ONE

THE GLOBAL KNOWLEDGE ECONOMY AND HIGHER EDUCATION

1.1. INTRODUCTION

Global refers to worldwide in scope and substance and de-emphasizes the concept of nation, but without negating it. Globalization, in general, is the flow of technology, knowledge, people, values, ideas, capital, goods, and services across national borders, and affects each country in a different way due to the nation's individual history, traditions, culture, and priorities (Knight 2004). Economists define globalization more narrowly as the integration of commodity, capital, and labor markets.

In any case, globalization involves the coming together and interaction of human beings. Thus, the process of globalization began with the genesis of human beings. It has always been driven by the human desire for economic and political gains, a zeal for spreading faith, ideology, and culture, and a quest for new knowledge. It has been made possible by advances in transportation and communication technologies. Globalization clearly is a continuous process that is dependent on and intertwined with technological progress.

Until about two centuries ago, it was possible to identify different civilizations as distinct from one another, simply because transportation and communication technologies were not as developed and widely available as they are today. This meant that different communities could not interact sufficiently to influence each other in a manner that would lead to new socioeconomic and cultural syntheses. Since then, and especially in the previous century, however, a single global civilization has emerged that like a marble or an amalgam, consists of the "higher outputs" of different cultures, political, scientific, technological, socioeconomic, artistic, and literary that are now shared by the masses worldwide. McNeill and McNeill (2003, 325), describe this process as follows:

> Civilizations engulfed originally independent human communities, creating new, more powerful bodies politic, economic and cultural; and being more powerful, they persistently spread to geographically favorable new ground. Moreover, their spread meant that across the past millennium, as communications intensified, what began as separate civilizations followed a familiar path by blending into an ever more powerful, global, cosmopolitan web that now prevails among us—a huge web of cooperation and competition sustained by flows of information and energy.

At the very core of this single global civilization is rational, critical human thought and reasoning, which originated in the Hellenic world in the first half of the sixth century BC.[1] From there, it followed a tortuous path over a vast area extending from China to Spain before eventually reaching the West to form the core of today's global civilization. Scholars, polymaths, philosophers, and students wandering from one place to another throughout centuries played a key role in spreading ideas, knowledge, know-how, and civilization.

This book is about how the international mobility of students, scholars, programs, and institutions of higher education evolved over time, and the ways in which it is occurring in today's global knowledge economy.

Students and scholars leaving their homes on a quest for education and knowledge is not a new phenomenon; neither are the transplantation of educational institutions, and the transfer of the epistemic knowledge base of curricula and textbooks from one culture to another. In medieval Europe, for example, there were times when foreigners accounted for about 10 percent of the student enrollment across the continent. This figure is much higher than the share of foreign students in higher education enrollment worldwide today, which is about 2 percent. However, the number of foreign students today is a staggering 2.75 million worldwide, compared with a few hundred in medieval Europe. At that time, students traveled to other places simply because there were no institutions where they lived. Today, there are more than seventeen thousand institutions of higher education in 184 countries and territories in the world, and opportunities for access have been vastly improved for masses since then. This is what makes the relatively smaller number of foreign students in higher education today much more significant. The question then is what has caused this expansion? In other words, what are the rationales, on the part of students and their families, the governments of their countries of origin, and the institutions and countries hosting them, that are driving this expansion? Furthermore, student mobility, although the biggest part, is just one component of the international higher education scene in today's world. More than one rationale is at work, and a multitude of modalities and opportunities exist, which are expanding academic mobility today, and they are all interdependent.

This book is an attempt to survey the literature on these complex phenomena. Academic mobility, in its various forms, is and has been an important aspect of the process of globalization throughout history. Rapid technological developments have made and are making it much easier and faster today. However, this is only part of the picture, even when analyzed in a historical perspective. Any attempt to study academic mobility without linking it to the evolution of institutions, structures, systems, functions, governance, administration, and financing of higher education throughout history would be incomplete. Developments in higher education worldwide that have taken place in the second half of the twentieth century, particularly those that have been paralleling the onset of the global knowledge economy, are particularly pertinent to the topic at hand.

1.2. GLOBALIZATION AND THE KNOWLEDGE ECONOMY

Throughout history, knowledge, as both technical expertise and any kind of information, has been important to humankind for improving the quality of life. What have changed over centuries, however, are the characteristics and the quality of knowledge, the relative importance of science as its source, the methods by which it is created, stored, accessed, transmitted, acquired and retrieved, its relative importance as a production factor, and the level of education and training required in the workforce.

1.2.1. The Industrial Society

Until the late nineteenth century, technology was developed independently of science; technological developments, in general, preceded scientific developments.[2] The Industrial Revolution that took place between 1760 and 1830 began with the invention and commercialization of the steam engine by James Watt (1736–1819), long before the formulation of the laws of thermodynamics that govern the relationships between heat and mechanical energy and the limitation imposed by nature on the conversion of the former to the latter.

