
The Chinese growth miracle: What can make it continue, what can make it go over?

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Foreword

Once I started thinking about a topic for my master thesis my main motivation was to analyze issues related to social and economic development in China. Since I am a Chinese student who studies in Europe, I noticed both social and economic development's difference between China and Western countries. And China is playing a quite important role in world economy. It has surpassed Japan in 2010, becomes the world second largest economy. My interest in the topic was further enhanced by China's potential challenges ahead.

In this thesis, I retrospect China's spectacular growth miracle in the past decades, analyzed the ongoing situation and difficulties lying ahead. And find the traces to made prediction about its long run growth outlook.

This work would have been difficult without help of certain people who surrounded me all the way through this thesis.

I hereby want to express special thanks to my academic advisor Klaus Mohn, who was guiding and supporting me throughout thesis writing process and giving valuable feedback.

I would like to express my deepest gratitude to my mother and all the friends who have been supporting me throughout these years.

Abstract

This thesis analyzes and explains China's economic growth miracle during the last decades and predicts China's likely long run outlook. In the first part the relevant theories are presented. And then China's current economic development was reviewed. Advantages to keep the growth miracle and persistent challenges would lead the growth go over were both discussed.

The analysis of this research revealed the difficulties for the growth miracle to continue, and provided the poignant long run growth prediction. It is deemed that previously swift growth miracle won't last, but there're chances that China may outperform in the future time to surprise the rest of the world

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Chapter 1 Introduction

1.1 Back ground and motivation

Thirty years ago China launched its economic reforms which have transformed the country at an outstanding speed. For more than three decades China has maintained high growth, which is being called a growth miracle in the world. Even after the financial crisis in 2007-2008, while many world major economies were nosedived into a new round recession, China was still a shining star, continued its fast growing. Since 2007, China has become the largest contributor to the world economic growth, as well as nowadays the nation has become the second-largest economy in the world, more and more people noticed this emerging global player on multiple aspects, not only economic aspect, but also social, cultural, political and environmental aspect.

The newly released statistics from China National Bureau of Statistics shows that the growth of its economy has just experienced an unexpectedly slowing down to 7.7% in the first quarter of 2013. (McDonald, 15th April 2013) Many economists believe that China has entered a period of slowing economic growth, and the era of double-digit annual economic growth rate has ended. It is a comprehensive economic growth phenomenon, many developed countries had experienced the similar transition phase, such as Japan in 1970s. Some of the economists are still quite positive, such as Lin Yifu, former Senior Vice-President and Chief Economist of the World Bank, and one of China's most important economists, predicted that China can maintain 8% annual growth for 20 years (Ross, 29th March 2013); however, there are also many serious concerns that China may be unable to sustain its current growing miracle. Considering the potential complexity of challenges China will face, it's not a simple task to rebalance its growth mode to maintain current growth. (Muto, 2011)

Significant slowdown in Chinese economic growth will directly affect other economies around the world. Due to the growing impact of Chinese economy to the rest of the world, the topic concerns whether China's growth miracle will continue or go over is heating up worldwide.

For myself, being a Chinese student studying in Norway, I will always remember how proud I was when surrounding people were talking to me the great success of Beijing's hosting Olympic Games in 2008. And I did feel excited when former Premier Wen Jiabao announced that China has brought down the number of people in absolute poverty from 250 million to 15

million in less than 30 years as one of China's major ongoing economic achievements. I care for the nation's economic outlook as well as you; moreover, my personal touch is added. Therefore I want to draw some insights from China's current growth miracle for forecasting Chinese economy's long-run outlook through my research paper.

1.2 Research questions

The recent slowing down pace in economic growth indicates that China's export-led economy is certainly not immune to a global slowdown that originates from financial crisis since 2007. And correspondently, China's growth has been heavily driven by investment, and it is being criticized such "excessive" investment-driven growth has side effects, which eventually may grow too large to control if China fails to rebalance its economic growth. Corruption, current massive housing bubble, barrage of bad loans...etc, these all seem not to be looking easy to get over for a bright future. Are we witnessing the end of a Chinese growth miracle, or this is just a bump in the road to reshape its economy? (Fukumoto & Muto, 2011) This will be the core question for my research paper.

With this in mind, the following specific questions are raised to support the core question.

- 1) What is the mysterious trick behind China's economic growth miracle over past three decades?
- 2) Will Lewis Turning-Point's coming together with energy bottleneck and sever environmental problem drive Chinese economy into dead corner?
- 3) How likely that China can overcome difficulties to realize so called "China dream", would its new round reform be helpful?

1.3 Structure of the thesis

Based on the questions listed above, my research paper is organized as following parts:

- 1) The first part is to provide theoretical support for the following chapters. It is denoted as Chapter 2. The starting point for this Chapter is economic growth theory. It presents general economic growth law by decomposing growth function into several important factors—Capital, labor, energy and technological progress.
- 2) Chapter 3 is a short briefing about China's current development. Not only about its past success, but also side effects from the phase of growth miracle. It provides the answer to the first research question

- 3) Chapter 4 is about the long-run outlook. In this chapter the potential difficulties and opportunities has been presented.
- 4) Summarizes the findings in research, provides suggestions for international cooperation with China.

Chapter 2 Review of theory and previous research

2.1 Economic growth theory

The economic theories, some are for people to explore the economic relations, some just revealed economics laws to us. And among all these economic theories, the economic growth theory is quite a corn content, people are most concerned about the mystery of the economic growth, since it relates tightly to standards of our living. To analysis the long-run economic growth we have to dwindle everything else into insignificance except the sustained and significant increases in standards of living.

2.1.1 Economic growth and causation – different schools of thought

For many years, economists have been discussing what the causes behind growth are. Although there is little sign of a consensus emerging, the current mainstream growth theories all focus on the determinants of long term rates of growth in economic activity.

The modern conception of economic growth began with the critique of Mercantilism. The sources and sustainability of productivity growth was first appeared in the early classical economists' literature -- Smith and David Ricardo's literatures. A characteristic feature of their approach is the belief that production involves labor, produced means of resources and natural resources. The classical growth theory provided the view that an increase in population would have an adverse effect on the economy as resources has been limited due to greater demand. Contemporary theories on economic growth are dominated by the neoclassical or exogenous growth model .It is also known as the Solow-Swan growth model. The neoclassical theory of growth is built on a concept of diminishing returns. Neoclassical economists believe that to raise an economy's long term trend rate of growth requires an increase in the labor supply and also a higher level of productivity of labor and capital. It attempts to explain long run economic growth by taking productivity, capital, population growth, and technological progress into consideration. (Rispen, 2009)

And more recently, another main stream thought for growth theory is endogenous growth theory. Endogenous growth theory economists believed that the key factor for improving productivity is innovation. A faster pace of innovation in both process and product, as well as additional investment in human capital, all can lead to a higher level of productivity.

These days, there is a new theory of economic Growth, given the transformation of the whole world we' are facing. According to professor Douglas McWilliams (2012), the new situation compared with the view where traditional economic growth theories are based on, is with two thirds of the world's population's transformation from starvation to moderate prosper, the economic capacity is not longer fully utilized, because that a part of the world may loss economic competitiveness, therefore it can't price itself back to full employment unless creating a certain high-level inflation. Besides of the aftermath of recent financial crisis, there're three key changes are affecting economy: (McWilliams, 2012)

- 1) The emerging economies become supercompetitive, not allow their emerging prosperity to blunt their economic edge.
- 2) The change in the terms of trade away from primary commodities, causing primary product inflation.
- 3) Constrains from inflationary consequences of primary products prices, with accelerating require on economy growth, and limited natural recourses.

This new growth theory included the balance of payments. Adopting the Thirlwall's Law, the long run growth of a country can be approximated by the ratio of the growth of exports to the income elasticity of demand for imports. (Thirlwall, 1979)

All in all, the actual economic growth is brought by the improvement of labor productivity, together with the increase of total output, where the very stuff is to increase goods and services per capita.

2.1.2 The Solow-Swan Neoclassical Growth Model

When we take broad view, it's clear that the overwhelming bulk associates economies' productive potentials, and in the factors that determine productive potentials are—the value of the capital stock, the skill of the labor force, the efficiency of energy consumption, and the level of the technology and organization currently used in production. This is consistent with Solow-Swan neoclassical growth model.

In 1956, Robert Solow published the famous paper: 'A Contribution to the Theory of Economic Growth', in which he formulated an economic model to describe and predict the future growth path of the economy in United States. And similar models were also proposed by Swan (1956) and Meade (1961). In 1957, Solow extended this theory by introducing

technology progress and production process as new factors. This model became more commonly known as Solow-Swan model.

The production function can be written as $Y_t = AF(K_t, L_t)$, where Y is output, K is aggregate capital, L is labor, and A is level and technology, with the following assumptions (Rispens, 2009):

- 1) Countries produce a single, homogenous good of output.
- 2) Output is measured as units of a country's gross domestic product
- 3) No government or international trade.
- 4) All factors of production are fully employed, but NAIRU (non-accelerating inflation rate of unemployment)
- 5) Available technology stock is considered exogenous.
- 6) Capital inputs are subject to diminishing returns.

Take the energy factor into the function, it becomes $Y_t = F(K_t, AL_t, E_t)$, where Y is output, A is an exogenous constant—level of technology, K is aggregate capital, E is energy consumption. The model's inner force is the diminishing returns to scale of capital. It is believed that a sustained increase in capital investment increases, the ratio of capital to labor will go up; however, the marginal product of additional units of capital is assumed to decline. Therefore, the economic growth with increased capital is only temporary. Eventually, the inner force will drive the economy smoothly back to its steady state, where the output and capital are growing at the same rate as labor (or population). This means that per-capita income and capital-labor ratio ($K_t/L_t = k_t$) are constant at the steady state. Once the steady state is reached, the growth of per-capita income can come only from exogenous technical progress. And it is unexplainable by the model.

As we have seen the basic Solow model's production function exhibits constant returns to scale and is assumed to be capital-augmenting. A neoclassical approach to the problem is usually based on the concept of a production function of the Cobb-Douglas type. The production function model here in Cobb-Douglas type becomes: $Y_t = A K_t^\alpha L_t^\beta$

Where Y is output, K is capital, L is labour, A is total-factor productivity, α and β are parameters, both are less than one, indicating diminishing returns to a single factor; and in

total equals to 1, that is $\alpha + \beta = 1$, indicating constant returns to scale. And we can use $1 - \alpha$, instead of β , to express the function in a much simpler way.

Considering the energy consumption factor and total-factor productivity, with the assumption that δ is exogenous and constant depreciation rate, the function can be rewritten as:

$$Y_t = AK_t^\alpha L_t^{1-\alpha} E_t^\gamma e^{\delta t}$$

Take the derivative of Y , we can derive $\dot{y} = \alpha \dot{k} + (1 - \alpha) \dot{l} + \gamma \dot{e} + \delta t$

In this equation \dot{y} denotes the growth rate of output, $\alpha \dot{k}$ is the contribution to the growth rate of capital stock, $(1 - \alpha) \dot{l}$ is the contribution of the growth rate of the labor supply, and $\gamma \dot{e}$ is the energy contribution to the growth in output. As for residual, here $\dot{a} + \delta t$ represents total-factor productivity and is dependent on estimates of the other components.

This basic growth accounting equation shows that per capita productivity growth can be decomposed into contributions of growth in physical capital \dot{k} , labor supply \dot{l} , energy consumption \dot{e} , and total factor productivity growth δt .

2.2 Capital formation and real investment (K)

Capital formation is of great importance for the overall economy, due to that the boost for investments can further the economic development. This is necessary for economic growth. Generally, when investment increases, capital goods also increase, and it is termed as capital formation.

2.2.1 Capital formation

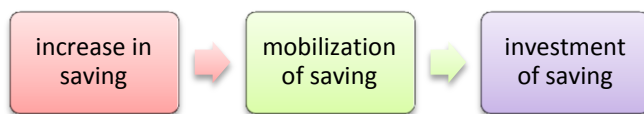
To reach a certain level of per capita income in an accurate time horizon, a certain quantum of investment should take place.

Simply to say, capital formation means the addition in the stock of capital goods. But it's just much more than just capital rising. It's a measure of capital accumulation that impacts the productive capacity of the economy. According to Todaro and Smith (2011), "Capital accumulation is increasing a country's stock of real capital". (Smith, 2011) That is to say, it requires that the capital raised be invested in productive assets. Obviously, new plant, machinery, equipments, and materials all can increase the stock of capital for a country, or otherwise be used to make a business more productive. Thus they're counted as capital

formation. The more productive those assets are, the greater the capital formation from the investment. And the more jobs could be created. (Aguilar, 2012)

Broadly speaking, human capital is also counted as a kind of capital formation. It's productivity investment in people. Just like physical capital, human capital also increases a country's productive capacity. Therefore, the costs derived from job-training, health expenditures and etc., which are for increasing the productivity are also known as capital formation.

2.2.2 three-stage process of capital formation



2.2.2 capital formation process (source: Process of capital formation, [www.http//Tutorsonnet.com](http://Tutorsonnet.com))

The process of capital formation can be categorized into three stages as the graph shown.

1) Increase in saving

In the very first segment, there're two factors mainly affect the change in saving.

The first factor concerns the environment for investment, if there is a secured market and stable money value. People would have much more willingness to save money when they're confident that there exists a means of storing value for long periods without any loss.

