

China's Economic Miracle

Minasyan S.S.

Department of Regulation of Economy and International Economic Relations of ASUE
(Armenia, Yerevan)

sasunminasyan@mail.ru

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Չինաստանի տնտեսական հրաշքը

Մինասյան Ս. Ս.

ՀՊՏՀ «Տնտեսության կարգավորում և միջազգային տնտեսական հարաբերություններ»

Ֆակուլտետ (Հայաստան, Երևան)

sasunminasyan@mail.ru

Ամփոփում: Սույն հոդվածում վերլուծվել է Չինաստանի, այսպես կոչված, տնտեսական հրաշքի բնույթը, պատճառներն ու հետևանքները: Անդրադարձ է կատարվել նաև մոտ ապագայում տնտեսական հրաշքի կայունության հիմնախնդրին: Օգտագործելով Սոլոուի տնտեսական աճի մոդելը՝ կրացատրենք խնայողության նորմի, բնակչության աճի և արտադրողականության ազդեցությունը երկարաժամկետ տնտեսական աճի վրա: Կուսումնասիրենք այս երևույթները՝ օգտագործելով Չինաստանի՝ որպես զարգացող շուկայական տնտեսության օրինակը՝ ապացուցելով, որ այն ընդունակ է ավելի արագ զարգանալ, քան զարգացած տնտեսությունները: Սույն հոդվածը քննարկում է նաև Չինաստանի հետագա շարունակական աճի հնարավորությունները: Մասնավորապես, արտադրողականությունը կարող է շարունակել աճել երկրի կայուն զարգացումը պահպանելու համար:

Վճռորոշ բառեր՝ տնտեսական աճ, Չինաստանի տնտեսական հրաշք, Սոլոուի աճի մոդել, աճի տեսություններ և մոդելներ, կայուն տնտեսական աճ, զարգացող շուկայական տնտեսություններ, զարգացած տնտեսություններ, խնայողության նորմ, բնակչության աճ, տեխնոլոգիական առաջընթաց:

Экономическое чудо Китая

Минасян С. С.

Факультет «Регулирования экономики и международных экономических отношений» АГЭУ

(Армения, Ереван)

sasunminasyan@mail.ru

Резюме: В данной статье анализируются природа, причины и последствия так называемого экономического чуда Китая. Также рассматривается вопрос устойчивости чуда в ближайшем будущем. Используя модель роста Солоу, мы объясним влияние нормы сбережений, прироста населения и производительности на долгосрочный экономический рост. Мы рассмотрим явления на примере Китая как страны с формирующейся рыночной экономикой, доказав, что она способна расти гораздо быстрее, чем страны с развитой экономикой. В этой статье рассматривается возможность продолжения роста Китая в будущем. В частности, производительность может продолжать расти, чтобы страна могла поддерживать свое развитие.

Ключевые слова: экономический рост, китайское экономическое чудо, модель роста Солоу, теории и модели роста, устойчивый экономический рост, страны с формирующимся рынком, страны с развитой экономикой, норма сбережений, рост населения, технологический прогресс.

I. INTRODUCTION

China's economy has experienced serious growth in the decades prior to the crash of war with Japan in 1937 (Brandt, 1989; Rawski, 1989). By the 1930s, China had developed a modern sector including industry, transportation, communications, banking, and finance. Rawski (1989) states that even though this undeveloped modern sector never surpassed the ten percent of GDP, its rapid

development, along with China's growing integration with the international economy, had stimulating effects on agriculture and on other sectors that pushed the economy toward moderate gains in GDP per capita. In the beginning of the Great Depression, prior to the collapse of international trade, China's share of the world trade, as well as the foreign trade to GDP ratio reached to levels that were impossible to attain for over sixty

years (Lardy, 1994). The eight-year battle against Japan followed by several years of civil conflict between Communists and Kuomintang forces, known as the People's Republic of China (established in 1949).

The Chinese economic reforms officially began in December 1978. There is an acceptance that the Chinese economic growth is a bigger miracle than the earlier East Asian Miracle in Taiwan, Singapore, Hong Kong, and South Korea, also known as "The Four Asian Tigers." None of these countries come anywhere near China.

