

China's Capital Formation in the Volatile Time

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Abstract

China's capital formation is an important theme, which, however, so far received only limited attention of researchers. The purpose of this study is to explore the major characteristics of the uniquely high rate of capital formation, close to 45% of GDP, that for many years has supported growth and structural changes in China. Data show that the official plans to alter the GDP structure by shifting the focus from investment to domestic consumption have not materialized. The shifts in the structure of capital investments demonstrate the country's modernization strategy and tactics, but they have not led to significant changes in the key macro proportions, so export remains crucial for economic growth and investments. Today, the country concentrates capital expenditures in machine industry and in the advanced branches of manufacturing. The real estate segment experiences financial difficulties, which may cause its GDP share to decline. Shifts in manufacturing investments reflect the focus of the Chinese authorities' decision-making, as well as their reaction to market signals. Although some proportions and correlation coefficients between profits, revenues and investments by industry remained fairly stable for a long time, the turbulent years of 2020-2022 prompted both declines and revivals in industrial investments with a changed structure. This paper offers an analysis of large statistical material on the sectors of the Chinese economy including manufacturing, its dynamics and structure, thus creating a clearer picture of the Chinese industries' investment behavior as a way to adapt to new trends or withstand various shocks. The work has its limitations since statistical evidence is available on a smaller set of indicators than that for many other market economies.

Keywords

capital formation, China, structure of investments.

JEL: D 63, E 22, F 44, H 54, N 15.

There are three periods in China's spectacular economic development that deserve special attention: first, fast growth before 2007; next, between 2012 and 2019, with the shifts in policy caused by the need to solve the problems that had been piling up; and, after that, continuous focus on the quality of growth together with responses to external shocks and domestic issues. In the last two decades, the economy of China has undergone substantial changes related to capital formation that resulted in a specific Chinese hybrid of market-driven demand for fixed assets and a planned instrument of structural changes. For outside observers, it is practically impossible to evaluate the exact ratio of these two components, so our starting hypothesis does not include attempts to do it and is relatively simple: during the period of 2012-2019, growth rates of investments by sector and industry are either planned or decision driven; in the crisis year the changes are "event driven"; the changes that occur after the crisis are "adaptation driven". The uniquely high capital formation rate in China is probably determined by complex characteristics of the sectors and industries and by the interplay between the market demand and central planning decisions. These parameters will be subjected to statistical analysis, since the possibility of analyzing capital formation in China has been rather limited so far.

The paper is organized in the following way:

- section one presents policy objectives and the related macroeconomic dynamics in the two decades leading up to 2022, together with the major factors that influenced them;
- section two describes the characteristics of investment process covering the interconnection between sales, profits and investment on the 2-digit industry basis in manufacturing over the period of 2006–2021 using available data);
- section three identifies major changes in the structure of investments on the basis of one-digit sectors of the economy over three periods, with particular focus on real estate;
- section four examines the structural and other trends in manufacturing investments over this period.

Policy objectives and major parameters

Research into China's centrally planned economy traditionally starts with analyzing decisions made by the government, which is quite natural in the light of successful past reforms and effective methods used by reformers. We, however, are looking into problems of the country's economy in the 21st century after a long period of dynamic growth. In this comparatively short paper, we concentrate on capital formation and its importance for economic growth.

In retrospect, the drivers of change were domestic problems related to demography, inequality, energy intensity, ecology and water supply. Global growth and weakening

global governance increased the urgency of changes. The second stage was started by the 18th National Congress of the Communist Party of China (CPC) in 2012. China's former Leader Hu Jintao announced¹ that it was necessary to promote sustainable and balanced economic development, primarily by boosting consumer demand and investing in high tech industries:

We must strive to remove major structural barriers to sustained and sound economic development, with a focus on improving the demand mix and the industrial structure, promoting balanced development between regions and advancing urbanization. We should firmly maintain the strategic focus of boosting domestic demand, speed up the establishment of a long-term mechanism for increasing consumer demand, unleash the potential of individual consumption, increase investment at a proper pace, and expand the domestic market.

This policy was approved and developed by the 19th CCP Congress in 2017. The Communist Party Secretary Xi Jinping underlined² that the Chinese economy had entered a new normal state, with a focus on quality and stability of growth:

This is a pivotal stage for transforming our growth model, improving our economic structure, and fostering new drivers of growth. We must put quality first and give priority to performance. We will improve systems and mechanisms for stimulating consumer spending, and leverage the fundamental role of consumption in promoting economic growth. We will deepen reform of the investment and financing systems, and enable investment to play a crucial role in improving the supply structure. We will adopt policies to promote high-standard liberalization and facilitation of trade and investment...

China's economic model was considered to be in need of transformation based on improving human capital, boosting aggregate factor productivity in GDP, and increasing investment in innovation, technology, and institutional transformation. According to many international studies, human capital, aggregate factor productivity, investment in technology, health, education and institutional reforms should be the key drivers of the modern economic model. China's new type of development required changes in the parameters of GDP: it would be necessary to increase consumption in response to declining savings rates, shift from an export-led economy to reliance on domestic demand, and address the country's social problems.

China's economic development is a typical example of the dual economy model proposed by William Arthur Lewis in his paper "Economic Development with Unlimited Labor Development" (Lewis, 1954). By the turn of the 21st century, China had faced a range of issues caused by rapid industrialisation and urbanisation. The expansion of the industrial sector, accumulation of investment and growth of exports have slowed the growth of the Chinese economy. The IMF analysts believe that the concentration of capital accumulation only in a few sectors adversely affected

¹ Full text of Hu Jintao's Report at 18th Party Congress. Embassy of the People's Republic of China in Nepal. http://np.china-embassy.gov.cn/eng/Diplomacy/201211/t20121118_1586373.htm

