

Whether Infrastructure Investment Can Still Light the Way for China's Economic Carriage?

Renyuan Cui^{1, †}, Qinjue Jiang^{2, †, *}, Jingyi Liu^{3, †}

¹Jinan Foreign Language school, Jinan, 250108, China

²Wycombe Abbey School, Changzhou, 213000, China

³ Canadian International School, 649414, Singapore

*Corresponding author: donnajiang@hbut.edu.cn

†These authors contributed equally.

Abstract. The treatment of economic crises is one of the key topics of research for economists today. China successfully solved this problem through infrastructure investment during the global recession in 2008. However, for the last few years, because of the enormous pandemic effects on the global economy, many economists remain doubtful about the usefulness of infrastructure investment. Therefore, this paper uses historical research and analysis of the current economic environment to find that China can make infrastructure investments applicable in the context of the epidemic through digital innovation, economic transformation, and productivity improvements. In addition, the 4 trillion-yuan investment can be still useful if combined with other policies such as the Belt and Road Initiative.

Keywords: New infrastructure investment, 4 trillion-yuan investment, The Belt and Road.

1. Introduction

Infrastructure investment occupied a significant proportion of China's gross domestic product, which is also a valuable project that the Chinese government pays attention to. A research report from Yongding Yu, who is the consultant of Peoples Bank of China, he has indicated that most of the land of sales-related revenue from China has goes to infrastructure construction, which was around 10 percent. [1] Over the past 20 years, China has dominated public infrastructure, and has invested heavily. In the sector of transportation in China, such as the market access that is provided by investments, the domestic market has been integrated in a facilitated way, reducing production and transportation costs, and enabling China to compete domestically and internationally. In this paper, we are focusing on three main parts of the infrastructure investment in China which still light the way for economic carriage. In section one, it introduced how has the belt and road initiative from China has made an investment based on Chinese economics. In section 2, it discussed new infrastructure in promoting economic growth. For section 3, the 4 trillion-yuan investment has introduced, which was based on a huge financial crisis from 2007 to 2008. These investments will explore and explain how infrastructure investment still lights the way of China's economy and also how each of it engaged a significant role in China's economy.

2. Investment on China's Belt and Road

Infrastructure investment stands for a form of real assets, which are physical and tangible. Bridges, roads, highways, sewage systems and energy that we see everyday will be counted as an infrastructure investment, an asset that is vital to the development of a country.[2] In China, the government is the main driver of trying to become the second largest economy country in the world after the pandemic period, due to Beijing trying to Offset repeated headwinds from coronavirus lockdown and housing downturn. To achieve this, the Chinese government has expanded the infrastructure investment by the way of financial supporting, it has made a significant rise about 7.7%.[3]

Due to Reuters, infrastructure investment is still lighting the way for China's economic carriage. China's economy has been slowly recovering by the shock of supply from the second quarter's

massive lockdowns. For reinvigorate the economy, doubling down on infrastructure development has become one of the government's main goals, and to fund large-scale projects, which is about a 800,000 million Chinese yuan from the government that pledged in new credit lines and also a financial bonds of 300 000 million Chinese yuan for bank of policy.[4]

Chinese consumers are existing the situation of losing jobs and income fallings, which caused them lives difficulty. Not only that, but the war in Ukraine, the extremely high costs of raw materials and the hurdles of supply chain also shows a risky future. [4] However, the inflation of now in Chinese consumers has been brought under the dominate and the authorities' room for economic development has been stimulated. While the most feasible move for Beijing is to put a higher amount of money in the infrastructure projects, it seems not enough to make up for weak real estate spending. [5] For the returns on project which are traditional, such as roads, train stations and also airports, China beginning struggled about expanding the fresh infrastructure tend to be 5G internet and artificial intelligence.