Starting from 1978, few in China believed that Deng Xiaoping, the paramount leader of the People's Republic of China after Mao Zedong's death in 1976, had found the magic formula when he re-introduced the goal of the Four Modernizations, including industry, agriculture, military, and technology. After some events in 1989, there were still doubters at home and even abroad who did not trust the successors to carry on further reforms to sustain the economic growth. A group of serious researchers in China began to ask one question: was there a "miracle"?

In this paper, we will analyze the nature, causes, and consequences of the so-called Chinese miracle. It will also address the question of sustainability of the miracle in the near future.

II. LITERATURE REVIEW

China's economy has sustained long-term rapid growth for over thirty years. Many social scientists have tried to provide explanations of the causes. The existence of the Chinese Miracle rounded by many debates and disagreements related to the understanding of China's rapid growth over the past thirty years. Krugman (1994), Shan et al. (2007), Sachs et al. (2000) bring references to economic efficiency, scientific and technological innovation, and political development. Lin et al. (1994), Cai and Treisman (2006), Anderson (2008), and Qin (2008) confirm the rapid growth of China though some explanations on improvements in the standards of the largest population of the world, as well as huge amendments in many areas of the society.

Malkiel (2009) is convinced that China will continue to grow rapidly. The goal of the Chinese Government is to achieve a quadrupling of per capita income by 2020. Substantial infrastructure investments in roads, power plants, networks have already been made and are continuing at a rapid pace. There is a convincing reason to believe that China's growth will continue. It is the immeasurable energy of the Chinese people. Sir W. Arthur Lewis, a Nobel laureate in economics was always quite clear about the importance of culture in explaining why some nations grow faster, while others do not. The necessary conditions for economic

development, according to Malkiel (2009), are a population with a strong work ethic, a commitment to education, an entrepreneurial spirit, and a willingness to take risks.

It is necessary to glance at a few summary statistics relating to the Chinese economic performance since the reforms. China achieved nearly 10 percent growth rate of GDP over the two decades beginning 1978 (Ray, 2002). But even more impressive has been the success in reducing poverty: the percentage of rural poor went down from 60 percent (1978) to 11.5 percent (1999). The life expectancy went up by 10 years (Stiglitz, 1999). In the past twenty years, the share of China in the total world trade went up from 1 percent to about 4 percent and is projected to go up to 10 percent by 2020 to make China the second largest trading nation in the world. Foreign direct investment flows into China jumped from near zero in 1978 to more than \$45 billion in 1997 and China became the second largest recipient of FDI after the US (World Bank, 1997).

There are different explanations from different scholars that have suggested a large number of variables for explaining the Chinese Economic Miracle. Most of them focus on one of these dimensions (Feng et al., 2011), such as initial conditions, institutional changes, state, and market, etc. Anderson (2008) argues that the high saving rate in China lead to the Miracle. On the other hand, we can say that the high level of capital stock is the reason for the high economic growth. It is obvious that a high level of saving rate does not necessarily bring high and sustainable economic growth (Feng et al., 2011). These explanations fit the observed facts to some extent. However, not one of them provides an adequate explanation. Feng (2011) states that we should also take into account other theoretical perspectives such as political economy and institutional evolution.

III. ANALYSIS AND RESULTS

Solow's Long-Run Growth Model:

In the early 1950s, everyone was interested in why some economies seem to grow faster than others, what differentiates the lucky ones from unlucky ones. Robert M. Solow, an emeritus professor of economics at MIT, Nobel Laureate in Economic Sciences (1987), was able to figure out the three main components of economic growth that provide increasing output in the economy. We will refer to the three components later in this particular paper.