Based on the educational backgrounds of the technological leaders of the Industrial Revolution, it can also be argued that the university as an institution made little, if any, contribution to the Industrial Revolution.[3] Mokyr (2002, 37–41), on the other hand, argues that the Scientific

Revolution and the Enlightenment, both of which owed indirectly to universities and other institutions of higher education, resulted in what he refers to as "Industrial Enlightenment." He cites the associations of technical and scientific knowledge, whose number in England had reached 1,020 by the end of the nineteenth century with a total membership of about 200,000, as a major contributor to the Industrial Enlightenment.[4] It should, however, be pointed out that chairs and professorships in various branches of natural sciences had been established in Oxford and Cambridge as early as the beginning of the seventeenth century, and by the end of that century, Scottish universities, St. Andrews (f. 1411), Glasgow (f. 1451), Aberdeen (f. 1495) and Edinburgh (f. 1589), together with the Dutch universities, Leiden (f. 1575), Groningen (f. 1612) and Utrecht (f. 1636), had emerged as the leading scientific and intellectual centers in Europe. It is inconceivable that the scholarship of the Scottish universities did not permeate the neighboring northern England, the cradle of the Industrial Revolution. Furthermore, the dissenting academies, where such great scientists as Joseph Priestley (1733–1804) and John Dalton (1766–1844) gave public lectures, were concentrated in the new commercial and industrial centers, Manchester, Liverpool and Birmingham, where rich merchants and industrialists sponsored and supported them. Many of the mechanical institutes affiliated to the Royal Institution[5] also were located in this region. The role that universities and other institutions of higher education played in the Industrial Revolution was obviously indirect; nevertheless, it should not be underestimated.

However, owing mainly to the German research universities (see Section 5.1.4), an entirely different picture started to emerge in the nineteenth century. Scientific breakthroughs achieved in laboratories led to new technologies, which, in turn, formed the bases of new industries. The chemical industry and electrical technologies are generally considered the first science-based industries.[6]

The period from about the middle of the eighteenth century to the beginning of the twentieth century marks the advent of the industrial society, which is characterized by technologies and industries based on the results of scientific research, replacement of inventions and inventors by innovations and organized research and development (R&D) activity, and the appearance of large-scale, smoke-stack factories mass-producing goods.

In the preindustrial society, individual scientists and scholars worked in isolation, even away from the universities where some of them were employed. With the advent of industrial society came the university research laboratories, and public research institutes. *Physikalisch-Technische Reichsanstalt* (f. 1887), the *Kaiser Wilhelm Gessellchaft* (f. 1911, renamed Max Planck institutes in 1948), the industrial R&D laboratories, such as those of the German chemical giant *Badische Aniline und Soda-Fabrik* (*BASF*, f. 1865)[7] were the first ones in Germany. Research laboratories of General Electric and Bell Telephone, and Edison's laboratory/shop in Menlo Park were the pioneers in the United States.

To channel public funds more effectively and to organize R&D activities toward national goals, institutions were established as early as the first quarter of the twentieth century. In this manner, national R&D systems began to emerge, comprising universities, public research institutions, and private-sector research departments, each with distinct, but partially overlapping and complementary functions.[8]

Technological progress financed by credits and sustained by innovations resulting from organized R&D activity was identified by Joseph Schumpeter (1883–1950) as the main driver of capitalist growth as early as 1934 (Mokyr 1990, 8). Such progress and growth effectively led to new scientific discoveries, which, in turn, formed the bases for new technologies, and opened up entirely new vistas for the humankind.[9]

Since then, the precursor–follower type of linear relationship between science and technology has been transformed into a much more intertwined, complex, and fuzzier relationship, where a science-based technology opens up a new scientific field that, in turn, forms the bases for a new set of technologies, and so on. The last quarter of the twentieth century especially was a period where distinctions between basic research, applied research and technological research, and development and industrial applications, and even marketing (e.g., e-commerce) and financing (e.g., venture capital) were increasingly blurred.

1.2.2. Transformation to the Knowledge Society and the Global Knowledge Economy

Out of this complex historical process in which many factors interacted over a period spanning more than one hundred years, but especially in the last quarter of the previous century, technologies emerged, which have started to change our lives profoundly, chief among which are the information and communication technologies.

Information and communication technologies involve innovations in microelectronics, computing (hardware and software), and telecommunications, in an integrated and interactive manner. Thus, these technologies, collectively abbreviated as ICT, enable the processing, storage, and transmission of and access to enormous amounts of data through communication networks. The Internet has grown exponentially, from 16 million users in 1995 to more than 1 billion users in 2005, with the number of users currently approaching 2 billion.

The ICT revolution is transforming the "industrial society" into the "knowledge society." A number of other factors, some of which are in fact byproducts of the complex interactive process I outlined above, also have contributed to this transformation. However, it is not possible to assign a specific date to this transformation. Bill Gates (2006) points out that it was in the last twenty years that the word *knowledge* became an adjective. The widespread availability of the Internet through personal computers equipped with browsers and the establishment of the World Wide Web in the early 1990s, have indeed revolutionized the way we live, and thus, in the eyes of many, epitomize the transition to the knowledge society and the global knowledge economy.[10]