² Full text of Xi Jinping's report at 19th CPC National Congress. Xinhua. http://www.xinhuanet.com/english/download/Xi_Jinping's_report_at_19th_CPC_National_Congress.pdf

the development dynamics (IMF, 2015). Although China joined the group of middle-income countries, it found itself in the "middle-income trap" because of irrational distribution of production capacity and insufficient factor productivity. The 'middle income trap' means that countries attempting to shift from extensive to intensive growth begin to stagnate and for a long time are unable to join the high-income group of countries (Vasilenko, Chernyadyev & Vlasov, 2018). Orekhovskiy (2020) explains this phenomenon in the following way: given the rise in Chinese labour prices that are now higher than in poor countries, the growth of labor productivity is limited by the lack of technologies that could ensure it. In research literature the middle-income trap is also called the "vacuum of comparative advantage". Low-income countries benefit from globalization thanks to their labour-intensive industries, while high-income countries take advantage of using advanced technologies and innovations. China and other middle-income countries have no comparative advantages in any industry. Even with economic slowdown from 10% to 6% , China is still above other countries in terms of growth dynamics. but the problem of catching up is complicated for most countries that experience a slowdown after a period of relatively fast development (Grigoryev, Maihrovich, 2023).

China is no longer a low-wage country so it should ~~further~~ develop technological and capital-intensive industries to meet the new challenges (Cai, 2012). One of these involves population aging, slower growth of working-age population (15-59 years), and the consequent rise in wages. Cost push inflation did nothing to improve workers' skills; instead, it forced some of the Chinese companies to relocate production to countries with sufficient manpower and lower production costs (Grigoriev, Kulpina, 2013). China's rapid economic growth has been accompanied by a demographic shift, i.e. a decline in the birth rate due to the Chinese government's one-child family policy since 1979. Its aim was to increase the proportion of the working age population and reduce the percentage of people unable to work (children and pensioners), which is commonly referred to as the "demographic dividend". This dividend initially helped transform China into a global factory and boosted productivity per worker; yet, it was soon exhausted and the country saw a rapid decline in return on capital and in the growth rate of human capital. Moreover, China's population began to age rapidly, and its labor force shrank, adversely affecting economic development. The increasing proportion of the elderly population has been a burden on the government, that had to carry out pension reform and other social programmes (Warsaw Institute Foundation, 2021). There is evidence, however, that accelerated process of population aging may yield a second dividend if the right institutional system is put in place (Wang et al., 2007).

Another challenge was connected with the dependence of growth on investment in the private economy as it may lead to economic instability. If the economy slows down, there is a risk that private investment will fall faster than the government can recover and replenish it (Naughton, 2016). Hence the significant influence of the government on the capital formation in China, which may lead to overinvestment and use of state financing to solve the problem.

The dynamics and structure of capital formation is, therefore, a major tool for implementing new policies and reaching new objectives. At the 19th CCP Congress in 2017, Xi Jinping claimed that China was at a crucial stage of the creation of a “xiaokang society” (a moderately prosperous society in all respects) and so it could usher in a new era of Chinese-specific socialism that would bring the state closer to a leading position in the world. As noted, the Chinese economy has entered “the new normal” with a focus on quality and stability of growth³. The 20th Congress was working in the third period, which, to quote an old Chinese curse, became an “interesting time” for the whole world. This period is characterized not so much by external economic shocks, as by non-economic ones, namely Covid-19 and sanctions. At the forum, Xi Jinping made⁴ the necessity of balancing growth very clear:

Pursuing high-quality development as our overarching task, we will make sure that our implementation of the strategy to expand domestic demand is integrated with our efforts to deepen supply-side structural reform...

The overall picture of macroeconomic trends (see Fig. 1) creates an impression of the difficulties that Chinese planning authorities had organizing the use of resources for efficient development in the gigantic country. In terms of capital formation, the government's objective was to increase investment in high-technology industries. In addition to strengthening the public sector of the economy, it was necessary to improve the competitiveness of the country's private companies. This can be achieved by stimulating technological innovation, improving the skills of business managers, and by establishing an effective system of private property rights by the government. The latter implies state protection of property rights and mutual respect for the property rights among the public. If intellectual property rights are not protected, entrepreneurs will have no incentive to increase their company's growth rate because of possible theft of ideas by employees who may want to start their own businesses (Zhang, 2008). Other measures proposed at the July 2017 meeting to attract private investment included simplifying the approval process for investment projects and encouraging companies to participate in the "Made in China 2025" program (Hu, 2017). The implementation of the One Belt One Road infrastructure project put forward by Xi Jinping in 2013 is one example of creating an innovative type of the government's opening-up policy. With this external economic opening, China entered a new phase of expanding its exports of its goods, services, and capital to the rest of the world and thus continued to strengthen its position on the global market.

³ Full text of Xi Jinping's report at 19th CPC National Congress. Xinhua. http://www.xinhuanet.com/english/download/Xi_Jinping's_report_at_19th_CPC_National_Congress.pdf

⁴ Full text of the report to the 20th National Congress of the Communist Party of China. Ministry of Foreign Affairs of the People's Republic of China. https://www.fmprc.gov.cn/eng/zxxx_662805/202210/t20221025_10791908.html