Solow (1956) analyzed the effects of the main factors of production, capital, and labor, and he assumed that for any year (t) a country's population (N_t) and the labor force grow at fixed n rate. If the economy's total output is Y_t , the total investment is

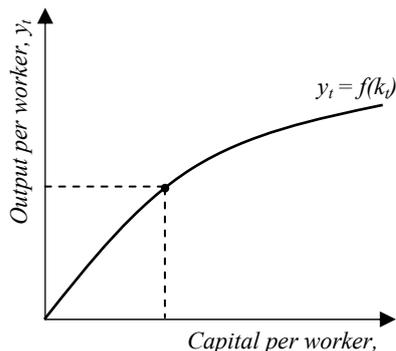
I_t , and the consumption is C_t , then we can write for the closed economy:

$$C_t = Y_t - I_t \quad (1)$$

Further, for simplicity we take the *per worker* of output, capital, and consumption:

- $y_t = Y_t/N_t$ (output per worker)
- $k_t = K_t/N_t$ (capital per worker or *capital-labor ratio*)
- $c_t = C_t/N_t$ (consumption per worker)

Therefore, we can write the production function for per worker terms as $y_t = f(k_t)$. It shows that output per worker is a function of capital per worker.



Moreover, they are directly proportional, which results in an upward sloping curve from left to the right because an increase in the capital per worker allows each worker to produce more and more output. Besides, the diminishing marginal productivity of capital (MPK) results in the bowed shape of the production function. This means as the capital per worker or the capital-labor ratio goes up, the output per worker increases at a diminishing rate.

Solow (1956) figured out that when there is no productivity growth, in the long run, the economy reaches to a condition called *steady state*, when output per worker, capital per worker, and consumption per worker are constant.

The gross investment is usually used in two ways:

- a) to replace the depreciated capital (dK_t)
- b) to enlarge the capital stock

We know that in steady state the capital-labor ratio (K_t/N_t) is constant, and both the capital and labor grow at the same rate (n). Hence, we can say that in steady state the net investment is nK_t , and the gross investment in steady state is:

$$I_t = nK_t + dK_t = (n+d)K_t \quad (2)$$

Inserting (2) in (1) we will get the consumption in steady state:

$$C_t = Y_t - (n+d)K_t \quad (3)$$

Now, dividing both sides by the number of population (N_t), and replacing y_t with $f(k_t)$, we will

get the fundamental equation of the Solow Growth Model:

$$c = f(k) - (n+d)k \quad (4)$$

The relationship between the steady-state consumption per worker and the capital-labor ratio per worker can be shown in the following figure:

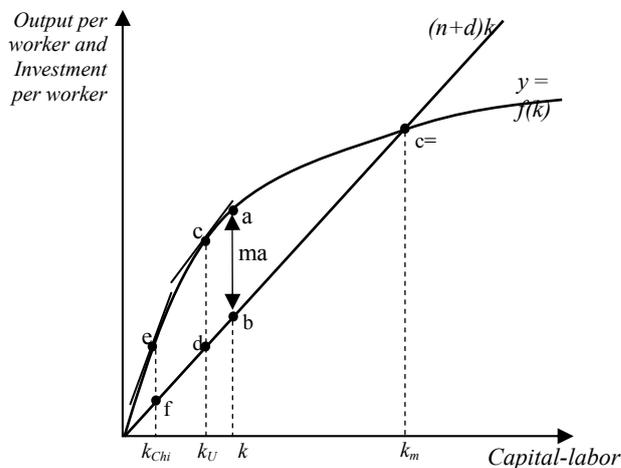


Figure (2): The relationship between the steady-state consumption per worker and the capital-labor ratio

The level of the capital-labor ratio that determines the maximum level of consumption per worker (ab) is called the *Golden Rule* level of the capital-labor ratio (k_G). Higher values of k will result in smaller steady-state consumption per worker. The reason is that in this case, we will need so much investment to get the high level of capital-labor ratio. The ultimate case will be $k=k_{max}$ (Figure 2) when all output goes to replacing the worn-out capital, as well as expanding the capital stock. Thus, the steady-state consumption per worker will be zero.

In his growth model, Solow (1956) figured out an essential outcome: a country that lies in the left side of the Golden Rule level of capital-labor ratio will grow faster, than countries with higher level of capital per worker. Specifically, a country with a small amount of capital-labor ratio is able to grow faster hoping to improve living standards in the long-run by increasing the capital-labor ratio. Therefore, countries that have already a high level of the capital-labor ratio may fail to increase the steady-state consumption. The fundamental reason behind this is the diminishing MPK (marginal productivity of capital), which reflects the fact that an economy with larger capital stock will gain smaller benefit by further expansion of the capital stock. Figure 2 shows that further increase of the capital per worker will reduce the steady-state consumption per worker.