China has created an ambitious BRI program, which is to build the physical and digital infrastructure that connects with a few countries spanning from Asia to Europe and also the Middle East. According to official data provided by China, in the past decade or so, China has signed more than 170 "Belt and Road" cooperation agreements with 125 countries, including Asia, Europe, Africa, and the South Pacific, and 29 international organizations. [6] Nearly \$800 billion has been invested to the project of Belt and Road, it also has been expected to invest a dollars of trillions in a network of six development corridors through Chinese infrastructure projects. Although the BRI does not strictly ensure that all projects are economically and environmentally friendly, China has changed its attitude towards the BRI in recent years, and more money is now flowing to more robust projects.[6]

China has boosted its overall economic growth through the project of Belt and Road, with participation energy sector also transportation of particular making up the bulk of the project of China's Belt and Road. In 2021, total participation in the energy industry will reach 22.3 billion US dollars, of which oil and gas transaction volume is much higher than before. [7] Among them, oil transactions In all of 2021, 10 oil transactions total of \$6400000 million, contrast the amount of 2020, which was with only \$1900000 million. Second, China's participation in natural gas-related projects in 2021 is about US\$4.5 billion, while in 2020 it is only US\$1.8 billion, more than twice as much. All natural gas projects in China are construction projects, such as gas field expansions. Furthermore, one of the other keyway was the engagement that related to the transportation, which has provided a way of trading among China and other countries with the BRI, and is significant to the economic growth. In 2021, China has invested in four aviation-related projects around the world, worth about \$810 million. More railways have been built, including a 422-kilometer railway between China and Laos, which cost about \$6 billion, 70 percent of which came from loans from Chinese financial institutions. [7] For China, ports are important investors in global ports. In 2021, the total investment in overseas ports will be about 3.1 billion US dollars.

3. New infrastructure investment

Throughout the history, infrastructure investment has brought huge impact on China's economic development, especially in the responding to 2008 financial crisis. However, the previous research has highlighted China's traditional infrastructure investment over three decades has accumulated huge debt, caused turmoil in financial institutions, and lead to economic downturn [8]. Therefore, the authors conclude China should switch to low levels of quality infrastructure investment. Also, the outbreak of Covid-19 has exposed the vulnerability of the traditional economic system. On the one hand, the offline production and operation is difficult to cope with the dynamic changes of market demand and international supply chain. On the other hand, digitalized enterprises can make dynamic adjustments and minimize the negative impact of the epidemic through flexible production and remote operation more efficiently. Therefore, China's economic transformation from traditional

industries to high technology manufacturing and highly skilled services, so strengthen the development of digital information technology is necessary to bring kinetic to future economic growth [9]. Consistent with previous study, China's economy is transforming to digital infrastructure, which means the country is in a stage of high-quality development. In a national conference, it was stressed that the construction of new infrastructure should be accelerated. New infrastructure is an important initiative to promote current and future economic acceleration. The aim is to prosper the digital economy, promote the transformation and upgrading of China's economy, and achieve high-quality development [10].

The traditional infrastructure investment is mainly focused on the Transportation, energy source infrastructure, such as high-speed railway, highway, bridge, etc. Different from the traditional infrastructure investment, "new infrastructure" refers to the infrastructure construction of digital information technology, which represented by 5G network, AI, internet. The recent statistic has showed the new investment in the field of digital economy has contribute 67.9% to the economic growth [11]. Current investments in new infrastructure promote economic growth by fostering innovation in the digital sector, facilitating economic transformation, and improving productivity [12].

3.1 Innovation in digital sector

Promoting long-term economic quality and rapid development needs to be innovation-driven rather than relying on factors. Firstly, new infrastructure improves regional technological innovation by reducing transaction costs. The existing research found that the enterprise transaction cost mainly comes from the information cost. In the recent years, information technology is upgraded through new infrastructure in many aspects such as IA, large amount of statistic and 5G. Hence, new infrastructure reduces the cost by provides more convenient trading platform and tools, broaden their search and trading scope, which extended information communication, optimizing production and transaction process, improve information transparency and eliminate the information asymmetry [13]. Secondly, new infrastructure improves regional technological innovation level through rising the technology mobility. Different from the traditional infrastructure investment, the new digital infrastructure can transfer technology through the circulation of information and improve the frequency of diffusion without geographical changes in capital, labor, and technology [14]. Therefore, interregional technology spillover helps to realize the sharing of knowledge and technology, and cutting-edge knowledge and technology can be more easily obtained, and thus improve the level of digital innovation.

