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Amelie F. Constant • Bienvenue N. Tien •
Klaus F. Zimmermann • Jingzhou Meng

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German Institute for Economic Research
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China's Overt Economic Rise and Latent Human Capital Investment: Achieving Milestones and Competing for the Top

Amelie F. Constant
DIW DC, George Washington University
and IZA

Bienvenue N. Tien
DIW DC

Klaus F. Zimmermann
IZA, DIW Berlin and University of Bonn

Jingzhou Meng
George Washington University

ABSTRACT

We provide an overview of China's economic rise through time. Over the past decade, China has maintained 10% growth in GDP, albeit with a GDP per capita at the low level of a developing country. Its tremendous economic development has overlooked the growing social inequalities and rising resentments of the 'cheap' workers and those laid off. The main contributor to its ascension is international trade and investment in physical capital, often at the expense of the environment. The year 1978 was the landmark for the foundation of the Chinese modern higher education system. Since then the number of students enrolled in Chinese higher education institutions has increased dramatically; China is producing serious scholars and a tremendous amount of scholarly output; more and more Chinese students seek higher education abroad; and international students find a rising interest in receiving education in China.

JEL Classification: F22, J24, N35, O15, O24, O53

Keywords: China, human capital, brain drain, higher education

Corresponding author:

Amelie F. Constant
Executive Director, DIWDC
1800 K Street, NW
Suite 716
Washington, DC 20006
USA
E-mail: constant@diwdc.org

> *"Science has no boundaries. China's endeavors in science and technology need to be more integrated with those of the world, and the world needs a China that is vibrant and able to deliver more in science and technology. Just as collisions generate sparks, exchange and communication enrich imagination and creativity"* (Premier Wen Jiabao, 2008).

Introduction

The cold war era adage "*optimists learn Russian, pessimists learn Chinese*," no longer holds. China's economic ascension has turned the country into the cynosure of (international) scholars and businesses as well as of public policymakers. Fulfilling the criteria[1] that a contender country must meet to become an economic superpower, China *is* now a global economic superpower along with the United States (USA) and the European Union (EU). In fact, as elaborated in Bergsten et al. (2009), China is the second largest national economy and the second largest exporter.[2] It also has the world's largest current account surplus and foreign exchange reserves, thus being "*far more deeply integrated into the world economy than either of the economic superpowers*" (Bergsten et al., 2009, p. 9).

On August 15, 2010, the New York Times headlines read: "*China Passes Japan as Second-Largest Economy*."[3] Tokyo said that Japan's economy was valued at about $1.28 trillion in the second quarter of 2010, slightly below China's $1.33 trillion. As China is now close behind the USA, some forecast that by 2030 China will succeed the USA as the largest super-economy, and the world will have to reckon with it.

While achieving the title of economic superpower is impressive, combining it with the status of being a cocoon of innovation and information technology and of incubating human capital is even more striking. Currently, China is spending, on average, more on research and development than any other major developed economy in the West. It is becoming an attraction pole for expatriates and international students alike and a pioneer in producing scientific papers in natural sciences and engineering. In 2007, 59% of the scientific papers published by Chinese scholars were in natural sciences. The questions we seek to analyze in this paper are whether

[1] The criteria are: (1) it is large enough to significantly affect the world economy, (2) it is dynamic enough to contribute significantly to global growth and (3) it is sufficiently open to trade and capital flows to have a major impact on other countries.
[2] China recently surpassed Germany and became the largest exporter.
[3] Recall that Japan had been the second largest economy, behind the USA, since the 1970s. In fact, in the 1980s the world was predicting that it would overtake the USA.

China is up to par in human capital and information technology with the USA, Japan and Germany, whether it can compete globally in this area, and whether it constitutes a menace to the USA, Japan and Germany's human capital production.

This paper is structured as follows. First, we present an overview of the major historical events that have ultimately shaped China's powerful ascent into the economic arena. We then present China's economic foundations – associated with its international commerce and finance relations with existing global players as well as with major emerging regions or continents, such as Africa. The third section is devoted to China's human capital strategy, its painstaking commitment to fostering and speeding up the progress of science and technology and its evolvement over the last 30 years. In the last section we summarize China's achieved milestones and conclude with possible implications for the 21st century.

I. The Beginning of a People's Nation

On October 1, 1949, Mao Zedong and the Communist Party of China announced the founding of the People's Republic of China (PRC),[4] and successfully accomplished one of their two main goals: breaking China's status as a 'half colony' and thus achieving sovereignty vis-à-vis Japan, the USA, the UK, and France. The second goal of reforming land and property à la Soviet Union resulted in an economic and political disaster. Under Maoism, landowners became dispossessed and previously landless, rural households were given grounds to have and to farm. In 1954, as PRC's leadership ordered a gradual dismantling of the household-based economy, individual properties were merged into larger entities that were collectively managed and cultivated. Similarly, in the cities entire industry and commerce sectors were almost nationalized. Mao's 1958 'Great Leap Forward' was originally aiming at preparing the nation for its transformation into a communist society. Serious energy and resource allocation deficiencies, however, contributed to his failed campaign and resulted in a disastrous country-wide hunger. The Great Chinese famine claimed the lives of more than 20 million Chinese, who died between 1959 and 1961. Mao resigned as the head of state and retreated from active politics although he still

[4] The pre-Mao era, although important, is often neglected. "*Beginning the mid-19th century, China was reduced to dire misery as the country suffered one humiliating defeat after another and the population languished in poverty and starvation as a result of brutal foreign aggressions and corrupt and incompetent feudal rulers*" (President Hu Jintao, 2005, as cited in Das, 2008).

remained the communist party's chairman. With China becoming one of the most autarkic and poor economies in the world Mao's plan was abandoned in 1961.

From 1961 to 1965 other representative members of the communist party assumed leadership and started working on the economic consolidation course. Among them was Deng Xiaoping, later regarded as the chief architect of the 'reform and opening-up policy' (Heilmann, 2005). In 1978, and after Mao's death, Deng Xiaoping became the paramount Leader of China. He officially launched the 'Four Modernizations'[5] (agriculture, industry, science and technology, and national defense), and formally marked China's reform era (Bergsten et al., 2009). A pragmatist, Deng gave to China its political and economic stability. Through the now renowned *Gai Ge Kai Fang*, or 'change the system, open the door' or 'open-door policy' (Das, 2008, pp. 3, 5), within 20 years, China emerged as an economic giant. In the new century and millennium the world's economies cannot afford to disregard China.

Table 1 summarizes the major policy reforms from the late 1970s to early 2000s. Since 1979 China has become an open economy and made a serious presence in international trade. At the same time, the reforms lifted hundreds of millions of Chinese out of poverty and improved their circumstances. Moving full speed ahead into industrialization and changing people's perceptions and thinking was a major task. Attracting Foreign Direct Investment (FDI) and investing in physical capital ensued in the 1990s. The new century found China openly investing in human capital and cognizant of its environmental neglect.

In sum, China traversed through important landmarks: a time dominated by feudal incompetence, which led to political and social disorder as well as to economic turmoil; the time of the Great Leap Forward (1958-1961); and the Cultural Revolution (1966-1976). During the mid-20th century and in particular in the 1960s, the country suffered from severe famines, and its economic fortunes reached their nadir. From 1978 to 1992 Deng's era was a combination of Maoist political elements and broad-based market-oriented macroeconomic reforms and restructuring. A noteworthy remark comes from Svejnar (2007), who compares China to the transition economies of Central-East Europe (CEE) and the Commonwealth of Independent States (CIS). While at the end of the cold war in the early 1990s these countries shared many systemic, initial conditions, China stood apart generating high rates of economic growth. Unlike many of the CEE and CIS countries, China had a more agricultural economy and a more stable political-economic system. Most importantly, it was China's strategic gradual economic

[5] The Four Modernizations were first introduced by Zhou Enlai in 1963.

transformation that maintained the existing system while creating new economic activities that helped the country avoid the transformation depression observed in CEE and CIS.

II. China's Prominence in the Economic Firmament in the 21st Century

China's unprecedented emergence as an economic giant within a couple of decades is uncontestable. Overall, the Chinese economy can be characterized as an economy in full mutation. In this section we focus on China's performance over the last decade vis-à-vis important economic indicators, and juxtapose them to those of other superpowers. We focus on the Gross Domestic Product (GDP) figures, as they are the best available measure of a country's economic well-being. Table 2 depicts China's consumption, investment and net exports as shares of real GDP over time and in comparison to other economies. In 1995 private consumption accounted for 45% of real GDP and government consumption for 13%. In 2008 the same aggregates were 35% and 13% respectively. That is, private consumption decreased by 21% and government consumption did not change. The share of investment, however, increased within this time period. In 1995 investment was 40%, reaching almost 44% in 2008, in spite of the worldwide financial crisis. India's investment was the second highest, at 36% of real GDP. All other Western developed economies, including Germany, Japan and the USA, had investment shares far below a quarter percent of their respective annual GDP.

With regards to net exports, China has also surpassed all others. While in 1995 its net exports were 1.6% of its real GDP, by 2008 they accounted for 7.9%. Table 2 shows that Germany followed closely, with net exports valued at 6.8% of real GDP, and Japan trailed behind with 4.9% of its GDP. The USA's and India's net exports were negative as they were importing more than they were exporting.

For the same five countries Table 3 shows their average GDP growth rates over the period of 2000 to 2008. Compared to all other four economies, China recorded double digit GDP growth (10.2%) during this period. Followed by India, with a GDP growth of 7.2%, China left the other developed countries far behind. At the same time, China's investment and net exports played a key role in its economic emergence. Investment accounted for 5% of the GDP growth, almost twice as high as private consumption. This is a much higher percentage than in the economies of Japan, the USA and Germany urging many observers to remark that China relies

heavily on investment growth (Prasad, 2009). Note that the USA's net exports average contribution to GDP growth was negative over the period 2000 to 2008.

In the context of the recent worldwide 'great recession,' China continues to have low domestic consumption and rely heavily on trade and investment.[6] Invigorating private consumption is being perceived as an indispensable way of rebalancing the world economy. In a globalized economic community, however, this is at odds with the USA's situation, where Americans should try to save more.

