China in the Global Economy

by

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China in the Global Economy[§]

Lawrence J. Lau[1]

August 2024

Abstract: In this paper, we review the position of China in the global economy today. First, we note that China's entry into the World has begun to shift, since 2000, the centres of gravity of the global economy, in terms of GDP, international trade, value-added in manufacturing, consumption and wealth, gradually but surely, from North America and Western Europe to East Asia, and within East Asia from Japan to China. China has managed to become, simultaneously, the "World's factory" as well as the "World's market". China has also become, in the process, the largest carbon dioxide emitter in the World. However, in terms of real GDP, aggregate wealth, and the sizes of the capital and consumer markets, the U.S. still remains by far the largest in the World.

Second, in terms of investments in intangible capital (human capital and R&D capital), China has also made great progress, beginning in the late 1980's and 1990's. As a result, China has also achieved much in terms of the educational attainments of its population and in innovation. However, there is still a great deal of room for China to improve in these areas.

Third, the renminbi, the Chinese currency, has also begun, since 2010, to be accepted as an invoicing, clearing and settlement currency in some bilateral international transactions involving China. However, the U.S. Dollar still remains, by a very large margin, the international medium of exchange and store of value of choice for many economies.

Finally, because of its rapid economic growth, China has also become, since 2005, the largest carbon dioxide emitter in the World, overtaking the United States. However, China is committed to peaking its carbon emissions by 2030 and achieving net carbon neutrality by 2060. China is today the leading pioneer in the development and application of renewable energy.

[1] Lawrence J. Lau is Ralph and Claire Landau Professor of Economics, Lau Chor Tak Institute of Global Economics and Finance, The Chinese University of Hong Kong, and Kwoh-Ting Li Professor in Economic Development, Emeritus, Stanford University. He wishes to express his immense gratitude to Prof. Yanyan Xiong of Zhejiang University for her indispensable help in the assembly and analysis of the empirical data in this paper. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the Institute.

1. Introduction

One of the most important developments in the global economy during the past almost half a century was the reform and opening of the Chinese economy and its participation in the World, beginning in 1978. As the most populous country in the World,[2] China has always had the potential of having a large impact on both the supply and the demand sides of the global economy. However, the actual results of the Chinese entry into the global economy since 1978 have been surprisingly successful, as we shall show below.

In this Chapter, we review the position of China in the global economy today. First, we note that China's entry into the World has begun to shift, since 2000, the centres of gravity of the global economy, in terms of GDP, international trade, value-added in manufacturing, consumption and wealth, gradually but surely, from North America and Western Europe to East Asia, and within East Asia from Japan to China. China has managed to become, simultaneously, the "World's factory" as well as the "World's market". China has also become, in the process, the largest carbon dioxide emitter in the World. However, in terms of real GDP,[3] aggregate wealth, and the sizes of the capital and consumer markets, the U.S. still remains by far the largest in the World.

Second, in terms of investments in intangible capital (human capital and R&D capital), China has also made great progress, beginning in the late 1980's and 1990's. As a result, China has also achieved much in terms of the educational attainments of its population, reflected in the rising proportion of the tertiary-educated in its labour force, and in innovation, reflected in the growth in its numbers of publications in international science and engineering journals and international patent awards. However, there is still a great deal of room for China to improve in these areas, especially in basic research.

Third, the renminbi, the Chinese currency, has also begun, since 2010, to be accepted as an invoicing, clearing and settlement currency in some bilateral international transactions involving China. However, the U.S. Dollar still remains, by a very large margin, the international medium of exchange and store of value of choice for many economies.

[2] The population of China was the largest in the World until 2023, when it was overtaken by that of India.
[3] At market prices and exchange rates.

Fourth, because of its rapid economic growth, China has also become, since 2005, the largest carbon dioxide emitter in the World, overtaking the United States. However, China is committed to peaking its carbon emissions by 2030 and achieving net carbon neutrality by 2060. China is today the leading pioneer in the development and application of renewable energy.

The timing of the beginning of China's economic reform and opening to the World could not have been more propitious. China was able to take advantage of the worldwide trend of economic globalisation which began in the 1950s. International trade has been growing by leaps and bounds, led, at first, by the economic recovery of the Western European countries and Japan from World War II. It was also during this period, that the advice given to developing economies by developed economies changed from "import substitution" to "export promotion"; and the developed economies decided that the acceptance of "trade" (that is, exports) from the developing economies is preferrable to the giving of "aid" to them. The rise of the Japanese economy and the four East Asian "newly industrialised economies (NIEs)" of Hong Kong, South Korea, Singapore and Taiwan, which pre-dated the Chinese economic reform and opening, was the outcome of this transformation. Moreover, in the decades since the 1990s, there has also been the increasing fragmentation and international division of labour in manufacturing production around the World, made possible by the advances in communication and transportation technologies, with the supply chain of a product typically running through quite a number of different countries and regions. All of this has caused the total volume of international trade of the World to increase even further.

An equally significant development in global geo-politics during this period, which also had important economic implications, is the dissolution of the former Soviet Union in 1991, and with it, the demise of the trading bloc Council of Mutual Economic Assistance ((CMEA), also known as COMECON) which consisted of the former Soviet Union and the formerly socialist countries of Eastern Europe (Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania).[4] The break-up of the former Soviet Union (and also Yugoslavia) led to the unification of East and West Germany and the emergence of many newly independent countries, including the Russian Federation, the successor state to the former Soviet Union. International trade of the World has continued to grow as many formerly domestic trade

[4] The CMEA also had non-European members: Cuba, the People's Republic of Mongolia, and Vietnam.

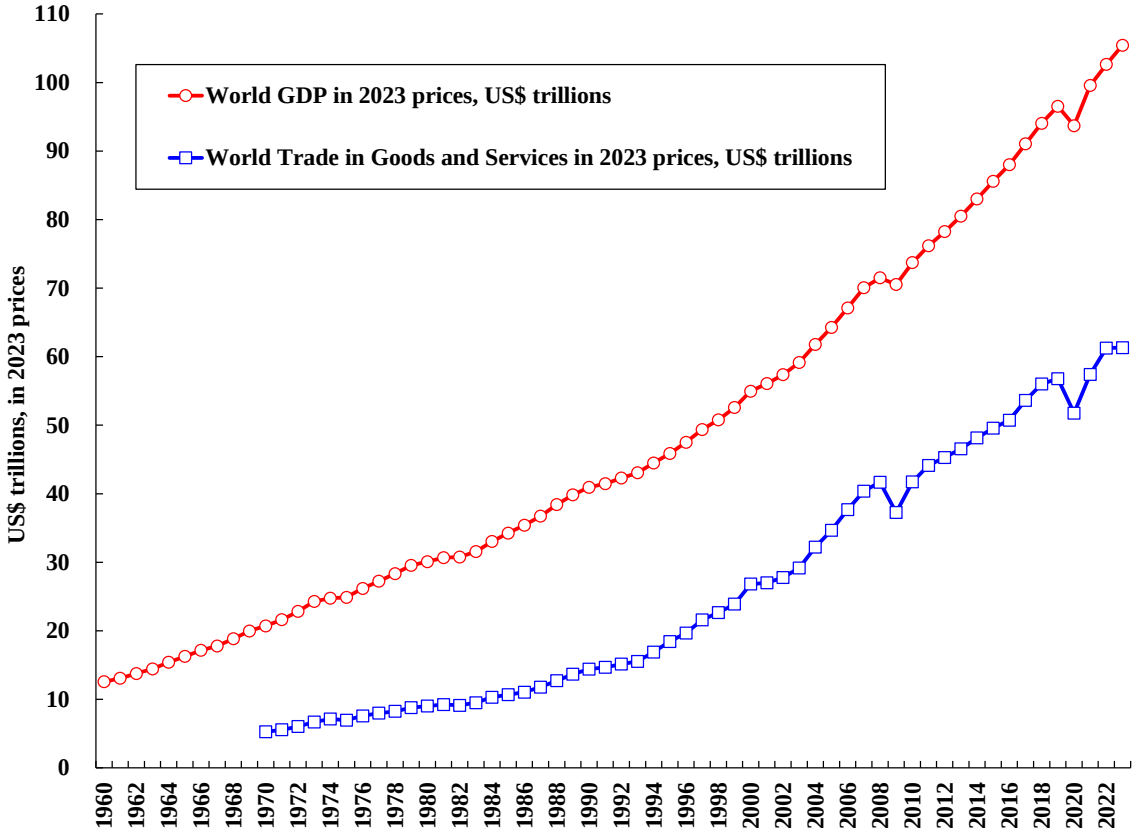
transactions become international transactions and the introduction of the free-market system in these formerly socialist countries has also encouraged and facilitated international trade.

Another momentous development during this period is the evolution of the European Common Market (also known as the European Economic Community)[5] into the European Union, making possible free flows of international trade among its members. This was capped by the introduction of a new global currency, the Euro, in 1999, to replace the national currencies of the many countries within the European Union—the Belgian Franc, the Dutch Guilder, the French Franc, the German Mark, the Italian Lira, etc.[6] The Euro is legal tender in all countries within the Euro Area,[7] which can trade with one another in the same currency without any currency exchange transaction costs and exchange rate risks.

In Chart 1, the total values of World real GDP and real international trade in goods and services, respectively, between 1960 and 2023, are presented.[8] Between 1960 and 2023, World real GDP grew steadily and almost continuously, at an average annual rate of 3.43%. The real quantity of World international trade, in constant 2023 U.S. Dollar, grew even faster, at an average annual rate of 4.74% between 1970 and 2023. However, in real terms, the growth of world trade appeared to have been stalled recently—it grew only 0.1% in 2023, reflecting the effects of the COVID-19 pandemic as well as the more recent trends of economic de-globalisation, de-coupling, de-risking and rising protectionism.

[5] Established in 1957, it consisted of six countries at the beginning: Belgium, France, Italy, Luxembourg, the Netherlands and West Germany.
[6] The United Kingdom was among the few members of the European Union that did not join the Euro Area.
[7] The Euro Area currently consists of 20 countries: Austria, Belgium, Croatia, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. It can be viewed as a proxy for Western Europe (ex the United Kingdom). Not all members of the European Union are members of the Euro Area.
[8] Between 1970 and 2023 for real international trade in goods and services.

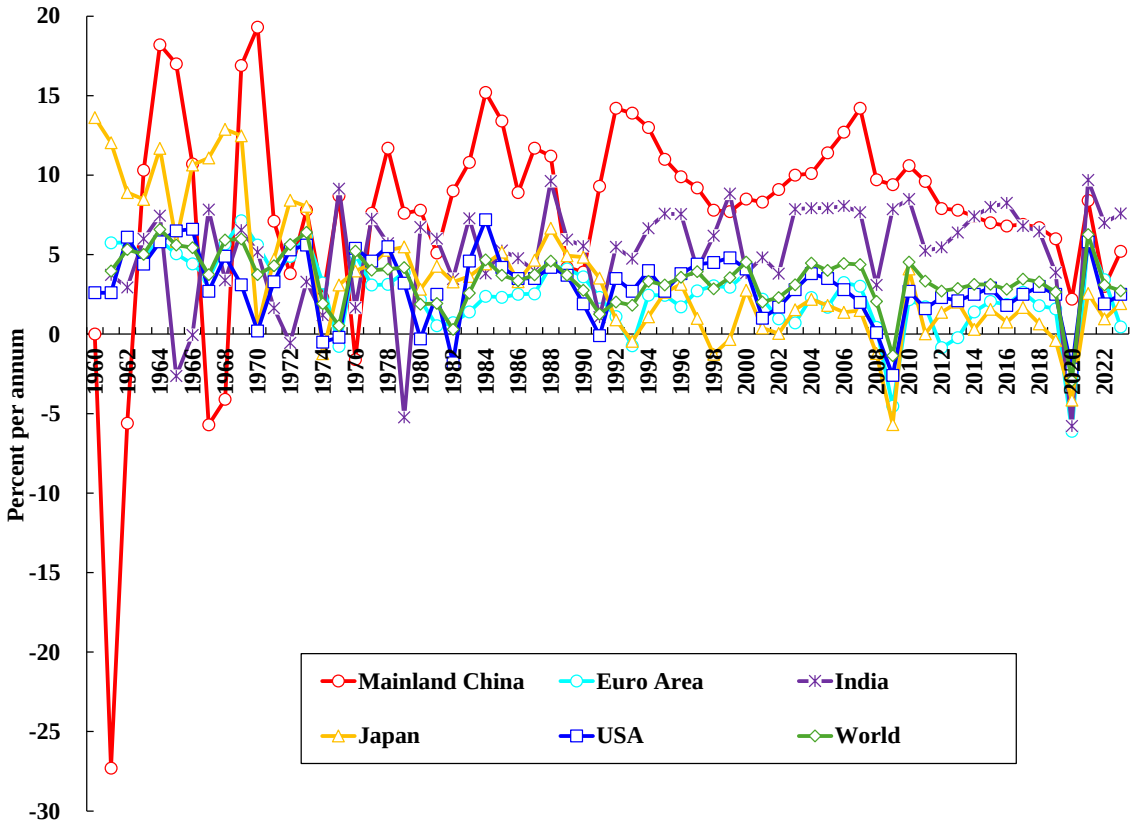
Chart 1: The Values of World Real GDP and Real International Trade in Goods and Services, Trillion 2023 US$



Sources: World Development Indicators; The World Bank (2024).

In Chart 2, the annual rates of growth of the real GDPs of Mainland China, the Euro Area, India, Japan, the U.S. and the World between 1960 and 2023 (in 2023 prices) are presented. China is represented by the red line, which shows huge fluctuations, with large positive as well as negative rates, before 1978. However, since 1978, China has stayed at the top until more recently, indicating that it has had the highest rate of growth among the included countries and regions most of the time. India, represented by the purple line, has since 1980 had the second highest rate of growth among this group of economies, and has even surpassed China in more recent years. The World as a whole, represented by the green line, is in the third place. The U.S., represented by the blue line, has been mostly just behind the World, in the fourth place, at around 3% per annum. The U.S. is followed by the Euro Area, represented by a turquoise line, in the fifth place, which has fallen behind Japan in 2023. Japan, represented by the yellow line, has had high rates of growth between 1960 and 1973 (the first oil shock), moderate rates between 1973 and 1992, but the lowest rates of growth since 1992 among this group of economies. For all of the economies, there were major dips in their rates of growth in both 2008, the year of the Global Financial Crisis, and in 2020, the first year of the COVID-19 pandemic.