And the second factor affecting change in saving is the power to save. The determinants for the power to save could be the level of income, distribution of income, government policy and foresight, interest rates, etc. (Process of Capital Formation Homework Help, Tutoring)

2) Mobilization of saving

Wealth can be consumed, saved or invested. To generate more wealth, the key is to transform savings into investments. Normally people save through financial institutes, such as commercial banks and financial companies, etc. Financial institutions play the role of intermediaries, who're mobilizing collected saving from savors towards investments. And their investments would lead to the increase in capital formation.

3) Investment of saving

The last stage is to create additional capital goods. And in a country, this act is accomplished by entrepreneurs. They chase on surplus from financial companies and other capital market, they invest in different industries. The increased capital formation leads to the growth of national income of a country eventually.

2.2.3 The Harrod-Domar Growth model

The neoclassical growth model (Solow 1956) suggests that saving has no influence on the long-run growth of a country's total output. And it's because capital deepening not only increases the capital to labor ratio but also requires an increased share of output to replace and maintain existing capital. (Alexia Prskawetz, 2007) The Harrod-Domar growth model, which is different from neoclassical growth model, is used in development economics to give some insights into the dynamics of growth in terms of saving level and productivity of capital. Let Y be GDP and s be savings' rate. The level of savings for a closed economy can be expressed in a function of the level of GDP:

$$I = S = sY.$$

Investment I is a very important variable, which represents an important component of the demand for the output of an economy as well as the increase in capital stock. And the level of capital K needed to produce an output Y is given by the equation

$$K = \sigma Y, \text{ where } \sigma \text{ is called the capital-output ratio.}$$

Thus $\Delta K = \sigma \Delta Y$. To reach equilibrium, supply and demand for a country's output should be balanced. In simplest case, closed economy, the condition for equilibrium can be $I = S$. Thus,

$$I = \Delta K = \sigma \Delta Y$$

together with $I = S$

$$\text{We can get } \sigma \Delta Y = sY$$

Assume g to be the equilibrium rate of growth, g is given by $g = \Delta Y/Y$. (Thayer Watkins, 2013) Substitute into function above, g can be expressed as s/σ . Put it in words, it says the equilibrium growth rate of output is equal to the ratio of marginal propensity to save and the capital-output ratio.

The main criticism for the model is that investors are only influenced by output, expressed in the function as the stock of capital goods K is proportional to the level of production Y . Because the investment is instantaneous, so the capital stock can jump, this assumption is inaccurate.

But still it proved that more investments can lead to capital accumulation, as well as generate economic growth.

2.3 Demographics and labor force development (L)

It is well known that productivity is a key determinant of a population's per capita income over the long term. Labor productivity, defined as the output per hour worked, therefore becomes a measure of how efficient a given population is in producing goods and services. It is vital for a country's economic growth.

Take a quick look from the simplest Cobb-Douglas function, $Y = AK^\alpha L^\beta$, where we can conclude that all else equal, Y and L are positively correlated. The more input of labor, the more output will be generated for a country.

When we take natural logarithm on both sides of the function, and then seek the derivative from it, we can get the equation, $\dot{y} = \dot{a} + \alpha \dot{k} + \beta \dot{l}$. The left side of the equation is the growth rate of total output, approximately can be seen as economic growth rate. And $\beta \dot{l}$ on the right side of the equation, which is on behalf of the contribution of labor to economic growth, appeared as the product of output elasticity of labor and labor growth rate.

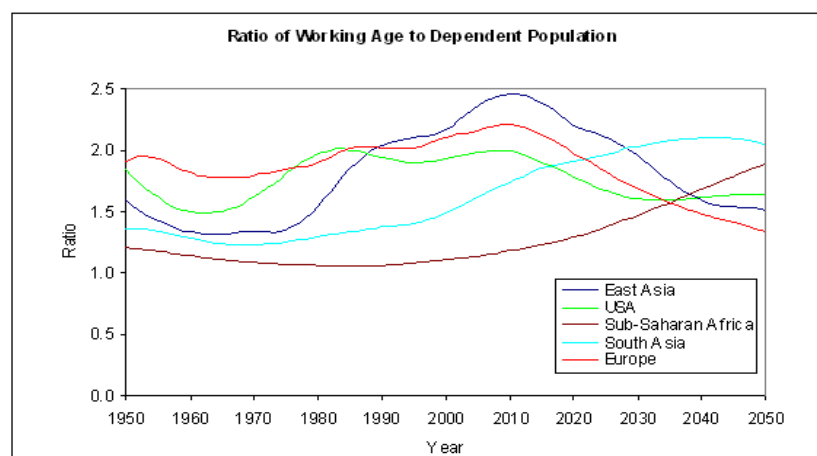
It's obvious that the proportion of the labor force in a country's population, as well as labor productivity, is positively correlated with economic growth.

2.3.1 Demographic change and economic growth

Due to capital dilution, population growth could reduce the growth rate of economics, according to the neoclassical growth model (Solow,1956). Nowadays, although several authors suggest that population growth has no effect on economic growth in growth equations with the growth rate of the total population as the only demographic variable, they still confirm that if look upon the assumption of a stable and constant age distribution, demography indeed matters for economic. In other words, age structure of the population can influence labor force, consequently it will affect productivity and economic growth.

Dependency ratio becomes an important measurement. It can be decomposed as youth dependency ratio (the population below working age divided by the population of working age) and aged dependency ratio (the population over retirement age divided by the population of working age). When the dependency ratio is falling, the demographic dividend appears. With the decline of youth dependency ratio, fertility rate drops, there become fewer younger dependents, meanwhile, there are fewer older dependents because that the older generations have shorter life expectancies. As a consequence, the proportion of population of working age group is particularly prominent. On the other hand, when the dependency ratio increases, or more specific, when a relatively large share of the population is constituted by elderly people, it becomes demographic burden. In this case, labor force may shrink because of the change in the population's age structure.

Generally it is believed that the demographic dividend leads to opportunities for economic growth. Contrarily, demographic burden would negatively affect the growth of output per capita.



2.3.1-1 dependency ratio (Source: WPP , 2004)

2.3.2 Labor force-- Engine for Development

A rising size of the labor force in a country represents an opportunity to drive its economic expansion and the increase in gross domestic product (GDP).

The growth of a country's labor force is determined by the growth in its population both numerically and structurally, and the labor force participation rate. The rate of labor force participation indicates the percentage of the people who are working or looking for work within the working-age range. In the short run, labor force participation is certain response to

unemployment and wages. But in the long run, it's driven by cultural influences, social welfare rules, returns to education versus experience, tax rates on capital and labor, and the long-run national economic background. As one of the determinants for the labor force, the labor force participation rate is not easy to predict as other determinants, but it is a key component in long-term economic growth. (Leila Bengali, 2013)

2.3.3 Turning Point—surplus labor economy

The idea of the “turning point” in a labor surplus economy was first developed by economist Arthur Lewis (1954). In Lewis’ model, the change in labor surplus economy is dualistic, with an urban industrial sector, and a rural relatively unproductive sector. Moreover, the marginal product of labor in rural areas is well below the living standards that poor residents of rural areas enjoy. The marginal product of labor in urban employment is positive and well above levels in the countryside. It leads to migration of labor from rural to urban areas so that increases total product and output per capita. And such rural-urban migration is a main source of growth in total output. According to Lewis (1954), when the rate of economic expansion in the urban sector is fast enough, sooner or later the surplus labor in the rural economy will disappear. At this point, the excess labor in the rural sector is fully absorbed into the urban sector, any further migration raises the marginal productivity of labor in rural employment. The rate of increase in living standards in the rural sector accelerates. The real wage rate increases in both the rural and the urban sectors. This is the “turning point” in economic development. (Garnaut, 2010)

Many economists believe that, the “Lewis turning point” is one of the important milestones for a developing economy to become a developed economy. Besides, “Lewis turning point” and the “demographic dividend” are positive related. The appearance of Lewis turning point is always a sign that “demographic dividend” has started to disappear gradually.

2.4 The role of energy in economic growth (E)

Originally, energy was not considered as one of the inputs to build up the production function. The mainstream economists were thinking of capital, labor and land as the primary factors of production, and fuels and materials were seeing as intermediate inputs. In the theory of growth, the approach had also focused on the primary inputs such as capital, and labor. Take traditional Solow model as example. It didn't take energy directly into account, well since 70s of the last century, a large literature on natural recourses economics was triggered by the oil price shocks. Follow by Stiglitz (1974) and Solow (1974), the growth model has been

developed as Cobb-Douglas production function that we mentioned previously, $Y = AK^\alpha L^{1-\alpha} E^\gamma$, where E is fossil energy use. Here energy is just the same as other commodity inputs and that a high enough price will create its own energy supply in perpetuity. After taking natural logarithm and derivative, we have the growth function $\dot{y} = \dot{a} + \alpha \dot{k} + (1-\alpha)\dot{l} + \gamma \dot{e}$, in which energy as one of the components contributes to the overall output growth. The model shows that when effective energy, which is the product of the quantity and quality of energy and the level of energy augmenting technology, is scarce, energy component in the function will constrain economic growth. But when effective energy becomes more abundant, energy is much less of a limiting factor for economic growth rate. This also explains why mainstream economic growth theory did ignore energy contribution in the first place.

2.4.1 Energy and GDP

Theoretically energy and economic growth is positively correlated. The Figure 2.4.1 supports to the prediction from Solow's growth theory.

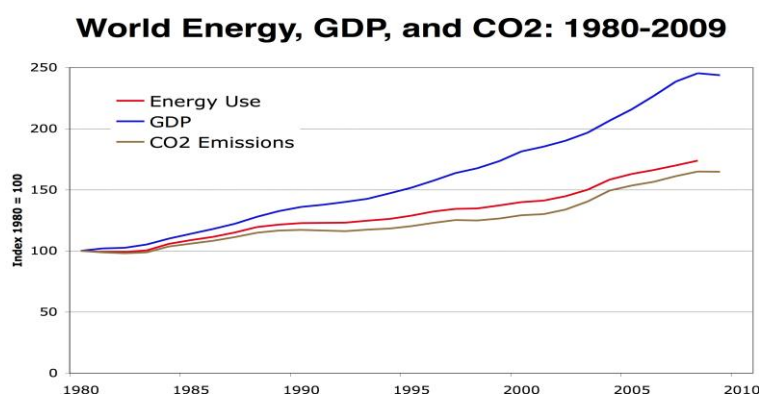


Figure 2.4.1 Energy and GDP (Stern, 2011)

First of all, figure 2.4.1 shows that not only that energy use has increased over the past decades in close association with GDP globally, but also the path along with the trend for both energy use and GDP growth are quite similar. Moreover, it's obvious that energy use has grown much more slowly than GDP's growth rate. This indicates that energy intensity has declined steadily over time. (Stern, 2011)

Energy intensity as a measure of the energy efficiency of a nation's economy, is calculated as energy used per dollar of GDP. Lower energy intensity indicates a lower price of converting energy into GDP. There're many factors influence an economy's overall energy intensity. The

possible drivers behind the decline in global energy intensity can be grouped into following categories according to Stern (2011):

1. Substitution between energy and other inputs
2. Technological change. It greatly improves energy efficiency.
3. Structural change. This can be thought in two aspects. The structural change can take place in inputs and outputs. Shifts in the composition of the energy input, such as shifts to higher quality fuels can reduce energy intensity. Shifts in the composition of output, for example, to increase the share of the service sector in economic activity, it helps to reduce energy inputs so that to reduce the overall energy intensity.
4. Prices
5. Policies

Get back to figure 2.4.1, the grey line in the figure stands for CO₂ emission. It follows the growth trend of energy use. And CO₂ emission has grown a bit slowly than the energy use dose. Similarly this tells that emission intensity declined over recent years, although not significantly. The methodology allows the change in emissions, could be separated into changes in the following factors (Bacon, 2009):

1. The carbon intensity of fossil fuels consumed
2. Fossil fuel intensity of energy, the share of fossil fuels in total energy used.
3. Energy intensity
4. Population
5. Income per capita

Among these five factors, income per capita and total population will be growing and the rest three factors can be decreased. The carbon intensity of fossil fuels can be reduced through the adjustment in energy input. As we all known coal has the highest carbon intensity, and natural gas had relatively low carbon intensity. And fossil fuel intensity of total energy consumption can be improved by shifting to renewable energy.

2.4.2 Efficient Energy Use

It has been widely discussed that to meet power needs without raising the pressure on the environment is to boost energy efficiency. It's a way of managing and restraining the growth in energy consumption.

With the result that energy consumption is increasing, improvements in energy efficiency are normally associated with proportionally greater improvements in total factor productivity. While technological improvements are introduced to increase efficiency of energy use, the behavioral or other systemic responses to the new technologies will occur. That is the rebound effect. Additional cost savings will also contribute to additional energy consumption. Due to the rebound effect, the increases in energy efficiency might result in increases in energy consumption. This is the extreme form of rebound effect, which is referred as backfire. According to the size of rebound effect there are three outcomes. The actual resource savings are negative, in which case the rebound effect is higher than 1, backfire appears. Greater efficiency leads to greater energy use since it causes people to consumer more goods and services. There is a school of thought that has argued that the effect of any energy-efficiency improvements will be a net increase in overall energy consumption. (B.Howarth, 1997) And it is generally calculated as a ratio of the lost benefit compared to the expected environmental benefit when holding consumption constant.

