

The seal of the Lau Chor Tak Institute of Global Economics and Finance, CUHK, is a circular emblem. It features a globe with latitude and longitude lines in the center. The text "LAU CHOR TAK INSTITUTE OF GLOBAL ECONOMICS AND FINANCE" is written in a circular path around the globe, and "CUHK" is at the bottom. The outer edge of the seal is decorated with a series of small triangles.

Public Goods Provision and Chinese Economic Development

by

Lawrence J. Lau

Working Paper No. 94

May 2022

Lau Chor Tak Institute of Global Economics and Finance
The Chinese University of Hong Kong
13/F, Cheng Yu Tung Building, 12 Chak Cheung Street, Shatin, Hong Kong

Acknowledgements

The Lau Chor Tak Institute of Global Economics and Finance is grateful to the following individuals and organizations for their generous donations and sponsorship (in alphabetical order):

Donors

Johnson Cha	Agile Group Holdings Limited
Vincent H.C. Cheng	Asia Financial Holdings Ltd
Jonathan K.S. Choi	Bank of China (Hong Kong) Limited
Fred Hu Zulu	BCT Financial Limited
Miky Kambara	China Concept Consulting Ltd
Tak Ho Kong	CMB Wing Lung Bank Limited
Lau Chor Tak and Lau Chan So Har	First Eastern Investment Group
Lawrence J. Lau	Four Seas Group
Chien Lee	Hang Lung Properties Limited
Milton K.H. Leong	Henderson Land Development Co. Ltd.
Antony Leung	Hong Kong Exchanges and Clearing Limited
Wei Bo Li	Hony Capital Limited
Francis Lui	Industrial and Commercial Bank of China (Asia) Limited
Robert Ng	Lai Sun Development Co., Ltd.
Simon Suen	Lau Chor Tak Foundation Limited
Wong Ting Chung	Man Wah Holdings Limited
Lincoln Yung	Sing Tao News Corporation Ltd.
Allan Zeman	Sun Hung Kai Properties Ltd.
	Tai Sang Bank Limited
	The Bank of East Asia, Limited
	The Hongkong and Shanghai Banking Corporation Limited
	The Lanson Foundation

Programme Supporters

C.K. Chow	Bangkok Bank Public Co Ltd
Alvin Chua	Bank of China (Hong Kong) Limited
Fang Fang	Bank of China Limited - Phnom Penh Branch
Eddy Fong	Bei Shan Tang Foundation
Victor K. Fung	China Development Bank
Wei Bo Li	China Soft Capital
K.L. Wong	HOPU Investment Management Co Ltd
	Industrial and Commercial Bank of China - Phnom Penh Branch
	King Link Holding Limited
	Sun Wah Group
	The Santander-K Foundation
	UnionPay International

Public Goods Provision and Chinese Economic Development[§]

Lawrence J. Lau¹

May 2022

Abstract: The provision of more and better public goods is part of the Chinese efforts to emphasise the quality rather than the quantity of economic growth. Provision of public goods such as education, public health, elderly care, environmental preservation, protection and restoration, basic research, infrastructure, social safety net, and alleviation of poverty has been vastly expanded in China since the establishment of the People's Republic of China in 1949, with significant positive results in all these areas. The provision of public goods has also raised the potential GDP of the Chinese economy through its effects on increasing the aggregate demand for investment and consumption, the productivity of the labour force, and the rate of return on other fixed-assets investments.

Public goods are by their very nature mostly “local”, and their provision is consistent with the Chinese “dual circulation development strategy” with primary focus on domestic circulation. The provision of public goods also constitutes a form of re-distribution in kind, for example, clean air and water, which can be enjoyed by everyone, and hence also directly advances the goal of “common prosperity”. Despite the significant increase in the degree of income inequality in China since the mid-1980s, the welfare of all Chinese people has improved significantly.

However, the provision of public goods frequently results in negative value-added at market prices, and therefore reduces rather than enhances the rate of growth of measured GDP. Finally, increasing the provision of public goods can be a significant source of growth of the domestic aggregate demand for both consumption and investment, over and above what increases in household income alone is able to provide. Maintaining an adequate growth of aggregate demand is essential for continued Chinese economic prosperity.

[§] © 2022 Lau Chor Tak Institute of Global Economics and Finance, The Chinese University of Hong Kong.

¹ Lawrence J. Lau is Ralph and Claire Landau Professor of Economics, The 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. This paper is based on a lecture presented in the China Centre Seminar Series, Jesus College, Cambridge, the United Kingdom on 5 May 2022. The author wishes to thank Prof. Peter Nolan for his invitation to present this lecture and for the insightful comments from him and the participants in the Seminar. He is also most grateful to Mrs. Ayesha Macpherson Lau and Prof. Yanyan Xiong for their advice and comments on earlier drafts, and to Ms. Sophia Lok for her able research assistance. However, all remaining errors are the sole responsibility of the author.

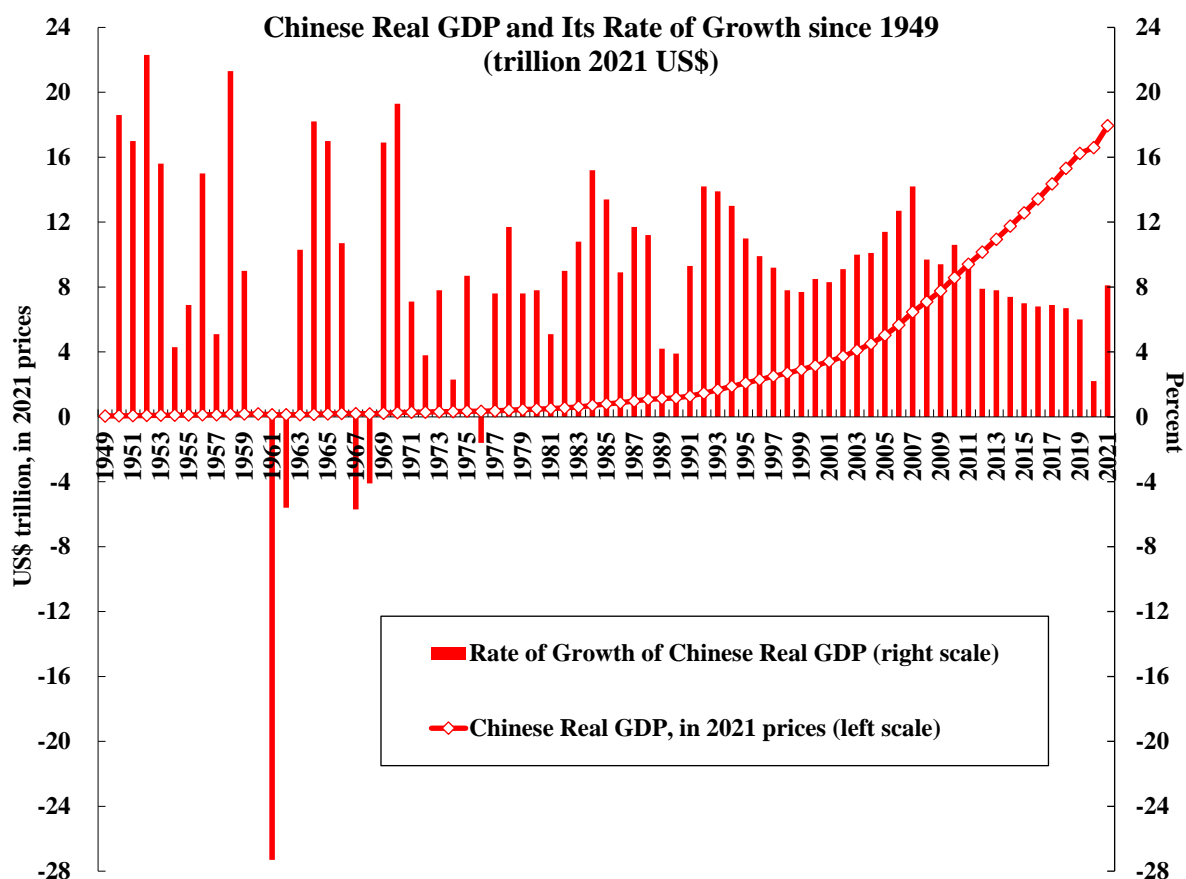
1. Introduction

We set the stage with a brief review of the Chinese economic record since 1949, followed by a discussion of the Chinese economic fundamentals.

The Growth of Chinese Real GDP and Real GDP per Capita, 1949-2021

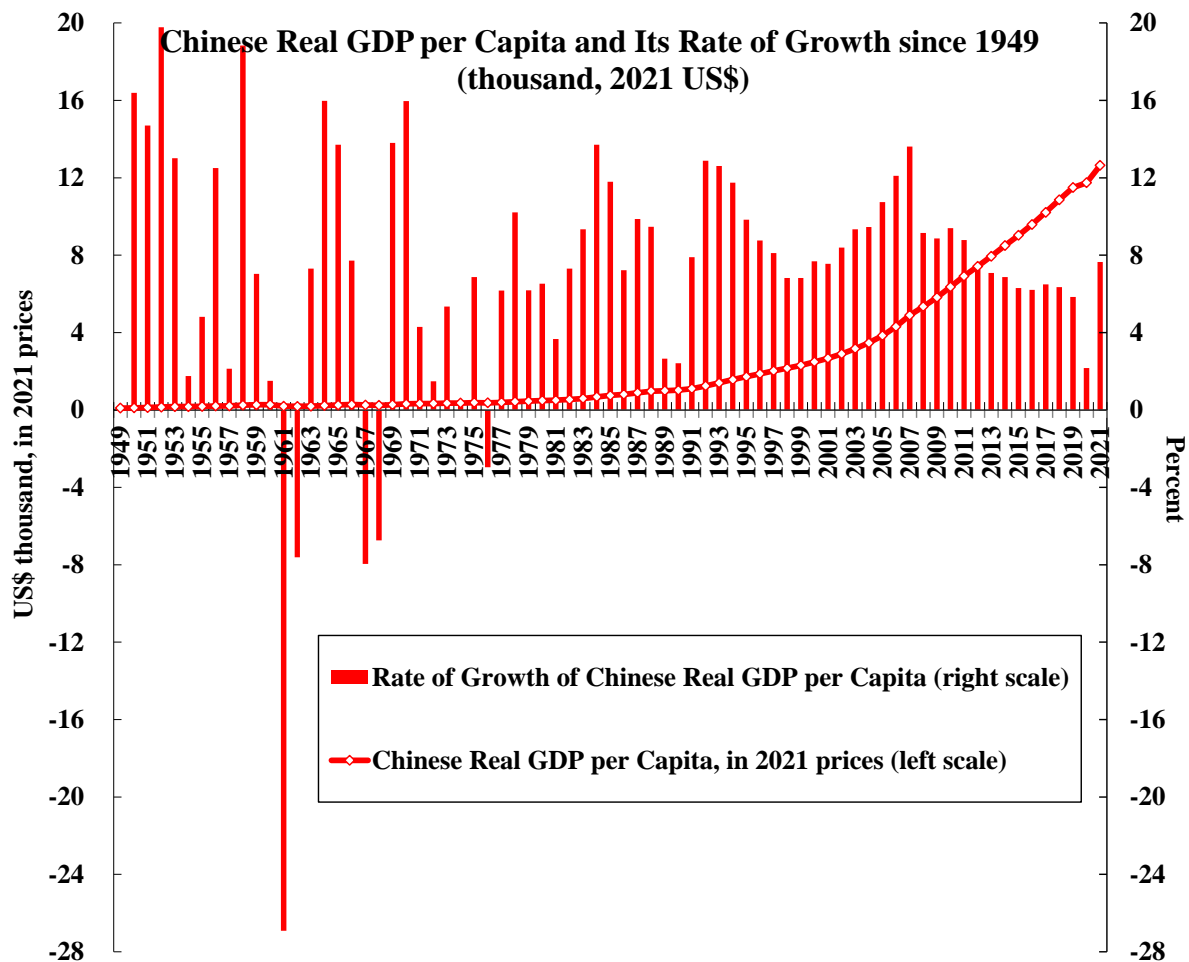
Between 1949 and 2021, Chinese real GDP has grown from 329 billion Yuan (US\$51.55 billion) to 114.4 trillion Yuan (US\$17.94 trillion), in 2021 prices, an almost 350-fold increase (see Figure 1-1). During the same period, Chinese real GDP per capita has grown more than 130-fold, from 607 Yuan (US\$95.2) to 80,962 Yuan (US\$12,699), in 2021 prices (see Figure 1-2).

Figure 1-1: Chinese Real GDP and Its Annual Rate of Growth: 1949-2021



Source: Rates of growth of real GDP from 1950 to 1952 are from National Bureau of Statistics of China (1959). Chinese GDP and its rate of growth from 1952 to 2021 are from online statistical database of National Bureau of Statistics of China, <https://data.stats.gov.cn/easyquery.htm?cn=C01>.

Figure 1-2: Chinese Real GDP per Capita and Its Rate of Growth: 1949-2021



Source: Rates of growth from 1950 to 1952 are from National Bureau of Statistics of China (1959). Chinese GDP and its rate of real growth from 1952 to 2021, Chinese population from 1949 to 2021 are from online statistical database of National Bureau of Statistics of China, <https://data.stats.gov.cn/easyquery.htm?cn=C01>.

Despite the significant fluctuations and volatility of the rates of growth during the two decades from the late 1950s to the late 1970s, which are clearly apparent in both Figures 1-1 and 1-2, the average annual rates of growth of real GDP and real GDP per capita for the entire period from 1949 to 2021 are respectively 8.47% and 7.03%, a truly remarkable and historically unprecedented achievement over a period of more than seven decades. We can attribute this success largely to the economic reform and opening to the world undertaken in 1978, as well as to the long time horizon of the Chinese economic policy makers and their single-minded focus on economic growth from 1978 onwards. With a long enough planning horizon, one can afford to undertake investment in development-leading infrastructure, that is, infrastructure the demand for which has not yet materialised but can be created by the supply itself, infrastructure that may take a long time to pay off.