At the beginning of the nineteenth century, "the global economic world" comprised only North America and western Europe that is the so-called Atlantic economy. The sociopolitical changes coupled with and driven by the ICT revolution, which made it possible for people to become aware of and informed about events and developments in other parts of the world, radically transformed the world economy and led to dramatic policy changes around the world. In 1978, Deng Xiaoping began to pave China's way toward capitalism. The Berlin Wall fell on November 9, 1989, which symbolized the implosion of the Soviet system. In 1991, with her model no longer intact, India abandoned the autarkic socialist system, and starting with her telecom industry, opened her economy to foreign investment and competition. These were paralleled by the consolidation of civilian rule in Latin America, and a much more improved sociopolitical landscape in Africa. In summary, the proportion of the world's countries practicing some form of democratic governance rose from 40 percent in 1988 to 61 percent in 1998 (The World Bank 2002, 19). The global world now comprises more than 6 billion people, nearly all of the global population.[11]

Privatization rather than central planning, and export competitiveness rather than import substitution, rapidly began to unify world markets. This process, referred to as "economic globalization," is intertwined with technological transformations. New tools of information and communication technologies make the world's financial and scientific resources more accessible and unify the markets into a single marketplace, where intense competition further drives scientific and technological progress (UNDP 2001, 30–31).

The convergent and mutually reinforcing impacts of globalization and the ICT revolution have radically changed not only the methods and structures of production, but also the relative importance of the factors of production. The transformation from an industrial society to a knowledge society and the global knowledge economy is characterized by the increased importance of knowledge, both know-how and information, and a well trained workforce that not only can apply know-how, but also is capable of analysis and decision making based on information. Just as the steam engine and electricity harnessed inanimate power to make possible the Industrial Revolution, digital breakthroughs are channeling brainpower to form the basis of the knowledge economy (UNDP 2001, 4).

In summary, knowledge and people with knowledge are the key factors of development, the main drivers of growth, and the major determinants of competitiveness in the global knowledge economy. In his seminal work on competitive advantage, M. Porter (1990) had already pointed out a decade and a half ago that a nation could no longer rely on abundant natural resources and cheap labor, and that comparative advantage would increasingly be based on combinations of technical innovations and creative use of knowledge.

These complex interactions are now driving the science, and technology-based global knowledge economy, where R&D and production are horizontally integrated in the form of networks covering production sites and laboratories in a number of countries, making it possible to outsource knowledge, labor, and other factors of production globally. Thus, the transformation from an industrial to a knowledge economy has been accompanied by the emergence of a worldwide labor market and global networks for production of both goods and services (World Bank 2002, 17–19).

This has been paralleled, and possibly brought about, by another type of transformation. The particular organization of R&D effort outlined earlier, which served industrial society very well, gradually evolved into the "national innovation system" (NIS), which now functions as the heart of the knowledge society, continually pumping knowledge to its organs through complex information and communication networks, of which the Internet is the prime example. The World Bank (2002, 24–26) defines the NIS as follows: "An NIS is a web of: (i) knowledge producing organizations in the education and training system; together with (ii) the appropriate macroeconomic and regulatory framework, including trade policies that affect technology diffusion; (iii) innovative firms and networks of enterprises; (iv) adequate communication infrastructures; and other selected factors, such as access to the global knowledge or certain market conditions that favor innovations."

M. Porter (1990) appropriately referred to the components comprising a fully developed NIS as "advanced and specialized factors of production." These can be summarized as follows: (1) the national R&D system; (2) modern infrastructure, particularly the ICT infrastructure; (3) an innovation- and business-friendly legal and regulatory environment; and (4) the education and training system, in particular, the higher education system.

Tables 1.1 to 1.3 show recent data available from the World Bank (2006a, 20–22, 88–91, and 302–9),[12] which determine in part the level of

Table 1.1. Demographic, National Income, and Educational Data for Selected Countries

Country or Country Group	GDP, Current $Billion, 2004	GNI per Capita, Current $ (Atlas Mthd.), 2004	Population, Million, 2004	Annual Population Growth Rate, % 2004	Gross Enrollment Ratio, % 2004		
					Primary	Secondary	Tertiary
Low-income	1,200.0	507	2,343.0	1.7	100[a]	46[a]	9[a]
Middle-income	7,200.0	2,274	3,017.8	0.8	111[a]	75[a]	24[a]
High-income	32,900.0	32,112	1,004.2	0.4	100[a]	105[a]	67[a]
World	41,290.0	6,329	6,365.0	1.1	106	65	24
U.S.	11,712.0	41,440	293.7	0.9	100	95	82
Europe[b]	9,500.0	27,921	309.3	0.1	104[a]	108[a]	57[a]
Sub-Saharan Africa	523.0	601	725.8	2.2	90	30	5
UK	2,124.0	33,630	59.9	0.3	101	170	60
Germany	2,741.0	30,690	82.5	0.0	99	100	48
France	2,046.0	30,370	60.4	0.3	105	110	56
Australia	637.0	27,070	20.1	0.9	102	154	72
Japan	4,623.0	37,050	127.8	–0.1	100	102	54
Russia	581.0	3,400	143.8	–0.5	118	93	68
Canada	978.0	28,310	32.0	0.8	101	105	57
New Zealand	98.9	19,990	4.1	0.5	102	119	72
China	1,932.0	1,500	1,296.2	0.6	118	73	19
India	691.0	620	1,079.7	1.4	107	52	11
Korea	680.0	14,000	48.1	0.5	105	91	89
Turkey	303.0	3,750	71.7	1.2	95	85	37
Morocco	50.0	1,570	25.8	1.6	106	47	11
Greece	205.0	16,730	11.1	0.1	100	96	72