On one hand, rebound effects are significant, and it limits the potential for decoupling energy consumption from economic growth. On the other hand, rebound effects made energy efficiency improvements less effective in reducing overall energy consumption. This could limit the potential for decoupling carbon emissions from economic growth. Specifically, the contribution from improved energy efficiency will be less than common expectation. This implies a need which requires focuses on de-carbonizing energy supplies, as opposed to emphasizing solely on developing and improving energy efficiency technologies.

Economic growth will lead to increased energy consumption and improved energy efficiency, while increased energy consumption and improved energy efficiency is one of the driving force for the sustainable growth in economic output.

2.5 Technological progress and productivity (TFP)

New technology creates new production possibilities and increases economic growth. Therefore, technological progress supports productivity. Basically there are two reasons lying

behind economic growth, either input more resources, or increase productivity for turning resources into goods and services. In our finite world, resources, especially natural resources are limited, so that increases in resources alone can't persistently drive economic growth. With improvement in productivity, and deploying new technologies, it's more likely to realize a sustainably growing economy.

2.5.1 Productivity --driver of economic growth

The approach that neoclassical growth theory took focused on labor input and capital accumulation as the main engines of economic growth. However because of the limit impact of capital accumulation, which refers that diminishing return to labor, the growth would stop beyond some point without increases in productivity. Endogenous growth theory (Stiroh, March 2001) recent years put a lot more emphasis on technological progress, which raises productivity. Productivity thus is said to be the main engine of economic growth. (Rashid, 2006)

Moreover productivity has been recognized as the single most important gauge of an economy's health. Nothing could matter more for long-term living standards than improvements in the efficiency with which an economy combines capital and labor. Most analysts focus on labor productivity by dividing total output by the number of workers, or the number of hours worked, which is unfortunately an inaccurate way for representing the economy's productivity growth. The reason is that labor productivity along is an incomplete gauge for the overall efficiency.

A better choice is total factor productivity (TFP). Since it's not only take labor efficiency into consideration, it assesses the efficiency with both capital and used energy. Theoretically, TFP is a variable which accounts for effects in total output which are not caused by traditionally measured inputs. If all inputs are accounted for, or in the simplest production function, TFP can be seen as a measure of an economy's long-term technological change. While in Solow's growth model TFP is a residual, it's often called the Solow residual, which represents output growth factors not accounted for by the growth in inputs.

Once a country's labor productivity stops growing and an increasing capital causes the decline of the return on new investment, TFP becomes the main source of future economic growth driver. It is calculated as the percentage increase in output that is not accounted for by changes in the volume of inputs of capital and labor. The factors which affecting TFP include technological progress, skill level of labor force, cost of imported inputs, environment, etc.

Such as political disputes, Greenhouse gas emission, crime, these are counted as factors which have a negative effect on TFP. Some factors like favorable financial policy, cutting of red tape, would have a positive influential on TFP.

2.5.2 New production function

The Solow growth model as developed previously showed how changes in the capital stock, population growth, and the energy use will affect the long-run level of output of an economy. And we added technology change factor to complete the model. While the Solow model provided an explanation of persistently growing output, we can incorporate technological progress into the most simple production function $Y = F(K, AL)$, where A denotes the level of technology, AL together represents effective labor. In the simple production function, output relies on capital and effective labor that is largely depending on the state of technology. A higher level of A (technology level), require a smaller number of labor to reach the same level of output, assuming K is constant. In other words, technological progress reduces the number of workers needed to achieve a given amount of output. When thinking of AL as a whole, it means effective labor, thus the function implies a more skilled or better trained workforce can produce more output with a given capital stock.

2.5.3 Sources of technological progress

The production has shown that with given amount of capital and labor, technological progress leads to increase in output of an economy. Technological progress could mean a larger quantity of output, better products, or even new products. As for the sources that can bring technological progress, it can be grouped as follows:

1. Market organizations. They make the most important contributions to technological progress. Such as R&D department in the company.
2. Non –market organizations. Government research institutions and university research are good examples.
3. Science severely contributes to technological progress. Therefore, education and training are also considered relevant for technological progress.

Chapter 3 China Today—ongoing situation in China

Based on the figures released from Chinese national Bureau of Statistics, China's economic expansion ended the year 2012 with a growth rate of 7.8 percent. Since its initiating market reforms and open-up policy, China realized rapid economic growth and social development for already thirty years. Almost all its millennium 5-years' plan goals have been reached. And China kept an average GDP growth rate about 10 percent until 2010 reaching an all time high of 14.2 percent in 1992. Well since 2010 its growth rate had experienced steadily falling. The statistics in the early of 2011 shows that China has leapfrogged Japan to become the world's second-largest economy. Well known as the recent growth miracle, China seems to become a heating economic topic. To uncover its mysterious veil, let's get closer to what is the ongoing situation there.

The graph below displays China's growth miracle when compared with other world's major economies in the past two decades.

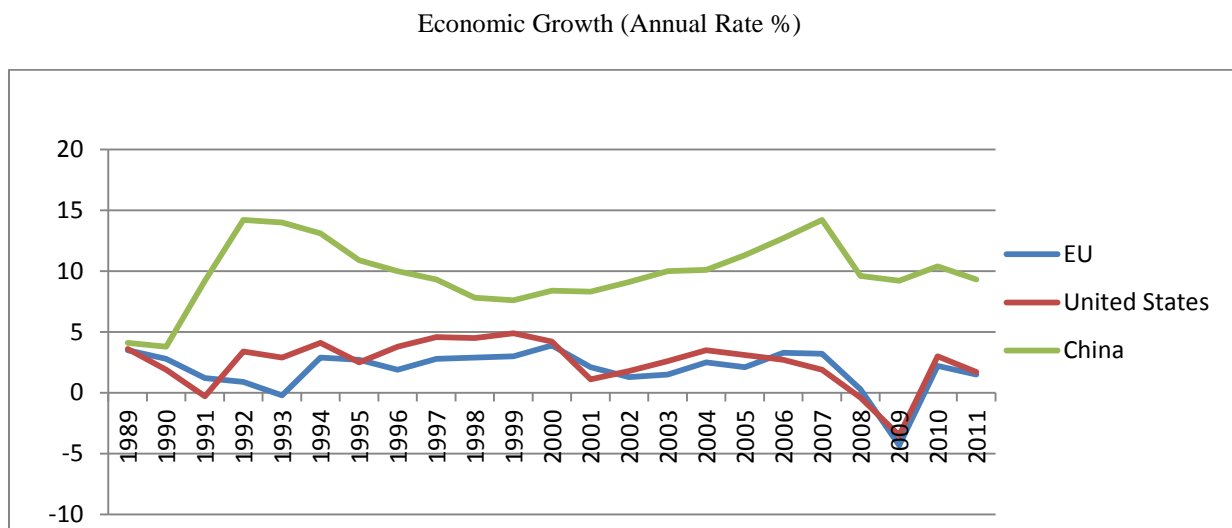


Figure3.0 economic growth (source: World Bank statistics)

3.1 General economic Growth

3.1.1 Slowing economy

According to the statistics released by Chinese national Bureau of Statistics on 22nd Feb. 2013, the preliminary figure of China's gross domestic product (GDP) is 519322 trillion Yuan in 2012, there's a growth of 7.8% compared with 2011's figure. Although this leads the global growth, it is indicated that China's economy growth is slowing.

From its GDP composition, as figure 3.1.1 has shown, with a slowing economy, China's private consumption is having a lower growth pace than GDP growth pace, though the share

of consumption is growing. Despite private consumption hitting 47% of GDP in the 1990s, it has fallen back in 2011 to below 40%. The composition of China's GDP is quite different from most major economies. In the US consumers spend around 70% of the GDP. And in most developed countries, private consumption reached around 60% of their own GDP amount. Even other fast growing developing countries followed this pattern, for example, India managed a private consumption proportion around 55%.

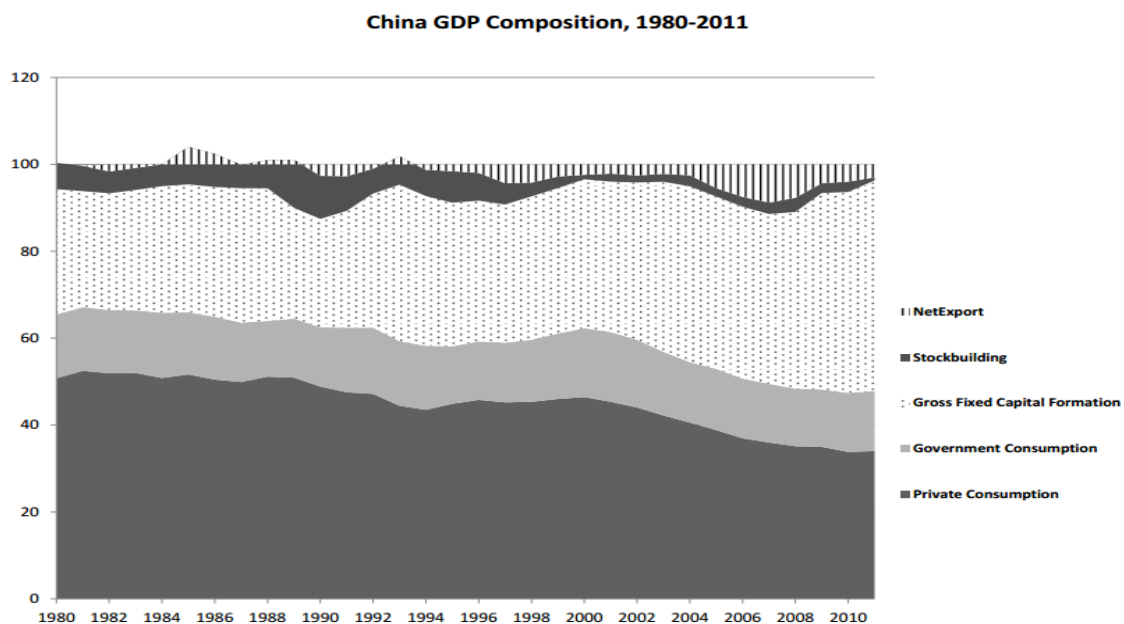


Figure 3.1.1 China GDP composition 1980-2011 (I.Mckinnon, 2012)

In 2008 and 2009, China unveiled a four trillion Yuan (586 billion dollars) stimulus package, which helped China to get through the global financial crisis with 9.2 percent growth. Although, infrastructure spending greatly supported the economic recovery, it has also raised many concerns after the Global Financial Crisis. One of the concerns is saying the stimulus did not change the deep structural problems, it left a growing investment and falling private consumption. The increase in investment is not necessarily a good thing. More investment than consumption leads to more supply than demand. It could be redundant investment that aggravates excess capacity. The only solution is internal reform, to increase internal demand. Therefore, boosting domestic consumption has been stated as the focus of economic policy in China's 12th Five-Year Plan already.

Another way to decompose the GDP structure is by sectors. The table 3.1.1.a shows China's GDP sector composition, and it indicates the ongoing industrial change in China in a comparative way with other major economies, such as United States and Japan. Again here, the GDP sector composition of China is different from most major economies. And

surprisingly, the figures presented by Table 2.1.1a for China in 2010 are not far from the figures for Japan in 1980. This finding has shown that there is similarity between China and Japan's growth path. The economic growth trend of China today is just the same as the growth mode of 1970s' Japan.

Region	Primary industry as % of GDP				Secondary industry as % of GDP				Tertiary Industry as % of GDP			
	1980	1990	2000	2010	1980	1990	2000	2010	1980	1990	2000	2010
China	30.1	27.1	15.1	9.5	48.5	41.6	45.9	44.6	21.4	31.3	39.0	45.9
Japan	6.1	2.5	1.8	1.5	46.7	42.0	32.4	28.0	47.2	55.5	65.8	70.5
U.S.	2.5	2.1	1.2	1.2	33.5	28.0	23.4	21.4	64.0	69.9	75.4	77.4

Table 3.1.1a GDP sector composition (Source: Chinese national Bureau of Statistics)

In retrospect, the changes in China's industrial structure can be roughly divided into three stages. The first stage began with the country's foundation and ended by the early 1970s. In this period primary industry prevailed and agricultural economy obviously dominated China's economy. The second stage started right after early 1970s and lasted until mid-1980s. Under the second stage, the proportion of primary industry still accounted for more than one third of the whole industrial pie, while secondary industry had surpassed the proportion of primary industry. In this stage, China's economy entered into the industrial economy. The third stage is after the mid-1980s, the status of the secondary industry continues to be solid, and the Primary industry is falling while the tertiary industry is growing rapidly. Compared with other major economies, the proportion of tertiary industry in GDP of China is still relatively low. Looking at table 3.1.1b, it is obvious that with the proportion's growth, the tertiary industry becomes another mainly pulling factor for China's economic growth. The growth of secondary and tertiary industry respectively contributed a figure which is more than 40 percentages to China's GDP growth.

	%Contributions from the growth of Primary Industry to the Increase of GDP	%Contributions from the growth of Secondary Industry to the Increase of GDP	%Contributions from the growth of Tertiary Industry to the Increase of GDP
1980-1985	26.7	37.5	35.9
1985-1990	25.9	39.9	34.2
1990-1995	16.8	49.8	33.4
1995-2000	7.3	43.9	48.2
2000-2005	8.9	49.8	41.3
2005-2010	8.4	46.2	45.4

3.1.1b contributions of the added value's growth of industrial sector to GDP growth

(Source: Chinese national Bureau of Statistics)

As well as stimulation of domestic demand, industrial restructuring as part of the internal reform has been included in 12th five year plan. And the first step is in action, reshuffle industrial structure and boost the competitiveness of state-owned enterprises.

