added value is created in China, which, at least in part, could have been realised elsewhere. In 2002, that value is estimated to have totalled 371 billion US dollars.

This added value has been created, above all, by foreign companies that have been attracted to the Chinese market and have therefore set up local production, and by Chinese companies that have built up a successful export industry (see Figure 9).

Foreign companies have also been important to China’s export growth, but they generate less added value as their principal activity is the assembly of imported components. The service trade is not yet very extensive.

Figure 9 “Market-driven” value-added in China from export industry and foreign direct investment in 2002



Source: *China Foreign Investment Report 2003, Embassy calculations*

The competition for added value is not a zero-sum game however. Both foreign companies and the Chinese export industry generate a strong demand for goods and services sold by the outside world to China. Together, they account for almost two thirds of China’s imports.

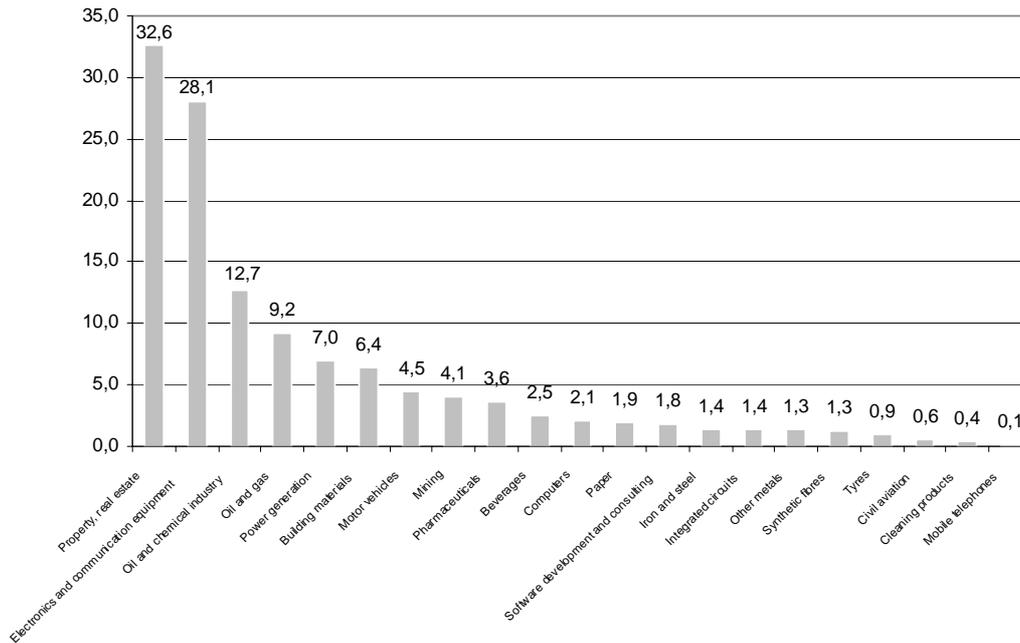
3.2.1 Foreign direct investment drives competitive expansion

Foreign companies have set up in China primarily to serve the Chinese market. Just over two thirds of the value added by foreign companies in China has come from sales to the Chinese market. Foreign companies, primarily from other Asian countries, have contributed more than domestic companies to the expansion of manufacturing in China, which, at least hypothetically, could have been set up somewhere else in the world. This includes manufacturing for the Chinese market under the management of foreign companies as well as manufacturing for the export market. In 2002, 65 per cent of the added value generated in China by this type ‘market-driven’ manufacturing, that is, manufacturing that takes place under conditions of global competition, took place in foreign-owned companies.

It should be noted, however, that other countries cannot compete directly for all the added value that is generated by foreign companies in China and that serves the domestic market. Sales, distribution and services may be location-specific, that is, some operations may be tied to the local market. Nonetheless, the expansion of manufacturing of a specific product in China may mean that there is no expansion of manufacturing for the same product in the homeland. At the same time, there may be efficiency gains which could lead to increased production and export of another product.

On the whole, foreign direct investment (FDI) into China has been strongly focussed on manufacturing, accounting for 69 per cent in 2003.¹⁵ Up until 2002, investment in infrastructure and basic industry for the domestic market dominated, e.g., real estate, oil and gas, chemical industry and energy (see Figure 10). Electronics and communication equipment was another important sector, but FDI in these sectors was initially aimed primarily at the export market.

Figure 10 Accumulated foreign direct investment in China in 2002 (billions of US dollars)

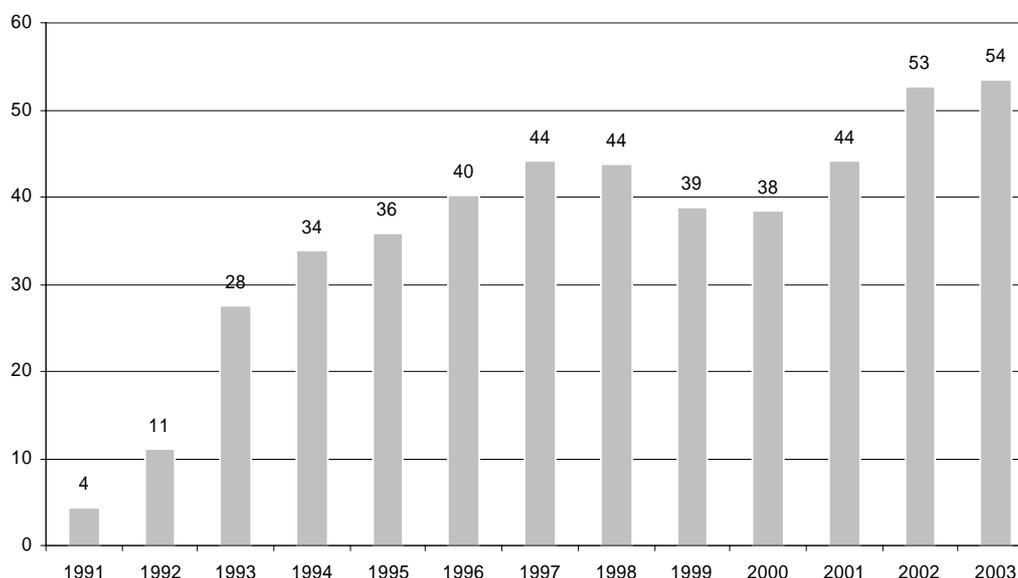


Source: *China Foreign Investment Report 2003*

FDI inflows gained momentum at the start of the 1990s, when the Chinese Government intensified its reform policy and increasingly opened its domestic markets to foreign competition (see Figure 11). In 2003, FDI accounted for 12 per cent of the total investment in China. Today, China is the world's third largest recipient with almost one tenth of the world's foreign direct investment, according to UNCTAD (UNCTAD 2005).

¹⁵ *China Statistical Yearbook 2004, Embassy calculations*

Figure 11 Foreign direct investment in China (billions of US dollars) per year



Source: UNCTAD

The neighbouring economies in Asia, in particular Hong Kong, account for the bulk of FDI into China (see Table 7). Chinese expatriates, especially in Hong Kong and Taiwan, made early use of the opportunities on offer when China opened its doors to the surrounding world. Between 1980 and 1995, they contributed up to 70 per cent of all foreign investment in China (Asian Development Bank).¹⁶ In 2003, the EU and the USA each contributed less than one tenth of the foreign direct investment.

Table 6 Foreign direct investment in China, selected countries

	2003		1997	
	Billion USD	Share (%)	Billion USD	Share (%)
Hong Kong	17.7	33	20.6	45
Japan	5.1	10	4.3	9
South Korea	4.5	8	2.1	5
Taiwan	3.4	6	3.2	7
Singapore	2.1	4	2.6	6
Subtotal	32.8	61	32.8	72
USA	4.2	8	3.2	7
EU	4.0	7	4.2	9
Total	53.5	100	45.3	100

Source: China Statistical Yearbook

¹⁶ FDI from Hong Kong is likely to be somewhat overestimated since a significant portion of these inflows comes from domestic Chinese capital which is taken out of China and then brought in again as 'foreign capital', thus allowing it to benefit from tax and other preferential treatment extended to FDI. This phenomenon is referred to as 'roundtripping'.

3.2.2 Chinese companies are competing successfully on export markets

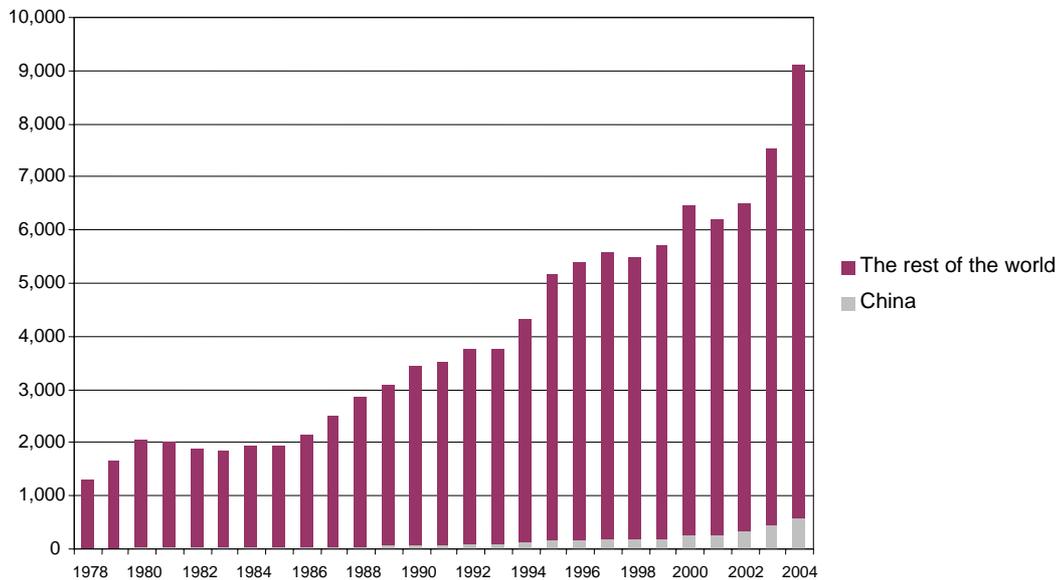
Chinese companies have been able to exploit China’s comparative advantages and take relatively large shares of world exports. When adding up the total value added generated in China through the production of export goods and the total production of goods by foreign companies for the Chinese market, Chinese export companies account for the second largest, namely 35 per cent (see Figure 9).

FDI has also been instrumental to the growth in Chinese trade. In 2004, foreign companies generated as much as 57 per cent of the exports, which is a significant increase from 41 per cent in 1996 and makes them the single most important driving force behind the Chinese export miracle. Manufacturing foreign-funded companies was lower in China than in the export-oriented domestic companies, however, as the former import more input products. Foreign companies have made use of the large supply of cheap labour to carry out simple production operations in China. In 2002, as much as 55 per cent of the exports by foreign companies therefore was made up of imported components, e.g., DVD chips.

In total, there has been more offshoring to China to serve the export market than to serve the Chinese market. 55 per cent of the added value generated by production that has been offshored to China was for export.

Starting from a very low level in the 1980s, exports have grown to make China the world’s third largest exporter with a share of approximately seven per cent, behind Germany and the USA. This expansion has taken place at the same time as world trade has expanded rapidly, which suggests that China’s export growth has not happened at the expense of the rest of the world (see Figure 12).

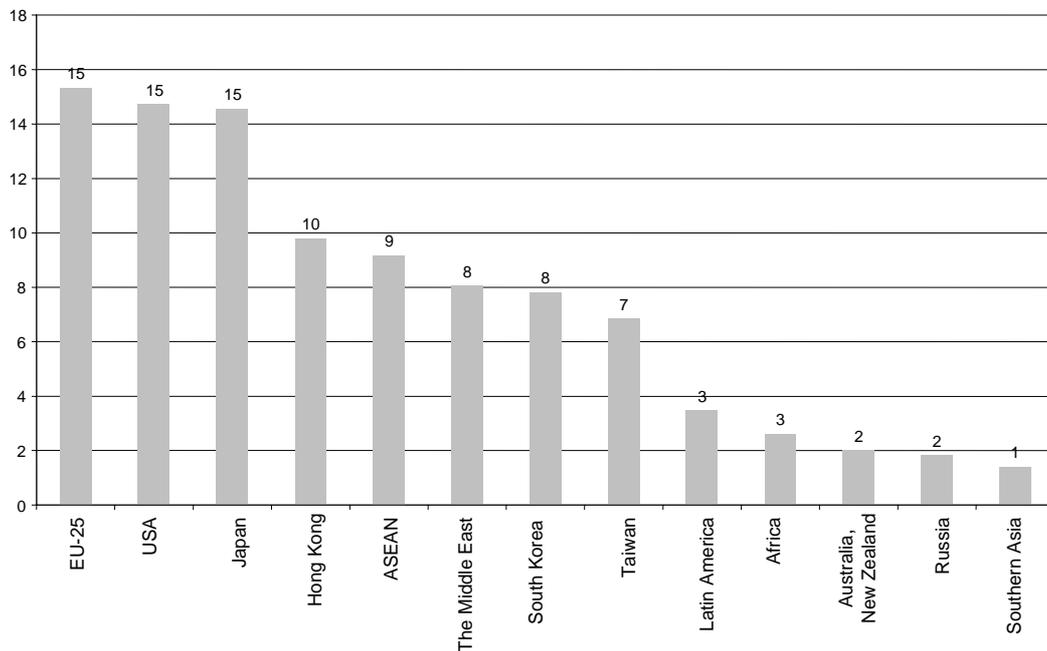
Figure 12 Exports by China and the rest of the world (billions of US dollars)



Source: WTO

China's foreign trade is dominated by a pattern in which input goods are imported from neighbouring countries, assembled in China and exported on to the richer countries, especially to the USA and the EU. Almost half of China's trade takes place in Asia. The USA, the EU and Japan are the single most important trading partners with approx 15 per cent each of foreign trade (see Figure 13). The USA and the EU are in a unique position, given China's large bilateral trade surplus with those countries. In return, China has large trade deficits with its Asian neighbours, apart from Hong Kong. Trade with Hong Kong is largely characterised by Hong Kong's role as a transit port. Much of the exports to the territory is shipped on to other countries.

