Volume Title: American Universities in a Global Market

Volume Author/Editor: Charles T. Clotfelter, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-11044-3; 978-0-226-11044-8

Volume URL: http://www.nber.org/books/clot08-1

Conference Date: October 2-4, 2008

Publication Date: May 2010

Chapter Title: Higher Education in China: Complement or Competition to US Universities?

Chapter Author: Haizheng Li

Chapter URL: http://www.nber.org/chapters/c11599

Chapter pages in book: (269 - 304)

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Higher Education in China
Complement or Competition to US Universities?

Haizheng Li

8.1 Introduction

In 2006, a total of 134,000 Chinese students went abroad to further their education, a number almost as large as the total number of new international students (142,923) coming to the United States from all countries.[1] Chinese students accounted for 11.6 percent of the total number of international students in the United States in that year. In recent years, China has ranked first, or second to India, in numbers of students studying in the United States. Since 1978, when China began to open to the outside world, the United States has been receiving an increasing number of Chinese students. In 2005, 23 percent of all overseas Chinese students were in the United States (Fazackerley and Worthington 2007).

Chinese students mostly enroll in graduate programs in the United States, and they are in all major universities, especially Research I universities. Chinese graduate students traditionally mostly studied in the fields of science, such as physics and mathematics, but now they are in many other fields, including business, economics, law, and medicine. Moreover, the reliance of Chinese students on financial aid from the hosting institutions that was characteristic of earlier cohorts has declined significantly in recent years

Haizheng Li is associate professor of economics at the Georgia Institute of Technology.

I am grateful to Sumei Guo, Fei He, Chongyu Lu, Yang Peng, Hua Wang, Ying Wang, Yanni Xu, Luping Yang, Xiaobei Zhang, and Xiaojun Zhang for data collection, and especially to Lan Ding for excellent assistance. I would like to thank Hongbin Cai, Yongjun Chen, Li Gan, Yongmiao Hong, Yifu Lin, Baoyun Qiao, Xiangdong Qin, Guoqiang Tian, Wei Xiong, and Gene Zhang for helping with the survey, and participants at the National Bureau of Economic Research (NBER) preconference and conference, especially Charles Clotfelter, Debra Stewart, and Hugo Sonnenschein, for insightful comments and suggestions.

1. See the Institute of International Education (IIE) Network, http://opendoors.iienetwork.org/page/92270/.

because more Chinese students are coming to the United States with funding from their families.

At the same time, China is increasingly becoming an important destination for international students. According to the Institute of International Education (2007a), China now ranks fifth as a destination country for international students, behind the United States, the United Kingdom, France, and Germany. The number of Americans studying abroad in China increased fivefold in the past ten years, making China one of the top ten study abroad destination countries for U.S. students, and U.S. students now account for 7 percent of all international students in China.

As the Chinese economy and family incomes grow and college tuition in China increases, studying abroad will become more affordable, and, thus, more Chinese students are likely to come to the United States to study. But the rapid expansion of higher education in China will also offer more educational opportunities and, thus, encourage many Chinese students to stay home for higher education. Meanwhile, the increasing job and career opportunities in China will attract an increasing number of overseas trained scholars and students to return to work in China, helping to build world-class education and research programs.

Therefore, the dynamics in the higher education system, both within China and in its interactions with the United States and other countries, raise many interesting questions. How will higher education in China affect universities in the United States? Will those American-trained Chinese students help American universities become more competitive in the global market? Or will they help China build world-class universities? Will Chinese universities eventually compete with American universities, or will they continue to serve as complements, preparing high-quality students for universities in the United States? Those questions have important implications for both American and Chinese universities. This chapter addresses questions regarding the prospects for higher education in China, focusing on its influences on American universities. In addition to the use of publicly available data, we also collected our own data for the analysis and conducted a small survey about the recruitment of faculty members by Chinese universities in the U.S. academic job market.

There are a few studies of China's higher education system and its impact on universities in other countries. An Agora report edited by Fazackerley and Worthington (2007), "British Universities in China: The Reality Beyond the Rhetoric," presents a comprehensive review of the relationship between British universities and Chinese universities. The article by Xin and Normile (2008) published in the Newsfocus section in *Science* discusses issues related to Chinese universities in their efforts to become world-class institutions. Ma (2007) reviews top universities in China and their role in economic transition. Liu (2007) provides an overview of research universities in China. In this study, we discuss China's higher education system from

a different angle, that is, its relationship with the outside world, especially the United States.

The remainder of the chapter is organized as follows. In the next section, we briefly describe the history of higher education in China. Section 8.3 discusses the rapid growth of higher education since economic reform began in 1978. In section 8.4, we present major policies adopted by the Chinese government for fostering world-class universities. The trends and patterns of Chinese students studying abroad are discussed in section 8.5. In section 8.6, we discuss the situation of Chinese students and scholars in the United States. Section 8.7 analyzes the trends and policies related to overseas Chinese students returning to work in China. Section 8.8 discusses the challenges in the higher education in China and concludes.

8.2 A Brief History of Higher Education in China

In the imperial era before the twentieth century, Chinese education focused on the Confucius doctrines. There was no institution that could be called a university. One element of Chinese ancient higher education was in the form of Taixue and Guozijian (imperial college), which taught mostly Confucianism and Chinese literature for high-level civil services. The imperial examination system (*Keju*) was the major mechanism by which the central government identified and recruited elites all over the country.

Following the defeat of the Chinese Empire in the Opium Wars in 1840, modern Western education was introduced to China. Western style professional schools began to be established, and some of these later became the earliest universities in China. In 1912, China had one university and ninety-four professional training colleges. By 1923, there were thirty-five university-level institutions of higher education and sixty-eight provincial training colleges (Yang [2005] and references therein). Chinese students had been going abroad to study as early as the late nineteenth century. Starting in 1872, the government of the Qing Dynasty selected 120 children aged twelve to fourteen years old and sent them to study in the United States, thirty students per year for four years.

From the very beginning, the modern Chinese higher education system was greatly influenced by foreign countries. The country's higher education first followed the Japanese system and then the American model. Western missionaries and Chinese scholars returning from Japan and Western countries played significant roles in the development of the modern institutions of China's higher education (Yang 2005). The war with Japan and the following civil wars hindered the growth and development of higher education. By 1949, when the new People's Republic of China was established, there were only 205 colleges and universities, with a total enrollment of 116,504 students (table 8.1). Beginning in 1949, the higher education system in China completely switched to the Soviet model and for the next sixteen years grew

Table 8.1 **Higher education institutions in operation and students in China, 1949–1977 (no. of persons)**

Year	No. of institutions of higher education (1)	New enrollment: undergraduate students (2)	Total enrollment: undergraduate students (3)	New enrollment: graduate students (4)	Total enrollment: graduate students (5)
1949	205	30,573	116,504	242	629
1950	193	58,330	137,470	874	1,261
1951	206	51,689	153,402	1,273	2,168
1952	201	78,865	191,147	1,785	2,763
1953	181	81,544	212,181	2,887	4,249
1954	188	92,280	252,978	1,155	4,753
1955	194	97,797	287,653	1,751	4,822
1956	227	184,632	403,176	2,235	4,841
1957	229	105,581	441,181	334	3,178
1958	791	265,553	659,627	275	1,635
1959	841	274,143	811,947	1,345	2,171
1960	1,289	323,161	961,623	2,275	3,635
1961	845	169,047	947,166	2,198	6,009
1962	610	106,777	829,699	1,287	6,130
1963	407	132,820	750,118	781	4,938
1964	419	147,037	685,314	1,240	4,881
1965	434	164,212	674,436	1,456	4,546
1966	n.a.	0	533,766	0	3,409
1967	n.a.	0	408,930	0	2,557
1968	n.a.	0	258,736	0	1,317
1969	n.a.	0	108,617	0	n.a.
1970	n.a.	41,870	47,815	0	n.a.
1971	328	42,420	83,400	0	n.a.
1972	331	133,553	193,719	0	n.a.
1973	345	149,960	313,645	0	n.a.
1974	378	165,084	429,981	0	n.a.
1975	387	190,779	500,993	0	n.a.
1976	392	217,048	564,715	0	n.a.
1977	404	272,971	625,319	0	226

Source: Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (1949–1981).

Notes: In column (1), the numbers of schools for the period of 1957–1963 fluctuated dramatically. For example, it increased from 229 in 1957 to 791 in 1958 and then dropped from 1,289 in 1960 to 845 in 1961. This is related to the government "Great Leap Forward" policy in 1958, which was aimed at catching up developed countries in a few years, and the resulting dramatic readjustments in the years followed. During the Cultural Revolution starting in 1966, most universities were closed, and statistical work was interrupted, and, thus, some data are missing. In column (2), there was no new undergraduate enrollment during 1966–1969 and no national college entrance examinations for 1966–1976. In column (4), there was no new graduate enrollment during 1966–1977 due to the Cultural Revolution. For graduate students, data for 1961 and before only include graduate students at universities; for 1962 and after, data also include graduates from the Chinese Academy of Science and research institutes. In column (5), when new enrollment goes to zero due to the political movement to close universities, there were still formerly enrolled students. They needed to finish or took time to leave school. That is why the total enrollments for those years were declining but still nonzero. n.a. = not available.

rapidly. Total enrollment grew almost sixfold between 1949 and 1965, peaking at almost one million in 1960.

The Cultural Revolution of 1966 to 1976 had a devastating impact on China's higher education. Colleges and universities were closed or stopped functioning. National entrance examinations for higher education were abandoned. From 1966 to 1969, no new students were admitted to colleges or universities. Graduate student admission was suspended even longer, for the twelve years from 1966 to 1977. Although official statistics show new enrollment starting in 1970, those students were mostly admitted into college based on their family background and political considerations. Such admissions were only allowed for a few universities. There were no academic standards for either admission or for graduation. During this period, the curricula, classes, and grading system were all distorted, not following the academic standards of higher education.

The year 1977 brought the end of the Cultural Revolution and a new beginning for higher education in China. In that year, China held its first national college entrance examinations for higher education since the beginning of the Cultural Revolution in 1966. Some 5.7 million aspiring students took part in the exams, but only 273,000 were admitted to colleges and universities, yielding a miniscule admission rate of only 4.8 percent.[2] As a result, the Class of 1977 was both extraordinary and renowned because it was selected from the accumulation of ten years' worth of potential students.