If we consider the thirty-year period 1949-1978, before the beginning of Chinese economic reform and opening, the average annual rates of growth of real GDP and real GDP per capita were respectively 8.01% and 5.85%. This economic performance, due in part to the rapid recovery in the rehabilitation period of 1949-1952, was really quite respectable by itself. The Chinese First Five-Year Plan (1953-1957) was also a success. The years of significant negative economic growth in the pre-reform period occurred during the Great Famine of 1959-1961 (in the aftermath of the Great Leap Forward of 1958), and the Great Proletarian Cultural Revolution of 1966-1967.

Between 1978, the beginning of the Chinese economic reform and opening, and 2021, Chinese real GDP has grown more than 40-fold, from 2.65 trillion Yuan (US\$415 billion) to 114.4 trillion Yuan (US\$17.94 trillion), in 2021 prices, and real GDP per capita has grown almost 30-fold, from 2,749 Yuan (US\$431.2) to 80,962 Yuan (US\$12,699). During this period of more than four decades, there was not one single year in which the rate of growth of real GDP or real GDP per capita turned negative. The average annual rates of growth of real GDP and real GDP per capita for the post-reform period from 1978 to 2021 were respectively 9.15% and 8.18%, even higher than the average annual rates of growth achieved since 1949. However, the income distribution did become much more unequal during the post-reform period. But despite the significant rise in the value of the Gini coefficient in China since the mid-1980s, the welfare of all Chinese people has also improved significantly.

Chinese GDP of US\$17.94 trillion in 2021 was 78 percent of the U.S. GDP of US\$23.0 trillion, but the Chinese GDP per capita of US\$12,699 remained far behind, at only 18.4 percent of the U.S. GDP per capita of US\$68,971.

The Chinese Economic Fundamentals

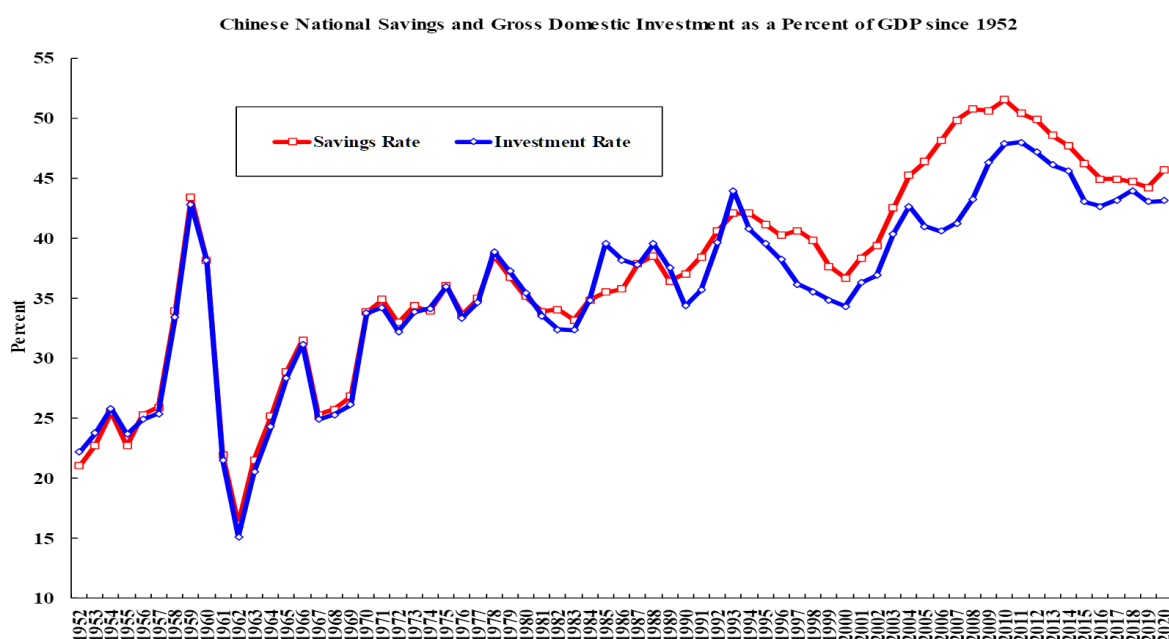
We now turn to consider the Chinese economic fundamentals. Are there sufficient primary inputs of production—capital and labour—to continue to support Chinese economic growth? The Chinese national savings rate has remained high, currently at approximately 45 percent, certainly the highest in the world amongst major economies. This means that the investment rate can also remain high, even in the absence of inflows of foreign direct investment or foreign loans. However, recent Chinese demographic developments appear

unfavourable—its population is ageing rapidly, with almost zero growth. But, as will be explained below, the labour supply problems are basically manageable.

Indigenous innovation has also been occurring in many areas, for example: 5G communication, the BeiDou Navigation Satellite System, high-speed trains, quantum communication, super-computers, and ultra-high-voltage transmission of electricity. In time, innovation or technical progress should also become an important source of economic growth.

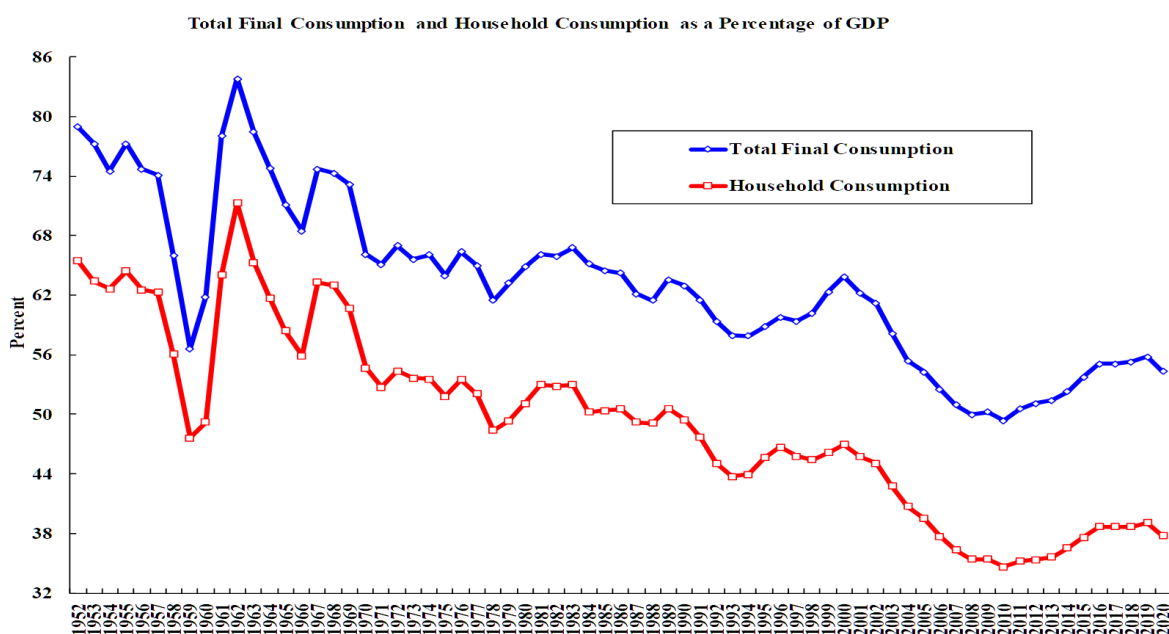
The Chinese national savings rate rose from 21.1% in 1952 to 36.8% in 1979 and 45.7% in 2020 (see Figure 1-3). It will remain high and provide the necessary resources for additional investment in fixed-assets, including infrastructure, human capital, research and development (R&D), and the provision of public goods such as education, healthcare, environmental preservation, protection and restoration, elderly care and poverty alleviation. Household consumption will rise as household income continues to rise and more and more households join the ranks of the middle class. However, as shares of GDP, household consumption as well as total consumption (including government consumption) have been on a downward trend for the past sixty years. As of 2020, they were respectively less than 40% and 60% of GDP (see Figure 1-4). Left on their own, they are probably not sufficient to shore up the aggregate demand needed for the economy to continue its growth.

Figure 1-3: Chinese National Savings and Gross Domestic Investment as Shares of GDP



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

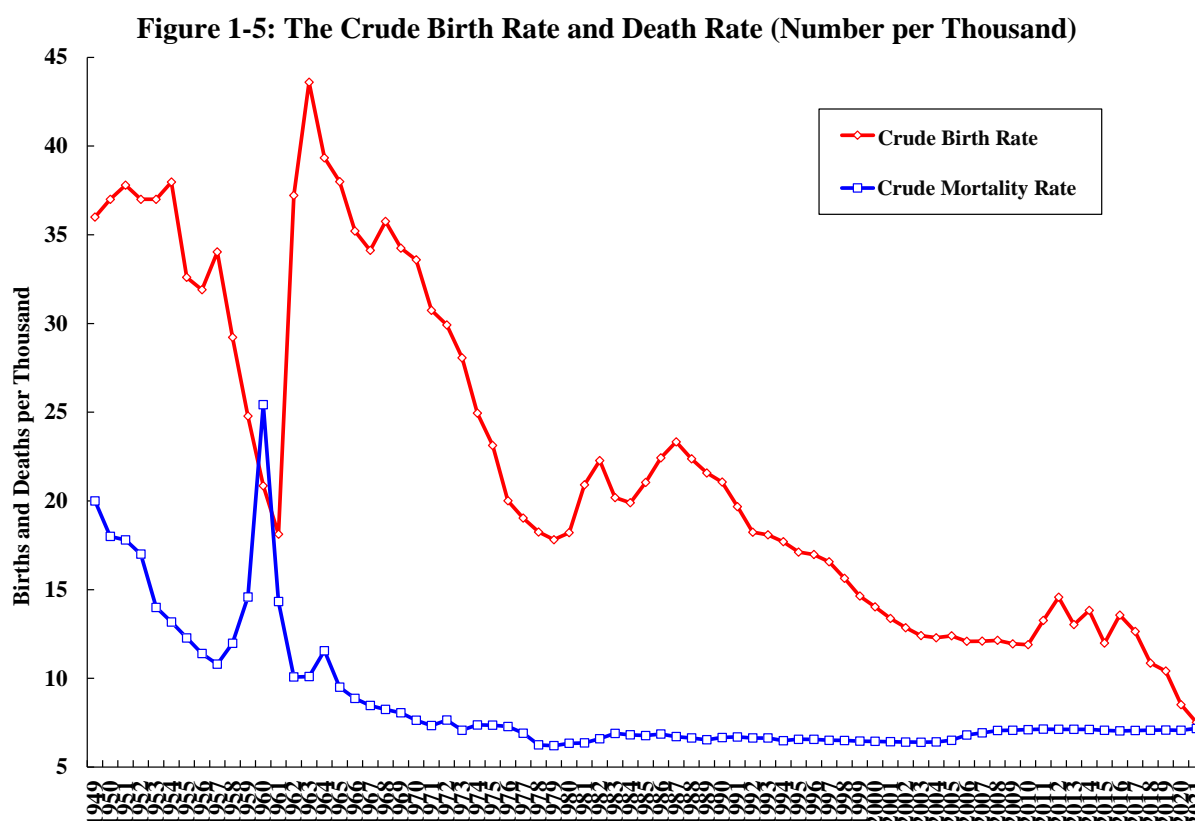
Figure 1-4: Chinese Total and Household Consumption as a Percent of Its GDP



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

The Chinese crude death rate declined from 2.0% in 1949 to 0.72% in 2021, with the exception of the period of the Great Famine (1959-1961), reflecting the improvements of the economic and public health conditions in China. The Chinese crude birth rate also declined from 3.60% in 1949 to 0.75% in 2021, barely above the crude death rate (see Figure 1-5). This

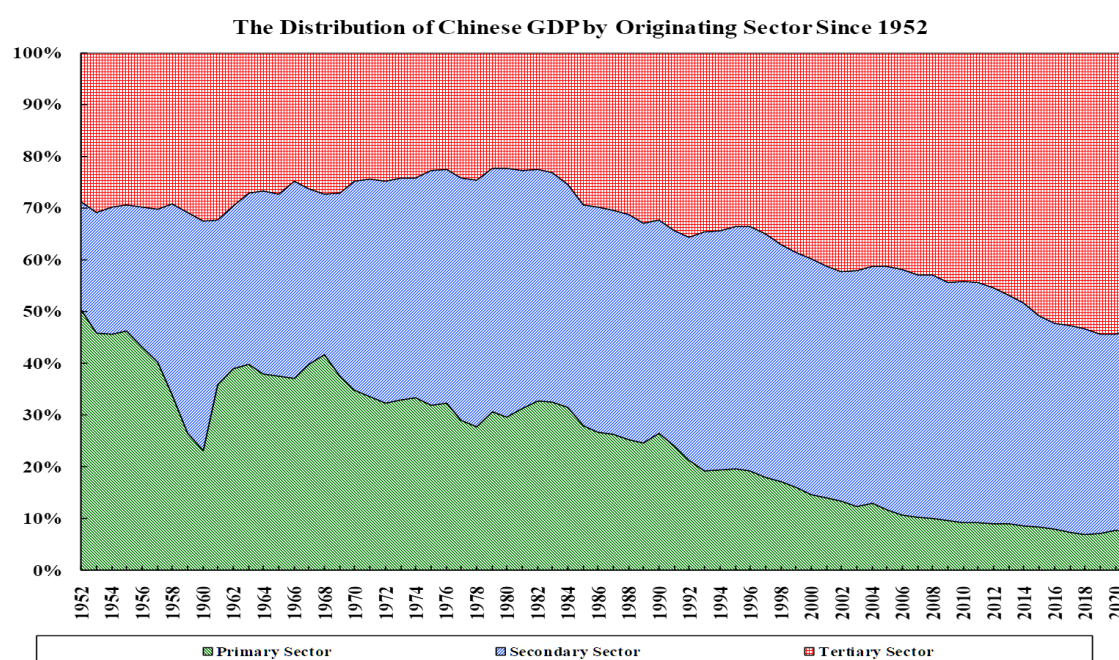
was due, in part, to the legacy of the one-child policy, which was implemented in 1980 and discontinued in 2016, as well as to the rising educational level of women and urbanisation.