Table 3 also shows the employment growth over the last decade for China and the other four economic players. Employment growth represents another way of thinking about the contributors to growth (Prasad, 2009). The relevant question is then, how much employment is generated in the process of achieving that GPD growth rate? It is quite striking that China's net employment growth over the period 2000 to 2008 was barely 1%. Although when compared to India's 2% employment growth it may look small, it was much higher than the average employment growth in the other developed countries. Still, China's employment growth appears to be limited. Experts point out that "*a growth model that generates high GDP growth but only minimal employment growth is not welfare-improving, especially in a less developed economy like China that has a high level of unemployment and underemployment*" (Prasad, 2009, p. 8). It is also worth mentioning that while China's GDP growth is high, its per capita income is low – at the level of developing nations like Tunisia, Angola and El Salvador.[7]

II. 1. China's Dominance in International Trade

China's dominant role in international trade is known. Still, it is interesting to juxtapose its international trade statistics to those of India, Germany, Japan and the USA. Table 4 details to what extent these countries depend on international trade and how these statistics changed from 2000 to 2008. While all countries exhibit an increase in their openness to trade during this

[6] In October 2010 the central committee of the ruling Communist Party is to meet in Beijing to discuss the formulation of China's 12th five-year plan. The plan, which lays out the major policy objectives for the economy, will run from 2011 to 2015. Bolstering domestic consumption is on the top of the agenda; Chinese officials are conscious of reducing China's reliance on exports and investment driven growth path (Bloomberg News, August 17, 2010. See http://www.bloomberg.com/news/2010-08-17/china-to-boost-private-spending-in-plan-to-boost-consumption-ulrich-says.html).

[7] According to the World Bank, China's gross national income per capita in 2009 was $3,620 (see World Development Indicators Data Catalog, http://data.worldbank.org/data-catalog, revised on July 9, 2010).

period, Germany records the highest average ratio of exports to GDP in 2008 (46.7%). This shows a high level of dependence on exports, and indeed, recent events confirm that Germany's economic crisis was mostly due to its exports. China followed with an average ratio of exports to GDP of 33% in 2008, up from 20.8% in 2000. Clearly, China's economic rise is thus associated with a heavy reliance on international trade. The USA ranked the lowest with an average ratio of exports to GDP of 12.8% in 2008, but considering that the financial and economic crises started in late 2007, the low 2008 figure might be partially due to the crisis (Prasad, 2009).

China is asserting its international trade presence especially in Asia. It has been a member of the Asia-Pacific Economic Cooperation (APEC) since 1991, it joined the Asia-Pacific Trade Agreement (APTA) in 2001, it signed the ASEAN (Association of SouthEast Asian Nations) – China Free Trade Area (ACFTA) in 2002 and continues to dominate the area with its trade. Among other recent trade agreements, China signed a historic trade agreement with Taiwan on August 18, 2010.

With its foreign exchange reaching about $1.8 trillion in May 2008, some observers voiced a concern about China 'plunking its dollars' and consequently posing a threat to the USA. Bergsten et al. (2009), however, contend that such a step is highly improbable because: 1) any partial sale of their current dollar holdings would drive down the value of their remaining dollar holdings; (2) Chinese sales of dollars would drive up the price of whatever currencies they convert into and could result in the appreciation of their own currency, the *renminbi* (RMB), which in turn would adversely affect China's competitiveness; and (3) China would be branded an international pariah if it were to 'dump' its dollars in a precipitous manner that would generate global financial and economic instability. Accordingly, the only plausible situation that this could happen is if China thought that the USA might be about to freeze those holdings, as in the case of Iran in 1979.

Both the USA and the EU have expressed their concern and voiced criticism of Beijing keeping the Chinese currency artificially low. While such a strategy can bolster exports and create trade surpluses for China, it causes trade deficits for its trade partners. Earlier in July – and apropos of the G-20 Summit in Toronto – China announced it would proceed with the promised reform.

II. 2. China's Savings Behavior and Worrisome Income Inequality

Table 5 presents recent statistics on the savings behavior in China and compares it to the other four selected countries. It is argued that savings and investment are two of the most important variables for a developing economy because together they create a productive capital stock that in turn has a material impact on the growth rate of GDP (Das, 2008). In 2008 China recorded a Gross National Savings rate of 53.9% and a Household Savings rate of 39.7%. These statistics are by far higher than in Germany, Japan and the USA.

Several arguments have been made to justify this phenomenon. Lin (2009) argues that the high level of corporate savings in China can be partly attributed to a financial structure that is largely dominated by state-owned banks and equity markets with restricted entry as both favor large firms (as mentioned in Prasad, 2009, p. 13). On the household side, however, Chamon and Prasad (2010) indicate that rising household savings cannot be explained by demographics, habits and the life-cycle hypothesis alone. "*Instead, the increasing private burden of education and health expenditures seem among the strongest candidates for explaining the increase in saving rates, at least during a transition period. Health expenditure-related risks can largely explain the dramatic increase in saving rates among elderly [urban] households*" (Prasad, 2009, p. 20).

The impressive numbers and figures that portray China often overshadow the existence of social incoherencies and disparities as well as environmental damages. In a recent study Yao (2010) examines China's income inequality and finds that the overall Gini coefficient reached 0.47 in 2008, a level as high as in the USA. Furthermore, the author finds that Chinese city dwellers earn three and a half times as much as their fellow citizens in the rural areas. These statistics represent the highest urban-rural income gap in the world, and prompt the author to predict the end of the 'Beijing Consensus.'[8] In the Chinese labor market, evidence shows that a significant difference in occupational attainment and wages exists between rural migrants and urban residents. For instance, 82% of the hourly wage differential between rural migrants and urban residents is due to intra-occupational wage differentials. Most of the differences cannot, however, be explained by productivity-related differences between the two groups, implying that

[8] The term 'Beijing Consensus' indicates economic development plans for the developing countries that follow the Chinese model.

urban residents are favorably treated while their migrant counterparts are discriminated against (Meng and Zhang, 2001).

III. China in Africa: Déjà vu Colonialism?

Over the last couple of years, the international community has witnessed China's burgeoning presence in Africa. China's 'come back' to Africa occurs at a time when the dominance or presence of other superpowers on the continent is steadily shrinking (Gu, 2006). Between 2000 and 2007 trade between China and Africa rose by a factor of seven, from $10.6 billion to $73.3 billion, making China the third largest trading partner of Africa, behind the USA and the EU (Besada et al., 2008).

Chinese officials maintain that their presence is based solely on business needs and resent the allegations that they want to impose some political order in Africa.[9] A recent study by Broadman et al. (2007) supports this view by showing that the current patterns of trade and investment between Africa and Asia, including China, are considerably driven by complementarities between the two regions. For example, Africa needs Chinese manufactured goods and machinery and China needs Africa's natural resources. These business dealings are different than the recent growth in Africa's trade with the EU and the USA, which is largely based on preferential treatments in these two markets.

However, Asche and Schüller (2008) show that China's presence in Africa is mainly driven by a thirst for resources[10] rather than any kind of 'South-South cooperation.' China's dependence on raw materials is further substantiated by an examination of China's African trading partners, the major ones of which are abundant with natural resources, such as crude oil. In 2006 three quarters of China's imports were African crude oil. Angola alone – a country rich in oil – accounted for 38% of the Chinese imports in 2006; followed by South Africa (14%), Equatorial Guinea (9%), the Republic of Congo (8%), Sudan (7%), Libya (6%) and all others

[9] Cf. China's deputy foreign minister, Zhou Whenzong's comment: "Business is business. We try to separate politics from business…. You [the West] have tried to impose a market economy and multiparty democracy on these countries which are not ready for it. We are also against embargoes, which you have tried to use against us," as cited in Besada et al. (2008, p. 15).

[10] China's energy consumption has doubled over the last eight years. Beating all forecasts, the International Energy Agency in July 2010 declared China the world's largest energy consumer. However, Beijing has contested the veracity of that data (http://online.wsj.com/article/NA_WSJ_PUB:SB10001424052748703720504575378243321158992.html).

(18%). In light of these statistics, skeptics question the win-win trading scenario between China and Africa. Some, such as Zambian economist Bob Sichinga, have gone as far as to accuse China of 'raping' Africa of its natural resources (Halper, 2010). Asche and Schüller (2008) further document that in 2006 Africa's imports from China were mainly mechanical and electronic products (45%), textiles and yarns (15%), high-tech products (11%), clothing (10%), iron and steel (6%), footwear (3%) and all others (10%).

With regards to bilateral official aid between China and Africa, Bräutigam (2010) observes that China's practices concerning aid and development finance in Africa deviate from OECD standards and norms on transparency and definitions, the management of concessional exports credits, and the management of sovereign debt. Regarding governance, however, the author did not find any difference between China and other traditional donors. For example, both have rules that discourage corruption in the procurement of aid. Nonetheless, neither China, nor the World Bank, or the IMF apply conditionality in the area concerning democracy and human rights. Therefore, she concludes that: "*In sum, China's practice as a provider of aid and development finance is not as different from the practice of others as is commonly believed*" (Bräutigam, 2010, p. 42).

Meanwhile, China is also exhibiting a rising profile in Latin America, with the understanding that China would provide Latin America with cell phones, cars and cheap plastic toys and would receive in return raw materials like oil, copper or iron ores; albeit not without mounting tensions and challenges. The most recent example is China's mining venture in Peru for dolomite that started in the early 1990s; to this day, China faces annual strikes and a growing resentment from the locals.[11]

IV. Investing in Human Capital and Conquering the World

Human capital has been deemed to be of paramount importance since the 1970s, and concrete steps have been taken to protect it and advance it. Still, using 1995 data on public expenditures on education as shares of GDP, Heckman (2003) found that China had only spent about 2.5% of its GDP on human capital investment. In stark contrast, China had devoted roughly 30% of its GDP to physical capital investment. The resulting ratio of annual investment in physical capital

[11] Cf. "*Tensions over Chinese mining venture in Peru*" by S. Romero in The New York Times, August 14, 2010.

to human capital was much higher than in most other countries in the world. Heckman heavily criticized China's underinvestment in human capital at the expense of over-investment in physical capital. This imbalance, he said, is "*symptomatic of a serious distortion in current policy that serves to retard economic development in China*" (Heckman, 2003, p. 795).