Malaysia	118.0	4,520	24.9	1.5	93	70	29
Hong Kong	163.0	26,660	6.9	1.0	108	85	32
Indonesia	258.0	1,140	217.6	1.0	116	62	26
Bulgaria	24.0	2,750	7.8	–0.8	105	99	41
Thailand	162.0	2,490	61.4	0.7	99	77	41
Mexico	677.0	6,790	103.8	1.1	109	79	22
Singapore	107.0	24,760	4.2	1.3	nd	nd	46
Vietnam	45.0	540	82.2	1.2	98	73	10

[a]Demographic and income data and enrollment data are for 2003 from World Development Indicators. The World Bank (2006a, 20–22, and 88–91), and can be accessed at http://devdata.worldbank.org/wdi2006/contents/Table1_1.htm, and http://devdata.worldbank.org/wdi2006/contents/Table2_11.htm. Other enrollment data are from UNESCO (2006).

[b]Europe includes only those countries in the European monetary union.

GDP, gross domestic product; GNI, gross national income

Table 1.2. National Innovation Systems: R&D Indicators

Country or Country Group	R&D Personnel per Million	R&D Spending, % of GDP, 1996–2003	Scientific and Technical Publications, 2001	High-Technology Exports, $Million, 2004	Royalty and License Fee Income, $Million, 2004	Patent Applications Filed, 2002	
						Residents	Nonresidents
Low-income	nd	0.73	13,147	0	59	1,469	3,003,874
Middle-income	851	0.87	83,927	266,410	2,447	81,493	4,789,712
High-income	3,558	2.54	551,426	1,170,986	107,302	853,868	5,088,479
World	nd	2.36	648,500	1,296,586	109,808	936,630	12,882,065
U.S.	4,484	2.60	200,870	216,016	52,643	198,339	183,398
Europe[a]	2,607	2.20	148,619	361,128	17,110	129,155	2,448,271
Sub-Saharan Africa	nd	nd	3,500	nd	17	220	181,463
UK	2,706	1.89	47,660	64,295	12,019	33,671	251,239
Germany	3,261	2.50	43,623	131,838	5,103	80,661	230,066
France	3,213	2.19	31,317	64,871	5,070	21,959	160,056
Australia	3,670	1.63	14,788	3,128	472	10,823	96,434
Japan	5,287	3.15	57,420	124,045	15,701	371,495	115,411
Russia	3,319	1.28	15,846	3,432	227	24,049	96,315
Canada	3,597	1.94	22,626	25,625	3,019	5,934	102,418
New Zealand	3,405	1.17	2,903	858	98	2,137	91,240
China	663	1.31	20,978	161,603	236	40,346	140,910
India	119	0.85	11,076	2,840	25	220	91,704
Korea	3,187	2.64	11,037	75,742	1,790	76,860	126,836
Turkey	341	0.66	4,098	1,064	0	550	250,492
Morocco	782	0.62	469	696	16	0	89,300
Greece	1,413	0.65	3,329	1,031	32	614	162,387

Malaysia	299	0.69	494	52,868	782	nd	nd
Hong Kong	1,564	0.60	1,817	80,109	341	112	9,018
Indonesia	nd	nd	207	5,809	221	0	90,922
Bulgaria	1,263	0.50	784	247	7	306	158,051
Thailand	286	0.24	727	18,203	14	1,117	4,548
Mexico	268	0.42	3,209	31,382	92	627	94,116
Singapore	4,745	2.15	2,603	87,742	224	511	93,748
Vietnam	nd	nd	158	594	nd	2	90,135

Source: World Development Indicators 2006. The World Bank (2006a, 306–09). http://devdata.worldbank.org/wdi2006/contents/Table5_11.htm.

Note: Data for a period beginning and ending in different years is for the most recently available year in that period.

[a]Europe includes only those countries that are in the European monetary union.

nd, no data available; R&D, research and development.

Table 1.3. National Innovation Systems: ICT Indicators

Country or Country Group	No. of Personal Computers per 1,000 People, 2004	No. of Internet Users per 1,000 People, 2004	Schools Connected to Internet, % 2004	International Internet Bandwidth, bits per Capita, 2004	Secure Internet Servers per Million People, 2004	Price Basket for Internet, $ per Month, 2003
Low-income	11	24	nd	10	0	45.5
Middle-income	61	92	nd	91	4	22.3
High-income	574	549	98	4,545	384	20.9
World	130	140	nd	816	65	25.8
U.S.	749	630	99	3,305	783	14.9
Europe[a]	421	443	94	5,785	149	22.5
Sub-Saharan Africa	15	19	nd	6	2	51.2
UK	599	628	99	13,055	466	23.9
Germany	561	500	99	6,860	274	14.1
France	487	414	97	3,312	79	14.1
Australia	682	646	97	1,097	500	18.1
Japan	542	587	99	1,038	257	21.1
Russia	132	111	65	100	2	10.0
Canada	700	626	98	6,803	570	12.7
New Zealand	474	788	99	1,127	493	12.9
China	41	73	nd	57	0	10.1
India	12	32	nd	11	1	8.7
Korea	545	657	100	1,485	20	9.7
Turkey	52	142	40	124	17	19.8
Morocco	21	117	nd	26	1	25.3
Greece	89	177	59	589	31	37.6