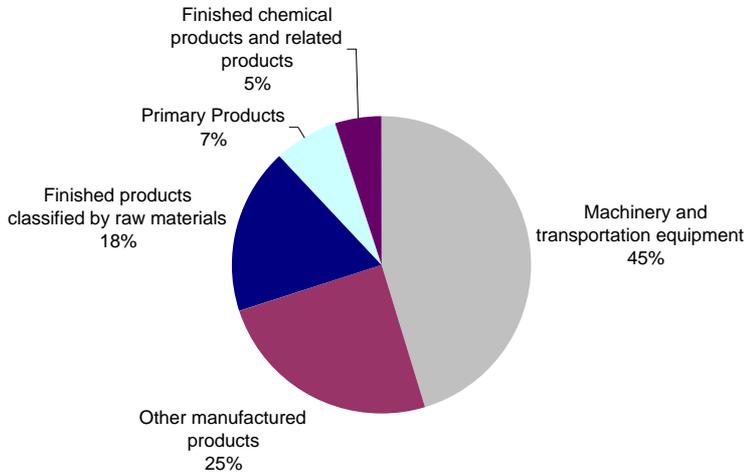
Figure 13 Shares of China's total imports and exports per trading partner in 2004 (per cent)



Source: China Statistical Yearbook

Chinese exports are dominated by machinery and transport equipment, including office and communication equipment and textiles and clothing (see Figure 14).

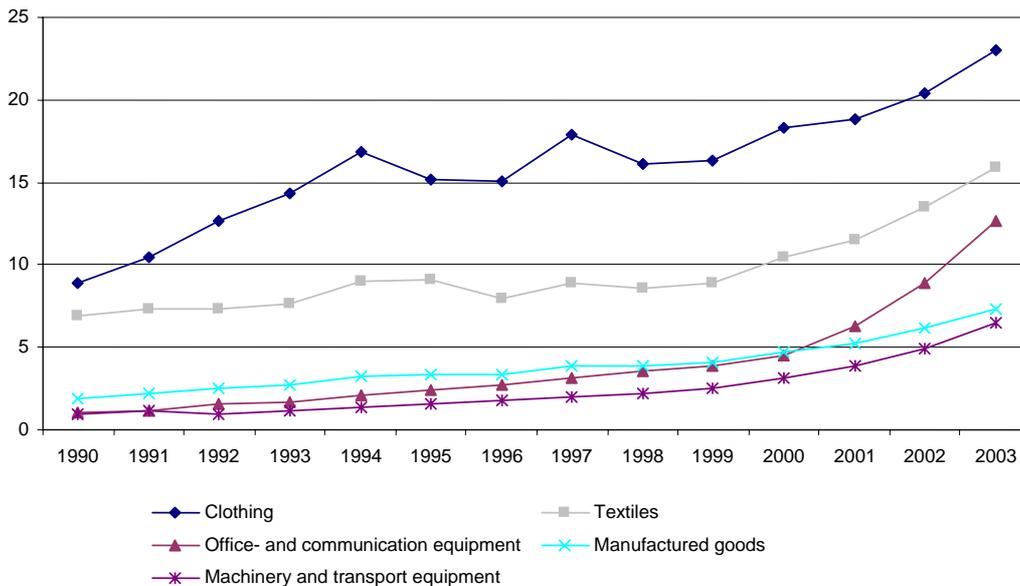
Figure 14 Composition of China's exports in the first six months of 2005



Source: Ministry of Commerce, Embassy calculations

During the 1990s and in the first few years of the 21st century, China has taken significant shares of world exports in a number of sectors (see Figure 15). In the textile and clothing industry, China had a particularly strong position in 2003 with 23 per cent of clothes exports and 16 per cent of textiles. In office and communication equipment, China has shown strong growth and in 2003 it reached 13 per cent, compared with around one per cent at the beginning of the 1990s.

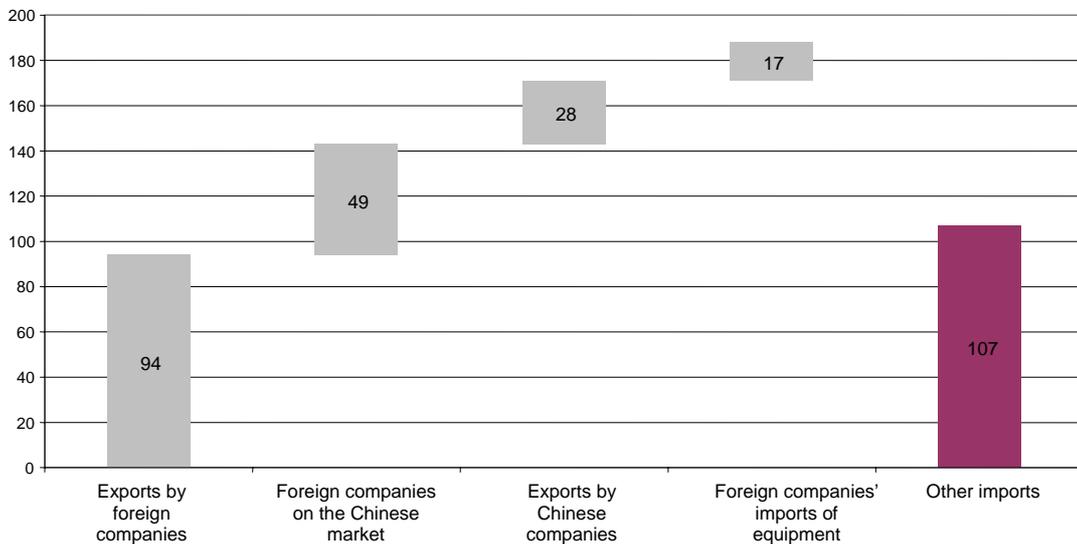
Figure 15 China's share of total world exports in selected product categories per year (per cent)



Source: WTO, Embassy calculations

FDI inflows into China have not only increased competition for the outside world. They have also been the most important driving force behind the country's rapidly growing imports. Just over half of total imports were generated by foreign-invested companies in China. In 2002, 42 per cent of imports were re-exported, particularly by foreign companies in the so-called processing industry, which, for example, assembles consumer electronics. 17 per cent of the imports were sold on by foreign companies on the Chinese market (see Figure 16). Six per cent was equipment for use by foreign companies' facilities. The "remainder" of the imports made up only 36 per cent.

Figure 16 Chinese imports per "driving" activity in 2002 (billions of US dollars)



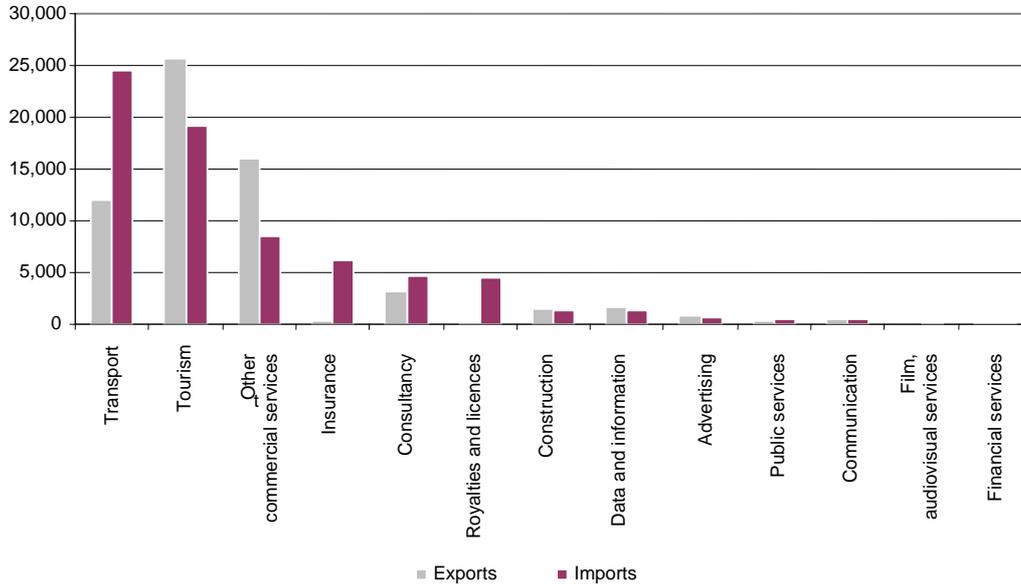
Source: *China Foreign Investment Report 2003, Embassy calculations*

3.2.3 Service trade is still undersized

China is not yet a big actor on the international market for service trade. In 2004, China was the world's ninth service exporter and eighth importer with 2.8 per cent and 3.3 per cent of the global trade respectively (Ministry of Commerce). In comparison, the USA's service exports were more than five times as big as China's. Service imports and exports totalled 135 billion US dollars, which was just 12 per cent of the turnover for goods trade. Unlike the trade in goods, China has a service trade deficit.

The most important services in the trade are tourism, other commercial services (including transit trade, leasing, commissions) and transport (see Figure 17). China has a significant surplus in tourism and other commercial services trade, and large deficits in transport, insurance, royalties and licences.

Figure 17 China's service imports and exports in 2004 (billions of US dollars)



Source: Report on the foreign trade situation of China, spring 2005

Unlike India, China has not yet become a large exporter of IT-based services, e.g., software and call centres. China's revenues from software and IT-based services were estimated to have increased by 42 per cent per year between 1997 and 2003 to 6.8 billion US dollars.¹⁷ That was not even half of India's revenues for the same year, 12.7 billion US dollars. In addition, software for export only makes up one tenth of total software production compared with around 70 per cent for India. Some experts predict that China can become the world's biggest destination for outsourcing of IP-based services by 2015.¹⁸ However, according to the consultancy firm McKinsey, the Chinese IT industry is too fragmented to take on larger commissions and there are still too few English-speaking engineers.

The country's share of service trade ought also to increase concurrently with the growth of the Chinese economy including transport for the expanding export sector, business consultancy services for an increasingly sophisticated industry, and tourism and education for consumers with greater spending power.

3.2.4 International companies' R&D activities are growing fast

While companies initially located production, purchases and/or sales offices in China, more and more companies are now also beginning to locate parts of their R&D activities to China. In the internationalisation process, R&D is usually one of the last company activities to be moved out (Gassmann and Han, 2004). The decision to set up a company's R&D in a certain country is generally driven by three factors. The first factor is a supply of knowledge resources which may be better and/or cheaper in some countries than others and some may be unique to a country, i.e., they do not exist anywhere else. Another

¹⁷ McKinsey Quarterly.

¹⁸ Global Outsourcing Report, see "China to be world's top outsourcing destination", *The Financial Express*, www.financialexpress.com, 26 March 2005.

explanation for companies choosing to locate their research to a certain country is the intention to adapt their products better to local markets (ibid.) and/or to be near production (“R&D follows production”). A third reason for companies transferring their R&D to, for example China, may be political or institutional aspects (von Zedtwitz, 2004). Examples of the latter driving force are “local content” rules, laws concerning intellectual property rights, national regulations that require foreign companies that want to produce in a country to also have R&D activity there, and fiscal incentives.

Many foreign companies with production in China also have some product development there. The activity, which usually consists of adapting existing products to the Chinese market, is often located in the same place as the production facilities in China. In principle, all companies with R&D activities in China had manufacturing, purchasing and/or distribution activity in China before they set up research or product development there. So far, product development and adaptation to the Chinese market are the dominant forms of R&D activity carried out by Swedish and most other foreign companies in China. Thus, in the 1980s and much of the 1990s, the establishment of foreign companies’ R&D in China was driven mainly by product adaptation to the local market and local requirements by the Chinese Government. In recent years, however, there has been a clear trend for multinational companies to set up significant R&D activities in China. Thus, an increasing number of multinational companies, however, including ABB, Astra Zeneca, Ericsson, Sony Ericsson, are moving parts of their global R&D activity to China. When it comes to setting up R&D activities that are not limited to product adaptation, most foreign companies choose to set up such activity in Beijing and/or Shanghai.

The transfer of R&D to China is currently driven by the growing strategic importance of the Chinese market and the supply of good and cheap human capital in China. In a recent survey among multinational companies, China was ranked as the most attractive country for future R&D investment, ahead of the USA, India, Japan and Great Britain (UNCTAD, 2005b). The development has led to increased concern in many developing countries that multinational companies will set up R&D in China in the future at the expense of R&D facilities in Europe and the USA. As one US author asked in 2003:

U.S. companies are beginning to outsource technology research and development to India and China. Will a meltdown in tech jobs follow? (De Ramos, 2003).

4 Sweden's economic relations with China

Sweden's economic relations with China have developed rapidly over the past ten years. China has become Sweden's biggest trading partner in Asia and an important destination for Swedish direct investment. China is very important for exports in exports of paper machines, for example, and for the energy sector. Swedish companies have a good position when it comes to purchasing goods in or from China. The service trade appears relatively undeveloped, especially in tourism and education.