3.2 Economic transformation

China's economy pursues quality economic growth. The new infrastructure investment is essential to optimize the economic structure and to win the international competitive advantage. The new infrastructure investment encourages the economic transformation in aspect of demand and supply side [12]. On the one hand, the supply has subsided capital intensive for labor intensive. For example, the development of artificial intelligence in manufacturing, driverless, driving, finance, supply chain, education, and healthcare, etc. improve the efficiency of data use and promote machines to replace manpower [15]. Thereby, new infrastructure investment promotes the use of capital, instead of labor, because the marginal output of capital will be much larger than that of labor.

On the other hand, the demand has switched from manufacturing product to services. New infrastructure investments require technologies that come from service production, such as 5G. The core of 5G development is the industrial Internet platform. The essence of the platform is to collect extensive data from industry through the network and provide data storage, management, display, analysis, modeling and application innovation environment, which also requires continuous investment in data services. As result, new infrastructure investment requires more value-added input in services sector compared to traditional one, so as to improve the product demand of the service industry [15].

3.3 Increase in efficiency of production

The new infrastructure increases the labor productivity through promotion of resource-allocation efficiency [12]. New investment breaks the original equilibrium of resource allocation within the industry by motives transformation of resources from slow to fast production stage, thus achieves the efficient allocation of resources. Previous study further examines the idea and defined the new infrastructure as two standard – broad and narrow sense. Through modelling, author conclude new infrastructure investment from 2004 to 2017 has significantly promoted the increase of labor productivity in China, which has an obvious spillover effect. In a broad sense and narrow sense, the new infrastructure has brought a significant role in promoting various industries, increasing the annual labor productivity by 1.39% and 2.09%, respectively [16].

3.4 Evaluation

New infrastructure construction has a long-term positive impact on economic growth in China due to its high output efficiency, as well as strong industrial driving force. It should also be noted that China is a country with a large population, manufacturing power and Internet power. China has the market scale conditions for developing the digital economy that no other country can match. New infrastructure has rich application scenarios and broad market space. Accelerating the construction of new infrastructure is the accelerator for transforming China's economy from a big one to a strong one.

However, it is always important to mention that, at present, the development of China's digital economy is still in its infancy, new infrastructure is the weak board, which most of enterprises are in the stage of learning from others [11]. So, the development of digital economy is restricted as the integration of information technology and real economy in China is not deep enough. On the one hand, there is still a gap between the manufacturing capacity and quality of new infrastructure-related hardware products and demand; On the other hand, the software design which embodies the ability of scientific and technological innovation also has shortcomings. As result, aforementioned problems must be remedied if China wanting to boost its future economy by invest in new infrastructure.

4. Trillion-yuan investment

4.1 Policy effects

There was a huge financial crisis from 2007 to 2008. Many countries experienced depression. As the trading partner of these countries, China's imports and exports have been affected, which brought a negative effect on the Chinese economy such as unemployment. In order to solve this economic crisis, the 4 trillion-yuan stimulus plan was enacted by the Chinese government in November 2008. [16] During this project, infrastructure investment was properly introduced. It is the most significant category, accounting for approximately 37.5% of the overall package, which includes 10 key fields, including rural infrastructure, technological innovation, low-income housing, the environment, electricity, transportation, and disaster recovery, particularly after the earthquake on May 12 [17]. According to China's National Bureau of Statistics, GDP in China increased by 8.7% from 2008 to 2009 [18].

China chose to use this expansionary fiscal policy to respond to its own economic issues. According to the AD-AS model, in short run, the aggregate demand increased since the increase in government spending, consumption and investment. The short-run aggregate supply increased since the rise in investment led to increasing capital accumulation. In long run, the long-run aggregate supply also increased, which means the Chinese economy grew at that time, and the total productivity of all goods increased.