3.1.2 Continuously uneven development

Just before the opening of National people's Congress (NPC) and Chinese People's Political Consultative Conference (CPPCC), the statistics of regional GDP for 31 regions (22 provinces ; 4 directly governed cities—Beijing, Shanghai, Tianjin, Chongqing; 5 autonomous regions—Tibet, Xinjiang, Guangxi, Ningxia, Qinghai) in 2012 were released. According to the figures published by China Economic Weekly (2013-8), there are 24 regions out of 31 regions (excluded Hong Kong and Macaw) have stepped into the “trillion club” by 2012 when calculated by Yuan. The more specific figures are revealed in the following table.

Regions rank by the amount of regional GDP	Regional GDP (Trillion Yuan)	Regional GDP per capita (Yuan)	Disposable personal income (Urban, Yuan)	Disposable personal income (Rural, Yuan)	Urban citizen ratio (%)	Disposable personal income as a % of regional GDP	Disposable personal income as a % of regional GDP (Rank)	Regional Location
1.Guangdong	57068	54325.31	30226	10542	66.5	0.499	3	East
2.Jiangsu	54068	68438.52	29677	12202	61.9	0.379	19	East
3.Shandong	50013	51897.06	25755	9446	50.95	0.346	26	East
4.Zhejiang	34606	63345.15	34550	14552	62.3	0.493	4	East
5.Henan	30000	31966.09	20442	7524	40.57	0.355	24	Middle
6.Hebei	26575	36703.22	20643	6061	45.6	0.356	23	East
7.Liaoning	24801	56685.22	23223	7384	64.05	0.369	21	Northeast
8.Sichuan	23850	29627.08	20307	7001	41.83	0.385	17	West
9.Hubei	22250	38645.52	20839	7851	51.83	0.384	18	Middle
10.Hunan	22154	30689.36	21319	7440	45.1	0.386	16	Middle
11.Shanghai	20101	85630.13	40188	17401	89.3	0.600	1	East
12.Fujian	19702	52961.77	28055	9967	58.1	0.417	12	East
13.Beijing	17801	88184.88	36489	16476	86.2	0.518	2	East
14.Anhui	17212	26640.55	21024	7160	44.8	0.438	8	Middle
15.Neimenggu	15988	54242.69	23150	7611	56.62	0.270	30	Middle
16.Shananxi	14451	38612.68	20734	5763	47.3	0.325	27	West
17.Heilongjiang	13892	36710.93	17760	8604	56.5	0.417	11	Northeast
18.Guangxi	13031	28063.91	21243	8008	41.8	0.406	13	East
19.Jiangxi	12949	38848.57	19860	7828	45.7	0.439	6	Middle
20.Tianjin	12885	35093.58	29626	13537	80.5	0.365	22	East
21.Shanxi	12113	33712.22	20411	6356	49.68	0.394	15	Middle
22.Jilin	11938	43419.57	20208	8506	53.4	0.354	25	Northeast
23.Chongqing	11459	39256.59	22968	7383	55.02	0.425	9	East
24.Yunnan	10310	22263.54	21075	5417	36.8	0.438	7	West
25.Xinjiang	7500	30968.47	18151	6442	43.54	0.315	29	West
26.Guizhou	8802	19609.54	18700	4753	34.96	0.418	10	West
27.Gansu	5669	21718.36	17237	4496	37.15	0.372	20	West
28.Hainan	2855	32544.51	20918	7406	50.5	0.439	5	East
29.Ningxia	2327	36386.02	22211	6922	49.82	0.397	14	West
30.Qinghai	1884	30167.89	17566	5364	46.22	0.320	28	West
31.Xizang (Tibet)	701	2312.43	18056	5645	22.71	0.233	31	West

Table 3.1.2 GDP distribution in mainland China (China Economic Weekly, 2013)

The table 3.1.2 summaries not only the figures of GDP contributed by each region but also a new concept so called percentage of regional GDP per capita contributed by each region's personal disposable income. The percentage is derived by dividing the average personal income in one region by its own regional per capita GDP. As it is said the denominator is per capita regional GDP and regional residents personal disposable income is molecular in this calculation. This new concept is aimed to warn people that there is a possibility of "high growth rate, slow development". From the table 3.1.2 we can see that some regions with a relative high regional GDP, the residents' disposable income is still relatively low. The reasons can be categorized into three aspects. Firstly, construction drives the strong regional GDP figure in many regions. As people concerned that behind the figure there might be not much more than "build up and tear down", the strong growth in GDP is not much about social wealth development. Secondly, when describing the GDP as a whole cake, the share of the government is too large compared to household share. In other words, unbalanced distribution of total national wealth would also lead to the situation of "high growth rate, slow development". And the last reason which we can't rule out is the false report by local government to exaggerate their achievement. Since the inflated growth figure can't be transformed into residents' income, therefore it's by including the percentage of regional GDP per capita contributed by each region's personal disposable income in the table, the ongoing economic development is reflected more accurate.

By ranking the GDP figures of each region, the table3.1 illustrates that the extremely uneven development among varied locations in mainland China has not changed yet. According to National Bureau of Statistics of China, the mainland China can be divided into four parts to reflect the socio-economic development of different regions. The four parts are Eastern (including 10 regions), Northeastern (including 3 regions), Middle (6 including regions), and Western (including 12 regions). Observing the rank after the amount of regional GDP, it's clear that within the top ten list, half of the regions are from Eastern part, and there's only one region is being labeled as Western part. Contrarily, there are seven regions from West part are ranked within bottom ten regions considering the amount of regional GDP. Similar result can be derived when we look at the statistics of personal disposable income as a percentage of regional GDP. Skim the top ten regions ranked by their percentage disposable personal income of regional GDP, it's not difficult to find out that there are six out of these ten regions are from Eastern part, and two regions which are respectively from Middle part and Western part; while to name the bottom five regions, four out of five regions are from Western part.

The huge economic development gap between Eastern China and Middle and Western China remains.

The growth miracle of China is benefiting from the political reform and opening-up policy initiated 30 years ago. But with the remarkable achievements in both economic growth and social development, the uneven development has also being generated. Especially since 1992, the year that the policy of reform and opening-up had been strengthened and market started to take lead in allocating resources, Eastern part of China became popular region for investments due to its geographical advantage, and preferential policies. With higher returns in Eastern regions and major cities, the imbalances are mainly underlining in two aspects—the uneven development among Eastern, Middle, Western regions; and the widening up income gap between urban and rural residents.

3.2 Economic Capital and Labor within manufacturing (K&L)

3.2.1 Gross Fixed Capital formation

Any progress or any tool, from the high-speed rail to a new advanced machine all can help to increase productivity and efficiency. Investments in such improvements and tools are called fixed capital formation. To be more precise gross fixed capital formation statistically measures the value of acquisitions of new or existing fixed assets by the business sector, governments and households. It shows that how much of the new value added in the economy is invested rather than consumed.

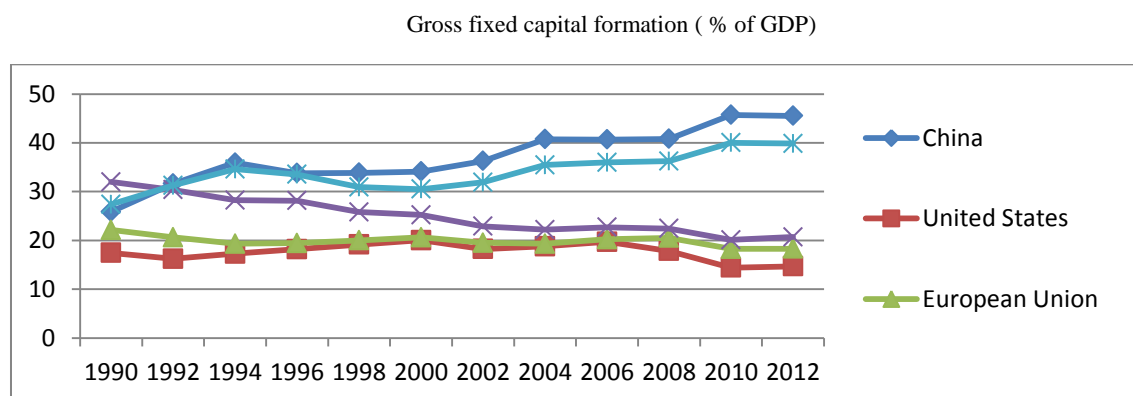


Chart 3.2.1Gross fixed Capital formation (% of GDP) (Source: World Bank)

The chart 3.2.1 above reflected the general law: developing countries often devote a relatively high percentage of GDP to their investment. And Among these countries, China has the highest gross fixed capital formation rate. Since the right amount of investment increases both

aggregate demand, but also increases future productive capacity. So far China's growth miracle has been spurred by devoting a significant percent of resources to investment.

The simple Keynesian Model can be expressed as $Y = C + I + G + (A - B)$, where C is consumption, I is investment, and G is government spending. Assume capital output ratio is a constant $k = K / Y$, hence the growth rate of K is $g_K = (I - dK) / K$, rewrite as $\Delta K = I - \delta K$. Observing with production function $Y = F(K, L)$, three functions together shows that investment can affect output level as well capital formation.

Investment is cyclical, and to some extent, the scale of a country's attracted investment can reflect the country's economic performance. Recessions can initiate falling investments. But with restoring market confidence, investment will find its way back. High investment produced rapid economic growth in China and rapid growth sustaining a feedback effect again to generate higher expectations which then elicited high investment. Different from China, most major economies had experienced recession after 2008, as chart 3.2.1 shown, needless to say, the fall in gross fixed capital formation has been a significant contributor. And China's success in financial crisis in 2008 is ascribed to the implementation of a 2 years stimulus package --four trillion Yuan (\$586 billion) plan. The stimulus package concerned government investment in 10 areas, including the spending on low-cost housing, rural infrastructure, health and education, as well as environmental protection and technology. (Jiabao, 2013) It has been proved that the stimulus package helped China to sustain its market confidence and generate higher expectations to induce high investment in the following years.

Despite remarkable rate of capital accumulation, how can China kept profitability remain promising enough to induce investment all along? It was probably maintained by rapid total factor productivity growth and the ready supply of surplus labor that could be combined with the increase in the capital stock. Both would have helped to keep up the marginal product of capital. (Ding, 2010) China's recent growth is in fact attributable to capital investment that has made the country more productive. In other words, new machinery, better technology, and more investment in infrastructure have helped to raise output. Therefore China kept its high investment expectations in recent times. (Khan, 1997)

3.2.2 Made in China

China is the world's most populous country. And over the past thirty years, "three dividends" - the demographic dividend, reform dividend, and the dividend of globalization, together pushed China's economic growth forward.

Since the birth peak in China happened in between of 1950 and 1973, and the people who were born within those years made great contribution for China's rapid economic development. It is considered as demographic dividend.

From late 1970s, with the reform and opening-up policy, a large number of Chinese manufacturing enterprises had gradually grown into a flourishing. Low-cost and intelligent Chinese workers, has made China become today's world factory. In recent decade, the label "Made in China" can be seen everywhere, and China has already become the major supplier for most of the giant low-cost goods retailers, such Wal-Mart, Carrefour. Although China's manufacturing output accounted for about 20% of the world manufacturing output, the production is either the low-end products or follows the pattern "Made in China & Designed by other industrial powers(such as U.S.)". Lacking of research and development devote, advanced technology, and brand building, there is still a considerable gap between China and other industrial powers.

In recent years, with the rising costs of raw materials and labor, the great advantage of China's manufacturing has been decreased. And more and more products now has been labeled Made in Vietnam, Indonesia, Cambodia, plus recent years weak external demand and slowing domestic economy, "Made in China" has been challenged.

1). Shrinking and aging labor force

According to China's National Bureau of Statistics, in 2012 China's working age population, which is aged between 15 years old and 59 years old, was 937 million, accounting for 69.2% of the total population. And there was a decrease of 3.45 million compared with the figure in 2011. Although it is still considered as great advantage in production, this first time decline has attracted eyeballs. And the population in the tender aged group, which aged from 0 to 14 years old was 222.87 million in 2012, accounted 16.5% of the total population. Together with chart 3.2.2a and 3.2.2b below, beside the shrinking population at working age, we can easily see an aged tendency of population and a decreasing trend in tender aged group.

