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Understanding the Factors behind China's Economic Growth and its Growth Trends in the Future

Sadhika Thapa
Union College - Schenectady, NY

Understanding the Factors Behind China's Economic Growth and their Impact on Growth Trends in the Future

by

Sadhika Rajeshwari Thapa

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ABSTRACT

THAPA, SADHIKA RAJESHWARI. Understanding the Factors Behind China's Economic Growth and their Impact on Growth Trends in the Future

ADVISOR: Eshragh Motahar

Since the implementation of economic reforms in 1979, the Chinese economy has transformed to one of the fastest growing economies in Real GDP terms. China's GDP growth averaged at 9.19 percent, annually, between 1989 to 2021. In 2018, the World Bank described this growth as being the fastest sustained expansion in history. This thesis aims to understand the factors behind China's impressive economic growth. The empirical framework estimates the impact of Total Factor Productivity (TFP), Foreign Direct Investment (FDI), and Openness on China's Real GDP. The results indicate that a 10% increase in TFP, FDI and Openness leads to a 7.7%, 7.5% and 0.5% increase in Real GDP respectively. TFP remains positive and statistically significant throughout the three regression models, indicating that TFP plays a crucial role in China's Real GDP. More recently China's economy has shown signs of slowing down, the International Monetary Fund projects the growth rate to fall to 5.5% by 2024. China's rapid economic growth is reminiscent to the economic growth of its East Asian neighbors like Japan and the Four Asian Tigers after the end of World War 2. I also compare the growth model of China to the one implemented by Japan and the Four Asian Tigers to analyze whether China's economy will experience a similar abrupt slowdown. The Chinese government's role in resource allocation cannot be over looked. As China shifts its focus to rebalancing its economic growth to escape the middle-income trap, the Xi Jinping administration is playing a greater role in resource allocation. In order to get a holistic picture of China's economic growth in the future it is important to consider government initiatives to maximize productivity, therefore, this paper also

analyzes recent news from China about economic goals, the Belts and Road initiative, and the Made in China 2025. This paper finds that Chinese government's economic policies need to be more effective to increase efficiency in the long run.

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CHAPTER ONE

INTRODUCTION

This chapter introduces the research question, its significance and the contribution of this paper to existing literature. This chapter also outlines the rest of this paper.

a. Statement of Core Research Question

My research question is what factors have led to the economic growth of China and whether these factors will continue helping the Chinese economy's growth trend. The Chinese economy has been able to grow at a substantially high rate even after economic crises like the Asian Financial Crisis and the Great Recession of 2008. However, China's GDP growth in the third quarter of this year grew by 4.9% compared to 7.9% in the last quarter. 2021 marks the beginning of China's 14th Five years plan to become a modernized socialist economy, which is keen on increasing more high-tech production, semiconductors in particular. Despite an initial recovery from the effects of COVID 19, the below expected growth rate in the third quarter of this year has raised questions about economic slowdown. Crackdown on technology, private education, and the real estate sector plays into this slowdown. Given China's importance in the world economy, this slowdown may hurt the world economic growth. The Chinese economy accounts for 15% of global trade and a quarter of the projected world economic growth for the next four years. The IMF predicts the that the Chinese economy will grow at 4.8% in 2022 and 5.2% in 2023, a sharp decline from its 8% growth rate between 2014 to 2019. The Chinese central bank however, remains optimistic projecting an economic growth between 5.1% to 5.7% until 2025 (Xie, 2022).

Currently China is trying to escape the middle-income trap, which requires economic reforms. The World Bank defines the middle-income economies as those economies that have a per capita income between $1,000 to $12,235. Since 2015, China is an upper middle-income country. The middle-income trap is defined by an inability to successfully shift to modern services as the country lack the necessary infrastructure. At the same time the wage of workers is increasing and therefore, decreasing the export driven growth. Diversification of the economy, types of good exported, and structural changes are very important as it enables reallocating resources from activities with low productivity to high productivity helping the economy escape the middle-income trap.

What makes the economic growth of China particularly interesting is that it is transitioning from a planned economy to a semi-market economy. Many Asian countries have made this kind of transition in the past and experienced high rates of economic growth even though their pre-transition condition may not be identical. Export promotion and rapid industrialization played an important role in achieving this high growth rate. The Four Asian Tigers serve as a model for other developing countries, and we can certainly see that China's economic growth has been elevated by similar factors. The economic growth of the Four Asian Tigers dwindled after the Asian Financial Crisis. While Japan was ineffective in responding to the Asian Financial Crisis, China implemented effective policies and gradually shifting the balance of power in the region to its favor. This leads to the question, will China's economic growth experience such a slowdown in the near future since these economies have had a similar growth trend. The success of Asian economies and their growth model have raised many debates, especially over interventionist industrial policies. Scholars argue that once Japan, Korea, Singapore, Hong Kong and Taiwan caught up with the level of technological advancement as

that of the west, the model didn't produce such high levels of growth. However, the growth strategy adopted by these Asian countries enabled them to make a mark in the world market and substantially improve the standards of living of their population (Garran, 1998).

b. Significance of Contribution

I contribute to literature by looking at multiple factors' contribution to China's economic growth. Current literature tends to focus only on one factor's growth trend. This paper includes all the factors that helped China's economic growth as indicated by previous literature and helps highlight which of these factors has been playing a consistent role in increasing China's GDP growth. The results can then be used to analyze China's current reforms and initiative to predict whether China's economic growth will slow down or not. I will be looking at more recent events like the Belts and Road initiative, Made in China 2025 and their potential impact on these factors to discuss China's economic growth in the near future. My paper will also focus on looking at more recent news from China about factors like education and FDI to better understand China's economic growth in the future. This is a significant contribution because most literature on China's economic growth mathematically extrapolates China's economic growth. In order to do so they assume that the growth and contribution of the factors remains constant overtime. However, in the case of China this assumption may not be ideal because the Chinese government has great control over the economy and resource allocation. The Chinese Communist Party under Xi Jinping seeks greater state control, which is in contrast to the vision of Deng Xiaoping who engineered the economic reforms in China in 1978. The government's reform initiatives have been crucial to China's economic growth. Therefore, it is important, especially when analyzing China's recent economic growth slowdown, to consider government reforms.

c. Structure of thesis

This thesis is divided into six chapters. Chapter Two gives readers a historical background on the China's economy and important government reforms. The purpose of chapter Two is to highlight the role of the CCP in controlling factor allocation to increase productivity. Chapter Three offers a review of the relevant literature on factors that have affected China's economic growth. Chapter Three also compares the factors that have led to China's economic growth to those that enabled the economic growth of Japan and the East Asian Tigers. The last section of Chapter Three also highlights recent news from China pertaining to the factors that affects China's economic growth. Chapter Four presents the analytical framework to answer my thesis question and the data description. Chapter Five presents the regression results its interpretation, and implication for China's economic growth. Chapter Six provide a conclusion.

CHAPTER TWO

HISTORICAL OVERVIEW OF THE CHINESE ECONOMY

This chapter provides an overview of China's economy after the end of World War 2 and the establishment of the Chinese Communist Party (CCP). Section A highlights the initial economic reforms implemented by the CCP under the leadership of Mao Zedong. During this time China aimed to improve its industrial productivity and be self-sufficient to decrease interaction with the capitalist West. Section B focuses on the opening of the Chinese economy under the leadership of Deng Xiaoping and China rise as a manufacturing hub. During this time China's productivity and Foreign Direct investment increased significantly, aiding the country's economic growth. In Section 3, I look at more recent initiatives like the Belts and Road Initiative (BRI) and the Made in Chines 2025 initiative undertaken by the Xi Jinping administration and their impact on China's productivity. Looking at these initiative gives us a better picture of how factor productivity of China will be affected in the future. The purpose of this chapter is to highlight the extent of the Chinese government's control over the economy. Unlike the Western government that exercise free market allocation of resources, the Chinese government controls the allocation of its resources to a great extent to produce optimal results. Especially right now as it hopes to increase its economic productivity in order to escape the middle-income trap.

a. Mao's Reforms

In 1957 the Chinese Communist Party leaders, who had recently gained control of China from Chiang Kai-shek's Nationalist Party, realized a plan to fix China's agricultural and industrial shortage. They had asked cadres to go into the countryside and increase production.

The Great Leap forward encouraged production by forming backyard furnaces and communes although they weren't as efficient and effective as they were presumed to be. The vision was to get the country out of the risk of famine and let the people know what the communist ideology really was. Chairman Mao had got the idea from his visit to Soviet Union that same year. The furnace was used to melt scrap steel in to usable steel so that China wouldn't have to rely on imports. And the communes were built to encourage more women to participate in agriculture and manufacturing. The communes facilitated daycare for children and food for all members of the commune so that most women are freed from their household duties and are able to participate in production. Desperate to meet the production quotas workers would melt personal items as the penalty for not meeting the quotas were high. The steel produced from these furnaces were of low quality. Agriculture production went well for the first year as the soil was in good condition but as more workers were being allocated to the production of steel, the crops started rotting. Cadres had an incentive to report high numbers to the leadership as they too feared repercussion. Since cadres were reporting such high numbers, the agricultural products were being taken to the more urban regions for even distribution of crops. This left many rural communes without enough food. The already starving population was hit by a massive flood in 1959. After failing to increase the GDP of China, the Great Leap Forward campaign came to an end in 1960. The death toll was 45 million.

Zhu (2012) writes that the Chinese government continued it unbalanced growth strategy with minimal adjustments. Mao wanted to compete with industrial nations and hoped to do so my collectivizing agriculture and greater industrialization. Resource allocation was centralized under the Communist party, most projects were undertaken with little input from experts, and served as an experiment to introduce new agricultural techniques. The economic implication of

this campaign was a great shortage of food supply and a subsequent decline in population. The allocation of resources to the manufacturing sector also didn't have the intended return, increase the urban population and further strained the food supply. After the failure of the great leap forward, Mao saw that social goals weren't completely consistent with rapid growth in the short run thus changing his priority to social goals.

The Cultural Revolution of 1966 was another campaign initiated by Mao which had a greater sociopolitical implication on China than it did on the economy. However, it is important to note that Mao was able to revolutionize a great mass of young people to believe that he was a great communist leader and that centralized governance was the path for China's future success. Many youths protested and stopped going to schools and colleges. The protests led to the decrease in factory production, railroads were chaotic and food supplies decreased. All in all, economic activity slowed down to a certain extent and China really was not in a position to bear a decline in production.