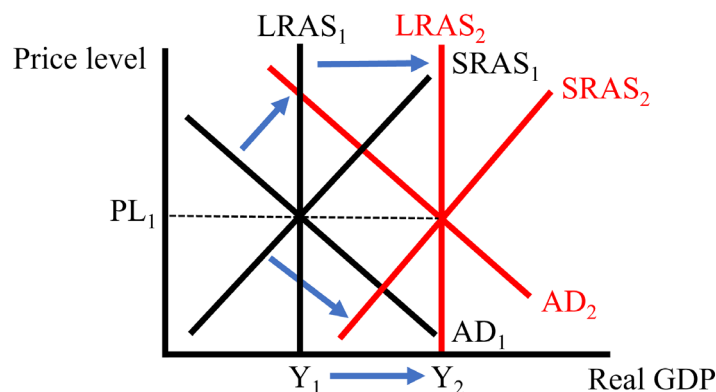


Figure 1. AD-AS Model

Also, by the data, the Chinese economy is also recovering nicely. For instance, the Composite Index of the Shanghai Stock Exchange has increased by 45% in 2009 (until June 3, 2009). On a yearly basis, industrial output increased by 7.3% in April 2009 (after increasing by 8.3% in March 2009). Additionally, April 2009 saw a 14.8% increase in retail sales and a 6.4% increase in real estate investment (year-on-year). [19]

However, such infrastructure investment also brought some troubles. Infrastructure projects, in most cases, are supported by governmental bonds. Under such a circumstance, the demand for loanable funds would increase. According to the graph of the loanable fund market, the real interest rate would increase, and the crowding-out effect would occur, which means the private investment would be crowded out. Private manufacturing enterprises' investment decisions were severely hampered by the significant increase in real interest rates. [20] This reallocation of investment from the private to the public sector is likely to reduce China's prospects for long-term growth, particularly in the regions where local governments have issued the most debt because these have significantly higher productivity than their state-owned equivalents. [21] In this case, the aggregate demand would not grow as expected.

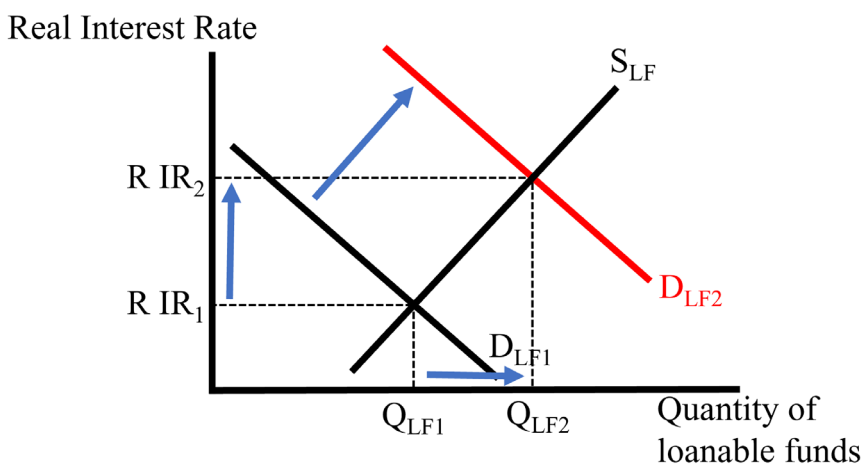


Figure 2. The Supply and Demand in The Loanable Fund Market

What's more, when these bonds were reclaimed, a large quantity of money would flow to the economy. The amount of money in circulation would significantly grow because of the money multiplier. Since the velocity of circulation and real production remain constant in the Fisher equation $MV=PY$, an increase in the money supply would also result in a rise in the price level, which would indicate inflation. Although inflation is not visible in the whole society, it has hit the real estate sector hard. The housing price index (HPI) is a good indicator that clearly shows the price changes of residential housing. According to the data, HPI increased from 140 in 2007 to almost 165 in 2009 [22], and M2 also increased by 73.6%. [23] It is the sign of the real estate bubble, and it imposed the citizens a large burden of finding a place to live. Furthermore, the possibility of a housing bubble bursting and a subsequent precipitous slide in housing prices also terrifies real estate investors,

householders, and even the local government, which owns a sizable amount of land and depends heavily on the real estate market for its revenue. [24]