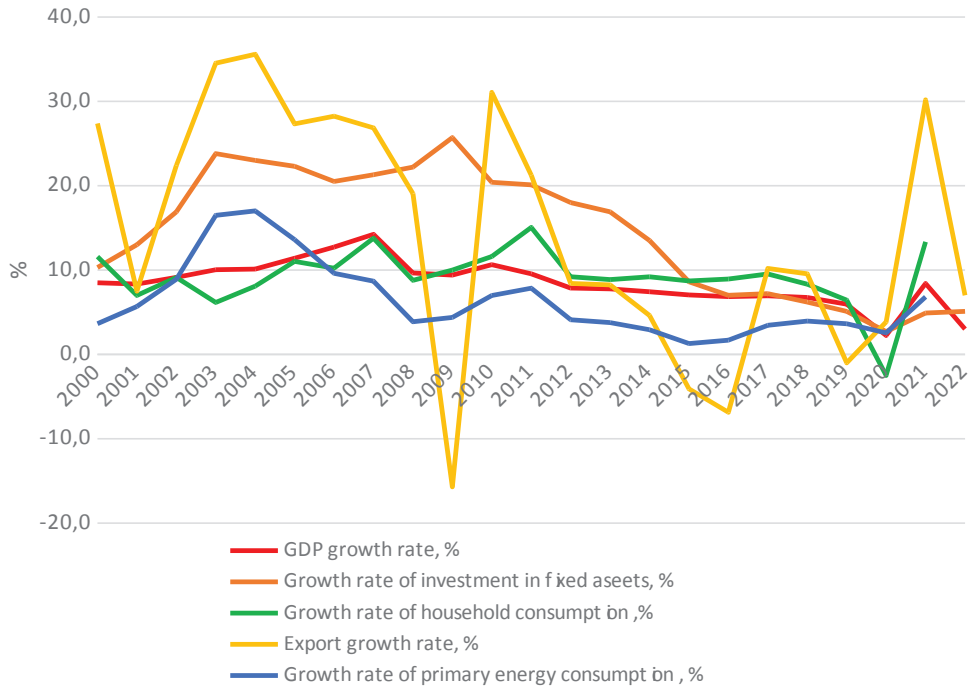


Figure 1. Key macroeconomic aggregates, 2000-2022. *Source:* compiled by the author using data from World Bank (2023), BP Statistical Review of World Energy (2022), National Bureau of Statistics of China (2022).

The macroeconomic dynamics of China in the 21st century shows that this huge country does not have immunity from external shocks and domestic problems. Economic growth slowdown caused a dramatic shift from 10.5% average growth rate of GDP in 2000-2008 to 7.7% in 2010-2019. Personal consumption fared slightly better, export demonstrated wide fluctuations, but the general proportions were rigid.

In this paper we emphasize the role of capital formation and its sectorial structure. Its dynamics by 2015 (fig. 1) came close to GDP, and the capital formation rate had since showed reduction by a few points, far less than it would take to reduce the growth dependence on investments.

We regard the period of 2006-2012 as a period of adaptation to the Great Recession; 2012-2019 as a period of slowdown; 2020-2022 as a period of crises and adaptation to them. Globally, the slowdown period is characterized, among other things, by a reduction in the intensity of capital formation (Grigoryev & Makarova, 2022). Here we attempt to describe major trends in capital formation in China.

Theory of investment suggests that capital formation supplies fixed assets for employment, creates conditions for technological innovations and reflects managerial improvements and institutional upgrading to ensure the rise in output

and efficiency of production. In the case of China, we expect a substantial role of state planning agencies and large state and private corporations, which makes our task easier as it suggests that fast and visible changes in the Chinese growth rates are determined not only by market shocks, but also by the reaction of economic authorities. The question arises how to “decode” such changes: what was due to businesses’ responses, and what was caused by fundamental changes in the state investment policies.

The coronavirus pandemic hit hard the Chinese economy, leading to structural changes in household consumption, exports, and investment. In 2020, GDP growth declined to 2.2%, while household consumption dropped to -2.7%. The government’s immediate response to the pandemic was a zero-tolerance policy and regime of isolation, which had a negative impact on domestic demand. As a result of closures and restrictions of movement, a large proportion of the population lost their jobs; this resulted in a decline in production. Investment growth dropped to 2.7% in 2020, distinguishing the coronavirus pandemic from other crises. In 2019, export growth fell sharply (-1.9%) due to the trade war between China and the US that began in 2018. The increase in customs duties on imports of Chinese goods in the US and restrictions imposed on the activities of companies, such as Huawei, ZTE, and others adversely affected China’s overall economic growth which declined from 6.8% to 6% in 2019 (Tsyplakov, 2023). In 2020, the figure rose to 3.8%, thanks to the agreement between China and the United States to reduce tariffs and remove new duties on Chinese exports. In 2021, export growth accelerated by 30.2%, driven by external demand for anti-epidemic, pharmaceutical and electrical products. The decline in export growth by 7% in 2022 was caused by the weakening global demand for Chinese goods and by supply chains disruptions due to labour shortages and a new wave of infections.

Characteristics of the capital formation mechanism in China

China’s economic system has its own features and complexities such as regional protectionism, social inequality, and many others. (Xu, 2011). Describing China’s institutional system, Joshua Cooper Ramo (2004) proposed the term “Beijing Consensus” as an alternative to the Washington Consensus. The Chinese system is unique in its continuous experimentation, regular state intervention in market relations, and gradual, rather than abrupt, changes. This was the key to the growth of the People’s Republic of China and its difference from other developing countries. During the whole period of transformation, one of the priorities of the Chinese government has been to develop and improve the country’s institutions.

Chinese investments have been mostly private: in 2000 their share was 91.1%, and in 2019 – 89.6% (OECD, 2023). During the crises, the Chinese government “pumps” investments into the economy to maintain internal demand. This is largely achieved by financing real estate investments, particularly in housing construction. The decrease

in the share of private investment from 89.2% to 87.7% and the increase in public investment from 10.8% to 12.3% in 2017 can be explained by the fact that the Chinese government adopted the "One Belt - One Road" initiative in 2016, which is aimed at developing China's cooperation with other countries through the construction of new Eurasian railway lines and improvement of the old ones. In subsequent years, the share of public investment declined, perhaps because the state began to invest more in private firms.

Indicators based on profits and revenues are traditional instruments of investment analysis. The share of gross profit in the revenue of the manufacturing industry is an indicator of profitability of sales. Considering the dynamics of this indicator from 2012 to 2021 (see table 1), it should be noted that income tax, which was reduced from 33% to 25%⁵ in 2008, is not included in our analysis.

Between 2012 and 2019, the figure for consumer goods (excluding cars, medicine, computers) dropped from 0.08 to 0.07. In 2020, the value increased to 0.08, but it returned to 0.07 in 2021. In the production of intermediate goods and computers in 2012-2020, the average figure remained at 0.05, increasing to 0.06 in 2021. The ratio of profit to revenue for production of automobiles decreased from 0.08 to 0.06 in 2019, and the figure did not change in 2021. The indicator for the production of medicine increased: 0.11 in 2012, 0.13 in 2019, 0.15 in 2020, and 0.22 in 2021.