Paus et. al. (2009) write that the economic experiments led by Mao skipped stages of production hoping to propel China ahead of capitalist western countries. Mao wanted to achieve national and regional self-sufficiency which critiqued the notion of comparative advantage. He aimed to build a comprehensive and independent industrial system which led to inefficiency. Zhu (2012) writes that after the Great leap forward the household registration system, hukou system was implemented to prevent farmers from leaving rural regions. This enabled the government to extract agricultural surplus which helped capital accumulation in the industrial sector, however, it reduced the productivity of farmers. The capital to output ratio grew by 140 percent between 1952 to 1978. Average years of education also increased significantly between those years. Zhu (2012) writes that despite the decrease in productivity the capital accumulation and education

helped increase China's GDP per capita. However, he further writes that the industrial policy pursued by the Chinese government between 1952-1978 created a misallocation of resources that declined productivity, minimal improvements in living standards, and decreased productivity overall.

b. Deng Xiaoping's Economic Reforms and Post-Mao China

After Mao's death in 1976, there was an opportunity for change. Under Mao the economic structure was centralized and the government allocated most of the resources. The economy was inefficient leading to a low growth rate, minimal consumption and technological progress. Soon Mao's goals of self-reliance were replaced by an open-door policy. Perkin (1989) writes that Chinese leadership began to alter the system that had evolved over the previous two decades. As the changes were implemented to the system, economic growth accelerated to an average of 8% a year, between 1977 and 1985. Zhu (2012) writes that economic reforms and institutional changes which increased productivity growth in China have taken place in experimental and decentralized method. The ultimate source of this rise in productivity was the change in political leadership at the top.

Under the leadership of Deng Xiaoping, the one child policy was implemented to control the population growth and avoid starvation. Deng Xiaoping's reforms built on the four modernizations: agriculture, industry, technology and defense. In 1981, Deng decollectivized agriculture and farmers were also given individual control over land. They were now able to control the profit of their output. This increased China's agricultural productivity. There was a relaxation of constraints on the state owned as well as collectively owned enterprises. Deng's policy relied on material incentives and lower price control. Town and village enterprises in the

country side enabled China to produce labor intensive goods and provided employment to the rural population, helping bridge some of the rural urban gap. They specialized in the production of textile, furniture and metal processing (Magnus, 2018). Capital allocation for enterprises also shifted from centrally allocated to banks, bonds and other financial instruments (Delisle and Goldstein, 2019).

Zhu (2012) writes that total factor productivity grew rapidly in the agricultural and non-state sector. The average growth rate between 1979 to 2007 was 4.031 and 3.91 in both the sectors respectively. The average rate of the state sector remained significantly low until 1998, after which the state sector grew at an average rate of 5.5 percent. He writes that 15th congress of the Chinese Communist Party in 1997 was a milestone for Chinese economic policies. Private enterprises were legalized and sanctions for the reform of state enterprises were introduced. This led to an increase in private enterprises. Most importantly the self-imposed isolation of China changed and shifted towards a greater role of foreign engagement to increase China's modernization. Numerous enterprises were granted the right to engage in international trade. In an attempt to join the WTO, China started to lower its trade barriers, broaden trade rights, and liberalize Foreign Direct Investment infrastructure. Four special economic zones were created in the southeast part of China in the initial years of economic reform, which served as a host for foreign investment. As investment increased the special economic zones were extended to more coastal cities. Wider sectors of the Chinese economy were opened to foreign investment. Delisle and Goldstein (2019) write that this gradual opening up to foreign investments reflects an early recognition of the benefits of foreign direct investment to China. They also realize the usefulness of international competition in catalyzing change. Zhu (2012) further finds that trade

liberalization and privatization increased competition in the manufacturing industry which led to higher productivity while the state sector which was exposed to little

c. Belts and Roads Initiatives & Made in China 2025

Looking at more recent economic initiatives by the Chinese government, two monumental initiatives are the Belts and Road initiative and the Made in China 2025 plan. In 2013, President Xi Jinping announced the Belts and Roads initiative during his visit to Kazakhstan. The infrastructure investment plan aims to create a network of railways, energy pipelines and highways that connect Asia, Africa and Latin America. During the Association of Southeast Asian Nations (ASEAN) in Indonesia the same year, President Xi Jinping announced his plans for a 21st century Maritime Silk Road, which aims to invest in port development in the Indian ocean to connect Southeast Asia to East Africa and Europe, to accommodate the increase in trade volume.

From an economic standpoint BRI provides China with new investment opportunities and an export market. Domestically, Kong et. al. (2021) find that the BRI has significantly increased the economic development of Chinese cities along the BRI route. They measure use TFP of a city as the proxy for the economic development of a city and BRI has improved the quality of economic growth in Chinese cities on the routes, compared to those that aren't on the route, by 0.191 units. They further find that the BRI has increased the Real GDP of Chine by 0.867 units and foreign investment by 0.82 units. Their paper specifically investigates the impact of the BRI on technological innovation, industrial structure upgrading, and resource allocation on the quality of economic growth of cities in China along the BRI route. Their findings indicate that BRI has promoted technological innovation and improved the quality of economic growth.

Similarly, they find that BRI has promoted the upgrading of industrial structure contributing to the overall increase in TFP of the city. They also find that BRI has improved the resource allocation efficiency of the cities on its route which has had a positive impact on TFP. They conclude that the BRI helps optimize and upgrade industrial infrastructure, improve urban resource allocation efficiency, and is the most effective way to achieve sustainable development.

Liu and Xin (2019) write that the Ministry of Environmental Protection has emphasized the need for sustainable development as China shifts from an input driven economy to an output driven economy. They look at the impact of BRI on green total factor productivity (GTFP), which takes into consideration resource and environmental constraints on TFP in addition to the input constraints. They find that BRI construction has promoted GTFP in both the Silk Road Economic Belt and the Maritime Silk Road regions and some provinces in China. However, they do find a negative relationship between provincial level economic development and GTFP. They note that this is in line with the environmental Kuznets curve where in pollution increases along with economic development, before reaching a point, inflection point, where the pollution slows down as economic growth continues to increase. They noted that a lot of the provinces had still not reached the inflection point. They believe that this is because R&D and economic development in these provinces haven't reached a point where foreign trade has clear positive impacts on GTFP.

The Chinese government has also launched the Made in China 2025 initiative, which aims to make China a dominant manufacturer of the high-tech goods and services. They aim to reduce China's dependence on foreign technology. Recently the Chinese economy has started shifting away from the low value added and low wage manufacturing primarily to escape the middle-income trap. The middle-income trap is a phenomenon characterized by a slow-down in

economic growth due to the diminishing return of the factor which led to its growth. Therefore, new sources of growth and productivity are required to escape the trap. McBride (2019) writes that currently China faces an unbalance economy with a low domestic consumption rate and high savings rate. By upgrading their manufacturing technology, China hopes to more up the value chain. The first step of the process, Made in China 2025, comprise of overall improvement of the quality of manufacturing, boosting innovation, and productivity. By 2025, China aims to boost competitiveness and improve innovation capabilities. Finally, on the 100th anniversary of the founding of the People's Republic of China, in 2049, it aims to have the capabilities to lead innovation and have a comparative advantage in major manufacturing areas.

Morrison (2019) writes that the implementation of the Made in China 2025 initiative signals an expanded role of the government in the economy, which can cause distortions in the global market. The Chinese government will provide financial assistance to Chinese firms especially state-owned enterprises. The government encourages Chinese companies to invest in foreign companies in the high-tech sector to gain access to technology while foreign firms that want to invest in China are compelled to form joint ventures with Chinese firms requiring them to share sensitive intellectual property and technological knowledge with the Chinese firm. Ramadori (2021) writes the after extensive backlash Chinese policy makers have eradicated provisions to better enable foreign investments and strengthen the protection of intellectual property rights. The end goal of the Made in China 2025 initiative is to create a self-sufficient high-tech industry and insulate itself from punitive trade sanctions from countries like the US.

Conclusion

Throughout Chinese history we see that the Chinese Communist Party has had a great control over the allocation of resources which in turn has substantially changed the productivity of the Chinese economy. Especially the reform implemented by Deng Xiaoping helped China achieve high economic growth and make its mark in the global economy. The current initiative like the BRI and Made in China 2025 initiative demonstrate the Chinese government's control over the economy and creating government policies that will continue to affect the Chinese economy's productivity and growth. The impact of the BRI has been extensively researched for its impact on the countries that will be along the route, Kong et. al. (2021) and Liu and Xin (2019) look at its impact on Chinese cities. They find that resource allocation and TFP are positively affected in cities along the route of the BRI. As for the Made in China 2025 initiative, some policies have raised concerns about intellectual property theft among countries like the US. Successful implementation of these policies will enable China to move up the supply chain and increase efficiency, which is essential for per capita income growth.

CHAPTER THREE

REVIEW OF LITERATURE

In this chapter I analyze and present literature on China's economic growth. The chapter is divided into three sections. Section A highlight the various factor that literature suggests is the key to China's economic. Section B compares China's economic growth model to the growth model followed by its East Asian neighbors. Section C summarizes more recent news pertaining to the factors highlighted in section A to better understand China's economic growth in the future. Section A helps understand China's impressive economic growth, section B and section C build on previous literature to analyze what course China's growth trend may take in the future.

a. Factors Affecting China's Economic Growth

Awan (2013) analyzes the role of R&D expenditure, savings and investment in GDP growth. The main question he seeks to answer is whether it is possible for an economy to sustain positive growth through investments in capital stock and savings. Using a Vector Autoregression model to capture the relationship between labor productivity, export, investment and R&D, he finds that in the long run exports and capital accumulation contribute to productivity. R&D expenditure affects investment and indirectly affects productivity through investment, showing a positive effect in both long and short run. He finds that export has a greater effect on productivity than investment. More efficient allocation of resources and greater competitiveness in the international market, increases spillover from technology transfer. The reallocation of investment from traditional to more dynamic sectors due to fiscal incentives given by the Chinese

government, is also an important factor in aiding the spectacular growth of China. He observes that investment is growing faster than export since the late 1960.