8.3 Growth after the Cultural Revolution

With the beginning of the economic reforms of 1978, Chinese higher education began expanding rapidly. As can be seen in table 8.2, from 1978 to 2006, the number of institutions of higher education more than tripled, and total enrollment exploded, increasing by a factor of 20. The acceleration in enrollments began around 1999, coinciding with government policies for expanding higher education. From 1999 to 2006, new enrollments grew at the astonishing average rate of 23 percent a year. As a result, the number of graduates also increased accordingly.

The expansion also increased the probability of getting into college for those taking the national college entrance examinations. Whereas the rate of admission before 1981 was below 10 percent, it increased to 48 percent in 1999 and to 62 percent in 2004. Since 1999, more than half of those who participated in the entrance exams have been admitted into college.[3]

Table 8.3 provides information about the distribution of undergraduate students by field of study. Engineering had the largest number of students,

2. Those admitted to universities in 1977 started their higher education in spring 1978. From 1978 on, the national higher education entrance exams have been held in summer time, and the students who received admission began school in fall of that year.

3. Admission rates are from http://www.neea.edu.cn/.

Table 8.2 Higher education institutions and students in China, 1978–2006

Year	No. of institutions of higher education (units)	No. of faculty members (thousands)	No. of graduate students (persons)			No. of undergraduates (thousands)		
			Total enrollment	New enrollment	Graduated	Total enrollment	New enrollment	Graduated
1978	598	206	10,934	10,708	9	856	402	165
1979	633	237	18,830	8,110	140	1,020	275	85
1980	675	247	21,604	3,616	476	1,144	281	147
1981	704	250	18,848	9,363	11,669	1,279	279	140
1982	715	287	25,847	11,080	4,058	1,154	315	457
1983	805	303	37,166	15,642	4,497	1,207	391	335
1984	902	315	57,566	23,181	2,756	1,396	475	287
1985	1,016	344	87,331	46,871	17,004	1,703	619	316
1986	1,054	372	110,371	41,310	16,950	1,880	572	393
1987	1,063	385	120,191	39,017	27,603	1,959	617	532
1988	1,075	393	112,776	35,645	40,838	2,066	670	553
1989	1,075	397	101,339	28,569	37,232	2,082	597	576
1990	1,075	395	93,018	29,649	35,440	2,063	609	614
1991	1,075	391	88,128	29,679	32,537	2,044	620	614
1992	1,053	388	94,164	33,439	25,692	2,184	754	604
1993	1,065	388	106,771	42,145	28,214	2,536	924	571
1994	1,080	396	127,935	50,864	28,047	2,799	900	637

1995	1,054	401	145,443	51,053	31,877	2,906	926	805
1996	1,032	403	163,322	59,398	39,652	3,021	966	839
1997	1,020	405	176,353	63,749	46,539	3,174	1,000	829
1998	1,022	407	198,885	72,508	47,077	3,409	1,084	830
1999	1,071	426	233,513	92,225	54,670	4,134	1,597	848
2000	1,041	463	301,239	128,484	58,767	5,561	2,206	950
2001	1,225	532	393,256	165,197	67,809	7,191	2,683	1,036
2002	1,396	618	500,980	202,611	80,841	9,034	3,205	1,337
2003	1,552	725	651,260	268,925	111,091	11,086	3,822	1,877
2004	1,731	858	819,896	326,286	150,777	13,335	4,473	2,391
2005	1,792	966	978,610	364,831	189,728	15,618	5,045	3,068
2006	1,867	1,076	1,104,700	397,900	255,900	17,388	5,465	3,775

Sources: National Bureau of Statistics of P.R. China (2005), "Comprehensive Statistical Data and Materials on 55 Years of New China"; National Bureau of Statistics of P.R. China (various years); *China Statistical Yearbook* (2003–2006); Ministry of Education of the People's Republic of China, "The Statistic Communiqué of Education Development in 2006."

Notes: In 1978, a total of 10,708 new graduate students were admitted. Although universities were mostly closed for the 1966–1976 period, there were still many people with university degrees who were eligible to apply for graduate schools at that time. Some of newly admitted graduate students may be left over from the early period when the universities closed.

Table 8.3 **New enrollment by field of study at each degree level for 2001 and 2007 (%)**

	Undergraduate		Master's		Doctoral	
Field	2001	2007	2001	2007	2001	2007
Philosophy	0.07	0.04	1.1	1.3	1.6	1.6
Economics	5.2	5.2	5.0	4.9	5.9	4.9
Law	5.5	3.4	7.4	8.0	4.0	5.5
Education	5.9	4.7	3.1	4.0	1.5	1.9
Literature	15.6	15.5	7.1	9.4	4.0	4.8
History	0.6	0.3	1.4	1.3	1.9	1.7
Science	9.6	5.3	11.8	10.5	17.7	15.4
Engineering	33.3	36.9	37.9	34.4	39.2	37.9
Agriculture	2.4	1.8	3.4	3.7	3.7	4.2
Medicine	6.5	6.5	9.7	10.4	12.4	13.4
Military Science	n.a.	n.a.	0.04	0.06	0.05	0.06
Management	15.5	20.6	12.3	12.2	8.1	8.6
Total	100.00	100.00	100.00	100.00	100.00	100.00

Sources: Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (1994–2007); National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2005–2008)

Note: The year 2001 is chosen as the starting year because the field classification was changed in 2000. n.a. = not available.

accounting for approximately 37 percent of all undergraduate students in 2007. Management ranked second, with 21 percent of all students. The third largest field was literature with 16 percent of students, followed by medicine, science, and economics (accounting for 5 percent). Growth rates by field differed, with the fastest growth in economics, literature, engineering, medicine, and management.

Graduate enrollments expanded even faster, given the increasing focus on research in China's universities. In 1978, there were only 10,934 graduate students in total. However, by 2006, the number had grown to 1.1 million, as shown in table 8.2, a breathtaking hundredfold increase from 1978. Growth was sporadic until 1992, but new admissions grew in every year after that. In 2006, the number of graduate students who completed their degree was 255,900, which was equivalent to the entire fifteen-year total of graduates between 1978 and 1992. Corresponding to the national entrance examinations for college, there is also a national entrance examination for graduate study although the admission rate for master's students is much lower than that for undergraduate students. As it is with undergraduate enrollment, engineering is also the largest field for master's students, accounting for more than one-third of the total in 2007. It is followed by management, science, and medicine. Unlike the undergraduate level, enrollment in master's programs increased rapidly between 2001 and 2007 for almost all fields.

Doctoral programs in China restarted in 1982, when there were only a few

hundred doctoral students in the country. By 1988, the number of doctoral students enrolled had reached 10,000 (see table 8.8 later in this chapter). It took fourteen years for the total enrollment to reach 100,000 (in 2002), but only another four years after that for total enrollment to increase by another 100,000 doctoral students. In 2006, there were 55,955 new doctoral students admitted to institutions in China, and the total enrollment of doctoral students reached 208,038. In that year, 36,247 students were awarded a doctoral degree. In comparison, there were 45,596 doctoral degrees awarded that same year in the United States. China's growing doctoral production is illustrated by this fact: whereas China's output of doctoral students in 1996 had been only 13 percent of the number awarded by U.S. universities, by 2006, China's production had reached 79 percent of the U.S. level. A very large proportion of Chinese doctoral students are in engineering. In 2007, the share was 38 percent (table 8.3). In contrast to the distributions for undergraduate and master's programs, science is the second largest field for doctoral study, accounting for 15 percent of all students.

Faculty size has not increased as fast as enrollments. In 1999, when undergraduate admission rose by approximately 50 percent and graduate admission rose by about 30 percent, the total number of faculty members increased by merely 5 percent. Although the faculty size grew at a faster pace after 1999, it is still far below the speed of enrollment. In particular, the average annual increase of faculty size from 1999 to 2003 was 12 percent, far below the growth of admission. The implication is that, since 1999, China has educated more college students with relatively fewer faculty members. Thus, the student-faculty ratio rose from 8.8 in 1998, before the expansion, to 10.3 in 1999. The ratio continued to rise to 16.2 in 2003 and 17.2 in 2006, which almost doubled the ratio since the start of recent expansion. This ratio is considerably higher than that in the United States. In particular, in the United States, the average ratio of students to faculty for four-year private schools is 12.2, and for four-year public schools it is 14.8.[4] Given the huge economic gap between the two countries, it is unclear whether the ratio in China is too high.

In China, graduate students can be advised only by professors who hold either the title full professor or associate professor. High student-faculty ratios at the graduate level are probably a bigger threat to quality at the graduate level than at the undergraduate level. The ratio of graduate students to the sum of full and associate professors was relatively low, mostly below 2 or even 1 before 2002. Yet the ratio increased quite quickly. For example, in a ten-year period from 1992 to 2001, the ratio more than doubled, from 0.90 to 1.85. Unfortunately, the data on professors at the full and associate levels are not available after 2001, and we cannot get the ratios for recent years.

4. See the National Center for Education Statistics, http://nces.ed.gov/programs/digest/d07/tables/dt07_237.asp.

However, anecdotal evidence suggests that a typical professor advises an increasingly large number of graduate students, especially master's students. It has become very common for a graduate student to have only very limited interaction with his or her advisor during the entire period of graduate study. Such a situation would likely lower the quality of graduate education.

8.4 Major Reforms and Government Policies to Foster "World-Class Universities"

Since the economic reforms started in 1978, the Chinese government has implemented a number of major market oriented reforms in higher education. First, the government abandoned the traditional command system on admission and placement so as to give schools some flexibility in enrollment. More important, it also abandoned the job assigning system and let graduates find jobs in the labor market. Second, it transformed the traditional free higher education to a tuition-based system. Third, it opened higher education institutes to the outside world and encouraged collaborations and exchanges with universities worldwide.

In addition to changes in the institution and system, the Chinese government also launched a number of specific programs with special funding in order to help some universities become world-class schools. The major initiatives include the "211 Project," the "985 Project," and some related projects like the "863 Project" and the "973 Project."