Chart 2: The Rates of Growth of Real GDP, in 2023 US$, Selected Economies, percent per annum

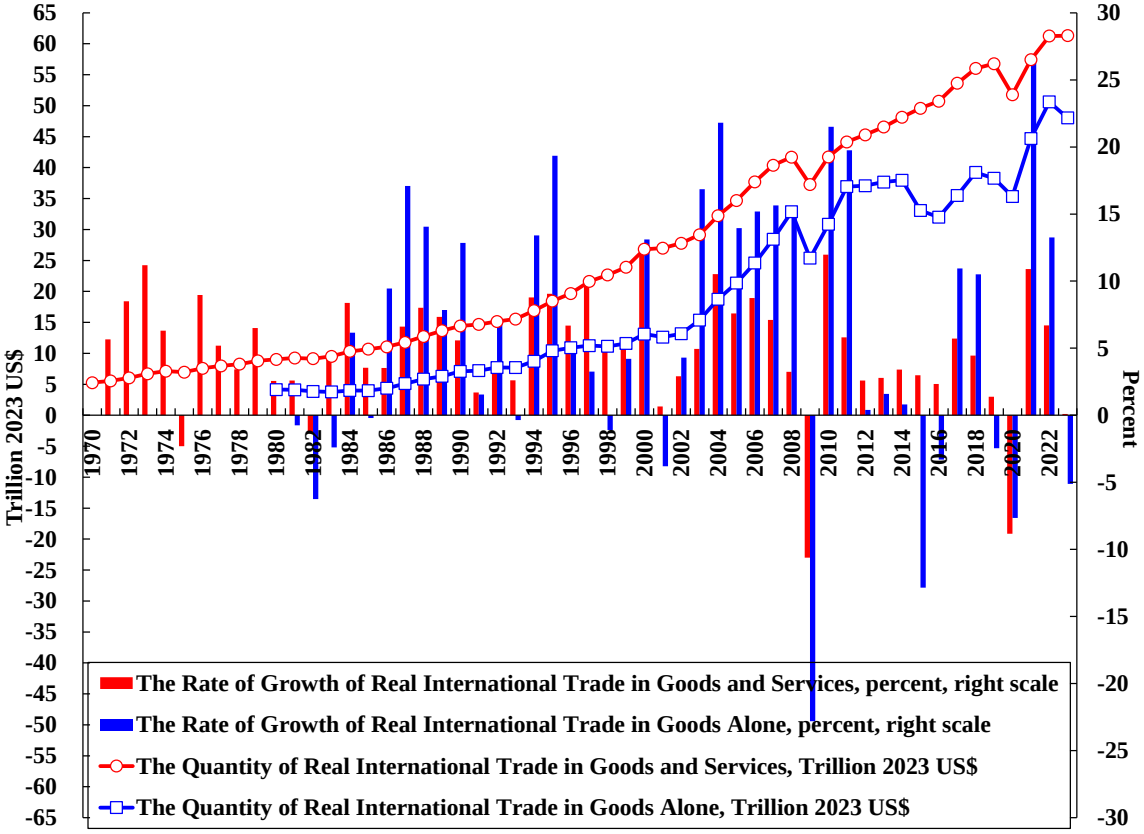


Sources: Chinese data are from the National Bureau of Statistics of China; data for the Euro Area, India and the World are from World Development Indicators; Japanese data are from Statistics of Japan and World Development Indicators; U.S. data are from the U. S. Bureau of Economic Analysis.

In Chart 3, the total quantities of World real international trade in goods and services, and in goods alone, respectively, as well as their rates of growth, between 1970 and 2023, in 2023 prices, are presented. Between 1970 and 2023, the quantity of World real international trade in goods and services has been growing at an average annual rate of 4.74%. Between 1980 and 2023, the quantity of World real international trade in goods alone has been growing at an average annual rate of 5.86%.[9] Thus, it appears that the growth of World trade has been driven more by the growth of trade in goods, which also tends to fluctuate much more than trade in services. However, the growth of World real international trade, especially in goods, appeared to have slowed since the Global Financial Crisis of 2008.

[9] Unfortunately, data on the quantity of World real international trade in goods alone only go back to 1980.

Chart 3: The Quantities and Rates of Growth of World Real International Trade in Goods and Services and Goods Alone, Trillion 2023 US$ and percent



Sources: Data on real international trade in goods and services from World Development Indicators and the World Bank (2024); data on real international trade in goods alone from World Trade Organization Statistics.

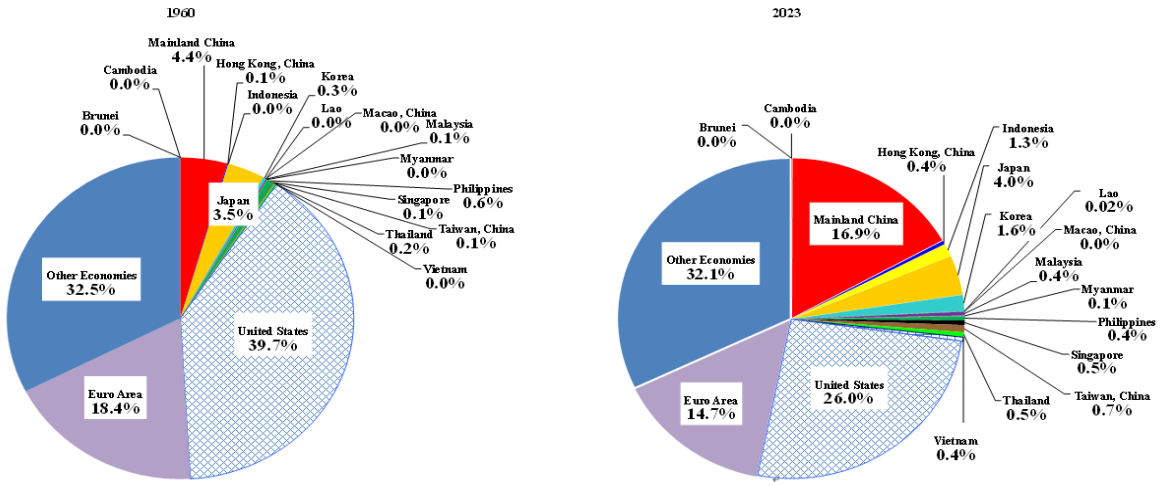
2. The Gradual Re-Emergence of China in the Global Economy

Around 1820, China supposedly accounted for more than 30% of the then World GDP. The Chinese share then declined continuously to below 5% until 1950, where it remained for three decades.[10] It finally began to recover around 1980, after its economic reform and opening to the World. Already since 1960, the centres of gravity of the global economy have been shifting from North America and Western Europe to East Asia. And within East Asia, they have been shifting from Japan to China since the mid-1990s. With the rise of the Indian and other South Asian economies, it appears that the centres of gravity of the global economy will have been shifted to Asia in another decade or so, with Asia accounting for more than half of the World's real GDP as it once did in the early 1800s. The shifts can also be seen in international trade, value-added in manufacturing, consumption, wealth, human capital and R&D capital and their outputs, and the choice of currency for the clearing and settlement of international transactions, to varying degrees. It can also be seen in terms of carbon dioxide emissions.

Based on market prices and exchange rates, in 1960, the United States and the Euro Area together accounted for over 58% of World GDP. By comparison, East Asia (defined as the ten Association of Southeast Asian Nations (ASEAN)—Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam—plus 3 (China including Hong Kong, Macau and Taiwan, Japan and South Korea)) accounted for approximately 9.4% of World GDP, with Mainland China at 4.4% (see Chart 4). By 2023, the share of United States and the Euro Area in World GDP has declined to approximately 40.7% whereas the share of East Asia has risen to 27.2% and that of China to 16.9% (see Charts 4 and 5).

[10] This is based on information from the Maddison Project Database, which are reported in terms of "purchasing-power-parity (PPP)" international prices.

Chart 4: The Distribution of World GDP, 1960 and 2023, US$

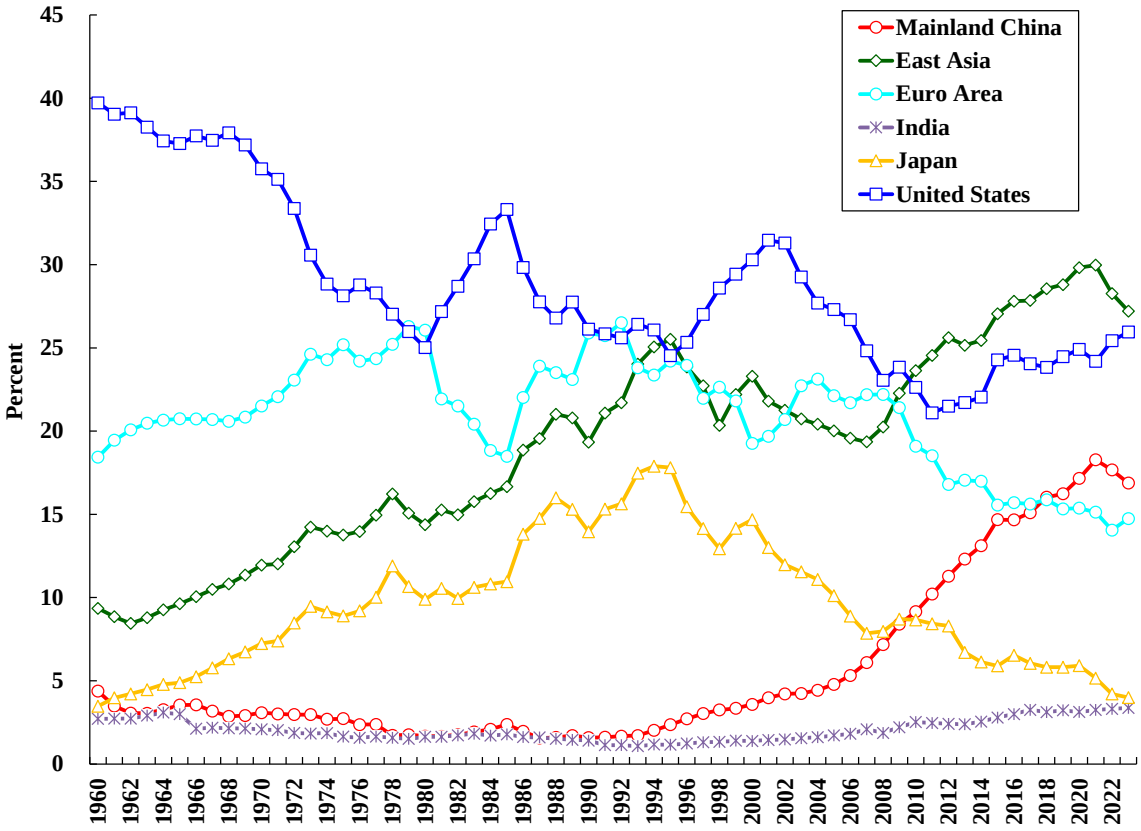


Source: World Development Indicators.

The annual shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World GDP between 1960 and 2023, based on market prices and exchange rates, are presented in Chart 5. Between 1960 and 2023, the share of the U.S. in world GDP declined from 40% to 26%;[11] the share of East Asia as a whole rose from 9.4% to 27.2%; and Japan's share went from 3.5% to 4.0%, although at its peak, Japan accounted for almost 18% of World GDP. The share of Mainland China, which was similar to India's share before the Chinese economic reform and opening to the World, rose from 4.4% to 16.9%. During the same period, India's share went from 2.7% to 3.4%. With the continuing growth of India, ASEAN, and other South Asian and Middle Eastern economies, Asia's share of World GDP is likely to exceed one half once again in another decade or so.

[11] The large fluctuations in the shares of the U.S. and the Euro Area were caused by the fluctuations in the exchange rates of the European national currencies and the Euro vis-a-vis the U.S. Dollar.

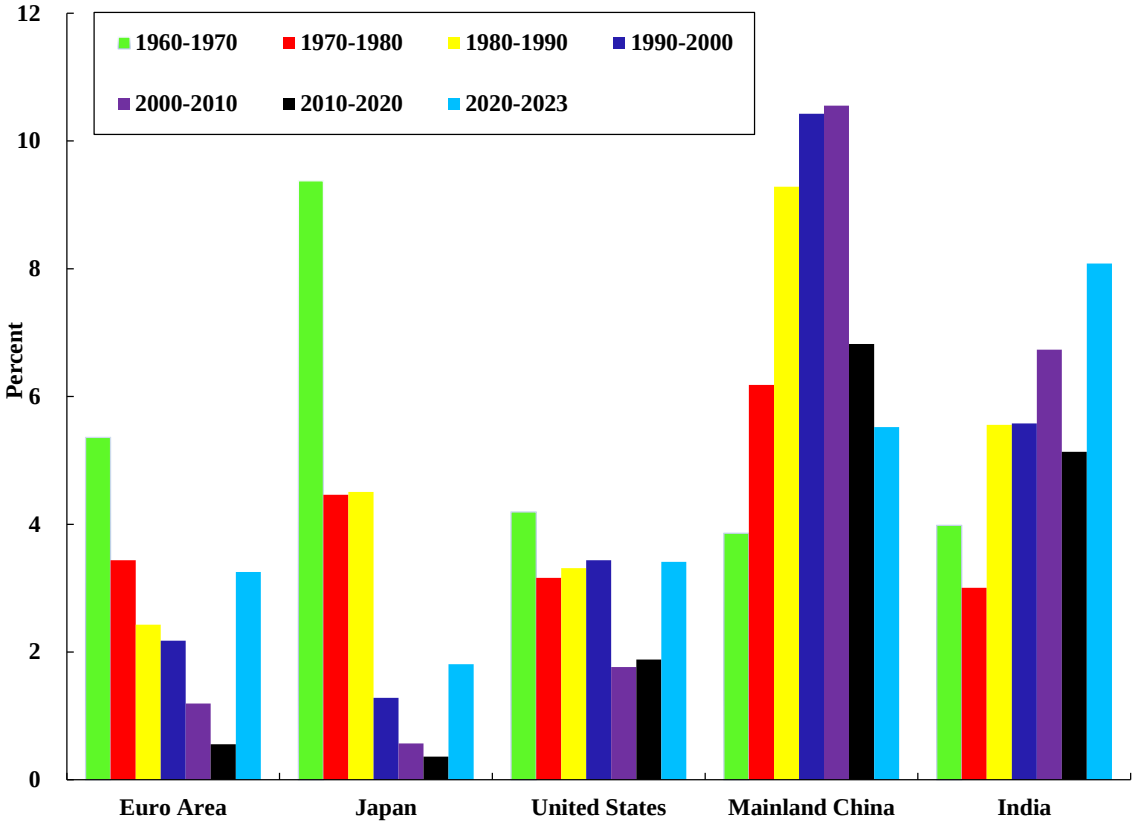
Chart 5: The Shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World GDP, 1960-2023 (percent)



Source: World Development Indicators.

In Chart 6, the average annual rates of growth of the real GDP of selected economies in different decades are presented. Mainland China and India are among the fastest growing economies during the past four and a half decades. Average Chinese annual growth rates exceeded 10% per annum in the two decades between 1990 and 2010. More recently, Indian economic growth has exceeded 8% per annum. Japan was the fastest growing economy in the 1960s but has stagnated since 1990. The U.S. and the Euro Area, being mature developed economies, have had relatively low growth rates during the past decades.

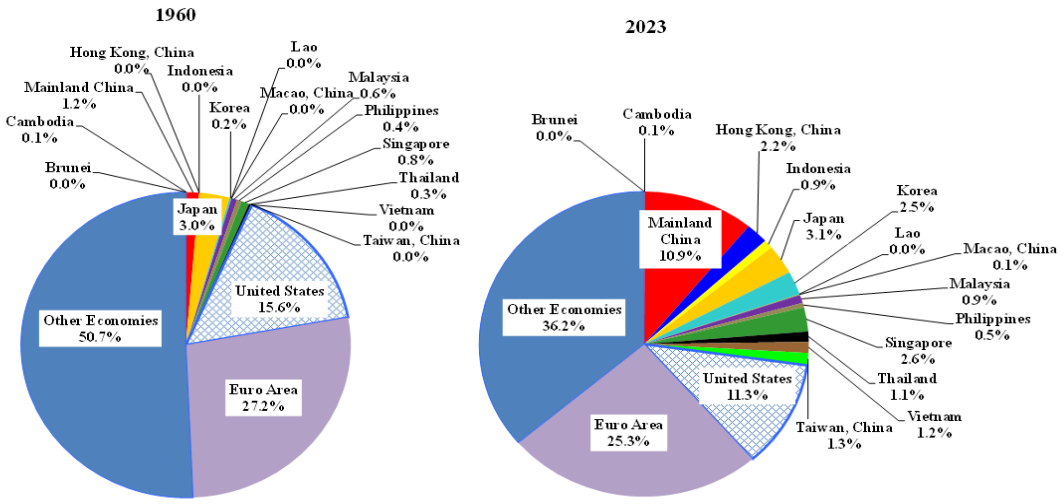
Chart 6: Decade Average Annual Rates of Growth of Real GDP, Selected Economies



Sources: World Development Indicators.