The analysis of profitability of sales in manufacturing during this period suggests that it is regulated by a centralized procedure, and is not only companies' market decision but also a decision of the government (Moziyas, 2014).

Between 2012 and 2021, the ratio of profit to investment in manufacturing industry, remained steady and lacked diversity (see Table 2). The figure for the production of consumer goods (except cars, medicine, computers) was the highest from 2012 to 2020. In 2021, investments in medical goods became the most profitable.

The correlation analysis of investments, profits, and revenues in the manufacturing industry (see Table 3) shows a high correlation between variables during the period between 2006 and 2021. It also indicates the involvement of Chinese government's central regulation, or state plan. The increase in the correlation between investments and profits, investments and revenues in 2020 is clearly visible.

The analysis presented above supports the hypothesis of a hybrid investment mechanism. There is a high correlation between investments, profits and revenues in manufacturing, as well as impressive performance. There are also changes due to global circumstances, such as the increase in the share of investment in medicine during the pandemic because of higher domestic and external demand for related products.

⁵ Law of the People's Republic of China on Enterprise Income Tax. (Order of the President of the People's Republic of China No.63). National People's Congress. http://www.npc.gov.cn/zgrdw/englishnpc/Law/2009-02/20/content_1471133.htm

Table 1. Gross profit to revenue ratio in manufacturing, 2012-2021

| | 2012 | 2019 | 2020 | 2021 |
|--|------|------|------|------|
| Production of consumer goods (excluding cars, medicine, computers) | 0,08 | 0,07 | 0,08 | 0,07 |
| Production of intermediate goods | 0,05 | 0,05 | 0,05 | 0,06 |
| Production of automobiles | 0,08 | 0,06 | 0,06 | 0,06 |
| Production of medicine | 0,11 | 0,13 | 0,15 | 0,22 |
| Production of computers | 0,05 | 0,05 | 0,05 | 0,06 |

Source: compiled by the authors using data from the National Bureau of Statistics of China (2021)

Table 2. Gross profit to investment ratio, 2012-2021.

| | 2012 | 2019 | 2020 | 2021 |
|--|------|------|------|------|
| Production of consumer goods (excluding cars, medicine, computers) | 0,68 | 0,58 | 0,87 | 0,66 |
| Production of intermediate goods | 0,33 | 0,25 | 0,32 | 0,47 |
| Production of automobiles | 0,54 | 0,38 | 0,43 | 0,50 |
| Production of medicine | 0,52 | 0,47 | 0,43 | 0,67 |
| Production of computers | 0,54 | 0,31 | 0,32 | 0,37 |

Source: compiled by the authors using data from the National Bureau of Statistics of China (2021)

Table 3. Coefficients of correlation between investments, profits and revenues in the manufacturing industry, 2006–2021.

| 2006 | Investment | Revenue | Profit | 2012 | Investment | Revenue | Profit |
|-------------------|------------|---------|--------|-------------------|------------|---------|--------|
| Investment | 1 | | | Investment | 1 | | |
| Revenue | 0,845 | 1 | | Revenue | 0,771 | 1 | |
| Profit | 0,823 | 0,806 | 1 | Profit | 0,899 | 0,803 | 1 |
| 2019 | Investment | Revenue | Profit | 2020 | Investment | Revenue | Profit |
| Investment | 1 | | | Investment | 1 | | |
| Revenue | 0,730 | 1 | | Revenue | 0,768 | 1 | |
| Profit | 0,844 | 0,870 | 1 | Profit | 0,893 | 0,870 | 1 |
| 2021 | Investment | Revenue | Profit | | | | |
| Investment | 1 | | | | | | |
| Revenue | 0,742 | 1 | | | | | |
| Profit | 0,806 | 0,865 | 1 | | | | |

Source: compiled by the authors using data from the National Bureau of Statistics of China (2021)

Investment and its structure in primary one-digit sectors of the economy

From 2006 to 2021, there was a stable growth in investment both at then current prices and in real terms (see fig. 2). In the past 15 years, nominal volumes increased 5.6 times, while real volumes went up 3.5 times. The difference between these indicators became more apparent with each consecutive year owing to inflation but there was no decline in the rate of capital accumulation in GDP, which could be expected since it was the government’s explicit goal.

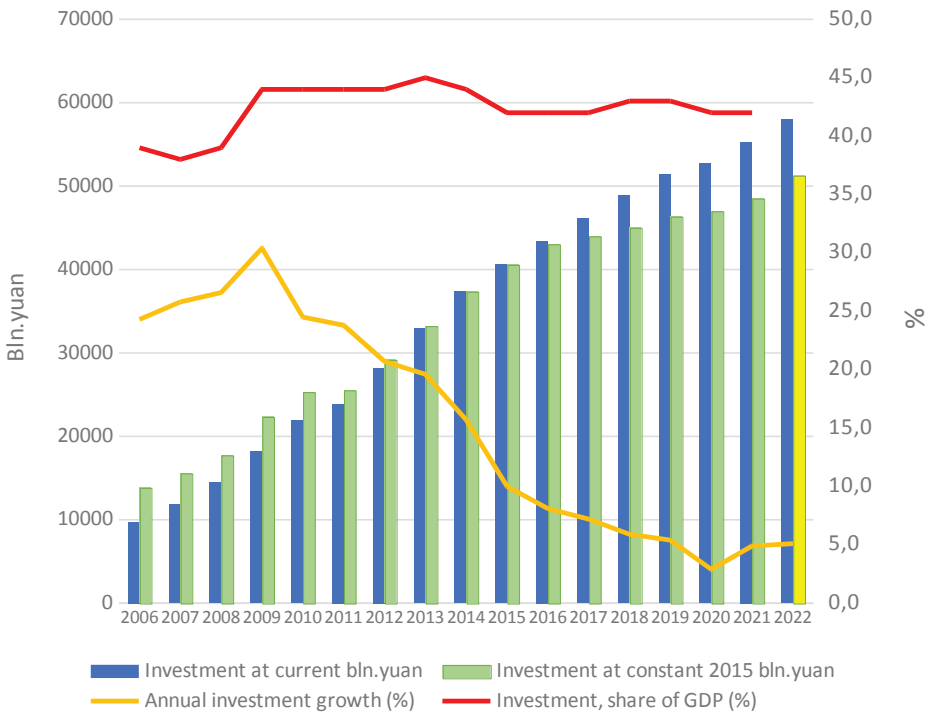


Figure 2. Investment in fixed assets, 2006-2022. *Source:* compiled by the authors using data from the World Bank (2023), the National Bureau of Statistics of China. (2022).