So far, the setting up of Swedish companies' operations in China has primarily been aimed at serving the Chinese market. Manufacturing has been the dominant activity. Over time, however, an increasing number of companies have moved other business functions to China, including product development and in some cases also research.

Chinese firms' presence in Sweden is small. Apart from a few shining examples, Chinese companies have not begun to invest to any great extent in Sweden.

Knowledge exchange between companies and between researchers is relatively well developed while institutional cooperation between universities, colleges and institutes, and student exchanges are less well developed.

4.1 Trade with China

Sweden's trade with China has seen very strong growth, and China has become an important trading partner for Sweden. With 5.6 billion US dollars in imports and exports, China is Sweden's biggest trading partner in Asia. In 2004, 2.6 per cent of Sweden's trade was with China, making it Sweden's twelfth biggest trading partner. Between 1995 and 2004, China's share of Swedish imports rose from 1.7 per cent to 3.1 per cent. The export share rose from 1.5 per cent to 2.1 per cent. Up until 2001, Sweden had a bilateral trade surplus with China, but since then it has had a deficit.

Sweden is still a very small trading partner for China accounting for a mere four per mille of the total foreign trade in the first six months of 2005. However, Sweden is the third largest exporter of high technology from the EU, according to the Chinese Ministry of Trade, and the biggest trading partner among the Nordic countries.

During the first six months of 2005, exports fell by 18 per cent in Swedish crowns, and 12 per cent in dollar terms. That was the largest decline of any EU country. The main reason is most likely the Chinese Government's tightening up of investments, which contributed to Chinese imports more than halving and falling to 14 per cent from the previously high growth rate of 36 per cent during the twelve months of 2004. Given that Swedish exports are highly dependent on investment, Sweden has been hit particularly hard. Telecommunications, vehicles and paper machines account for the bulk of the fall. At the same time, imports to Sweden increased, however, due to the significant rise in textiles, clothing and shoe imports resulting from the abolition of textile and clothing quotas at the start of 2005.

Swedish exports to China are dominated by traditional large export sectors (see Figure 18). Thus, telecoms, energy equipment and other engineering industry form the core of Swedish exports. These sectors have accounted for two thirds of exports and almost the same amount of the total increase since 2002 (see Table 8). Paper, iron and steel exports have risen rapidly and have driven a quarter of the total export growth during the same period. Vehicle and pharmaceutical industries contributed just over one tenth of the exports.

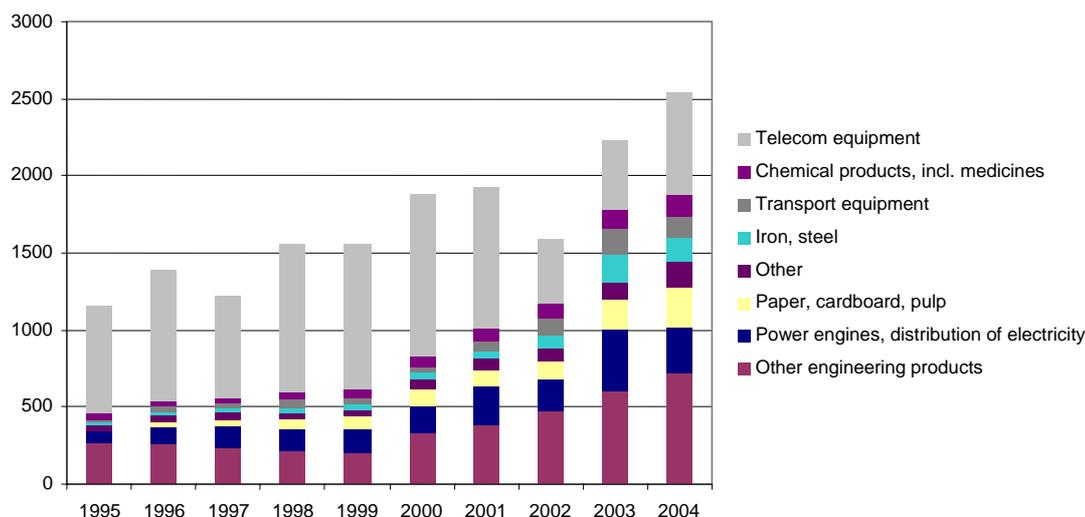
Table 7 Sweden's exports to China (share of 2002-04 increase, share of exports 2004 and growth rate 2002-04)

	Export share 2004	Growth rate per	
		year 2002-04	Contribution to growth 2002-04
Basic exports	66%	23%	61%
Telecom equipment	26%	25%	25%
Power engines, distribution of electricity	12%	21%	10%
Other engineering products	28%	23%	26%
Growth drivers	16%	48%	24%
Paper, cardboard, pulp	10%	47%	15%
Iron, steel	6%	50%	9%
Potential	18%	22%	15%
Chemical products, incl. pharmaceuticals	6%	20%	5%
Transport equipment	6%	12%	3%
Other	6%	34%	8%
Total	100%	26%	100%

Source: SCB, Embassy calculations.

Figure 18 Composition of exports from Sweden to China (millions of US dollars)

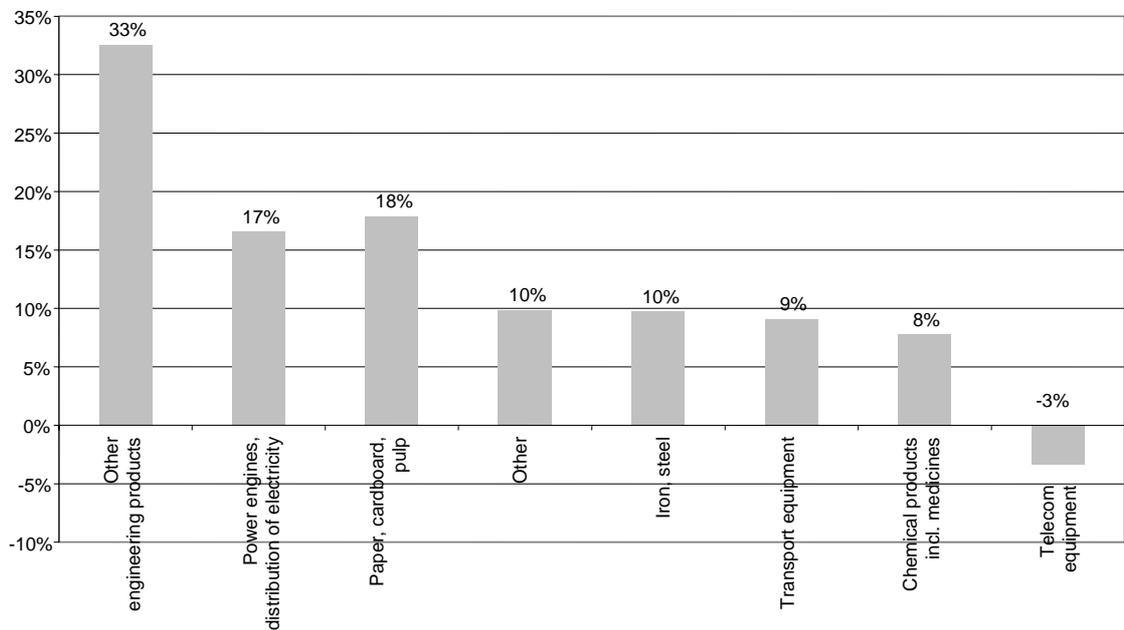
Average growth rate (CAGR) 1995-2004: +9%, of which -1% for telecoms and +17% for non-telecoms



Source: SCB, Swedish Central Bank, Embassy calculations

Between 1995 and 2004, growth of Swedish exports to China was driven by heavy industry. Telecoms has been the biggest sector, but became less important during this period. Excluding telecoms, other exports grew by 17 per cent per year between 1995 and 2004, which is much more than exports from most other countries. In total, exports grew by nine per cent per year during this period. Paper products contributed 18 per cent of the growth, power engines and electricity distribution 17 per cent, iron and steel 10 per cent, transport equipment nine per cent and chemical products, including pharmaceuticals, eight per cent (see Figure 19). Other engineering products, primarily different machines and apparatus, accounted for 33 per cent of the growth. Telecoms became less important during this period.

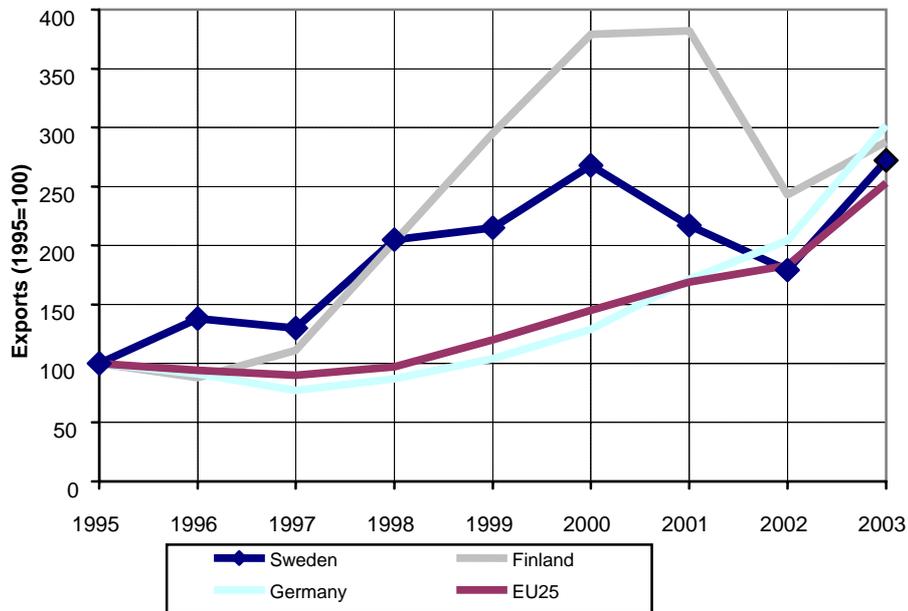
Figure 19 Contributions to the export trend from Sweden to China between 1995 and 2004 (share)



Source: SCB, Embassy calculations

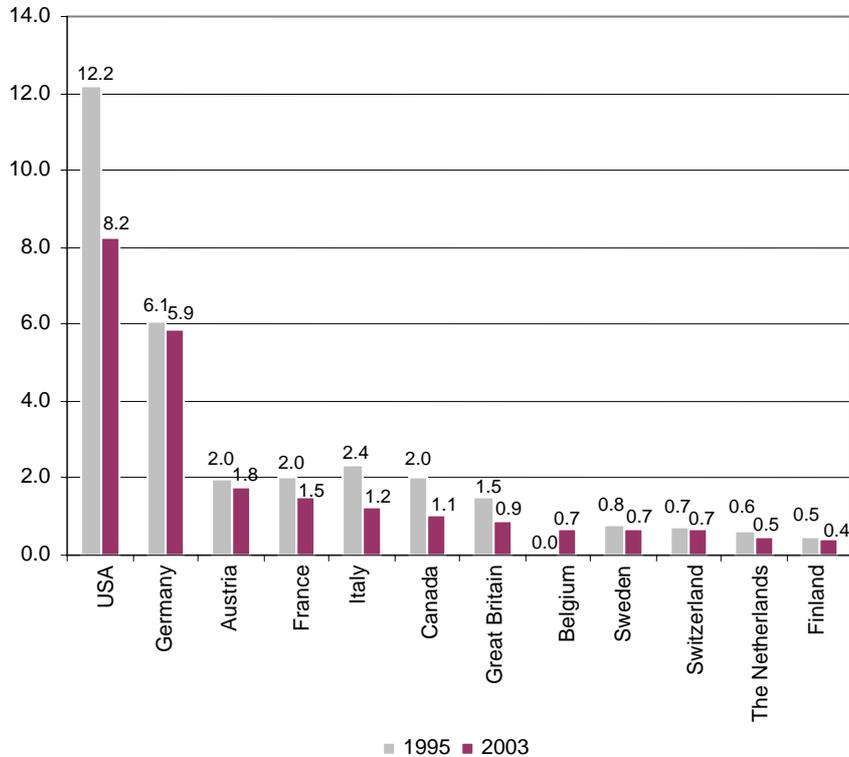
Swedish exports have also enjoyed healthy growth compared with the main competitors Germany and Finland (see Figure 20). In the last ten years, all three countries have more or less retained their shares of China's total imports. During the same period, other countries in Europe and North America have seen less growth and lost large shares. The winners have been countries in the Middle East, Latin America, Africa and Asian neighbours, who have all increased their shares.