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

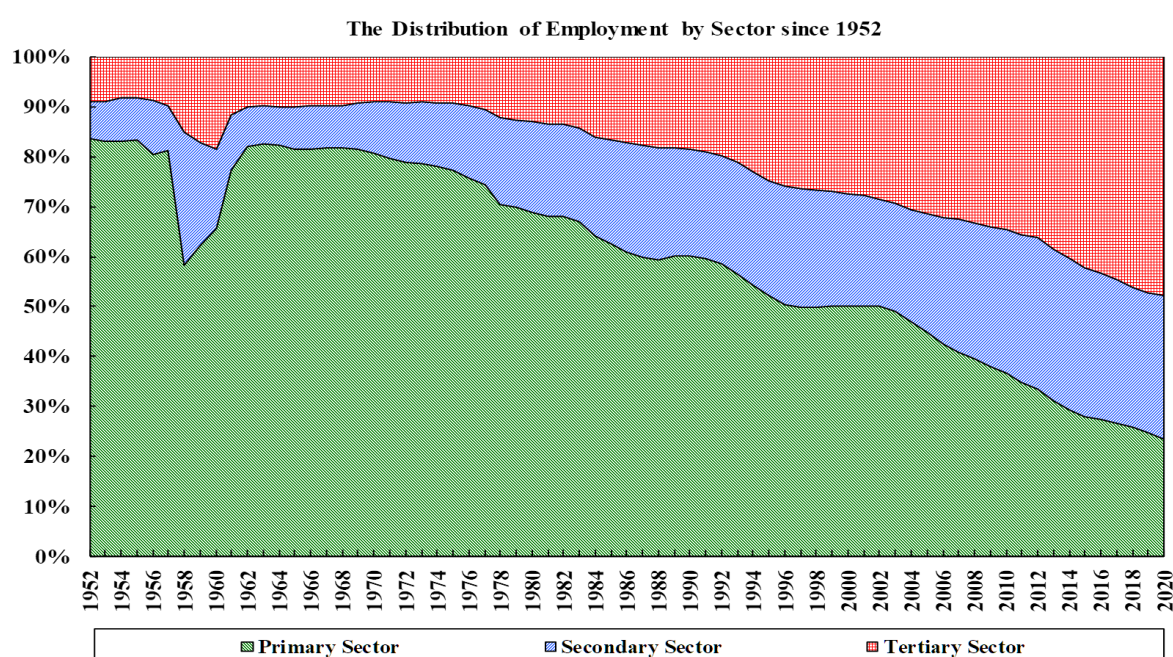
While the net rate of growth of the total population, the difference between the crude birth and death rates, has been approaching zero (see Figure 1-5), and may even turn negative soon, it is unlikely to result in a serious shortage of labour as yet. The demand for labour can be satisfied through continued urbanisation, that is, by the movement of surplus labour from the rural to the urban areas. Despite the claim that the “Lewis Turning Point” has arrived in China, there still exists substantial surplus labour. The primary (agriculture) sector, which generated only 7.3% of GDP in 2020, but accounted for 23.6% of total employment in 2020, is still in a position to supply labour to the secondary (manufacturing, mining and construction) and tertiary (service) sectors without affecting its output (see Figures 1-6 and 1-7).

Figure 1-6: The Distribution of Chinese GDP by Sector Since 1952



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

Figure 1-7: The Distribution of Chinese Employment by Sector Since 1952



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

In addition, the mandatory retirement ages, which have officially remained at 55 for women and 60 for men, an anachronism inherited from the early 1950s, when life expectancy was in the low sixties, are ready for a change. The gradual raising of the mandatory retirement ages, given the current life expectancy at birth of more than 77 years, should help to augment

the labour force. In the transition to a new mandatory retirement age of say 65 for all, one can make retirement at 55 for women and 60 for men optional, so that no one's rights will be abridged.² Moreover, the quality of the Chinese labour force has also improved significantly through various investments in education and public health over the past decades. The “efficiency-equivalent” quantity of the labour force continues to grow even though numerically the labour force may no longer be growing. Finally, the adoption of automation and robotics through the application of artificial intelligence can also enhance the effective labour force.

The elimination of restrictions on the number of children and the possible lowering of the marriage-eligible ages should also help to increase the Chinese birth rate gradually, but it will take a couple of decades before there will be a noticeable impact on the labour force.

With a large population and hence a large domestic market, China also enjoys economies of scale from both production and marketing, learning-by-doing (that is, efficiency improvement resulting from repetitive production of the same good, such as high-speed trains), and the advantage of longer upper tails in the ability distribution because of the size of its population. Moreover, as a large continental economy, the domestic Chinese economy is largely unaffected by external disturbances, similar to the U.S. Thus, while the Chinese rates of growth of exports and imports fluctuate like other East Asian economies, the rate of growth of its real GDP has remained relatively stable.

² Opposition to raising the mandatory retirement age also comes from those awaiting to succeed their supervisors. This opposition can be mitigated by instituting term limits for executive positions. For example, a medical doctor is allowed to serve as the head of a hospital for only two terms but can remain as a clinician at the hospital afterwards until the new mandatory retirement age is reached.

2. The Definition of a Public Good

In economics, a public good is usually defined as a product or service that is openly available to be enjoyed by all members of a society. The Encyclopaedia Britannica defines a public good to be a product or service that is non-excludable and non-depletable (or “non-rivalrous”). Examples of such public goods include law enforcement, national defence, a stable local currency, and clean air and water. The elimination of a public bad, such as air pollution, is also a public good. The definition of a “public good” used in this lecture is slightly generalised to include potentially rivalrous goods, such as a seat on a train, so long as it is non-excludable *ex ante*. (The supply of a public good may have capacity constraints so that some form of rationing, whether by price or otherwise, may be necessary.) Basic education is a public good that is generally non-rivalrous; whereas mass transit is a public good that can at times be rivalrous. The National Health Service in the United Kingdom is a public good, even though there may have to be rationing through waiting for some treatments.

Typically, these goods and services are administered and/or provided by central or local governments and paid for collectively through taxation. Public goods are unlikely to be supplied in sufficient quantities to satisfy potential demand through the free market because they are frequently “money-losers”. Public goods provision may therefore require taxes, subsidies, or even direct government intervention. A public good often faces the “free-rider” problem, that is, someone who is happy to enjoy the good or service, but will try to avoid bearing the cost. Food is normally a private good, but the provision of food security is a public good. Personal insurance is a private good. But a social safety net is a public good, as is the alleviation of poverty. Infrastructure is a (local) public good. Goods that generate externalities, e.g., mandatory basic education, and the simplification of Chinese characters—goods that provide a benefit for the society as a whole, are public goods.

3. The Possible Roles of Public Goods

China has done a relatively good job in the provision of public goods to its people, as will be shown below. The provision of these public goods has in turn enhanced the real rate of growth of the Chinese economy in various ways.

Public goods provision mandates both capital and current expenditures and hence increases aggregate demand. They include, for example, fire and police protection, environmental preservation, protection and restoration, and the maintenance of blue skies, green mountains, and turquoise waters. These current expenditures can become part of an important component of the aggregate demand for government consumption. The capital expenditures such as those on infrastructure (communication, transportation and power), and the building of schools, hospitals and charging stations for electric cars, can also become a part of an important component of the aggregate demand for fixed-assets investment.

Moreover, the provision of many public goods such as education, public health and basic research can also be considered intangible investments even though they are often expensed on a current basis. A stable currency (money), in terms of purchasing power, is also a public good. The regulation of the markets so that they remain competitive and free of monopolistic influences is also a public good. Finally, maintaining public confidence and creating positive expectations of the future are also important public goods.

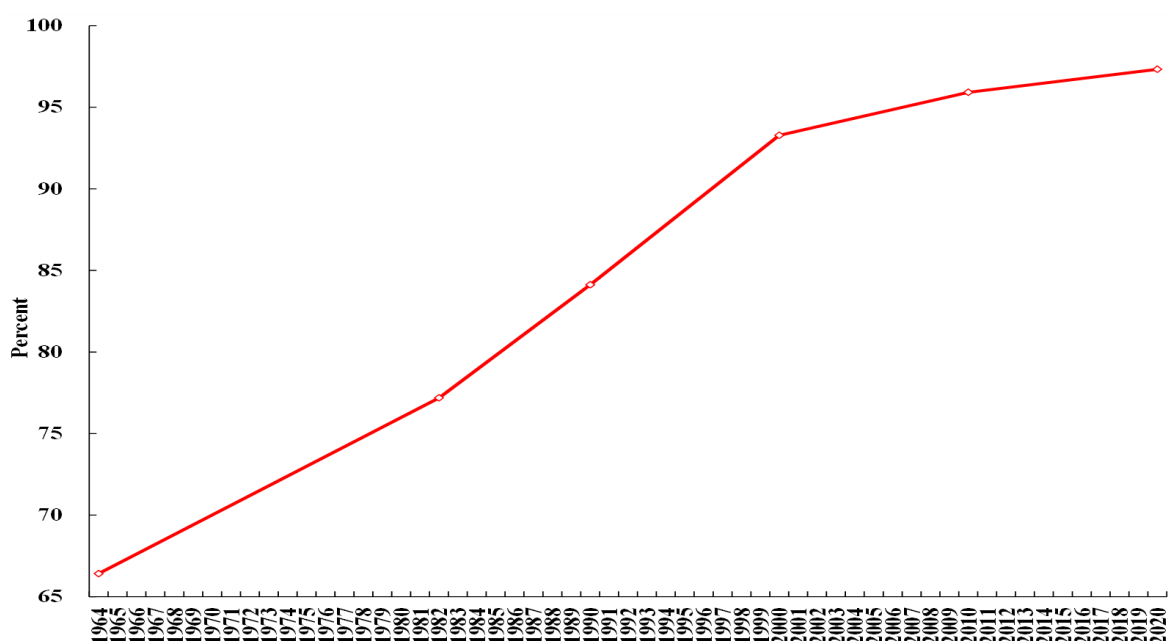
4. Public Goods Provision as Intangible Investment I—Education, Public Health and R&D

Public Goods Provision as Intangible Investment—Literacy

Traditionally, for at least a couple of millennia, the Chinese people have always valued education highly, in large part because it was one of the very few channels for upward social mobility. In the social hierarchy of old China, up to the early Twentieth Century, scholars were on the very top, followed by farmers, and then by labourers, with the merchants at the very bottom. Being wealthy alone did not improve social status or earn respect.

More generally, literacy and the promotion of Putonghua are clearly public goods because they enable all Chinese people to communicate with one another in both speech and writing. The literacy rate, which must have been way below 50% in 1949, increased from 66.4% in 1964 to 97.3% in 2020 (see Figure 4-1), thanks in part to the simplification of the Chinese characters undertaken in the 1950s and codified in 1964. The simplification has been subject to much criticism, some quite justifiable, but it did reduce the number of years of schooling required for an average person to be able to read a newspaper from eight to four years, a major accomplishment.

Figure 4-1: The Literacy Rate (Percent)

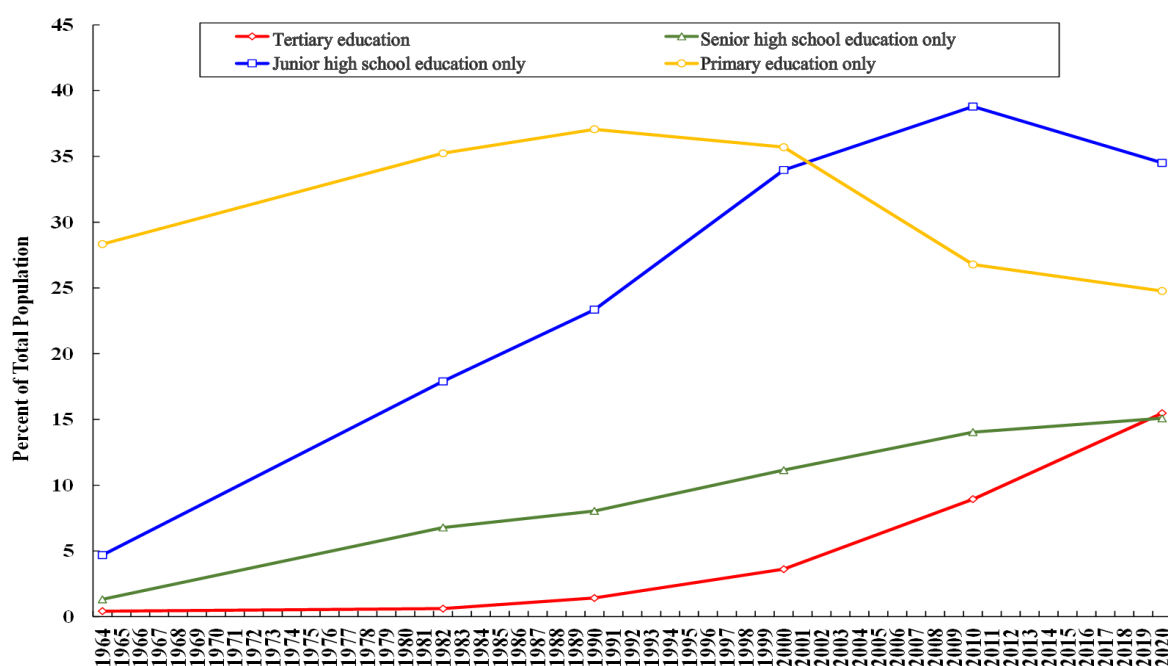


Source: China Statistical Yearbook 2021.