It remains to be seen whether, after recovering from the crisis, the government of China intends to reduce the share of capital formation in GDP from 42-43% to the average global levels of about 25%. So far, this has not been observed (see fig. 2). If it is implemented, the real estate and manufacturing industry can be expected to show a steady decline in their share or even in the amount of capital accumulation.

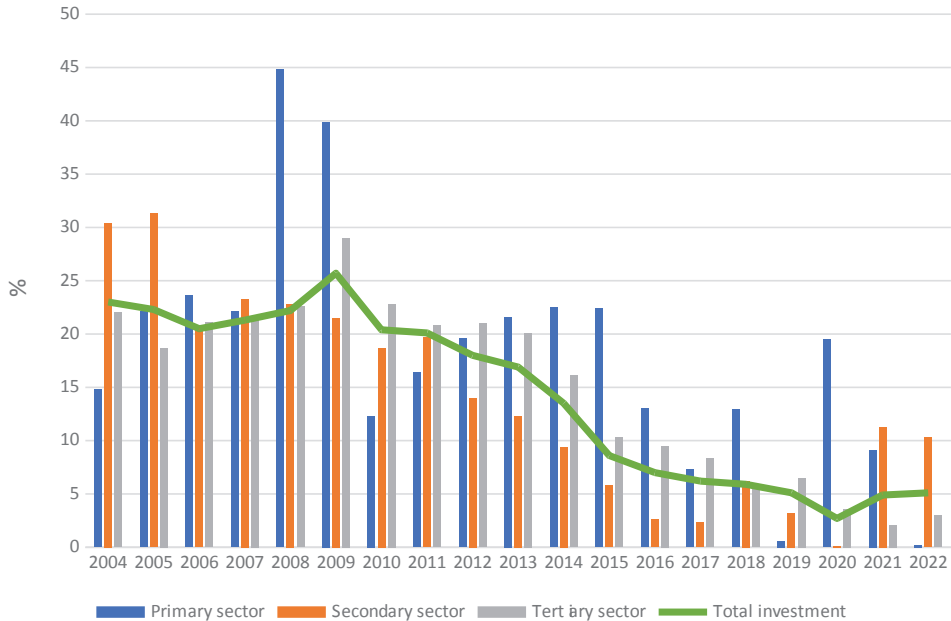


Figure 3. Annual growth rate of investment by sector, 2004-2022. *Source:* The National Bureau of Statistics of China (2022)

Statistical data on investment by sector between 2004 and 2022 show that the growth rate of investment in the secondary sector fell from 30% to 10%, in the primary sector – from 15% to 0.2% and in the tertiary sector – from 22% to 3% (see fig. 3).

In 2006-2013, the real estate sector had a very high investment growth rate (20–35%); then it slowed down to the moderate 4–8%, which can be explained by declining demand for housing as the GDP growth had been deteriorating since 2010. Real estate investment policy has always been associated with writing off bad debts from the balance sheets of state-owned banks and transferring them to the balance sheets of asset management companies (ACS), also called ‘bad banks’. Although the credit problem in the Chinese economy is serious, investment in the real estate market increased mainly due to bad debt (“bad banks”) playing an important role in stabilizing demand, not only structural, but also counter-cyclical (2008–2010, 2020–2021). Thus, in 2020, the investment growth rate was 5%, and in 2021, despite the default of one of the largest developers, Evergrande, and a large number of unfinished housing construction, it also remained positive (4.4%).

In 2022, the real estate sector was hit hard and investment growth fell to negative levels (-8.4%) most probably because of the lack of liquidity in the sector due to the large debts accumulated by developers and defaults by some of them. As a result, the completion of many housing projects was delayed. The population refused to pay mortgages, reducing the demand for real estate. COVID-19 restrictions also

affected buyer sentiment (Reuters, 2023). The analysts are not so much concerned about domestic housing problems as they are about the risks to external investors. The prospects of real estate sector are closely monitored by both investors and analysts who have observed certain improvement in 2023 (International Monetary Fund, 2023).

Changes in the structure of capital investment in urban areas between 2006 and 2022 had gone through an instructive path for public policy observers (see table 4). The share of investment in the manufacturing industry kept its top position among all investments (about 1/3 of total fixed investment) and remained almost unchanged (from 28.2% to 31.9%). At the height of the 2009 and 2020 crises, investment fell by 1% and 1.5%, respectively. This was followed by a rapid recovery and return to pre-crisis state in subsequent years: in 2010, 30.9% and in 2021, 31.9%.

The real estate remained the second largest sector in terms of investment, increasing by 1% (from 22.9% to 23.9%). It should be remembered, however, that the Chinese government tends to manipulate the cycle using the counter-cyclical mechanism through investment in real estate: in times of crisis, investment is pumped into the economy.

The share of the industries connected with environmental protection increased from 8% to 11.9%, ranking third in total. In 2022, the People's Republic of China invested 9,530 billion yuan, or \$1,387 billion, in environmental conservation. Production and supply of electricity, heat power, gas and water decreased from 8.8% to 5.1%. Essentially, this change reflects an important step of diverting some investments in public utilities to ecology needs, conservation and climate policies while retaining a very large share, 16.8–17.0%, of total investment. This offers an insight into domestic ecological and energy policies: the expected and officially promised large investments into dramatic reduction of greenhouse gas emission in China by 2060 will probably be financed from this source.