By looking at Figure 2, we can, therefore, conclude that China will grow much faster than the United States because China's capital per worker is smaller than that of the United States'. In addition, the slope of China (point *e*) on the per-worker

production function has higher value, than the slope of the United States (point *c*). What this also means is that China with a smaller level of consumption per worker ($ef < cd$) may hope to increase its living standards in the long run.

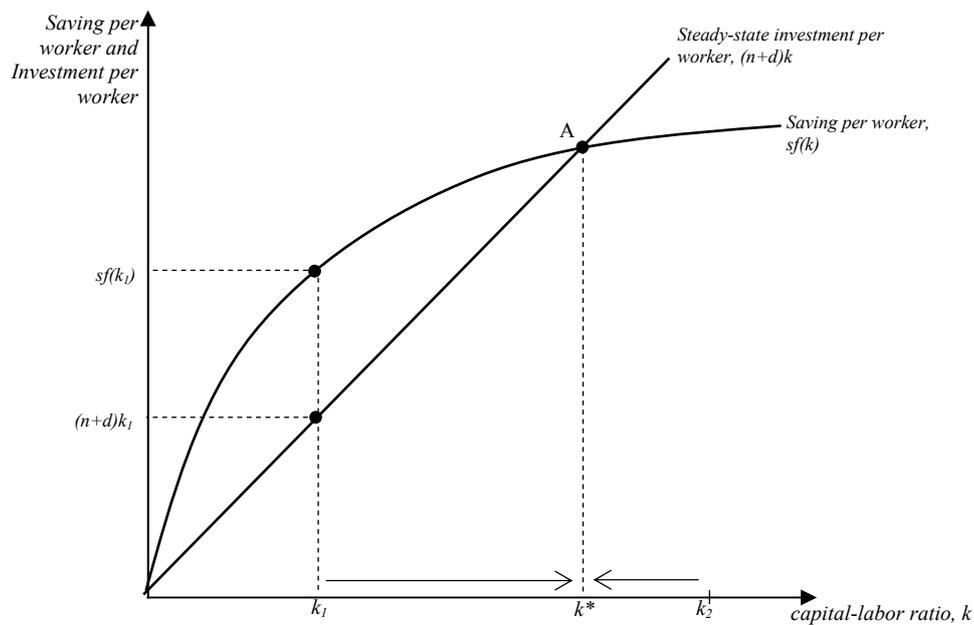