Public Goods Provision as Intangible Investment—Educational Attainments

Mandatory nine-year education for all was introduced in China in 1986. Today, most young people have had at least 12 years of education, even though senior secondary education is still not yet mandatory at this time. The proportions of people with only primary education (the yellow line) or junior secondary education (the blue line) have already peaked and begun to decline (see Figure 4-2). The tertiary enrolment rate of graduates of senior secondary schools was 24.6% in 1989 and rose to 94.5% in 2016. This means almost everyone who wishes to attend a tertiary educational institution is now able to do so. (However, the proportion of the population aged 18-22 that were enrolled in tertiary education institutions in 2021 was only 57.8%, because not everyone in that age cohort had completed senior secondary school.) The proportion of the total population with tertiary education (the red line), which was only 0.42% in 1964, rose to 17% in 2021, and is expected to increase further with time.³

Figure 4-2: Educational Attainment Rates

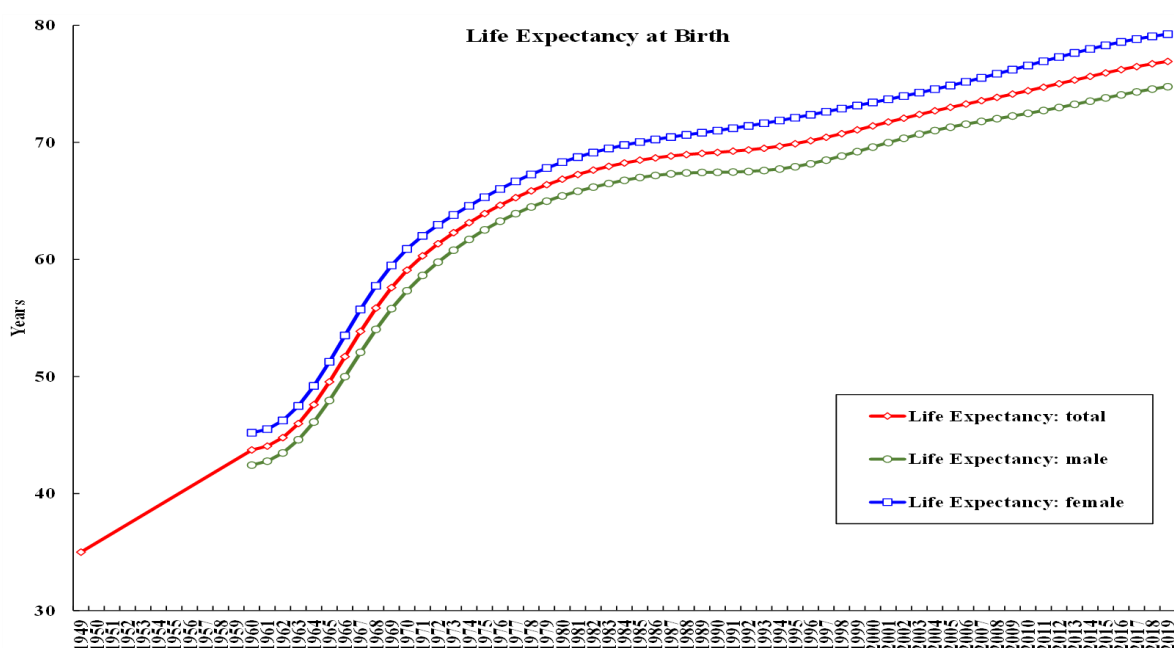


Source: China Statistical Yearbook 2021.

³ The 2021 figures are based on an announcement by the Ministry of Education on 17 May 2022.

Much improvement has also occurred in healthcare and public hygiene in China. As mentioned above, the population mortality rate declined by more than half from 2.0% in 1949 to 0.72% in 2021. Life expectancy at birth, which was only 35 years in 1949 and 67.8 years in 1981, grew to 77.3 years in 2019 (see Figure 4-3), compared to 72.6 years for the world as a whole. Life expectancy at age 60 was 20.21 years in 2020.

Figure 4-3: The Life Expectancy at Birth (Years)



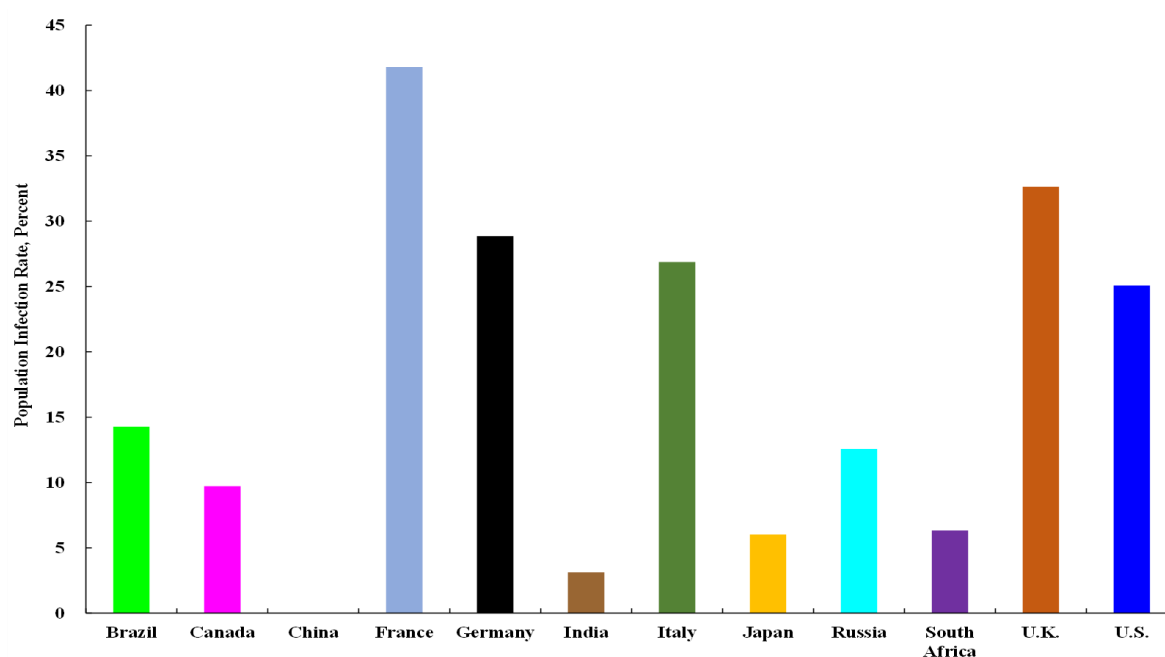
Source: Data from 1960-2019 are from World Development Indicators. Data in 1949 are from <http://www.nhc.gov.cn/xcs/zllkrm/201909/c5b349de3ede49db971c9ec9520cb5a9.shtml>.

The COVID-19 epidemic first broke out in China in Wuhan, Hubei, in December 2019. However, it was soon successfully contained through a blockade of the city of Wuhan and the province of Hubei, and a complete lockdown in Hubei. Through rapid testing, isolation and quarantine of the infected, and timely treatment, the epidemic was brought under control by the end of March 2020.

In early 2022, there were once again surges of the epidemic in different parts of China—Shanghai, Shenzhen, Jilin, Guangdong and Beijing--due to the omicron variant. However, as of 22 April 2022, Mainland China still had the lowest per capita cumulative infection rate and the lowest per capita cumulative death rate from the COVID-19 epidemic among the Group-

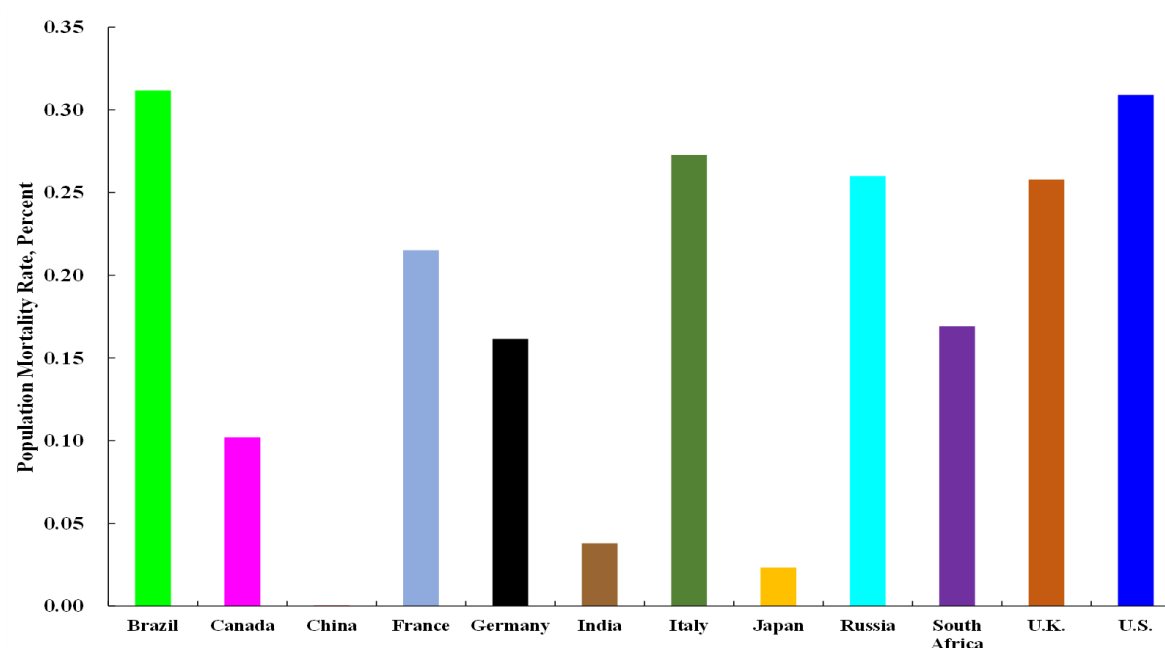
of-Seven (G-7) and the BRICS countries (see Figures 4-4 and 4-5). There was a significant loss of Chinese GDP in 2020 that could be attributed to the epidemic, to the tune of approximately 4 percent. This was partially compensated by the recovery growth of 8.1 percent in 2021.

Figure 4-4: The COVID-19 Epidemic: International Comparison of Population Infection Rates



Source: Worldometer: <https://www.worldometers.info/coronavirus/>.

Figure 4-5: The COVID-19 Epidemic: International Comparison of Population Mortality Rates



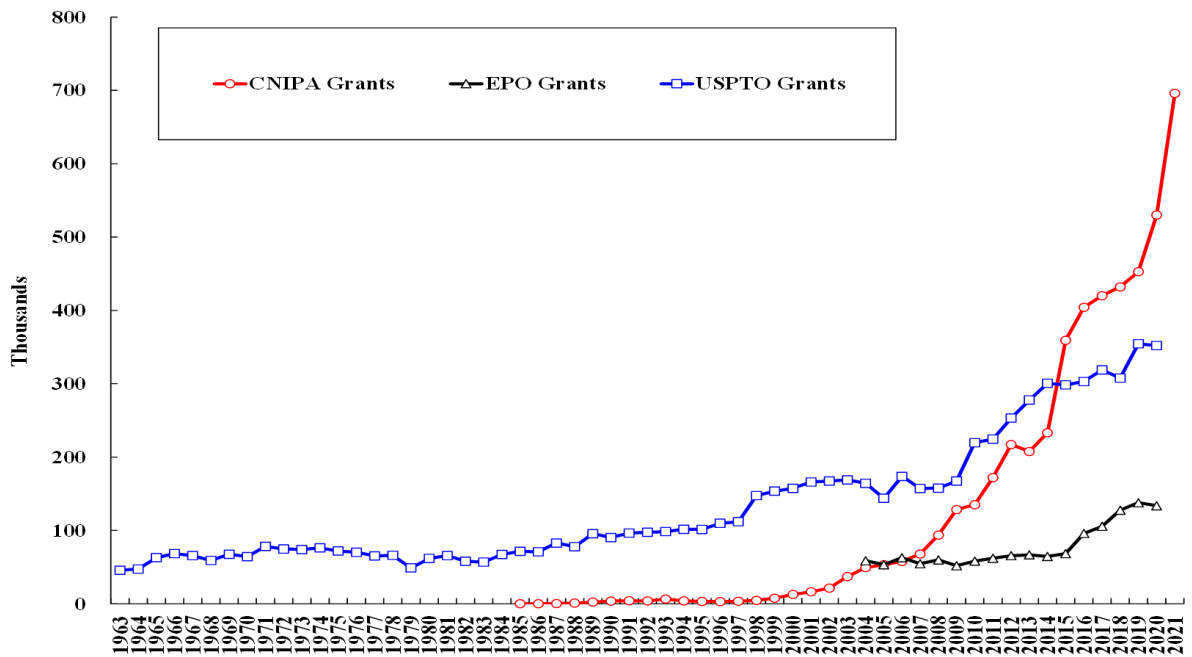
Source: Worldometer: <https://www.worldometers.info/coronavirus/>.

The management of the COVID-19 epidemic in China must be considered quite successful. As of 22 April 2022, the COVID-19 epidemic infected 180,982 persons (excluding imported cases) and resulted in 4,686 deaths on the Mainland, with a quarter of the world's population. By comparison, the rest of the world had, on the same date, a cumulative total of more than 508 million (508,526,800) infected cases and more than 6.2 million (6,235,952) fatalities. The recent surges in COVID-19 cases in China appeared to have come under control. The potential reduction in 2022 GDP due to the COVID-19 epidemic may be estimated to be between 0.5 and 1 percent.

Public Goods Provision as Intangible Investment—Innovation

China has been increasing its investment in research and development (R&D), which reached 2.44% of GDP in 2021. Since 2014, it has also strengthened intellectual property right protection significantly by establishing special intellectual property courts with sole nationwide jurisdiction on such matters. The numbers of patents awarded to Chinese discoverers and inventors by respectively the United States Patent and Trademark Office (USPTO) (blue line), the European Patent Office (EPO) (black line), and the China National Intellectual Property Administration (CNIPA) (red line), have all been increasing by leaps and bounds in recent years (see Figure 4-6). China is now the recipient of the largest number of patent grants in the world from these three patent offices combined.