The 211 Project was designed to provide special support to the top 100 universities to help improve their teaching, research, and infrastructure. It includes improvements in faculty, labs, and infrastructure for those universities, support for some selected programs to help them become leading programs in the fields, and improvements in information technology, including the Internet and libraries. The total funding for the 211 Project for the five-year period from 1995 to 2000 was RMB 18.37 billion Yuan ($2.3 billion). In this project, the amount of RMB 6.4 billion Yuan ($0.8 billion) was for supporting the selected priority programs.[5] The fund supported a total of 107 universities and 602 priority programs. Among the programs supported, 42 percent were in engineering and new technology, 20 percent in social science and humanity, 15 percent in basic research, 11 percent in medical and health, and the remaining 12 percent in environmental and agriculture.[6]

The 985 Project is aimed at helping the top forty universities to become world-class universities. Its provisions include (a) reforming and improving university administrative and operational mechanisms; (b) recruiting lead-

5. In this period, the exchange rate was approximately $1 = RMB 8.0.

6. The figures are from the official Web site of Ministry of Education, China, http://www.moe.edu.cn/edoas/website18/level3.jsp?tablename=724&infoid=5607; and http://www.moe.edu.cn/edoas/website18/level3.jsp?tablename=724&infoid=3568.

ing scholars inside or outside China to establish strong research teams; (c) establishing the Science and Technology Innovation Platform and the Social Science Research Base in those selected universities; and (d) improving university infrastructure and supporting international collaborations.[7] The 985 Project provides special financial support to those universities, ranging from RMB 300 million to RMB 1.8 billion per school.[8] The funding comes from the Ministry of Education and local provincial governments. Compared to the 211 Project, the 985 Project is weighted more heavily on research. Table 8.4 lists all universities supported by the 985 Fund and some basic information about those schools, including the size of faculty, students, graduate students, location, and date of founding. This list includes the top research universities in China.

The 863 Project focuses on research and development of high-level technology, while the 973 Project supports basic research. Both projects represent a large investment in science and technology by the Chinese government. Universities in China have received a considerable share of the funding from these two projects for their research. For example, by 2002, there were forty-nine universities that each received funding in the amount of 10 million Yuan or more from the 863 Project for specific research projects.[9] In addition, every year, the National Natural Science Foundation and Social Science Foundation in China provide a large amount of financial support to faculty members in universities for their research.

It is difficult to evaluate the direct effects of those policies. Yet it is clear that Chinese universities have made significant progress since the beginning of economic reforms in 1978. The relative importance of Chinese universities in the world can be inferred from rankings of world universities, as shown in table 8.5. This table lists three rankings by three different agencies for two years each. As of 2008, according to the Shanghai Jiaotong University (SJTU) Ranking, no Chinese university was among top 200 in the world. However, the progress has been impressive. In 2004, only two Chinese universities were among the top 300, but the number increased to five in 2008. The Times ranking put five Chinese universities in the top 200 in 2004 and six universities in this rank range in 2008, and most of those schools had a big jump in the ranking within this time period. The Webometrics ranking is based on different criteria, but the trend is similar; that is, as time goes on, more Chinese universities join the ranks of the elite universities of the world.

7. See the official Web site of Ministry of Education, China. http://www.moe.edu.cn/edoas/website18/level3.jsp?tablename=684&infoid=5120.

8. The exchange rate varied from $1 = RMB 6.8 - 8.3 in this period.

9. See China Education Online, October 28, 2005, http://www.51paihang.cn/html/edu/716.html.

Table 8.4 Top universities in China supported by the government 985 Project (no. of persons)

School name	Enrollment	Faculty	Graduate students	Date of founding	Location
Beihang University	22,768	1,851	9,695	1952	Beijing
Beijing Institute of Technology	21,914	1,927	7,666	1939	Beijing
Beijing Normal University	19,500	2,198	8,999	1902	Beijing
Central South University	50,004	2,732	15,796	1953	Changsha
China Agricultural University	22,414	1,490	7,821	1905	Beijing
China University of Mining and Technology	44,900	1,500	4,900	1909	Beijing
Chongqing University	52,000	3,010	16,063	1929	Chongqing
Dalian University of Technology	30,780	2,025	11,392	1949	Dalian
East China Normal University	25,640	1,660	7,730	1951	Shanghai
Fudan University	29,359	2,250	11,542	1905	Shanghai
Harbin Institute of Technology	46,701	3,027	20,474	1920	Harbin
Huazhong University of Science and Tech.	56,307	2,290	18,005	1953	Wuhan
Hunan University	30,000	1,970	10,600	A.D. 976	Changsha
Jilin University	60,067	6,428	19,614	1946	Jilin
Lanzhou University	27,397	1,758	9,190	1909	Lanzhou
Nanjing University	27,600	1,990	11,316	1902	Nanjing
Nankai University	21,942	1,773	9,522	1919	Tianjin
National University of Defense Technology				1953	Changsha
Northeastern University	30,010	2,003	9,271	1923	Shenyang
Northwest A&F Technology	26,885	1,490	5,942	1934	Yangling
Northwestern Polytechnical University	25,100	1,300	9,200	1938	Xi'an
Ocean University of China	19,681	1,298	5,573	1924	Qingdao
Peking University	29,854	1,597	15,119	1898	Beijing
Renmin University of China	22,329	1,700	9,378	1937	Beijing
Shandong University		4,000		1901	Ji'nan
Shanghai Jiaotong University	50,225	2,930	9,649	1896	Shanghai
Sichuan University	60,000	3,946	21,000	1896	Chengdu
South China University of Technology	38,253	2,213	12,859	1952	Guangzhou
Southeast University	26,303	2,185	11,436	1902	Nanjing
Sun Yat-Sen University	53,356	5,097	19,908	1924	Guangzhou
The Central University for Nationalities	14,296	1,040	2,691	1941	Beijing
Tianjin University	24,875	2,000	8,800	1895	Tianjin
Tongji University	42,205	2,851	18,663	1907	Shanghai
Tsinghua University	31,395	2,789	17,495	1911	Beijing
University of Electronic S&T of China	25,000	1,900	9,000	1956	Chengdu
University of S&T of China	26,601	1,098	12,087	1958	Anhui
Wuhan University	50,235	3,500	17,467	1893	Wuhan
Xiamen University	33,979	2,391	11,513	1921	Xiamen
Xi'an Jiaotong University	31,441	2,438	12,690	1896	Xi'an
Zhejiang University	40,910	3,539	16,214	1897	Hangzhou

Sources: The list of universities in the 985 Project: http://bmxxfb.cic.tsinghua.edu.cn/docinfo/board/boarddetail.jsp?columnId=0090401&parentColumnId=00904&itemSeq=2131. The data are from the official Web sites of the universities (collected in December 2008).

Notes: China University of Mining and Technology and East China Normal University were added to the project in 2007. The location and date of founding is based on the main campus. Blank cells indicate "not available."

Table 8.5 **The ranks of universities in China among universities in the world**

	SJTU ranking		Times ranking (top 200)		Webometrics ranking	
School name	2008	2004	2008	2004	2008	2007
Peking University	201–302	202–301	50	17	112	120
Fudan University			113	195		
Nanjing University	201–302		143	192		
Shanghai Jiaotong University	201–302		144		285	
Tsinghua University	201–302	202–301	56	61	238	270
University of S&T of China	201–302		141	154		

Notes: The SJTU Rankings are published in "Academic Ranking of World Universities" by the Institute of Higher Education at the Shanghai Jiaotong University (SJTU). The key ranking criteria are quality of education, quality of faculty, research output, and size of institution. The SJTU Ranking does not distinguish ranks for universities ranked after 200. Instead, it groups every 100 universities into one group such as group 200-300 (the number 201 or 302 in the table is caused by the same rank of some schools above or below; available at http://www.arwu.org/. The Times Higher Education-Quacquarelli Symonds World University Rankings are a composite measure based on four key criteria: research quality, teaching quality, graduate employability, and international outlook. It only ranks top 200 universities and is available at http://www.timeshighereducation.co.uk/hybrid.asp?typeCode=142&pubCode=1&navcode=105. The Webometrics Ranking measures volume, visibility, and impact of the Web pages published by universities, with special emphasis in the scientific output (referred papers, conference contributions, preprints, monographs, theses, reports) but also taking into account other materials (courseware, seminars or workshops documentation, digital libraries, databases, multimedia, personal pages) and the general information on the institution, their departments, research groups, or supporting services and people working or attending courses (available at http://www.webometrics.info/premierleague.asp).

8.5 Chinese Students Studying Abroad

It has been a long tradition for Chinese students to go abroad to study, beginning as early as 1872, as discussed in the preceding. From the founding of the People's Republic of China until the Cultural Revolution, most students going abroad were sponsored by the government. From 1950 to 1966, the Chinese government sent a total of 10,678 students to study in approximately twenty-five countries, mostly in the Soviet Union, Eastern Europe, and other socialist countries. The policy of studying abroad was largely abandoned during the Cultural Revolution, along with other programs involving international exchanges in education. For the ten-year period from 1966 to 1976, only 1,629 students were sent to other countries, mostly to study foreign languages.[10]

Following the start of economic reform in 1978, the government resumed the policy of sending students and scholars to study abroad. In 1979, a total of 1,750 people were dispatched to other countries to study. Most of them (74 percent) were visiting scholars. Among those, 82.6 percent studied

10. Data are from *China Education Statistical Yearbook 1949–1981.*

natural science, 16.1 percent language, and only 1.3 percent social science.[11] This natural science-oriented pattern continued for a number of years.

Individuals going abroad to study can be classified as visiting scholars and students, who generally will not get a foreign educational degree, or as formal students, who are to pursue degrees in foreign countries. Most visiting scholars and students from China were sponsored by the government or their employers, while most degree students going abroad were sponsored by the hosting schools in the form of fellowships or assistantships. In 1981, the Educational Testing Service (ETS) from the United States entered China to offer the Test of English as a Foreign Language (TOEFL), Graduate Record Examination (GRE), and Graduate Management Admission Test (GMAT) for Chinese students. Those tests make it possible for Chinese students to apply for formal graduate degree programs and financial aid from the schools to which they applied. Before 2000, due to the relatively low level of family income, financial aid was almost the only financial resource for Chinese students to study abroad for a graduate degree.