Cao and Jariyapan (2012) investigate the relationship between FDI and economic growth and also the relationship between economic growth and the interaction of FDI with two types of human capital, knowledgeable human capital and technical human capital. They define knowledgeable human capital, the share of enrollment of university and college students over the total employment. Technical human capital is defined as the share of enrollment of specialized secondary school (including vocational school and technical school) students over total employment. They find that between the period of 1995 and 2009, FDI positively affects the economic growth but is statistically insignificant. The interaction term between FDI and knowledgeable human capital has a greater positive impact on economic growth and is statistically significant. A one percent increase in FDI together with knowledgeable human capital increases GDP by 0.45%. They also find that knowledgeable human capital is more efficient than technical human capital. Their findings are contrary to beliefs that FDI in China has always been beneficial. They argue that the complementary effect of FDI and knowledgeable human capital increase the growth of a host economy. They also find that the interaction term between FDI and technical human capital has a negative effect on the GDP, but attribute it to the lack of data. They conclude that FDI contributes to economic growth only when absorptive capability of advanced technologies is available in the host economy. In the case of China, higher academic education is needed compared to secondary technical education.

Yao and Zang (2003) write that the devaluation of the RMB and FDI have played an important role in creating a solid foundation for China's export growth. In the external environment the exchange rate, FDI and export all together have created a favorable environment

for economic growth. Reforms in the exchange rate market promoted exports and FDI. In the internal environment human capital played a greater role in increasing economic growth than transportation and location (province).

As Cao and Jariyapan (2012) highlight the importance of human capital in addition to FDI as key to China's economic growth, Bailliu et. al. (2019) predict that between 2010-2030 the working age population will shrink by 7%, people between the age of 15-29 will make up only 30% of the working population. They estimate the trends of China's economic growth so far using the Cobb-Douglas production function. In order to predict human capital development, they carry forward the observed educational characteristics of the 2010 cohort. They predict that secondary enrollment increases by 9% while tertiary employment increases by 20%, thus average years of education will increase in the future. R&D spending's contribution to total factor productivity is significant, they predict that the real FDI stock will grow at 5% in the future. They conclude that factor productivity will be the driving force of Chinese economic growth. Implementation of government reform to enhance productivity will have a positive impact on TFP growth.

Liu and Wang (2003) analyze the relationship between TFP and FDI and whether TFP plays a role in attracting FDI in a particular sector. They find that FDI in a certain sector is affected by the level of export, market size, and skill intensity, further writing that there is no two-way link between FDI and total factor productivity. They find a positive relationship between FDI and total factor productivity. Since technological progress is an important determinant of total factor productivity growth in the long run, they conclude that technological progress has a positive relationship with FDI. Like Cao and Jariyapan (2012) they find that the

interaction between human capital and R&D, which serves as a proxy for innovation, has a positive and significant effect on total factor productivity.

Similarly, Zeng et. al. (2009) observe that in the future, China has to rely more on total factor productivity than capital deepening. They analyze the effect of factor accumulation, factor allocation and total factor productivity growth to understand the growth of China. Subsidies on land, electricity, and other utilities like water and availability of cheap loans for state owned enterprises have enabled high growth of investments. China's investment strategy therefore has three major side effects. It has enabled a buildup of excess capacity, which has led to greater exports, which has increased China's foreign reserve, the increase in money surplus leads to further investment. They further write that there are signs of too much investment in the manufacturing for exports. Most FDI comes from firms that are small or medium sized bringing relatively little advanced technology. Policy makers soon realized that investment alone was not increasing productivity and that total factor productivity due to urbanization, investment in human capital and technological innovation would help economic growth.

Prime (2012) argues that more reforms and improving technology will be vital for China's economic growth in the future. She highlights that after joining the WTO, the western and central regions of China have opened to FDI. Increasing use of capital relative to labor, expanding export, advanced technology, and greater efficiency of the economy through market reforms has propelled China's economic growth. However, the strongest contributor to China's economic growth according to Prime (2012) is savings which have enabled high levels of investment and slow population growth. She further writes that without new resources and technological change, China's output may decrease overtime. It is difficult to decrease the population growth even more because it is already low and has begun to age. Since savings are

already quite high and overcapacity due to investment is already a problem, it is increased consumption that can be China's economic growth engine in the future.

Looking at demographic data, Black and Morrison (2019) too believe that China's slowdown is inevitable. They find that the working age population is decreasing, without a dramatic improvement in labor productivity, this will lead to a decrease in GDP. They compare China's economy to that of Japan and argue that Japan had a similar decrease in labor productivity and find it unlikely that China will succeed where Japan has failed. In addition to labor productivity, excess supply of rural workers and access to foreign technology is weakening. In the case of Japan, as its population growth started decreasing, domestic consumption decreased which led to Japanese firms slipping off of the Global 500 list. A country can increase productivity by either increasing immigration or increasing the productivity of the given workers. Since 2006, the urban-rural migration has decreased and this is being reflected by the increase in labor wage rates. Corporate and government debt is also on the rise. Due to the high savings rate and current account surplus, China has been able to sustain its borrowing. Black and Morrison (2019) predict that due to lower productivity growth the government is likely to borrow more through state owned enterprises.

b. Is China Following the East Asian Growth Model?

Perkins (1989) writes that an increase in the inputs for production like capital and labor or an increase in the productivity of these inputs are essential to economic growth. In South Korea and Taiwan capital stock grew at a higher rate than national products, labor force growth however wasn't as significantly high. Labor force and increase in capital stock only accounted for half of the national product growth rates from 1950s to 1970s. The other half was accounted

for by the increase in productivity. He writes that Africa, in the 1970s and early 1980s, too experienced a substantial capital formation and had a greater labor force growth than East Asian countries, however, the national product growth rate averaged at 3 percent while the growth rate in East Asia was 9 to 10 percent. This was because there was no increase in productivity, and in fact much of the region experienced a decrease in productivity. He further writes that growth rate in China between the years 1977 to 1985 averaged at 8 percent and that productivity growth accounted for most of the growth. As China has a greater size than its East Asian neighbors, China's future will depend on whether it moves away from central planning. He predicts that if China comes up with an efficient urban economic system and if the international market is willing to accommodate increasing Chinese exports; China can achieve similar growth as that of its East Asian neighbors.

Boltho and Weber (2009) write that while there isn't an agreed definition of what the East Asian Development model means, for the purposes of their study they describe it as a development model consisting of a rapid growth in investment, manufacturing sector, external competitiveness, protection of domestic firms from international competition, fairly authoritarian government, and a homogenous population. In their paper they are specifically looking at the growth of Japan, Taiwan and South Korea. This definition suits my thesis as well, therefore, moving forward the Asian Development characteristic will refer to those mentioned above. They observe that the growth rate of China is identical to that of Japan, South Korea and Taiwan and the total factor productivity rates are also very similar. Rapid growth in these economies was made possible because of high savings, investment rate and external competitiveness. Investment effort in Japan, South Korea and Taiwan was mostly in the private sector, while in the case of China most investment has taken place in state owned enterprises. The private sector has had a

difficult time getting funds. China's export trend has also been very similar to its East Asian neighbors. Despite China's relative poverty it has a higher level of human capital formation, compared to Japan, and that investment in human growth was substantial before economic growth.

Overholt (2018) highlights that the China Model, like the Asian Model, is gradually opening its national market, removing state-imposed pricing of goods and services, and developing regulatory infrastructure that enable the market to function smoothly. It is doing so gradually instead of a shock therapy, which didn't go well for the Soviet Union. China has broken up most of its monopolies in the 1990s, to achieve efficiency through competition. He further argues that competition has enabled efficiency leading to the creation of companies like Lenovo; instead of having firms inefficient companies pampered by the state. Overholt (2018) writes that the extent of Chinese leaders' acceptance of competitive success remains to be seen. He notes that Prime Minister Xi Jinping's decisions seem to be encouraging inefficient state-owned enterprises (SOE).

Zheng et. al. (2013) write that a major characteristic of China's economic development is that it has become a major economy without having a large group of internationally competitive firms. The Chinese economy has been heavily reliant on the import of foreign manufacturing technology. Such was not the case for countries like Japan and Korea. Industrial policy, which selected certain industries over others for fixed and technological investment to increase economies of scale, was crucial for the development of Japan and Korea. Each economy had a conglomerate of private firms, which benefited from shared R&D and government subsidies on input, called Keiretsu and Chaebol. Boltho and Weber (2009) highlight that China's economic growth lacks such a conglomerate. China's industrial policy focused more on State owned

enterprises instead of private companies. Another major difference between China and the three countries in their study is that China has been more open to FDI. The authors write that this is because China was preparing for its accession in the WTO which required it to forgo protectionist behavior. Japan and Korea over the years aimed to move away from an export basket with light manufacturing to heavy manufacturing while China did the opposite. They also note that in China an interesting difference can also be observed between China and its East Asian neighbors, income distribution. Even though China is socialist there is an emerging urban rural gap unlike that in Japan, Korea or Taiwan. This is reflective of Deng Xiaoping's famous phrase "Let some get rich first" which was his pitch to the Chinese population to popularize his economic reforms. Special Economic Zones were created along the coastal regions, which led to the prosperity of the people who lived in those regions while those in the central and western region didn't gain from the economic reforms.

Prime (2012) also writes that the urban rural divide ensures an endless supply of cheap labor which has helped export oriented industry to keep costs low. The hukou system is a household registration system that limits the permanent migration of the rural population to the urban regions. Therefore, most rural workers travel for work temporarily and are referred to as the "floating population". This system along with a preference for the east coast, which has historically had better capital, infrastructure, and educated labor force, has sustained the urban rural divide in China and has led to an increase in the income inequality in China. This prompted the Chinese government in 2000 to begin a program called "Develop the West" to invest more government funding into infrastructure, education and health in the western provinces to address geographical inequality.

Jia and Chao (2016) compare the growth strategy of China and the growth strategy of the Four Asian Tigers. Several major features, including high investment rates, rapid trade-opening, strong export orientations (with an undervalued currency), active government interventions and macroeconomic management, have arguably been critical for the growth experience of these economies. Many economists are worried that the Chinese mainland would follow the Four Tigers' growth path and that its growth might suddenly end. The authors found that the four Asian tigers relied more on physical capital accumulation. Government intervention as a share of GDP encouraged GDP growth in Taiwan and Mainland China but had a hindering effect on the other economies. Significant reform efforts should be made to reduce the heavy dependence on the high investment rate and export by encouraging greater consumption.