In a more recent study Heckman and Li (2004) use newly available Chinese micro-data to estimate the return to college education in China in 2000. They find substantial heterogeneity in returns to schooling: people sort into schooling according to their comparative advantage. This finding has become an empirically important phenomenon in modern Chinese labor markets. The authors find that the effect of college attendance on a randomly selected person is an 11% annual increase in earnings in the urban areas; the effect on those who go to college is actually higher (13%). The authors conclude that China's economic reform with pronounced market orientated economic directives over the past 20 plus years has significantly increased returns to education in the 2000s.

Commencing in 1999 China's higher education expansion directive affected the education opportunities of various population groups and the labor market. Based on 2005 Census data, Li and Xing (2010) find that higher education expansion increased the probability of going to college for some groups. While minority females, those from the central-western region and from rural areas were less likely to benefit from it, one-child families were more responsive to this policy. Education expansion decreased the within sector inequality of those with above high school (inclusive) education mostly because of the increase of the income level for high school graduates.

IV. 1. China's Tumultuous Love Affair with Education

Access to higher education was not open to ordinary people until late into the 19th century, when the first modern Chinese higher institution was established during the Qing Dynasty (1871-1908).[12] During the Republican Era of 1912-1949 and with the newly founded higher education system, Western university models began to gain in popularity, and Chinese students were sent abroad to learn advanced technologies. By 1949, 205 universities had been founded in China (Brandenburg and Zhu, 2007). The beginning of the PRC in 1949 heralded an end to the

[12] For an extended historic overview of China's education, see Constant et al. (2010).

educational expansion; and by 1953 the number of comprehensive universities had fallen from 49 to 13. Only colleges specializing in applied subjects such as medicine and agriculture were spared as they were regarded vital for economic development (Ouyang, 2004). During the Cultural Revolution of 1966-1976 China's higher education system suffered further in the hands of political meddling. Many universities were forced to close between 1966 and 1971. Shortly after they were allowed to reopen, but the emphasis was to be on political studies rather than a standard college curriculum (Zhang et al., 2007).

Meng and Gregory (2007) studied the educational cost of the large scale school interruptions due to the Chinese Cultural Revolution. They estimated that those who did not obtain a university degree, because of the Cultural Revolution, lost an average of more than 50% of potential earnings. Men and women alike suffered reduced attainment of senior high school certificates and more than 20% prematurely stopped their education process at junior high school level. Interestingly, these education responses do not appear to command lower earnings. While at each level of education attainment most of the cohort experienced missed or interrupted schooling, the authors find that, once they control for the education certificate attained, the impact on earnings of these missed years of schooling or lack of normal curricula was small.

Deng Xiaoping's opening-up policy in the late 1970s brought about many reforms, which put education back on course. He recognized the importance of education in turning China into a global, economic power. A two-way street approach was to be implemented: that of learning from the West and that of attracting the West to China. In 1977 China resumed the National College Entrance Examination, granting more people the opportunity of higher education (Mullins, 2005). The academic system was based on British and American models, with associate degrees offered by short-cycle colleges, and bachelor's, master's and doctoral degrees granted by standard institutions of higher education; a post-doctoral research system was also enacted. All of which signaled a new phase in modern Chinese higher education.

The Chinese government had also been encouraging students to study abroad, with the availability of various scholarships. However, recipients had to return to China after graduating and work for at least two consecutive years, or face a severe penalty. In addition, the quota that stipulated the number of students studying abroad who financed their own studies and supported themselves was relaxed by the end of 1986. The government even pledged to "*support students and scholars studying abroad, encourage them to return to China after their completion of*

studies and guarantee them the freedom of coming and going" (Ministry of Education of the People's Republic of China, n.d.).

IV. 2. China's Policies in Internationalizing Education

In the 1990s and especially after the return of Hong Kong to mainland China in 1997, China's higher education entered an international phase. Chinese and Western universities started cooperating, and a growing number of Chinese students went abroad to study. In 2003 the Chinese Government started offering scholarships to outstanding students who were financing their own studies (Yao, 2004). These scholarships were open to all Chinese citizens who had shown an excellent academic performance and respected the recipients' choice after graduation in case they wanted to stay abroad. However, scholarships were only given for doctoral programs, and the $5,000 grant could not be awarded to the same recipient twice (NesoChina, 2008). By 2007 China had established educational relationships with 188 countries and regions all over the world (*2008 China Education Yearbook*), and agreements on the mutual recognition of academic degrees had been signed with 32 countries and regions in the world. Further steps to strengthen international ties resulted in the establishment of Confucius Institutes, which are centers for the promotion of Chinese language and culture. By the end of 2007 the number of such centers had reached 226 and could be found in 66 countries and regions abroad, with 81 in Europe and 56 in America.

IV. 2. a. Trends and Distributions of the International Circulation of Students

Since 1978, the number of higher education institutions has increased from 600 to more than 2,000 in 2008, accompanied by an even more dramatic increase in student enrollment to 20 million in 2008 (National Bureau of Statistics of China, 2009). At the same time, the body of students and scholars studying abroad – called 'expatriate brains' – as well as the body of international students studying in China – called 'lured in brains' – have witnessed rapid developments.

Depending on the type of funding they have, Chinese students studying overseas can be broadly put into two categories: those officially sponsored by the government and those who support themselves. The first category can be further divided into two groups: state-sponsored students, sent overseas by the Ministry of Education (MoE); and organization-sponsored students, supported by provincial governments or companies (Yao, 2004). In the beginning of the opening-up reform era, most Chinese students overseas were officially sponsored, as they lacked financial resources to support their studies abroad. However, the introduction of the loose policy in 1986 and the fast economic growth in the 21st century reduced limitations for self-supported students.

In 2000, 38,989 Chinese students[13] went overseas. The majority of them were self-supported (82.8%), followed by those who were financially supported by organizations (10.0%) and by the government (7.2%). In 2008, the number of Chinese students who went abroad was 179,800; a more than a four-fold increase. Self-supported students accounted for a whopping 89.9% of the outgoing students. The percentage of students receiving organizational support was 4.8% and 6.2% of the students were financially supported by the government. With the year 2000 as the reference year, Figure 1 illustrates the overall number of Chinese students overseas since 2000 by type of financial sponsorship. While the number of self-supported students is clearly above the others and keeps increasing, it is the number of government supported students that exhibits the fastest pace especially, after 2005. This affirms the Chinese government's continual effort to support students going abroad. However, the number of students supported by organizations is dwindling down after 2005.

Not only has the number of Chinese students studying abroad increased, but Chinese students are now to be found in 108 countries and regions all over the world (MoE, n.d.). While their preferred destinations vary with time, they mostly favor Western countries, especially English-speaking ones. Table 6 documents that the top five destinations of Chinese students in 2008 were the USA, the UK, France, Australia and Germany. The USA is by far the most popular destination for Chinese students. According to the latest statistics released by the *Institute of International Education*, the number of Chinese students in American higher education institutions in the academic year 2008/2009 accounted for 14.6% of the international student body.

[13] Note that we refer to students from mainland China; students from Hong Kong are not included in any of the statistics on education.

Figure 2 (assuming 1999 = 100) depicts the flow of Chinese students at the tertiary level by the top 5 destination countries over the period 1999-2008. While the flow of students to the USA has remained almost constant, there has been a rapid ten to twelve-fold increase of students going to the UK, France and Australia. First, it is interesting to note the UK's dominant role as a top 5 destination country. The impressive increase in the number of students going to the UK reached a maximum in 2005; it has been slowly decreasing since then. Nonetheless, the UK is still a favorite destination because of its – perceived by the Chinese – prestigious and high quality education. According to the British Council's Vision 2020 (Böhm et al., 2003, p. 36), Chinese students will be the UK's number one source of international students after 2010, with an annual growth rate of 11.4%.

Second, Figure 2 shows that the number of students going to France has followed an impressive up-sloping curve: while only 2,000 Chinese students chose France in 2000, 12,000 went in 2004 and 21,000 in 2008. Burgeoning bilateral agreements between French and Chinese institutions and universities to support the international exchange of students between the two countries have certainly contributed to this trend. Australia is the present and future favorite of Chinese students, as flows have been rising steeply since 2002. Lastly, the promising rise in the number of students going to Germany has been short-lived. Undoubtedly, the number of Chinese students enrolled in tertiary education in Germany has tripled from 2000 to 2008. While flows have been increasing since 2000, albeit at a rather slow pace, they reached a maximum in 2005 and started decreasing after 2005. As German policymakers debate about charging higher tuition fees to international students,[14] Chinese students clearly show that they prefer to go to other countries to study.

Figure 3 illustrates the portions of graduate and undergraduate students from mainland China who were enrolled in American schools juxtaposing the academic years 2006/2007 and 2008/2009. It is clear that the number of students enrolled in graduate education is the highest in both academic years, supporting the perception that graduate education obtained in Western universities is very prestigious in China. However, comparing the percentage change of graduates to that of the undergraduates in these two academic years, Figure 3 shows that while the graduates increased by 17%, the undergraduates increased by 62%. Put it differently, while the share of graduate students as a percentage of the entire Chinese student body fell from 70.83% in 2006/2007 to only 58.48% in 2008/2009, the share of undergraduates as a percentage

[14] See http://www.spiegel.de/unispiegel/studium/0,1518,680051,00.html.

of the entire Chinese student body increased from 14.7% in 2006/2007 to 26.7% in 2008/2009. Therefore, while the total number of undergraduates is far smaller than the number of graduate students, these statistics indicate strong demand for American education at the undergraduate level. Equally notable is the number of Chinese students with Optional Practical Training (OPT) status.[15] While in 2006/2007 2,573 Chinese students who graduated from American Colleges and Universities stayed to work for a year in the USA, their number almost quadrupled in 2008/2009 to 8,212.

IV. 2. b. How China Deals with its Talented Students Going Abroad

It is said that whoever wins the battle over talents will be the victor in the 21st Century. The statistics presented above allude to some kind of brain drain for China. The pertinent question is then, how does the Chinese government deal with this possibility? This section documents the systematic steps taken towards the return of the talented Chinese living abroad.

Acknowledging a looming brain drain, China's Premier Wen (2008) said that the "*future of China's science and technology depends fundamentally on how we attract, train, and use young scientific talents today. Thus, at the core of our science and technology policy is attracting a diverse range of talents, especially young people, into science and providing them with an environment that brings out the best of their creative ideas*." (Wen, 2008, p. 649).