Since 1978, the number of Chinese students going abroad has increased continually except for the period of 1988 to 1991, due to the Tiananmen Square demonstration.[12] Figure 8.1 shows the total number of Chinese students and scholars studying abroad. The number increased from 860 in 1978 to 134,000 in 2006. In this period, there were more than 900,000 Chinese students and scholars who studied abroad. Based on the Institute of International Education (2007a), China has been the overall largest supplier of international students to countries around the world over the past decade. Since 1992, especially after 1998, the growth in the total number of Chinese students going abroad to study has accelerated. The total number of students going abroad increased from 2,900 in 1991 to 6,540 in 1992, an increase of 126 percent. The second fastest increase occurred in 2001, growing that year by 115 percent.

As can be seen in figure 8.1, almost all students and scholars studying abroad before 1992 were funded by the Chinese government. The number of students without government funding increased rapidly after that. Before 2000, it was almost impossible for Chinese students to get a U.S. entry visa if he or she did not get some sort of scholarship from the hosting institute. Thus, most of the nongovernment sponsored students were funded by financial aid from the hosting institutes in the foreign country. Since 2000, due to the rapid increase in family income in China, it has been much easier for a Chinese student to get a U.S. entry visa with self-funding.

For the ten-year period from 1996 to 2006, the average annual growth rate of students studying abroad was 25.7 percent.[13] The largest increase

11. The numbers are from *China Education Statistical Yearbook 1949–1981.*

12. In 1989 and 1990, the number of students going abroad funded by the government dropped 21 percent and 25 percent, respectively, compared to the previous year.

13. Data before 1996 were either missing or noncomparable. For example, the official statistics before 1991 does not include self-funded students.

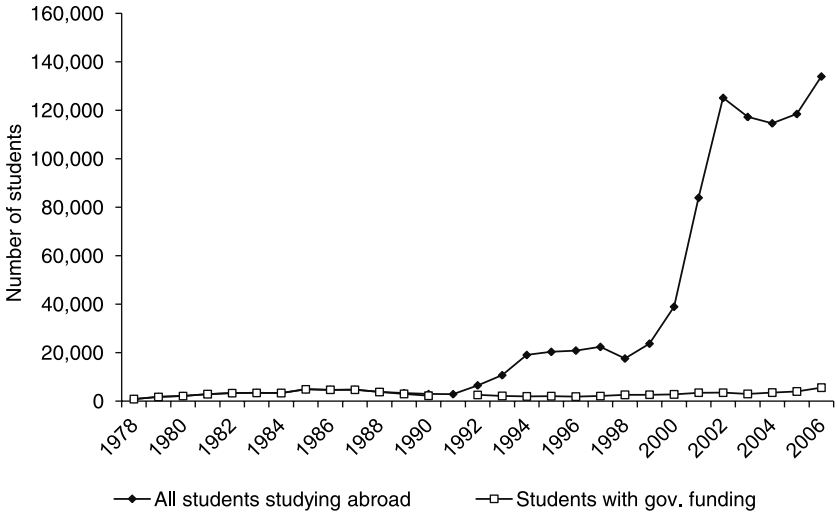

Fig. 8.1 Chinese students studying abroad (1978–2006)

Sources: National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2006); Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (various years).

Note: Year 1991 is excluded for lack of data.

is in the group of self-funded students, with an annual growth rate of 31.7 percent, although annual changes fluctuated from year to year. Obviously, the increase has been driven mostly by these self-funded students, given the lower annual average growth rates of 12.3 percent and 5.3 percent for government-funded and employer-funded students, respectively. The proportion of self-funded students was about 65 percent in 1996, but it increased to 90 percent or above after 2001.[14] As the income level continues to grow, we can expect that more Chinese students can afford to study abroad with their own financial resources.

The distribution of Chinese students in selected countries is listed in table 8.6. Since 1999, the United States has received the largest number of students from China, followed by Japan. Since 2001, the United Kingdom has surpassed Germany to become the largest hosting country for Chinese students after the United States and Japan. In fact, in the United Kingdom from 2000 to 2006, the number of Chinese students increased more than sevenfold. No wonder the Agora report (Fazackerley and Worthington 2007) admits "that the UK is financially dependent on a tide of Chinese students flooding into this country . . ." (1, introduction). Similar or even larger increases in the number of Chinese students for the same period can be found for Australia, New Zealand, South Korea, and France. In contrast, the increase in

14. Self-funded students include those who received financial aid from hosting schools in a foreign country.

Table 8.6 **The flows of new students from China to selected countries at the tertiary level (no. of persons)**

Year	Australia	Japan	New Zealand	Republic of Korea	Canada	France	Germany	United Kingdom	United States
1999	4,578	25,655	247	902	n.a.	1,934	5,355	4,250	46,949
2000	5,008	28,076	1,133	1,182	n.a.	2,111	6,526	6,158	50,281
2001	n.a.	31,955	3,338	1,645	n.a.	3,068	9,109	10,388	51,986
2002	17,343	41,180	8,481	2,407	n.a.	5,477	14,070	17,483	63,211
2003	23,448	51,656	16,479	4,025	n.a.	10,665	20,141	30,690	92,774
2004	28,309	76,130	24,215	6,462	n.a.	11,514	25,284	47,738	87,943
2005	40,316	83,264	23,260	10,093	17,913	14,316	27,129	52,677	92,370
2006	n.a.	86,378	n.a.	15,288	n.a.	17,132	n.a.	50,753	93,672

Source: http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=171.

Notes: The data is the number of new Chinese students going to the country for that year. n.a. = not available.

the United States is slower but steadier. In 2005, Australia, Germany, and New Zealand ranked four, five, and six, respectively, in receiving Chinese students.

The rapid increase of Chinese students in Europe, Australia, and other non-U.S. countries has undoubtedly been spurred by the efforts of those countries to actively recruit students in China and in teaming up with Chinese universities. Some universities in those countries have even set up offices in China to market their programs and to recruit students. Europe is reforming its higher education and research, trying to become more competitive. Australia would like to see itself as the graduate education and research anchor for all of Asia. Therefore, high quality Chinese students would contribute to both graduate programs and research there, and the revenue derived from Chinese students would also be important to those education systems.

The significance of study abroad for higher education in China, especially in graduate education, can be seen in figure 8.2. It shows the ratio of students studying abroad to undergraduates who completed their degrees in that year. We can see that, since 1978, those going abroad to study have accounted for an increasing proportion of graduated college students, assuming that most students studying abroad pursue graduate degrees. The percentage reached more than 9 percent in 2002. In other words, about 10 percent of graduating Chinese college students in that year went to other countries to further their study. The ratio declined to around 3.5 percent in 2006, though. One reason for the declining proportion is the enrollment hike in China because students affected by the 1999 expansion in enrollment reached graduation time in 2002 to 2003.

On the other hand, the ratio of students studying abroad to domestic new graduate admissions is much higher, and it shows a stronger rising trend.

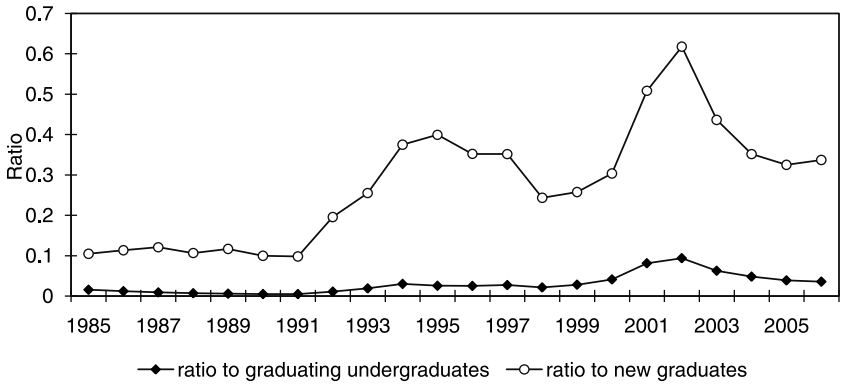

Fig. 8.2 The significance of studying abroad in China's higher education

Sources: National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2006); Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (various years).

Note: The lower line is the ratio of the number of new students studying abroad to total undergraduate students graduated in China for that year. The upper line is ratio of the number of new students studying abroad to total new graduate students admitted in China for that year.

In particular, in 1995, the ratio was 40 percent, meaning that those going abroad for graduate education were almost 40 percent of those who stay home for graduate education. For most of the years since 1994, the number of Chinese students going abroad for graduate study is approximately one-third of those joining domestic graduate programs. Therefore, studying abroad is an important component for Chinese students after finishing an undergraduate degree.

However, the enrollment boom that started in 1999 does not seem to have significantly increased the flow of Chinese students studying abroad. The first wave of the enrollment boom started in 1999, and those students began to graduate in 2003. From 2003 to 2006, the average annual growth rate of graduation for undergraduate students and graduate students was 30 percent and 33 percent, respectively. Yet the annual average growth for studying abroad for the same period was merely 2 percent. The growth of studying abroad showed a different pattern, decreasing in both 2003 and 2004 and increasing only slightly in 2005. Therefore, the proportion of students studying abroad among those who newly completed their undergraduate and graduate degrees declined in this period.

It is unclear though whether the decline is caused by diminishing propensity to study abroad or by other social and economic factors. In general, the candidate pool for studying abroad is mostly recently graduated undergraduate students plus current graduate students. We calculate a proxy for study abroad propensity by dividing the number of students studying abroad by

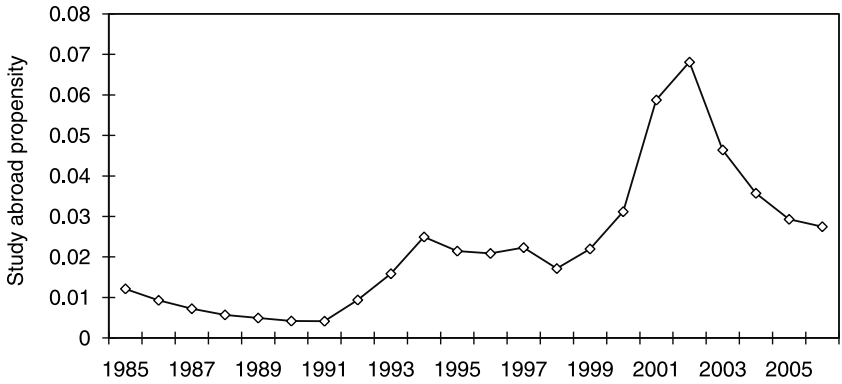

Fig. 8.3 Study abroad propensity (1985–2006)

Sources: National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2006); Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (various years).