In Chart 7, we compare the distributions of world international trade in goods and services in 1960 and 2023. In 1960, the United States and the Euro Area together accounted for almost 43% of the value of total international trade in goods and services in the World. By comparison, East Asia accounted for only 6.6% of total World trade. By 2023, the combined share of United States and the Euro Area in World trade declined to 36.6% whereas the share of East Asia rose to almost 27.6%. The Chinese share of World trade rose from 1.2% in 1960 to 10.9% in 2023. The growth in Chinese international trade may be attributed in part to the reform of the Chinese exchange rate system and the adoption of current-account convertibility in 1994, accompanied by a significant devaluation, and to Chinese accession to the World Trade Organization in 2001. Chinese international trade accounted for approximately 40% of East Asian international trade in 2023.

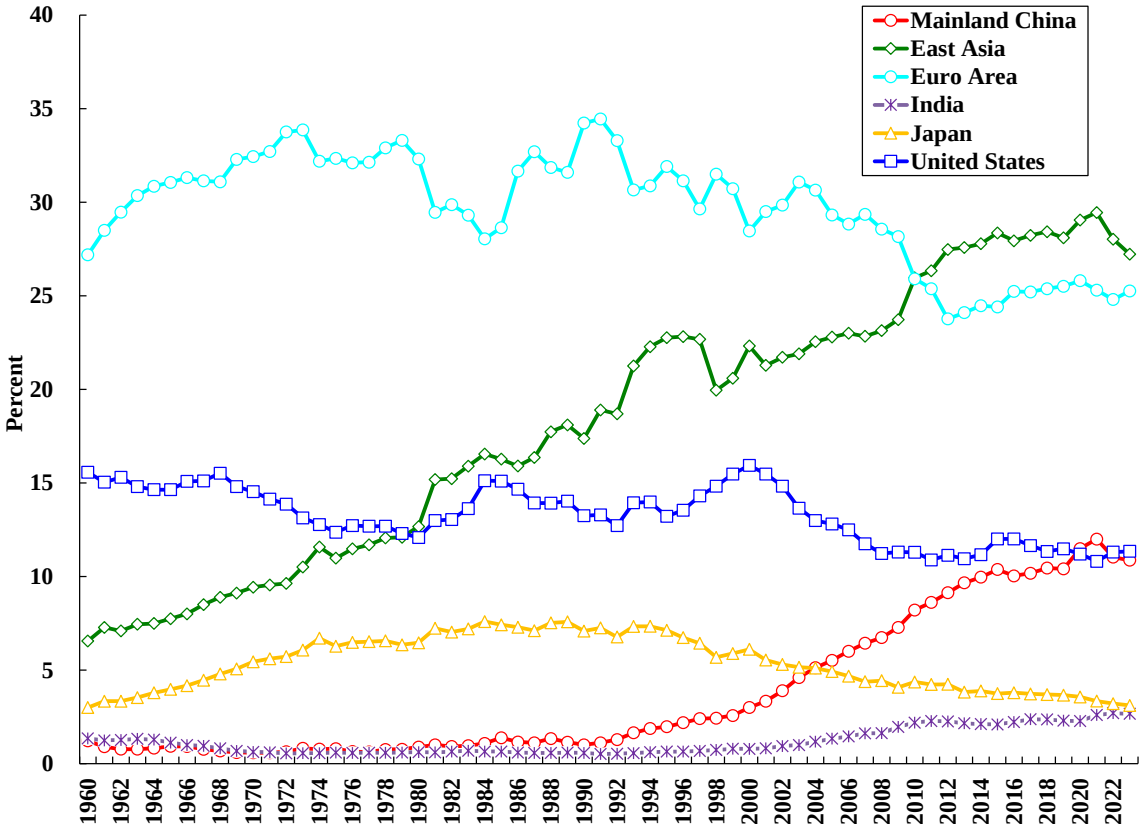
Chart 7: The Distribution of World International Trade in Goods and Services, 1960 and 2023, US$



Sources: U.S. Data are from the U.S. Bureau of Economic Analysis; data for other economies are from World Development Indicators.

The annual shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World international trade in goods and services, in terms of current U.S. Dollar, between 1960 and 2023, are presented in Chart 8. Between 1960 and 2023, the share of the U.S. in World international trade in goods and services declined from 15.6% to 11.3%; and the share of Mainland China, which was similar to India's share before its economic reform and opening in 1978, rose from 1.2% to 10.9%. During the same period, the share of East Asia as a whole rose from 6.6% to over 27%, surpassing the Euro Area. Japan's share rose from 3.0% to 3.1% and India's share rose from 1.3% to 2.7%. With the continuing growth of the international trade of the ASEAN economies, India and other South Asian economies such as Bangladesh, and the oil and gas producers of the Middle East, Asia's share of World trade should also approach one half of the World total in another decade.

Chart 8: The Shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World International Trade in Goods and Services, 1960-2023 (percent)

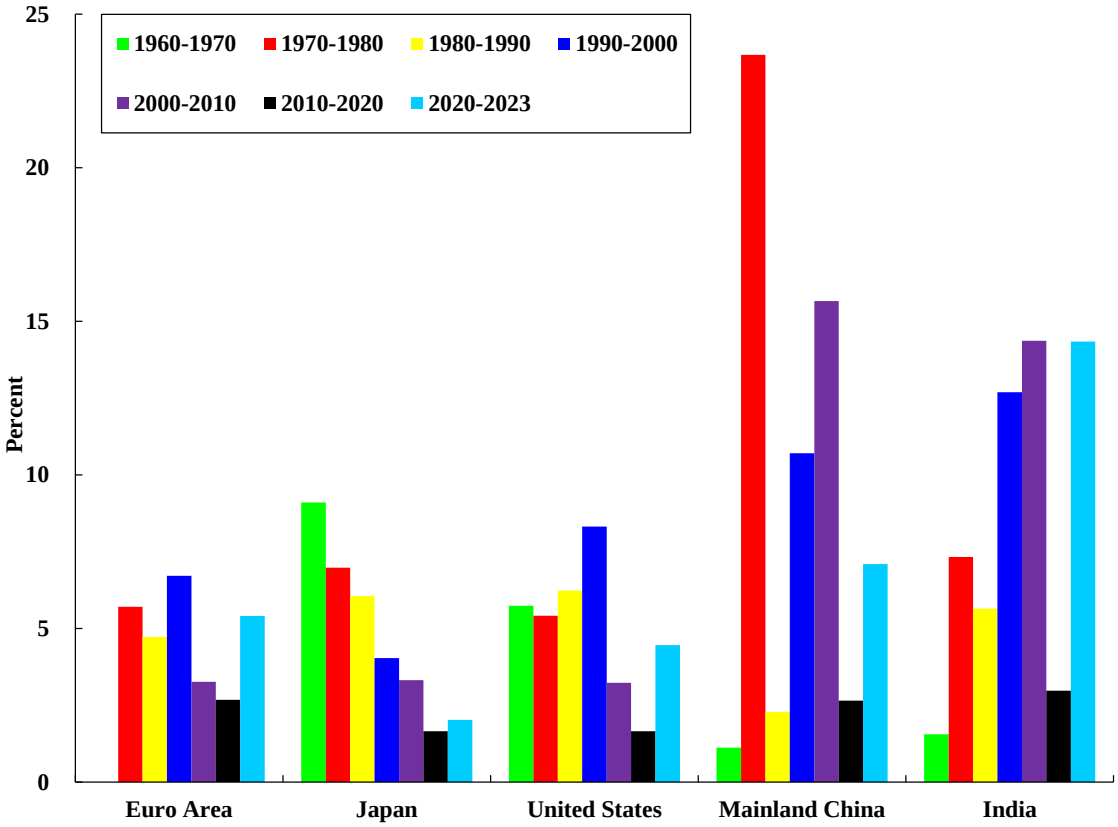


Sources: U.S. Data are from the U.S. Bureau of Economic Analysis; data for other economies are from World Development Indicators.

In Chart 9, the average annual rates of growth of total real international trade in goods and services for selected economies for different decades are presented.[12] China and India have had the highest rates of growth in international trade, especially since the 1990s. Growth in Chinese international trade was particularly rapid during the decade of 2000-2010 because of its accession to the World Trade Organization (WTO) in 2001 and because of the expiration of the Multi-Fibre Agreement governing World trade in textiles. India also had exceptionally high rates of growth in its real international trade and in fact exceeded China since 2020. However, all the developed economies—the U.S., the Euro Area, and Japan—had relatively low real rates of growth of international trade during the past several decades.

[12] Unfortunately, the rate of growth of the real international trade of the Euro Area during the decade of the 1960s is not readily available.

Chart 9: Decade Average Annual Rates of Growth of Total Real International Trade in Goods and Services, Selected Economies

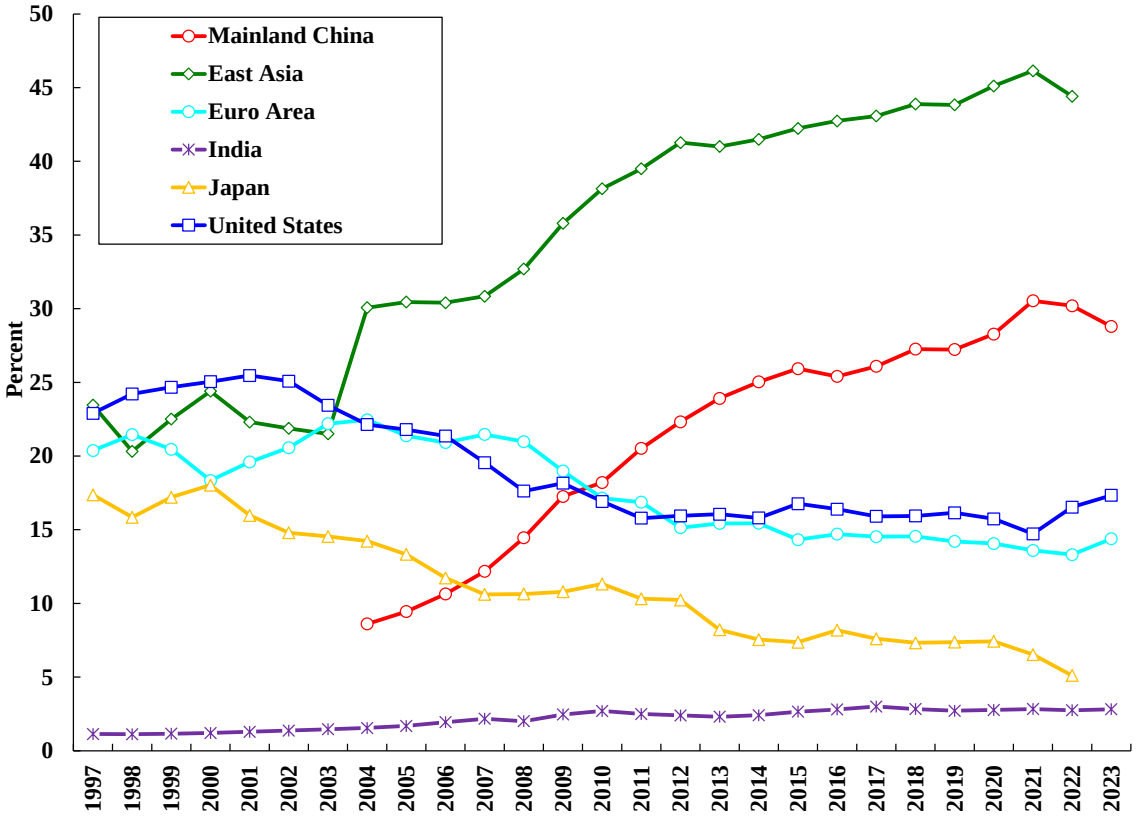


Sources: Chinese data from the National Bureau of Statistics of China and World Development Indicators and; data for the other economies from World Development Indicators.

In Chart 10, the annual shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World value-added in manufacturing, between 1997 and 2023, are presented.[13] Chart 10 shows the rapid rise in the share of Mainland China, from below 10% in 2004 to almost 30% in 2023, accounting for more than half of the value-added in manufacturing of East Asia. With the rise of China, the share of East Asia in manufacturing value-added rose to just under 45%, even as the share of Japan shrank from over 17% in 1997 to just above 5% in 2023. The shares of both the U.S. and the Euro Area have declined over time, from more than 20% around 2004 to 17.3% and 14.4%, respectively, in 2023. Between 1997 and 2023, India's share rose from 1.1% to 2.8%. The share of Asia as a whole is likely to have already exceeded half of the World total, by taking into account the value-addeds in manufacturing of the other South Asian economies such as Bangladesh.

[13] Unfortunately, comparable data for Mainland China are only available from 2004.

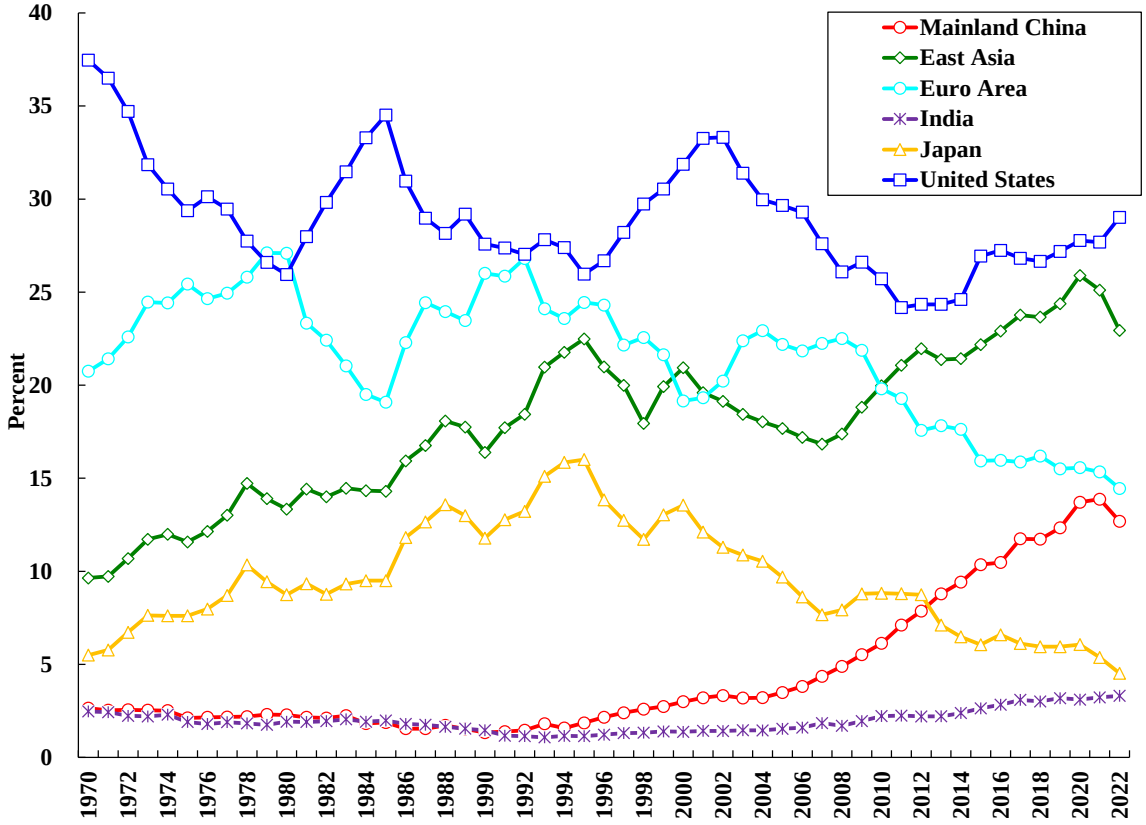
Chart 10: The Shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World Value-Added in Manufacturing, 1997-2023 (percent)



Sources: U.S. Data are from the U.S. Bureau of Economic Analysis; data for other economies are from World Development Indicators.