Figure 20 Sweden's export trend to China compared with selected competitors (Index: 1995=100)



Source: Comtrade

Figure 21 Shares of some of Sweden's competitors of China's imports 1995 and 2003 (per cent)

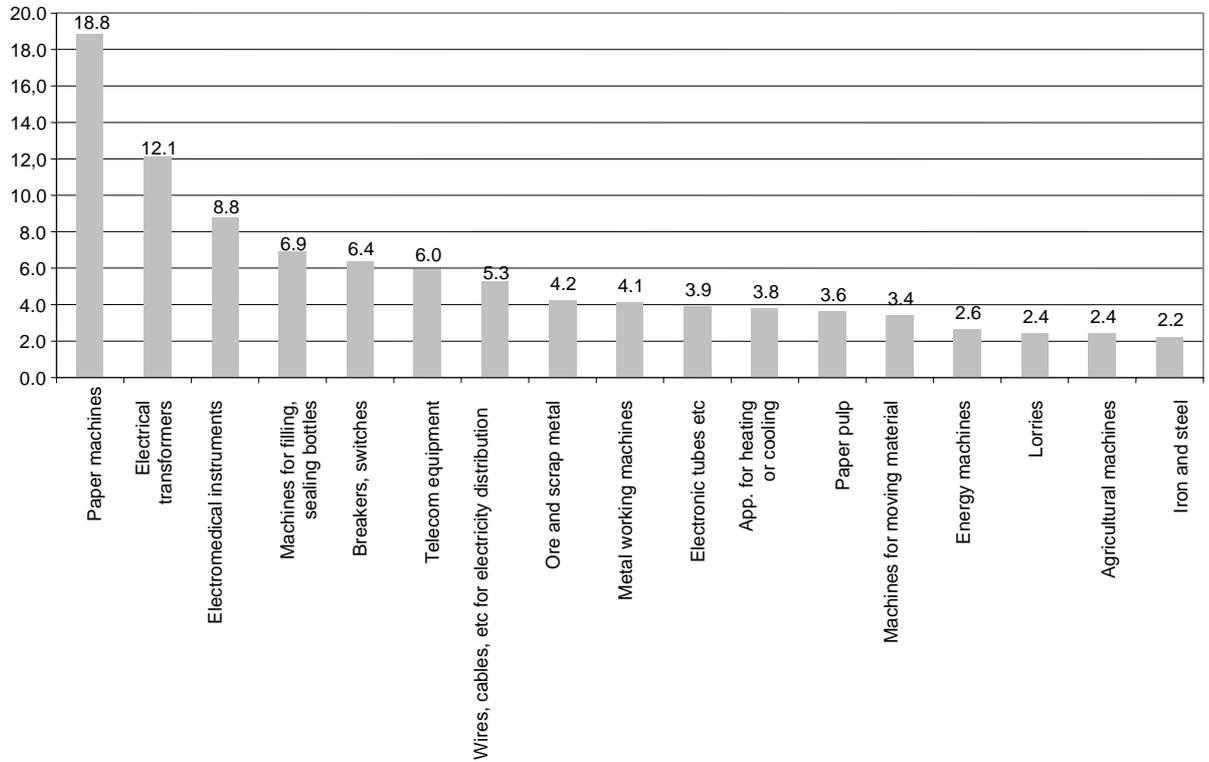


Source: China National Bureau of Statistics, Embassy calculations

4.1.1 China is important for heavy industry

China has become a very important market, especially for heavy industry. In 2004, China accounted for 19 per cent of the exports of paper machines. In the energy sector, China bought 12 per cent of the transformers, six per cent of the breakers and switches and five per cent of the cables for electricity distribution. Nine per cent of all electrical health-care equipment was sold to China. Seven per cent of the exports of bottle filling machines went to China. In the telecom sector, China accounted for six per cent of the exports (see Figure 22).

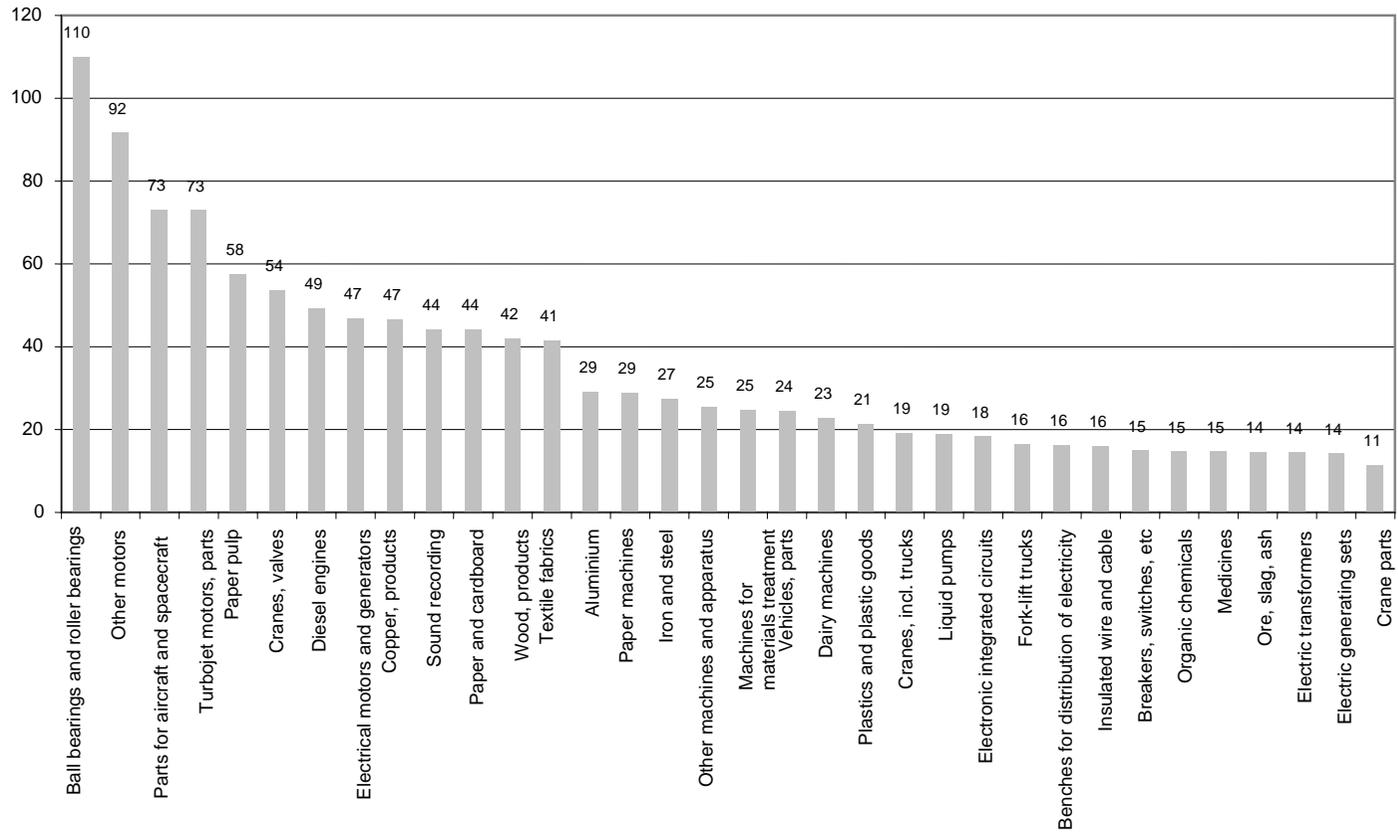
Figure 22 China's share of Swedish exports of selected product lines in 2004 (per cent)



Source: SCB, Embassy calculations

The Chinese market is a strong driving force behind many Swedish exports. Between 1995 and 2004, exports to China increased by 110 per cent per year for ball bearings, 58 per cent for paper pulp and 47 per cent for electric motors and generators (see Figure 23).

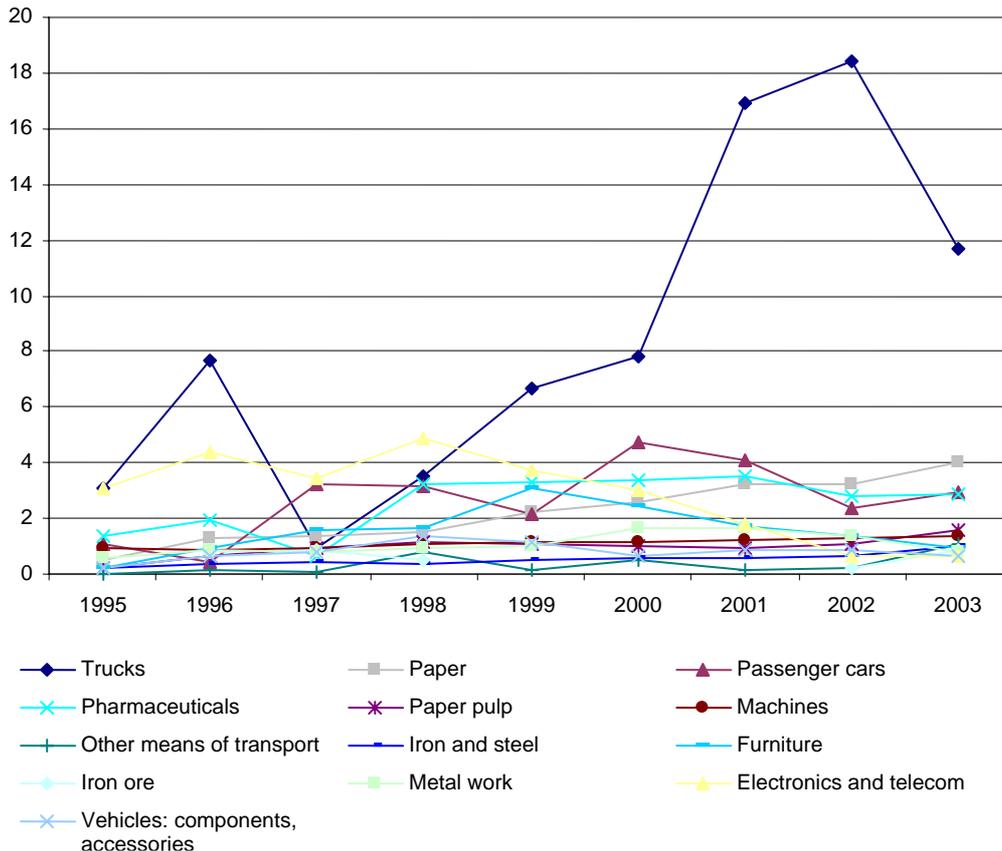
Figure 23 Average rate of growth per year 1995-2004 for big and fast-growing product lines (per cent) (above the average of 83 million SEK and the average growth rate of 10 per cent)



Source: SCB, Embassy calculations

In the traditional export sectors, Swedish industry also has a very strong position in China. The transport vehicle sector is particularly strong. Sweden accounted for 12 per cent of China's imports of lorries in 2003 and three per cent of passenger cars. Swedish paper accounted for four per cent of imports and Swedish paper pulp almost two per cent. Medicines accounted for three per cent (see Figure 24).

Figure 24 Sweden's share of China's imports, selected product groups (per cent)



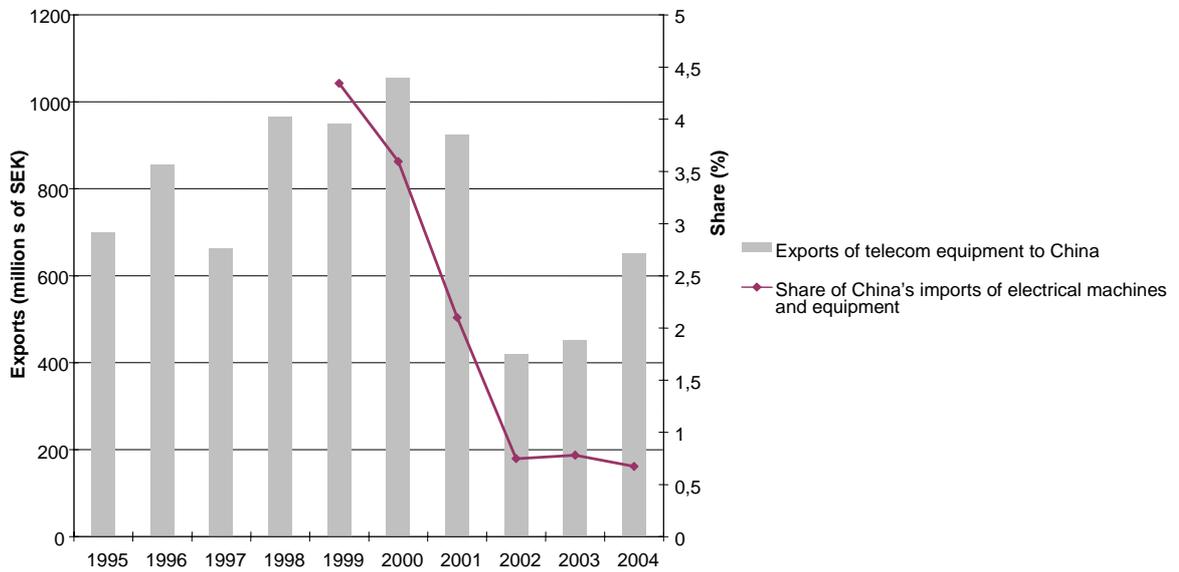
Source: Comtrade

4.1.2 Telecom exports have fallen

Exports of components for telecom equipment to China experienced a massive decline between 1995 and 2004. An estimate showed that the drop in exports in this sector accounted for 77 per cent the total fall of exports of 31 different product groups with the total drop amounting to 415 million Swedish crowns during this period. This downturn can largely be explained by parts of the telecom sector having successfully set up production in China.

During the 1990s, telecom products completely dominated Swedish exports, accounting for 62 per cent of total exports to China in 1998. Since then, this share has fallen sharply. In 2004, it was 26 per cent. At its peak, telecom exports totalled one billion US dollars, around the turn of the millennium, but in 2004, the figure was dropped to approximately 600 million. The downturn coincides with a fall in Sweden's share of China's imports of electrical equipment, a proxy measure for the telecom sector. In 1999, Sweden's share in this category was above four per cent. By 2004, it had fallen to below one per cent (see Figure 25).

Figure 25 Export trend for Swedish telecoms to China (millions of Swedish crowns) and Sweden's share of China's imports of electrical machines and equipment (per cent)



Source: SCB, Ministry of Commerce, Embassy calculations

This trend coincided with the downturn in telecoms after the turn of the millennium and with parts of production being moved to China and other countries, which is reflected by large foreign direct investments in China's telecom industry.