The Chinese economy still suffers from a number of structural imbalances as a result of infrastructure spending. During the 2000s, the consumption rate in China has been dropping for years and has been far below the global average. [25] Production capacity has expanded quickly as a result of infrastructure investment, while demand growth has lagged behind these developments, leaving a persistent surplus of capacity. Without government intervention, the Chinese infrastructure sector suffers from significant resource misallocation, which was shown in the low return on some investment projects. According to the data, China's steel production kept declined about 26.2% since 2008 because of the deficiency of domestic demand. [26] However, after the stimulation package was launched, these loss-making industries kept producing, creating much more excess capacities, which the whole society could not support them. [27] One way to solve this problem is through international cooperation. The Belt and Road Initiative is a good example. It is well known that in some backward countries they are in great need of technology to build public utilities. It is a coincidence that China has advanced technology for infrastructure building. [28] China not only can improve its global status and maintain friendly relations between countries, but also can solve the problem of overcapacity caused by China's traditional infrastructure investment policy. It's a win-win for both countries. We can analyze this policy by using the balance of payment. Some corporations that purchase infrastructure have overseas divisions that enter into agreements with foreign infrastructure projects, which is known as foreign direct investment. In this case, China can get the payment through the current account. In addition, some domestic businesses perceive these initiatives as exports of construction services and offer these services directly for payment, which can be seen as a credit in the trade balance in the current account. Furthermore, other countries can borrow money from institutions like the Export-Import Bank of China in order to pay for these builders of infrastructure and designers of blueprints, which is the debit in the financial account. It will bring a huge economic gain to China [29].

4.2 Evaluation

A serious epidemic that is currently affecting the entire world is a threat to all economic systems. The globe is once again teetering on the brink of a worldwide financial collapse, just like it did in 2008. There is a wise way for economists to solve the problem is that learning from historical experience. The 4 trillion-yuan investment policy is a great example. China, as a result, was the first major nation to emerge from the crisis. GDP has also improved significantly, and numerous nations with plenty of resources were able to avoid the economic downturn because of China's strong growth. China's powerful, wealthy, and efficient public sector is the crucial factor behind this policy's effectiveness.

However, the massive injection of money also raises a number of issues. Extremely strong expansionary fiscal policy will inevitably cause the price level to rise and cause drastic inflation. In fact, it contributed to an asset bubble that accelerated the rise in land and housing costs in 2009, more than double in several major cities. What's more, the Chinese economy cannot absorb the overcapacity caused by the overproduction of companies that received the investment. If economists want to make this fiscal policy be more effective, China must use it in combination with other economic policies. Multiple policies could supplement each other's weaknesses so that China would be able to overcome the economic crisis caused by the pandemic.

5. Conclusion

In this paper, we analyze the impact of infrastructure investment during financial crisis and recent epidemic. We found that during the time covid-19 epidemic, economic turmoil, and the market downtown, the Chinese government uses new infrastructure investments to recover the economy and achieve both short-run and long-run qualitative economic development. Economic growth cannot

happen without domestic innovation, economic transformation and an increase in productivity. New infrastructure investment promotes innovation in the digital sector by reducing the transaction cost and rising technology mobility; it is a key factor in having a new round of industrial revolution by switching from labour intensive to capital intensive and manufacturing product to service; lastly, it motivates the transformation of the industry from low to high productivity sector, so leading economic close to the stage of resources allocation efficiency. However, currently, the digital sector is a wakeboard in China, so to better boost the economy in future, China should deepen the relationship between technology infrastructure and the economy by making data collection more convenient and having an independent and controllable sharing platform.

During the period of the financial crisis, China imposed 4 trillion yuan on traditional infrastructure investment to rise aggregate demand and both short-run and long-run aggregate supply. However, there are limitations, the infrastructure project financed by government bonds finally led to a crowding out effect as interest increases. Thereby, the increase in aggregate demand and economic growth did not meet the expectation. After the bond is reclaimed, the rising in the money supply caused inflation. The impact on real estate is most stark as housing prices reached a spiking period at the main time. Furthermore, the infrastructure investment resulted in a prolonged surplus in capacity due to a lack of demand and large production capacity. But after China had increased international cooperation, the problem of overcapacity had been solved and a strong relationship with foreign countries had been established. For example, expansion in foreign direct investment and export all led to a surplus in the domestic current account. Other counties also borrowed money from a bank in China to pay for infrastructure construction, which also brought a large amount of financial gain to the Chinese economy.