While in terms of its share in World value-added in manufacturing, China has clearly emerged as the World's factory, it is also increasingly becoming one of the World's most important consumer markets. In Chart 11, the annual shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World consumption, between 1970 and 2023, are presented. In 2023, the U.S. is still the World's largest consumer market, with the largest share of World consumption, 29.0%, followed by East Asia (22.9%) and the Euro Area (14.5%). Mainland China's share has been rising rapidly, especially since the Global Financial Crisis of 2008, and by itself accounted for 12.7% of World consumption (more than half of East Asia's share) in 2023. The shares of both the U.S. and the Euro Area have been generally falling, despite large fluctuations caused by changes in the Euro/US$ exchange rate. If current trends continue, the East Asian consumer market is likely to surpass that of the U.S. in another decade. (Of course, this also depends on the movements of the relative exchange rates.)

Chart 11: The Shares of Mainland China, East Asia, the Euro Area, India, Japan and the U.S. in World Consumption, 1970-2023 (percent)



Sources: Chinese data are from the National Bureau of Statistics of China; data for other economies are from World Development Indicators.

A similar shift in the centre of gravity of World wealth (including individual, corporate and sovereign wealth) has also been occurring. According to the 2024 survey conducted by the Forbes magazine, there were a total of 2,781 US$ billionaires in the World, amongst whom U.S. citizens accounted for 813 (29.2%), Chinese (including Hong Kong and Macau) citizens accounted for 473 (17%), and Indian citizens 200 (7.2%). A similar survey by Hurun for 2023 concluded that there were a total of 3,112 US$ billionaires in the World, amongst whom U.S. citizens accounted for 691 (22.2%) and Chinese citizens accounted for 969 (31.1%). Of course, there may well be even many more unknown US$ billionaires in Mainland China as well as elsewhere. However, it is probably safe to say that in 2000, the number of US$ billionaires in China, if any, would be on the order of single digit. Even though the exact numbers and rankings of the two surveys differ significantly, it is unmistakable that Chinese aggregate household wealth has been rising rapidly over time with the emergence of not only US$ billionaires but also a sizeable middle class of a couple of hundred million households.

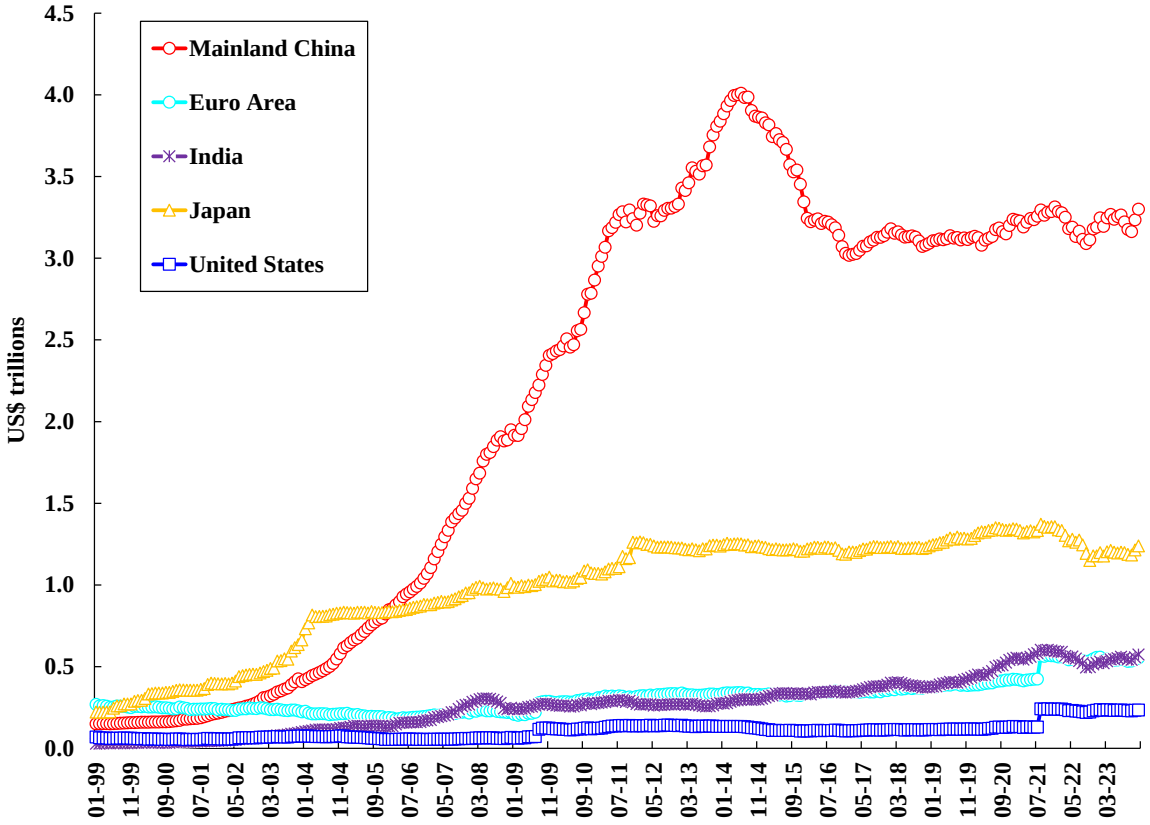
But there is still quite a gap between the aggregate household wealth of China and the U.S. Directly comparable data on aggregate household wealth are not readily available. However, one useful indicator is the capitalisation of the national stock markets. In 2023, the Mainland Chinese stock markets had the second largest market capitalisation in the World, at US$10.94 trillion, trailing the U.S., with its US$48.98 trillion (see Table 1).

Table 1: The Stock Market Capitalisation of Selected Economies, Year-End 2023
Trillion US$

Economy	Market Capitalisation
United States	**48.98**
Mainland China	**10.94**
Japan	**6.15**
India	**4.34**
Hong Kong, China	**3.97**
Source: World Federation of Exchanges Statistics Portal	

Today, China has the world's largest official foreign exchange reserves, at approximately US$3.3 trillion, followed by Japan, with approximately US$1.2 trillion (see Chart 12). India and the Euro Area each has approximately US$600 billion in their official foreign exchange reserves. The U.S. maintains a very low level of foreign exchange reserves because most countries are willing to accept the U.S. Dollar, which the U.S. can print at will, as payment for their exports.

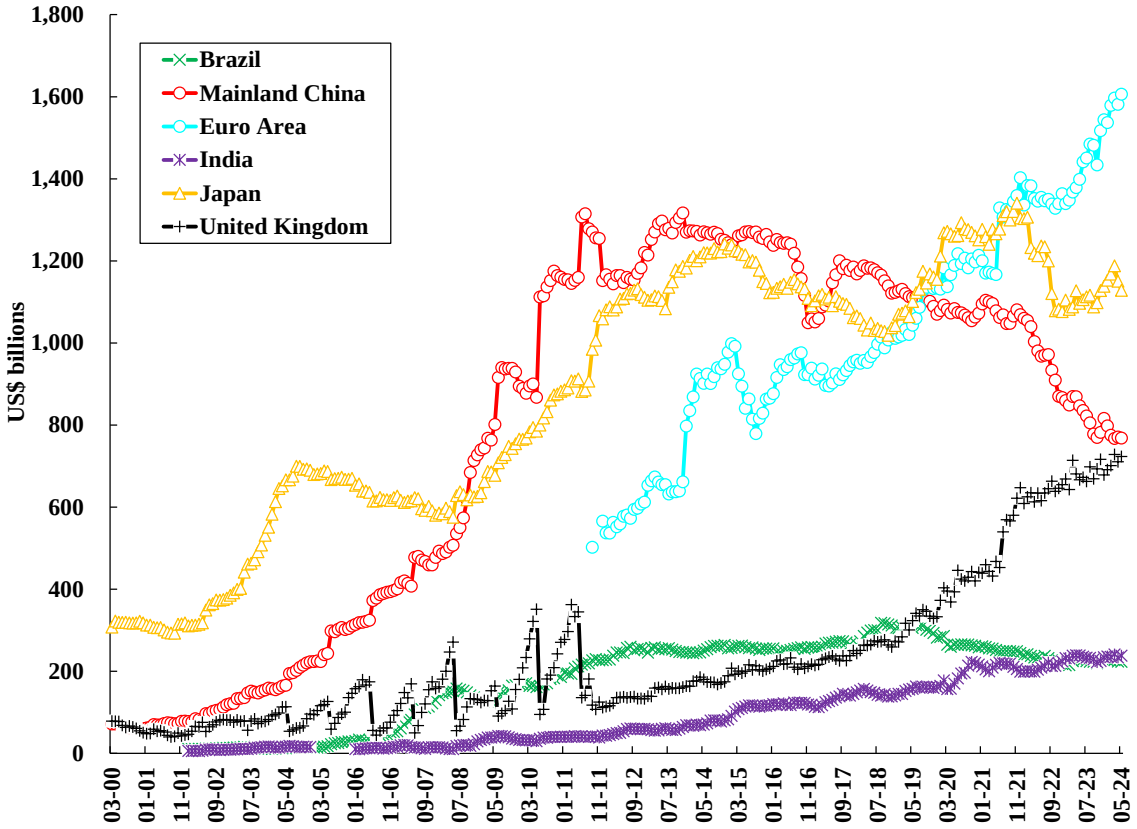
Chart 12: Total Foreign Exchange Reserves minus Gold, Selected Economies



Sources: International Financial Statistics.

The Euro Area central banks collectively hold the largest quantity of U.S. Treasury and Agency securities in the World, at over US$1.6 trillion (see Chart 13). The Bank of Japan (US$1.13 trillion) and the People's Bank of China (US$770 billion) are the largest and second largest individual central bank holders of U.S. Treasury and Agency securities, respectively. The United Kingdom has become a close third, with US$723 billion. However, the holdings of U.S. Treasury and Agency securities by the People's Bank of China has been steadily declining in recent years, reflecting, in part, the increased use of the renminbi in Chinese foreign-related transactions and therefore a reduced need for U.S. Dollar balances for transaction purposes, and, in part, to a desire for diversification.

Chart 13: The Value of U.S. Treasury and Agency Securities Held in Foreign Exchange Reserves by the Central Banks of Selected Economies

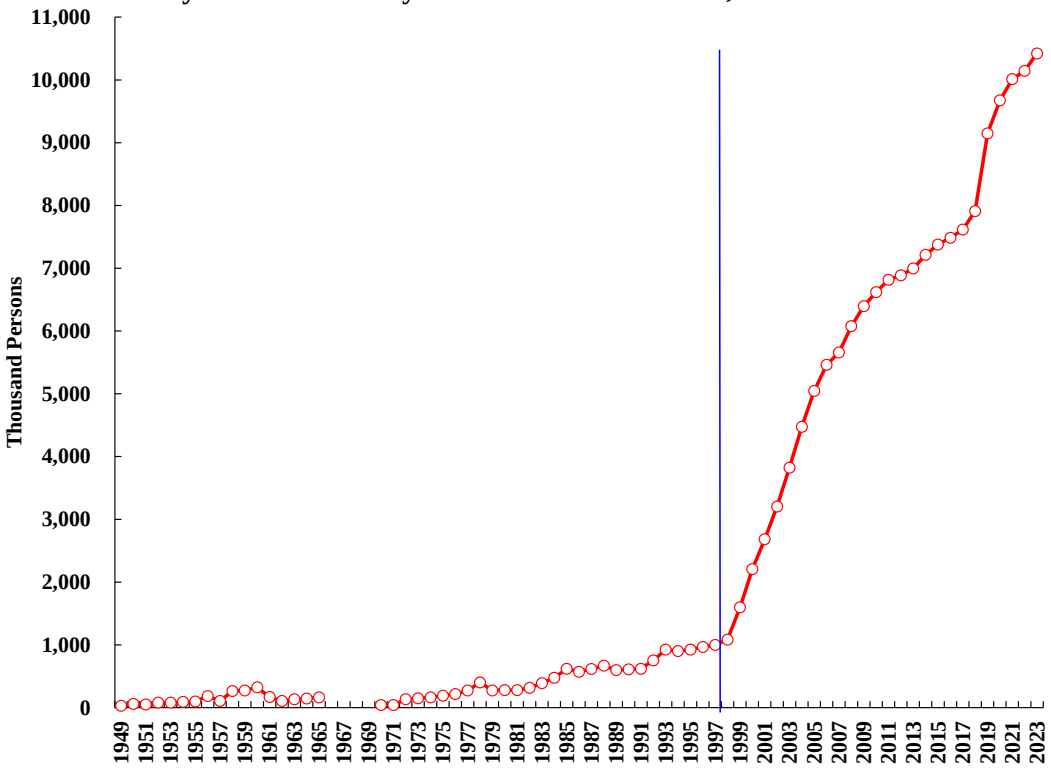


Sources: U.S. Department of the Treasury.

3. Intangible Capital and Innovation

In terms of the quantity of intangible capital or wealth, China has also made significant progress since its economic reform and opening. It has invested heavily in human capital and R&D capital. In 1986, China introduced mandatory nine-year education for all. In 1999, China vastly expanded the annual number of freshman students admitted by its tertiary educational institutions though nationwide competitive examinations (see Chart 14).[14] As a result, the share of the Chinese population with tertiary education rose from 0.2% in 1949 to 19.5% in 2022, a significant improvement.[15] However, as of 2020, China still lagged far behind the developed economies of the U.S., Japan and Germany, and was similar to India in terms of tertiary educational attainment (see Chart 15). The Chinese share would have been higher if the age thresholds were changed to 16-64 from 25-64 because the more recent Chinese tertiary graduates have not yet reached 25 years of age. It will definitely take some time for China to catch up to the same quality of labour force as the developed economies.

Chart 14: The Number of Freshman Students Admitted by Chinese Tertiary Educational Institutions, 1949-2023

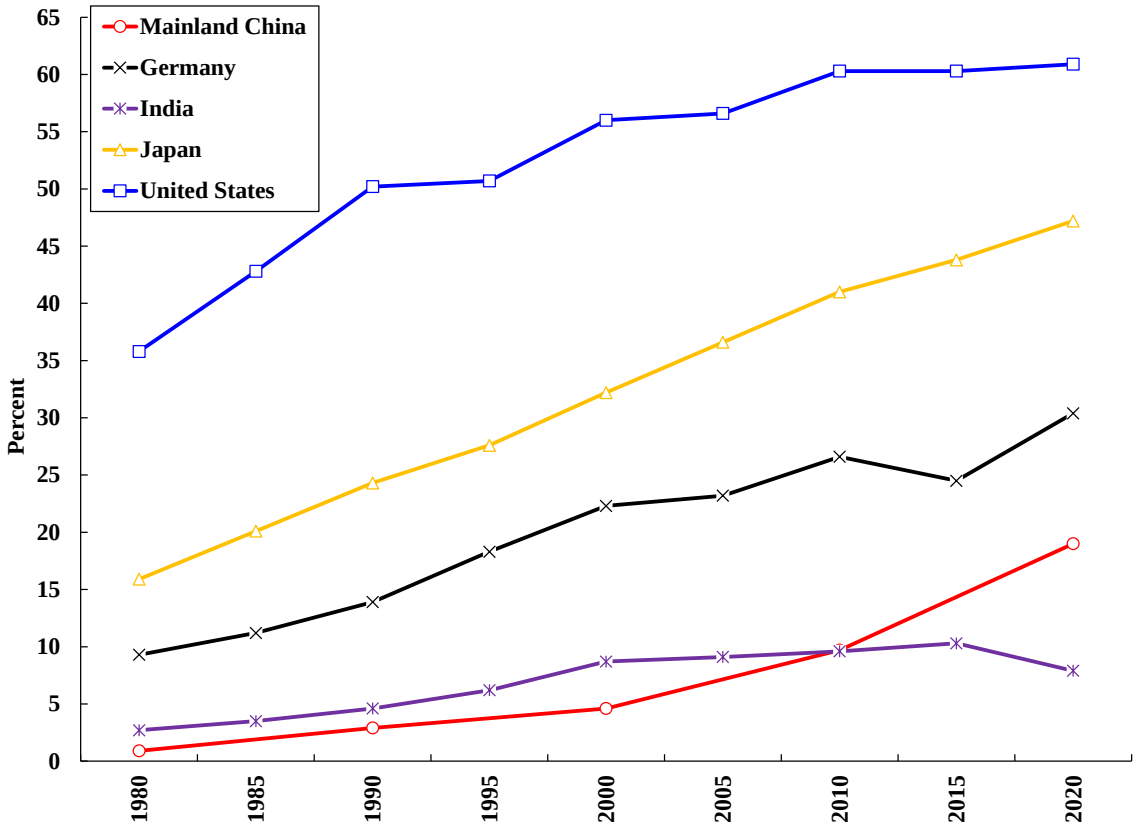


Source: The National Bureau of Statistics of China.