Figure (3): Determining the steady-state capital-labor ratio

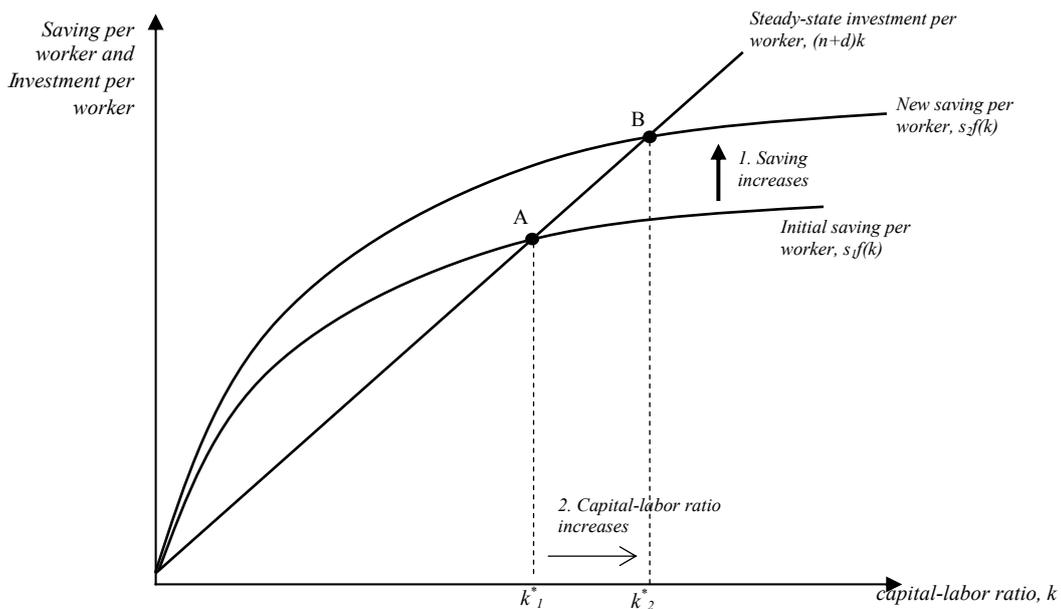


Figure (4): The effect of increased saving rate on the capital-labor ratio in steady state

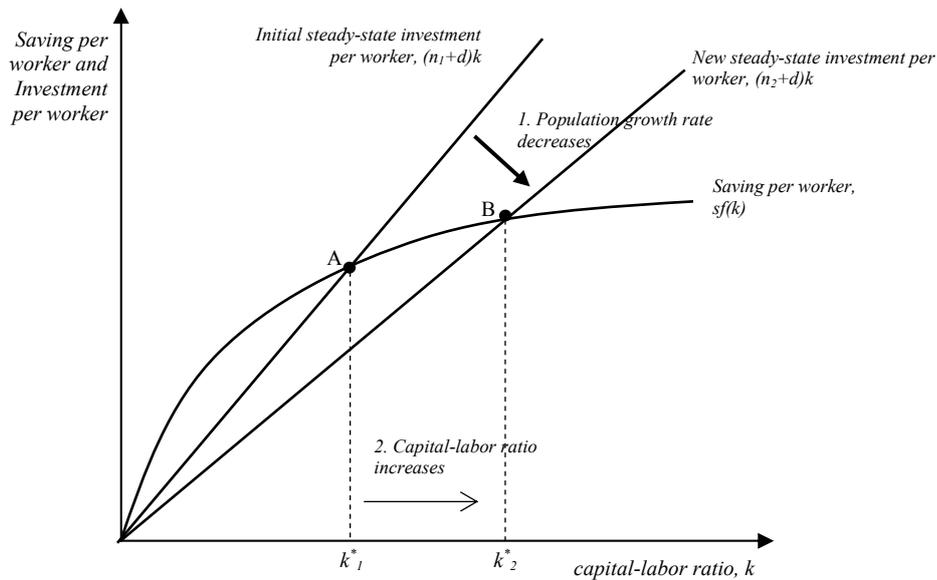


Figure (5): The effect of decreasing population growth rate on the capital-labor ratio in steady-state

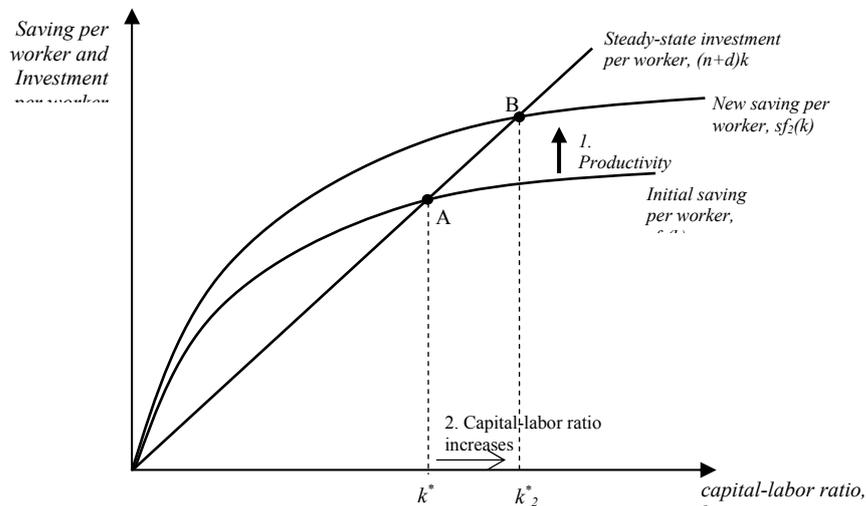


Figure (6): The effect of increasing productivity on the capital-labor ratio in steady-state

Determining The Steady-State Capital-Labor Ratio:

The steady-state capital-labor ratio (k^*) is achieved when the saving per worker sY_t or $sf(k)$ (assuming that in the economy saving is proportional to current income) equals steady-state investment per worker, that is $(n+d)k$, which intersect at point A.

$$sf(k) = (n+d)k \quad (\text{steady state})$$

If the capital-labor ratio is at k_1 , where the saving per worker is greater than the investment per worker, the extra saving will be converted into capital, and the capital-labor ratio will increase until it reaches the steady-state. Similarly, in the case of k_2 , the saving per worker will be smaller than the investment per worker, which will not allow converting into capital. Thus the capital-labor ratio will decrease over time.

We can write the steady-state output per worker as:

$$y^* = f(k^*)$$

Therefore, the steady-state consumption per worker will be:

$$c^* = f(k^*) - (n+d)k^*$$

The Fundamental Components of Long-Run Living Standards:

If we use the steady-state consumption per worker to measure the long-run well-being, we can answer the following question by using the Solow model: "What are the determinants of long-run economic well-being?"

Solow (1956) discusses the three main components of long-run living standards. They are:

- Saving rate
- Population growth rate
- Productivity or technology

According to the model, the saving rate and productivity are directly proportional to the long-run living standards. That is, increasing saving rate (s) or productivity is providing higher living standards, whereas increasing population growth can lower the living standards. The following figures show the effects of these three determinants mentioned above.

In real life, the saving rate cannot be more than its 100%, or we cannot say how much the population growth will decrease (Figure 5). Therefore, both the saving rate and population growth rate are not long-run sources to ensure higher living standards.

As we mentioned above, Solow (1956) was able to figure out the three main components of economic growth that provide increasing output in the economy. Subsequently, Solow (1956) found a way to say how much of this growth in the economy is due to increasing labor supply, how much is due to the investment in new capital and is there any leftover. And if there is anything leftover in the economy, that is what Solow (1956) meant by technological progress or productivity, the ability to get more goods and services out of a given amount of labor and capital. Solow (1956) then found out that by far the largest contribution to the economy came from this leftover. Solow (2018) states that the only way to get sustained faster growth is to have sustained faster technological progress¹. Hence, we can conclude the two fundamental predictions of the Solow Growth Model:

a) Emerging market economies (including China) are able to grow faster than advanced economies.

b) Technological progress is the fundamental determinant of long-run economic growth.

Now, let's discuss the government policies for raising a country's long-run living standards.

Government policies for affecting the saving rate:

1) The government should not try to change the saving rate if the private market is efficient.

2) The saving rate of the private market represents the trade-off of present for future consumption.

3) In the case of an inefficiently low level of saving rate due to the tax laws or myopia, the government's policy to raise the saving may be justified.

Saving can be increased by raising the real interest rate, or the government can reduce the deficit or run a surplus.

Government policies for raising the rate of productivity growth:

1) *Improving infrastructure* (bridges, highways, airports): Empirical studies suggest a link between infrastructure and productivity.

2) *Building human capital*: There is a connection between human capital and productivity. The government can encourage human capital formation through educational policies, relocation programs, worker trainings, as well as health programs. Entrepreneurial skill is another form of human capital. The government should support the growth of small and medium scale enterprises (SME).

3) *Encouraging research and development*: The government should support scientific research, fund government research facilities, provide grants, contract for particular projects, give tax incentives, provide support for science education, etc.

The remarkable growth of China:

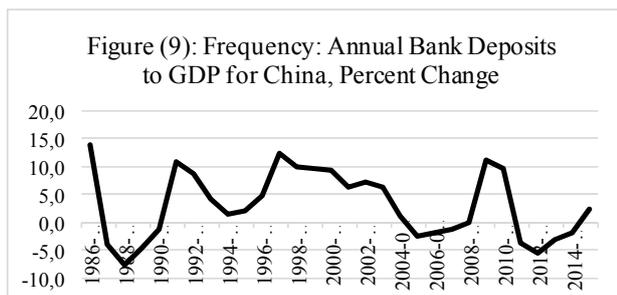
China has grown rapidly since the launch of reforms. With its population of 1.38 billion, China could become an enormous economic power in the world. China has started from a very low level of GDP per capita, and it has a long way to go until its GDP per capita nears to GDP per capita in advanced economies.