Since 1990, the Chinese government and the MoE have initiated, sponsored and carried through various programs to encourage highly talented Chinese expatriates to return and contribute to the country's economic reform and human capital. These programs have a wide range, covering young students and middle-aged scholars alike, and short-term visits or permanent stays. The most famous among them is the Chunhui Program (literally, Spring Bud), which – by the end of 2003 – had funded more than 8,000 individuals and 90 groups of scholars and researchers who returned on a short-term visit (MoE, n.d.). Table 7 lists the main programs in the 1990s and early 2000s.

In December 2008 the Chinese central government set the bar higher in terms of attracting la crème de la crème by launching the 'One Thousand Talents Scheme.' This scheme

[15] OPT status allows international students who graduate from American universities to stay in the USA and work for a maximum of 12 months after graduating.

aimed at attracting three groups of the most talented. Those "*who (1) have an academic title equivalent to professor in internationally well-known universities and institutions, or (2) work as senior managing staff within a well-known international company or banking institution, or (3) have developed technologies and patents and established their own business abroad*" (Zhao and Zhu, 2009, p. 327). It is worth mentioning here that there is a division of tasks between the central and local governments in terms of attracting the most talented people to China. While the central government has indeed placed priority on recruiting top scientists and academics, local governments are more active in attracting high-tech entrepreneurs (Zhao and Zhu, 2009).

These great efforts to attract expatriates along with the 'China opportunity theory, which results from China's continual double-digit GDP growth and its recent growing global influence, have enticed more and more Chinese students overseas to return and live their 'American dream' in China. Figure 4 depicts the flows of students going abroad and students returning in reference to GDP per capita (in yuan). The positive co-movement between economic development (represented by the blue GDP per capita curve) and the students who return to China (represented by the red returnees curve) is striking. Over the last 30 years the flow of returnees has exactly followed the GDP per capita growth of the country. Up to the late 1990s the number of students going abroad and the number of students returning had followed the same curve. The dip around 2003 was mostly due to SARS.

The trend of returnees according to their sponsorship status is illustrated in Figure 5. Similar to Figure 1, financial support is provided by the government, by organizations or assumed by the individuals. Overall, from 2003 to 2008 the total number of returnees increased by almost 50,000. The number of self-financed students, in particular, grew by 44,000 within these six years. Figure 5 also shows that the number of students who were financed by the government increased.

Returning students and scholars play a leading role in fostering new high-tech start-ups and upgrading educational institutions (Naughton, 2007, p. 363). The important contributions of these returnees, often called *haiguipai*, are observed in almost all relevant societal domains. Returnees are present in leadership positions at educational institutions, research centers, investment banks, insurance agencies, state and private enterprises, law firms etc., and some are even well integrated into the Chinese political arena (Li, 2006). Examining the distribution of the overseas educational attainment of Chinese leaders Li (2006) finds that almost 49.2% were visiting scholars, 32.8% PhD graduates, 3.3% post-doctoral fellows, 9.9% MA/MS graduates

and 1.6% JD/MD, MBA or BA/BS. In addition, with regards to their respective fields of responsibility, the author finds that roughly 79% of these returnees were in charge of science and technology, education, industrial development, finance, foreign trade and foreign affairs, 6.6% were in the political scene (organization or political publicity) and 1.6% in charge of rural development. Furthermore, by classifying these returnees according to their (high-ranking leader) length of study time, the author finds that 73.8% spent fewer than three years abroad, and 11.4% stayed more than six years; however, it should be noted that most of these years were spent in intensive study for a doctorate.

Chinese higher educational institutes have made great efforts to attract returnees as well. Their strategic goal is to be on the list of the world's best universities as soon as possible. For example, Tsinghua University and Peking University, the two most prestigious universities in China, allocated 20% of their annual budget to attract talent, with preference given to those from abroad (Le Bail and Shen, 2008).

IV. 2. c. China's Academic Presence and Influence in the International Scene

China's concerted effort to strengthen its international competitiveness was primarily set up in the mid-1990s as "*science, technology and education were put at the forefront of development policy*" (Dahlman and Aubert, 2001, p. 18). Statistics on China's educational outcomes as well its scholarly output, especially in natural sciences and engineering, are impressive. China has followed a steady upward trend of 'first university degrees'[16] in natural sciences and engineering. Figure 6 depicts the number of university graduates in natural sciences and engineering in China and other selected developed countries from 1998 to 2006. In 1998 already, China had the largest number of university graduates in natural sciences and engineering from the USA, Japan, South Korea and Germany. These numbers remained stagnant throughout this period for all four developed countries. In the USA, in particular, while the numbers of these graduates was higher than Japan, South Korea and Germany, they hardly changed over this period (from 205,000 in 1998 to 237,000 in 2006). Japan, Germany and South Korea had either below or just above 100,000 graduates per annum in natural sciences and engineering over this period. In sharp contrast, the numbers for China kept increasing, going

[16] A first university degree is the equivalent of the American Bachelor's degree.

from 239,000 in 1998 to 807,000 in 2006. Since 2002, especially, the number of university graduates in natural sciences and engineering seems to have taken off and keeps rising (National Science Board, 2010, p. O-7).

With regards to PhD graduates in natural sciences and engineering Figure 7 shows that China has come a long way since the early 1990s, emerging as a country that is producing a growing number of doctorates at a rapid pace. While the USA has still the sovereignty of and is keeping reins on the production of natural sciences and engineering PhDs – staying above all other countries – China experienced a tenfold increase in its PhDs. While in 1993 the number of awarded doctorates in China was about 1,000, in 2006, it was 21,000. Moreover, since the early 2000s China's PhDs seem to increase at an increasing rate and approaching the USA fast. It is also worth mentioning that other emerging countries, particularly India, have experienced a considerable rise in terms of PhD graduates in natural sciences and engineering as well (National Science Board, 2010, p. O-7).

Even more important than the number of PhDs is the scholarly output produced. Looking at the annual growth of refereed journal articles in science and engineering of selected countries as a percent over the period 1988 to 2008, Figure 8 shows that China clearly stands out. According to the latest National Science Board report (2010), researchers in the EU and the USA have long dominated the world's journal article production. However, their combined world share of published science and engineering articles steadily decreased from 69% in 1995 to 59% in 2008. On the other hand, both Asia's-10 and Asia's-8[17] scholarly output in science and engineering articles has been increasing (National Science Board, 2010, p. O-9). China alone has been expanding its publication record in science and engineering by 13.8% annually from 1988 to 2008. During this period, the corresponding numbers for the USA, Japan and the EU were 0.8%, 1.7% and 2.4% respectively.

Lastly, we examine the distribution of publications by discipline for some selected countries. In a sense this could reflect where a country's research priorities lie; for instance whether they lie in natural sciences, engineering, medical sciences or others. Figure 9 illustrates this distribution in 2007. Compared to other countries in Figure 10, the USA exhibits a more balanced distribution of journal articles among the fields of natural sciences, medical sciences and biological sciences. However, the USA's publications in engineering and the social or

[17] Asia-8 includes India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand. Asia-10 includes China, Japan and Asia-8 (http://www.nsf.gov/statistics/seind10/c0/c0g.htm).

behavioral sciences are four times lower. In contrast, China's distribution is completely different. Its scholarly output lies predominantly in the natural sciences with 59% of the scientific papers published by Chinese scholars. China's largest share in natural sciences publication might be justified by the country's need to expand its chemical industry (National Science Board, 2010, p. O-9). Engineering is the next field with 17% of the publications, followed closely by biological sciences with 15%. Medical sciences claim only 8% of the publications and last are the social and behavioral sciences with only 1%.

With the exception of South Africa, all other countries in Figure 10 show that the larger number of publications comes from the natural sciences: India (52%), Singapore (43%), Japan (41%), France (44%) and Germany (38%). Germany's next mostly published fields are medical sciences (27%) and biological sciences (23%). Engineering occupies 8% of the publications and social and behavioral sciences rank last with 5%.

Investments in Research and Development (R&D) go hand in hand with a country's research priorities. Spending in R&D is, undoubtedly, of paramount importance for any country's development and competitiveness. Figure 10 shows the average growth of R&D expenditures as shares of GDP for selected countries over the period of 1996 to 2007. Emerging Asian countries devoted a large share of their economic output to R&D. China, as the leading country among the emerging economies, spent, on average, almost 22% of its GDP in R&D; India spent 9% on average. The USA, as well as the EU-27, allocated, on average, around 6% of their GDP towards R&D.

IV. 2. d. 'Luring Brains In': Can China Reach Human Capital Supremacy?

At the signing ceremony on scientific and the cultural exchange between the USA and China in 1978, President Jimmy Carter, following Premier Deng Xiaoping's remark, said: *"Our aim is to make this kind of exchange between our countries no longer the exception but the norm; no longer a matter of headlines and the historians, but a routine part of the everyday life of both Chinese and American people"* (as cited in Li, 2010[18]). More than thirty years later, China's

[18] Li, Cheng's (2010) comment during a panel discussion "Chinese foreign-educated returnees: Shaping China's future," The Brookings Institution, Washington, DC.

booming economy and relatively stable political and social environment have attracted more and more international students to the country.

Official data from the MoE reveal that the overall number of international students in China grew steadily in the last decade, rising from about 50,000 students in 2000 to almost 200,000 in 2007. According to the MoE, 195,503 international students from 188 countries and regions went to study in China; they were distributed among 544 Chinese higher education and research institutes in 2007. The majority of them, 141,689, or 72.5%, were from Asia, especially from South Korea and Japan. European students were in second place with 26,339 or 13.5% of the international students in China; they mostly were from the UK, France and Germany. Next were American students (19,673 or 10.1%), followed by Africans (5,915 or 3%) and people from Oceania (1,887 or 1%).

Figure 11 is produced by plotting these numbers over time (from 2000 to 2007) as well as by country of origin; the year 2000 is used as the reference year. The number of European and African students in China has quadrupled in seven years. We observe a similar pattern for the Asian and American students, albeit their numbers only tripled; the number of students from Oceania over the same time period doubled. Figure 11 shows that by 2007, there was a serious foreign students presence in China. It is interesting that the SARS pandemic in 2003 decreased the number of students from Europe and the Americas but not those from Oceania and Africa.