[14] The years with missing data were 1966-1969 when almost all tertiary educational institutions were closed because of the Great Proletarian Cultural Revolution.

[15] Based on the 2022 population sampling survey data from the National Bureau of Statistics of China, it is calculated that 19.5% of the population aged 6 and above attained tertiary education.

Chart 15: The Share of Population Aged 25-64 with either Completed or Partially Completed Tertiary Education, Selected Economies, 1980-2023

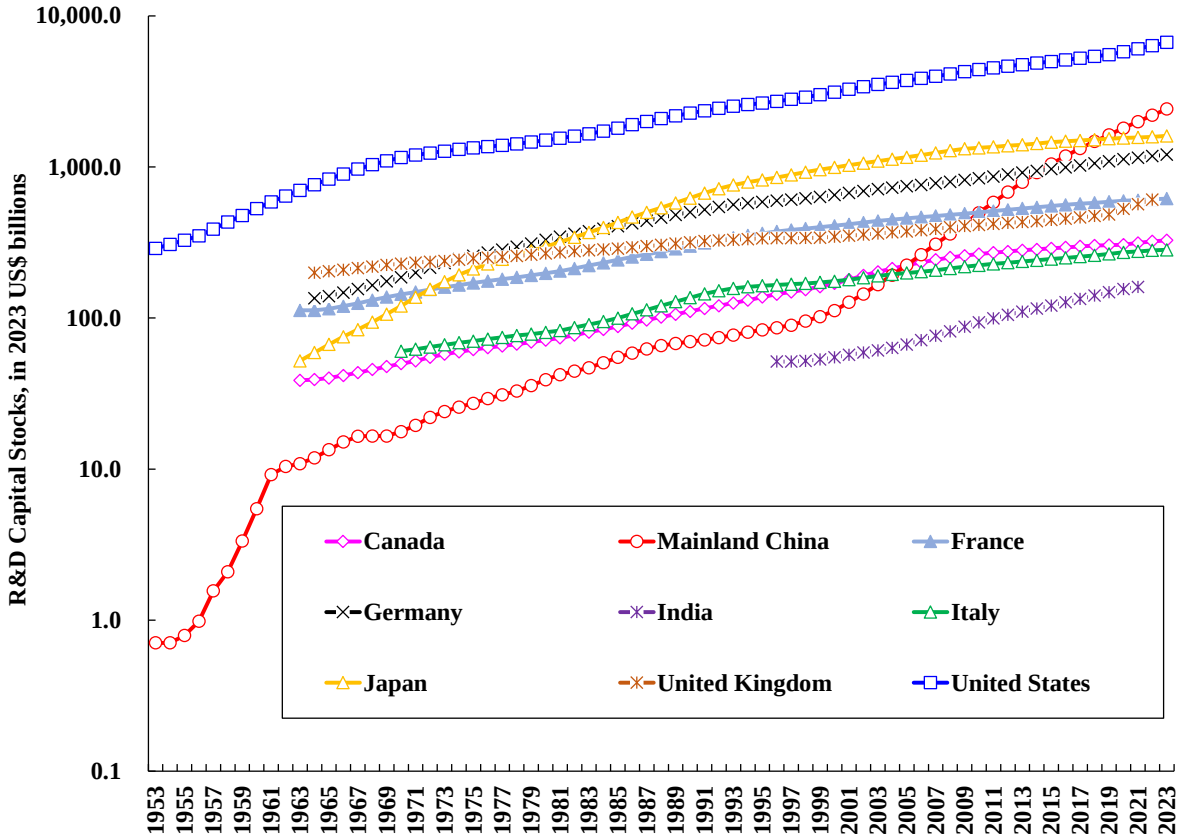


Sources: Chinese data are derived from national population census data; data for other economies are taken from the Barro-Lee Educational Attainment Dataset, updated at barrolee.com.

In Chart 16, the real R&D capital stocks of selected economies, in 2023 U.S. Dollar, are presented. R&D capital stock is defined as the cumulative real R&D expenditures less a depreciation of 10 percent per annum. The U.S. has the largest R&D capital stock in the World. China has been trying to catch up in recent years, but still lags significantly behind the U.S. even as it has overtaken all the other Group-of-Seven (G-7) countries.[16]

[16] The Group-of-Seven (G-7) countries consist of Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

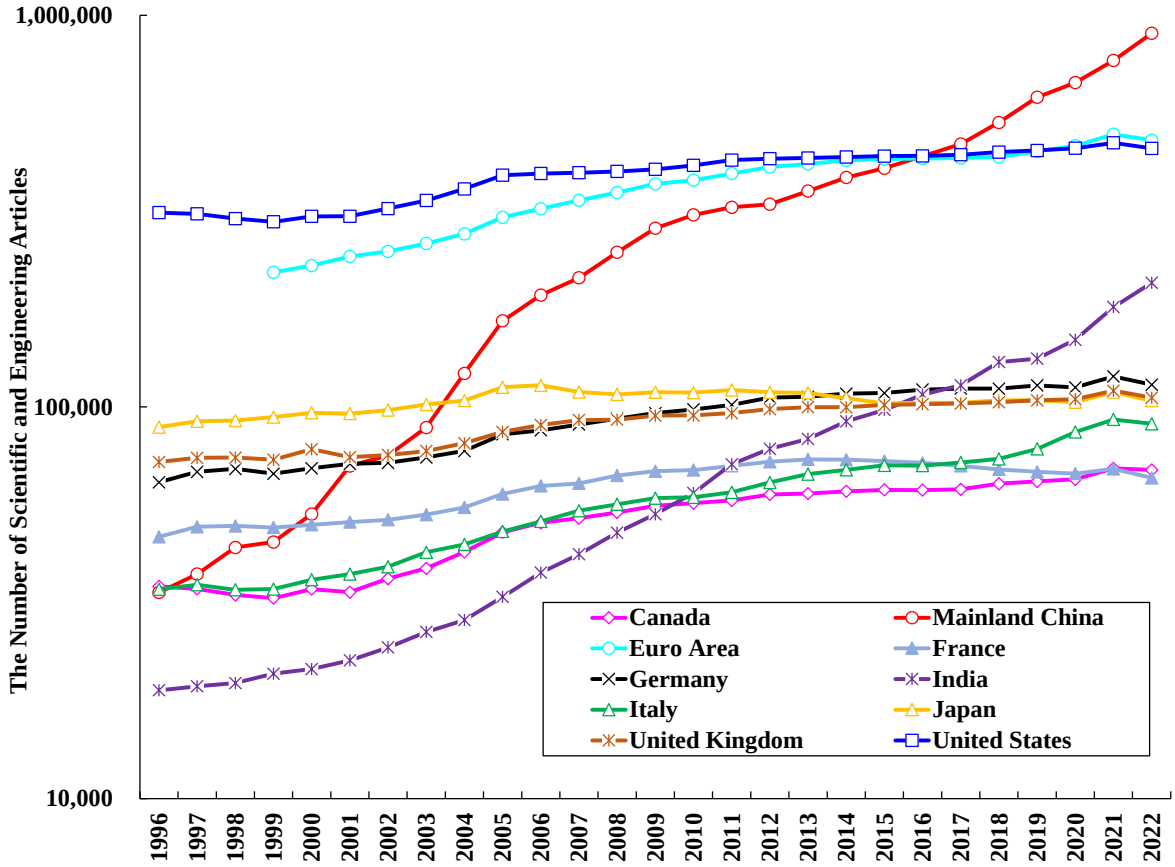
Chart 16: The Stock of Real R&D Capital, in 2023 US$ billions, Selected Economies



Sources: Data for India are estimated by the author using the same method as in Lau and Xiong (2022); Data from 1953 to 2019 for all other economies are from Lau and Xiong (2022), Table A3.4, pp. 38-40; data for all economies since 2020 are the author's estimates using data on R&D expenditures from the Organisation for Economic Co-operation and Development (OECD), Main Science and Technology Indicators, GDP deflators from World Development Indicators, and exchange rates from International Financial Statistics.

One of the outputs of R&D is publication in science and engineering. The total number of science and engineering scholarly articles published in international professional journals by Chinese authors started from a relatively low level, on a par with Canada and Italy, in 1996 (see Chart 17). However, the number of articles by Chinese authors increased rapidly and exceeded those by U.S. and all the other G-7 authors, who had been the world leaders for decades, in 2017. Today, Chinese authors collectively publish the largest number of such articles in the World. Indian authors have also made great progress and overtaken the authors of all the G-7 countries except the U.S. in 2017.

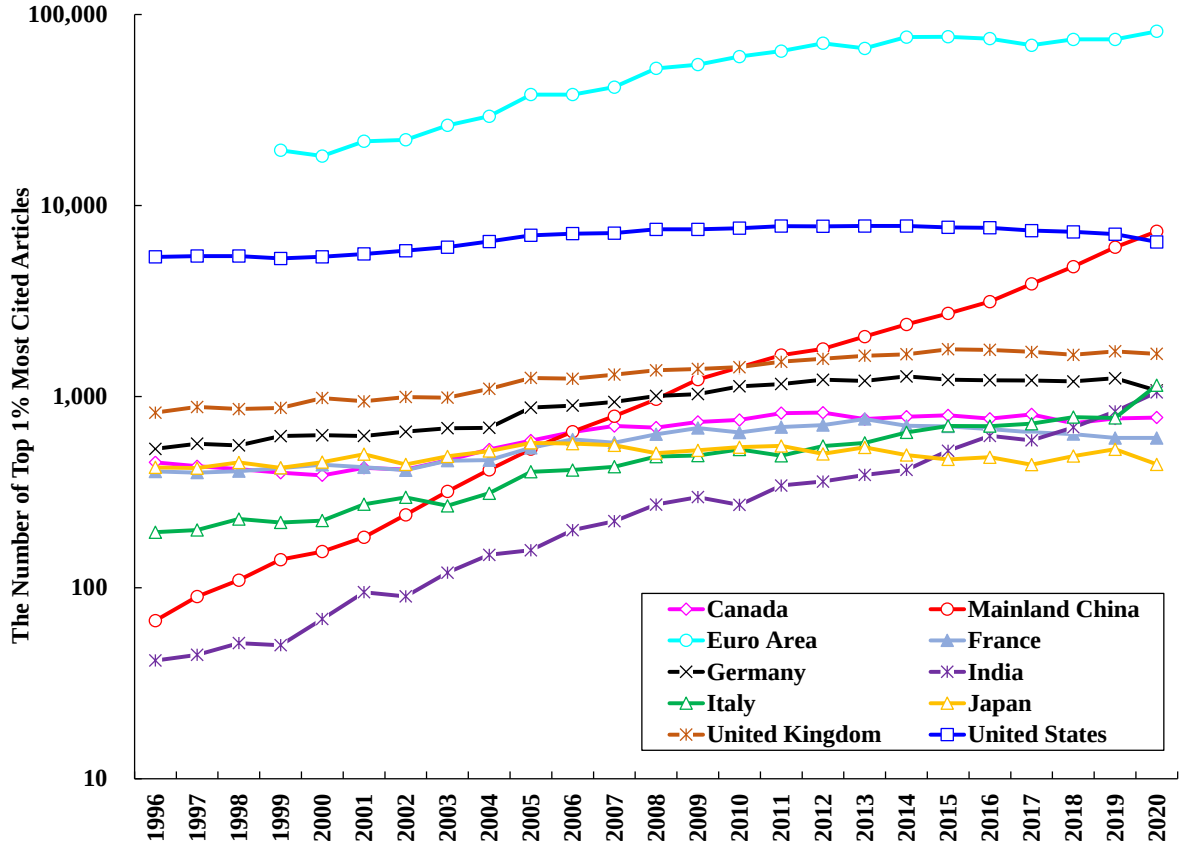
Chart 17: The Number of Scientific and Engineering Articles Published, 1996-2022, Selected Economies



Sources: U.S. National Science Board, Science and Engineering Indicators.

But what about the quality of these articles by Chinese authors? One useful indicator of the quality of an article is how often it is cited by other authors in their published articles. Chinese authors trailed the authors of the U.S., the other Western countries and Japan in the number of top-1% most cited science and engineering articles for many years, but managed to surpass U.S. authors to become number one in 2020 (see Chart 18). Chinese authors remain behind the authors of the Euro Area collectively. Indian authors have also made significant progress, surpassing Canadian, French and Japanese authors and almost catching up with German authors.

Chart 18: The Number of Top-1% Most Cited Science and Engineering Articles, 1996-2020, Selected Economies



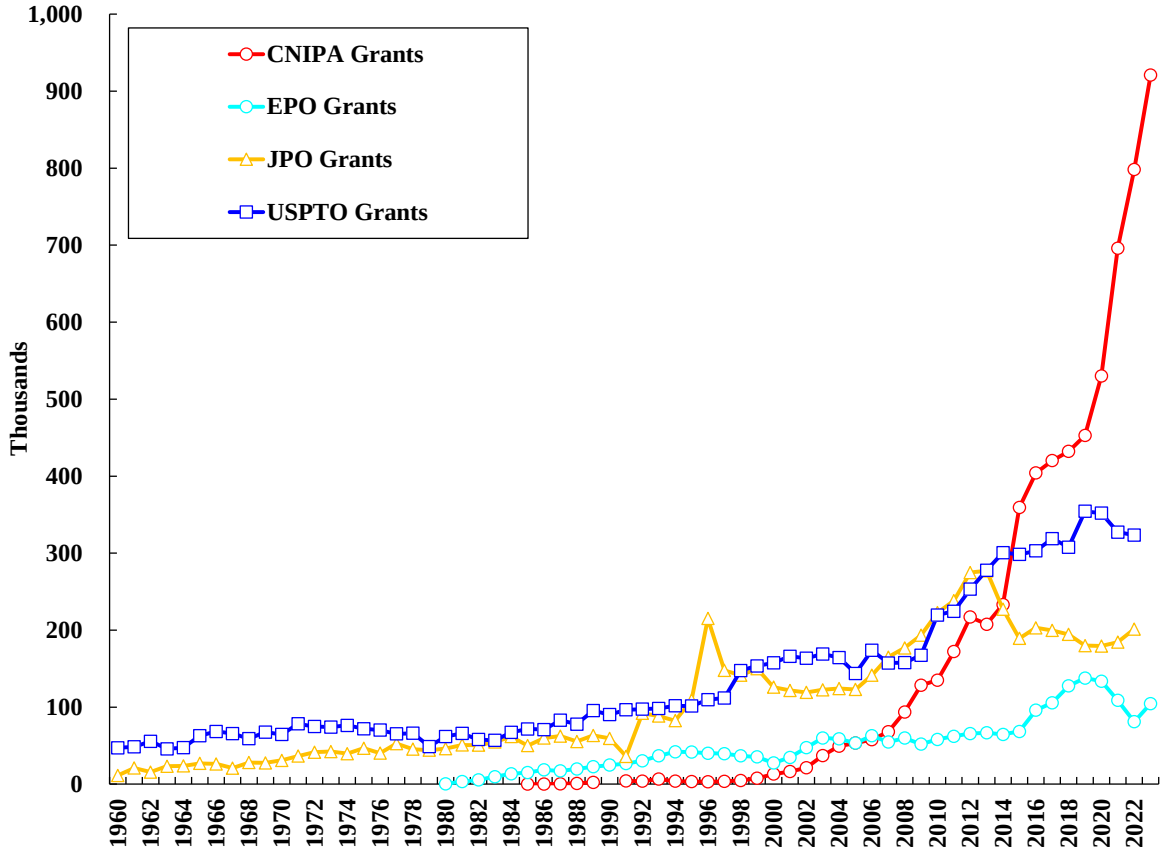
Sources: U.S. National Science Board, Science and Engineering Indicators.