The real GDP growth in China has been quite fast in recent years. Figure 7 shows the GDP growth rate of China compared with that of the United States'. During 2000-2014, the GDP growth rate in China averaged approximately 10% per year, whereas the GDP growth rate in the U.S. averaged only about 1.8% per year. Many scholars believe that the reason behind China's rapid growth rate was the tremendous increase of investments in capital, the rapid technological progress or *Total Factor Productivity Growth (TFP)* during the transition from centrally planned economy to market economy, as well as increased trade with the world.

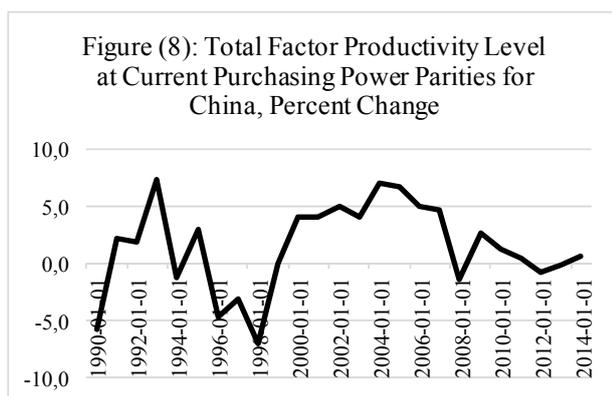


¹ <https://www.ubs.com/robert-solow>

Source: Federal Reserve Economic Data (FRED)



Source: Federal Reserve Economic Data (FRED)



For an emerging market economy that has a low-level capital-labor ratio, like China, high rates of investment are good for faster accumulation of capital stock and higher growth during the merging to the steady-state rate of the long-run economic growth. Prasad (2008) states that the considerable fraction of this investment in China was financed by credit provided by state-owned banks at low-interest rates. Indeed, the cheap capital played a huge role in changing the capital-labor ratio and holding down the employment growth (Aziz, 2006; Lardy, 2006).

China had been distinguishing from the rest of the world due to the high level of saving as a fraction of GDP (Ma et al., 2010). Moreover, China's gross national saving rate had been rising in the 2000s, because China is a high saving country.

By studying the Solow Growth Model, we confirmed that China as a developing country often grows much faster than advanced economies like the United States. Economies experience rapid growth when they make more rational use of underemployed resources, such as labor, and take advantage of more advanced technology that was developed in a different country. Rapid growth also occurs when there is an important economic transition, for instance, from a centrally planned economy to a market economy. However, as economic growth progresses in an emerging economy, the underemployed resources become scarce, technology moves closer to the level in

advanced economies. At that point, the economic growth unavoidably slows down. Hence, we will not be able to say when and how much China's growth will slow down. However, starting from 2010 China increased its GDP per capita by 10% per year, while in the United States the GDP per capita grew by only 1% per year. It is necessary to state, that this amount of growth would take about 16 years for China's GDP per capita to catch up with the GDP per capita in the United States.

I. CONCLUSION

China's economic growth was one of the most remarkable growths of all time. The Chinese economic reform started in 1987, which was believed to be better than the economic growths of "The Four Asian Tigers" (Taiwan, Singapore, Hong Kong, and South Korea). In this paper, we studied the most reliable economic growth model by Robert Solow, who suggested the three components of the long-run economic growth: the saving rate, the population growth, and the TFP growth. Solow highlighted the one and only determinant of an economy's long-run growth, which is the technological progress or productivity (TFP). We mentioned above that these three main components of economic growth provide increasing output in the economy. However, the only factor is productivity growth, which we reflected on China's example.

Subsequently, we made the two fundamental conclusions of the Solow Growth Model: firstly, emerging market economies will grow faster than advanced economies, and secondly, the technological progress is the fundamental determinant of the long-run economic growth.