Increases in the share of investment are also typical of the sectors of culture, sports and entertainment (from 0.9% to 1.6%), health and social services (from 0.7% to 1.7%). The share of agricultural investment increased fourfold (from 1.2% to 4.8%), while the share of investment in mining decreased threefold. At the same time, their total share remained almost unchanged, with the total growth of nominal volumes of investment increasing 8 times between 2006 and 2021. The education sector showed a fluctuating trend: in 2019 the investment growth rate increased to 17.7% compared to the decline in 2018, and by 2020 the figures dropped again to 12.3% and continued to decline in 2021-2022 (11.7%, 7.5%, respectively).

The production and supply of gas, water, electricity and information technologies (IT) demonstrated a high growth rate of investment in 2020 (17.6% and 18.7%, respectively). Although the IT industry showed a decline in 2021 (-12.1%), the rate climbed to the highest values in 2022: by 21.8% relative to 2020. The same dynamics could be observed in the production and supply of gas, water and electricity, with 1.1% in 2021 and 19.3% in 2022.

Table 4. Composition and annual growth of investment in fixed assets (excluding rural areas) at current prices, 2006-2021 (%)

| Sector | Share | | | | | | Annual growth | | | |
|---|-------|-------|-------|-------|-------|-------|---------------|-------|-------|------|
| | 2006 | 2008 | 2009 | 2010 | 2019 | 2022 | 2019 | 2020 | 2021 | 2022 |
| Total absolute value (bln. yuan) | 9754 | 14459 | 18177 | 21183 | 51361 | 57955 | 5.4 | 2.9 | 4.9 | 5.1 |
| Agriculture, Forestry, Animal Husbandry, and Fishery | 1.2 | 1.5 | 1.7 | 1.6 | 4.0 | 4.7 | 0.7 | 19.1 | 9.3 | 4.2 |
| Mining | 4.5 | 4.7 | 4.2 | 4.0 | 1.7 | 1.5 | 24.1 | -14.1 | 10.9 | 4.5 |
| Manufacturing | 28.2 | 31.3 | 30.3 | 30.9 | 31.0 | 32.7 | 3.1 | -2.2 | 13.5 | 9.1 |
| Real Estate | 22.9 | 23.8 | 22.2 | 23.8 | 23.4 | 20.6 | 9.1 | 5 | 4.4 | -8.4 |
| Production and Supply of Electricity. Heat Power. Gas and Water | 8.8 | 7.1 | 6.9 | 6.0 | 4.1 | 5.1 | 4.5 | 17.6 | 1.1 | 19.3 |
| Water Conservancy, Environment, and Public Facilities Management | 8.0 | 8.3 | 9.2 | 9.2 | 12.4 | 11.9 | 2.9 | 0.2 | -1.2 | 10.3 |
| Construction | 1.1 | 0.9 | 1.0 | 1.0 | 0.4 | 0.4 | -19.8 | 9.2 | 1.6 | 2 |
| Wholesale and Retail Trades | 2.0 | 2.1 | 2.3 | 2.2 | 1.5 | 1.0 | -15.9 | -21.5 | -5.9 | 5.3 |
| Transport, Storage and Post | 11.9 | 10.5 | 12.0 | 11.5 | 9.3 | 9.0 | 3.4 | 1.4 | 1.6 | 7.8 |
| Hotels and Catering Services | 1.0 | 1.2 | 1.2 | 1.2 | 0.8 | 3.0 | -1.2 | -5.5 | 6.6 | 7.5 |
| Information Transmission, Software, and Information Technology Services | 1.9 | 1.4 | 1.3 | 1.0 | 1.1 | 1.2 | 8.6 | 18.7 | -12.1 | 21.8 |
| Financial Intermediation | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 10.4 | -13.3 | 1.9 | 10.5 |
| Leasing and Business Services | 0.7 | 0.9 | 1.0 | 1.0 | 2.5 | 3.0 | 15.8 | 5 | 13.6 | 14.5 |
| Scientific Research and Technical Services | 0.5 | 0.5 | 0.5 | 0.5 | 1.1 | 1.4 | 17.9 | 3.4 | 14.5 | 21.0 |
| Services to Households, Repair, and other services | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | -9.1 | -2.9 | -10.3 | 21.8 |
| Education | 2.3 | 1.6 | 1.7 | 1.5 | 2.0 | 2.3 | 17.7 | 12.3 | 11.7 | 5.4 |
| Health and Social Service | 0.7 | 0.7 | 0.9 | 0.8 | 1.2 | 2.0 | 5.3 | 26.8 | 19.5 | 26.1 |
| Culture, Sports, and Entertainment | 0.9 | 1.0 | 1.1 | 1.1 | 1.7 | 1.6 | 13.9 | 1 | 1.6 | 3.5 |
| Public Management, Social Security, and Social Organization | 3.1 | 2.3 | 2.2 | 2.0 | 0.8 | 0.6 | -15.6 | -6.4 | -38.2 | 42.1 |

Source: compiled by the authors using data from National Bureau of Statistics of China (2022)

A shift from investment to consumption led to a decline in investment in the largest sectors of the Chinese economy: real estate and manufacturing. The GDP deflator (IMF) was used to convert nominal investment to real investment (2015=100). Real investment in manufacturing industry grew almost 2.5 times, from 8,6 to 21,3 trillion yuan, as well the real estate investment, from 6,66 trillion yuan to 15,98 trillion yuan.

The picture we observe casts certain doubts on the prospects of reducing the capital formation rate in GDP. Obviously, it cannot be one-time dramatic reduction in investments. Yet, as the manufacturing sector is crucial for export and the housing sector for the social and financial stability we may see today and expect in the future certain changes in the structure, but not in the overall rate.