Another possible output of R&D is a patent. The total numbers of patents awarded to discoverers and inventors worldwide by the major patent offices in the World are presented in Chart 19. They include the United States Patent and Trademark Office (USPTO) (blue line), the European Patent Office (EPO) (turquoise line), and the Japan Patent Office (JPO) (yellow line), in addition to the China National Intellectual Property Administration (CNIPA) (red line). They have all been increasing by leaps and bounds since 2000, with the exception of the Japan Patent Office.

The China National Intellectual Property Administration (CNIPA) is the government agency in charge of patents and trademarks and the primary intellectual property regulator of China. Although its earliest predecessor was founded in 1980, it was not particularly active until around 2000. Since 2000, the annual number of patents awarded by CNIPA has increased exponentially, reaching 921,000 in 2023, the highest in the World. Since 2014, China has also strengthened intellectual property right protection significantly by establishing special

intellectual property courts with sole nationwide jurisdiction over such matters. CNIPA is followed by the USPTO, JPO and the EPO, in that order.

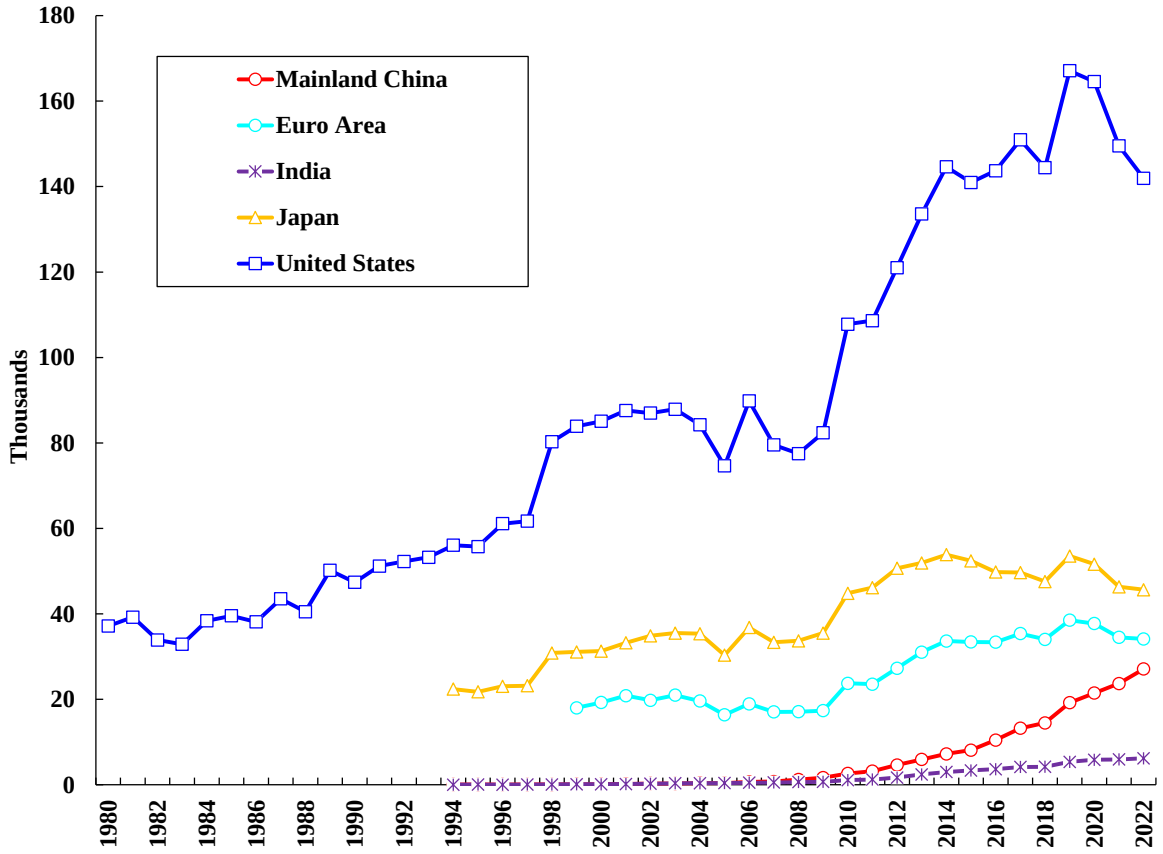
Chart 19: The Total Number of Patent Grants Awarded Worldwide by USPTO, JPO, EPO and CNIPA, 1960-2022



Sources: Data for 1960-2022 from World Intellectual Property Organization (WIPO) statistics database; 2023 data for CNIPA from the National Bureau of Statistics of China; 2023 data for EPO from Statistics and Trends Centre, European Patent Office.

However, there may exist significant differences in the qualities and standards of the patents awarded by the patent offices of different countries. In terms of the number of the United States Patent and Trademark Office (USPTO) patents awarded, China still lags behind the U.S. significantly, but has been gradually catching up to the Euro Area and Japan (see Chart 20). In fact, China also lags behind in terms of patents awarded by both the European Patent Office (EPO) and the Japan Patent Office (see Appendix Charts A1 and A2). It is also the case that the recipient of the largest number of patents, by a large margin, from the China National Intellectual Property Administration (CNIPA), is China itself (see Appendix Chart A3).

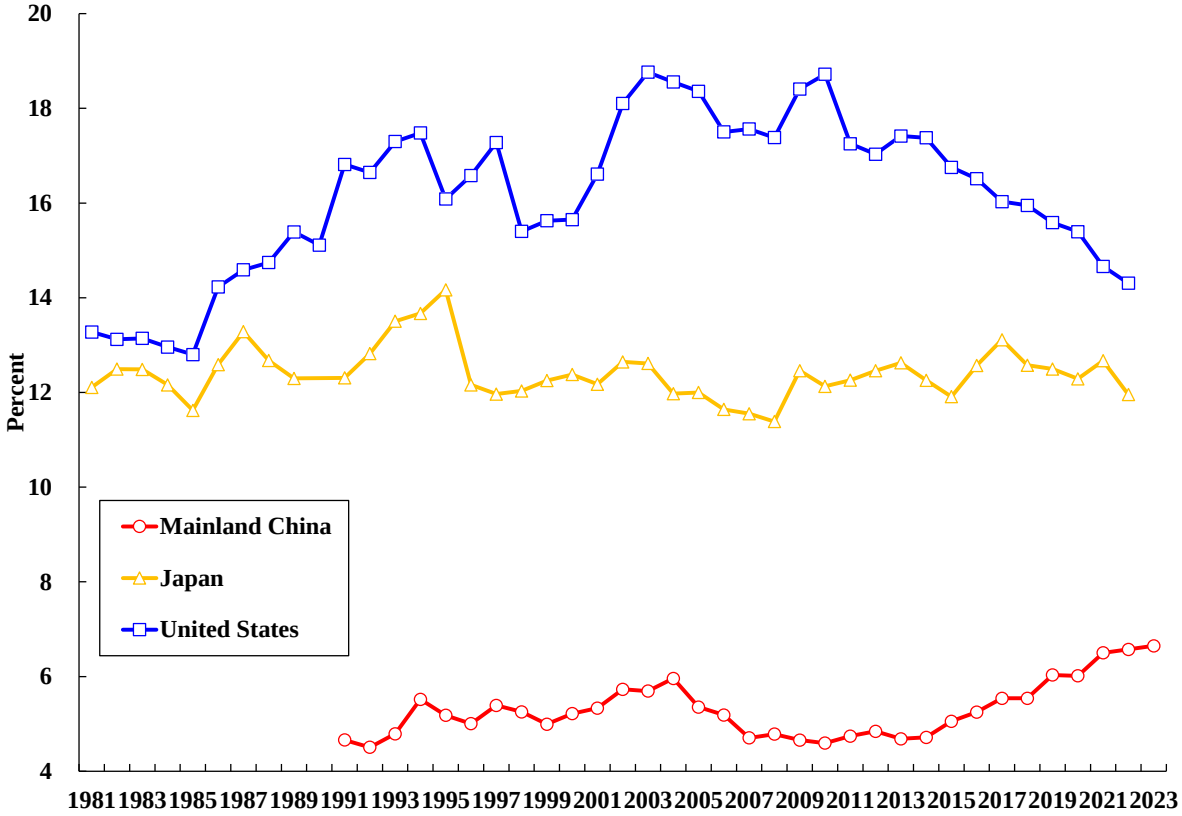
Chart 20: The Number of USPTO Patent Grants Received by Mainland China, the Euro Area, India, Japan and the U.S., 1980-2022



Source: WIPO statistics database.

China has also been able to make indigenous innovations in many areas: for example, 5G and 6G communication, the Beidou Navigation Satellite System, electric vehicles, high-speed trains, quantum communication, solar panels, super-computers and ultra-high-voltage transmission of electricity. However, China still lags behind in terms of its investment in long-term basic research, which is essential for breakthrough discoveries and inventions. In 2023, China devoted 6.65% of its total R&D expenditure to basic research. By comparison, since 1981, U.S. basic research has accounted for, on average, 15% of its total R&D expenditure, and Japanese basic research for 12% (see Chart 21). China should significantly increase its investment in basic research in order to compete successfully in innovation in the long run.

Chart 21: Basic Research Expenditure as a Percent of Gross Expenditure on R&D, Mainland China, Japan and the U.S.



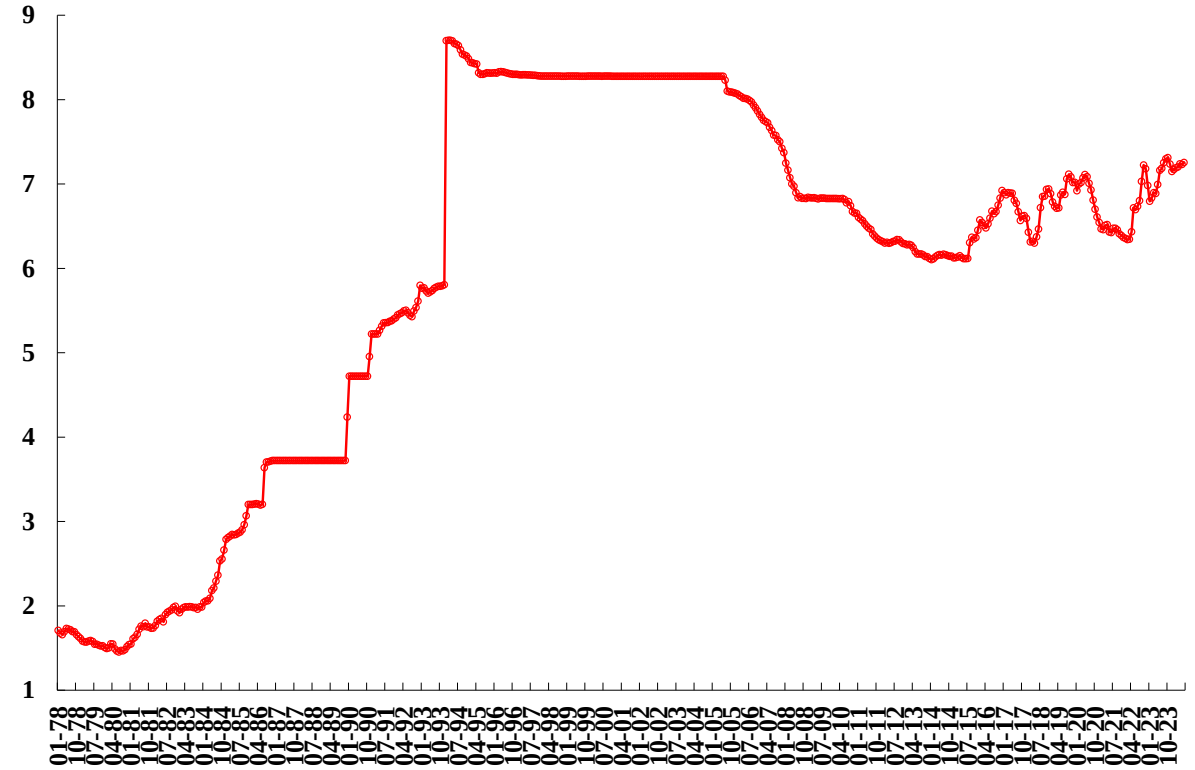
Sources: Data for China from 1991 to 1997 from OECD, Research and Development Statistics; data for China from 1998 to 2023 from the National Bureau of Statistics of China; Japanese and U.S. data from OECD, Research and Development Statistics.

4. The Use of the Renminbi in International Transactions

Since the early 1970s, the invoicing, clearing and settlement of bilateral trade between two countries has mostly been done in U.S. Dollar. In 2000, after the establishment of the Euro Area, the invoicing, clearing and settlement of bilateral trade between two countries in the Euro Area is done exclusively in Euro. Clearing and settlement of bilateral trade transactions in the own currencies of the two countries, as opposed to a third-country currency like the U.S. Dollar, reduce transaction costs and exchange rate risks to both the exporting and the importing countries, because there is only one currency exchange, and hence only one exchange rate risk. This practice is gaining wider international acceptance. One principal use of the official foreign exchange reserves of a country is to pay for imports. If imports can be paid for in a country's own currency, the level of foreign exchange reserves that has to be maintained for transaction purposes can be significantly reduced.

The exchange rate of the Chinese currency, the renminbi or Yuan, vis-a-vis the U.S. Dollar, has also undergone huge changes during the past 45 years (see Chart 22). In 1978, US$1 is worth less than 2 Yuan. In order to maximise the benefits of the policy of economic reform and opening to the World, the Chinese Government began to devalue the renminbi significantly with respect to the US$ in 1980, to a more competitive and sustainable level. For a few years in the early 1990s, China actually maintained dual exchange rates: an official rate and an "adjustment" rate determined in a market restricted to Chinese exporters and importers with import licenses. At the time, foreign exchange certificates (FECs) were also used by foreign visitors to China instead of the renminbi itself because the official renminbi/U.S. Dollar exchange rate was significantly over-valued. In 1994, China implemented full current-account convertibility but maintained controls on the capital accounts. In both nominal and real terms, the renminbi has appreciated relative to the U.S. Dollar since 1994, but especially after 2005 (see Chart 22). The renminbi/US$ exchange rate has been moving within a band between 6.8 Yuan/US$ and 7.3 Yuan/US$ within the last couple of years.