Malaysia	197	397	nd	128	15	8.4
Hong Kong	608	506	100	4,793	159	3.8
Indonesia	14	67	nd	10	0	22.3
Bulgaria	59	283	60	80	9	12.4
Thailand	58	109	37	47	5	7.0
Mexico	108	135	60	108	8	22.6
Singapore	763	571	100	5,826	270	11.0
Vietnam	13	71	nd	23	0	19.9

Source: World Development Indicators 2006. The World Bank (2006a, 302–305).

http://devdata.worldbank.org/wdi2006/contents/Table5_10.htm.

[a]Europe includes only those countries that are in the European monetary union.

ICT, information and communication technology; nd, no data available development of NIS in a number of selected countries that currently are key players in international student mobility (see Chapter 6). The countries selected include the major host (destination) countries for foreign students, the United States, the United Kingdom, Germany, France, Australia (see Table 6.1 and Figure 6.2, and Table A.6 in Appendix A). Japan is both a major host and a major country of origin (source country) of foreign students. There also are emerging destinations like Canada and New Zealand; Russia is still both a major host country and an emerging country of origin.[13] Other major countries of origin of foreign students are China, India, Korea, Turkey, Morocco, Greece, Malaysia, Hong Kong, Indonesia, and Mexico (see Figure 6.5 and Table 6.2, and Table A.6). Recently emerging countries of origin are Bulgaria, Thailand, and Vietnam. Singapore, a major country of origin until recently, is aspiring to become a regional hub for international education.

Table 1.1 shows the data on national income, demographics, and enrollment at the three levels of education. It is interesting to note that the six major host countries with only 10 percent of the world's population generate 58 percent of the global income. The United States, the United Kingdom, Australia, Canada, and New Zealand, collectively referred to as the major English-speaking destination countries (MESDCs) for foreign students (Bohm et al. 2004), which have 6 percent of the world's population, produce 38 percent of the global wealth. The second point to note in Table 1.1 is that the differences in per capita income between the United States, the leading host country, and China and India, currently by far the leading first and second countries of origin of foreign students, are more than twenty-seven- and sixty-six-fold, respectively. Third, all of the countries shown in Table 1.1 are able to provide primary education to the full age cohort in their countries, and most are able to do it at the secondary level as well. Large differences exist at the tertiary level between host countries and countries of origin. It is thus clear that enrollment at the tertiary level is a key factor in determining the participative power of a country in the global knowledge economy (see Figure 2.4).

Table 1.2 shows the data on R&D indicators as they pertain to the degree of development of NIS in selected countries. The six major host countries on the average spend 2.3 percent of their gross domestic product (GDP) on R&D, and produce 61 percent of the scientific and technical publications, account for 47 percent of the high-technology exports, and receive 83 percent of the annual royalty and license fee income. The corresponding figures for the MESDCs are 45, 24, and 62 percent, respectively, and 31, 17 and 48 percent, respectively, for the United States alone. A key indicator is the ratio of patents filed by nonresidents to that by residents. This ratio is 0.98 for the United States, 1.4 for the six major host countries, 2.9 for the MESDCs, and 12.4 for the major countries of origin, including Russia and Singapore.

Table 1.3 shows ICT indicators as they pertain to the degree of development of NIS in selected countries. The ratio of personal computers per one thousand people in the six major host countries to that in the major countries of origin is 8.4, when Korea, Hong Kong, and Singapore are excluded. This ratio becomes 9.7 for the MESDCs, and 9.5 for the United States. The corresponding ratios for Internet users per one thousand people are 5.0, 5.2, and 4.9, respectively. When expressed in terms of the number of secure Internet servers per 1 million people, the ratios become 48, 56, and 87, respectively. Furthermore, although nearly all schools in the major host countries and Canada and New Zealand are connected to the Internet, major countries of origin other than Korea, Singapore, and Hong Kong still have a long way to go.

A very important characteristic of a fully developed NIS is the share of the private sector in the R&D activities. In the recent past, countries such as India (before the transformation in 1991), Brazil, and especially the former USSR failed to gain significant returns on their investment in R&D, mainly because the outputs were "locked" in public institutes, academies, and universities, or in defense industries with no civilian spin-offs. In the global knowledge economy, the private sector has much of the finance, knowledge, and personnel for technological innovation. Among industrialized nations, the share of the private sector in the national R&D activities is above 50 percent, both in terms of financing and in carrying out. Universities typically undertake 15 to 20 percent, and public institutions on the average account for 10 to 15 percent of the activities (UNDP 2001, 37).

Thus, the data reported in the World Development Indicators 2006 allow cross-country comparisons to be made that show the relative degree of development of NIS in selected countries.[14] Such comparisons clearly show that most of the countries in the West and Japan, Korea, Singapore, Hong Kong, and Israel have succeeded in transforming their national R&D systems, fully or partially, into NIS. These also are among the richest and humanly most developed countries, as indicated by the Human Development Index.