Note: Study abroad propensity year t = (students studying abroad in year t)/(total undergraduates completed the degree in year t + total graduate students enrollment in year t).

the candidate pool. Figure 8.3 shows the trend of the studying abroad propensity. The trend is generally upward until 2002 when it was 7 percent, and then the proxy declined continuously to around 3 percent in 2006. It appears that a smaller proportion of the students who benefited from expanded college admission studied abroad.

On the other hand, the Chinese government expanded the scope and scale in sponsoring graduate students to study in developed countries. In 2007, the Chinese government launched a new program called the Graduate Students Joint Training program (GSJT). This program sponsors first or second year doctoral students currently studying in universities in China to do dissertation work in a number of designated universities in developed countries for a period of one to two years, as well as provides partial financial support to the students who have been admitted into a formal graduate program to study for a graduate degree, mostly for doctoral degrees, for up to four years.[15] The funding comes from the China Scholarship Council (CSC), with a monthly stipend of approximately $1,000, plus a round-trip international airline ticket.[16] Based on the current government plan, from 2007 to 2011, China will support 5,000 GSTJ graduate students each year. To get an

15. In order to get the GSTJ's support for degree study in other countries, the student must obtain admission and tuition waiver from the overseas university. Because it is generally more competitive to get a tuition waiver, students supported by this program have been mostly nondegree students.

16. The China Scholarship Council (CSC) is a nonprofit institution affiliated with the Ministry of Education. The objective of the CSC is to provide financial assistance to Chinese citizens wishing to study abroad and to the foreign citizens wishing to study in China. The CSC is financed mainly by the state's special appropriations for scholarship programs.

idea of the magnitude of this program, in 2006, the total new enrollment of doctoral students was about 56,000. Thus, the scale of the GSJT program is almost one-tenth of all new doctoral students admitted into domestic programs.

The new GSJT program reflects a much more open view of the Chinese government on studying abroad. Traditionally, students studying abroad were viewed somewhat as "dissidents" and faced various restrictions from the government. Now, the Chinese government is starting to view higher education systems in developed countries as a part of the domestic higher education system and is interested in partnering with U.S. and other research universities around the world in an effort to train its own research talent who will return to China. Such a cooperative view on higher education is certainly a welcome development in China although it may take a while for universities in other countries to see the benefits of this program.

8.6 Chinese Students and Scholars in the United States

The number of Chinese students in the United States has risen in almost every year since 1979, reaching 81,127 in 2007. As shown in figure 8.4, the majority of Chinese students are in the United States for graduate studies. In general, undergraduate students, both international and domestic, are self-funded in the United States. It is likely that the number of Chinese undergraduate students will increase in the future, as tuition in U.S. universities becomes more affordable for Chinese families. A similar trend is possible for graduate students, especially for the professional master's programs (like

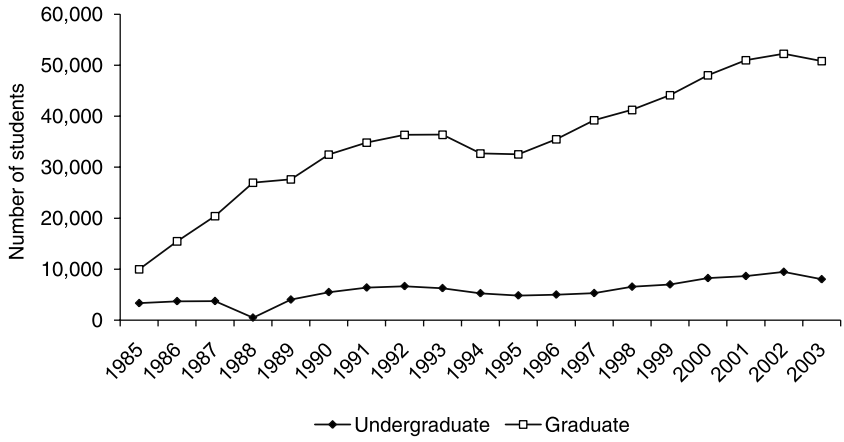

Fig. 8.4 Chinese graduate students and undergraduate students in the United States

Sources: Institute of International Education. 2007b. *Open Doors: Report on International Exchange (1948–2006),* CD version, New York. Data collected from tables for various years.

MBA) and PhD programs in non-STEM (Science, Technology, Engineering, and Mathematics) fields.

Table 8.7 lists the number of new Chinese students coming to the United States, as well as student flows from Taiwan, India, South Korea, and Japan. The flow of Chinese students to the United States with an F-visa increased steadily from 1997 to 2001 and then dropped for 2002 and 2003. A similar decline from 2002 to 2003 can be found for India. The September 11 attacks in 2001 and the related change in U.S. policy for foreign students might have contributed to the decline. However, the flow of students picked up speed between 2004 and 2005 and then accelerated. For the years 2006, 2007, and 2008, the annual growth of Chinese students coming to the United States with an F-visa was 27 percent, 35 percent, and 40 percent, respectively. The increase with J-visa students followed a similar pattern with a somewhat slower pace. It appears that, after slowing down in 2001 to 2003, the flow of Chinese students going abroad accelerated beginning in 2006, when the number of students grew 13 percent compared to 2005.

The trend in the flow of Chinese students to the United States and other

Table 8.7 Foreign students in the United States, by type of visa, 1997–2007 (no. of persons)

	China-Mainland		China-Taiwan		India		South Korea		Japan	
Year	F	J	F	J	F	J	F	J	F	J
1997	11,909	5,206	14,794	967	10,532	2,874	36,188	3,886	35,157	7,344
1998	13,958	6,462	13,867	995	12,154	2,855	21,271	3,087	34,063	7,605
1999	16,303	6,470	14,709	1,111	15,286	3,288	20,883	4,022	33,762	8,041
2000	21,586	7,708	16,084	1,274	20,469	3,740	27,520	5,525	32,661	8,304
2001	25,218	7,579	15,821	1,403	24,106	4,073	28,977	6,391	32,237	8,300
2002	21,784	6,790	13,952	1,629	20,771	3,626	26,670	7,399	25,036	7,638
2003	19,251	8,020	12,071	2,151	20,320	5,311	34,697	14,218	25,962	11,377
2004	21,227	9,459	14,880	2,472	19,567	4,838	35,365	15,169	25,581	10,810
2005	24,653	12,341	16,137	2,850	21,312	5,231	40,721	15,891	25,567	10,343
2006	31,199	15,098	17,398	3,508	27,555	5,932	49,414	16,706	24,435	9,922
2007	42,248	20,024	15,545	4,500	35,959	7,678	53,169	17,452	22,831	9,915
2008	58,942	25,792	15,165	5,498	37,890	8,815	56,309	17,157	20,714	9,382

Sources: Visa statistics report by U.S. Department of State, http://www.travel.state.gov/visa/frvi/statistics/statistics_4396.html; 2008: http://www.travel.state.gov/pdf/FY08-AR-TableXVII.pdf; 2007: http://www.travel.state.gov/pdf/FY07AnnualReportTableXVII.pdf; 2006: http://www.travel.state.gov/pdf/FY06NIVDetailTable.pdf; 2005: http://www.travel.state.gov/pdf/FY2005_NIV_Detail_Table.pdf; 2004: http://www.travel.state.gov/pdf/FY2004_NIV_Detail_Table.pdf; 2003: http://www.travel.state.gov/pdf/FY2003_NIV_Detail_Table.pdf; 2002: http://www.travel.state.gov/pdf/FY2002_NIV%20Detail_Table.pdf; 2001: http://www.travel.state.gov/pdf/FY2001_NIV%20Detail_Table.pdf; 1999: http://www.travel.state.gov/pdf/FY1999_NIV_Detail_Table.pdf; 1998: http://www.travel.state.gov/pdf/FY1998_NIV_Detail_Table.pdf; 1997: http://www.travel.state.gov/pdf/FY1997_NIV_Detail_Table.pdf.

Notes: F and J are two types of visas issued by the U.S. Department of State to foreign students and scholars coming to the United States for a short period of study or scholarly visit. Visa issuance includes the Border Crossing Cards. Also, we do not exclude possibilities that students who obtained an F or J visa and came to the United States for immigration purposes.

countries raises some interesting questions. What determines the flow of Chinese students studying abroad? How will the flow change over time as the higher education system in China expands and as the Chinese economy continues to grow?

It is possible that only the top students in China go abroad to study. If so, the expanded enrollment in China's higher education will not have much impact on this group. Also, the rapid expansion of graduate programs in China offers Chinese students more chances to do graduate study home, thus reducing the demand to further their studies in a foreign country. Additionally, it is also possible that, with growing career opportunities in China, students are becoming less interested in going abroad. Other factors hindering Chinese students' going abroad include restrictions placed by foreign universities and the economic condition in destination countries. For the United States, because some other countries, such as the United Kingdom, France, Australia, and New Zealand, are actively attracting Chinese students to their universities, such competition may take students away from the United States.

On the other hand, with the rapid increase in family income in China (magnified by the appreciation of the Chinese currency), the greater openness of the country, the higher degree of connections with universities around the world, and the relaxation of visa restrictions on Chinese students by foreign countries, more Chinese students may well decide to study abroad.