Another interesting aspect about the international students in China is their sponsorship type. Figure 12 displays the flows of the international students to China over the last decade by their financial sponsorship status, with 2000 as the reference year. They are categorized as students who are self-financed and those who are financially supported through a scholarship. Note that self-financed or self-supported status means that these students do not receive support neither from the Chinese government nor from any other Chinese organizations. It includes, however, students who have a scholarship from their home country government or other non Chinese foundations and organizations.

Figure 12 clearly shows that the self-financed students have been gradually playing a dominant role. It also expresses a growing demand for Chinese culture, language and know-how by other countries. Aside from the dip in 2003 – probably mostly related to the SARS epidemic – the number of self-financed foreign students increased dramatically over the period of 2000 to 2007. The scholarship-supported status of foreign students in China indicates students who receive scholarships provided by the Chinese government, such as the Chinese government

scholarship, the Great Wall Scholarship, the Excellent Student Scholarship, the HSK Winner Scholarship, the short-term program for foreign teachers of Chinese and the Chinese culture research program (MoE, n.d.). Interestingly, the number of scholarship-supported foreign students doubled between 2000 and 2008, indicating a conscious effort to lure and support foreign students wanting to study in China.

Most foreign students in China enroll in non-degree programs, such as studying Chinese language and culture, or in short-term programs of less than six months. In 2007 there were 127,290 such non-degree students, accounting for 65.1% of the entire international student body in China. Undergraduates came second with 29.3% of the entire international student body. Note that the number of Master's (7,628) and PhD (3,218) students was relatively small compared to other student groups, representing 3.9% and 1.6%, respectively. Nonetheless, as shown in Figure 13, the number of international students following academic fields – whether they are at the graduate level (Master's and PhD) or in non-degree programs – has clearly more than tripled over the past eight years (with the year 2000 as the reference year). Undergraduates, in particular, experienced an almost six-fold increase over the same reference period, and their numbers keep increasing. This indicates that the world is expressing a serious interest in China and is eager to know more about it.

Figure 14 illustrates how international students in China share the pie of disciplines in 2007. The vast majority of them go into liberal arts that include Chinese language and culture studies. With 135,477 enrolled students, this seems to be the favorite and most popular discipline. The next most attractive discipline is studies in Chinese and Western medicine with 25,573 international students. Economics with 8,804 and engineering with 6,785 international students follow in the enrolment of international students (*2008 China Education Yearbook*). We conjecture that the relatively high number of international students majoring in medicine in China might be due to the reputed Chinese traditional medicine, i.e., acupuncture practices.

One question that concerns policymakers is how to improve the quality of international education in China and attract more international students. In the Action Plan of 2005 the MoE clearly stated its aim to "*adopt a strategy of creating 'renowned brand names' for selected institutions and academic fields and adhere to the principles of 'expanding the scale, raising the level, ensuring the quality, and managing according to established norms and standards'*" (Ministry of Education Action Plan, 2005, p. 29).

Conclusion

In this paper we provided an overview of China's economic rise through time. We enumerated and assessed China's steps toward becoming a global economic superpower. Compared to America's and the Soviet Union's booming economies of the 1960s, China's awakening has come rather late. It was only after the late 1970s with Deng Xiaoping's 'open-door policy' that the country became a member of the global community. Since then China has reoriented and reinvented itself in the pursuit of becoming a global superpower. It has adapted its centrally planned communist economic system to Western, market oriented economic models, and within three decades the country achieved the status of a superpower.

We began by presenting China's economic indicators that reflect an overall active economy, often in overdrive. Over the past decade, China has maintained 10% growth in GDP, albeit with a GDP per capita at the low level of a developing country. Some argue that its tremendous economic development has overlooked the growing social inequalities and rising resentments of the 'cheap' workers and those laid off. The main contributor to China's phenomenal global economic ascension is international trade (mainly net exports) and investment in physical capital, often at the expense of the environment. During the recent global financial and economic crises, China managed not only to continue growing but to also be able to lend money to other countries. China's practices as an international player do not differ from those of other countries or organizations: for example, China's growing presence in Africa is attributed to its need for natural resources.

Next, we examined China's lesser known but highly important feature; human capital. Starting with the opening-up reform of 1978 – a landmark for the Chinese modern higher education system – we dissected the available statistics with an emphasis on the past decade. China has achieved important milestones in human capital, working painstakingly and following a steady course. In particular, our study shows that: (i) the number of students enrolled in Chinese higher education institutions has increased dramatically; (ii) more and more Chinese students seek higher education abroad (and are encouraged and supported by the government); (iii) China is producing serious scholars and a tremendous amount of scholarly output; and (iv) international students have started to show a steadily growing interest in receiving education in China.

Specifically, we documented an ever increasing trend of Chinese students going abroad. According to the Ministry of Education statistics, the number of Chinese overseas students has reached about 1.4 million in total by 2008. While many students have returned, many more remain abroad after graduating. Some observers think that China may soon face a brain drain problem. Being aware of the issue, astute Chinese officials have been following a steady course to bring their expatriates back to China by creating a welcoming environment and favorable conditions for them to flourish. Regarding those who choose to stay abroad, China's attitude is to befriend them and keep them happy so that the ethnic network stays alive and can be used in the future.

Today, China is providing first rate education, comparable to other international universities in Europe and the USA, and produces more university degrees in natural sciences and engineering than any other country. If "*science is the ultimate revolution*," as Premier Wen (2008) said, then China is 'revolving' fast: (i) it produces an exorbitant amount of doctoral degrees in science and engineering, reaching the level of the USA; (ii) it has the highest annual growth rate of published refereed papers in science and engineering by far; and (iii) it produces the highest percent of scholarly output in the natural sciences with 59% of the scientific papers published by Chinese scholars. This is more than double the corresponding percent in the USA (27%), a country that has been long considered the global leader. China is also spending, on average, more on research and development than any other major developed economy in the West. All these facts render China a country that has to be taken seriously in the international academic community.

Lastly, we presented evidence of the Chinese government making great efforts to attract international students from other parts of the world to go to China for their education and of the rest of the world expressing a serious interest in China, ranging from learning about the language and culture to Chinese acupuncture or studying other fields. This is manifested by the increasing number of international students studying in China.

It is said that whoever wins the battle over talents will be the victor of the 21st century. All countries advocate the need for skilled immigrants. China has undoubtedly emerged as one of the largest economies in the world and has shown considerable global power, which begs the question of whether China is satisfied with only being the world's cheap manufacturer. If not, can China turn its labor intensive economy into a knowledge-based one and win the global tug-of-war for talents?

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Table 1: Chinese Economic Slogans and Foreign Policy: 1979 - Present

Period	Economic Policy Slogan	Referents	Connection to Foreign Policy
1979-1992	'reform and opening'	Rural reforms; FDI	Peaceful international environment used to expand economy
1993-2001	'socialist market economy'	Expansion of FDI; state enterprise reform; production and investment over consumption	Joined international arena without hampering domestic growth
2002-present	'scientific development' and 'harmonious development'	(Re)balance toward domestic consumption; energy security	Shaped international arena to promote continued economic growth; secured supply of energy and raw materials

Source: Adapted from Frazier (2010, p. 91).

Table 2: Economic Indicators as Shares of Real GDP Over Time (in %)

	1995				2000				2008			
	Consumption				Consumption				Consumption			
Country	Private	Gov't	Invest	Net Exports	Private	Gov't	Invest	Net Exports	Private	Gov't	Invest	Net Exports
China	44.9	13.3	40.3	1.6	46.4	15.9	35.3	2.4	35.3	13.3	43.5	7.9
India	66.3	11.1	24.6	-1.5	64.2	12.9	25.9	-1.9	57.2	9.8	36.2	-4.3
Germany	59.5	19.6	22.1	-0.9	58.9	19.0	21.8	0.4	54.7	18.4	20.3	6.8
Japan	56.7	15.5	27.7	0.4	56.2	16.9	25.5	1.5	55.5	17.6	23.2	4.9
The USA	67.7	16.2	17.2	-0.9	68.7	14.4	20.8	-3.9	71.0	14.5	17.5	-3.3

Note: Net Exports = Exports – Imports; Invest stands for private investment in physical capital.
Source: Prasad (2009); own presentation.

Table 3: GDP Growth, Contributions to Growth and Employment Growth: 2000 - 2008 (in %)

	GDP Growth	GDP Growth Contributions					Empl't Growth
		Consumption			Investment	Net Exports	
Country		Total	Private	Gov't			
China	10.2	4.1	2.8	1.3	5.0	1.1	0.9
India	7.2	4.1	3.5	0.5	3.6	-0.3	1.9
Germany	1.4	0.5	0.3	0.2	0.1	0.9	0.4
Japan	1.5	1.0	0.6	0.4	0.2	0.5	-0.1
The USA	2.3	2.3	2.0	0.3	0.1	-0.1	0.7

Source: CEIC, IMF's WEO, ADB, Prasad (2009); own presentation.

Table 4: Openness to Trade (in % of GDP)

	2000			2008		
Country	Total Trade	Exports	Trade Balance	Total Trade	Exports	Trade Balance
China	39.6	20.8	2.0	59.2	33.0	6.8
India	27.4	13.2	-0.9	54.3	24.0	-6.3
Germany	66.4	33.5	0.5	86.7	46.7	6.7
Japan	21.2	11.3	1.5	36.2	18.3	0.4
The U.S.	25.7	10.9	-3.8	30.5	12.8	-4.9

Note: Following Prasad (2009), openness to trade is exhibited by: (1) the ratio of total trade (imports + exports); (2) exports; and (3) trade balance (exports – imports) as a percentage of GDP. The measure of exports and imports used here includes goods and non-factor services.
Source: CEIC, Asian Development Bank's Statistical System (SDBS), Prasad (2009); own presentation.