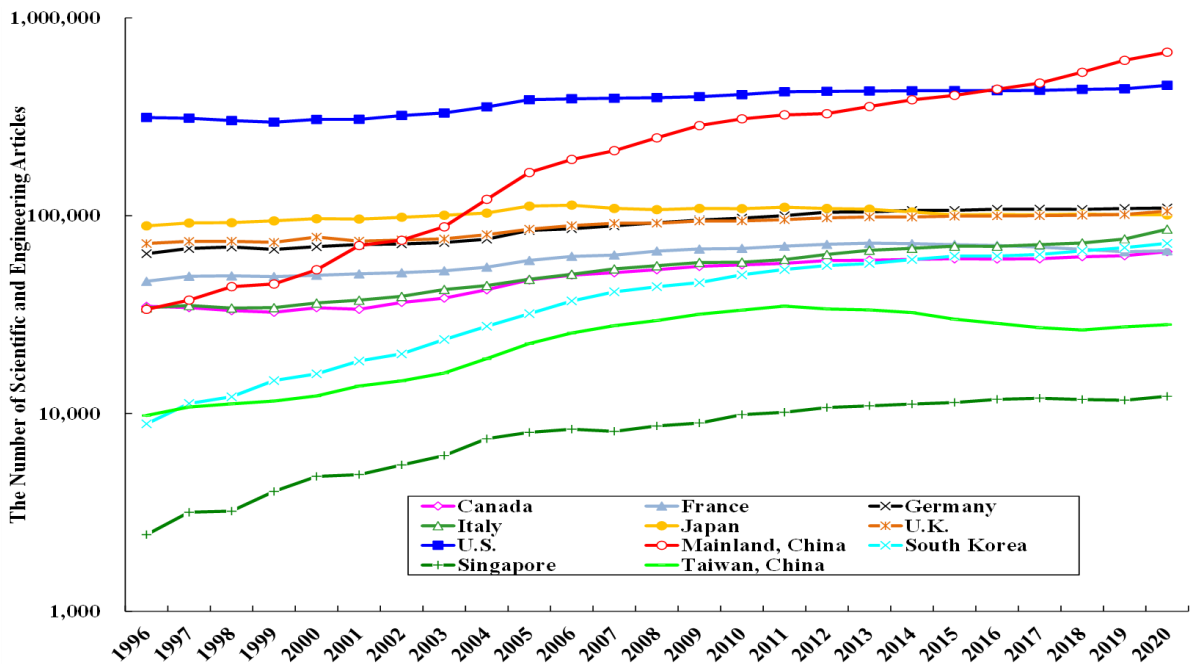
Figure 4-6: Chinese Patent Grants Awarded by USPTO, EPO and CNIPA



Source: Data on China National Intellectual Property Administration (CNIPA) patent grants are taken from China Statistical Yearbook, various issues. Data on European Patent Office (EPO) patent grants are taken from the EPO website. Data on United States Patent and Trademark Office (USPTO) patent grants are taken from Lawrence J. Lau and Yanyan Xiong (2022), Table A5.2.

Another possible measure of the quantity of innovation output is the number of scientific and engineering articles published. The total number of science and engineering scholarly articles published in international professional journals by Mainland Chinese authors exceeded that by U.S. authors in 2016 (see Figure 4-7). Chinese authors now collectively publish the largest number of such articles in the world.

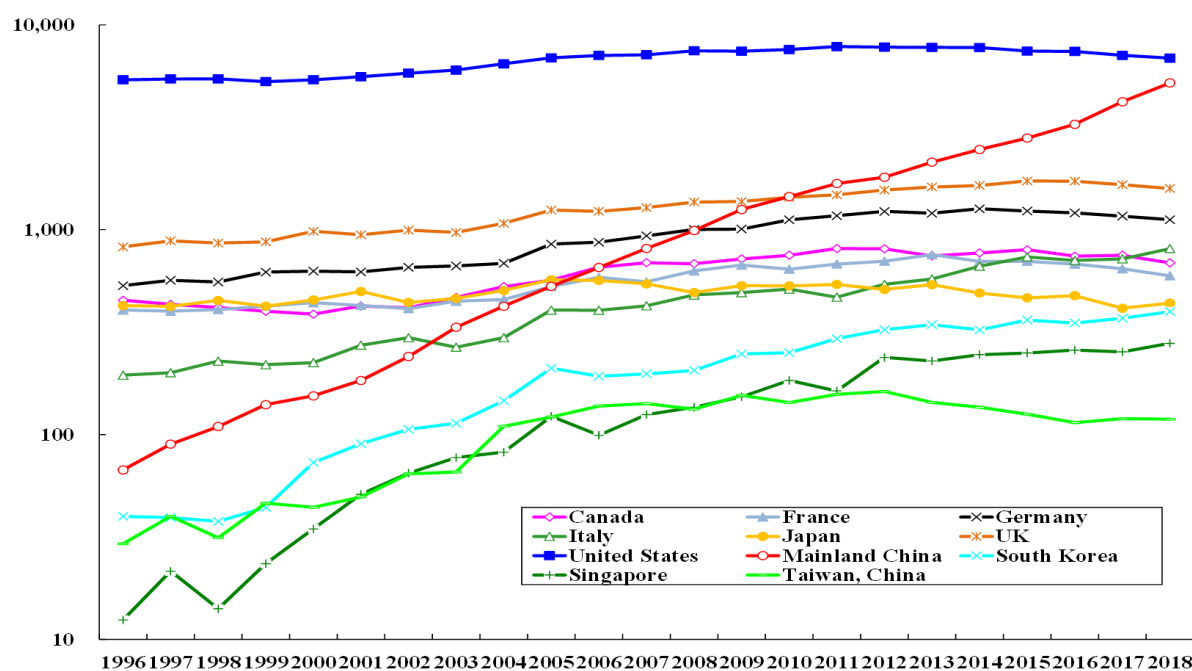
Figure 4-7: Innovation: The Number of Scientific and Engineering Articles Published



Source: U.S. National Science Foundation, “Publications Output: U.S. Trends and International Comparison”, Table SPBS-2 (<https://ncses.nsf.gov/pubs/nsb20214/data>).

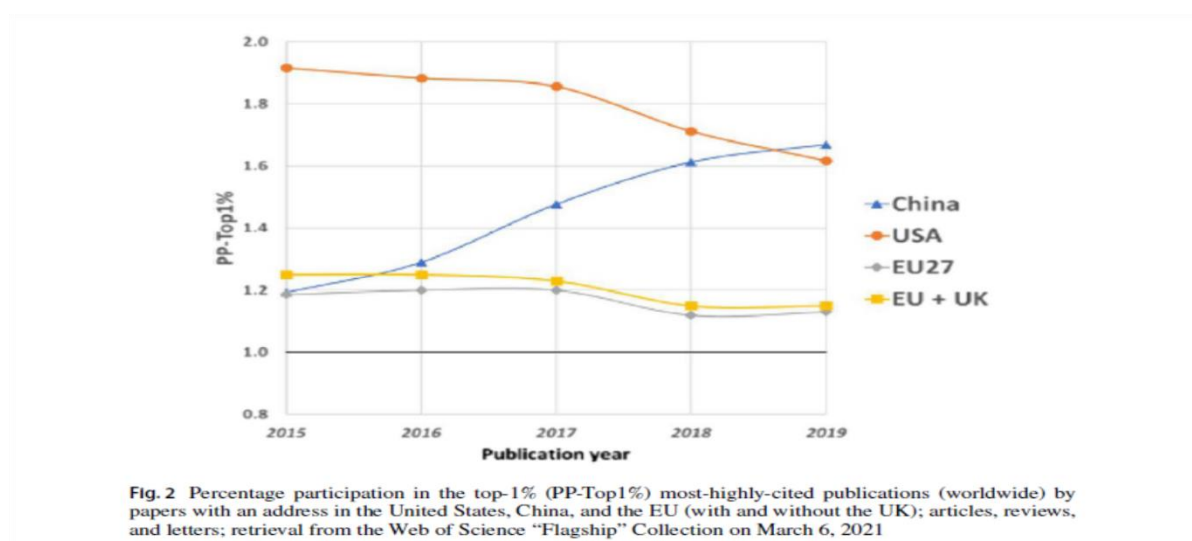
However, what should count more is not the total number of published articles, but the total number of citations received by the published articles. The number of top 10% most cited scientific articles by Chinese authors overtook that by U.S. authors in 2019, according to a Japanese study. A recent study published in the journal *Scientometrics* shows that China and the U.S. were neck and neck in the number of top 1% most cited scientific articles in 2019 (see Figures 4-8 and 4-9). China trailed the U.S. and the European Union countries for many years.

Figure 4-8: The Number of Top 1% Most Cited Articles



Source: National Center for Science and Engineering Statistics; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed May 2021.

Figure 4-9: Innovation: The Number of Top 1% Most Cited Articles



Source: Wagner, Caroline S., Lin Zhang, and Loet Leydesdorff. “A discussion of measuring the top-1% most-highly cited publications: quality and impact of Chinese papers,” *Scientometrics*, 2022.
<https://doi.org/10.1007/s11192-022-04291-z>

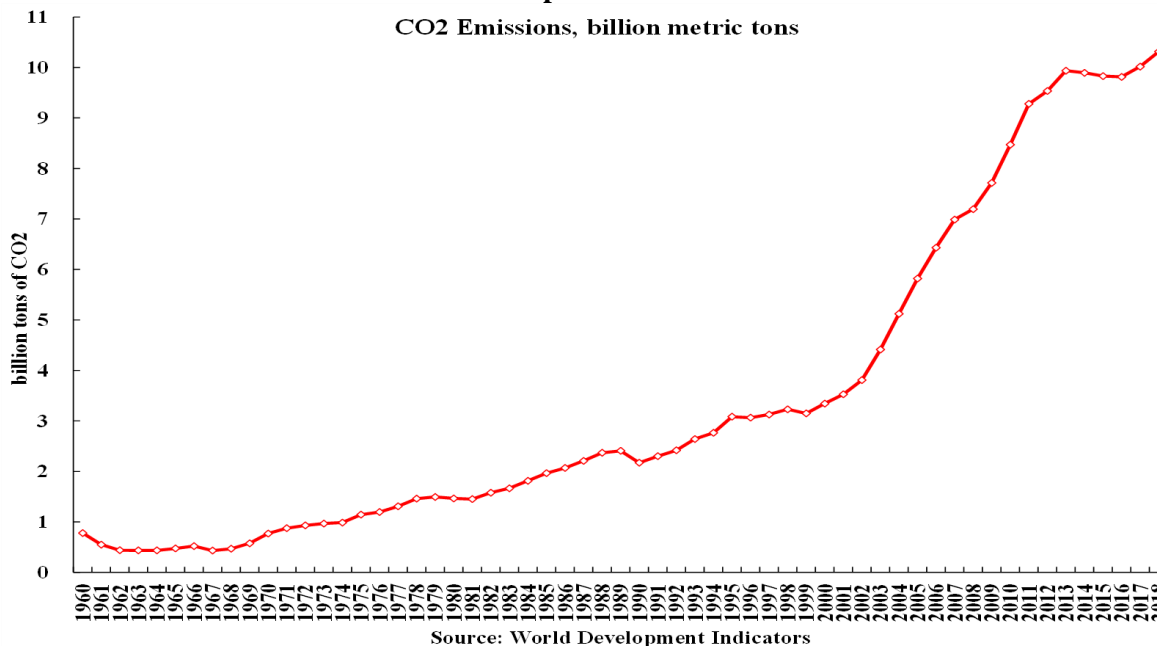
5. Public Goods Provision as Intangible Investment II—Environmental Preservation, Protection and Restoration, and Poverty Alleviation

Environmental Preservation, Protection and Restoration

President XI Jinping committed China to peak its carbon emissions by 2030 and to achieve carbon neutrality by 2060. Prevention of climate change is not only a Chinese public good, but also a global public good. The objectives of carbon peaking by 2030 and achieving carbon neutrality by 2060 will be achieved through, for example: massive expansion of renewable energy, including hydro, massive solar and wind power farms, and potentially nuclear fusion, as sources of electricity generation, replacing the fossil fuels; ultra-high-voltage long-distance transmission of electricity from the West to the East; replacement of fossil-fuel vehicles with electric and hydrogen vehicles; substitution of air travel by high-speed rail travel domestically; and large-scale re-forestation.

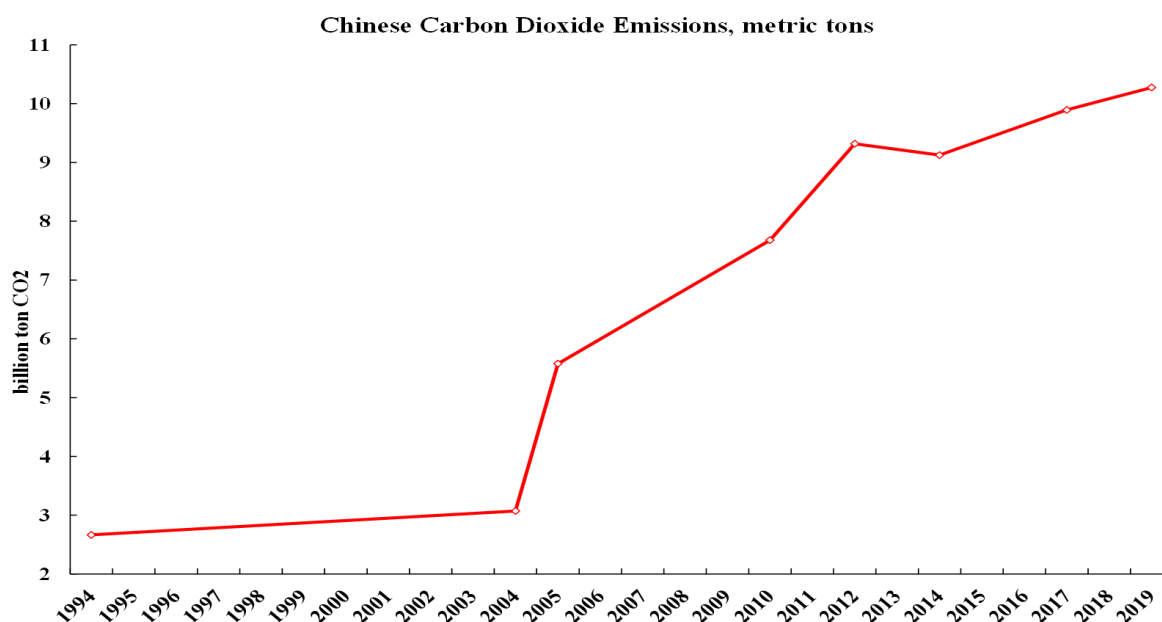
Carbon dioxide emissions have basically plateaued in China since the early 2010s, after a period of rapid increase (see Figures 5-1, 5-2 and 5-3). The emissions have been growing very slowly in the past few years. If current trends continue, it is entirely feasible that emissions will peak before 2030 and fall to zero by 2060.