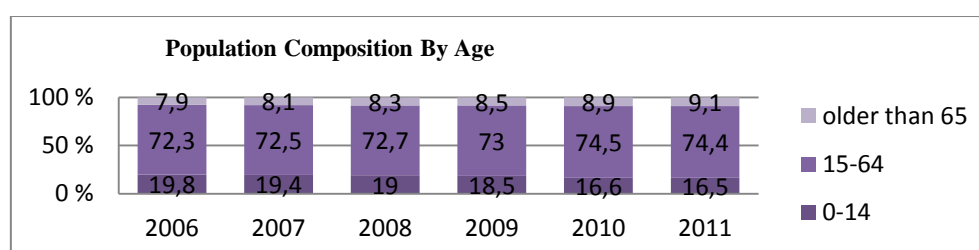


Chart3.2.2 a Population structure2006-2011(Source: Chinese national Bureau of Statistics)

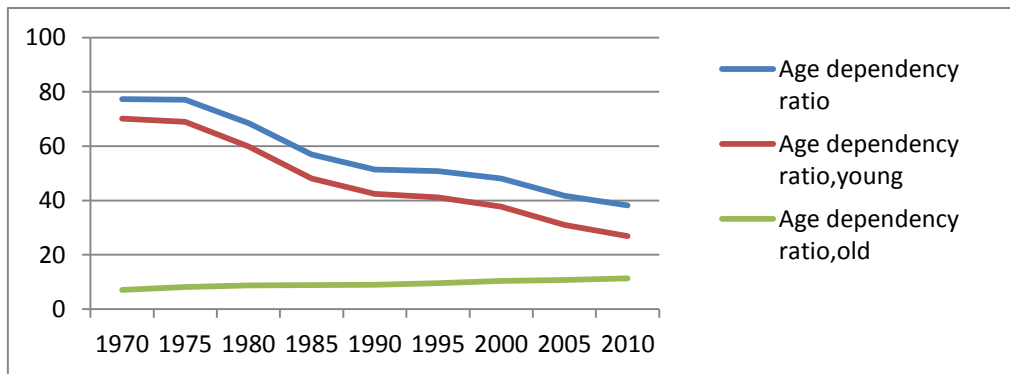


Chart3.2.2 b Age dependency ratio (Source: World Bank)

The Estimated decline in the Chinese working age population would start around the middle of this decade, while it occurred in 2012, according to Chinese national bureau of statistics. Generally speaking, as societies become richer, birth rates tend to decline naturally. But in China that trend has been deeply affected by the country's one-child policy which has been introduced since the late 1970s. The chart 3.2.2 b displays the value for age dependency ratio form 1970s to recent time. Age dependency ratio is the ratio of dependents (tender aged group 0-14 or aging group older than 64) to the working-age population (15-64). The chart showed a significant down-turn in both the age dependency ratio and the ratio of tender group aged between 0-14 in China since late 1970s. The one-child policy has kept China's dependency ratio artificially low, but it has also begun to slow the flow of new entrants into the workforce. Therefore the first decline in working-age population appeared in 2012 has aroused different opinions on whether demographic dividend is now coming to an end in China. (Crooks, 19th Jan 2013) The positive aspect is China's labor participation rate is sustaining a higher level than other major economies, as shown in Chart 3.2.2c.

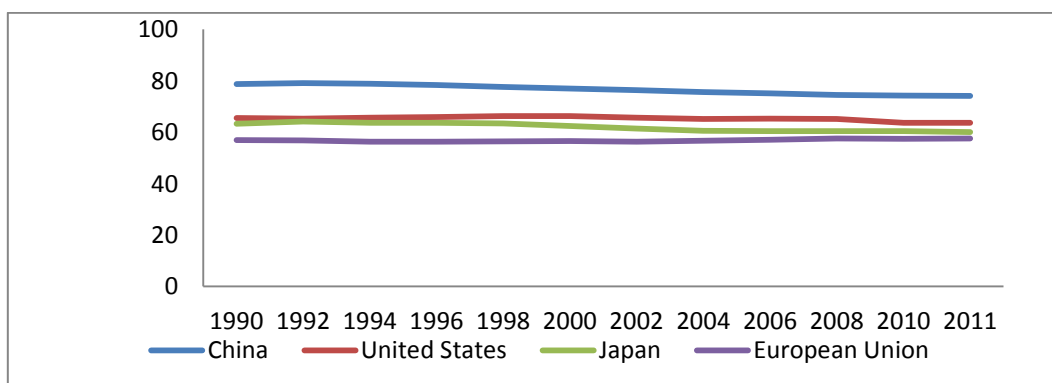


Chart3.2.2 c Labor participation rate in China (Source: World Bank)

With continuous one-child policy, China's intensive-manufacturing industry is facing the challenge from decreasing working-age population and aging workforce.

2). Low cost is ending

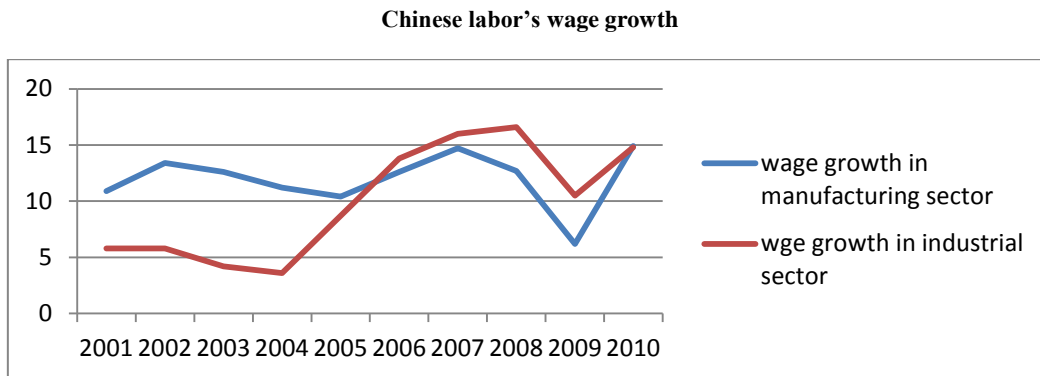


Chart 3.2.2 d wage growth in China (Source: Asian Development Bank)

The advantage of low cost labor force in China is now reducing. At stake is China's position as the "world factory", while competitors from South Asian countries to South American Countries, such as Vietnam, Mexico stand to gain as investors seek to relocate to countries that have cheaper labor or are closer to big markets in the U.S. and Europe. A very good example is given by Yao Dongqing (2013) which is in 2000, 40 percent of Nike shoes in the world were made in China, 13 percent in Vietnam. In 2009, both China and Vietnam accounted for 36 percent of shoes' manufacturing for Nike. While, in 2010 Vietnam has replaced China become the largest manufacturing country for Nike shoes. (Yao, March 2013)



(Source: The Economist 2011-Aug 27th)

The chart 3.2.2 d has shown a continuously quick rising average labor wage in manufacturing factor and industrial factor. And the chart 3.2.2 e intuitively reflects the fact that wage growth in China has been significant faster than many other Asian countries. While kept a rapid increase in labor wage, their labor productivity has not risen as fast as the wage growth rate. Quickly rising labor cost, made China's world factory status weakened, especially in low-cost goods

production. The labor-intensive manufacturing factories start to move out of mainland China towards South Asian countries in recent time.

Shrank labor force, aging population, quickly rising labor cost, plus relatively low productivity is becoming more and more severe challenge for manufacturing in China.

3.3 Energy Consumption (E)

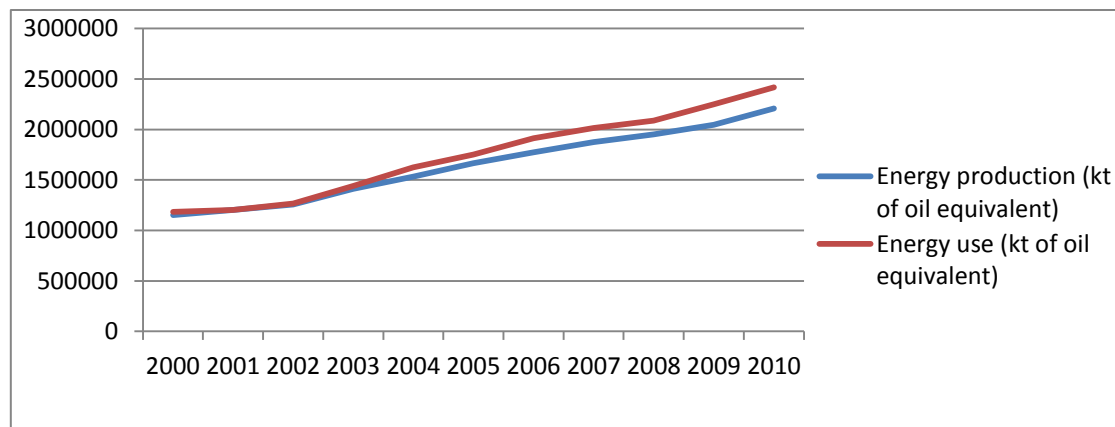


Chart 3.3.0 China's Energy production and consumption (Source: World Bank)

China's economy has been expanding rapidly in the past thirty years, especially in the last decade. As chart 3.4.0 has shown, this great growth is powered by a corresponding increase in energy production and energy use. The data of Chinese National Bureau of Statistics has shown that China had a total energy consumption of 3.25 billion tons of standard coal (also known as coal equivalent, 1 ton of raw coal is equivalent to 0.7 ton of standard coal, 1 ton of crude oil is equivalent to 1.4 ton of standard coal) in 2010, while the energy production of primary energy is 2.99 billion tons of standard coal. The gap between energy use and production is actually originated from 2002 as the chart 3.4.0 presented.

The bottleneck of China's energy supply seems to be arrived quietly. In 1993, China went from self sufficient to net oil importer, and not long after, China became the second largest world oil importer in 2009. Since 2003, China become the world's largest oil consumer, its oil consumption increasingly relies on import. Similarly, China became a net importer of natural gas and coal respectively in 2006 and 2007. In 2012, China overtook Japan and eventually became the world's top coal importer. (Jianhua, 2012)

3.3.1 Composition of China's energy consumption

It is well known that China is the largest consumer of coal in the world. Decomposing its energy consumption, coal consumption is fluctuating around 70% of China's primary energy consumption in recent years as chart 3.4.1 presented. This is definitely higher than any other world economies. And the reason behind, was because of the relatively large coal reserves in the first place. And now is more likely due to its coal-derived electricity system. Even with energy structural adjustment targets within the 12th five years plan, the seeing tendency is China has been and will continue to be a coal-powered economy.

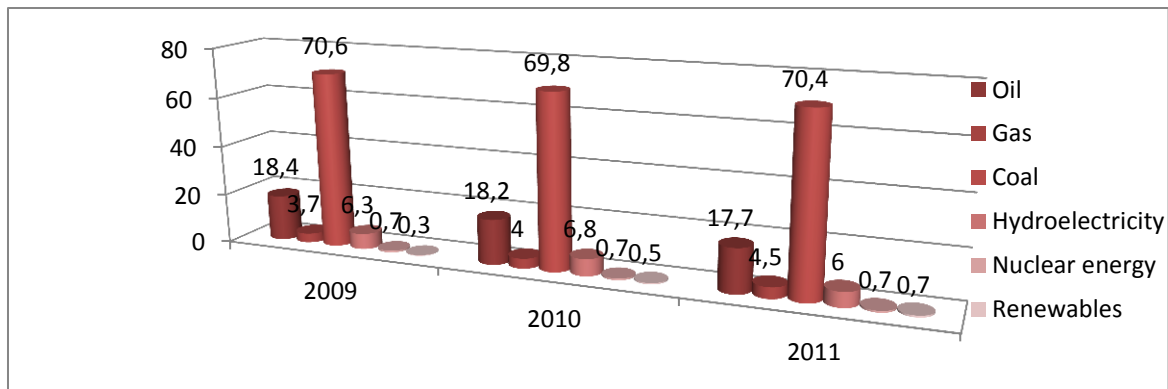


Chart 3.4.1 China's primary energy consumption, by type (2009-2011) (Source: BP Statistical Review of World Energy)

3.3.2 Energy targets in 12th five year plan

China's 12th Five Year Plan includes a few energy targets which can severely affect energy production and use in China. And these targets aimed at the period between 2011 and 2015.