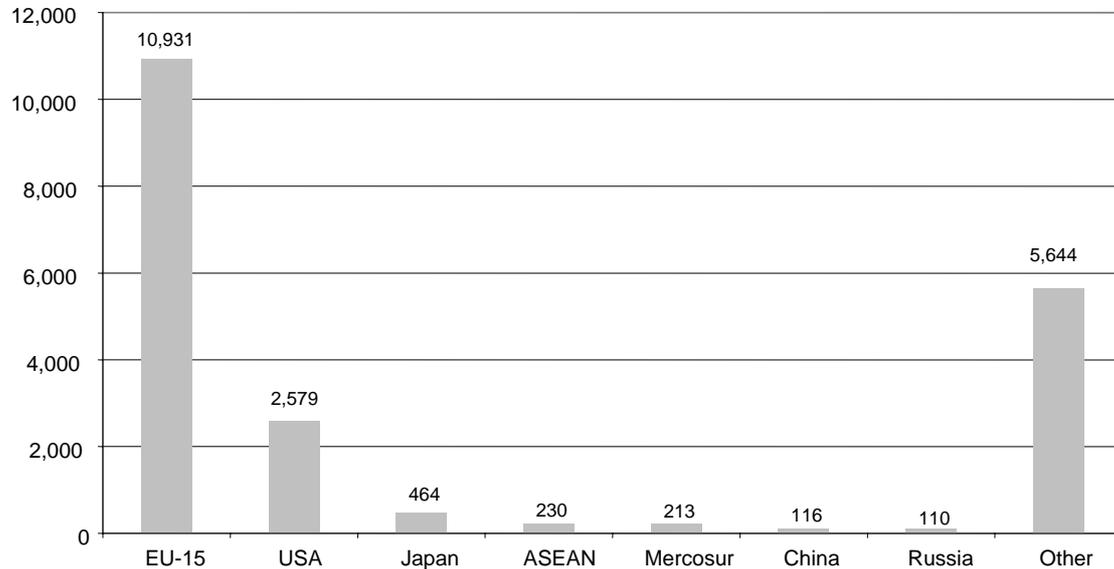
Investment by Swedish companies in the Chinese telecom sector increased sharply during this period. According to one estimate, Swedish telecom companies had accumulated approx 1.1 billion US dollars in investments in 2004. That was a sharp increase from approx 100 million in 1998 and 35 million in 1994. Recently, Ericsson announced that it plans to invest one billion US dollars over the next five years in R&D and further production in China ("Ericsson Plans \$1B Investment in China", *Associated Press*, 7 September 2005).

The downturn in exports is not matched by poor sales in China. In fact, the Swedish telecom industry is doing very well in China. In 2004, the Swedish IT and telecom companies had revenues of 2.2 billion US dollars in China, which was much more than telecom exports from Sweden. Swedish telecom companies also export from China with 0.9 billion of their sales exported to a third country.

4.1.3 Scope for further growth in the service trade

There is a lack of statistics on service trade, but available information suggests that there is scope to increase Swedish exports of services to China. According to an OECD study, Swedish service exports to China totalled 205 million US dollars in 1999 and 116 million US dollars in 2000 (OECD, 2004) (see Figure 26). This corresponded to one per cent of the total service exports in 1999 and 0.6 per cent in 2000, which was a lower level than China's share of goods exports, which was at 1.8 per cent and 2.2 per cent respectively for the years. It was also lower than the exports to Japan, which was the only other Asian country measured, at 550 million US dollars and 464 million for the years respectively.

Figure 26 Swedish service exports per recipient in 2000 (millions of US dollars)



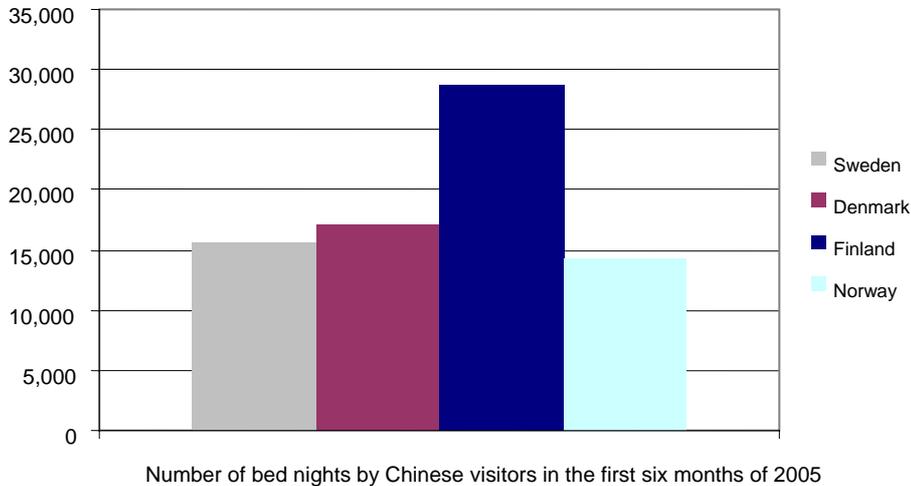
Source: OECD

According to a study on Swedish industry, the export of IT/telecom services to China was one of the most promising categories in the service sector (Skår, 2002). In the same study, the authors acknowledge that joint-venture requirements, corruption, and language and cultural barriers pose serious obstacles to selling services abroad, including in China. Another study also notes that small and medium-sized companies are over-represented in the service sector and that greater service exports could benefit them (Frycklund, 2004).

Tourism from China to Sweden is not yet well developed. Sweden attracts fewer Chinese visitors per inhabitant than other comparable countries. In 2004, just over 23,000 bed nights by Chinese visitors were registered, which corresponds to 0.1 per cent of the total number of bed nights (the Swedish Tourist Authority). This can be compared with, for example, Finland, which had four times as many bed nights by Chinese visitors, or 0.5 per cent of the total number of bed nights (Statistics Finland). In the first six months of 2005, Sweden had a total of 15,600 bed nights by Chinese visitors compared with 14,200 in Denmark and 28,800 in Finland (see Figure 27).¹⁹

¹⁹ The figures have been calculated based on data from the national statistics authorities.

Figure 27 Chinese bed nights, first six months of 2005



Source: own calculations based on information from the Swedish Tourist Authority, Statistics Denmark, Statistics Norway and the Finnish Tourist Board.

Finland's success in attracting Chinese visitors can be partly explained by Finnair's early strategic investment in direct flights to China. Finnair was the first airline to start a non-stop route between Western Europe and China (1988), which may have provided a first-mover advantage.

4.2 Swedish companies in China and Chinese companies in Sweden

Most big Swedish companies have established themselves in China in one way or another. According to a study by Teknikföretagen, the Association of Swedish Engineering Industries, Swedish firms' expansion in China has not been at the expense of activity in Sweden. According to the study, the main activity in the mid-1990s was exports to China. Almost ten years later, most have set up manufacturing for the local market. A smaller number also has manufacturing in China for export, primarily within the telecom sector (Rune and Sadegh, 2005). Some companies have also set up R&D operations in China, primarily within telecoms, power technologies and pharmaceuticals. There is also extensive purchasing activity ("sourcing") in China. Some leading Swedish multinational companies are estimated to purchase more for their global activities than for Swedish imports from China.

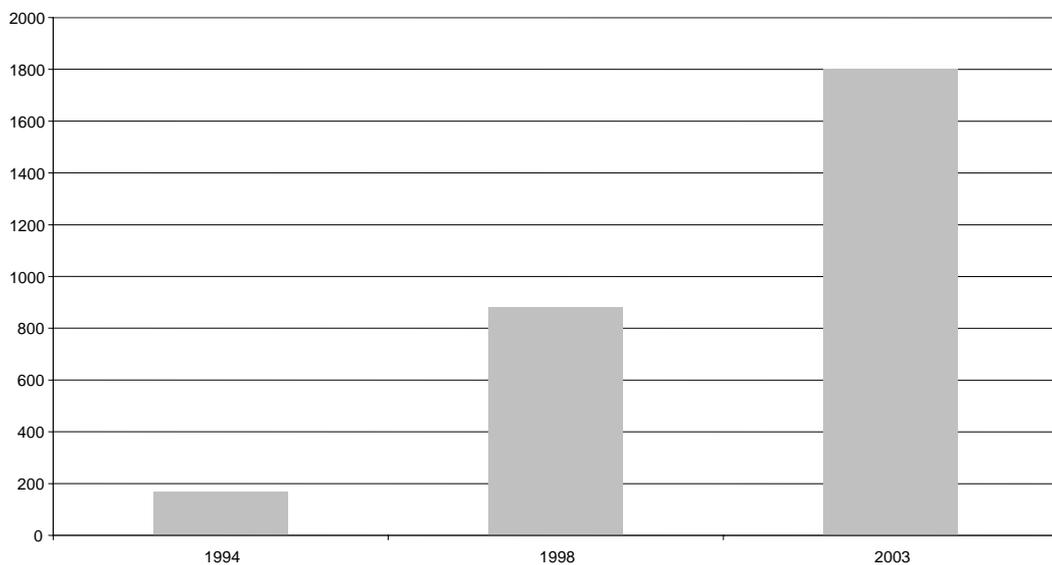
4.2.1 The presence of Swedish companies in China is growing fast

Investment by Swedish companies in China is comparable with other relevant countries in terms of size. Swedish companies setting up operations in China are predominantly large companies within heavy industry with manufacturing. Small and medium-sized companies, and service companies form a much smaller part of this presence in terms of volume and number of employees. The most important reason for setting up in China has been the size and potential of the market. Some companies make purchases in the country for their global activities. Few other company functions have so far been located in China, but it is

becoming more common to locate product adaptation there as well as some product development and, for some companies, also research.

In the 1980s few Swedish firms invested in China. Between 1979 and 1986, there were six Swedish investments in China, of which two were government-subsidised. Between 1987 and 1992, there were only two investments in China. Swedish investment picked up in 1992 when a number of Swedish companies took the step towards establishing production in China. But the real upswing began in 1993 when 15 investments were made. By the turn of 1998/1999, 40 Swedish companies had invested 882 million USD in 97 different projects in China. This figure includes a clear majority of big Swedish investments, but most of the representative offices are not included. In a study by the embassy, it emerged that 93 companies had invested 2.8 billion US dollars up to 2004.

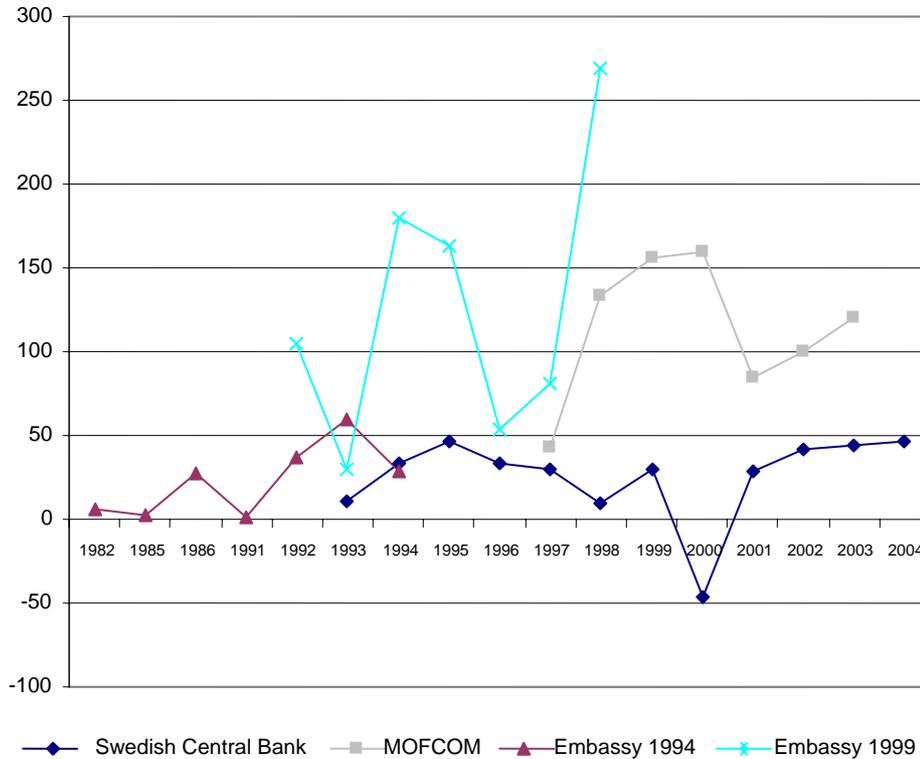
Figure 28 Accumulated Swedish direct investment in China (millions of US dollars)



Source: Embassy

Figures on Swedish investment differ greatly depending on the source (see Figure 29). The embassy information comes from a survey carried out among a majority of the member companies of the Swedish Chamber of Commerce in China. The official information from MOFCOM reflects investments by Swedish registered companies in China but misses Swedish-related companies with head offices in other countries. The information from the Swedish Central Bank underestimates investment as it only registers outflow from Sweden to China. The financial source of the investment may come from another country however.