The statistics given in Tables 1.1 to 1.3 clearly point to the concentration of technological capacity in today's globalized world in the hands of the few. In fact, the capacity to generate knowledge and innovate is more than ever, "the lever of the riches" (Mokyr 1990). The United States is the undisputed leader in scientific knowledge production with 31 percent of the scientific and technical articles originating from there; Japan (8.9 percent), the United Kingdom (7.3 percent), Germany (6.7 percent), and France (4.8 percent) are far behind. The share of the United States in terms of most frequently cited articles is even greater with 44 percent (Friedman 2006). In a survey entitled "Brains Business" in *The Economist* of September 8, 2005, it is reported that 70 percent of the Nobel laureates are presently employed in American universities. On the other hand, according to an article in *The Wall Street Journal* of May 16, 2006 (p. 11 in the European edition), Europeans won 19 percent of the Nobel prizes between 1995 and 2004, down from 73 percent in the period from 1901 to 1950.

Developed countries are taking advantage of low-cost labor abroad to improve their competitiveness in the global markets, but are also experiencing the repercussions of job loss and displacement at home. Outsourcing of manufacturing and services is now an established feature of the global knowledge economy. China has emerged as the manufacturing hub of the global knowledge economy, followed by Thailand, Malaysia, Indonesia, the Philippines, Vietnam and Mexico.

Scardino et al. (2004) forecasted that by the year 2008, total spending on ICT services via global outsourcing would surpass $50 billion per year. More than thirty countries in varying degrees of development are presently competing in this subsector. India is presently the leader, but Indian companies are being challenged by companies in Canada, Russia, Ireland, China, Singapore, Malaysia, the Philippines, and Bulgaria, to name but a few.

Capitalism in the global knowledge economy is now driving the virtuous cycle of innovation, reward, reinvestment, and more innovation. It appears that the world is moving in a direction where there are three groups of countries. The first group, largely led by the United States, comprises the countries that create knowledge and knowledge-based technologies; these are the "knowledge producers." China is emerging as the manufacturing hub, and India as the service hub of the global knowledge economy, both countries taking on increasingly central roles in the global supply chains. China and India are currently leading the so-called knowledge users. The third group includes countries that either are passive users of knowledge or "technologically disconnected."

Not only manufacturing and services are being globalized. Technology increasingly is being developed and commercialized in locations where critical masses exist with respect to the capacity to generate new scientific knowledge, and where human resources with the requisite skills profile exist. In other words, innovation, too, is being globalized. Many of the tasks formerly performed in the integrated R&D centers of multinationals are now being outsourced to India, China, and Russia. In March 1986, Deng Xiaoping announced the so-called 863 Program, which aimed to make China a world power in science and technology; today there are some seven hundred multinational R&D centers in China (Liu 2006). In other words, economic activity is moving to wherever it can be performed in the cheapest and most effective manner. The large number of English-speaking, well-educated Indian technicians, engineers, and software scientists played a key role in overcoming the Y2K bug. The technicians are the graduates of hundreds of technical colleges in India. The software engineers are the graduates of the prestigious Indian Institutes of Technology (IITs), which date back to 1951. A well-educated workforce with connections to networks in knowledge-producing countries is a key asset in the global knowledge economy.

It is thus quite clear that countries with fully developed NIS are the knowledge producers with the capacity to convert the knowledge produced into goods and services that can be traded in the global markets, and that these also are the countries that are attracting foreign students from all over the world. The general direction of international student mobility is clearly from "knowledge-user" countries to "knowledge producers" (see Sections 6.4 and 6.5.)

Nearly two decades ago, M. Porter (1990) pointed out the importance of "clusters," where start-up companies, research labs, financiers, and corporations converge; creating a dynamic and conducive environment that brings together knowledge, finance, and opportunity. At the beginning of the new century, forty-seven such "global hubs of innovation" existed around the world. The United States has thirteen hubs. Europe has seventeen: four in the United Kingdom; three in Germany; two each in Finland, Sweden, and France; and one each in the Netherlands, Austria, Norway, and Ireland. Japan, Brazil, and Australia have two each, China has three, and there is one hub in each of Canada, Singapore, Korea, New Zealand, Israel, India, South Africa, and Tunisia (UNDP 2001, 45). Many multinational companies are moving parts of their in-house R&D activities to countries where such hubs, qualified workforce, and a business- and innovation-friendly environment exist.

According to an article entitled "China Becomes Magnet for R&D," in the March 14, 2006 (European edition) issue of *The Wall Street Journal*, the huge and inexpensive talent pool in China is drawing multinationals to that country. Furthermore, China is pouring money into R&D, which promises to broaden the country's big role in the global economy. China is currently spending close to $30 billion on R&D annually, up from just over $10 billion in 2000. The corresponding figures for India are $4 billion and $3 billion, respectively. China, the United States and India, in that order, are now at the top of the list of most attractive R&D locations, with Japan as a distant fourth, and followed by the United Kingdom, Russia, France, and Germany. As seen in the following parts of this book, with the exception of Russia, these also are among the most active countries in international student mobility, and Russia, too, is reemerging, both as a host for and a source of foreign students.