**Figure 5-1: Total Carbon Dioxide Emissions, 1960-the Present:
World Development Indicators Data**



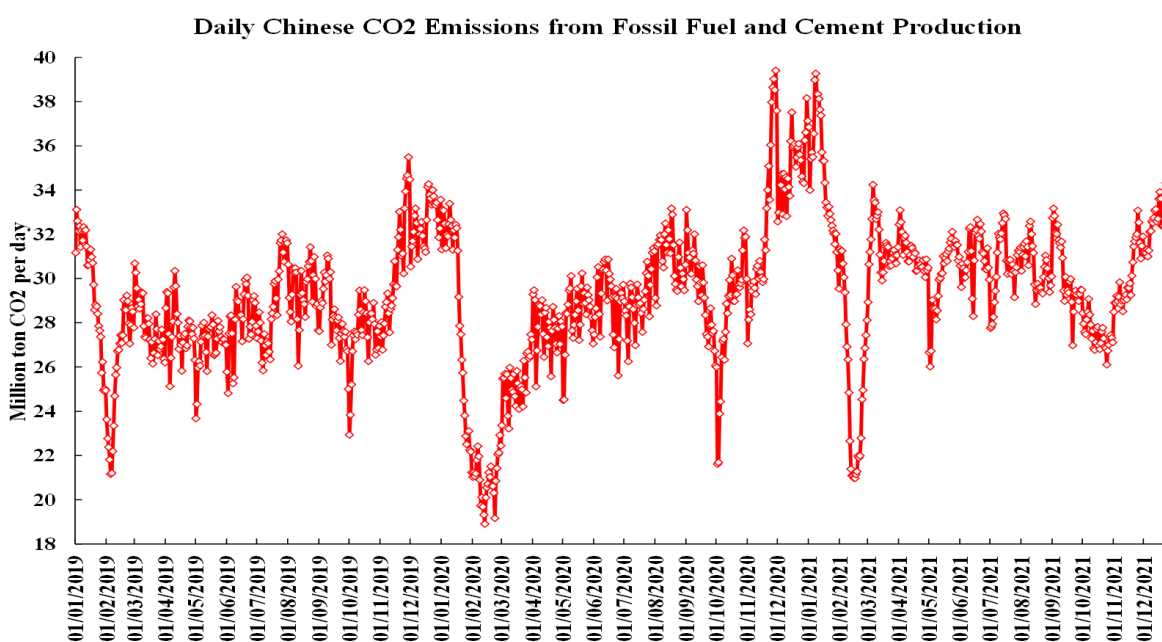
Source: World Development Indicators.

Figure 5-2: Total Carbon Dioxide Emissions, 1994-the Present: Chinese Data



Source: Almanac of China's Economy 2020; Ministry of Ecology and Environment of the People's Republic of China (2004, 2018a, 2018b).

Figure 5-3: Daily Chinese Carbon Dioxide Emissions: 01/01/2019-31/12/2021



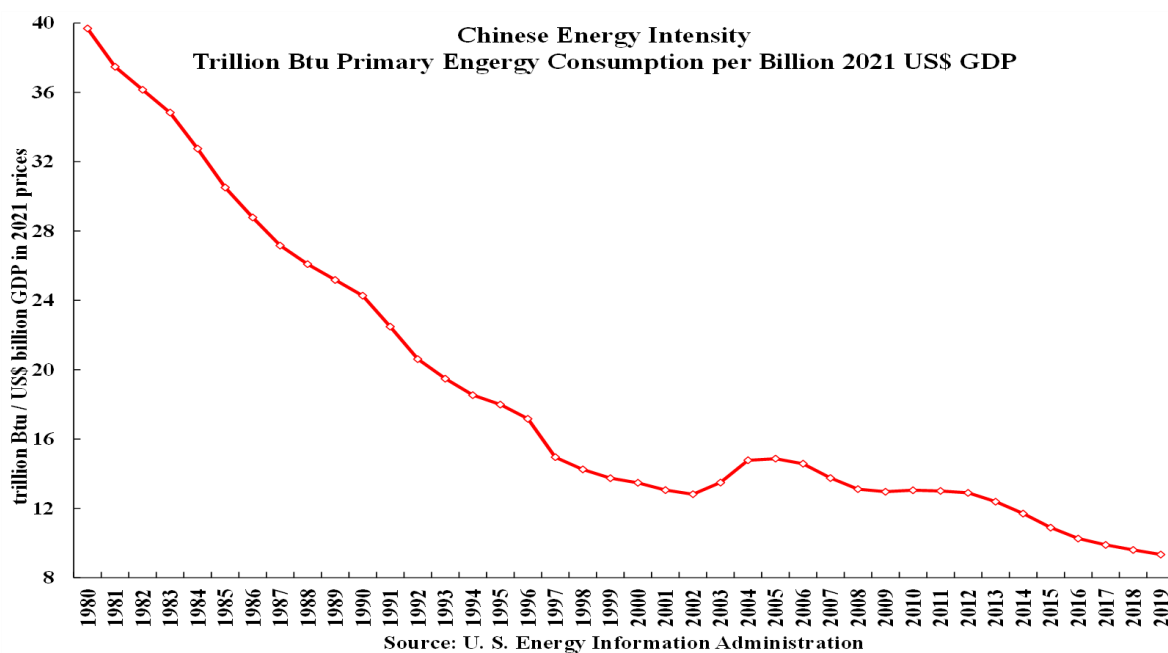
Source: Carbon Monitor, <https://www.carbonmonitor.org.cn/user/>.

The energy intensity, defined as primary energy consumed per unit real GDP, has been declining over time in China (see Figure 5-4).⁴ This is due to a number of factors: energy

⁴ The energy consumed per unit GDP decline by a further 2.7% between 2021 and 2020. However, the energy intensity of China is still approximately 1.5 times the global average.

conservation efforts both public and private as a result of prices, taxes and regulatory requirements; technological improvements, e.g., higher efficiency and lower transmission losses; and the relative contraction of the energy-intensive secondary (manufacturing, mining and construction) sector and the relative expansion of the much less energy-intensive tertiary (services) sector.

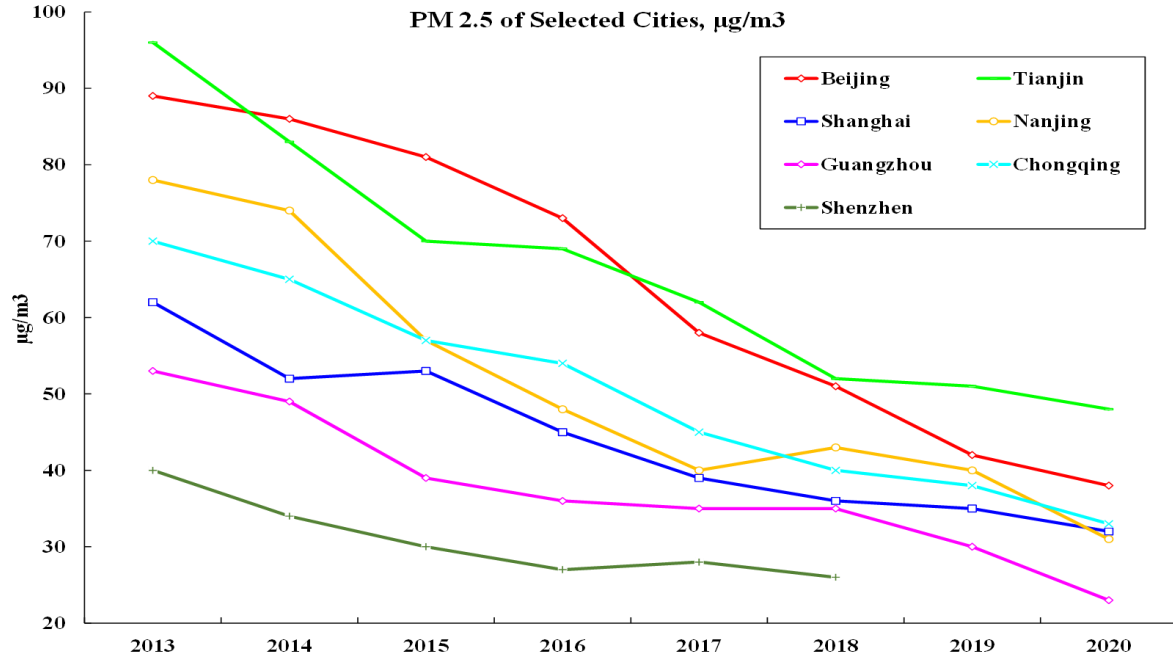
Figure 5-4: The Energy Intensity—Primary Energy Consumed per Unit Real GDP, 1980-2019



Source: U.S. Energy Information Administration.

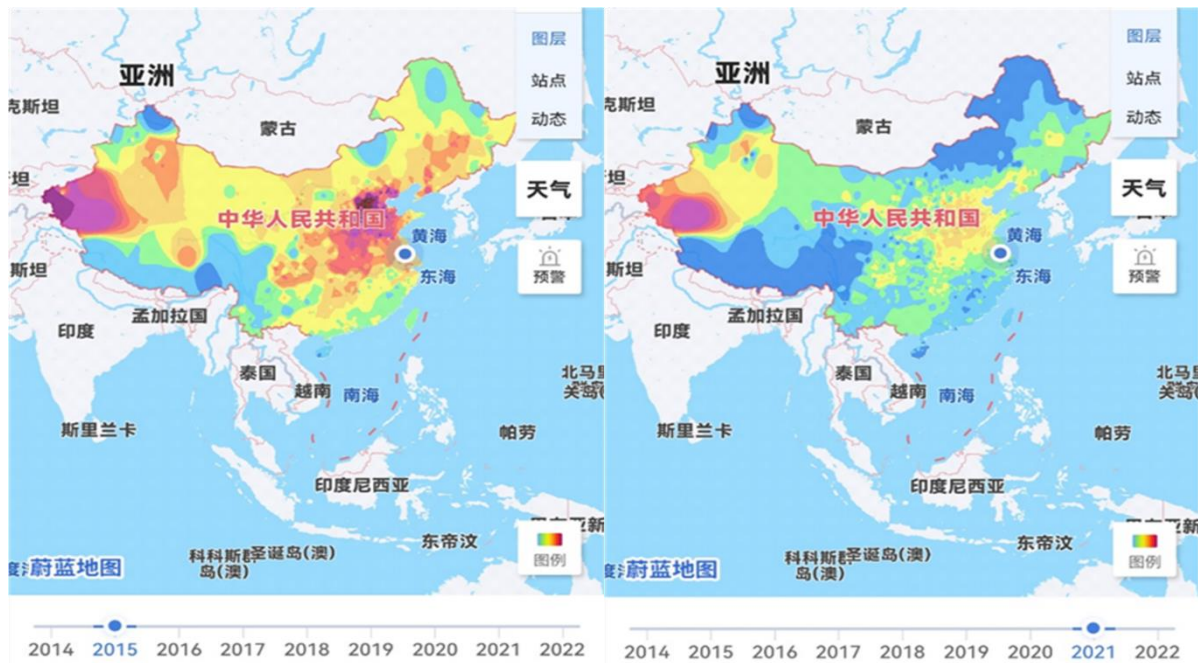
The quality of air in major Chinese urban centres has improved significantly. Fine particulate matter 2.5 (PM2.5) is an air pollutant that reduces visibility and causes the air to appear hazy when the level is high. It is also a concern for people's health. China implemented the new ambient air quality standard (GB3095-2012) in 2013. The levels of PM2.5 in the air of 31 major Chinese cities have been declining since. The actual levels of PM 2.5 of seven major cities—Beijing, Chongqing, Guangzhou, Nanjing, Shanghai, Shenzhen and Tianjin—between 2013 and 2020 are shown in Figure 5-5. A comparison of a PM2.5 map of China in 2015 and 2021 is presented in Figure 5-6 (blue is good and red is bad). The improvement over time is clearly apparent.

Figure 5-5: The Level of PM2.5 in the Air of Major Chinese Cities, microgramme per cubic metre



Source: China Statistical Yearbook, various years.

Figure 5-6: The Level of PM2.5 in the Air: A Comparison of 2015 and 2021 (from <http://www.ipe.org.cn>)



Source: The Institute of Public and Environmental Affairs, <http://www.ipe.org.cn>.

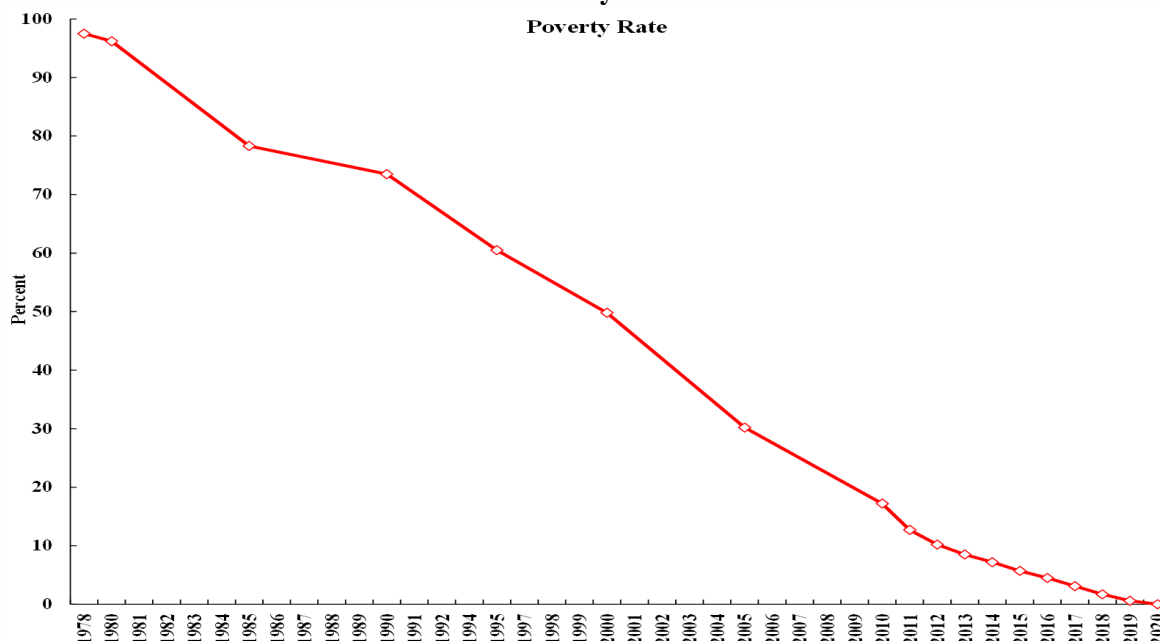
The Huang He (Yellow River), the second longest river in China, used to be very polluted and full of fine sediments, and would flood easily. Its water is now in the process of being cleared up through the planting of vegetation in the upstream regions of the River. The

vegetation holds the top soil in place and prevents it from being blown into the river by the winds. The River is expected to clear up within the next decade.