Table 5: GDP, Current Account Balance and Household Savings in 2008

		Current Account Balance		Gross National Savings		Household Savings	
Country	Nominal GDP (USD billions)	Value (USD billions)	As % of GDP	Value (USD billions)	As % of GDP	Value (USD billions)	As % of GDP
China	4327.4	440.0	10.2	2333.4	53.9	1006.3	39.7
India	1209.7	-33.3	-2.8	479.0	39.6	264.4	32.0
Germany	3467.3	229.4	6.6	79.5	2.3	-	-
Japan	4910.3	158.5	3.2	344.1	7.0	157.5	20.3
The USA	14265.0	-706.1	-4.9	1712.3	12.0	342.3	3.2

Source: CEIC, IMF's WEO, Prasad (2009); own presentation.

Table 6: International Flows of Students at the Tertiary Level – Matrix of the Top 5 Host and Home Countries in 2008

	Host Country						
Home Country	The USA	The UK	France	Australia	Germany	Other countries	**Total number of native students abroad**
	1	2	3	4	5	6	
1 China	110,246	45,356	20,852	57,596	21,977	163,082	**419,109**
2 India	94,664	25,901	1,038	26,520	3,257	13,700	**165,080**
3 Republic of Korea	69,198	4,031	2,292	6,270	3,929	25,683	**111,403**
4 Germany	8,917	13,625	6,918	1,934	-	46,857	**78,251**
5 Japan	34,010	4,465	1,908	2,974	1,858	3,623	**48,838**
6 Other Countries	307,439	248,413	210,428	135,341	158,326	660,351	**1,720,298**
Total number of foreign students in the host country	**624,474**	**341,791**	**243,436**	**230,635**	**189,347**	**913,296**	**2,542,979**

Note: Tertiary education refers to ISCED 5 and 6.
Source: UNESCO Online Education Database, http://stats.uis.unesco.org; own presentation.

Table 7: Main Official Programs to Fund Chinese Returnees

Program Name	Starting Year	Targeted Group	Incentives
The Fund for Returnees to Launch Science and Technology Researches	1990	Returnees with doctoral degree who work at education and research institutes*	Provide funds for purchasing equipments and books, doing on-site research, and attending conferences
Program for Training Talents toward the 21st Century	1993	Outstanding young teachers returning from overseas	Provide 200,000 to 300,000 yuan annually for doing research in major topics
The *Chunhui* Program (literally, Spring Bud)	1996	Returnees with doctoral degree and outstanding achievements in their fields	Cover traveling expenditure to attend conferences and academic exchange programs
*Changjiang*** Scholar Incentive Program	1998	Young and middle-aged leading Chinese scholars who have experience studying abroad and are invited by HEIs as visiting professors	The program provides 100,000 yuan annual incentives, and the HEIs offer the salary, insurance and other social welfares during the visit.
Program of Academic Short-return for Scholars and Research Overseas	2001	Outstanding Chinese scholars who come back to China in short breaks to give lectures or do research in 28 key Chinese HEIs***	The Ministry of Education covers traveling expenditures, and HEIs pay salaries, provide accommodation and health insurance

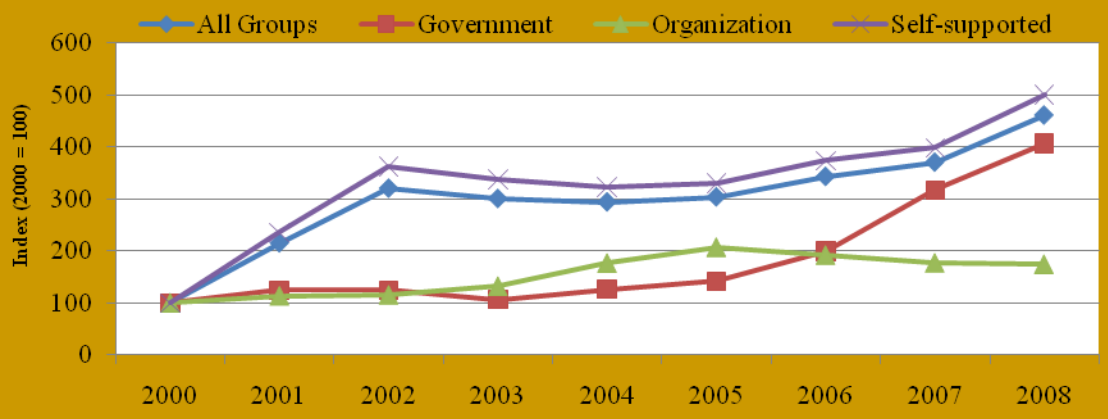
Note: * For detailed information, refer to http://www.moe.gov.cn/edoas/website18/level3.jsp?tablename=1263260667176395&infoid=1263277716024458 (in Chinese).

** It is also called the 'Yangtze River,' literally translated as the 'Long River.' It is the longest river in China and Asia and the third longest one in the world.

*** The list of 28 key Chinese Higher Education Institutes (HEI) is available at http://www.moe.gov.cn/edoas/website18/level3.jsp?tablename=1305&infoid=12200 (in Chinese).

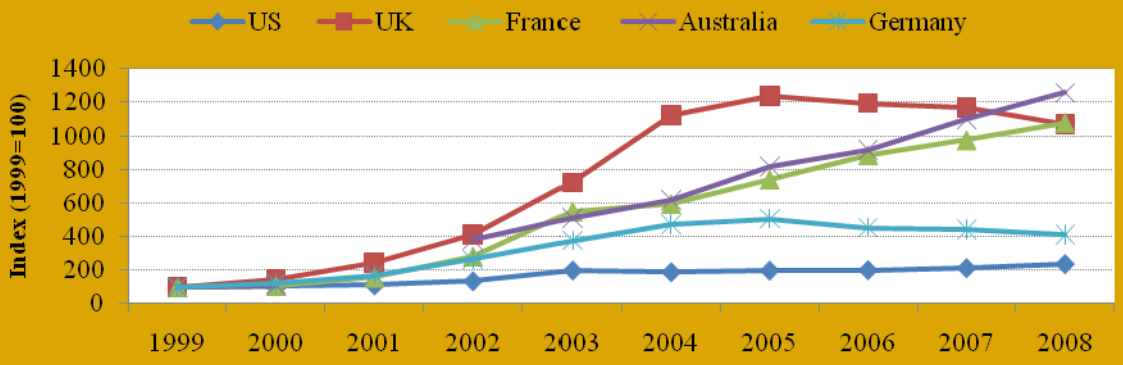
Source: Ministry of Education of the People's Republic of China, http://www.moe.edu.cn/english/international_2.htm.

Figure 1 : Evolution of Chinese Overseas (Post-)Graduate Students by Sponsorship Status



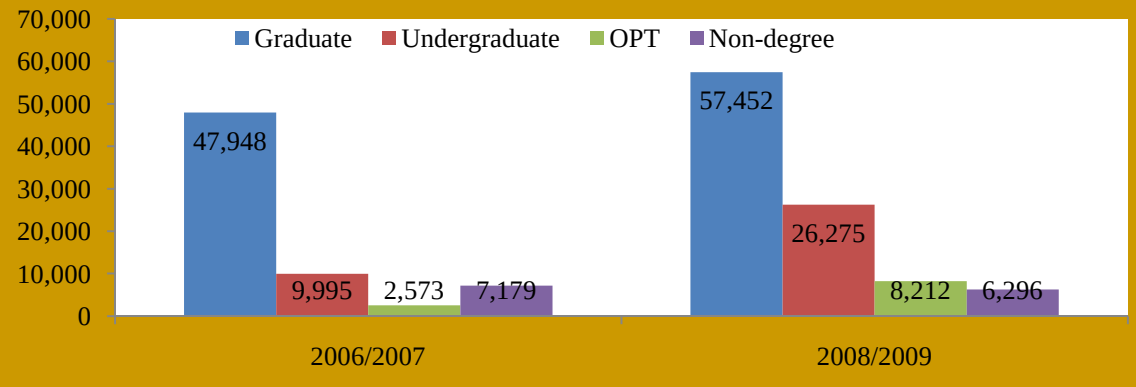
Note: Data for 2008 are from Ministry of Education of the People's Republic of China
Source: China Education Yearbook, 2001-2008 Editions; own calculation

Figure 2: Flows of Chinese Students at the Tertiary Level to some Selected Host Countries: 1999-2008



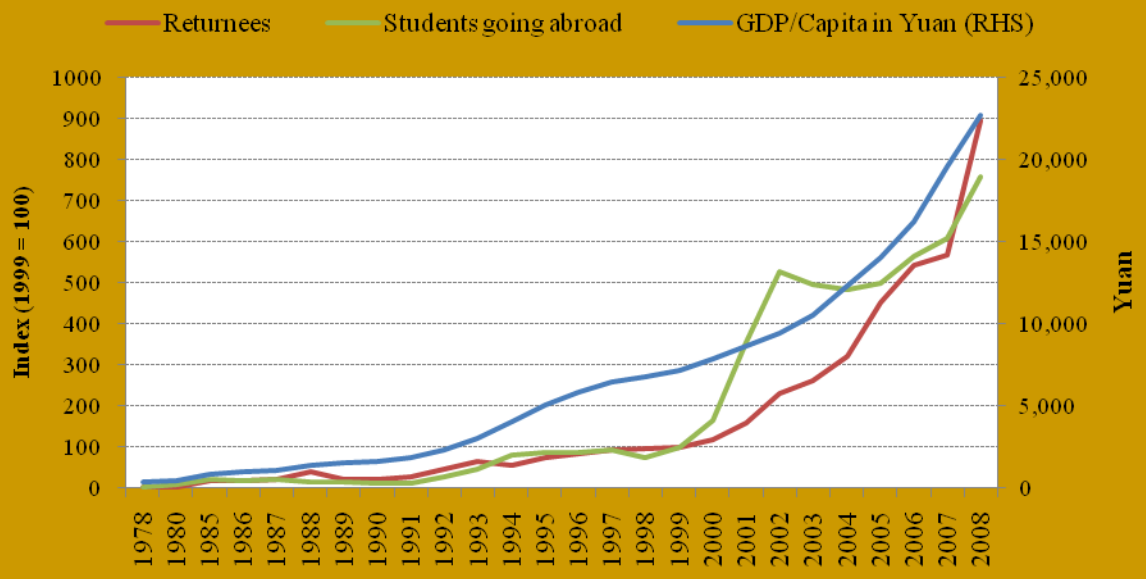
Note: Data for Australia in 2001 were not available in the UNESCO database
Source: UNESCO education online database; own presentation