- 1) Reduce Energy Intensity of the economy by 16% (Revkin, 2013)

Energy Intensity of Economy

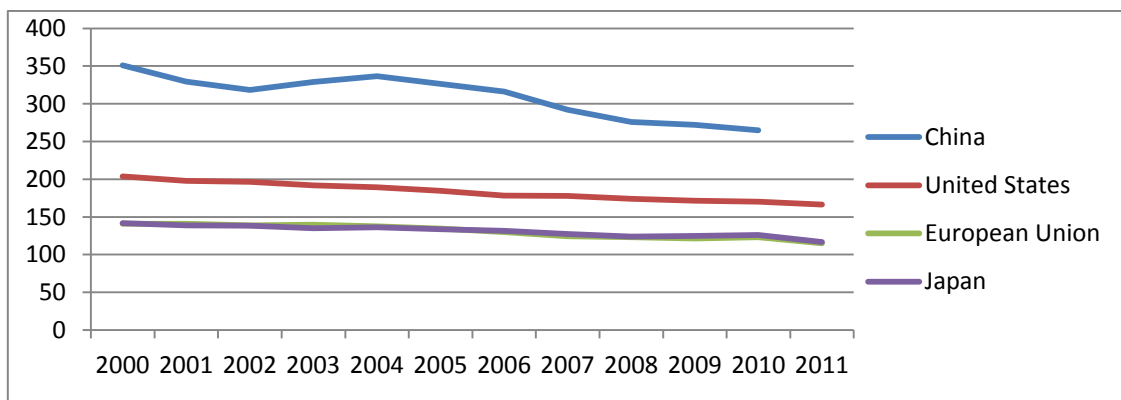


Chart 3.3.2 a Energy Use (kg of oil equivalent) per \$1000 GDP (constant 2005ppp)

(Source: World Bank)

Energy intensity is a measure of energy efficiency in a country. China has a much higher energy intensity compared to other major economies in the world. The higher energy intensity is the higher cost of converting energy into the country's GDP. Recent slowing economy in China can directly cause the slow-down in energy intensive industrial production, therefore a falling energy demand growth. In a way, it helped to reduce the energy intensity. Chart 3.4.1 above shows the long term trend in energy consumption from 2000 until quite recent. With a 16% reduction as target, China is making effort on continually raising energy efficiency, so that to narrow its energy intensity gap with developed countries. (Andrew, 2013)

- 2) Increase Non-Fossil Energy to 11.4% of Total Supply (Andrew, 2013)

In 2012, the share of Chinese electricity generated from renewable energy has increased to 19.4% from previous 15.7%. And preliminary estimates suggest the share of total energy supply from non-fossil sources would increase to 8.5-9%. While overall energy demand growth was falling, that's a significant improvement compared with 2011 if look back the chart 3.3.1. It is promising that non-fossil energy will be increasing even with a slowing economy in recent time. (Andrew,2013)

3) Cut the carbon intensity of GDP by 17% (Andrew,2013)

Slowing energy demand growth combined with an increasing non-fossil energy proportion in energy use, had curbed Carbon emissions' growth in China. The carbon intensity will follow the rising trend in the chart 3.4.2 b. But the growth rate of CO₂ emissions is declining. To meet the target by 2015, China's carbon-intensity needs to fall faster. (Andrew,2013)

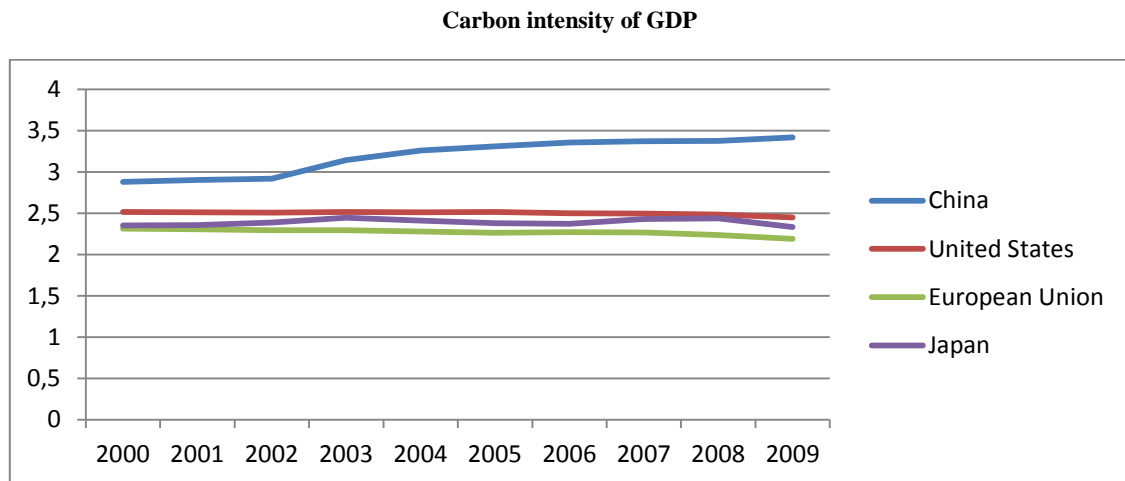


Chart3.3.2 b Carbon intensity (kg per kg of equivalent energy use) (Source: World Bank)

3.4 Technological progress (TFP)

The difficulties which has encountered by Chinese manufacturing reflect also the innate deficiencies lie in Chinese enterprises. As a new force in the global economy, Chinese enterprises are facing constrains brought by the weakness in their thinking, and lacking of human capital resources, innovation and technological progress. Breakthrough innovation and deployment of new technologies can level the playing ground for enterprises everywhere. To survive from ongoing difficulties, technological progress, as well as R&D investments is quite important for Chinese manufacturing. (Edwin Fung, 2012)

Percentage of R&D expenditure over GDP

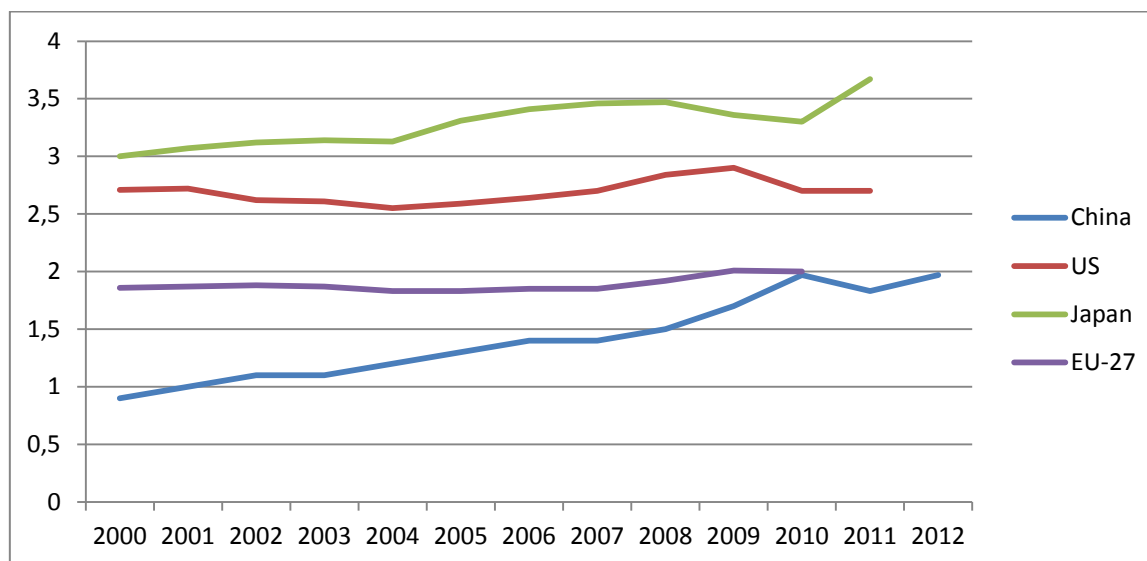


Chart 3.4.1 Percentage of R&D expenditure over GDP (Source: World Bank)

From Chart 3.3.1 we can see the upwards trend of China's R&D investment in recent decade, while compare with United States and Japan, China's input in R&D is still far behind. According to China daily (2013), China spent a record 1 trillion yuan (\$160.6 billion) on research and development in 2012, of which 74 percent came from companies. R&D expenditure represents 1.97 percent of the gross domestic product, higher than 1.84 percent in 2011. The rise comes from the guiding policy that government calls on the country's efforts to build an innovation-driven economy, which has been emphasized in 12th Five-Year Plan.

Indeed, China's investment in R&D has maintained a steady rate of growth for decades. In recent years, this growth was boosted by the government new development policies. However, as expected, the top 10 sectors with the largest R&D spending covered most of the so-called high-tech industries, such as pharmaceuticals, medical equipment, computer, electronic and communication equipment, and aerospace, etc. This can be seen as huge potential for R&D investment industry sectors other than high-tech.

More and more enterprises realized that the production efficiency is closely interrelated to technological progress. And input in R&D investment can positively boost technological progress. Therefore in order to seize great developing opportunities, and keep pace with traditional technological leaders, Chinese enterprises have to devote more time and energy to R&D. The final goal is to create a domestic ecosystem that supports innovation, and increase productivity through innovation in both products and processes.

3.5 Reforms

Over the past 30 years, investment and exports are the two main driving forces behind China's growth miracle. Massive investment as an input factor is always accompanied with great energy and other natural resources consuming. Overinvestment resulted in excess capacity. And China's export is deeply dependent on changeable external market. Since last financial crisis, Chinese government has realized that the only solution to continue their China dream is to carry out the internal reform. The newly appointed Prime Minister Li Keqiang pointed out: "Reform is China's largest dividend" at his first press conference. Recall the growth model, reform is not as an single factor, but it can influence labor(L), capital(K), energy use(E) and productivity greatly.

3.5.1 Deregulation and liberalization

1) Curbing government power

Initiated by China's former Prime Minister Wen Jiabao, China has started its internal reform. According to Wen Jiabao (2013) in his last government works' report, during the last five years, there were 498 items in administrative approval procedures which had been either cancelled or adjusted. Calling off government power from administrative and approval aims to diminish government roles in the market, and give more reign to market forces. As a continuous internal reform, the new Prime Minister Li Keqiang has pledged to call off another one third items from government administrative and approval procedures. And he has announced that the new government will curb the power of bureaucrats, restrain the government spending, and form a more level playing field for private enterprises in China on his first premier press conference. (Anderlini, 2013)

2) Propelling Urbanization

Market and liberalization are both the soul of Urbanization. Therefore, the starting point for urbanization is market and deregulation. Government can't use the administrative power to force, contrarily government need play smaller role and protect the spontaneous urbanization. Take land system reform as an example, the new government has put the emphasis on the importance of keeping the red line of farmland without setting the red line. Not mandatory to grow crop on the land, this is very meaningful for farmers. By giving the decision right to them on how to deal with their land, urbanization is propelled spontaneously.

Conversely, urbanization will help rural residents' liberalization, and equality between rural and urban residents.

3.5.2 Industrial policies

The new round reform in China's industry will focus on broadening the state-owned capital shareholder base, leveling the playing field and redeploying state-owned capital to public welfare areas. (Davies, 2013) Loosening control of government-held companies is in action already. Separating state enterprises and commercial banks from government is the most important ongoing reforms in China. In 2012, China started the reform of its railway, postal-service and salt sectors as part of an overhaul of the country's state-run companies. Although without accurate timetable, the reform of industries such as power supply, telecommunications are also within the plan. China's future lies with competitive and private firms in industry and services. (Mozur, 2013)

3.6 Foreign Political issue with Japan

The thorniest foreign political issue in recent time is deteriorating relation with Japan. A dispute between Japan and China blew up in 2012 over eight uninhabited islands. Tensions have flared up again since 2012. Relations between China and Japan slumped into the lowest due to this Island dispute. For Japan, an extremely export-dependent country, there is no reason that it isn't worrying about decreasing bilateral trade. The data has shown that since 2007 to China has become Japan's largest trading partner, and in 2011 bilateral trade between China and Japan is accounted for 19.3% of Japan's total foreign trade. Similarly, since China should worry bilateral relation too. By the end of 2011 China holds 18 trillion yen's Japanese government bonds according to National Statistic Bureau of China.

With a crumbling relation between China and Japan, needless to mention the possible military conflict has drawn fear and anxiousness, even the potential economic war has brought many people's sharper focus. In China, the fact is some Japanese owned enterprises have already been planning to move their plants out of China, considered the deteriorating relationship between China and Japan would not be reversed in short time. Meanwhile Japan's exports to China have already been decreased since the dispute started. Will FTA talks among China, Japan, and South Korea continue? It is uncertain what is more that China and Japan will loss under the dispute with its increasingly tough foreign policy.

The harm to China's economic growth from having political dispute with Japan can also be analyzed by the economic growth model. The more and more upgraded tension has already had negative impact on Japan's investment in China, the capital in growth model is going downward which will lead to a drop in total output Y in growth function. Decline in economic growth caused by the political dispute is not what the both countries were expecting.

Chapter 4 Challenges facing ahead to continue China's growth miracle

As previous chapter has introduced, in general the slowing economic growth in China is a fact. And seeing the ongoing advantages and disadvantages rooted in China's economic development today, the new government team is pulling the curtain open on a series reform. How far they will take promises of reforms, to which extent the problems will be resolved...etc. What are the challenges would disrupt China's economic long-run growth?

4.1 Reallocation in manufacturing

China's growth miracle happened in the past thirty years was greatly benefited from its internal drive of both capital investment and labor input in manufacturing. The manufacturing in China has greatly contributed to its GDP growth, employment status, and urbanization. And a continuing strong manufacturing will help continuous urbanization in future China, since it would become the first opportunities for farmers to enter into city. A declining Chinese manufacturing, to some extent, is to weaken China's overall national economy when there's not any other industries' to substitute.

In recent years, an erosion of China's manufacturing cost advantages, especially for wages, started to bring manufacturing production back to the United States from China and other low-wage countries in Southern Asia, reversing a decade-long trend of outsourcing production overseas. Therefore one of the huge challenges now facing by China is transformation of Chinese manufacturing, due to the changing labor market and investment interests. And the future of Chinese economy will definitely influenced by transformation in Chinese manufacturing.

4.1.1 Economic capital adjustment

In recent decades, contrary to develop conventional wisdom-led industries China has formed an economy which is exports- and investment- led. By 2010 China's fixed capital formation which corresponds to infrastructure such as factories, roads and housing, has jumped to 47.5% of GDP. In the mean time, private consumption has been decreasing. (Zhang, 2011) Chart 4.1.1 followed in the next page has shown trends of investments and consumptions.

With decreasing internal consumption, growing labor costs, and sluggish exports international background. Businesses operating in China or planning to enter into China have a growing

need in China's economy transition, from a manufacturing center to a consumer market and from labor-intensive to skill-intensive manufacturing, so that to provide investors greater profit opportunities. Consequently, to transite into a consumption-focused and skill-intensive manufacturing will be China's long-run task in capital adjustment.