Many scholars suggest their views on the reasons behind the miraculous growth of China, while there are others who cast doubt on China's capability to grow faster in the future. Optimists say that as China's lying in the left side of the Golden Rule level of capital-labor ratio, it will grow much faster than countries with higher level of capital-labor ratio. The authors continue offering explanations for China's growth. They have assessed its consequences in their articles, in terms of the labor market, income inequality, poverty, and happiness. All of these authors' main motivation was to resolve the puzzle of the remarkable growth of the Chinese economy.

All in all, we find that China will continue to grow faster at higher rates than other economies. In addition, within twenty years China will not only continue to have the largest population but also will become the largest economy in the globe.

REFERENCE LIST

1. Allen, F., Qian, J., & Qian, M. (2005). Law, finance, and economic growth in China. *Journal of Financial Economics*, 77(1), pp. 57-116.
2. Chen, B., & Feng, Y. (2000). Determinants of economic growth in China: Private enterprise, education, and openness. *China Economic Review*, 11(1), pp. 1-15.
3. Demurger, S., Sachs, J. D., Woo, W. T., Bao, S., Chang, G., & Mellinger, A. (2002). Geography, economic policy, and regional development in china. *Asian Economic Papers*, 1(1), pp. 146-197.
4. Ding, S., & Knight, J. (2009). Can the augmented Solow model explain China's remarkable economic growth? A cross-country panel data analysis. *Journal of Comparative Economics*, 37(3), pp. 432-452.
5. Feng, X., Ljungwall, C., & Guo, S. (2011). Re-Interpreting The "Chinese Miracle." *International Journal on World Peace*, 28(1), pp. 7-40.
6. Fleisher, B., Li, H., & Zhao, M. Q. (2010). Human capital, economic growth, and regional inequality in China. *Journal of Development Economics*, 92(2), pp. 215-231.
7. Gilboy, G. J. (2004). The myth behind china's miracle. *Foreign Affairs*, 83(4), pp. 33-48.
8. He, L. (2005). The chinese path of economic reform and its implications. *Asian Affairs, an American Review*, 31(4), pp. 195-211.
9. Jain, R. (2014). China's remarkable economic growth. *Journal of Third World Studies*, 31(1), pp. 240-241.
10. Krugman, P. (1994). The myth of asia's miracle. *Foreign Affairs*, 73(6), pp. 62-78.
11. Lau, K., & Brada, J. C. (1990). Technological progress and technical efficiency in chinese industrial growth: A frontier production function approach. *China Economic Review*, 1(2), pp. 113-124.
12. Malkiel, B. G. (2009). The chinese economic miracle: Can it last?1. *Proceedings of the American Philosophical Society*, 153(2), pp. 193-199.
13. Rawski, T. G. (2001). What is happening to China's GDP statistics? *China Economic Review*, 12(4), pp. 347-354.
14. Ray, A. (2002). The Chinese Economic Miracle: Lessons to Be Learnt. *Economic and Political Weekly*, 37(37), 3835-3848.
15. Solow, R. M. (1991). In Becker R., Burmeister E., eds (Eds.), *A Contribution To The Theory Of Economic Growth*, International Library of Critical Writings in Economics, no. 10.
16. Wang, X., & Zhou, Y. (2016). 4. Forecasting China's Economic Growth by 2020 and 2030. China's new sources of economic growth: Reform, resources and climate change, 1, pp. 65-87.
17. Wu, Y. (2003). Has productivity contributed to China's growth? *Pacific Economic Review*, 8(1), pp. 15-30.
18. Wu, Y. (2004). China's economic growth: A miracle with Chinese characteristics. Routledge. <https://www.taylorfrancis.com/books/9781135786960>
19. Wu, Y., Guo, X., & Marinova, D. (2017). 9. Productivity, Innovation and China's Economic Growth. *China's New Sources Of Economic Growth*, p. 213.
20. Yao, Y. (2014). The Chinese growth miracle. In *Handbook of economic growth* (Vol. 2, pp. 943-1031).
21. Zhang, C., & Zhuang, L. (2011). The composition of human capital and economic growth: Evidence from china using dynamic panel data analysis. *China Economic Review*, 22(1), pp. 165-171.
22. Zhu, X. (2012). Understanding china's growth: Past, present, and future. *Journal of Economic Perspectives*, 26(4), pp. 103-124.