Krugman (1994) writes about growth accounting and the importance of an improvement in efficiency in sustaining economic growth rates. He highlights that the economic growth of the Soviet Union, after the end of World War 2, can be fully explained by the increase in input like expansion of employment, increase in education level, and considerable investment in physical capital. Therefore, Soviet Union's growth was not as mysterious or shocking as the west had perceived it to be. He argues that economic growth based on the expansion of input instead of a growth of output per unit of input is subject to diminishing returns, therefore, a slowdown of the economic growth is inevitable. He further wrote that the future prospects of the rapid growth of Asian economies is also limited, and so it was. The only secret to Asian economies growth according to Krugman is their willingness to sacrifice current satisfaction for future gains.

More recently Overholt (2018) also highlights the same issue with China's economic growth as Krugman (1994) did with the growth of Soviet Union and Asian economies like Japan. Overholt (2018) notes that China's net export growth is declining as China's wage rate has

increased and manufacturing is cheaper in countries like Vietnam, Bangladesh and other African countries. The efficiency of infrastructure investment has declined to a great extent that it might become negligible. Boosting domestic consumption is the solution to China's economic growth problem. Since it is difficult to increase consumption through just subsidies on goods and services, the government is focusing on supply side reforms like facilitating urbanization, reducing red tape and encouraging entrepreneurship and innovation.

c. Recent News on Productivity, FDI, and Government Initiatives and Reforms

In the last quarter China's economic growth was 4.9%. Many economists believe that this is due to the lagged effect of 2020, they question whether China needs to rethink its policies for the rest of 2021. Xie (2021) writes that China long-term aims to regulate the real estate industry, internet companies and private tutoring as officials blame high housing and education cost as a burden to the middle class, discouraging many to have children.

The Chinese government claims that the economy is facing three-fold pressure – contraction of demand, supply shock and weakening expectation. Retail sales growth and consumption's contribution to China's GDP has slowed down while COVID 19 continues to disrupt the production and labor market (Sun 2021). Tang and Wang (2022) write that a decrease in the birthrate adds to the problem. In 2021 the births dropped to 10.6 million from 12 million in 2020, causing the birth rate to be at a record low of 7.52 births for every 1,000 people. With the natural growth of the population at 0.34 the speed of population ageing is faster than expected. Wang and Sun (2021) note that the job losses due to the pandemic has decreased household income, which has further lowered people's willingness to have more children. However, a

number of initiatives have been taken on the provincial and municipal level by giving parents financial support and time off for having a second or a third child.

Goldman (2021) writes that despite the crackdown on real estate, which accounts for a fourth of the GDP, China continues to grow because consumption has stayed on track and strong net exports. However, Lee and Tang (2021) write that Fitch and Morgan Stanley predict that China's economic growth is likely to deteriorate in 2022. They highlight three main reasons: the COVID-19 delta variant, upcoming leadership reshuffle, and rising debt levels. Due to China's zero tolerance policy, some cities in China are still under a lockdown due to the delta variant. The deleveraging of property developers, according to Fitch ratings, will decrease China's economic growth rate. Morgan Stanley believes that China may pause to balance growth and debt management. The chief China economist at Morgan Stanley predicts some tax-cuts and consumption subsidies are necessary to keep up the economic growth. Wei (2021) further writes that China's aim to reduce carbon dioxide emission by 2030 has led to a decrease in the generation of electricity from coal powered plants, the power outage has affected production in many factories. He further writes that the goals of the policies are reasonable but the implementation is generating greater economic loss.

For the first time China has decided not to set a target labor productivity and economic growth rate. China's productivity is expected to slow-down as its labor force is expected to shrink. However, Beijing aims to increase the average number of years spent in school, particularly in rural regions to have a more skilled and educated labor force. As of 2016 only half of the youth in rural regions attend high school, most rural youth chose to follow their parents' footstep and find work in the city. Leng and Lee (2021) write that as the hukou system is relaxed in cities with lower population density, a greater rural population may be able to access better

healthcare and education. Another major challenge for China to avoid the middle-income trap is also to have 60% of its labor force that has graduated high school. As of 2015 only 30% of China's labor force had graduated high school or higher.

Siqi (2021) reports that especially after the pandemic, more recent college graduates are applying to government jobs instead of the private sector, which is contrary to the sentiments of the previous generation. Due to the pandemic uncertainty in the private sector has increased. The Chinese youth is concerned about the high living cost, work pressure of the private sector opting for a more certain government job with steadier income and benefits. Last year 1.576 million applicants applied for a total of 25,726 positions.

In most developed countries, consumption as a share of GDP is about 70-80%. In the case of China, the consumption as a share of GDP is around 55%. Ip (2021) writes that the first three quarters of 2021, consumer spending contributed 64.8% of GDP. Boosting consumption spending is the economic priority for the top leadership. The upper middle income is expected grow by 68% between 2020 to 2030. Chinese consumers are being encourage to spend more by increasing discounts and deals on e-commerce platforms, minimum wages on the provincial level is regularly adjusted for inflation and living cost. Ip (2021) further writes that reliance of export-oriented strategy is unsustainable especially amidst deteriorating relations with trade partners. Therefore, China's leaders are implementing a more inward-looking strategy to drive economic growth. Zipser et. al (2021) finds that consumers in the upper middle-income bracket are going to drive consumption growth in China. By 2030 they estimate that the middle and upper middle-income consumers' contribution will increase to 60% of urban consumption from 35% as of 2021.

Conclusion

A review of relevant literature indicates that FD, TFP, human capital, increase in export, and government interventions to enhance factor allocation have played an important role in increasing the GDP growth of China. Joining the WTO gave China an incentive to open up its economy and decrease barriers to entry. The Chinese economy emphasized investment in human capital and innovation to help economic growth. Scholars predict that factor productivity will be the driving force of Chinese economic growth. Implementation of government reform to enhance productivity will have a positive impact on TFP growth which will increase economic growth.

While the Chinese development model is different from the Asian development model, there are some similarities like the emphasis on export-oriented growth, growth in investment, and opening up of its economy to foreign competition. However, the Chinese economy is mostly powered by state owned enterprises while countries like Japan and South Korea had business conglomerates that undertook major productions and R&D. Many economists warn that China may follow the Four Tigers' growth path and soon experience a decrease in growth rate. Krugman (1994) compared the Soviet Union's growth with that of the Four Asian Tigers and found that these economies were able to grow at high rates only because there was an increase in inputs thus diminishing return led to a slowdown of these economies. In order to keep a modest economic growth rate China needs to focus more on factors that increase the output per input to increase efficiency.

In the previous chapter, I highlighted government initiatives like BRI and Made in China 2025. The Made in China 2025 initiative hopes to increase high tech manufacturing in China and move up in the supply chain. Having a high-tech manufacturing infrastructure will increase value-added and thus, increase the productivity of its inputs which can subsequently increase the

efficiency of the economy. Recent news about the Chinese economy shows an emphasis on rebalancing the economy to achieve sustainable growth. Escaping the middle-income trap and increasing domestic consumption remains the top priority of government policies. With an increase in crackdown on private enterprises, many young college graduates are applying for government jobs instead of private sector jobs. This may accelerate the economic slowdown as its labor force is also expected to shrink.

CHAPTER FOUR

ANALYTICAL FRAMEWORK

This chapter presents the analytical framework and the model that will be used to estimate the effect of TFP and FDI on the GDP of China. In the Section A, I describe the three models I will be using to understand the relationship between the independent and dependent variables. In Section B, I will present the data that I use for my empirical analysis and the summary statistics. I will also highlight the trend of TFP and FDI in China to better understand its effect on the GDP.

a. Model

The literature reviewed in the previous section emphasizes the contribution of Foreign Direct Investment and Total Factor Productivity to the economic growth of China. Cao and Jariyapan (2012), Yao and Zang (2003), and Liu and Wang (2003) highlight the role of FDI in China's economic growth. While Cao and Jariyapan (2012) dig deeper and interact FDI with knowledgeable human capital to investigate the effect of FDI on China's economic growth, Yao and Zang (2003) find that FDI and exports together promote economic growth. Liu and Wang (2003) investigate the relationship between FDI and TFP believing that FDI will be greater in a sector with a higher TFP. However, there is no two-way link between FDI and TFP, and that the positive relationship between FDI and TFP is due to technological progress. Bailliu et. al. (2019) decompose China's economic growth trend into capital stock, TFP, labor and human capital. They predict that over the next 15 years capital accumulation will slow down and while TFP growth will continue to grow, therefore, TFP will be an important determinant of China's economic growth. Economic reforms to rebalance China's economy also focus on promoting TFP. Therefore, TFP and FDI are included in my model and are the variables of interest.

Looking at the Asian Development model, literature review suggests that opening up to trade played a major role in the economic growth. Boltho and Weber (2009) and Zheng et. al. (2013) write that external competition and rapid growth in investment has helped East Asian countries increase economic growth and can be seen doing the same for China. Therefore, I include a proxy variable for economic openness, called Openness.

Contribution of FDI to economic growth is dependent on the host country's ability to absorb advanced technology. The ability to absorb advanced technology refers to the infrastructure of host countries but also the literacy of its population. In order to account for this, I include Human Capital Index in my model. Human Capital Index quantifies the contribution of education and healthcare in increasing the productivity of workers, therefore making it a key indicator for sustainable development. To further analyze the effect of FDI, I include the capital stock to labor ratio. Alam et. al (2013) write that FDI is bound to impact the labor productivity of the host economy due to technological transfer and managerial knowledge transfer to local firms. Literature review suggests that FDI is important for China's economic growth, I wanted to understand how impactful technological transfer has been for labor productivity therefore, I create a proxy variable to calculate this by dividing the capital stock by total labor force. This variable will shed light on how technology is affecting labor productivity.

Prime (2012) writes that China's household registration system, *hukou*, has been advantageous to China as it has created an endless supply of low-cost labor for jobs in the export-oriented industry, decreased cost of construction and kept wage rates low. Therefore, I include labor participation rate in my model to account for the supply of labor in China, which is one of the most populous countries in the world. Prime (2012) further writes that China joining the World Trade Organization enabled the opening of the its central and western region to

foreign investment. To understand the effect of China's accession into the WTO, I create a dummy variable that has the value 0 prior to 2001 and takes the value 1 post 2001.