China has already overtaken Russia as a knowledge-producing country. Scientific and technical publications from China accounted for 3.2 percent of the global total in 2001, as opposed to 2.4 percent from Russia, and 1.7 percent from India. Chinese royalty and license fee income was $236 million in 2004, compared to $227 million for Russia and $25 million for

India. With a 12.5 percent share of the global high-technology exports in 2004, China was way ahead of Russia (0.3 percent) and India (0.2 percent). These are reflected in the increased average income of the Chinese and the Indians; the per capita GDP growth rate from 2003 to 2004 was 8.8 percent in China, and 5.4 percent in India (World Bank 2006b, 292).

China and India have emerged as by far the first and the second leading countries of origin of foreign students within a few decades. Although there are, as of the date of the writing of this book, no quantitative studies on the relationship between outward student mobility from and economic development in these countries, sufficient indirect evidence exist, such as those I have reported, to conclude that China and India are benefiting from this phenomenon. According to *The Economist* ("Brains Business," September 8, 2005):

> Few highly skilled migrants cut their links with their home countries completely. Most keep in touch, sending remittances (and, if they are successful, venture capital), circulating ideas and connections, and even returning home as successful entrepreneurs. A growing number of Indian and Chinese students go home after a spell abroad to take advantage of the hot labour markets in Shanghai or Mumbai. And a growing number of expatriate businessmen invest back home.

(See Section 6.5 and Concluding Remarks.)

1.3. THE GLOBAL HIGHER EDUCATION AGENDA

The foregoing analysis shows that a country's capacity to take advantage of the global knowledge economy, not necessarily as a technology creator or developer but even as a user, adapter, and diffuser of technologies developed by others, clearly depends on its capacity to participate, at least to some extent, in the processes of generating, accessing, and sharing knowledge. If no such capacities exist, then that country is technologically disconnected and excluded from the global knowledge economy. National developmental efforts worldwide currently are focused on acquiring, maintaining, and improving such capacities. Among the minimum requirements are (1) a national education and training system catering to the masses, rather than to a handful of elites, and producing a workforce with a relevant skill profile; (2) the essentials of an R&D system with the potential to evolve into a fully developed NIS; and (3) a reasonably developed ICT infrastructure.

Higher education plays a dual role as the key component of both the education and training system and the R&D system of a national economy.

Its contributions to developing human resources and knowledge creation are vital. Jobs in the knowledge economy are increasingly requiring a tertiary-level degree. In a survey entitled "The Knowledge Factory," *The Economist*, October 4, 1997 (p. 4), the university has aptly been referred to as "not just a creator of knowledge, a trainer of young minds and a transmitter of culture, but also as major agent of economic growth: the knowledge factory, as it were, at the centre of the knowledge economy."

The brief survey and analysis of the developments in the past few decades presented in the section above indicate that globalization, transformation from the industrial into the global knowledge economy, and international student mobility are mutually reinforcing one another and changing the higher education landscape worldwide.

The seventh Transatlantic Dialogue was held in July 2001 at the Universite Laval in Quebec, Canada, and was focused on this particular theme. Thirty presidents, vice chancellors, and rectors from the United States, Canada, the United Kingdom, and Continental Europe participated in the meeting. The essay that emerged from this meeting was published with the title "The Brave New (and Smaller) World of Higher Education: A Transatlantic View" (Green, Eckel, and Barblan 2002). It is indeed a smaller world driven by rapid technological changes, which make it easier for people, goods, services, capital, and ideas to move around the globe.

Nye (2004) defines globalization as follows: "Globalism is a state of the world involving networks of interdependence-networks of connections and multiple relations at multi-continental distances." This definition has been made in the context of international relations and governance, but is obviously equally pertinent to the global knowledge economy, for production of goods and services in global supply chains and the functioning of international capital markets clearly depend on people who can communicate with each other. This, in turn, requires a common language, a common base of skills, and the capacity to work in intercultural environments. These are factors driving internationalization of higher education worldwide.

The same factors are also motivating young people to seek the best education they can afford anywhere in the world so that they can compete in the global labor market, and, in the process, also make friends and meet future business partners. The outcome is internationalization of higher education as an end in itself, and a historically unprecedented number of students attending institutions of higher education in foreign countries.

Internationalization of higher education is a multifaceted topic. It includes elements that pertain to curricula, such as teaching of foreign languages and cultures, as well as those that have to do with scientists and scholars carrying out research and teaching in other countries, and students studying abroad for a full degree or as part of their degree requirements back home. The latter component is referred to as "academic mobility," and until recently has essentially involved the movement of persons and, to a much smaller extent, institutions across borders. Transnational movement of institutions is not a new phenomenon: It dates back to centuries ago when the university, then a distinctly western European institution, was transplanted to other continents, and more recently to the classical branch campuses. International mobility of students and scholars is an even older phenomenon. It dates back to the origins of the medieval European university when it was difficult to distinguish students from teachers. What have changed in the second half of the past century, however, are the numbers involved and the modes of delivery made possible by developments in transportation, information, and communication technologies. Educational services can now be provided across borders and over intercontinental distances (distance education, e-learning, online provision). Branch campuses are no longer the small outfits they were, many now are operated by local partners, and higher education increasingly is being provided in many parts of the world in organizational forms derived from the world of business (franchises, offshore provision). Thus, internationalization of higher education in today's global knowledge economy includes, in addition to increased international content in curricula, movement of students, scholars, programs, and institutions across borders. These are collectively referred to as "transnational" or "cross-border" higher education (see Section 4.5).