Poverty Alleviation

China has been the most successful in the eradication of chronic extreme poverty. The Chinese poverty standard, adopted in 2010, defines a family to be in poverty if its annual per capita income is below 2,300 Yuan in 2010 prices. This is equivalent to approximately 3,054 Yuan in 2021 prices (US\$479). In 1978, before the beginning of the economic reform and opening, the poverty rate according to this standard was a whopping 97.5%! By the end of 2020 it reached zero. (See Figure 5-7). Granted that this is still a rather low level of annual income per capita, but it is slightly more than US\$1.30 per person per day, higher than the United Nations standard of one U.S. Dollar a day. We should emphasise that this is a permanent eradication of extreme poverty, rather than a one-off relief. The formerly extremely poor are now able to provide a decent living for themselves in a sustainable manner.

Figure 5-7: The Eradication of Extreme Poverty: The Share of Population under the 2010 Poverty Line

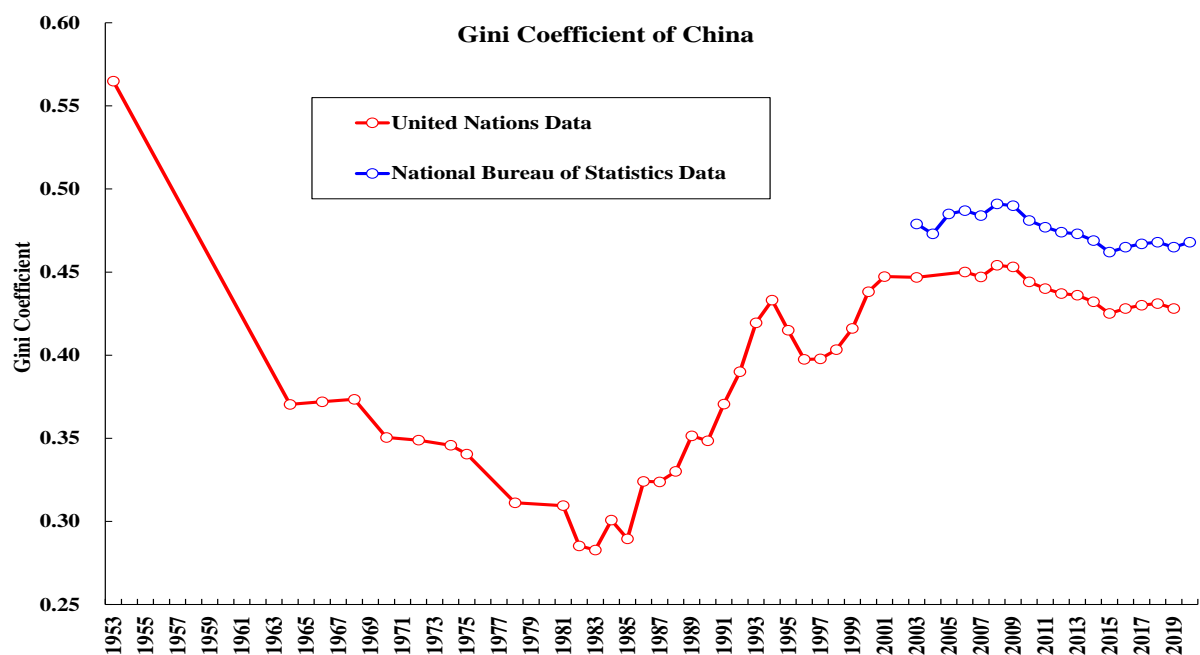


Source: China Statistical Abstract 2020.

However, despite the significant progress in the alleviation of poverty in China, the degree of income inequality in China has increased significantly since 1983 (see Figure 5-8). According to the National Bureau of Statistics of China (NBSC), the Gini coefficient for China

stood at 0.47 in 2020, comparable to the 0.49 for the U.S. Historically, the Chinese Gini coefficient fell from 0.56 in 1953 to 0.28, its lowest point, in 1983, a tremendous improvement, according to data compiled by the United Nations. It then turned around and rose to a peak of 0.45 (0.49 according to NBSC) in 2008. It has since declined to 0.43 (0.47 according to NBSC) in 2019. This is a very high level of income inequality, but consistent with Mr. DENG Xiaoping's policy of letting some people get rich first. It is now time to let other people get rich too. This is the reason for the "Common Prosperity" policy.

Figure 5-8: The Evolution of the Chinese Gini Coefficient over Time



Source: United Nations data from United Nations, World Income Inequality Database; National Bureau of Statistics data from the National Bureau of Statistics of the People's Republic of China.

6. Public Goods Provision through Infrastructural Investment

In the short run, all increases in government expenditures have the same macroeconomic effects on both GDP and employment. However, in the long run, increases in real fixed-assets investments augment the real capital stock and increase the real GDP, whereas increases in consumption due to increases in disposable income through, for example, tax cuts and transfer payments, generate no direct lasting benefits. Infrastructural investment, which is often needed for the provision of public goods, can generate benefits that can be widely shared in the economy even though they cannot be fully captured or internalised by the projects themselves.

Historically, in China, the Great Wall, built in the Qin Dynasty (221-206 B. C.), was an infrastructure for national defence, and the Grand Canal, constructed in the Sui Dynasty (581-618), was an infrastructure for the transportation of grains. Over the past few millennia, there were numerous water conservancy projects for irrigation and flood control. These were all government financed and often depended on conscripted labour.

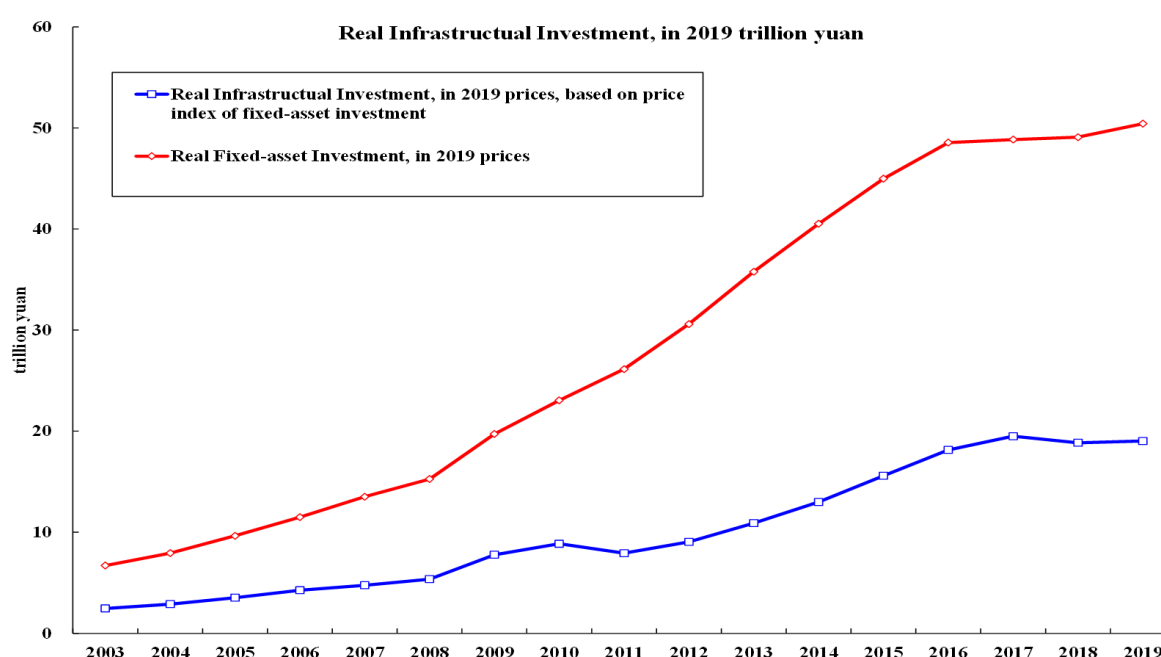
Infrastructural investment includes investment in communication, transportation, and power. Infrastructural investment is complementary to non-infrastructural fixed-assets investment because it can enhance the latter's rate of return. (Think of how a new highway can enhance and facilitate the expansion of trade among the enterprises located en route.) The existence of appropriate infrastructure can make the markets even more efficient (the “visible hand” working with the “invisible hand”).

In addition, many infrastructural investments are “development-leading” investments, with their supplies creating their own demands, as opposed to “developing-lagging” investments, that is, investments that are undertaken only when the demands already exist. “Development-leading” infrastructural investments can generate significant externalities and enhance the returns of other fixed-assets investments both public and private.

Real fixed-assets investment, including real infrastructural investment, grew rapidly in China between 2008 and 2017, partly as a response to the Global Financial Crisis of 2008 (see Figure 6-1). Since 2017, their rates of growth have considerably moderated. Infrastructural investment is a major component of fixed-assets investment. The share of infrastructural

investment in total fixed-assets investment ranged between a low of 30 percent and a high of 40 percent between 2003 and 2021, with an average of 35.8 percent. Infrastructural investment in communication and transportation has also helped to make the Chinese economy a single unified market, realising the huge benefits of its economies of scale. However, infrastructural investment frequently generates benefits known as externalities that cannot be captured by the investment itself and hence must be financed or subsidised by the government. On 26 April 2022, in a meeting of the Central Committee for Financial and Economic Affairs, President Xi Jinping called for “all-out efforts to strengthen infrastructure construction” in the country.

Figure 6-1: Real Fixed-Assets Investment and Real Infrastructural Investment, 2019 prices



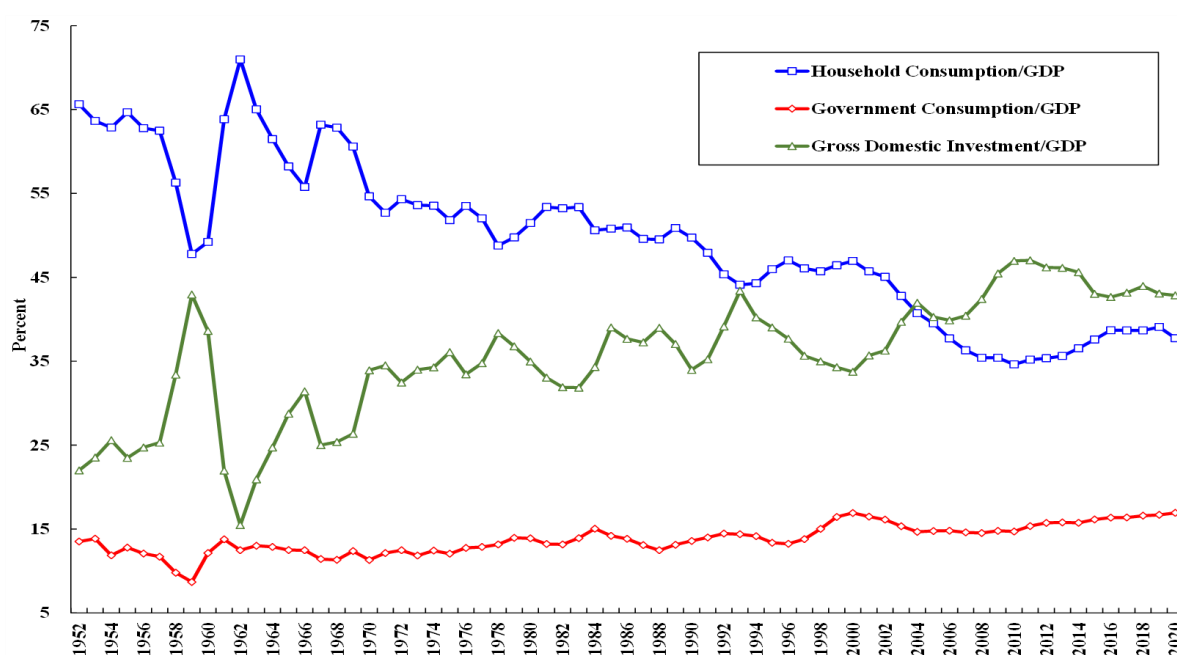
Source: Author’s calculations from data published in the China Yearbook of Social Statistics 2020.

7. Public Goods Provision as Aggregate Demands for Consumption and Fixed-Assets Investment

The Components of Chinese Aggregate Demand

The share of household consumption in aggregate demand (GDP) has been declining over time, from a peak of almost 71 percent in 1962 to less than 38 percent in 2020 (see Figure 1-4 above). Gross domestic investment, which includes real fixed-assets investment, has become the most important source of aggregate demand since 2004 (see Figure 7-1). It was just below 43 percent in 2020. The share of government consumption, which includes most public goods consumption, has been increasing slowly and gradually from 13.5 percent in 1952 to just below 17 percent in 2020. There is a great deal of room for both government investment and government consumption to grow through increased public goods provision. Net exports will continue to decline in relative importance as a component of Chinese aggregate demand, given the Chinese objective of balanced international trade.