My empirical model is as follows:

$$\text{Real GDP} = \beta_0 + \beta_1 \text{FDI} + \beta_2 \text{TFP} + \beta_3 \text{Openness} + \beta_4 \text{Human Capital Index} + \beta_5 \text{Inflation} + \beta_6 \text{Labor Force Participation} + \beta_7 \text{Capital stock to labor ratio} + \beta_8 \text{WTO} + \varepsilon \quad (1)$$

Equation (1) estimates the relationship between Real GDP and the variables of interest FDI and TFP. In order to better understand the relationship between Real GDP and the variables of interest, I run a regression with the log of each variable. Doing so helps linearize the variable thus, we are able to see a liner relationship between non-linear variables. Equation (2) estimates the relationship between the log of Real GDP and log of FDI and log of TFP. The variable WTO is not logged as it is a dummy variable.

$$\text{Log Real GDP} = \beta_0 + \beta_1 \log(\text{FDI}) + \beta_2 \log(\text{TFP}) + \beta_3 \log(\text{Openness}) + \beta_4 \log(\text{Human Capital Index}) + \beta_5 \log(\text{Inflation}) + \beta_6 \log(\text{Labor Force Participation}) + \beta_7 \log(\text{Capital stock to labor ratio}) + \beta_8 \text{WTO} + \varepsilon \quad (2)$$

In equation (3) I look at the first difference of the log of each variable. The log of each variable is lagged by a year and the difference between the two years is estimated. This helps check for stationarity in the data. Lack of stationarity indicates that the trend has predictable patterns in the future.

$$\Delta \text{ Log Real GDP} = \beta_0 + \beta_1 \Delta \log (\text{FDI}) + \beta_2 \Delta \log (\text{TFP}) + \beta_3 \Delta \log (\text{Openness}) + \beta_4 \Delta \log (\text{Human Capital Index}) + \beta_5 \Delta \log (\text{Inflation}) + \beta_6 \Delta \log (\text{Labor participation}) + \beta_7 \Delta \log (\text{Capital stock to labor ratio}) + \beta_8 \text{WTO} + \varepsilon \quad (3)$$

b. Data Description

This study uses data from 3 main sources World Bank DataBank, Federal Reserve Economic Data, and the Penn World Table (Version 10). The frequency of the data that I use for this research is annual. The data ranges from the years 1990 to 2019.

The Total Factor Productivity (TFP), at current purchasing power parities, the data comes from Federal Reserve Economic Data (FRED) maintained by the Federal Reserve Bank of St. Louis. They measure the total factor productivity level at Current Purchasing Power Parity by dividing the change in real GDP between year t and year t-1 which is then divide by quantity index of factor inputs. The data ranges from the years 1956 to 2019.

In Figure 1, to better highlight the impact of Total Factor Productivity on the economic development of China, I look at the TFP at Constant National Prices for China indexed the year 1980 to be the base year. This data is only used for figure 1 to highlight the effect of TFP in the Chinese economy. I use constant purchasing power parity for the data in the regression analysis with USA indexed 1. In late 1978, under Deng Xiaoping, China opened up its economy to the West. The effects of the economic opening are lagged therefore I chose 1980 as the base year. Figure 1 shows the trend in TFP. The orange line indicates the base year 1980. Looking at the graph post 1980, we can see a significant increase in TFP. Between the years 1999 to 2010, we see a steep increase in TFP. This is of great interest as this increase could be due to China's

accession into the World Trade organization in 2001, and its steps taken in preparation for its accession in the years before 2001. Furthermore, in Figure 1 we can see that there has been a steady decline in TFP since 2014, and seems to have plateaued after 2018. This helps addresses the second part of my thesis question, whether the factors that have contributed to China's economic growth will continue to sustain China's growth trend in the future. A scatterplot of the relationship between TFP Current Purchasing Power Parities and China's Real GDP between the years 1990 to 2019 in the Appendix shows a positive relationship between the two variables.

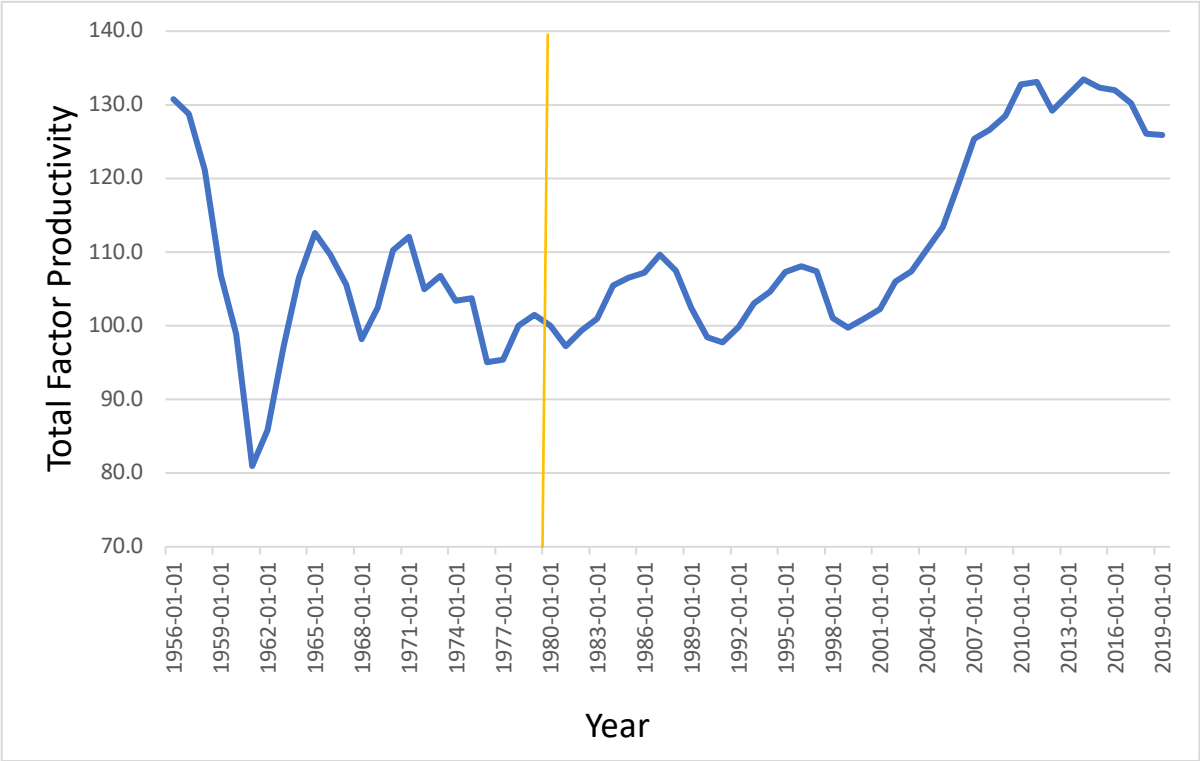

Figure 1: Total Factor Productivity at Constant National Prices for China, Index 1980=100, Annual, not seasonally adjusted.

The Foreign Direct Investment (FDI) data comes from the World Bank, for the purposes of this paper I use FDI net inflow BoP in current USD. FDI is calculated as the sum of equity capital, reinvestment of earning, and other capital. FDI net inflow indicates the investments made by non-resident investors in China. According to literature review FDI has been crucial to

China's economic growth by enabling better access to technology which in turn makes production more efficient. Figure 2 shows the FDI inflow trend from the years 1979 to 2019. We can see that after 2004 there has been a significant increase in FDI flow to China. There is a steep drop in 2008 to 2009 reflecting the impact of the Great Recession, followed by a steeper increase in FDI inflow since 2010. From the year 2008 to 2019 we can see that FDI inflow has become more volatile than in the years prior to 2008. From 2013 to 2017 there was a consistent decline in FDI inflow, Morrison (2017) notes that between January 2013 to December 2016 China's FDI recorded a year on year downward trend. In 2016 it experienced an all-time low for both job and project creation. China global rank for FDI also dropped down to the fourth position from the second position in 2013. In 2017, the Chinese government announced plans to decrease restrictions on foreign firms to operate in China. A scatterplot of the relationship between FDI Net Inflow and China's Real GDP between the years 1990 to 2019 in the Appendix shows a strong positive relationship between the two variables.

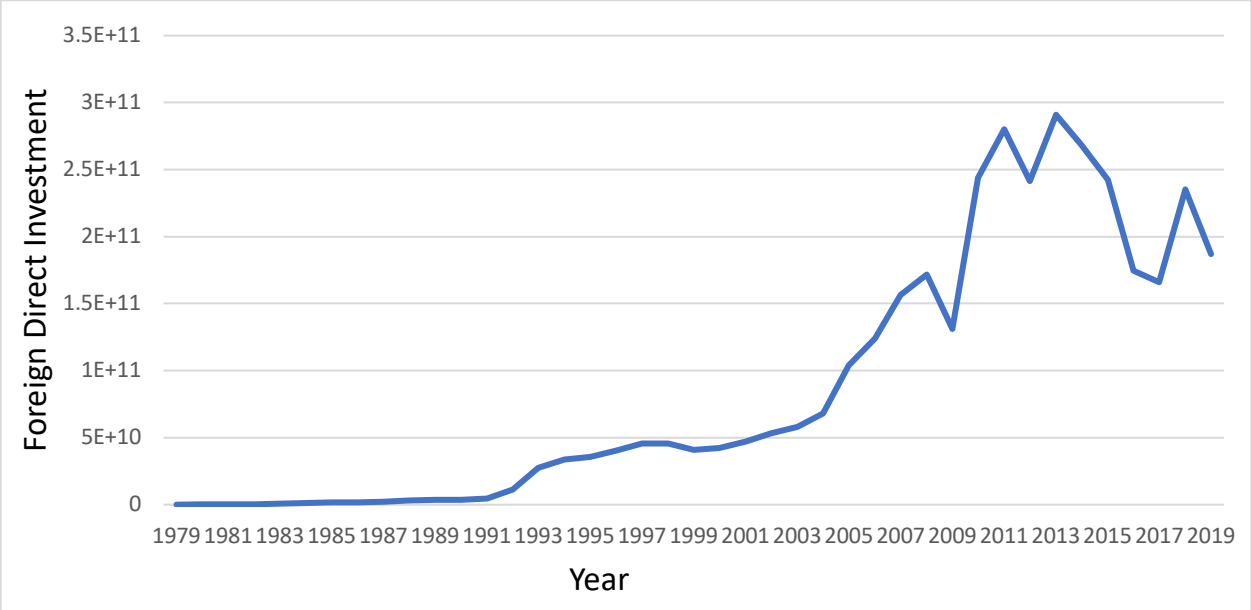

Figure 2: Foreign Direct Investment Net Inflow Current US$

In order to calculate the openness of the Chinese economy I add the export in goods and services volume and the import in goods and services volume and divide that by the real GDP. The variable is a proxy variable to measure the openness of the Chinese economy. This data comes from the World Bank DataBank. In Figure 3, we can see that there is a steep rise in China's openness after the year 2002. This is expected and in agreement with literature reviewed as China decreased its trade barrier and shifted towards an export led economic growth strategy. In the figure we also see a slight decrease in the latter half of 2018 and continuing on to 2019. This is reflective of the trade war between USA and China under the Trump administration. The trade war started January of 2018, when the Trump administration announced tariffs on solar panels, throughout the year many other trade sanctions were implemented to decrease the trade deficit with China. China also retaliated by levying tariff on US goods and services. An approximate $350 billion worth of exports from China was targeted while China levied tariffs on approximately $100 billion worth of imports from the US. Thus, we can see the effect only show later in 2018 and a sharp downward decline in 2019. The graph also shows a leftward skew.