References

- [1] Anon Web. Worldbank. Org, 2022.
- [2] CFI Team, Infrastructure Investments. March 28, 2022
- [3] Bloomberg News, - China Readies \$1.1 Trillion to Support Xi's Infrastructure Push. 2022
- [4] Hou Xiangming and Yao Kevin. Exclusive: China plans \$75 billion infrastructure fund to revive economy, July 5, 2022 2:54 AM EDT.
- [5] Briefing, C. China Infrastructure Investment in 2022 - Spurring Economic Growth, China Briefing News. 2022.
- [6] China's Belt & Road Initiative: Infrastructure Investment for Sustainable Development | A4ID "China's Belt & Road Initiative: Infrastructure Investment For Sustainable Development | A4ID". A4ID, 2019.
- [7] Wang Christoph. "Brief: China Belt And Road Initiative (BRI) Investment Report 2021 – Green Finance & Development Center". Greenfdc.Org, 2022.
- [8] Atif Ansar, Bent Flyvbjerg, Alexander Budzier, Daniel Lunn. Does infrastructure investment lead to economic growth or economic fragility? Evidence from China, Oxford Review of Economic Policy, Volume 32, Issue 3, 2016, Pages 360–390.
- [9] Zhu Min, Zhang Longmei, Peng Daoju. China's industrial structure transformation and potential economic growth rate. Social Sciences in China, 2020(11):24.
- [10] People's Daily, 2020. New infrastructure accelerated the transformation of our economy from big to strong.
- [11] Jia Kang. "New Infrastructure Construction in China: Both Urgent and Long-Term Support" SSRG International Journal of Economics and Management Studies, vol. 7, no. 4, Apr. 2020, pp. 54-59.
- [12] Xin Du, Hengming Zhang, Yawen Han. How Does New Infrastructure Investment Affect Economic Growth Quality? Empirical Evidence from China. Sustainability 2022, 14, 3511.
- [13] Lou Min, Li Liangyu. Business innovation in the Internet era: from the perspective of value creation [J]. China Industrial Economics, 2015(1): 95 - 107.
- [14] Zhao Xing. Research on the Technological Innovation Effect of New Digital Infrastructure. Statistical Research, 2022, 36(4).

- [15] Guo Kaiming, Pan Shang, Yan Se. Investment in new infrastructure and industrial structure transformation and upgrading [J]. *China Industrial Economy*, 2020(3) : 63 – 80.
- [16] Schmidt, D. The Financial Crisis and Its Impact on China. *China Analysis*, 67, 2009.
- [17] Consulate-General of the People's Republic of China in Chicago. China's 4 trillion-yuan stimulus to boost economy, domestic demand. 2008.
- [18] National Bureau of Statistics of China. Statistical Bulletin of the People's Republic of China on National Economic and Social Development in 2009. 2010.
- [19] Morrison, W. China and the Global Financial Crisis: Implications for the United States. Congressional Research Service, 7-5700. 2009.
- [20] Zhang, L., Brooks, R., Ding, D., He, H., Lu, J. and Mano, R. China's High Savings: Drivers, Prospects, and Policies. 2008.
- [21] Wong, C. The Fiscal Stimulus Programme and Public Governance Issues in China [J]. *OECD Journal on Budgeting*, 2011, vol. 11/3 <https://doi.org/10.1787/budget-11-5kg3nhljqrjl>.
- [22] Wu, F. Commodification and housing market cycles in Chinese cities [J]. *International Journal of Housing Policy*, 2014, 15(1), pp.6-26.
- [23] Tradingeconomics.com. 2022. China Money Supply M2.
- [24] Huang, Y., Pagano, M., Panizza, U. Local Crowding Out in China, 2017.
- [25] Statista. 2021. Final consumption as a share of the gross domestic product (GDP) in China from 1980 to 2020.
- [26] Tradingeconomics.com. 2022. China Steel Production.
- [27] Zheng, Y., Chen, M. How Effective will China's Four Trillion Yuan Stimulus Plan Be [J]. *The China Policy Institute*, 2009, Issue 49.
- [28] Boffa, M. Trade linkages between the belt and road economies (English). Policy Research working paper, no. WPS 8423 Washington, D.C.: World Bank Group. 2018.
- [29] OECD. The Belt and Road Initiative in the global trade, investment and finance landscape. 2018.