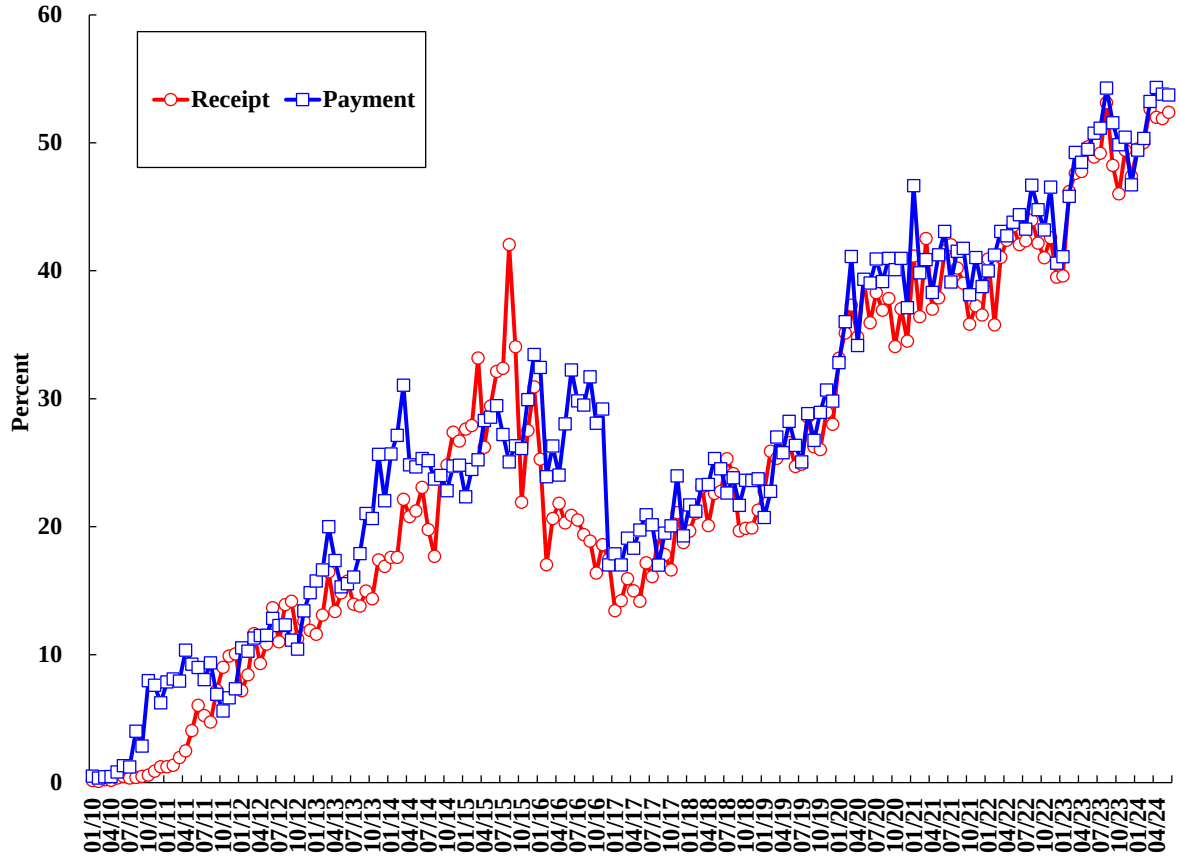
Chart 22: The Nominal Exchange Rate of the Renminbi, Yuan/US$, 1978-present



Source: International Financial Statistics.

Before 2010, almost all of China's foreign-related transactions, including international trade and inbound and outbound foreign direct and portfolio investments, were settled in U.S. Dollar. The share of renminbi settlement began to rise from zero in 2010, and reached a peak of approximately 40% in mid-2015. However, a sudden and unexpected devaluation of the renminbi coupled with a large decline in the Chinese stock market led to a retreat from renminbi settlement. It took about five years for the share of renminbi settlement to recover to the level of 40%. Since then, the share of renminbi settlement has continued to rise steadily and currently stands at around 50% (see Chart 23). The main impetus for the wider use of the renminbi in settlement comes from the fact that international trade between China and many of its trading-partner countries is increasingly settled in each other's own national currencies.

Chart 23: The Share of Renminbi Settlement in China's Foreign Related Transactions

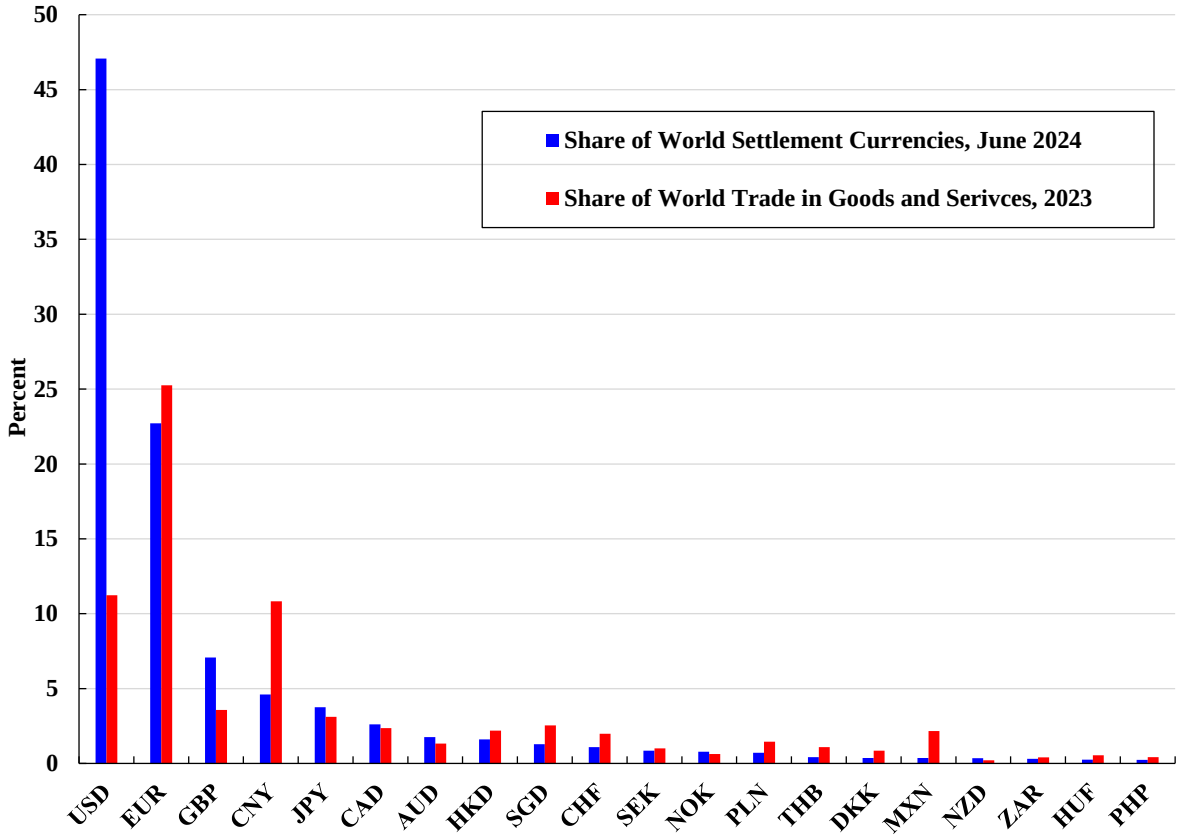


Source: State Administration of Foreign Exchange, China.

In Chart 24, we compare the share of World settlement of the currency of a country or region (blue column) in June 2024, with the share of World trade in goods and services of that country or region (red column) in 2023 (this is because the 2024 World trade data are not yet available). In 2023, the Euro Area accounted for the largest share of World trade in goods and services, 25.3%, followed by the U.S, with 11.2%, and the Mainland China, with 10.8%. (We note that these shares are sensitive to changes in exchange rates.) In June 2024, the U.S. Dollar accounted for the largest share of World settlement, at 47.1%, the Euro accounted for 22.7% (slightly below its share of World trade), and the British Pound accounted for 7.1%. The renminbi share in World settlement, while small, has been increasing rapidly, from 2.3% in March 2023 to 4.6% in June 2024 to become the fourth most frequently used settlement currency, surpassing the Japanese Yen.[17]

[17] The renminbi share in World settlement has been increasing rapidly—It went from 2.3% in March 2023 to 3.1% in July, 4.1% in December, 4.5% in January 2024 and 4.6% in June 2024.

Chart 24: Share of World Settlement versus 2023 Share of World Trade, Jan. 2024



Sources: The Society for Worldwide Interbank Financial Telecommunication (SWIFT), RMB Tracker; World Development Indicators.

We note that for the U.S. Dollar, the British Pound and the Japanese Yen, their shares of World settlement were all higher than the respective shares of these countries in World trade. The Japanese Yen was in fifth place in World settlement, accounting for 3.8%, higher than Japan's share in World trade of 3.1%, while the renminbi share in World settlement was only 4.6% even though China's share in World trade was 10.8%. If the share of renminbi settlement could eventually reach China's share of World trade, it would become 10.8%, surpassing the share of the British pound to become the third most widely used settlement currency. There is a great deal of room for the renminbi share of World settlement to continue to grow, but the renminbi's share is not expected to catch up to the U.S. Dollar's share of 47.1% for a long time.

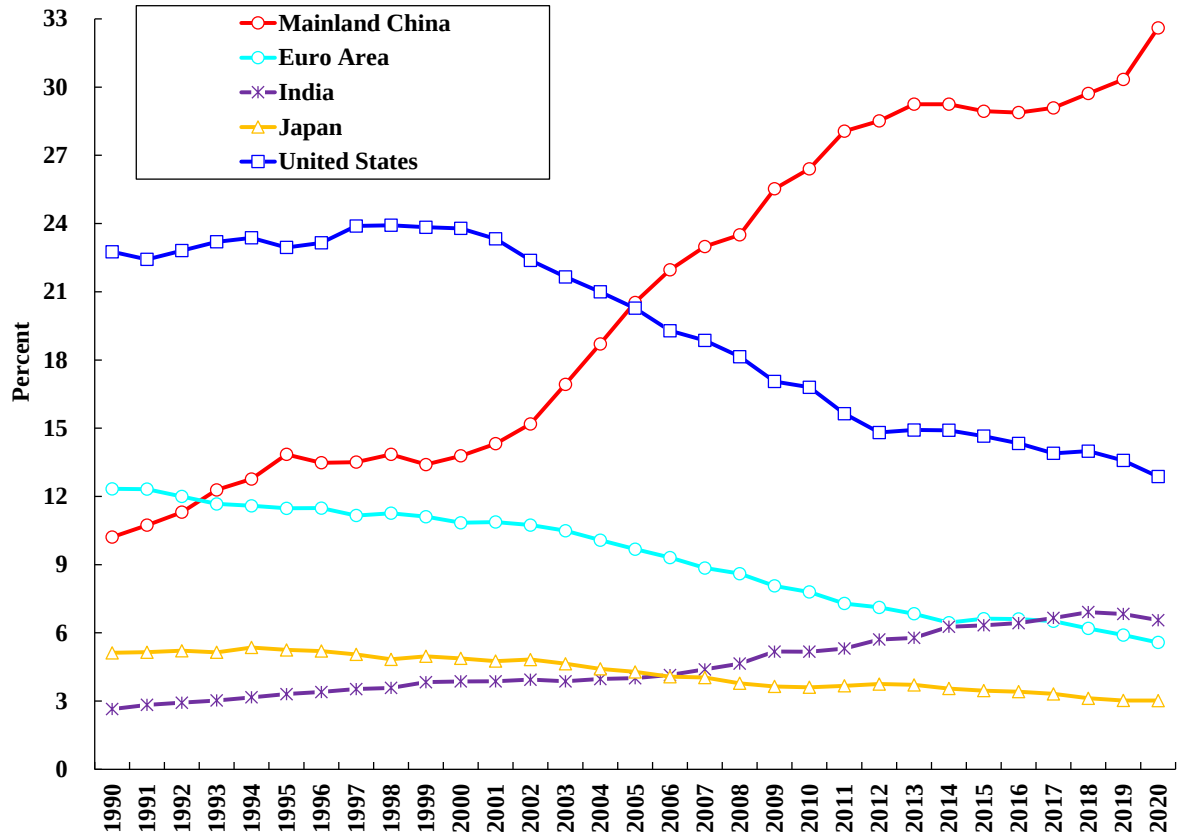
However, replacing the US Dollar with the renminbi as a medium of international exchange between other countries may not be in China's own best national interests. In order to maximise the benefits from the seigniorage of providing the international medium of exchange, a country must be prepared to run a significant trade deficit and become a net debtor vis-à-vis the rest of the World. China aims to have balanced international trade. Instead, China

should support the clearing and settlement between bilateral trading-partner countries in their own respective national currencies, as they did under the Bretton Woods system before 1971.

5. Alleviation of Climate Change

Since 2005, China has been the largest carbon emitter in the World, overtaking the United States. They are followed by the Euro Area, India and Japan, the lowest among major economies, in that order (see Chart 25). India has become the third largest carbon emitter in the World. In order to help prevent further global climate change, China has the responsibility of reducing its carbon emissions significantly.

Chart 25: The Shares of World Carbon Dioxide Emissions, Selected Economies

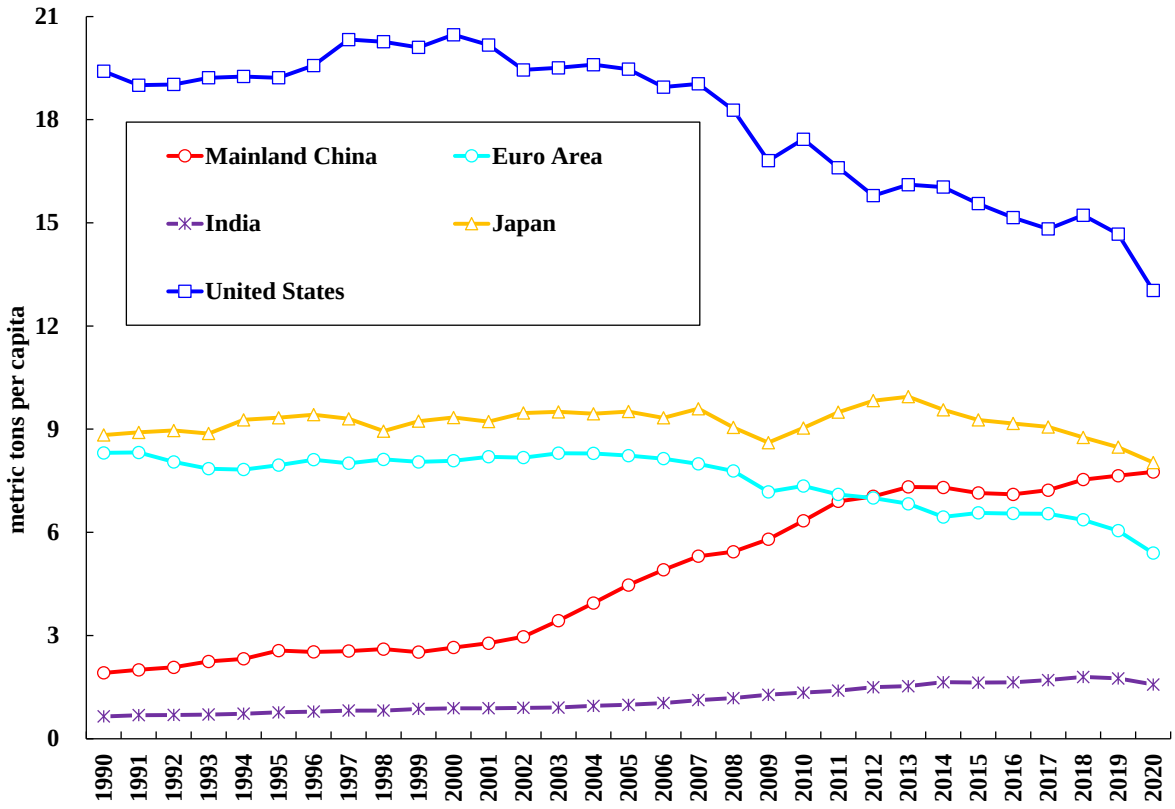


Source: The World Development Indicators (WDI) Database.

The carbon emissions of the developed economies—the United States, the Euro Area and Japan—have all been declining over time, in part because of the rising share of the service sector in their economies. The emissions of China and India, driven by their fast-growing GDPs, have been rising. However, on a per capita basis, the U.S. still has the highest, albeit

declining, carbon dioxide emission in the world, followed by Japan, China and the Euro Area (see Chart 26).