Figure 7-1: The Percentage Distribution of the Sources of Aggregate Demand

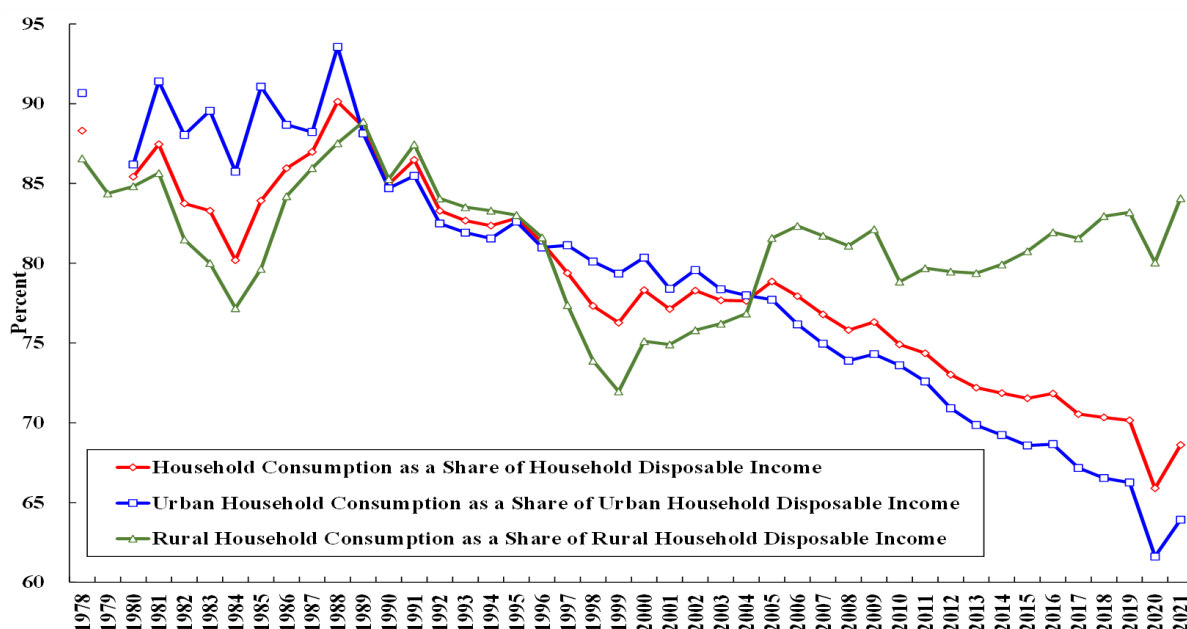


Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

The share of household consumption in household disposable income has also been declining over time, from over 90 percent in 1988 to 68.6 percent in 2021 (see Figure 7-2). Moreover, as China becomes increasingly urbanised, the share of household consumption in

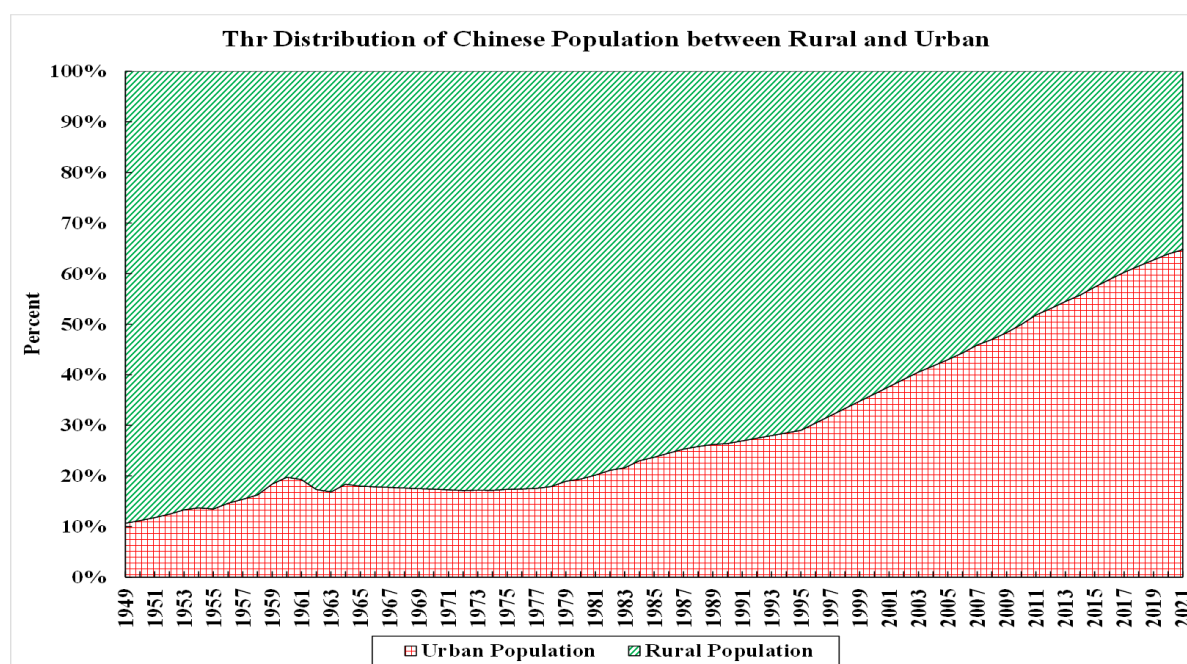
household disposable income is likely to decline further, since urban households have a higher propensity to save than rural households. In 2021, the shares of household consumption in disposable income were respectively 84.1 percent for rural households and 63.9 percent for urban households. Between 1949 and 2021, the share of rural population fell from almost 90 percent to slightly more than 35 percent (see Figure 7-3). Thus, increases in household disposable income alone are not likely to be sufficient to increase household consumption significantly as a component of aggregate demand. Increases in fixed-assets investments and government consumption are needed. This is where public goods provision can make an important contribution.

Figure 7-2: Household Consumption as a Share of Household Disposable Income



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

Figure 7-3: The Distribution of Chinese Population between Rural and Urban



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>).

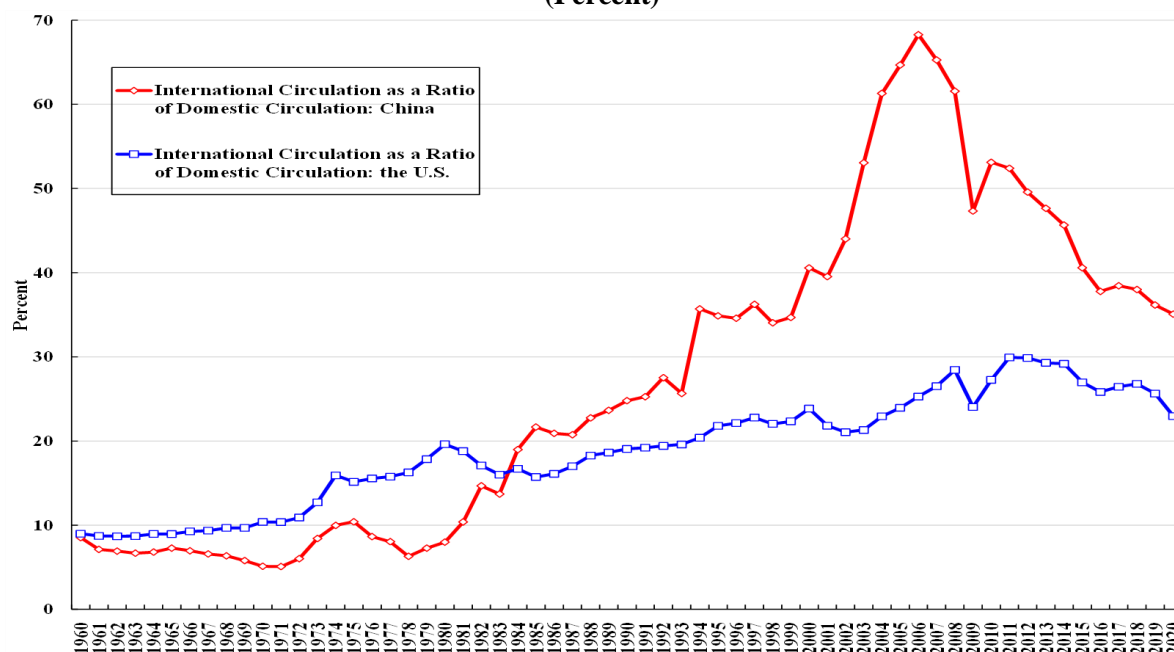
The Dual-Circulation Economic Development Strategy

The Chinese economy will pursue a dual-circulation development strategy with a domestic circulation and an international circulation complementing each other, but with the domestic circulation playing the primary role, which is to be expected for large continental economies like China (and also the U.S.). The Chinese economy is no longer export-driven. It aims to have balanced international trade. It will be domestic demand-driven—by household consumption, gross domestic investment, and public goods consumption. The adoption of a dual circulation strategy by China is evidence of its recognition that total self-sufficiency is not a viable alternative and of its continuing commitment to an open economy and to economic globalisation.

The Chinese ratio of international circulation to domestic circulation was below 10 percent before 1981, when it began to rise. It reached a peak of almost 70 percent in 2006, but then declined to 35 percent by 2020 (see Figure 7-4). The U.S. ratio was around 20 percent between 1980 and 2000 and rose to a peak of 30 percent in 2011, but then declined to 23 percent by 2020. It is expected that the ratios for both countries will be declining some more over time and eventually reach similar levels. A possible de-coupling of the Chinese and U.S. economies will increase the importance of domestic circulation for China. Public goods provision can

become a major source of increase in domestic aggregate demand for both consumption and investment going forward.

Figure 7-4: International Circulation as a Ratio of Domestic Circulation: China and the U.S. (Percent)



Source: National Bureau of Statistics of China (<https://data.stats.gov.cn/easyquery.htm?cn=C01>); U.S. Bureau of Economic Analysis (<https://apps.bea.gov/itable/index.cfm>).

What Public Goods will be Provided?

What are some of the public goods that need to be provided in the next decade or decades that require significant capital and current expenditures? The following is a possible list:

- (1) Prevention of climate change. This will require both infrastructural and non-infrastructural fixed-assets investment—the replacement of fossil-fuel-based infrastructure and equipment, carbon sequestration, and research on nuclear fusion;
- (2) Environmental preservation, protection and restoration;
- (3) Common prosperity—alleviation of poverty in accordance with a new 2030 standard;
- (4) A free and free-standing public text (including email), voice and video communication system that is respectful of personal data privacy;
- (5) The construction and operation of pre-schools, schools and universities, hospitals, and elderly care homes;

- (6) The construction and operation of public rental housing in urban areas; and
- (7) Outer space exploration.

8. The Financing of Public Goods Provision

One problem of public goods provision is that most of the activities do not generate positive value-added at market prices. For example: cleaning up air pollution is costly but does not generate any net revenue and hence does not create any net positive GDP; providing mass transit improves the environment, reduces traffic congestion, and enhances welfare, but often cannot break even on its own. Thus, increasing public goods provision is likely to result in a reduction of the rate of growth of conventionally measured real GDP even as it enhances social welfare (unless and until China adopts a “green GDP” as a metric).

How can public goods provision be financed? In general, it has to be subsidised by the government. Public goods can be financed through general revenue, project bonds, user fees, or specific taxes such as a carbon tax. One potential source of government revenue that can be tapped by China is the accumulated undistributed earnings of state-owned enterprises (SOEs) and their parents. Publicly listed SOEs should be required to pay annual cash dividends to their shareholders, including their state-owned parent companies. These funds will eventually end up in the State Treasury to help finance the budget deficit, if any. General revenue can also be increased through a reform of both individual and enterprise taxation and through enhanced tax compliance and enforcement. For example, Chinese income taxation is supposed to be “worldwide”, just like that of the U.S., but the income of Chinese individuals from foreign sources is currently effectively not taxed.

9. Concluding Remarks

The economic development of China since the establishment of the People's Republic is characterised by not only quantitative growth, but also significant improvements in the “quality” of growth. Most of the improvements in quality have been brought about through the provision of more and better public goods. Provision of public goods such as education, public health, elderly care, environmental preservation, protection and restoration, basic research, infrastructure, social safety net, and alleviation of poverty has been vastly expanded over the past seven decades, with significant positive results. The provision of public goods has also raised the potential GDP of the Chinese economy through its effects on increasing the aggregate demand, the real capital stock, the productivity of the labour force, and the rate of return on other fixed-assets investment. For example, the improvements in the quality of the Chinese labour force have greatly enhanced its productivity.

Public goods are by their very nature mostly “local”, and their provision is consistent with the Chinese “dual circulation development strategy”, which has its primary focus on domestic circulation. The provision of public goods also constitutes a form of re-distribution in kind, for example, clean air and water, which can be enjoyed by everyone, and hence also directly advances the goal of “common prosperity”. Finally, increasing the provision of public goods can be a significant source of growth of the domestic aggregate demand for both consumption and investment, over and above what increases in household consumption alone is able to provide. Maintaining an adequate growth of domestic aggregate demand is essential for continued Chinese economic prosperity.

However, the provision of public goods frequently results in negative value-added at market prices, and will therefore reduce rather than enhance the rate of growth of measured GDP. This is one reason why the targeted rate of growth of the Chinese economy in 2022 has been set at a relatively low level of 5.5 percent, the lowest in more than four decades. Despite the significant increase in the degree of income inequality in China, as measured by the Gini coefficient, the welfare of all Chinese people has improved significantly since 1978 as a result of its economic reform and opening to the world.

References

- Lawrence J. Lau and Yanyan Xiong (2022), Are There Laws of Innovation? Singapore: World Scientific Publishing Company, forthcoming.
- Ministry of Ecology and Environment of the People's Republic of China (2004), The People's Republic of China Initial National Communication on Climate Change. Beijing: China Planning Press
(<https://www.mee.gov.cn/ywgz/ymqhbh/wsqtz/201904/P020190419524224387926.pdf>).
- Ministry of Ecology and Environment of the People's Republic of China (2018a), Second Biennial Update Report on Climate Change of the People's Republic of China
(<https://www.mee.gov.cn/ywgz/ymqhbh/wsqtz/201907/P020190701765971866571.pdf>).
- Ministry of Ecology and Environment of the People's Republic of China (2018b), The Third National Communication on Climate Change of the People's Republic of China
(<https://www.mee.gov.cn/ywgz/ymqhbh/wsqtz/201907/P020190701762678052438.pdf>).
- National Bureau of Statistics of China (1959), Great Decade: Statistics on the Achievements of Economic and Cultural Construction of the People's Republic of China. Beijing: People's Publishing House.
- National Bureau of Statistics of China (2020). China Statistical Abstract. Beijing: China Statistics Press.
- National Bureau of Statistics of China, China Statistical Yearbook, various issues. Beijing: China Statistics Press.