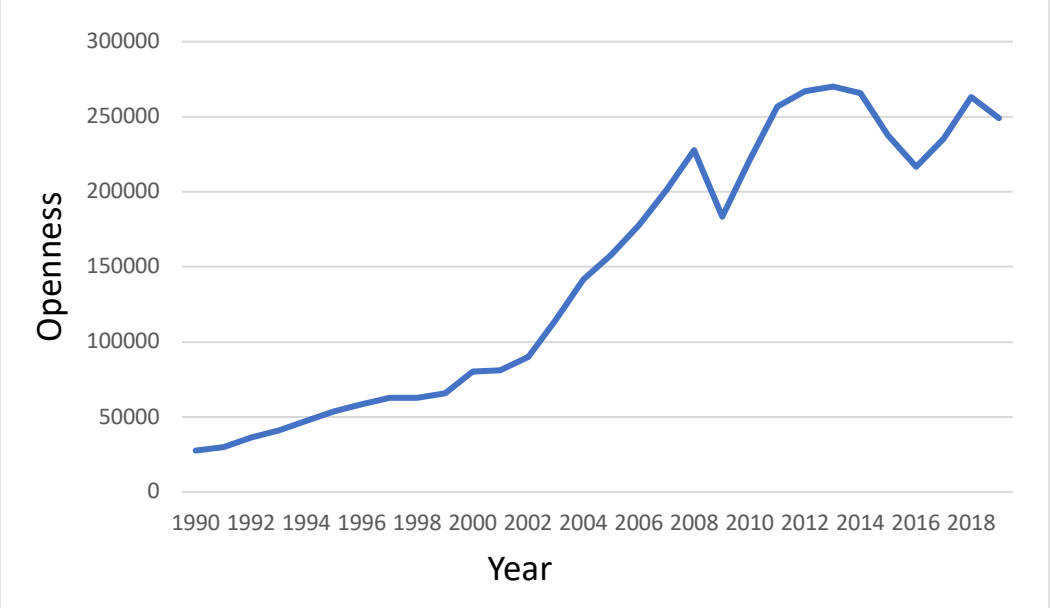

Figure 3: Total export and Import of good and services over the Real GDP

I calculate the capital stock to labor ratio using the capital stock at constant national prices and the total labor force. The capital stock at constant national prices data for China comes from FRED St. Louis and is calculated in millions of 2017 US dollar. The labor force data comes from the World Bank DataBank. In order to calculate the ratio, I divide the capital stock by the labor force. The human capital index data is from the Penn World Table. I get the inflation data for China from FRED St. Louis.

Variable	Mean	Median	Max	Min	Standard Deviation	Inter Quartile Range	Number of Observations
GDP growth	9.341168	9.249783	14.23086	3.920251	2.515807	2.97422	30
Real GDP	1.03E+07	8622787	2.06E+07	3165272	5885985	1.01E+07	30
FDI net inflows	1.19E+11	8.61E+10	2.91E+11	3.49E+09	9.41E+10	1.46E+11	30
TFP Current PPP	0.386004	0.3885823	0.4318668	0.3239195	0.0328492	0.0606859	30
Export of goods and services	1.06E+12	6.90E+11	2.66E+12	4.91E+10	9.75E+11	1.99E+12	30
Import of goods and services	9.38E+11	6.02E+11	2.56E+12	3.85E+10	8.89E+11	1.80E+12	30
Openness	147479.7	149554.7	270106.9	27672.67	88961.61	172431.7	30
Human Capital Index	2.358772	2.387103	2.698987	1.956077	0.2084005	0.3037882	30
Labor force Participation Rate	74.28233	73.885	79.14	68.24	3.818165	7.53	30
Total Labor Force	7.44E+08	7.61E+08	7.93E+08	6.42E+08	4.70E+07	6.97E+07	30
Inflation	4.072292	2.620287	24.25699	-1.401473	5.538346	3.379744	30
Capital Stock at Constant National Price	3.36E+07	2.21E+07	1.02E+08	5316134	2.90E+07	4.18E+07	30
Capital Stock to labor ratio	0.0434753	0.0289725	0.1288021	0.0082865	0.0361583	0.0521236	30

Table 1: Data Summary Statistics

Conclusion

In this chapter I outline the analytical framework. I have three regression equations that will highlight the effect of FDI and TFP on China's GDP. Looking at the trend of TFP at Constant National Prices, I see that there is a steep upward trend from 1998 to 2011. After 2011 we can see a decrease in TFP. This is in agreement with Krugman (1994) who argues that there is a need to increase efficiency in addition to productivity to sustain economic growth. Looking at FDI trends we see a steep increase in net inflow starting 2009 followed by a steep decrease in 2013. In 2017 the government implemented some policies to incentivize FDI. This is reflected by a brief increase in FDI.

CHAPTER FIVE

RESULTS

This chapter presents the empirical result for this paper. This chapter is divided in three section, based on the three regression equations presented in the previous chapter. The first section presents the results for the first equation with the dependent variable Real GDP, the second section presents the results for the second equation with the dependent variable Log Real GDP, and the last section presents the results for the second equation with the dependent variable first difference of Log Real GDP.

a. Regression Results

This chapter presents the results for the regression analysis of the equation specified in the previous section. The relationship between the log of Real GDP and the variables of interest, FDI and TFP is positive and significant. This chapter will focus on the three regression tables with Real GDP as the dependent variable in Table 2, Log Real GDP as the dependent variable in Table 3, and the first difference of GDP and all other variables in Table 4.

i. Section 1: Real GDP

Table 2 below shows the effect of FDI and TFP on the Real GDP of China as specified by equation (1). The results on column (1) indicate that a one unit increase in FDI lead to a 4.46e-05 unit increase in Real GDP of China if all else remains equal. The coefficient is positive and statistically significant at the 99% confidence interval. The coefficient on the TFP variable, however, in table one is not statistically significant. The Durbin-Watson statistic for this column is only 0.41, indicating that there is autocorrelation in the residuals from the regression model.

Column (2) of Table 2 includes additional variables and control variables. Adding these variables makes the TFP coefficient statistically significant. A one unit increase in TFP leads to a 2.542e+07 unit increase in the Real GDP of China if all else remains equal. The coefficient is statistically significant at the 99% confidence interval. The coefficient on the FDI variable in column (2) has decreased but remains positive and statistically significant at the 99% confidence interval. The coefficient on the Human Capital Index is positive and statistically significant at the 99% confidence interval. A one unit increase in Human Capital Index leads to a 4.303e+06 unit increase in the Real GDP of China if all else remains equal. The coefficient on the capital stock to labor ratio is also positive and statistically significant. A one unit increase in the capital stock to labor ration leads to 8.177e+07 unit increase in the Real GDP of China if all else remains equal. The coefficient on Inflation is negative and statistically significant at the 95% confidence interval. A one unit increase in inflation leads to 50,211 unit decrease in the Real GDP of China if all else remains equal. The coefficient on the variable openness is positive but statistically insignificant. The coefficient on the WTO variable is positive but statistically insignificant. The R-squared value of column (2) is 0.997 indicates that the independent variables of the regression account for a great proportion of the variance in the dependent variable, Real GDP. The Durbin-Watson statistic also increases to a 1.19, however, there is still autocorrelation in the residuals from the regression model of column (2).

Table 2: Regression Results
DEPENDENT VARIABLE: REAL GDP AT CONSTANT NATIONAL PRICES

VARIABLES	(1) Real GDP	(2) Real GDP
FDI	4.46e-05***	8.63e-06***
	(9.60e-06)	(2.75e-06)
TFP	3.930e+07	2.542e+07***
	(2.750e+07)	(6.560e+06)
Openness		5.11e-07
		(2.37e-06)
Human Capital Index		4.303e+06***
		(1.308e+06)
Inflation		-50,211**
		(20,034)
Labor force Participation Rate		-167,972
		(171,589)
Capital Stock to labor ratio		8.177e+07***
		(2.105e+07)
WTO		-325,504
		(428,700)
Constant	-1.016e+07	-1.470e+06
	(9.676e+06)	(1.616e+07)
Observations	30	30
R-squared	0.822	0.997

ii. Section 2: Log of Real GDP

Table 3 below shows the regression result for equation (2), which has the log of Real GDP as the dependent variable. I run three regressions with log of Real GDP as the dependent variable. The first regression only has the variables of interest, FDI and TFP. The second regression consists of all the other independent variables as well. For the third regression I remove the independent variables that are insignificant to check whether it has any effect on the significance of the coefficients on the variables of interest.

In column (1) of Table 3 shows that the coefficient on FDI is positive and statistically significant at the 99% confidence interval. A ten percent increase in FDI leads to a 3.8 percent increase in Real GDP of China if all else remains equal. The coefficient on the TFP variable is also positive and statistically significant at the 95% confidence interval. A ten percent increase in

TFP leads to a 17 percent increase in the Real GDP of China if all else remains equal. The Durbin-Watson statistic is 0.33 is indicating that there is autocorrelation in the residuals from the regression model.