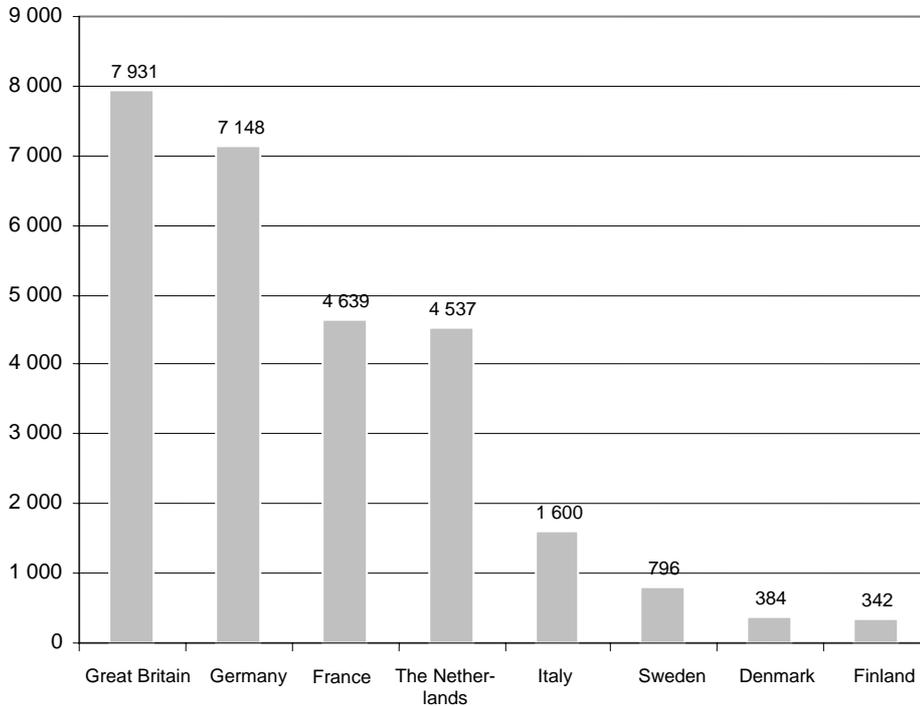
Figure 29 Swedish investments in China per year (millions of US dollars)



Source: Swedish Central Bank, MOFCOM, Embassy

The statistics reflect that Swedish companies have invested to a level which is comparable with other relevant countries, such as Germany and Finland, for example (see Figure 30). Official Chinese statistics show that Sweden invested almost 800 million US dollars during the period 1997-2003. That was slightly more than one tenth of Germany’s investment, which roughly reflects the relative magnitude of the Swedish and German economies. According to the embassy’s analysis, however, the real investment volume, is much higher. It is therefore reasonable to believe that Swedish firms are well-established in China.

Figure 30 Direct investment in China by some European countries 1997-2003 (millions of US dollars)



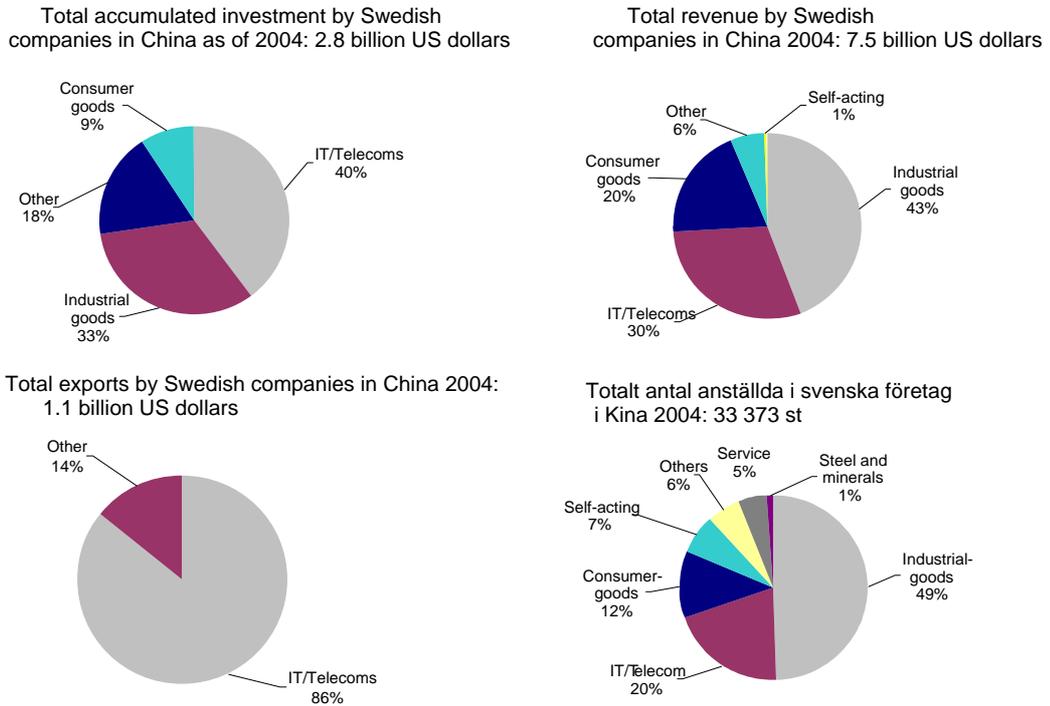
Source: MOFCOM

Swedish firms' sizable investments are also reflected in the growth of the number of employees in Swedish groups of companies in China. In 2004, Swedish companies had at least 33,000 employees in China. The number of employees in Swedish companies in China has continued to grow since 1997 according to an investigation by ITPS, in contrast to, for example, India and to the total number of employees in Swedish companies abroad. The majority of employees work in machinery production. Telecom products, motor vehicles and other machinery account for two thirds of all employees in Swedish companies in China. The service sector accounts for a negligible share of employees of Swedish companies in China so far. Thus, compared with the whole world where services account for approx 41 per cent of all employees abroad, services account for less than 2 per cent of all employees of Swedish companies in China (ITPS).

4.2.2 Large-scale manufacturing industry dominates

In 2004, the Swedish presence in China was dominated by large-scale manufacturing industry. Nine out of ten persons in Swedish companies in China worked for large companies with 250 employees or more. Companies within engineering, especially within energy and IT/telecoms, contributed 73 per cent of the total investments up to 2004. These companies employed 69 per cent of all staff in Swedish companies in China. In terms of revenue, they accounted for 73 per cent (see Figure 31).

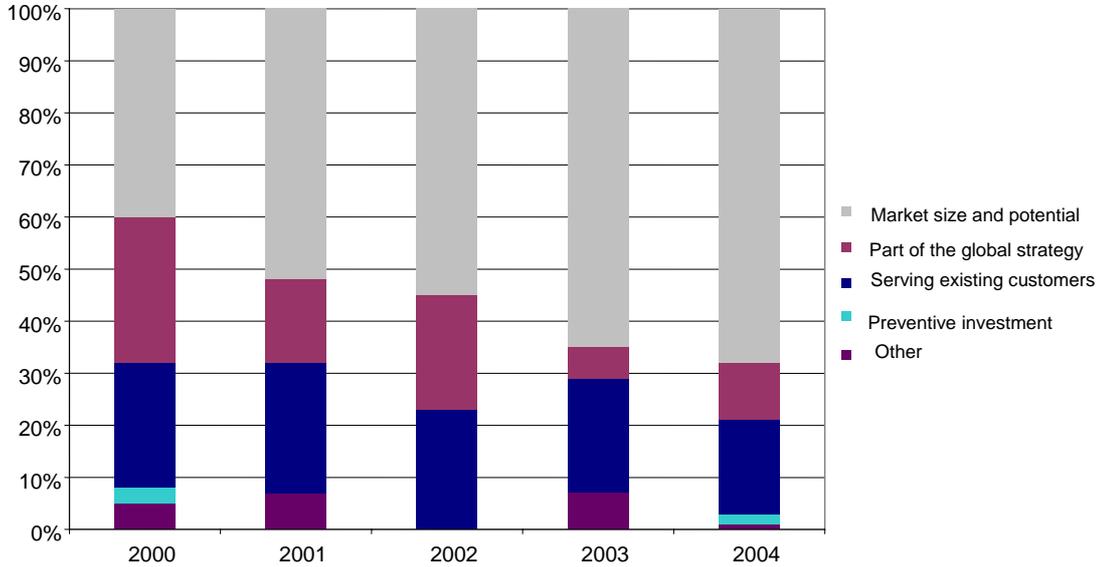
Figure 31 Swedish companies in China and their investments, revenues, exports and number of employees per sector in 2004



Approximately four out of ten companies in China had local production of engineering products or consumer goods, which corresponds to investments. Just over a third were active in the service sector. The rest were primarily considered to be involved in sales and marketing. Data collected by ITPS shows that Swedish service companies are underrepresented in China compared with their activities worldwide.

Most of the Swedish companies that have made their way to China have done so for market reasons, attracted by the size and potential of the market. Since 2000, this motivation has grown in strength. A smaller share of firms, approx one fifth, have followed their customers to China. So-called “strategic” reasons are becoming less important grounds for setting up in China (see Figure 32). Examples of strategic reasons may be local-content rules or other requirements by the Chinese government.

Figure 32 The main reasons for going to China



Source: Business Confidence Survey 2004, Swedish Chamber of Commerce in China.

4.2.3 Purchasing are bigger than Swedish imports

Swedish companies appear to be well established in China in terms of purchasing for their global operations. Large Swedish companies such as H&M, IKEA, Ericsson, Electrolux and ABB are estimated to buy and export for approx 6 billion US dollars. This is more than double Sweden’s exports to and imports from China. H&M reportedly makes a third of its purchases in China (*China Daily*, 1 September 2005). According to a study by the consultancy firm Accenture, companies with head offices in Sweden represented five per cent of all the so-called international purchasing offices, which put Sweden in fifth place behind the USA (36 per cent), Germany (17 per cent), France (eight per cent) and the Netherlands (five per cent).

A survey conducted by Föreningssparbanken in March 2005 of approximately 100 purchasing managers and persons with purchasing responsibility in Swedish companies clearly showed that a growing number of Swedish companies are looking to China. In the survey, China was ranked as the most interesting purchasing country and the purchasing market with the best export potential (Föreningssparbanken, 2005). China also ranked first as the best purchasing country within the segment “low tech/lower mid tech” and fourth best purchasing country within the segment “higher mid tech/high tech” behind Sweden, Germany and Finland, but ahead of Poland and others. China is not only considered an attractive purchasing country within high tech. Swedish companies are also increasingly beginning to consider China as a possible location for their R&D.

4.2.4 Growth of Swedish R&D in China

So far, activities by Swedish companies in China have been aimed mainly at production, purchasing and sales. In recent years, however, some companies have set up product development and a few even research and design in China. This is a relatively new and

growing phenomenon. According to von Zedtwitz, there were 199 R&D facilities by foreign companies in China in the beginning of 2004 (von Zedtwitz, 2005). The trend was partly, but not fully, explained by the Chinese Government's policy to encourage companies within certain sectors, e.g., telecoms, energy and transport, to set up such activities locally. In some cases, the investment has even proved commercially profitable. Ericsson, Sony-Ericsson, ABB, Astra Zeneca and Electrolux are some of the companies with at least one R&D facility in China. Ericsson, for example, has R&D offices in Beijing and Shanghai that also contribute to the whole group's R&D. Sony-Ericsson is developing mobile phones in their entirety at its facility in Beijing. ABB has several R&D offices. IKEA plans to locate a global design centre in Shanghai.

ABB, Astra Zeneca, Sony-Ericsson and Eriksson have moved parts of their strategic or global R&D operations to China. These four companies employ a total of between 1000 and 1500 R&D staff in China. The figure is even higher if one includes R&D work contracted out to wholly owned Chinese companies. Some companies, such as Ericsson, are also planning a substantial increase in R&D employees in China in coming years. About ten other Swedish companies (e.g. Volvo Penta, SKF and Sandvik) have product development for the Chinese market in China.

Table 8 R&D activities in China by Swedish or Swedish-related companies¹

Company	R&D centre, (year and place of setting up)	Type of R&D activity	Number of employees within R&D ²	Other activities in China	Comment
ABB	Beijing (2005) branch in Shanghai (2005)	Global R&D centre (one of ten in the world)	20-50	Manufacturing, sales	China is the third largest market. A total of approx 8,000 employees in China
Astra Zeneca	Shanghai (2002)	Clinical research institute (East Asia Clinical Research Institute)	approx 100	Manufacturing, sales	The biggest international companies in China within prescription medicines; growth of approx 30% per year in China; a total of approx 1,800 employees in China; cooperation with Shanghai Jiaotong University and others.
Electrolux	Shenzhen (2003) Shanghai (2004) Changsha (2004) Hangzhou	Electronic development centre, global design centre, some product development for the world market (fridge-freezers, hot goods)	approx 50	Manufacturing, sales	A total of approx 2,000 employees in China
Ericsson	Beijing (1999) Chengdu (2004) Dalian (2005) Guangzhou (2005) Nanjing (2005) Qingdao (2004) Shanghai (1997)	7 R&D centres, some R&D for the world market	approx 750 (approx 20% of the total no of employees in China)	Manufacturing, sales	China is the second largest market; the leading supplier on the Chinese mobile market.
Sony Ericsson	Beijing (2002)	Global R&D centre (one of four in the world)	approx 100	Manufacturing, sales	China is the world's largest mobile telephone market; a total of 6,000 employees, of which 1,000 are full-time
IKEA	Shanghai (being planned)	Global Design Centre		Purchasing, sales	
Trelleborg	Shanghai (2004)	Technology centre for Trelleborg Automotive; Technology and development for China and the Far East		Manufacturing, sales	a total of approx 400 employees in China
Assa Abloy		Some product development for the Chinese market.		Manufacturing, sales	
Atlas Copco		Some product development for the Chinese market.		Manufacturing, sales	
Munters		Some product development for the Chinese market.		Manufacturing, sales	
Nolato		Some product development for the Chinese market.		Manufacturing, sales	
Sandvik		Some product development for the Chinese market.		Manufacturing, sales	
SKF		Some product development for the Chinese market.		Manufacturing, sales	
Tetra Pak		Some product development for the Chinese market.		Processing, sales	China's biggest market since 2002

Volvo Group		Some product development for the Chinese market (particularly market-adaptation within Volvo Penta)		Manufacturing, sales	
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- Companies that currently have strategic R&D activity in China, i.e., R&D activity that consists of more than just product adaptation for the Chinese market.
- Companies planning or about to build up strategic R&D activity in China.
- Companies whose R&D activity in China consists mainly of product development or product adaptation for the Chinese market.