Structure and dynamics of capital investment in manufacturing

Investment in manufacturing comprises roughly one third of the total capital formation. Its branch structure was changing very intensively in 2006-2021 (the years for which the data is available). The changes made it possible to meet the domestic demand for capacities and expand exports in the medium term. Enormous investments have been made to facilitate China's adaptation to the global environment.

Export growth fluctuations added uncertainty to Chinese domestic economic development during the Covid lockdowns. In contrast to investment, export showed two dramatic slowdowns in 2020 and 2022 (Table 5). The average growth rate for sixteen years (2006-2022) is 8.5 % but in the last four years the rates noticeably differed from this figure: 0.2% in 2019, 3.6% in 2020, 29.9% in 2021 and 6.9% in 2022. It is clear that delayed deliveries in 2021 yielded almost 30% growth and a total of 43% over these four years (11,6% average). Difficulties in export expansion had been visible since 2019, but we can assume they were due to contractual, financial and logistical complications for export operations. Some of changes in export dynamics can be easily attributed to the global Covid-19 specific demand: finished textile product exports almost tripled in 2020, and medical exports doubled in 2021.

The "Chinese way" of adapting to global realities has been steady, well-organized and focused investing. Looking at the structure of manufacturing investment (see Table 6), one may distinguish three groups of industries:

- 1) Industries with higher growth (share and volume of investment increase over time);
- 2) Industries with declining shares of total investments in manufacturing;
- 3) Industries with an almost unchanged share.

Branches with growing shares include production of computers (from 6.4% to 10.7%), production of non-metallic mineral products (from 7.1% to 10.6%), production of electrical machinery and apparatus (from 4.2% to 7.1%), production of pharmaceutical products (from 2.9% to 4.2%), special purpose machinery unavailable

Table 5. Shares and growth rates of export by type (%), 2006-2022

| | Shares of export (%) | | | Annual growth (%) | | | |
|--|----------------------|-------|-------|-------------------|--------|--------|--------|
| | 2006 | 2019 | 2022 | 2019 | 2020 | 2021 | 2022 |
| Total value (bln dollar) | 969 | - | - | 2498 | 2588 | 3362 | 3594 |
| Electrical machinery and equipment and parts thereof | 23.48 | 26.84 | 26.57 | 0.91 | 3.61 | 29.88 | 6.89 |
| Telephone sets, incl. telephones for cellular networks or for other wireless networks; | 1.22 | 8.96 | 6.63 | -6.83 | -0.32 | 15.43 | 6.63 |
| Electronic integrated circuits; parts thereof; | 2.22 | 4.09 | 4.30 | 20.59 | 14.58 | 32.75 | 4.30 |
| Diodes, transistors and similar semiconductor devices, photosensitive semiconductor devices... | 0.63 | 1.38 | 1.83 | 18.96 | 3.16 | 36.84 | 1.83 |
| Electric accumulators, incl. separators therefor, whether or not square or rectangular; | 0.53 | 0.68 | 1.59 | 14.04 | 19.49 | 66.77 | 1.59 |
| Other electrical machinery and equipment | 18.88 | 11.73 | 12.22 | -0.87 | 7.15 | 28.57 | 8.79 |
| Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof | 19.26 | 16.68 | 15.36 | -3.1 | 5.61 | 24.45 | 0.80 |
| Computers, other automatic data-processing machines and units thereof; magnetic or optical readers... | 9.6 | 5.94 | 5.22 | -3.75 | 14.66 | 20.19 | -8.12 |
| Parts and accessories (other than covers, carrying cases and the like) | 3.41 | 1.3 | 0.97 | -28.38 | -2.74 | 17.28 | -5.59 |
| Air or vacuum pumps (excluding gas compound elevators and pneumatic elevators and conveyors) | 0.47 | 0.65 | 0.69 | 6.17 | 10.76 | 32.90 | 3.55 |
| Taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, vats or the like | 0.59 | 0.65 | 0.62 | -2.39 | -1.14 | 29.64 | 7.70 |
| Other machinery, mechanical appliances | 5.19 | 8.14 | 7.86 | 2.41 | 0.47 | 28.00 | 7.90 |
| Articles of apparel and clothing accessories | 9.15 | 5.52 | 4.67 | -4.83 | -9.69 | 25.75 | 7.43 |
| Furniture and stuffed furnishings | 2.89 | 3.97 | 3.64 | 2.74 | 10.4 | 27.54 | -6.16 |
| Plastics and articles thereof | 2.29 | 3.37 | 3.99 | 5.02 | 14.52 | 36.0 | 9.5 |
| Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical equipment | 3.37 | 2.92 | 1.96 | 2.09 | 9.99 | 21.51 | -27.93 |
| Transport | 3.97 | 4.48 | 5.58 | -12.42 | -9.63 | 66.17 | 20.25 |
| Other made-up textile articles | 1.25 | 1.12 | 1.05 | 0.15 | 171.01 | -44.62 | -10.01 |
| Toys, games and sports requisites; parts and accessories thereof | 2.34 | 2.5 | 2.88 | 10.07 | 14.54 | 42.4 | 1.45 |
| Articles of iron or steel | 2.59 | 2.77 | 3.07 | 5.65 | 2.53 | 34.49 | 15.5 |
| Organic chemicals | 1.6 | 2.27 | 2.84 | -5.04 | 0.31 | 45.00 | 23.37 |
| Pharmaceutical products | 0.16 | 0.37 | 0.39 | 3.41 | 44.06 | 191.89 | -63.67 |

Source: compiled by the authors using data from The International Trade Centre (International trade in goods statistics by product exports, 2006-2022).

off the shelf (from 4.1% to 8.4%), production of measuring instruments and machinery (from 0.9% to 1.5%), production of articles for culture, education, arts and crafts, sport and entertainment activities (from 0.5% to 1.1%), production of general purpose machinery (from 6.0% to 6.7%). Generally speaking, this group shows the direction and intensity of China's present-day and near future competition on the global markets. Unique growth rates of investment in medicine look dramatic, yet they are natural in the period of pandemic and post-pandemic demand and probably reflect the effort made to carry out special projects.