In column (2) of Table 3, all the independent variables are logged. After including all the independent variables, the coefficient on the FDI variable decreases but remains positive and statistically significant at the 99% confidence interval. A ten percent increase in FDI leads to a 0.7 percent increase in Real GDP of China if all else remains equal. The coefficient on the TFP also decreases in but remains positive. The statistically significant of the coefficient increases to the 99% confidence interval. A ten percent increase in TFP leads to a 6.8 percent increase in Real GDP of China if all else remains equal. The coefficient on the openness is positive and statistically significant at the 95% confidence interval. A ten percent increase in openness leads to a 0.4 percent increase in Real GDP of China if all else remains equal. The coefficient on inflation is negative and statistically significant at the 95% confidence interval. A ten percent increase in inflation leads to a 0.2 percent decrease in Real GDP of China if all else remains equal. The coefficient on the capital stock to labor ratio is positive and statistically significant at the 99% confidence level. A ten percent increase in capital stock to labor ratio leads to a 4.1 percent increase in Real GDP of China if all else remains equal. The coefficients on Human Capital Index, labor participation rate, and WTO are positive but statistically insignificant. The Durbin-Watson statistic for column (2) is 1.9, indicating that there is no autocorrelation. The R-squared is also high, indicating great goodness of fit.

In column (3) of Table 3, I remove the variables Human Capital Index, labor participation rate, and WTO as they were statistically insignificant in the regression results shown in column (2). The results in column (3) show that the coefficient on FDI and TFP still

remain statistically significant at the 99% confidence interval. The coefficient on FDI marginally decreases but the coefficient on TFP marginally increases. The coefficient on openness also marginally increases and its statistical significance also increases to the 99% confidence interval. The coefficient on inflation decreases but remains negative and its statistical significance also increases to the 99% confidence interval. The coefficient on the capital stock to labor ratio also increases marginally, remains positive and statistically significant at the 99% confidence interval. The R-squared value remains 0.99 while the Durbin-Watson statistics decreases to 1.6.

Table 3: Log Variable Regression Results
DEPENDENT VARIABLE: LOG REAL GDP AT CONSTANT NATIONAL PRICES

VARIABLES	(1) log GDP	(2) log GDP	(3) log GDP
log FDI	0.382***	0.0741***	0.0724***
	(0.0554)	(0.0137)	(0.00822)
log TFP	1.764**	0.688***	0.774***
	(0.753)	(0.176)	(0.152)
log openness		0.0471**	0.0573***
		(0.0180)	(0.0179)
log HCI		0.0473	
		(0.432)	
log inflation		-0.0215**	-0.0235***
		(0.00795)	(0.00783)
log labor participation rate		-0.904	
		(0.962)	
log capital stock to labor ratio		0.411***	0.455***
		(0.0794)	(0.0275)
WTO		0.0171	
		(0.0267)	
Constant	8.092***	18.88***	15.05***
	(1.997)	(3.744)	(0.601)
Observations	30	26	26
R-squared	0.878	0.999	0.999

iii. Section 3: First Difference Regression Results

The results in Table 4 are the result for equation (3) where the dependent variable is the change in log GDP and the independent variables are also changes in log of the respective variable. The results in column (1) show that the coefficient on the change in log of FDI and TFP are both positive and statistically significant, FDI is significant at the 90% confidence interval while TFP is significant at the 99% confidence interval. A ten percent change in FDI leads to a 0.2 percent change in the Real GDP of China if all else remains equal. A ten percent change in TFP leads to a 5 percent change in the Real GDP of China if all else remains equal. The Durbin-Watson statistic for column (1) is 1.2, indicating that there is autocorrelation.

In column (2), I include the first difference of all other independent variable. Doing so makes the coefficient on FDI statistically insignificant. The coefficient on TFP remains statistically significant but decreases in significance and magnitude. All other variables are statistically insignificant as well. The Durbin-Watson statistic and the R-squared marginally increase for column (2).

Table 4: First Difference Log Variable Regression Results
DEPENDENT VARIABLE: CHANGE IN LOG REAL GDP AT CONSTANT NATIONAL PRICES

VARIABLES	(1) Δ Log GDP	(2) Δ Log GDP
Δ log FDI	0.0230*	0.0309
	(0.0132)	(0.0185)
Δ log TFP	0.514***	0.494**
	(0.125)	(0.199)
Δ log openness		0.0160
		(0.0315)
Δ log HCI		0.148
		(2.055)
Δ log inflation		-4.95e-05
		(0.00853)
Δ log labor participation rate		0.693
		(3.129)
Δ log capital stock to labor ratio		0.367
		(0.627)
Constant	0.0589***	0.0201
	(0.00403)	(0.0746)
Observations	29	22
R-squared	0.513	0.565

Conclusion

The results presented in this chapter indicates that the variables of interest, TFP and FDI, have a positive and statistically significant impact on the Real GDP of China. In Table 2 we see that Total Factor Productivity become significant when we factor in variables like Human Capital Index, Labor Force Participation Rate, Capital Stock to Labor Ratio, Inflation, and dummy variable WTO. This indicates that when the effect of the control variables is isolated from the relationship between the variables of interest and the dependent variable, Real GDP of China; we learn that the impact of TFP on the Real GDP of China is statistically significant. The results of Table 2, especially the coefficients on the variables of interest, are in line with the literature reviewed for this paper. The coefficients on the variable openness and dummy variable

WTO are positive and in line with literature reviewed however are statistically insignificant. This further emphasize the importance of FDI and TFP in playing a major role in China's Real GDP over openness and China's accession into the WTO.

In Table 3, the dependent variables and the independent variables are logged. This make the relationship between the dependent and independent variable linear. The results indicate that the log of FDI and the log of TFP remain positive and statistically significant. After dropping the insignificant control variables from the results in column (2), the statistical significance of all the independent variables in column (3) is at the 99% confidence interval. Therefore, the results of Table 3 further confirm the importance of FDI and TFP on China's Real GDP. We see that the openness of China's economy has become significant in these sets of regression while the WTO dummy variable still remains statistically insignificant. Labor force participation also remains insignificant indicating that the increase in labor force just by itself doesn't drive China' Real GDP.

In Table 4, the dependent variable is the lag of log of GDP and all the log of all independent variables are lagged too. Given that I am dealing with a time series data, it is important to make sure that the trends are dependent on the time at which the series is observed, thus not stationary. A stationary time series doesn't have predictable patterns in the long run. When checking for stationarity in column (1) both FDI and TFP have a positive and significant relationship. When include other dependent variables, in column (2), FDI becomes insignificant but TFP remains significant, however, TFP also loses its significance and is only significant at the 95% confidence level.

Overall the results indicate that TFP remains positive and statistically significant in most regression results. This indicates TFP's significant contribution to China's Real GDP. FDI too

remains significant in the first two regressions but loses significance in the first difference analysis. As for other independent variables, labor force participation rate remains statistically insignificant while capital to labor ratio remains significant. This indicates that an increase in capital intensity of production has a positive and significant relationship with Real GDP. The WTTO dummy is insignificant in all regression results, this indicates that China's accession into the WTO didn't have statistically significant on the Real GDP between the years 1990 to 2019. However, opening up of its economy has had a positive and statistically significant impact on Real GDP, similar to its East Asian neighbors.

CHAPTER SIX

CONCLUSION

a. Summary of Findings

The purpose of this paper was to understand what factors that have led to China's economic growth and analyze whether these factors will continue helping the Chinese economy's growth trend. The empirical model aimed to look at the effect of TFP and FDI on the China's Real GDP. The results indicate that TFP plays an important role on the Real GDP of China. In most of the regression models TFP is positive and statistically significant. These results are consistent with literature reviewed. FDI is positive and statistically significant in the results for equation (1) and equation (2). This indicated that FDI positively affects Real GDP. In equation (3) when checking for stationarity, FDI loses its significance when other factors are included in the regression. This makes sense as we saw a lot of fluctuation in the trend for FDI after 2008. As the dataset for this paper is limited to the years 1990-2019, the trends between this time frame may not be reliable to predict patterns in the long run.

To get a more holistic picture, I include variable like openness, HDI, labor force participation rate and the capital stock to labor ratio. Scholars write that the opening up to trade was an important factor behind the economic growth of the Four Asian Tigers. As China experiences a similar economic growth, it is important to understand the effect of openness on China's GDP. The results indicate that openness was only statistically significant when linearized in the equation (2). Openness data has a leftward skew, normalizing the data make the variable more statistically significant. Capital stock to labor ratio has a positive and statistically significant relationship with real GDP, indicating that capital intensity has a positive effect on GDP. Inflation has a consistent negative and statistically significant relationship. Labor force

participation which accounts for the abundant supply of labor, has an insignificant impact on the real GDP of China. Human Capital index remains insignificant in the last two regression results. The dummy variable WTO also remains statistically insignificant, indicating that China's accession into the WTO, for my dataset hasn't had a significant impact on China's real GDP.

b. Limitation

A major limitation of this paper is the number of observations in the dataset I have used for my regression analysis. My dataset only contains annual observations for the year 1990 to 2019. My data was severely limited due to the unavailability of inflation data. If inflation data was available for a greater number of years, the results could have been more robust. I believe that the WTO dummy variable would have been more significant. China started preparing for its accession to the world trade organization by removing barriers to trade many years prior to 2001. Having data from 1958, which is the earliest data available for most of my variables, would have shown a better picture of change in China's economy's opening up to trade.

c. Concluding Remarks

In conclusion the results of my paper highlight the importance of FDI in increasing the real GDP of China. By looking at all the factors highlighted by previous literature, this paper shows that FDI has a greater magnitude of effect on China GDP. This can especially be seen in Table 3, a 10% increase in TFP leads to a 7.7% increase in Real GDP. A 10% increase in FDI leads to a 7.2% increase in Real GDP.

Looking at the historical background of the Chinese economy we see that the government exercises great power over resource allocation. It is, therefore, important to consider government

interventions to accurately predict the course of China's economic growth. Contrary to the its east Asian neighbors like Japan and South Korea, government intervention has actually had a positive impact on the GDP growth of China. Recent government interventions like the Belts and Road and Made in China 2025 initiative will have a great impact on the productivity of China. Research shows that the Chinese cities along the BRI route have experienced an increase in their TFP. Made in China 2025 aims to enhance China's manufacturing infrastructure and produce more high-tech products, this will help increase more capital inputs in the Chinese economy compared to labor inputs, potentially increasing efficiency. Krugman (1994) writes that increasing efficiency in addition to productivity is essential to sustaining economic growth. Especially under President Xi Jinping's Administration, resource allocation has been centralized. However, China at the moment has an incentive to implement market-oriented reforms to decrease chances of isolation from the international market. The government realizes that an export led growth strategy, followed by the Four Asian Tigers, has diminishing return. This paper indicated that the government's policy initiatives and ability to increase efficiency will prevent it from facing the same abrupt slowdown as the Four Asian Tigers.