Among those Chinese students coming to study in the United States, many of them come for a doctoral degree. In 2006, the number of doctoral degrees awarded to Chinese students in the United States was 4,774 (table 8.8). This represents 30 percent of all doctoral degrees awarded to all foreign students and 10 percent of all doctoral degrees awarded in the United States for that year. In 2006, the number of doctoral degrees awarded in China was 36,247. Thus, the number of doctoral degrees awarded to Chinese students in the United States was 13 percent of the number of doctoral degrees awarded in China. In other words, U.S. universities have played a significant role in training Chinese doctorates. As a result, the total number of Chinese students who received a doctoral degree in both countries in 2006, 41,021, was more than the total of doctoral degrees awarded to all non-Chinese students in the United States.

Table 8.9 shows the number of U.S. doctoral degrees in science and engineering (S&E) earned by students from China, India, and Korea, the top countries for foreign-born PhDs in the United States. In every year from 1996 to 2006, the number of doctorates earned by Chinese students in S&E was larger than the combined number of doctorates in S&E earned by students from India and South Korea. Since 2004, for both Chinese and Indian students, the number of doctorates has increased at a very fast pace, much faster than that for Korean students, a fact probably related to the economic boom in those two countries.

Table 8.8 Doctoral degrees awarded in China and in the United States (no. of persons)

	Doctoral students in China			Doctoral degrees awarded in the United States			
Year	Total enrollment	New enrollment	Awarded	To Chinese students	To all foreign students	To U.S. citizens	Total awarded
1983	737	172	4			24,393	31,280
1984	1,243	492	39			24,045	31,334
1985	3,639	2,633	287			23,388	31,295
1986	5,654	2,248	284			23,097	31,897
1987	8,969	3,615	464			22,984	32,365
1988	10,525	3,262	1,583			23,290	33,497
1989	10,998	2,776	2,046			23,402	34,325
1990	11,345	3,337	2,457			24,913	36,065
1991	12,331	4,172	2,610			25,583	37,530
1992	14,558	5,036	2,528			26,009	38,886
1993	17,570	6,150	2,940			26,449	39,800
1994	22,660	9,038	3,723			27,150	41,033
1995	28,752	11,056	4,641			27,740	41,747
1996	35,203	12,562	5,430			27,777	42,437
1997	39,927	12,917		2,408	11,390	28,160	42,539
1998	45,246	14,962	8,957	2,571	42,683	28,456	42,637
1999	54,038	19,915	10,320	2,400	11,368	27,986	41,097
2000	67,293	25,142	11,004	2,594	11,597	27,986	41,365
2001	85,885	32,093	12,867	2,670	11,602	26,907	40,737
2002	108,737	38,342	14,638	2,644	11,353	25,936	40,025
2003	137,000	48,740	18,806	2,784	12,063	26,413	40,757
2004	165,610	53,284	23,446	3,209	13,000	26,431	42,123
2005	191,317	54,794	27,677	3,827	14,225	26,312	43,385
2006	208,038	55,955	36,247	4,774	15,916	26,917	45,596

Sources: National Bureau of Statistics of P.R. China (2005), "Comprehensive Statistical Data and Materials on 55 Years of New China"; National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2003–2006); Ministry of Education of the People's Republic of China (2007), "The Statistic Communiqué of Education Development in 2006; NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates; the Doctorate Recipients from United States Universities Summary Reports, http://www.norc.org/projects/Survey+of+Earned+Doctorates.htm (various years).

Notes: The total awarded does not equal the sum of all foreign students and U.S. citizens because of the group of unknown citizenship. Blank cells indicate "not available."

Table 8.10 provides some information on specific fields in S&E. The table shows that from 1985 to 2000, there were a total of 28,698 Chinese students who earned doctoral degrees in the United States, and 92.5 percent of them were in S&E. Among different fields, engineering has the most recipients, accounting for more than 25 percent, followed by biological sciences, accounting for 24 percent. The physical sciences have the third most recipients, accounting for 22 percent. Although the number of Chinese doctorates from the mainland is much larger than that from Taiwan, India, and South Korea, the number in non-S&E is much smaller. Clearly, students from mainland China have been mostly focused on S&E when pursuing the

Table 8.9 **Non-U.S. citizens earning science/engineering (S&E) doctorates at U.S. institutions by country, 1996–2006 (no. of persons)**

Year	China	India	South Korea
1996	3,033	1,287	991
1997	2,395	1,281	901
1998	2,502	1,134	822
1999	2,233	915	760
2000	2,378	834	753
2001	2,404	817	865
2002	2,401	681	856
2003	2,495	769	956
2004	2,877	863	1,056
2005	3,448	1,103	1,170
2006	4,323	1,524	1,219

Source: NSF Division of Science Resources Statistics, *Survey of Earned Doctorates.*

Table 8.10 **Asian recipients of U.S. science/engineering (S&E) doctorates by field and country/economy of origin, 1985–2000 (no. of persons)**

Field	China	Taiwan	India	South Korea	Total of these four countries/economies
Physical sciences	6,356	1,923	1,856	1,852	11,987
Earth, atmospheric, and ocean sciences	972	327	180	252	1,731
Mathematics	1,954	614	438	579	3,585
Computer/information sciences	673	839	1,178	531	3,221
Engineering	7,207	7,518	6,146	5,052	25,923
Biological sciences	6,790	2,175	1,766	1,520	12,251
Agricultural sciences	901	601	316	515	2,333
Psychology/social sciences	1,681	1,490	1,394	2,954	7,519
Non-S&E	2,164	3,021	2,755	3,820	11,760
S&E	26,534	15,487	13,274	13,255	68,550
All fields	28,698	18,508	16,029	17,075	80,310

Source: NSF Division of Science Resources Statistics, *Survey of Earned Doctorates,* special tabulations (2003)

Note: Foreign doctorate recipients include permanent and temporary residents.

highest degree in the United States. Comparing table 8.8 and table 8.9, we can see that, even in recent years, most doctoral degrees awarded to Chinese students are in S&E, approximately 90 percent. One important reason for such a field distribution is the funding opportunities.

Given the large number of Chinese students studying in the United States, it is clear that American universities play a significant role in providing higher education to Chinese students, especially in graduate education. On the other hand, foreign recipients of U.S. doctoral degrees are an important part of the internationally mobile, high-skilled labor force. When they return

to their home countries after completing their degrees, they add to the stock of potential leaders in research and education, making those countries more competitive in related fields. Those who remain in the United States enhance the competitiveness of U.S. enterprises and universities. Many Chinese students stay in the United States to work after graduation and, thus, make contributions to the U.S. economy. Given the competitive labor market in the United States, Chinese students who get a job in the United States after graduation must be at least as productive as any others in the same job.

Ultimately, the supply of highly educated Chinese students to the U.S. labor market is determined by their intention to stay in the United States. Table 8.11 provides information on intentions to stay in the United States for U.S. doctorates in S&E. It shows that the intent to stay is the highest for students from mainland China, much higher than for students from Japan, South Korea, and Taiwan. In 1998 to 2001, more than 96 percent of Chinese students who earned doctorates in the period planned to stay in the United States. These high stay rates are perhaps largely attributable to the higher income, better environment, and higher level of social stability available in the United States. Interestingly, when it comes to firm plans to stay (those reporting accepting firm offers), the percentage of Chinese doctorates is smaller than that for Indian doctorates, suggesting that Chinese doctorate recipients may be less likely to find jobs than those from India. One likely reason is differences in English language proficiency.

Research by Finn (2007) confirms the high stay rates of foreign-born doctoral recipients in general and for those from China in particular. Of foreign citizens who received S&E doctorates from U.S. universities in 2003, two-thirds still lived in the United States in 2005. As can be seen from table 8.12, among those who came to the United States on temporary visas and got their doctoral degrees during the years 1990 to 1991, 79 percent from

Table 8.11 **Plans of foreign recipients of U.S. science/engineering (S&E) doctorates to remain in the United States, by place of origin, 1990–2001 (%)**

	Plans to remain			Firm plans to remain		
Place of origin	1990–1993	1994–1997	1998–2001	1990–1993	1994–1997	1998–2001
All non-U.S. citizens	63.4	69.3	76.3	40.9	43.3	54.1
East/South Asia	68.6	75.4	83.2	44.1	46.2	58.5
China	93.5	96.6	96.2	58.0	57.3	67.5
Taiwan	56.0	54.3	68.8	33.8	28.9	42.2
Japan	42.7	44.0	54.9	29.6	31.6	36.8
South Korea	38.7	42.3	65.7	24.4	25.8	45.1
India	85.6	90.1	94.0	62.6	61.8	73.2

Source: NSF Division of Science Resources Studies, *Survey of Earned Doctorates,* http://www.nsf.gov/statistics/seind04/append/c2/at02-31.xls.

Note: Firm plans include plans for future education and employment.

Table 8.12 **Percentage of foreign students on temporary visas receiving science/engineering doctorates who remain in the United States (%)**

Country of origin	1987–1988 doctorate recipients in 1992	1990–1991 doctorate recipients in 1995	1992–1993 doctorate recipients in 1997	1994–1995 doctorate recipients in 1999	1996 doctorate recipients in 2001	1998 doctorate recipients in 2003	2000 doctorate recipients in 2005
China	65	88	92	91	96	90	92
India	72	79	83	87	86	86	85
United Kingdom	n/a	59	56	60	53	60	58
Canada	32	46	48	55	62	58	56
Greece	44	41	46	49	53	60	54
Germany	n.a.	35	38	53	48	51	49
Taiwan	47	42	36	42	40	47	50
Japan	17	13	21	27	24	37	39
Brazil	13	25	15	21	25	25	30
Korea	17	11	9	15	21	34	42
All average	41	47	53	51	56	61	65

Source: This table is taken from Finn (2007), table 8; Oak Ridge Associated Universities, http://orise.orau.gov/sep/files/stayrate07.pdf.

India and 88 percent from China were still working in the United States in 1995. In contrast, only 11 percent of the corresponding group from South Korea were still in the United States in 1995. Since 1990, the stay rate of Chinese doctorates has been the highest among the countries shown, averaging 90 percent. Countries whose doctoral recipients have the lowest stay rates include Korea and Japan. The high stay rate of Chinese doctorates in the United States has made them become an important component in the U.S. academic labor force.