International student mobility refers to students studying in a foreign country. It is just one component of transnational higher education, but one with the greatest socioeconomic, cultural, and political implications.

A global higher education market has thus emerged, with annual revenue estimated at tens of billions of dollars. Services provided in this market range from publishing, testing, and counseling to the provision of education in one transnational form or another. This market is characterized by intense competition among traditional institutions as well as new types of providers, which were made possible by advanced educational technologies based on ICT. International student mobility is again just one of the components of this market, but at the present, financially, its largest segment.

Rapid technological progress is creating new types of jobs, which require different and, usually, more advanced skills. At the same time, other types of jobs are becoming obsolete and disappearing. Reeducation and retraining of already highly educated adults is a major challenge faced by many nations (World Bank 2003). Lifelong learning is increasingly becoming a key component of education and training systems in advanced economies, especially in those countries with aging populations. The World Bank (2003) has recently put a priority on the establishment of national systems of lifelong learning in order for developing countries to reap the benefits of the global knowledge economy. This has led to the emergence of new types of students in addition to those in the relevant age cohort. To meet the demand for lifelong learning, traditional institutions have developed new programs and structures, and new types of providers have emerged that heavily rely on ICT. Many such programs and new providers are transnational in nature and operate for profit.

Parallel and in response to the emergence of the global knowledge economy, higher education institutions worldwide are increasingly being scrutinized and called on to change in the following directions:

1. Institutions should not be insular to the world of business and academic research should produce commercial activities.
2. Access should be broadened and teaching should produce a workforce with an entrepreneurial attitude, capacity to learn, intercultural skills, and the skills that are necessary to adapt to the new ways of using knowledge and organizing work to produce goods and services internationally.
3. Traditional institutions should change the way they are organized so that they can efficiently, effectively, and preferrably profitably, compete with each other and the new providers of postsecondary education for students, scholars, and resources in the global higher education market.

The socioeconomic developments that have taken place over the last few decades have thus set a global agenda for higher education, which can be analyzed under the following subheadings: (1) increasing demand; (2) demographic shift and nontraditional students; (3) the rise of market forces; (4) impact of technology; (5) new providers and increasing competition; and (6) globalization/internationalization.

To understand international student mobility in today's global knowledge economy, this global higher education agenda needs to be analyzed in its entirety and with a historical perspective, as the six agenda items are intertwined, and all have historical roots. Not only would the global picture be incomplete, but it would also be difficult to analyze international student mobility in today's knowledge-driven economy without understanding the changing nature of higher education worldwide. For example, answers to the following questions are crucial to understanding international academic mobility:

- Why has demand for some form of postsecondary education increased over time, but especially in the second half of the twentieth century?

- Would it have been possible to increase access to and massify higher education worldwide if the traditional, Humboldtian type of university were the only type of higher education institution available to humankind?
- If higher education institutions were completely financed from public sources, and were governed by academics alone according to rules and regulations prepared by state bureaucracies, would there be any incentive for them to expand their range of activities, to diversify their revenue base, and to increase student intake, both nationally and internationally?
- Why are increasing numbers of students worldwide attending higher education institutions abroad or some form of foreign-provided higher education at home, while cheaper local opportunities also are increasing? Is the demand increasing for a particular type of higher education, or just any type?
- Why is demand for foreign-provided higher education more in some countries and less or nonexistent in others? Why are some countries being preferred as destinations? Why are countries interested in hosting foreign students, even when there is unmet local demand?

Clearly, these questions cannot be answered in isolation, and are interlinked with the global higher education agenda items I summarized. An answer to the first question posed is provided in the previous section. Chapter 2 deals with issues related to demand and supply. Chapter 3 deals with questions related to finance, administration, governance, and the emergence of national systems. A clear understanding of these aspects of higher education in a historical perspective is central to the topic at hand, and at the same time provides answers to many of the questions posed. Chapter 4 is an attempt to summarize the literature and information on technology-driven developments in higher education worldwide. This is an area that is currently growing at such a pace that any article written on it is faced with the prospect of being obsolete shortly after its release. Chapter 5 is an analysis of the internationalization of higher education, and attempts to identify the dynamics embedded in historical antecedents of academic mobility and the historical developments presented in the previous chapters, which may have possibly led to today's global higher education scene. Chapter 6 is concerned with the major host countries for and the countries of origin of foreign students, and in particular, the rationales for and the drivers of international student mobility that are specific to these countries.

The concluding remarks are simply musings by the author on the topic at hand. Given the increasingly rapid pace of change and developments occurring in this area, those remarks, and possibly some of the material presented in the previous chapters, may be irrelevant and obsolete by the time this book is published.