Figure 3 : Number of Chinese Students in the USA by Academic Levels



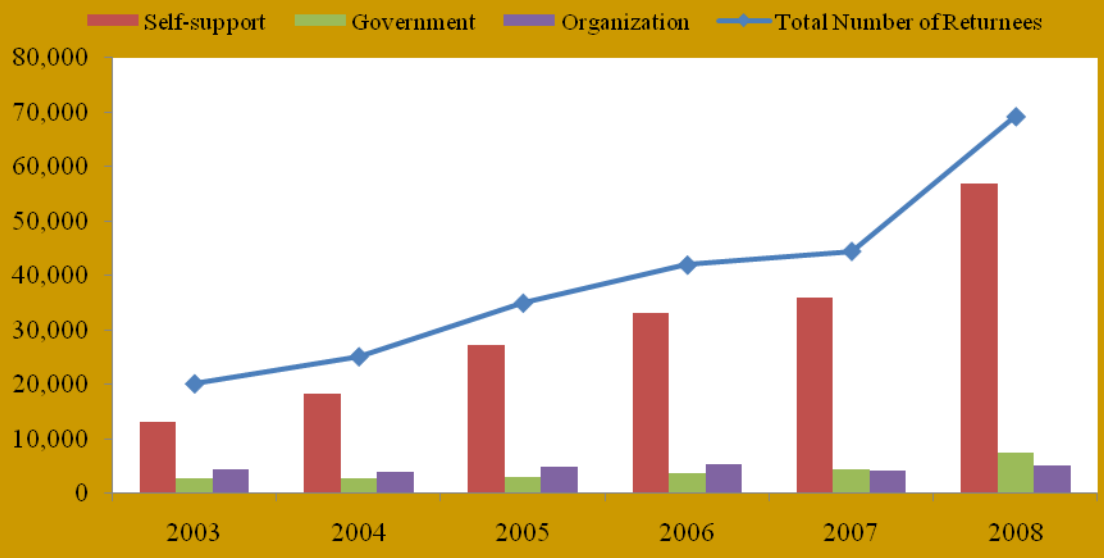
Note: OPT stands for Optional Practical Training

Figure 4: Evolution of GDP per Capita and Flows of Students Abroad As Well As Returnees



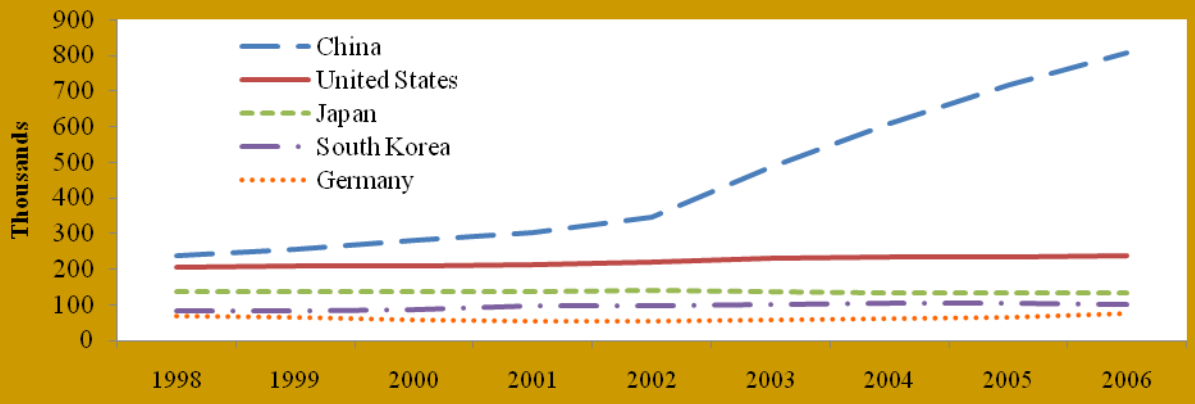
Source: China Statistical Yearbook 2009, 20-8; World Bank (for GDP per Capita); own presentation

Figure 5: Number of Overseas Students Back to China by Sponsorship Status: 2003-2008



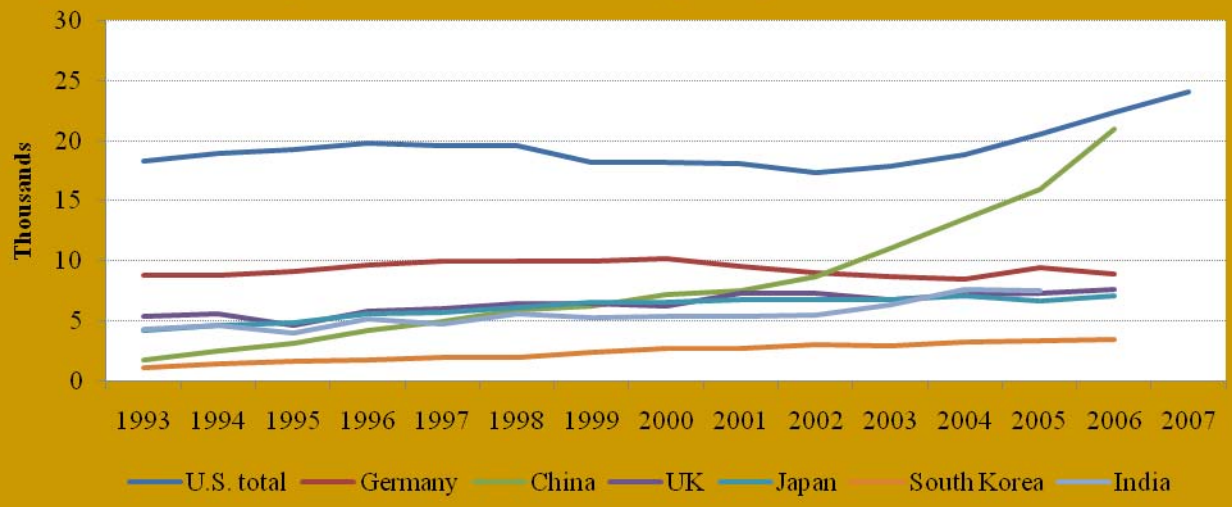
Source: Ministry of Education of the People's Republic of China; own presentation

Figure 6: First University Degrees in Natural Sciences and Engineering, Selected Countries: 1998-2006



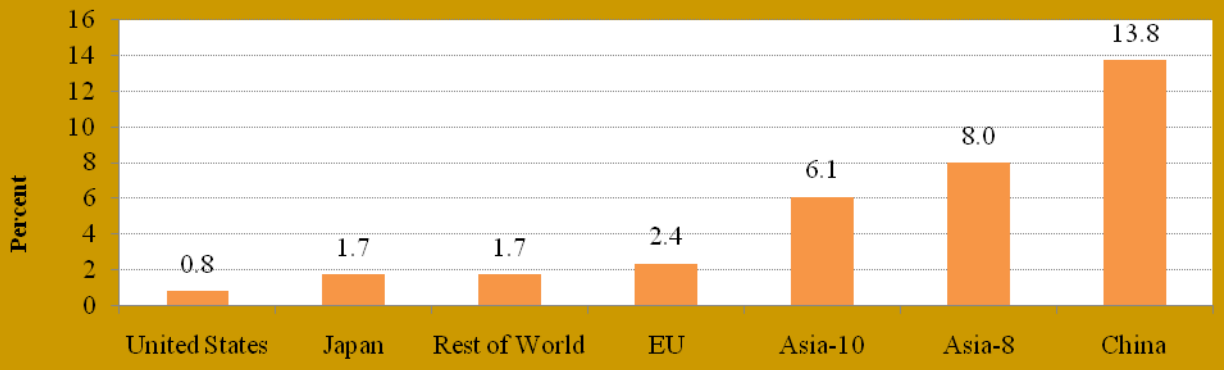
Source: Adopted from National Science Foundation, Science and Engineering Indicators 2010

Figure 7: Doctoral Degrees in Natural Sciences and Engineering, Selected Countries: 1993-2007



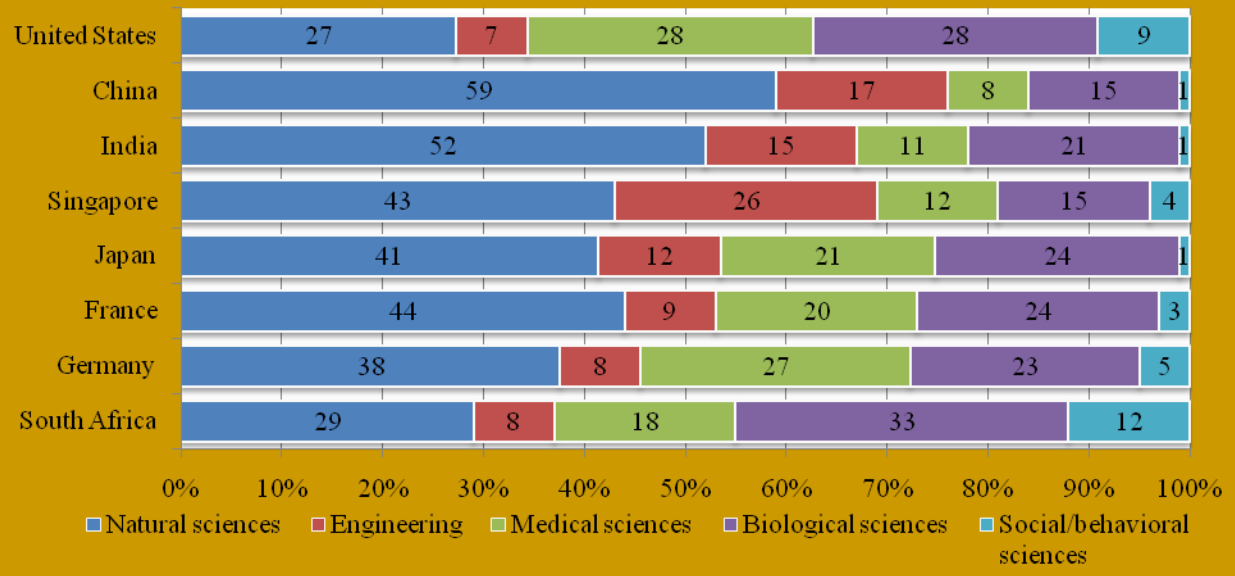
Source: National Science Foundation, Science and Engineering Indicators 2010