¹ Swedish-owned companies, or companies with relevant links to Sweden

² It is very difficult to obtain reliable and comparable figures on R&D employees. The figures in the table are a rough estimate. The estimate covers companies whose R&D activity in China consists of more than just product development and product-adaptation for the Chinese market.

Source: The data for the table has been compiled by a combination of reading annual reports, web pages and interviews.

For several reasons, it is difficult to paint an accurate picture of R&D activities by foreign companies in China. The figures of R&D employees in Swedish companies in China only reflect part of the actual R&D effort in China. Many Swedish and other foreign companies have R&D cooperation with, or buy R&D services from, Chinese companies. In addition, R&D is one of the companies' most strategic and therefore sensitive activities, which means that they are not always keen to disclose how much or what kind of R&D they have and where. A third reason why it is difficult to gain a clear picture of the extent of R&D activities by foreign companies in China is that China sometimes requires companies to set up R&D activity there, even if this is not in the companies' interest, in order to manufacture or sell in China. Consequently, some of the foreign companies' R&D activities in China sometimes exist more on paper than in reality. Gassman and Han, 2004, observe that preferential treatment and government incentives for foreign R&D facilities may induce some foreign firms to register their activities as R&D even if their activities would not otherwise be classified as such. In spite of the difficulties of obtaining reliable data on R&D operations in China, it is safe to say that there is a relatively new but clear trend of companies setting up R&D activity in China and, not just, with the aim of conducting product development for the Chinese market.

4.2.5 Few Chinese companies in Sweden

The presence by Chinese companies in Sweden is still modest. In 2004, there were fewer than 20 Chinese companies with a total of less than 250 employees in Sweden (ITPS). Some investments have made big headlines, however, including the setting up of research facilities by the telecom companies Huawei and ZTE in Kista. Earlier this year, the steel manufacturer Baosteel announced that it would invest in research in Sweden. Other Chinese investment is very small.

Recently, Chinese companies have set out to expand their presence abroad. This trend is partly driven by the appeal from the Chinese government to large companies to find new markets and 'go abroad'. Last year, China invested around four billion US dollars abroad. In Germany, more than 1000 companies have set up operations, many of them through mergers and acquisitions.

Sweden's agency for promoting investment, Invest in Sweden Agency (ISA), has been present in China since 2002. In 2005, ISA took a number of important initiatives aimed at increasing Chinese direct investment in Sweden. One of the events ISA arranged was a visit by a large media delegation of journalists from some 20 of China's most important newspapers and news agencies to Sweden to give the journalists the opportunity to learn more about Sweden's strengths within different knowledge- and technology-intensive trades and research environments. In the autumn of 2005, a delegation consisting of approximately 200 Chinese business people, representing 100 companies, came to Sweden to participate in a high-tech fair to investigate the potential for strategic cooperation between Swedish and Chinese companies. The delegation was led by China's Ministry of Commerce (MOFCOM) and is the largest Chinese industrial delegation so far to travel abroad under the leadership of MOFCOM. In the past year, ISA has noted a strong increase in interest among Chinese companies for making direct investments. On China's side, the greatest interest in direct investment in Sweden seems to be within IT, biotechnology, motor vehicles and natural resources.

4.3 Flows of human capital/knowledge

Swedish researchers and companies are working successfully with Chinese partners and in China. Sweden is among the leading non-Asian countries in terms of the number of co-published articles with Chinese researchers and patents in China. Academic research cooperation is strongly driven by individuals, however, thus, there is an apparent lack of more structured and strategic cooperation with China. Student exchanges, which are an important building block for productive future economic relations, are underdeveloped. Too few Chinese students are going to Sweden and too few Swedes are studying in China or about the Chinese economy. Student exchanges between China and Sweden are low compared with other countries and fall short of Sweden's significant potential for attracting Chinese students. There is currently no general overall strategy for the line Sweden should take with regard to the large human capital resources currently emerging in China.

4.3.1 Active research cooperation

Cooperation between Swedish and Chinese researchers is quite well-developed and productive when compared with other countries in terms of research agreements, co-publications, and patents. Today, approximately 25 Swedish universities and colleges have an estimated 60-70 cooperation agreements with Chinese universities. The agreements apply to research cooperation as well as exchange arrangements. It is worth mentioning, however, that some of these agreements (especially with regard to research agreements) exist only on paper, i.e., they have not led to any tangible cooperation apart from a possible initial visit to the respective institutions/universities.

One way of measuring the results of research cooperation is through co-published scientific articles. Co-publications between Swedish and Chinese researchers have continuously increased over the last five years, both in absolute numbers and as a share of the total number of Swedish scientific articles. In 2002, around 250 articles, or just over one per cent of all Swedish articles, were published in cooperation with Chinese researchers (Thomson Scientific Inc. and the Swedish Research Council). Between 2000 and 2004, approximately 1100 articles were published by Chinese and Swedish researchers. Co-publications increased by an average of roughly 25 per cent per year. Sweden had more than twice as many co-publications with China as its Nordic neighbours Norway, Finland and Denmark, but also many more than, or almost as many as, countries with more inhabitants such as Spain, Austria and the Netherlands (see Table 10).

Table 9 Co-publications with China, 2000-2004

	Only the People's Republic	
USA	19785	19499
Germany	5115	
England (not Wales etc.)	4426	
France	2549	
Holland	1126	
Sweden	1101	1097
Spain	768	
Denmark	501	
Austria	468	
Finland	361	
Norway	345	

Note: The figures should be seen as provisional, as not all the articles for 2003 and 2004 have been included yet.

Source: Thomson Scientific Inc. and Swedish Research Council.

Research cooperation between Sweden and China is concentrated primarily in the so-called "old universities" in Sweden. The Swedish universities that published most articles with Chinese researchers were the Karolinska Institute, Lund University and the Royal Institute of Technology (KTH). Together, they accounted for almost half of all co-publications between 1998 and 2003. Co-publications between Chinese and Swedish researchers are concentrated to the fields of physics, clinical medicine and biomedicine. These three subjects represent over half of all co-produced articles between Swedish and Chinese researchers between 1998 and 2003.

Bearing in mind that Sweden is one of the top publishing countries (in relation to its population) in the world, it may not be surprising that there is a relatively large number of co-publications with Chinese researchers. One important question is whether the publication cooperation between researchers is a sign of, or leads to, practical and productive cooperation and spillovers in the form of knowledge exchange and dissemination to a wider circle of researchers and companies in both countries, or whether the effects and benefits are limited to the authors.

4.3.2 Student exchanges are still limited

Student exchanges between Sweden and China are still relatively underdeveloped and, at least from Sweden's side, limited mainly to language and cultural studies. Thus, few Swedish engineers or economists travel to China to study. Furthermore, Sweden attracts few Chinese students compared with other countries. In the academic year 2002/2003, Sweden hosted approximately 900 students, or 0.3 per cent of Chinese foreign students, which was fewer than, for example, Denmark, Finland and Belgium (UNESCO).

Similarly there are relatively few Swedish students studying at Chinese universities. In the academic year 2003/2004 there were 101 students in China with study grants, which was 0.4 per cent of the total number of Swedes studying abroad (Swedish National Board of Student Aid, CSN).

Table 10 Chinese students abroad 2002/2003

Recipient country	Chinese students	Share of totals
US	92774	33.89%
Japan	51656	18.87%
UK	30690	11.21%
Germany	20141	7.36%
Australia	17343	6.34%
Canada	11700	4.27%
Malaysia	10849	3.96%
France	10665	3.90%
New Zealand	8481	3.10%
Republic of Korea	4025	1.47%
Netherlands	1371	0.50%
Finland	1107	0.40%
Cyprus	1091	0.40%
Philippines	1088	0.40%
Belgium	1062	0.39%
Denmark	1042	0.38%
Thailand	944	0.34%
Sweden	868	0.32%
Norway	316	0.12%

The figure for Canada is from International Trade Canada for 2001

The figure for Thailand is for 2001/2002

Source: UNESCO Institute for Statistics

It is difficult to obtain reliable and comparable figures on Chinese students abroad. According to the Swedish Migration Board, between 2001 and 2005 a total of 2300 residential permits were granted for Chinese guest students at Swedish colleges and universities. The real number of Chinese students in Sweden is probably lower however, as some of them can be expected to have left Sweden during this time and some may no longer be in Sweden to study. In addition, some Chinese students come to Sweden to study

but never actually commence their studies (the Swedish Migration Board, 2005).²⁰ The real number of Chinese students in Sweden is therefore somewhere between the number shown in Table 10 and the number of residential permits granted to Chinese guest students, i.e., between 868 and 2300. There are no indications, however, that the margin of error in UNESCO's database is significantly higher for Sweden than for other countries. It can therefore be concluded that there is great potential, and good arguments, for increasing student exchanges between China and Sweden. This impression is reinforced further by the significant increase in recent years in the number of Chinese who travel abroad to study. The EU's share of Chinese guest students has continued to grow while that of the USA and Japan has fallen (Schaaper, 2004).

4.3.3 Swedish companies are expanding their R&D activities in China

Swedish corporate R&D is active and well represented in China. In 2004, 841 patents were approved from Sweden. Sweden was thereby the third largest EU country in terms of patents approved by the Intellectual Property Office of China, SIPO (see Table 12). Sweden had more approved patents than, for example, Great Britain and Italy.

Table 11 Approved patents by foreign companies in China

Position	Country	2001	2002	2003	2004	1985-2000	1985-2004
	<i>Total</i>	14973	20296	32638	38910	55414	162231
1 st	Japan	5577	7817	12674	16356	19722	62146
2 nd	USA	3116	4259	6835	7824	13576	35610
3 rd	Germany	1494	1767	2799	3379	4564	14181
4 th	South Korea	1024	1703	2693	2865	2159	10444
5 th	France	782	730	1180	1541	2684	6917
6 th	The Netherlands	360	514	868	1276	2120	5138
7 th	Switzerland	562	733	913	1084	2430	5722
8 th	Sweden	277	480	832	841	851	3281
9 th	Great Britain	370	465	808	787	1844	4274
10 th	Italy	258	352	531	506	1083	2730

Source: State Intellectual Property Office of China (SIPO) (2005).

²⁰ The Swedish Migration Board recently presented a report that looked at the extent to which guest students outside the EEA complete, or even start, studies in Sweden. One of the conclusions that can be drawn from the study is that some of the Chinese who were granted residence permits for guest studies between 2001 and 2005 either never started their studies or did not complete their studies but remained in Sweden without valid permits (The Swedish Migration Board, 2005). China does not differ significantly in this respect from other countries outside the EEA that took part in the study.

5 Challenges and opportunities facing Sweden and Swedish firms

5.1 China's growth means new challenges for Sweden...

China's economic growth poses challenges that affect the whole world, e.g., environmental pollution, the consequences of a possible major economic crisis in China ("what happens if China crashes?") and potential dramatic changes in China's conduct in the international political arena. China also poses a big threat to many countries due to the direct competition within low-cost production that, in turn, is part of the globalisation trend. In this section, we will focus on challenges emanating from China's economic growth and which are of particular relevance to Sweden and the Swedish economy. One example is the specific challenges resulting from China's focussed investment in knowledge-intensive industries, in which Sweden has a major interest.

Sweden already faces tough competition from China with regard to production. In the future, Sweden will also compete for R&D, jobs and manufacturing within knowledge-intensive and, for Sweden, important sectors such as telecoms, energy, vehicles, etc. China combines rapidly growing knowledge resources with a determined economic and technology policy – with the express aim of turning China into a strong industrial and knowledge nation – and a large, rapidly growing market. This combination is attracting an increasing number of international companies to move their production to China, and this in turn takes with it R&D activities.

When talking about challenges and opportunities, it is important to remember that these are not always, and by definition, the same for Swedish companies as for Sweden as a country. Some challenges facing the country (e.g. the transfer of jobs, moving out headquarters) may not be challenges for the companies, on the contrary, they may be opportunities or necessities to safeguard competitiveness. The fact that Swedish companies, big and small, are successfully setting up in China and competing with Chinese companies on the global market, however, is decisive to the future growth and welfare of Sweden as a country.

5.1.1 China as a growing knowledge hub

One of the biggest economic and strategic challenges facing Sweden, and most of the other industrialised countries, with regard to China's growth will be the competition for knowledge resources and China's growing role as an important knowledge base. China's rapidly growing supply of internationally competitive human capital, together with the growing importance of the Chinese market, is already a strong attraction point for highly qualified labour and international companies when considering where they want to work and carry out their research. Targeted R&D investments (e.g. telecoms, vehicles, medicine /biotechnology) further reinforce these attraction points and thereby increase competition for some sectors that are important to Sweden.

China is far from becoming a high-tech country, but there are many signs suggesting that it is reaching a critical mass in terms of its accumulation of knowledge resources and that it is building up a strong global knowledge base, in terms of both quality and quantity. In addition to R&D expenditure, the number of engineers, articles and patents is growing faster than in any other country. Even if high technology constitutes a small share of China's economy (and will continue to do so for many years), its high-tech sector is very large in absolute terms (number of engineers etc) compared with other countries.