Investments, Savings, and Consumption in China

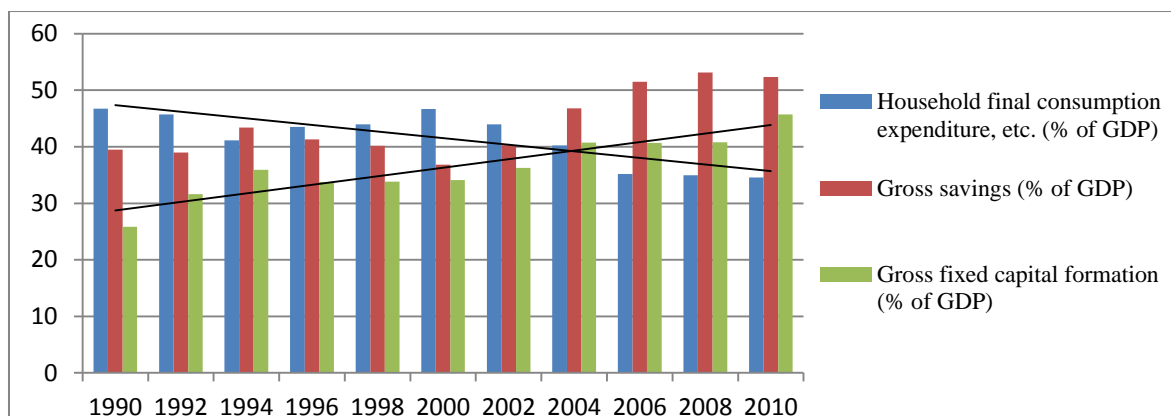


Chart 4.1.1a Investment, savings, and consumption in China (Source: World Bank)

1) From a manufacturing center to a consumer market

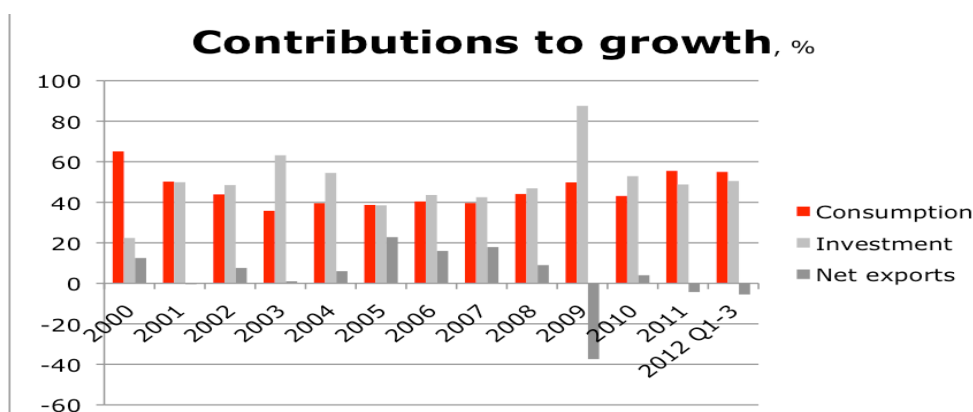


Chart4.1.1b contributions to growth (The economists, 2012)(Source: The economists, China's consumer-led growth)

The consumption in Chart 4.1.1b above includes government consumption as well as household consumption. And the contribution share does not refer to GDP level, but to GDP growth of China.(The Economists,2012) Due to the approve of Chinese government four trillion Yuan (\$586 billion) stimulus program in the end of 2008, we can see a surge in the following year' s investment contribution to GDP growth. Consequently China became the first major economy to recover from the global recession. By aggressively increasing government spending and investment by state-owned enterprises, the impact of weak exports has been cushioned. But the stimulus package has deepened unbalance of China's economic growth. Even the chart 4.1.1b indicated that from 2011, China's growth has become

consumption-led, still need to be clear that the consumption here is not only about private consumption, it includes government spending too.

Reviewing Chart 4.1.1a, household's consumption proportion in GDP has fallen below the level of 1990. Why do Chinese consumers spend so little and save that much? The price of boosting economy by government investment to take is the state advances and private sector retreats. Especially after the stimulus plan in 2009, money is channeled toward larger state-owned enterprises, while smaller private enterprises struggled to survive from the economic downturn. Plus large population residents in rural area, and inflation indirectly plundered lower-middle class income, inequality of the income among residents has been largely widened. Obviously, income allocation has a significant impact on private consumption when there's not a complete social-security system. (McKinsey, 2009) To build a better social safety net and implement pension reform will make people feel more secured to spend money instead of saving.

Therefore, it's clear that the realization of transition from manufacturing center into consumer market, the crucial task is to increase spending on social-security system and reallocate income distribution. Besides government policies' adjustment, continuous urbanization, and a more competitive manufacturing itself will be helpful. (McKinsey Quarterly, 2009)

2) From labor intensive to skill intensive manufacturing

"Made in China" has always been labeled as a result of labor-intensive, low-innovation content manufacturing. Accordingly manufacturing in China, no matter direct or outsourced has been seen as a way to cut costs and therefore increase profits. Until recently, rising wages, waning number of young factory workers in China, and even political dispute with Japan are causing manufacturers to look elsewhere.

In addition to China's shrinking manufacturing wage and cost advantages highlighted by previous Chapter, there are additional factors contributing to the reallocating trend, including:

- Long delivery times and rising shipping costs for overseas production
- Quality control issues
- The physical separation of design and production personnel
- A lack of safeguards on intellectual property (Perry, 2011)

In long-run, the new advantage for Chinese manufacturing will be strategic position that fits investors' global aspirations, and its world largest consumer market. And the mindset of the investors has to change since the perceived advantage of low cost labor is disappearing and there may be a labor shortage in future because of shrinking in working aged population.

Over the last few years China has reduced its comparative trade weakness in more capital intensive industries, such as like non-office machinery while its comparative strength in traditional labor-intensive products like clothing is waning. To resolve Chinese manufacturing's difficulty, maintain its international competitiveness, manufacturers in China have to adjust to produce more skill-intensive products as well as to value quality management during the manufacturing. On one hand, rising educational standards and largely growth in higher educational institutes greatly increases the number of skilled workers in China. And this growing base of skilled worker will help a further shift in manufacturing from labor-intensive to skill-intensive activities. On the other hand, the pace of innovation still has a long way to go due to the governance standards and teaching methods.

4.1.2 Labor issue

Population structure of China Year 2000 (blue shaded) V.S. Year 2005

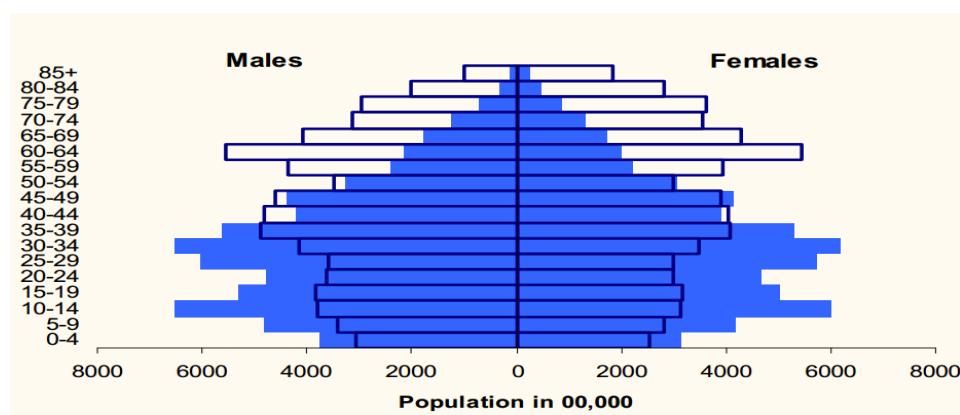


Chart 4.1.2 a Population Structure (Cai, 2009)

In past thirty years, China has adopted one-child policy which is a neo-Malthusian perspective on the relationship between population and development. And reductions in mortality led to higher life expectancy while reductions in fertility led to a slower population growth in China. In 2012, China first time found its labor-aged population decreased when compare with previous year. And population aging as we can see from Chart 4.1.2a is also on horizon. Both the problem of aging population and shrinking labor force will become bottlenecks of manufacturing's development.

1) Aged tendency of Population

The threat of aging population for China is not only about that it would bring great pressure on pension system. And it will lead to labor shortage in labor-intensive manufacturing. Meanwhile, labor shortage is manifested as a potential rise in pay levels. Observing the function of consumption with pay level R , $C = (I-S)R$, with an increasing R , private consumption would increase together with income. As a result of increased production cost, the products' price will go up, and the competitiveness of China's export products across the world will be weakened.

2) Lewis Turning Point

Take China as example, Arthur Lewis' model, which argues that in an economy with excess labor in a low productivity sector--agriculture, the increasing of wage in the industrial sector is limited by wage level in agriculture, as labor moves from the farms to industry (Lewis, 1954). So called Lewis Turning Point is happened when agriculture surplus labor is exhausted, industrial wages rise faster, industrial profits are squeezed, and investment falls. Simply to say it is a turning point at which China would move from a vast supply of low-cost workers to a labor shortage economy. (Diaye, 2013)

With the continuous one-child policy, decreasing labor age population, surplus from rural area migrate to urban. Labor's supply and demand will be reversed from current surplus to shortage. This means that the path that takes advantages of low-cost labor to achieve economies growth will be blocked. China has not reached the Lewis Turning Point yet, but on current trends, the Lewis Turning Point will emerge between 2020 and 2025 based on the recent report by IMF (2013). Higher fertility, greater labor participation rates will help to delay Lewis Turning Point in China. Seeing the importance of demographic dividend for manufacturing, adjustment to one-child policy is under state government consideration, as well as boost urbanization.

3) Urbanization

Urbanization in China

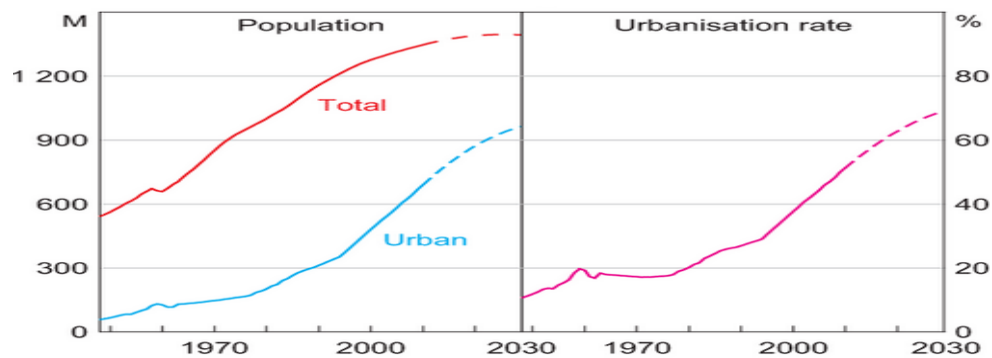


Chart 4.1.2b Urbanization in China (Source: Reserve Bank of Australia)

Urbanization is seen as a very effective way to solve the potential labor shortage in manufacturing. Current Urbanization rate in China is over 50%, but it is still lower than developed countries' urbanization rates. By further urbanization, current rural residents can enter into labor market so that to fill in the gap of labor demand and supply in manufacturing.

For further urbanization, the factor of urbanization quality has to be highlighted. In past few years, since "urbanization project" became one of the leading reform policies, urbanization rate has been worshipped as the sole criterion for measuring urbanization levels, an urbanization spree has been well underway. By the end of 2012 China's urbanization rate had reached 52.57%, which means China has more urban residents than rural residents already. But the process of this speeding urbanization has neglected the value of quality. Failing to keep in sync with economic development, industrialization, resources and environment sustainability, as well as employment, blind urbanization has brought along with it various problems. (Fang, 2012) The poor quality of urbanization in smaller cities directly enhances the internal labor migration in China. Therefore the imbalanced development between regions has been reinforced. It is severe problem for manufacturing's expansion in less developed regions.

Urbanization and industrialization, especially manufacturing in China, are two faces of the same coin - a supply side and a demand side. Both sides complement each other. The new round urbanization project should pay attention to the interests of migrant workers, and adjust household registration system, land system, central and local fiscal and taxation systems, college entrance examination, pension, etc, in order to keep new urban residents stay in labor force and form more balanced manufacturing distribution. (Ding Y. , 2013)

4.1.3 R&D investment

Percentage of R&D expenditure over GDP

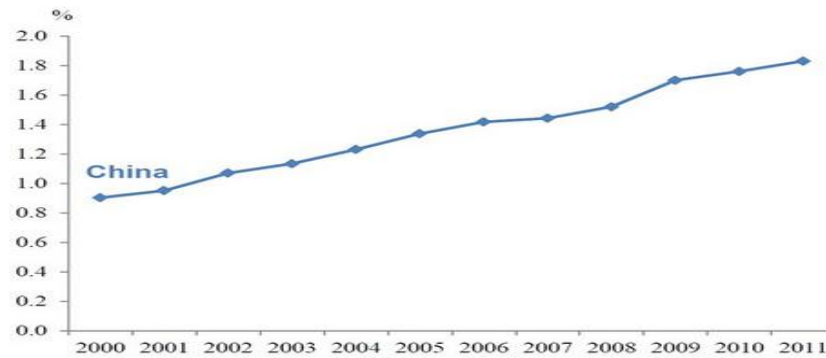


Chart 4.1.3 Percentage of R&D expenditure over GDP (The Conversation, 7th December, 2012)

Chart above has shown the recent decade R&D investment trend in China. It is newly reported that in 2012 China spent over 1 trillion Yuan (\$160.8 billion) on research and development, which represented 2 percent of the country's gross domestic output. And according to Wang Gang (2013) China's Minister of Science and Technology, R&D contributed 51.7 percent to China's economic growth in 2011. Chinese Government aims to increase R&D spending to 2.2% GDP by 2015. This goal has been emphasized in its 12th Five-Year Program (FYP) 2011-2015. To encourage R&D investment is foundation stone for building skill-intensive manufacturing.