Figure 8: Average Annual Growth of S&E Journal Articles Produced by Selected Countries: 1988-2008



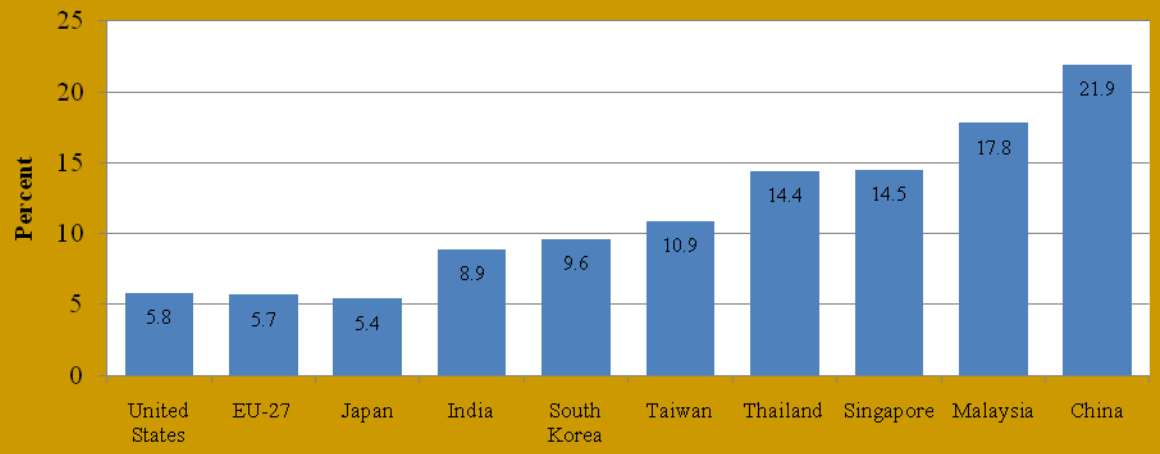
Note: Asia-8: Includes India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand
Asia-10: Includes China, Japan, and Asia-8
Source: National Science Foundation, Science and Engineering Indicators 2010; own calculation

Figure 9: Shares of Research Articles by Field of Study for Selected Countries: 2007



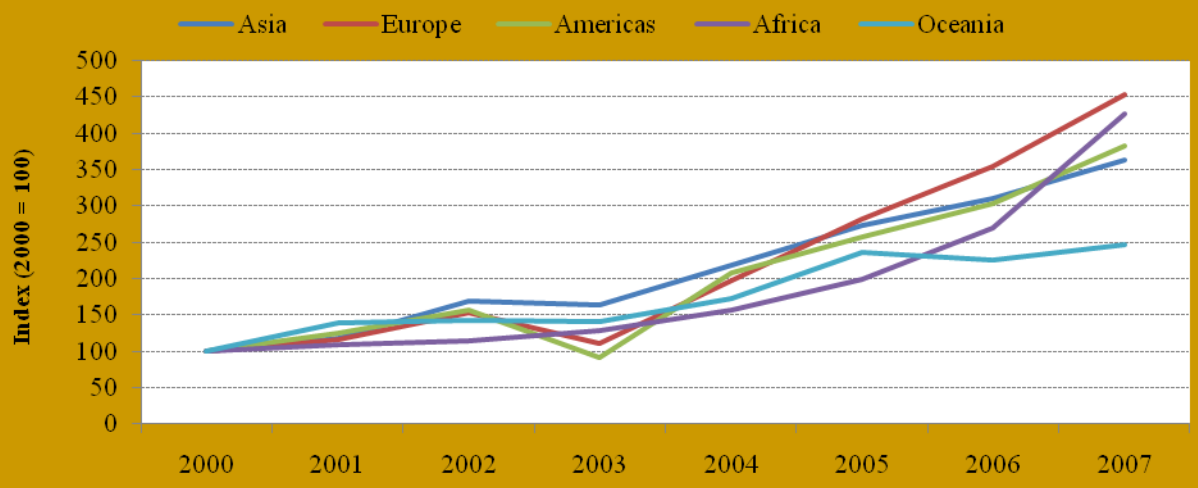
Source: Adopted from National Science Foundation, Science and Engineering Indicators 2010

Figure 10: Average Annual Growth of R&D Expenditures as Share of Economic: 1996-2007



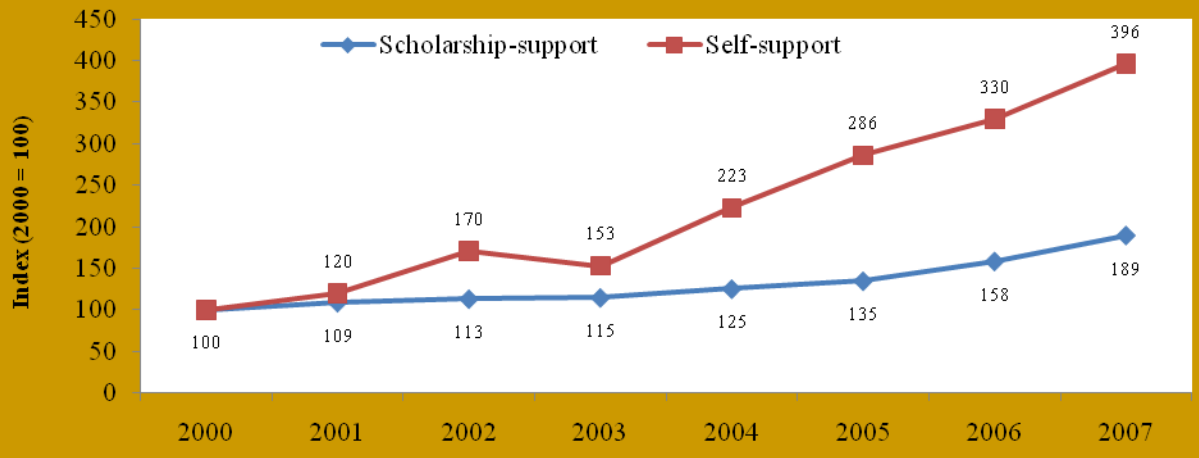
Source: National Science Foundation, Science and Engineering Indicators 2010

Figure 11: Evolution of International Students in China by Place of Origin: 2000-2007



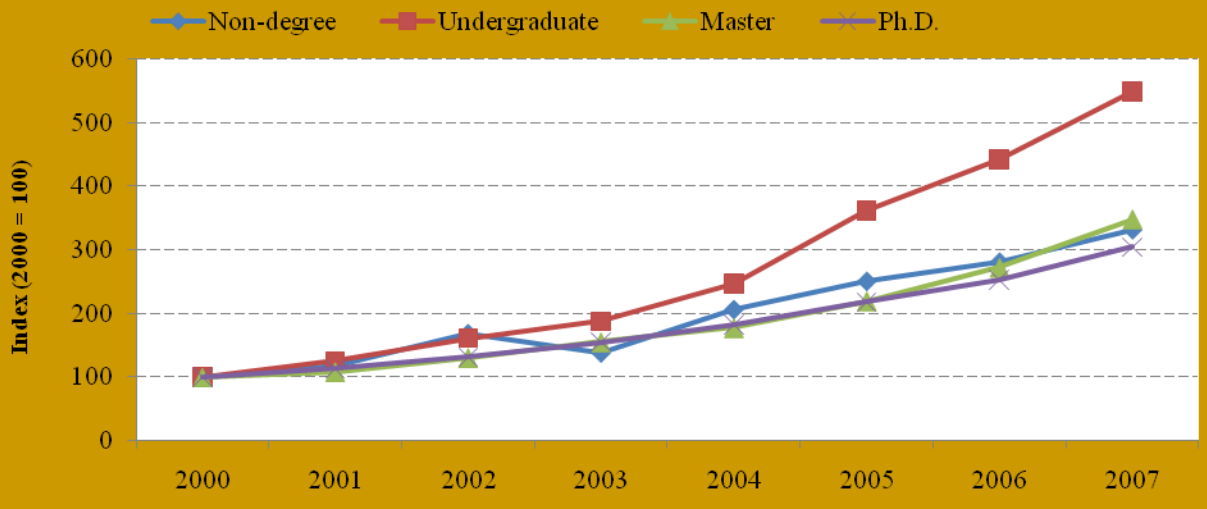
Source: China Education Yearbook, 2001-2008 Editions; own calculation

Figure 12: Flows of International Students to China by Sponsorship Status: 2000-2007



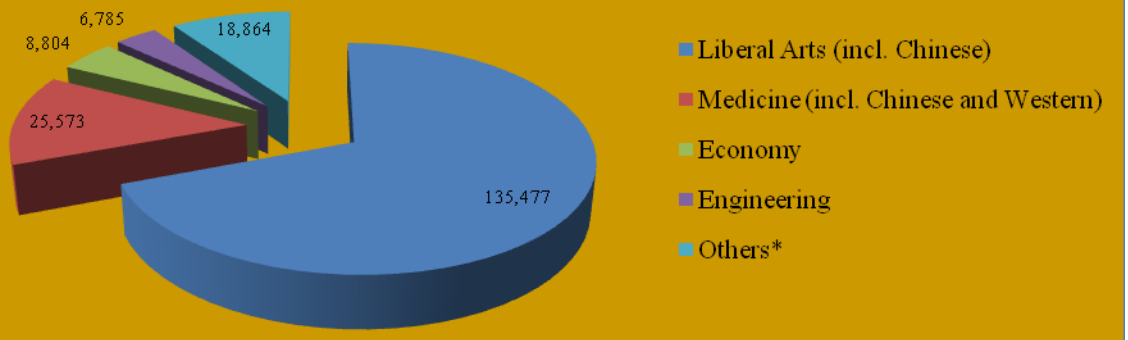
Source: China Education Yearbook, 2001-2008 Editions; own presentation

Figure 13: Flows of International Students to China by Academic Level: 2000-2007



Source: China Education Yearbook, 2001-2008 Editions; own calculation

Figure 14 : Number of International Student by Field of Study in China: 2007



Note: * incl.: Management, Law, Education, Science, History, Agriculture, Philosophy
Source: Ministry of Education of People's Republic of China; own presentation