Chinese research is also starting to become very strong and internationally competitive within certain sectors such as IT, telecoms, nanotechnology and biotechnology. Here, there are large overlaps in areas of strength with Swedish research competencies, which creates opportunities for strategic cooperation as well as challenges in the form of competition (for labour, companies, jobs) from China.

In the 1980s and much of the 1990s, foreign companies' establishment of R&D in China was driven primarily by product adaptation to the domestic market and location requirements by the Chinese Government. In recent years, however, there has been a clear trend for multinational companies to set up significant, and sometimes strategic, R&D activities in China. Today, the transfer of R&D to China is increasingly driven by the growing strategic importance of the Chinese market and by the supply of good and inexpensive human capital in China. The development has led to growing concern by many developed countries that, in the future, multinational companies will set up R&D in China at the expense of R&D facilities in Europe or the USA.

One real challenge facing Sweden as a country is to address the growing human capital competition from China in a positive and proactive way. Some countries, such as Finland, are currently formulating strategies for Asia and China within the area of science and technology in order to tackle challenges as well as opportunities that emanate from China with regard to human capital. These strategies include visions or goals for research cooperation as well as student exchanges.

5.1.2 Chinese economic policy and barriers to trade

Chinese economic policy, which aims to build up the country's industrial and technical capacity, is a particularly important challenge for a country such as Sweden. Swedish industry is very greatly affected. Much of Sweden's trade is concentrated in so-called strategic sectors, especially telecoms, energy and vehicles, which account for 44 per cent of Swedish exports to China and most of the Swedish investments in the country. China has big ambitions to become a leading actor within these sectors. With the aid of economic policy, the development of these sectors in China has advanced considerably.

In these sectors, foreign companies wishing to gain access to the Chinese market are required or 'encouraged' to transfer manufacturing and some R&D to China. The State controls the energy market through public procurement, and telecoms through its ownership. The private car market is protected by high duties, and cooperation with a local partner and local procurement is a prerequisite for being able to sell in China.

China's telecom industry is already internationally competitive. Multinational companies, including Ericsson, export from China and a few Chinese companies, such as Huawei, have entered the international market. An increasingly technically knowledgeable energy sector is developing in China with some export successes. Most of the automotive manufacturers have set up operations in China but have not yet started to export. The State has very large ownership in all these industries. Telecoms and vehicles are two prioritised sectors in the large state research programmes. The aim is to become a world leader within these areas in the foreseeable future.

Chinese economic policy has laid the foundations. As conditions improve, e.g., in the form of market size, technical knowledge and the presence of subcontractors, there are growing incentives to move an increasing amount of manufacturing and R&D to China. This is sensible from an individual company's point of view. For Sweden as a manufacturing country, however, this poses a very big challenge.

5.2 ... as well as great opportunities

5.2.1 A promising market...

China's large and rapidly growing market offers great opportunities for Swedish companies, which is reflected in the fact that almost all categories of companies having made their way onto the Chinese market in search of customers. So far, however, investment in China is driven primarily by the big Swedish export companies within heavy industry, telecoms, energy and vehicles.

In the future, there is scope for continued growth within the traditional export industry as well as within service exports, particularly for business-related services, education and tourism. There are also great opportunities for Swedish companies to improve their international competitiveness by setting up more manufacturing for export in China, which can also drive Swedish exports. We also see a considerable potential for investment by Chinese companies to contribute positively to jobs in Sweden and to increased exchanges with China.

5.2.2 ...for Swedish products

Given the continued rapid industrial development, the conditions for continued export growth by engineering companies are good. A comparison with the Swedish export structure in general and with the import structure of China's neighbours shows significant export opportunities, particularly for paper, iron and steel. It is worth noting that China's domestic production in these sectors is growing. There may also be scope for growth within passenger cars and pharmaceuticals.

In addition to increasing exports within already established sectors, there a number of small, less well-established areas in which the authors foresee be good opportunities to develop Swedish exports to China. These opportunities are driven by a rapidly growing middle class, which is leading to fundamental changes in consumption patterns and a growing need for efficient use of natural resources and reduction in environmental pollution. This is an area with opportunities for Swedish manufacturers of consumer goods and environmental technology.²¹

Big environmental problems combined with China's growing consumption of natural resources, the inefficient use of these resources and increasing scarcity have created a demand for environmentally friendly energy sources, products and technologies (see, for example, *China Daily*, "Energy-efficient vehicles set trend for auto industry", 28 September 2005).²² There ought to be good opportunities here for Sweden and Swedish companies to set up productive cooperation. One example of cooperation within sustainable development that is already underway between Sweden and China, and which

²¹ *The value of China's imports of, for example, fish, dairy products and alcohol has more than doubled between 2001 and 2004 (Comtrade database). Studies also show that the Chinese are keen to buy expensive designer and prestige goods to show off their increased wealth.*

²² *For example, China is among the least efficient users of water (Miller, 2005).*

involves the public sector as well as industry, is the project “Sustainable City”, a state-funded project aimed at marketing Swedish environmental solutions for sustainable city development.

5.2.3 ... and services

The service sector offers great opportunities that have not yet been fully realised. In the long term, it may be possible for service exports to China to reach the same level as for Japan. This means that they would correspond to almost half a billion US dollars, or about one fifth of current goods exports.

Perhaps the least-explored sector is education, which shows very large potential. The Chinese demand for foreign university education is high. Every year, at least 200,000 Chinese study at universities abroad and the number is expected to grow. A large proportion pays for its own education. Sweden is currently underrepresented among the students’ choices of study location. Swedish universities have a good name in China, however, and could become very attractive to students. A recent ranking of the world’s best universities carried out by the “Institute of higher education” at Shanghai’s Jiao Tong University had four Swedish universities in the top 100.²³ This puts Sweden in seventh place, after the USA, Great Britain, Germany, Japan, Canada and France, and ahead of countries such as Australia, the Netherlands and Switzerland. In relation to population size, Sweden is in first place, far ahead of all other countries. Today, Swedish universities and colleges offer almost 300 *Masters* programmes and 3000-4000 courses in English (National Agency for Higher Education, 2005). The importance of the Nobel Prize, creating a trademark for Sweden as a world-leading knowledge nation, cannot be underestimated.

There is great potential to develop a profitable education industry with Chinese students as an important customer base. Chinese students are the biggest foreign group of students in Germany, and in Great Britain foreign students contribute between 10 and 23 million pounds (Johnes, 2004).²⁴ Furthermore, there are positive, dynamic effects if these students then stay and work or run businesses with China. Some Swedish universities work actively to attract Chinese students and to increase exchange and cooperation between Swedish and Chinese researchers. The universities of Lund and Uppsala, for example, are carrying out a number of activities within research cooperation and student exchanges with Chinese universities and are the only Swedish universities with a Chinese homepage. Lund University has also recently employed a professor of Chinese economy. The Karolinska Institute (KI) has cooperation agreements with a number of universities in or around China, and in May 2005 it had about 100 graduate students from China. KTH and Chalmers have cooperation with universities in or near Shanghai.²⁵ In autumn 2005, KI, KTH and Chalmers opened joint offices at Beijing University and Fudan University. Some Swedish companies have identified this education potential. EF and Worldlink Education are examples of Swedish companies that already run language education programmes on location in China.

²³ <http://ed.sjtu.edu.cn/rank/2005/ARWU2005TOP500list.htm>. The universities were ranked according to a combination of different indicators of research quality.

²⁴ The USA and Australia are estimated to have earned 13 billion US dollars and 4 billion US dollars respectively from educating foreign students (IIE, 2004 and Pearson, 2004).

²⁵ In 2003, KTH opened a joint research centre in photonics with Zhejiang University in Hangzhou (Joint Research Center of Photonics).

There is also a potential to develop tourism. Today, Sweden is underrepresented as a travel destination for Chinese tourists. Denmark and Finland are more popular travel destinations than Sweden. At the same time, the World Tourist Organisation (WTO) predicts that the number of Chinese tourists abroad will grow fast and that they will spend more money on travel. Chinese tourists are expected to become the absolute biggest growth engine in tourism the world over in coming years (WTO, 2003).²⁶ In Sweden, the great potential of Chinese foreign tourism has attracted attention in a study published by the Swedish Tourist Delegation in autumn 2004 with the title *Kina – möjligheternas marknad. Förutsättningar för den svenska turistnäringen* (Swedish Tourist Authority 2004).

Business services are another area with great potential. The Confederation of Swedish Industry pointed out IT/telecom services as being of particular interest in China. This is confirmed by the Swedish Trade Council in China, which registers a strong interest in such companies. There are also many examples of individual and small Swedish consultants within marketing, architecture, personnel, etc running businesses in China, often for existing customers that have moved their businesses to China. Here the local networks of Swedes is very important.

Transport is another service area that could continue to see rapid growth, especially if Chinese imports and exports continue to grow fast. One example would be transport of vehicles for export, where the Wallenius shipping companies have a leading position in the world. Another is increased oil imports, where the shipping company Stena has a strong position.

5.2.4 More exports from China

It ought to be possible for Swedish companies to expand their production in China to export to their global operations with the aim of improving their international competitiveness. Today, this takes place primarily within the telecom sector. There are likely to be other opportunities to export more from Sweden in the form of input goods. Another possibility is to purchase more for the global market in China.

5.2.5 Important opportunities and difficult challenges for small and medium-sized companies

Small and medium-sized companies (SMEs) have not yet played a particularly large role in the Swedish-Chinese economic exchange. They are underrepresented in trade with and investment in China. At the same time, both the Swedish Trade Council and Almi Företagspartner report a strong increase in interest among SMEs for China. Given their important role in the service sector, they could prove important for the regeneration of Swedish exports, especially with regard to technology and services.

However, SMEs face special challenges in China. It is comparatively much more difficult for SMEs than for large companies to enter the Chinese market. Firstly, most SMEs lack the resources required to establish themselves in China. SMEs face special recruitment problems (difficulties to recruit) and big “learning costs”. Staff turnover is high within

²⁶ *The WTO estimates the number of Chinese tourists to grow from 12 million in 2001 to 100 million in 2020 or by an average of approx 13 per cent per year between 1995 and 2020. Rapidly growing prosperity and, above all, a growing middle class combined with the abolition of restrictions for the Chinese to travel abroad and the introduction of paid holiday are behind this dramatic growth in the importance of Chinese tourists to the international tourist industry.*

foreign companies in China, which is a big problem for SMEs, with business in China often depending on a few key persons.²⁷ They also often face cutthroat competition. For many companies, the first few years in China are burdened with heavy losses, which are more difficult for a small company, with limited financial assets, to shoulder. For many SMEs, the vast geographic distance also poses a big problem, which prevents them from, for example, being able to make use of the huge opportunities China offers as a purchasing country (Föreningssparbanken, 2005). Finally, language problems and cultural aspects are another challenge that is often mentioned by SMEs in connection with China.

Secondly, Chinese trade barriers are particularly difficult for SMEs to overcome. In particular, SMEs point to the formal requirements of an investment, e.g., the number of local employees and the technical difficulties to import their products. SMEs are probably also in a worse position to protect themselves against breaches of their intellectual property rights.

For Sweden as a manufacturing country, it will be a challenge to support SMEs to enter the Chinese market:

Most small and midsize manufacturing companies must face up to the challenges posed by China or risk being squeezed out of their home markets in the years ahead (Orr, 2005).

SMEs face special challenges in China, compared with large companies or the terms for SMEs in other countries, within issues of intellectual property rights. Thus, for example, China's patent legislation requires patent applications in China to be made by a registered Chinese patent service, which foreign investors must use (Walsh, 2003).

5.2.6 Greater presence by China in Sweden

There ought to be good potential to increase Chinese investment in Sweden, when compared with Chinese investment in, for example, Germany and the large purchases made by Chinese companies in the raw materials sector and heavy industry. Here, there are opportunities to strengthen exchanges with China and the number of jobs.

For Swedish consumers, Chinese imports mean scope for cheaper goods and a greater supply. The same applies to manufacturers of imported input goods.

²⁷ Staff turnover in foreign companies in China increased from 8.3 per cent in 2001 to 14 per cent in 2005 (China Daily, "Message to employers: Staff want more cash", Sept. 27, 2005, p. 2).

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Appendix: Interviewees

Below is a list of persons to whom the authors have spoken in connection with, or who have contributed input to, the report.²⁸ Input from these persons (plus those who prefer to remain anonymous) has proved a valuable and important contribution to the report. The conversations took place between April and October 2005. The content and conclusions of the report do not necessarily reflect the views of the persons interviewed and the authors take full responsibility for these.

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Xinyu Yang, Deputy Director General, China Scholarship Council

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plus a number of representatives (mostly of Swedish companies) who prefer to remain anonymous.

The Swedish Institute for Growth Policy Studies (ITPS) is a Government Agency responsible for providing policy intelligence to strengthen growth policy in Sweden. ITPS primarily provides the Government Offices, Members of the Swedish Parliament, other state authorities and agencies with briefings based on statistical material, policy papers and key analyses. Business policy and regional development policy are areas given high priority.

Changes in policy should be based on:

- Statistic data and analyses of the structure and dynamics of industry – to obtain an up-to-date view of future challenges and opportunities.
- Evaluation of results and effects of policy measures and programmes – to provide benchmarks and learn from measures implemented earlier.
- Policy intelligence in order to look outwards and ahead – what issues are likely to come on the growth policy agenda in the future?

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