Declining shares are seen in production of raw chemical materials and chemical products (from 9,7% to 7,8%), production of automobiles (from 6,5% in 2012 to 5%), smelting and pressing of ferrous metals (from 8,7% to 3,5%), production of transport and transport equipment (from 7,5% to 1,5%), production of rubber and plastic products (from 4.1% to 3.7%), production of textiles (from 4.8% to 3.1%), smelting and pressing of non-ferrous metals (from 3.7% to 2.6%), production of metal products (from 4.2% to 1%), production of paper and paper products (from 2.5% to 0.9%), processing of petroleum, coking and processing of nuclear fuel (from 3.6% to 1.7%). China is producing an astonishing number of cars (more than 21 million units), but the amounts invested tend to decline, which is a feature of a mature industry.

The share of investments in the third group has slightly decreased or in some cases stabilized: production of textile, wearing apparel and accessories (from 2.1% to 1.6%), production of liquor, beverages and tea (from 2.1% to 1.8%), production of foods (from 2.9% to 2.8%), production of chemical fibers (from 0.8% to 0.7%), production of tobacco (from 0.4% to 0.1%), printing and reproduction of media (from 1.1% to 0.8%).

Table 6 provides a clear picture of corporate investment response to both market impact and to substantial influence of the planning authorities. Global lockdowns affected the domestic and export demand while investments naturally were more stable.

In 2006-2022, investment grew at an average annual rate of 11.8% and exports at an average rate of 8.5%. The variations during the shock years were significant, especially for individual manufacturing industries and product categories. The previous monotonous growth of exports and investments is not observed in the last three "shock" years; the economy is shifting investment to more advanced high-technology industries with export potential thus constraining investment growth, albeit at high level, even in the automotive sector.

During the given period, both stable investment growth rates and volatility are clearly seen, indicating the logic of state planning. We believe a significant decline in the share of investments in ferrous metal production may be interpreted as a planned decision and the growth of the share of investments in the medical products field in 2019-2021 as a mixture of state planning and market demand.

Table 6. Shares and growth rates of investment in manufacturing by type (%), 2006-2021.

| | Shares (%) | | | | | Annual growth (%) | | |
|---|------------|---------|---------|---------|---------|-------------------|-------|------|
| | 2006 | 2012 | 2019 | 2020 | 2021 | 2019 | 2020 | 2021 |
| Total value, bln.yuan | 2628,4 | 12336,7 | 21384,9 | 21377,3 | 22623,4 | 3,1 | -2,2 | 13,5 |
| Production of Computers, Communication and Other Electronic Equipment | 6,4 | 4,8 | 8,2 | 9,3 | 10,7 | 16,8 | 12,5 | 22,3 |
| Production of Non-metallic Mineral Products | 7,1 | 9,7 | 10,1 | 9,8 | 10,6 | 6,8 | -3 | 14,1 |
| Production of Special Purpose Machinery | 4,1 | 6,8 | 7,3 | 7,1 | 8,4 | 9,7 | -2,3 | 24,3 |
| Production of Electrical Machinery and Apparatus | 4,2 | 6,7 | 6,5 | 6,1 | 7,1 | -7,5 | -7,6 | 23,3 |
| Production of General Purpose Machinery | 6,0 | 6,8 | 6,9 | 6,4 | 6,7 | 2,2 | -6,6 | 9,8 |
| Processing of Food from Agricultural Products | 4,5 | 5,5 | 5,1 | 4,9 | 5,5 | -8,7 | -4 | 18,8 |
| Production of Medicines | 2,9 | 2,9 | 3,2 | 4,1 | 4,2 | 8,4 | 28,4 | 10,6 |
| Production of Automobiles | i/ä | 6,5 | 6,3 | 5,5 | 5,0 | -1,5 | -12,4 | -3,7 |
| Production of Raw Chemical Materials and Chemical Products | 9,6 | 9,1 | 7,2 | 7,1 | 7,8 | 4,2 | -1,2 | 15,7 |
| Production of Rubber and Plastics Products | 4,1 | 3,5 | 3,5 | 3,4 | 3,7 | 1,0 | -1,2 | 13,2 |
| Smelting and Pressing of Ferrous Metals | 8,7 | 4,2 | 2,6 | 3,2 | 3,5 | 26 | 26,5 | 14,6 |
| Production of Textile, Wearing Apparel and Accessories | 4,8 | 3,2 | 3,1 | 2,9 | 3,1 | -8,9 | -6,9 | 11,9 |
| Production of Foods | 2,9 | 2,5 | 2,7 | 2,7 | 2,8 | -3,7 | -1,8 | 10,4 |

Source: The National Bureau of Statistics of China (2022).

Conclusion

Chinese economy continues its fast economic growth in spite of external shocks and internal demographic problems, inequality, and post-pandemic health issues. It is true that 5-6% growth rates are less impressive than the previous 10%, but they are well above the global norms. The engine of this growth is still capital formation and export. While Chinese investments are considered by the OECD to be 90% private, one may see deep involvement of the government into the dynamics and structure of capital formation through both cyclical and structural components of government policies. Obviously, investments in real estate are not only used to solve social problems, but also as a counter cyclical instrument. Large public utilities and ecology segment

are diversifying over time into conservation programs, which is good news for global prospects of preventing climate change.

At the same time, the country has not attained the objective to increase the share of personal consumption in GDP and decrease the capital formation rate as a way to get some independence from global demand fluctuations. Macroeconomic proportions and inequality in the economy and society remain essentially the same. Interrelations between revenues, profits and investment in industries of manufacturing show similar characteristics from 2006 to 2021.

The picture of changing sectorial and industry shares of real investment reflects tremendous efforts of planning authorities and companies to catch up with changes in domestic and global market demand. In a span of a few years - especially in 2020–2022 - investments in some industries demonstrated substantial fluctuations, reflecting export instability and changing plans. Chinese authorities are clearly focusing on high-tech production in the electronics and machinery sectors and, after the start of the pandemic, medicine, by building new physical capital in the relevant industries.

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