Chart 26: Carbon Emissions per Capita, metric tons, Selected Economies

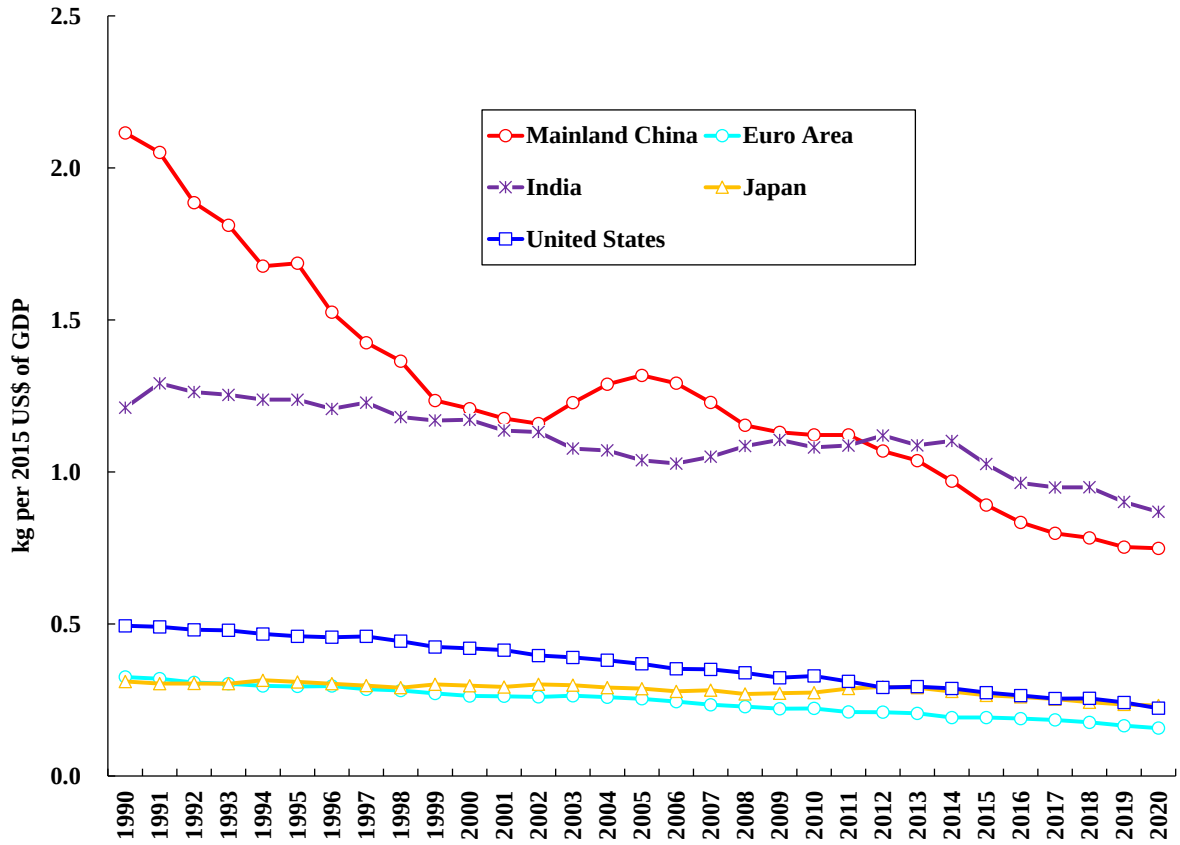


Source: The World Development Indicators (WDI) Database.

On an efficiency basis, that is, carbon emissions per unit real GDP, India is the worst emitter, followed by China, which has made a great deal of progress. The developed economies of the U.S., the Euro Area and Japan have significantly lower emissions per unit GDP because of the dominance of the service sector in their economies (see Chart 27).[18]

[18] However, the "re-shoring" of manufacturing by the U.S. and other Western economies may change the situation.

Chart 27: Carbon Emissions per Unit Real GDP, kilograms per 2015 US$ GDP, Selected Economies



Source: World Development Indicators.

As mentioned above, China has committed to peaking its carbon emission by 2030 and achieving net carbon neutrality by 2060. These objectives, if realised, should be enormously helpful to the prevention of further global climate change. In addition, China has also made great progress in the development of technologies for the more efficient generation of renewable energy (such as solar power panels and wind turbines), for the manufacture of electric cars (to substitute for fossil-fuel-powered cars) and durable batteries, and for the ultra-high voltage long-distance transmission of electricity.

6. Concluding Remarks

First, we have seen that China's entry into the World has shifted the centres of gravity of the global economy, in terms of GDP, international trade, value-added in manufacturing, consumption and wealth, from North America and Western Europe to East Asia, and within East Asia from Japan to China. Asia already accounts for half of the World's value-added in manufacturing. However, in terms of real GDP, aggregate wealth, and the size of the capital and consumer markets, the U.S. is still the largest in the World. Propelled by the continuing economic growth of both China and India, Asia is likely to account for half of the World's GDP, international trade and consumption in another decade.

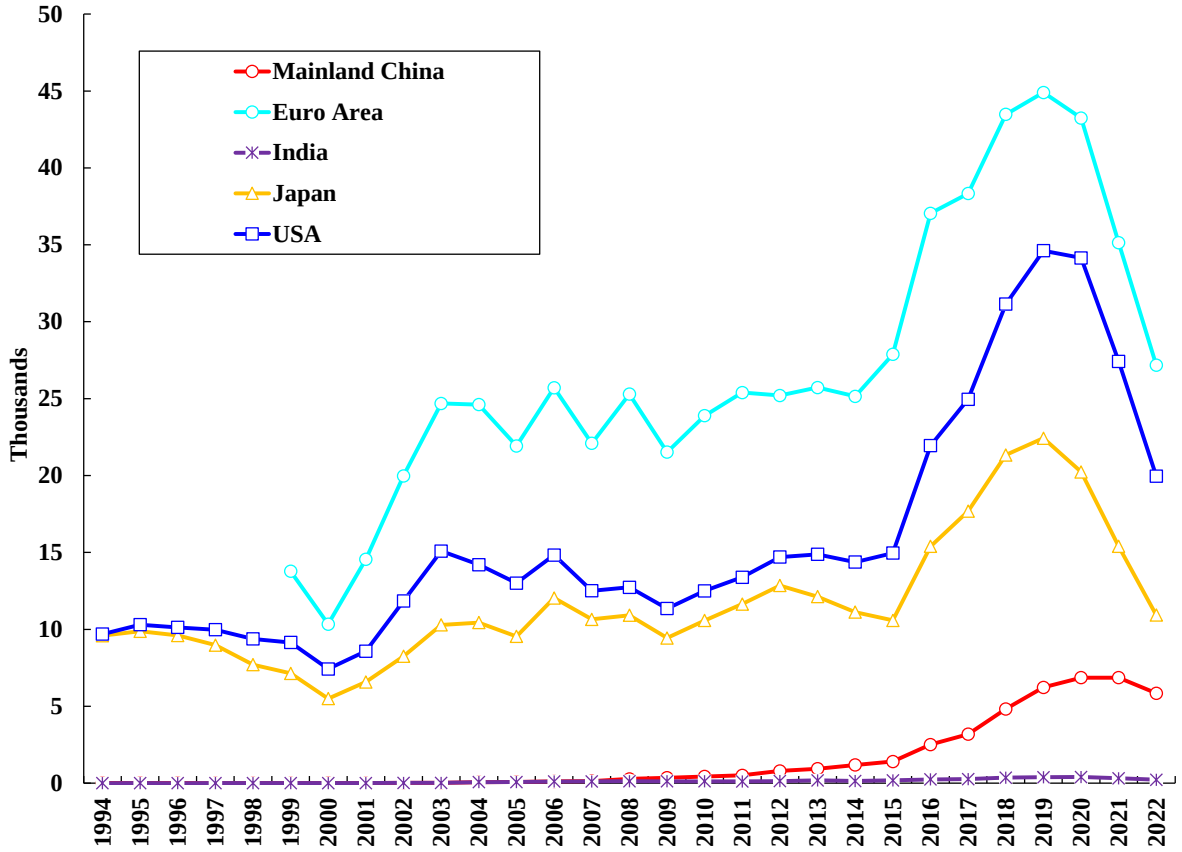
Second, China has made significant investments in human capital and R&D capital and should be catching up to the developed economies of North America and Western Europe in the next couple of decades. China has proven itself to be capable of indigenous innovation, especially in applications of technology. However, there is still a great deal of room for China to improve, in education, for example, in extending mandatory education to twelve years from its current nine years, and in basic research.

Third, the renminbi, the Chinese currency, will be increasingly internationalised and more widely accepted in clearing and settlement of transactions involving China. However, there is no plan for the renminbi to replace the U.S. Dollar, which will remain the international medium of exchange and store of value of choice for many economies in the foreseeable future.

Finally, China is fully committed to mitigate and prevent global climate change. It will peak its carbon dioxide emissions by 2030 and achieve net carbon neutrality by 2060. In addition, it will provide environmentally friendly products such as electric cars, solar panels, wind turbines, and durable batteries to help the rest of the World.

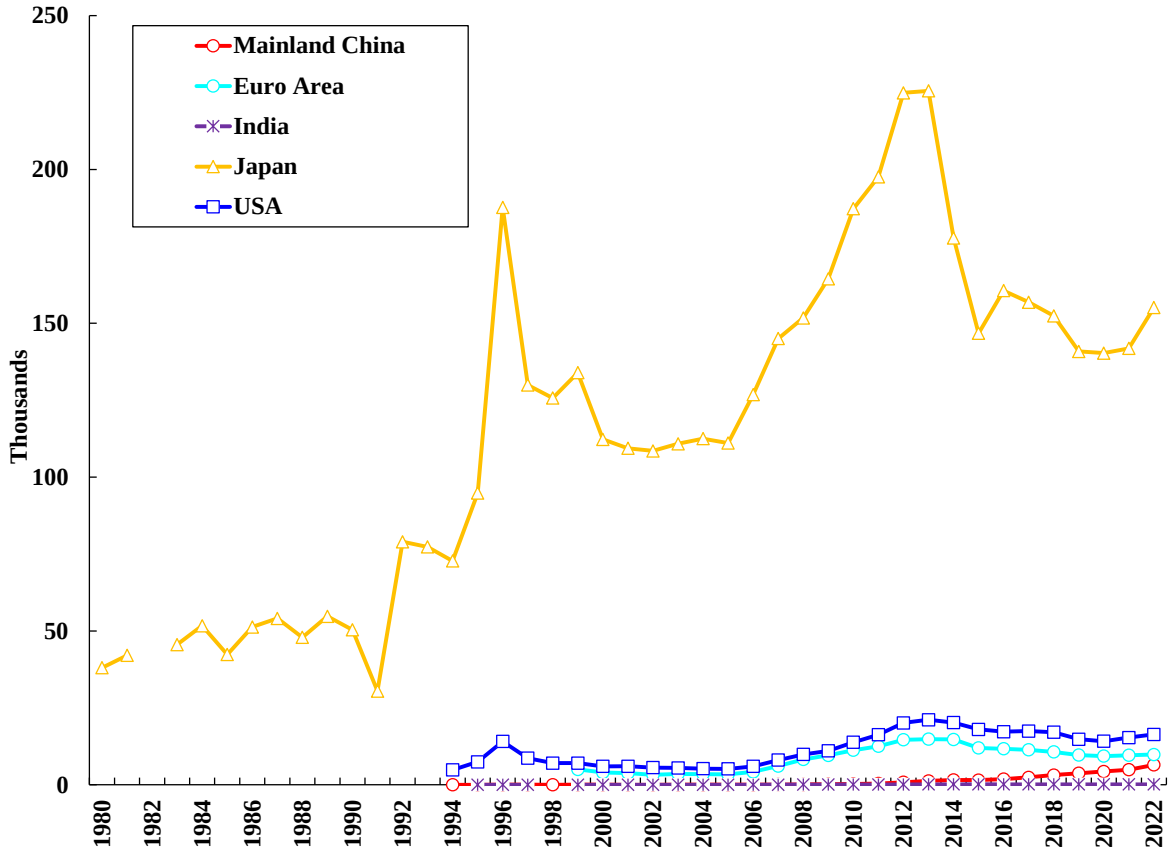
Appendix

Chart A1: The Number of EPO Patents Received by Mainland China, the Euro Area, India, Japan and the U.S., 1994-2022



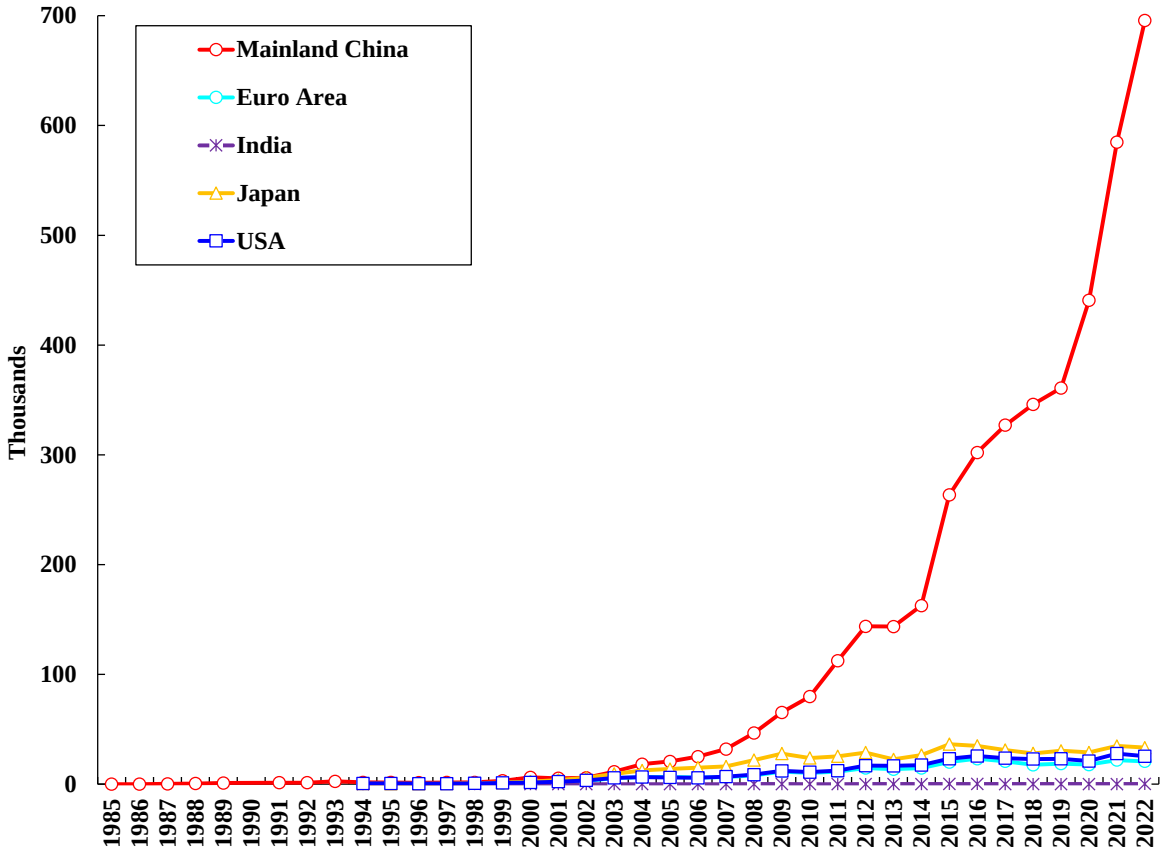
Source: WIPO statistics database.

Chart A2: The Number of Japanese Patents Received by Mainland China, the Euro Area, India, Japan and the U.S., 1980-2022



Source: WIPO statistics database.

Chart A3: The Number of CNIPA Patents Received by Mainland China, the Euro Area, India, Japan and the U.S., 1985-2022



Source: WIPO statistics database.

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