The Chinese economy faces other obstacle than productivity at the moment. Low domestic consumption, an aging population, and an increase in debt has highlighted a need to rebalance China's economic growth. The upper middle-income consumer is expected to grow and drive consumption growth in China. Recent news from China indicates that tax reforms and subsidies are necessary to increase consumption especially after the pandemic which has led people to save their income more given the rise in uncertainty. Recent college graduates have also been opting for government jobs instead of the private sector. Government initiatives to decrease pollution has led to a decrease in the generation of electricity from coal powered plants,

which has subsequently affected production in many factories due to the increase in power outages. Economic policy reform at the moment is top priority for leaders as it is aiming to escape the middle-income trap. While the Chinese government's policies are in the right direction there is a need for more effective implementation.

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APPENDIX

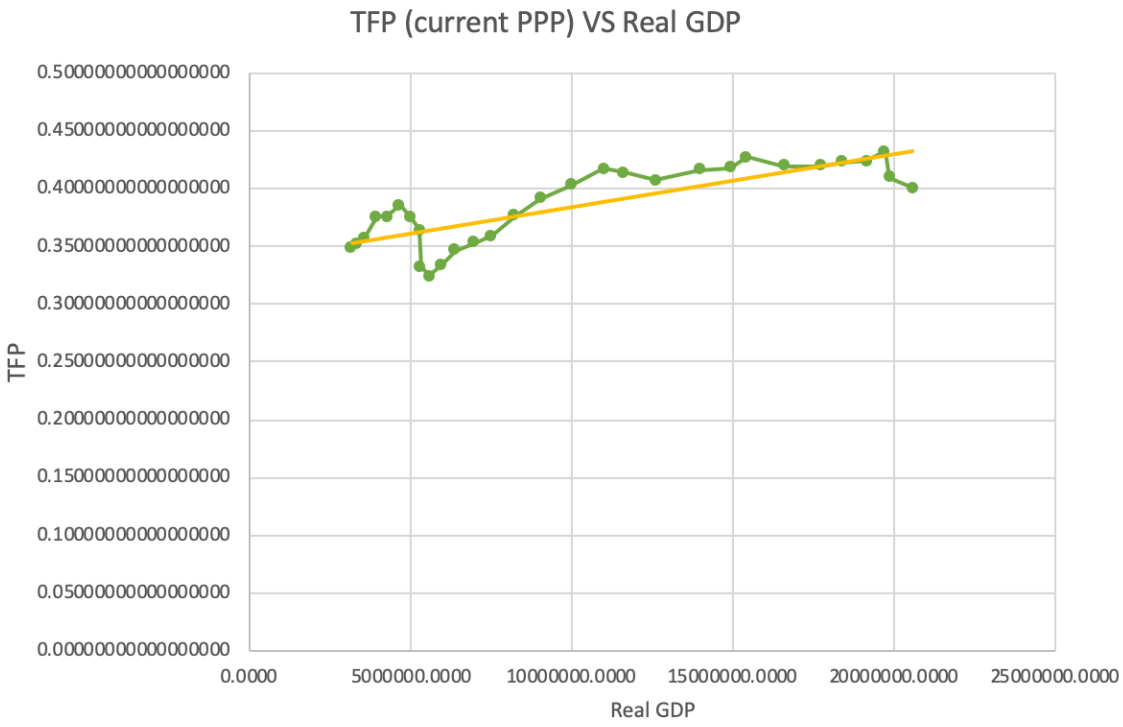

Figure 4: Scatterplot of the Relationship Between TFP Current Purchasing Power Parities and China's Real GDP (1990-2019)

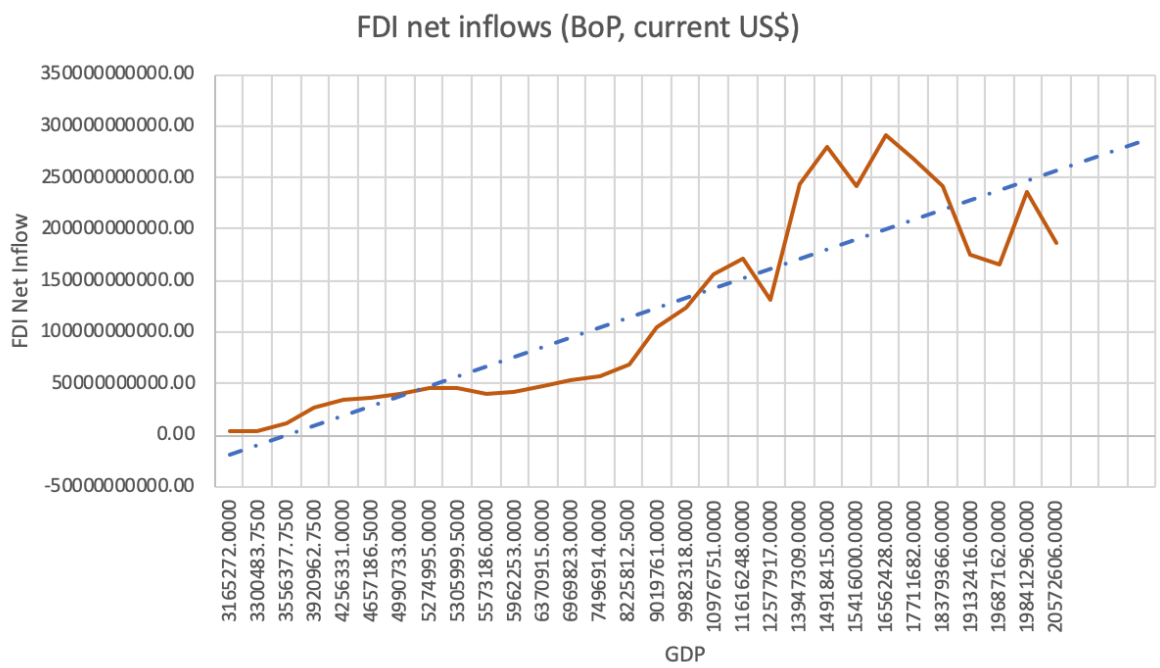

Figure 5: Scatterplot of the Relationship Between FDI Net Inflow and China's Real GDP (1990-2019)

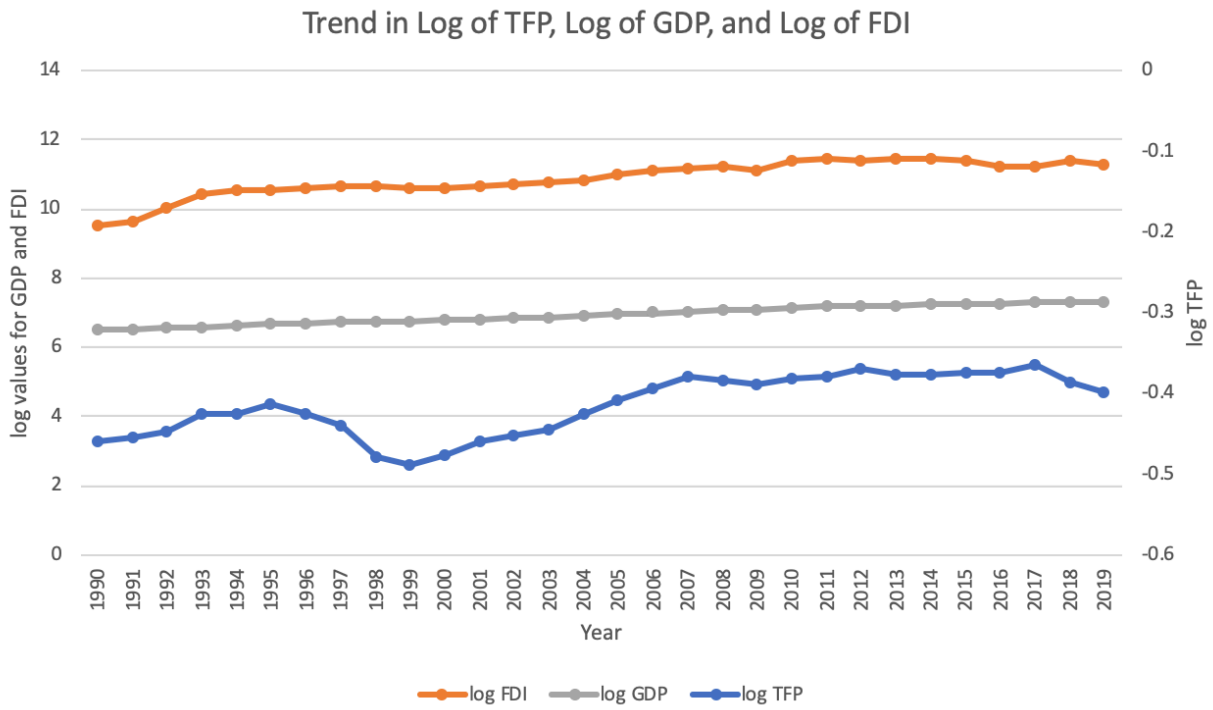

Figure 6: Trends in Log of TFP, Log of GDP, and Log of FDI

Variable	Description	Source
Real GDP	Real GDP at Constant National Prices for China, Millions of 2017 U.S. Dollars, Annual, Not Seasonally Adjusted	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis
Foreign Direct Investment (FDI)	Foreign direct investment, net inflows (BoP, current US$)	International Monetary Fund, Balance of Payments database, supplemented by data from the United Nations Conference on Trade and Development and official national sources.
Total Factor Productivity (TFP)	Total Factor Productivity Level at Current Purchasing Power Parities for China, Index USA = 1, Annual, Not Seasonally Adjusted	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis
Export	Exports of goods and services in current USD	World Bank national accounts data, and OECD National Accounts data files.

Import	Imports of goods and services in current USD	World Bank national accounts data, and OECD National Accounts data files.
Human Capital Index	Human capital index, based on years of schooling and returns to education	Penn World Table
Labor force participation	Labor force participation rate, total (% of total population ages 15+)	International Labour Organization, ILOSTAT database. Data retrieved on June 15, 2021.
Total labor force	Labor force, total	Derived using data from International Labour Organization, ILOSTAT database. The data retrieved on June 15, 2021.
Inflation	Inflation, consumer prices for China, Percent, Annual	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis
Capital Stock	Capital Stock at Constant National Prices for China, Millions of 2017 U.S. Dollars, Annual, Not Seasonally Adjusted	Federal Reserve Economic Data, Federal Reserve Bank of St. Louis

Table 5: Data Description