To learn where Chinese scholars are in American universities, we collected data for a sample of ninety-five universities.[17] Most of them are among the top 100 colleges and universities as ranked by *U.S. News & World Report.* Those ninety-five institutions had 6,230 Chinese faculty members, accounting for 3 percent of total faculty size. Table 8.13 lists the institutions with the largest number and share of Chinese faculty. The University of Michigan and the University of Pittsburgh had the largest number of Chinese faculty; Stevens Institute of Technology and the Georgia Institute of Technology had the largest shares.

Although data are lacking on both the rate of growth in Chinese faculty and its size relative to faculty from other nations, it is reasonable to expect that the absolute and relative size will continue to grow, given the large number of Chinese students now in the United States. The career paths of American-trained Chinese students, most of whom are top students from China, reveal an interesting dynamic in what is effectively the integration of higher education among these two countries. In this sense, higher education in China and the United States is complementary and mutually beneficial.

8.7 Enticing Foreign-Trained Chinese Scholars to Return Home

Before 1992, very few Chinese students who received graduate degrees in the United States and other countries returned to China. In the United States, Chinese doctorates worked in academia, industry, and even government. Together with other highly educated Chinese students, they quickly entered the American middle class after graduation. In order to attract such well-established scholars to return to work in China, the Chinese government has adopted a number of preferential policies specifically aimed at them. Those policies provide attractive packages, including relatively high compensation, generous research support, and prestigious awards.

For example, in 1998, The Ministry of Education and the Li Ka Shing Foundation in Hong Kong jointly established the Changjiang Scholar Fellowship program. This program sets up the "Changjiang Professorship,"

17. Those schools are chosen because they hosted more than five Chinese graduate students sponsored by the GSJT program in 2007. Details about the sample can be found in Ding and Li (2009).

Table 8.13 **U.S. universities with the largest number and the highest percentage of Chinese faculty, 2007**

Institute	Chinese faculty (no. of persons)	Chinese faculty to total faculty ratio (%)
By number of Chinese faculty		
University of Michigan, Ann Arbor	139	2.6
University of Pittsburgh, Pittsburgh	133	3.1
University of Missouri, Kansas City	131	7.0
University of California, Los Angeles	129	3.6
Cornell University	127	6.2
Purdue University, West Lafayette	124	4.5
Ohio State University, Columbus	122	2.9
Vanderbilt University	120	3.8
Yale University	119	3.6
University of Florida	111	2.3
By percentage of Chinese faculty		
Stevens Institute of Technology	56	11.6
Georgia Institute of Technology	69	7.6
University of Missouri, Kansas City	131	7.0
University of Missouri, Rolla	32	6.8
Case Western Reserve University	87	5.5
Baylor College of Medicine	105	5.5
Rensselaer Polytechnic Institute	27	5.5
University of California, Riverside	43	5.2
The University of Texas, Arlington	57	5.1

Source: Ding and Li (2009).

the "Changjiang Lecture Professorship," and the "Changjiang Scholar Achievement Award" in Chinese universities and research institutes. A Changjiang Professor is expected to work in the awarding institute at least nine months, and a Changjiang Lecture Professor at least two months. Changjiang Scholars are expected to play a leading role in research, in building research and graduate programs, in teaching core courses, and in advising young scholars and graduate students. From 1998 to 2006, there were 803 Changjiang Professors, 304 Changjiang Lecture Professors, and 14 Changjiang Scholar Achievement Awards bestowed in ninety-seven Chinese universities.[18] Among those Changjiang scholars, 94 percent had studied or worked overseas, a figure showing that a majority of China's leading scholars have some training in other countries. Of those named Changjiang Professors, 231 (or 29 percent of the total) were overseas scholars, whereas all 304 Chang-jiang Lecture Professorships were awarded to overseas scholars, including some prominent non-Chinese scholars.

Following the Changjiang scholarship program of the central govern-

18. See http://www.cksp.edu.cn/news/16/16-20070319-136.htm.

ment, provincial governments and universities established similar fellowship programs to attract well-established scholars, such as the "Furong Scholar Fellowship" program in Hunan Province and the "Zhujiang Scholar Fellowship" in Guangdong province. Although such local fellowships are not as prestigious as the Changjiang fellowship, their funding amounts are comparable. Such funding has become one of the important channels to attract established overseas scholars into the higher education sector in China.

In addition, the Natural National Science Foundation of China (NSFC) also sets up specific funds to support overseas scholars to do research in China. For example, it established the "Distinguished Young Scholar" fund for overseas scholars in 2005. Recipients of this fund must work full time in China to do research. The program granted RMB 9.4 million in 2005, increasing to RMB 24 million and 20 million in 2006 and 2007, respectively.[19] In order to encourage joint research, the NSFC has also established the Joint Research Fund for Overseas Chinese Young Scholars to do joint research with a Chinese institute. All of those research resources provide incentives for overseas Chinese scholars to collaborate with researchers in China or to return to work in China permanently.

With more internationally established scholars working in Chinese universities, young Chinese scholars and especially fresh PhDs in other countries have begun to consider universities in China in their job search. Taking a faculty position in a university in China is becoming much more acceptable than in the past and is sometimes a better option for many fresh Chinese PhDs or even senior scholars in foreign countries, including some in the United States.

In the meantime, universities in China have started to actively recruit faculty overseas. Although detailed data on the recruiting efforts of universities in China are still not available, we are able to collect data for the economics field via *Job Openings for Economists* (*JOE*), published by the American Economic Association (AEA). Every year in early January, the AEA, in conjunction with approximately fifty associations in related disciplines, holds a large scale annual meeting in the United States, as part of the Allied Social Science Association (ASSA) annual convention. In this convention, the AEA provides a job placement service to which universities and some nonacademic employers submit their job opening advertisements for economists (mostly with PhDs in economics). In addition, the *JOE* publishes job openings on a regular basis.

The archives of *JOE* reveal a marked increase in recruiting by Chinese universities and research institutes. The first year that Chinese universities listed job openings was 1995. Two units listed job openings for this year, Peking University's China Center for Economic Research and Nanjing Uni-

19. See http://www.nsfc.gov.cn/nsfc2008/index.htm. In this period, the exchange rate was approximately $1 = RMB 7.0 to 8.0.

versity's Hopkins-Nanjing Center. After that, from 1996 to 1999, Hopkins-Nanjing Center was the only employer listed. In 2000 and 2001, Peking University was the sole employer, and in 2002 and 2003, Tshinghua University began recruiting at the AEA meetings. In 2004, another university, Shanghai University of Finance and Economics started to recruit faculty in the ASSA placement market, and it listed ten openings for that year. Since then, the number of schools and institutes recruiting in the ASSA market increased very quickly, reaching eight and seven in 2005 and 2006. The number doubled to fourteen in 2007 (plus three other research institutes). As the number of Chinese universities recruiting in the American academic job market increased, so did the total number of positions. Whereas the total number of economics faculty positions from China in the ASSA job market was below ten until 2003, the number increased to 108 in 2005 and 2006 and was eighty in 2007.[20]

Given the large gaps in salary between universities in China and in the United States, the biggest concern for job candidates considering a job in China is likely to be the level of compensation. In 2002, Tsinghua University was the first to publish a salary range in its *JOE* advertisement: $25,000 to $75,000 plus housing subsidies and research support. Although that salary was not high by U.S. standards, it was five to ten times the salary earned by faculty members with the same rank in that university, and it was in the very highest percentile of all salaries in China. Since then, it has become common for Chinese universities to put a salary range in their *JOE* job advertisements. In 2007, the highest advertised salary was from Shanghai University of Finance and Economics, in the range of $43,000 to $214,000. Given the relatively low cost of living in China, such a pay scale is becoming increasingly attractive, especially with the additional housing subsidy and research support.

In order to find more detailed information about faculty hiring packages from universities in China and to assess their competitiveness, we conducted a survey of Chinese universities. The survey covers seven of the fourteen universities recruiting economics faculty in the ASSA job market in 2007. All seven are major Chinese universities and have been listed in the *JOE* for three or more years. The survey questionnaire was completed by the chairs or deans to provide information for their departments or colleges. Because some universities have multiple departments engaged in hiring, our sample includes a total of ten departments from those seven universities.

Based on the survey, the faculty size varies dramatically in those departments, from 3 to 140. This is because some departments are newly established. So far, there are two hiring models for adding faculty members with

20. The number for 2005 and 2006 should be interpreted with caution because one school, Southwestern University of Finance and Economics, advertised fifty and forty positions in the *JOE* for those two years, respectively.

overseas doctoral degrees. One is to add new faculty members to the existing faculty in a department but with different pay schemes and evaluation standards. The other one is to set up an entirely new department for overseas faculty. The latter model is easier to implement, as it can reduce potential conflicts between faculty groups caused by the huge differences in pay scale and promotion standards. A direct consequence of these policies is that the ratio of U.S. trained faculty is very high, 45 percent on average for full-time faculty and as high as 97 percent in the sample.

Because tenured, senior faculty members in the United States are generally difficult to recruit, due to the uncertainty associated with positions in China, most Chinese with doctorates in economics who return to China are fresh PhDs. But senior faculty members from overseas are generally in very high demand, owing to the need to build programs, to mentor young faculty and to advise graduate students. In order to find a practical way to recruit senior faculty from the United States, many universities in China have established some type of special-term professorship, which is a part-time position specifically designed for overseas senior faculty members. Such professors can go to teach at the Chinese university during summer break or during sabbatical leave. To accommodate such short-term appointments, many universities in China have set up specially condensed courses or even condensed semesters. These short-term professors serve to bolster Chinese programs by teaching courses and advising graduate students. In our survey, the average number of special-term professors was about four, and the ratio of special-term professors with U.S. academic appointments to full-time faculty with U.S. PhD degrees averaged 0.65. These findings suggest that the flexible special-term professorship plays an important role in overseas faculty recruiting.

Learning from the policy of establishing special economic zones in China, Chinese universities established new departments, institutes, and centers subject to special policies on recruiting, promotion, and compensation. In such "Special Platforms," teaching is mostly in English, special-term faculty members are mostly from the United States and Europe, full-time faculty are mostly those with PhD degrees from the United States and Europe, and the system is similar to the American academic system. Moreover, in order to start at a higher level in education and research, most newly established departments and programs have hired as director (or chair or dean), on a part-time basis, a senior overseas faculty member. This overseas director normally resides in China during summer and winter breaks and works on program building (not teaching). In our survey, 70 percent of departments or academic units have an overseas head. The obvious advantage of having a director and special-term professors from overseas is that they can help to quickly build the program to international standards and to attract more faculty members from overseas. This reflects the combination of competition and cooperation, noted in the preceding, between universities in China and in the United States and around the world.

Table 8.14 Information on recruiting packages for U.S.-trained faculty in economics

Survey indicator	Average		Min.	Max.	No. of observations
	From	To			
Junior starting salary	36,143	43,429	28,571	57,143	10
Senior starting salary	47,143	67,143	42,857	78,571	5
Junior annual housing subsidy	6,589	7,244	3,429	9,571	8
Junior housing subsidy (in years)	4		3	6	8
Junior annual research support	5,486	6,771	2,857	14,286	10
Senior annual housing subsidy	8,524	11,952	6,857	26,190	5
Senior housing subsidy (in years)	5.6		3	10	5
Senior annual research support	5,095	6,048	2,857	11,429	6

Source: The survey of overseas faculty recruiting in economics from universities in China, 2008.

Note: Numbers are U.S. dollars unless otherwise indicated.

The survey revealed ambitious plans for expansion. On average, the surveyed departments planned to hire over the following three years more than thirteen new faculty members from overseas, or about four a year. This number of planned overseas hires would far exceed the existing number of U.S. trained faculty and would, if acted on, lead to more than doubling of overseas faculty in three years.

Table 8.14 provides information on the compensation packages that are being used to recruit overseas faculty. The average starting salary offered for a fresh PhD in economics in 2008 was approximately $36,000 to $43,000 and could go as high as $57,000. Housing subsidies offered for a limited number of years were in the range of $6,600 to $7,200 per year, and annual research support for junior faculty was in the range of $5,500 to $6,800. Compensation packages for senior faculty were generally higher, with a base salary ranging from $47,000 to $67,000, on average. This compares to an average in the United States of $118,000 for full professors in 2007.[21] Although the typical salary plus housing subsidy offered by Chinese universities is still low by U.S. standards, it is at least close to the U.S. range. Moreover, the cost of living is much lower in China, the teaching loads in China (two to three semester courses per year) tend to be lower than in most economics departments in the United States, and the annual research support is comparable to that in the United States.

On the strength of hiring packages such as these, universities in China have become more competitive in recruiting Chinese faculty in the U.S. academic market. As evidence, consider the responses given to the survey question asking the name of two top universities in the United States from

21. This is based on American Association of University Professors (AAUP); in 2007, for doctoral institutes, the average salary for an assistant professor is $68,112, and for an associate professor and a full professor is $80,043 and $118,044, respectively. See "The Annual Report on the Economic Status of the Profession, 2007–08," http://www.aaup.org/.

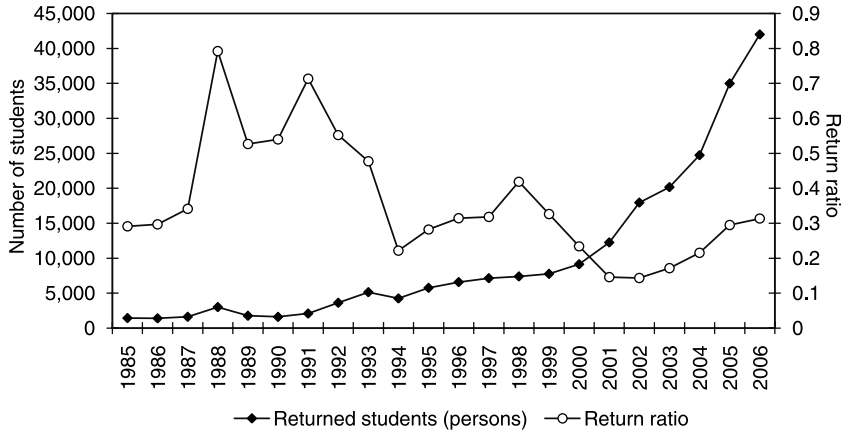

Fig. 8.5 Chinese students returned to China

Sources: National Bureau of Statistics of P.R. China (various years), *China Statistical Yearbook* (2006); Ministry of Education of the People's Republic of China (various years), *China Education Statistical Yearbook* (various years).

Note: Return ratio = the ratio of returned Chinese students to those going abroad to study for that year.

which their U.S.-trained full-time faculty members received their degrees. The answers included top-ranked institutions like Harvard, Princeton, Stanford, and Berkeley.

As a result of all these efforts, in aggregate, the number of Chinese students with overseas degrees who returned to work in China began to grow at an accelerated pace after 2000, reaching 42,000 in 2006, as shown in figure 8.5. Between 2002 and 2006, the average annual growth in returned students and scholars was 29 percent, which is higher than the growth rate of those going abroad to study.[22] Although there are still many more students going abroad than returning home (in 2006, the number who returned was 31 percent of those who left China), the ratio of those who returned to those going abroad has shown a steady increase. It will be interesting to see whether this trend continues.

8.8 Challenges and Conclusions

This chapter discusses the higher education system in China and the study-abroad behavior of Chinese students, focusing on those in the United

22. For recent anecdotal evidence on the return of Chinese scholars in other fields, see, for example, "Back-to-China Syndrome," *Business Week,* September 15, 2008, 53, and "China Entices Its Scholars to Come Home," *The Chronicle of Higher Education,* December 19, 2008.

States. In the era of globalization, higher education in most countries is not isolated. This is especially the case for China as it becomes more integrated into the world. Additionally, because of the large number of Chinese students and scholars studying abroad, the development of higher education in China will also inevitably affect universities in other countries.

We show that China's higher education has been growing rapidly since the beginning of economic reforms, made possible with the resources generated by rapid economic growth. However, there are still many challenges facing China's higher education. First, rising college tuition makes higher education an increasing financial burden for Chinese families (see Wang et al. 2009). Since 1989, China's higher education began to transform from tuition-free (with some living allowances to students) to tuition-based. By 1997, tuition became mandatory in all colleges in China. By 2002, the average tuition per student had reached 46 percent of per capita gross domestic product (GDP), roughly the same ratio for private colleges and universities in the United States.[23] Second, the rapid expansion of college enrollments has probably had a negative impact on job placement. In 2003, the job placement rate for college graduates was only about 70 percent. The slower growth in college admissions in 2005 and 2006 may improve the job prospects for college graduates if economic growth remains steady.[24]

A third problem lies in the objectives and quality of graduate programs. The objective of master's programs is not well defined in China. It is unclear whether such programs are for training researchers or just for a professional degree. Moreover, doctoral programs in China generally need dramatic improvement in quality, design, and curriculum in order to train the best researchers. Unfortunately, such an effort has been hindered by the fact that a large number of government officials and business executives are getting their doctoral degrees, mostly in economics and business-related disciplines, on a part-time basis. Such desire for "window dressing" from those in control of administrative and financial resources compromises efforts to improve doctoral education in China and makes doctoral education, especially in social science and humanity fields, to some extent, effectively an Executive Master of Business Administration (EMBA) type program. A final challenge is still the central planning administrative system for higher education. Unlike much of the economy, which is in transition toward a market system,

23. The tuition and enrollment data include only regular institutes of higher education. The ratio for the United States is based on a per capita GDP of $37,626 for 2003 and an average tuition for private four-year institutions of $16,826, yielding a ratio of 0.45. U.S. Council of Economic Advisers, *Economic Report of the President,* 2008, table B-31, http://www.gpoaccess.gov/eop/tables08.html, 2/5/09; U.S. Department of Education, *Digest of Education Statistics,* 2007, table 320, http://nces.ed.gov/programs/digest/d07/tables/dt07_320.asp, 2/5/09.

24. The placement rate is based on the September number of that year, *China Education Statistical Yearbook* (various years), and http://edu.people.com.cn/GB/8216/52456/52459/106207/index.html.

the higher education system in China is still largely centrally planned. Government intervention is observed in almost every aspect of teaching and research in universities.

In the face of so many challenges, an effective strategy to improve Chinese universities is to continue to engage with universities in developed countries. From its earliest days, China's modern higher education system has been influenced by foreign countries. Many Chinese students have gone abroad to receive the best education in world-class universities, making foreign universities a significant part of the education of Chinese students, especially at the graduate level. Chinese scholars and faculty who return to China help improve the quality of higher education in China. At the same time, many overseas Chinese students contribute to the economies in the hosting countries through their employment after graduation. Moreover, Chinese faculty in increasing numbers contributes to higher education in those countries as well. Such dynamics between universities in China and in other countries help to reinforce the mutual positive impact on higher education on both sides.

The large number of Chinese students in the United States makes it impossible to ignore the impact of the development of China's higher education system on American universities. First, high quality Chinese students and Chinese faculty should help make American universities more competitive. Second, the increasing number of Chinese students with self-funding may also contribute to the financial resources of American universities. Moreover, the collaboration between Chinese and American universities will help to expand education and research experiences for American students and faculty.

Therefore, although higher education in China will continue to expand, for the foreseeable future, a large portion of best students from Chinese universities will still come to the United States to further their education. Given the big economic and political gap between China and the United States, many of the best trained Chinese students in the United States will be likely to stay to work in the United States after graduation, especially in American universities. In this sense, Chinese universities are a complement to American universities.

On the other hand, the accelerating return of established Chinese scholars from overseas—spurred by the aggressive recruiting policies of Chinese universities—may help to speed up the process of building world-class programs in China. As a result, some Chinese students may choose to stay home for further education instead of going abroad, and more international students may come to China to study. Universities in China are starting to compete with American universities in faculty recruiting and in attracting students. Thus, there are some signs that Chinese universities compete with American universities.

Given the significant differences between the Chinese and the United

States' higher education systems as well as in their economic and political systems, it seems likely that the relative standing of Chinese and American universities will not change significantly in the foreseeable future. In recent years, the Chinese government and universities have shown greater openness in higher education, and they are willing to partner with world-class universities around the world in order to promote their own schools to the elite status among world universities. The combination of competition and cooperation between universities in China and in other countries is most likely the model for the future, and such a model should have a positive impact on higher education in the world.

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