Despite this growing investment R&D year over year, the growing skills' shortage is now attracting more attention while the dwindling supply of young migrant workers has been widely noticed. And the insufficient supply is worsening at both entry-level and experienced level. The reasons behind, firstly concerns to China's education system which favors theory and exam results over practice and creative thinking; Secondly, more and more graduates say no thanks to factory jobs because of less respectable salaries. If not taking any effective adjustment in education, job training system, or not to narrow down income gap, skills' shortage in manufacturing as well as the other industries will very likely to be intensified. (Xu, 2013)

4.2 Reforms

4.2.1 Reforms relate to 12th-Five-Year Plan (2011-2015)

China's growth miracle in past thirty years is largely benefited from the reform and opening-up policy since 1978. Take the growth model as a prove, the opening-up policy successfully attracted investments, has an positive effect on capital; meanwhile favorable policy for having education also positively influenced labor and productivity. But the reform efforts have stalled in recent years because of vested interests. Against this standstill, previous Premier Wen

Jiabao suggested a further reform in China's 12th-Five-Year Plan in 2011. The core of this 12th-Five-Year Plan is concerned with improving the lives of common people. And it calls for stepping up efforts to transform the economic growth model and build a solid foundation for a sizeable middle class.

1) Financial reform

The key concept for financial reform is deepening the opening-up policy of the financial sector. And financial reform is the most crucial part in the whole new round reform since it plays an important role in economy transition and upgrading. Specifically, it requires accelerating the reform of state-owned monopoly industries, and improving and implementing the policies which is to encourage non-public economies' development and private investments. And create fair competition in the market. The plan also calls for more efforts to support technological innovations and economic restructuring. By 2015, the value-added output of the nation's financial industry will account for 5 percent of the gross domestic product (GDP), while the value of direct financing by non-financial organizations will account for at least 15 percent of the total social financing value, according to the plan. To achieve these quantity targets, a multi-layer capital market will be in place. (Lina, 2012) That is to say that Chinese government welcomes private capital to participate in the reform of financial sector, such as banks, and insurance companies, encourages private capital to expand investment in financial organizations, and also supports private capital in setting up rural banks, credit companies and capital cooperatives. (Lina, 2012)

2) Social Wealth and Welfare system reform

This is most important reform content for enriching people and improving the lives of common people. The government will work on reallocation of income distribution and adjust current social welfare systems. Improvements will be made in the initial distribution mechanism by enhancing fiscal and tax policies. China's past thirty years old economic model of fast, investment-intensive export-propelled growth, was at the expense of domestic consumption is no longer sustainable. By reallocation income distribution and improving welfare system, government expects to cut saving and expand domestic consumption eventually. (Tekes, 2011)

4.2.2 New leader team's reform

The newly appointed Chinese president Xi Jinping and Premier Li keqiang are said to hold much sharper opinions on the new round reform than previous leaders. The first public statement that made by President Xi did highlight two words—"China Dream". Reform in short term will follow the 12th-Five-Year-Plan. Curbing state power in market, and enriching people are still to be current targets.

4.2.3 Challenges in reform

1) Macro-Restructuring

The hottest word for China now is "restructuring". By restructuring, the new leadership meant cutting red tape as well as letting go some state owned enterprise back to market-oriented management. By now the new leader team has released the first few sectors to be restructured. The Ministry of Railways, food safety, and energy sector are on the list. This macro restructuring move might make sense or might not — depends on what happens on the ground and whether implementation is handled correctly. Besides, for each sectors' restructuring, it has its own challenges. Take Ministry of railways' restructuring as an example, the construction of high-speed railways in China was in charged by this government department. High-speed rail supposed to be placed in highly-populated and economically-flourishing regions. But now high-speed rail net is more than market demand. Although it looks good, it's not profitable. The decision and construction were carried out by the monopoly, the Ministry of railway in China. And the minister was investigated for a claim of corruption. The problem of superpowers (state-owned companies) and bureaucratic government departments in China is more and more exposed. Macro-restructuring is in need.

2) Expand domestic consumption

The purpose that government is carrying out a series macro restructuring projects is to drive economic transition, and make China's economy consumption led. Different from normal consumers, the younger generation is considered to be the most potential consumer. The analyst Benjamin Cavender, who works for China Market Research, has ever commented that young generation aged between 18 and 35, is more optimistic in spending while they are not obsessed in savings. (Lee, 2013)The key factor to drive domestic consumption up will be the interests of younger generation.

4.3 Energy Consumption tendency & Greenhouse Gas Emission issue

In order to promote further efforts to be made to curb energy consumption and foster greener growth as part of 12th- Five –Year Plan, the State Council has emphasized the “12th Five-Year Plan for Energy Development on 1th of 2013 again. The 12th Five-Year Plan adopted by the Chinese government in 2011, provides a policy framework and sets overarching national goals, including in areas of energy consumption, supply, and environment protection.

4.3.1 Key targets in energy sector according to 12th Five-Year Plan

1) Energy consumption

A target of 16% reduction in energy intensity needs to be reached by 2015. As well as total energy consumption is capped at 4billion tons of standard coal by 2015. In which total electricity consumption has to be limited within 6.15 trillion kilowatt-hours by 2015. And overall energy efficiency is expected a 38% rise by the end of 2015. Since large percentage of China’s energy consumption is taken by coal consumption, accelerated development of “clean coal” technology is required. (Govenment work paper, 2011)

The targets in energy consumption are not only in the efficiency aspect, it’s also guide the optimization of energy structure. The main idea is to reduce fossil energy consumption, and promote low-carbon energy sources gradually. The proportion of non-fossil energy consumption has been set to 11.4 percentage of primary energy consumption, together with natural gas accounting for 7.5 % by 2015. A series large-scale demonstration projects to be undertaken for plug-in hybrid electric vehicles, pure electric vehicles and fuel cell technologies. (Government work paper,2011)

2) Energy Supply

The supply of primary energy should reach 4.30 billion tons of standard coal in 2015, and in which domestic supply shall take up 85%, around 3.66 billion tons of standard coal. The investment in new energy is enlarged. It is expected to see investment (both public and private) in new energy of around RMB 5 trillion (US\$760 billion) over the next ten years, with renewable energy and grid investments taking the largest shares: wind (US\$230 billion), smart grid (US\$210 billion) and solar (US\$30 billion). (Finamore, 2013)

3) Challenges

The resource constraint will continually to be a main challenge for China’s energy outlook. On one hand China has a shortage in energy resources, especially the insufficient supply capacity of conventional fossil energy. With only 6% of the average world remaining

recoverable reserves per capita in oil and gas, the annual oil production level can only be maintained at around 200 million tons; the new conventional natural gas production can only meet about 30% of the new demand; and coal has already been over exploited. To meet growing consumption in long run development will be challenging

Besides, current energy structure which is dominated by coal is a reason behind China's high Green house emission. Restructuring energy utilization will be more and more necessary for continue the economic development transition of sustainable low-carbon economy.

4.3.2 Greenhouse Gas Emission issue

In the lead-up to the Copenhagen climate negotiations in the fall of 2009, the Chinese government made a commitment to reach a 40-45 percent reduction in national carbon intensity from 2005 levels by 2020. To achieve this 2020 target, the 12th FYP sets a target of reducing carbon intensity 17 percent from 2010 levels by 2015. But in 2011, carbon dioxide levels measured at 392.2 parts per million at Qinghai Province, that it the highest level of China's greenhouse gas emissions ever since 1990 data began to be collected. Given China's large population, limited resources and vulnerable environment, authorities have emphasized a green low-carbon path will be the only choice for the nation's sustainable development.

1) Targets on curbing the emission of CO₂

The key target for environment protection is to curb the emission of CO₂. The Chinese government has also merged the plan for industrial transformation and upgrading in 12th-Five-Year Plan with the aim of decreasing greenhouse gas emission. The specific industrial restructuring strategic direction includes that industries' development will go toward energy conserving and cutting emissions during the process of optimizing and upgrading its industrial structure. Furthermore, the government has issued the Development Plan for National Strategic Emerging Industries during the 12th Five-year Plan Period. It charts the road map for seven strategic emerging industries: energy conservation and environmental protection; new-generation information technology; biology; high-end equipment manufacturing; new energy; new materials; and new-energy vehicles. (Xinhua, 2012) (Xinhua, 2012)

2) PM_{2.5} measurement

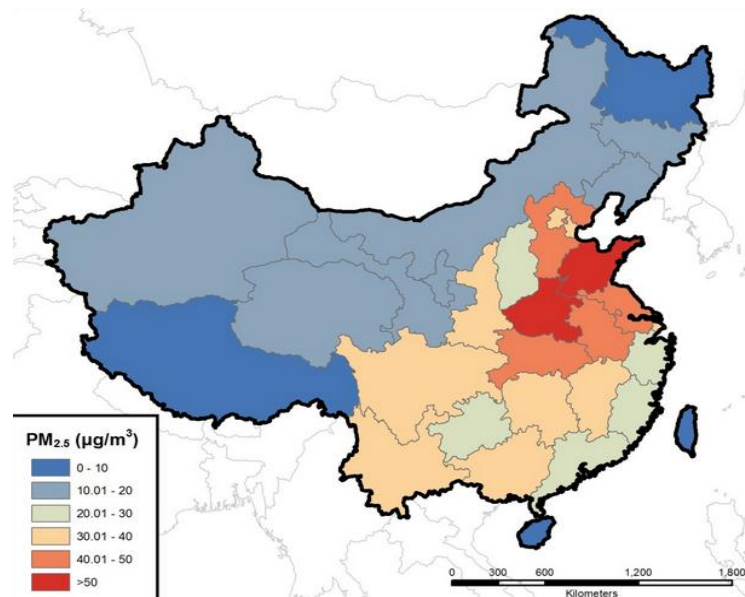


Chart4.3.2 Air pollution in China(2007) (Hsu, 2012)

The Chart 4.3.2 is the annual-average population-weighted fine particulate matter concentrations (PM 2.5) for Chinese provinces in 2007. The U.S. Environmental Protection Agency's Air Quality Index, which uses PM2.5 as its standard, says a reading of 0-50 means good air quality. Particle pollution is also known as "Particulate Matter" or simply PM. PM can be a relatively complex mixture with extremely small particles and liquid droplets that float around in the air. There are two kinds of particle pollution, fine particles and inhalable coarse particles. Fine particles are called PM2.5, because their size is 2.5 micrometers in diameter and smaller. (Angel Hsu, 2012) And since 2012 each Chinese provincial capital and municipality has began monitoring PM2.5. This newly adopted measurement in China just reveals a grim picture of China's air quality, 80% of the data has been collected so far would not meet urban air quality standards. PM 2.5 is called "invisible killer", that is because when we breathe, the fine particles can reach the deepest regions of our lungs. Therefore exposure to particles is linked to variety of significant health problems. As we know, carbon emission is the main source of PM2.5.

Because that more and more sever air pollution problems that Chinese major cities are encountering, China goes to War on PM 2.5. According to Gong and Cui (2012), take Beijing for instance, municipal government plan announced that they will make the capital to reach the national standard of annual average PM2.5 concentrations of 35 micrograms per cubic meter by 2030 at the earliest. And the plan provides that Beijing's PM2.5 concentration will reach 60 micrograms per cubic meter by 2015 and 50 micrograms per cubic meter by 2020. Low carbon growth will be the huge challenge for Chinese government. (Zheng, 2012)

4.4 Foreign Policy

New president Xi Jinping has taken his call of “China dream” and “great renaissance of the Chinese nation” into his foreign diplomacy arena.

Tensions flare between China and Japan over disputed islands has been aroused in recent time. And both China and Japan is seeing at risk of losing sight of true interests. In 2006 China and Japan have vowed to pursue their strategic relationship of mutual benefits. But the island dispute began since last September becomes the barrier in between both countries.

Historically, as long as economic relations between Japan and China were sound, the two governments were able to manage other potential areas of political friction. That is because that economic growth is always top priority for China. However, the new president in China seems very likely to continue taking an assertive diplomatic posture. President Xi has emphasized that islands’ dispute with Japan concerned China’s core interests such as sovereignty and territories. And Japan is also on a rising nationalism, claims the sovereignty of the islands. The situation became tense.

In short run foreseeable, the diplomatic row over the islands dispute has affected economic ties as Japanese exports to and investments in China declined already and will this trend continue.

In long run, this dispute would disrupt the establishing of FTA among China, Japan and South Korea. This would greatly cut down the potential trade and investment, having a negative impact to capital formation. And it may hinder China’s productivity’s lifup, and labor’s free flow. The combined GDP of China, Japan and South Korea has reached \$15 trillion, accounting for 20 percent of the world’s total and 90 percent of East Asia’s, but the trade volume among the three accounts for less than 20 percent of their total foreign trade volume. Their economic relations are complementary. Establishing this trilateral FTA will reduce the influence of many trade barriers and build a huge market of 1.5 billion people. (Xin, 2013) In spite of existing disputes over the islands, East Asia leads the development of the global economy. Such rapid economic development and increasingly can maintain stability in region’s economy. An excessive focus on political issues viewing the islands disputes between China and Japan, Japan and South Korea, could lead China, as well as Japan to lose sight of their true national interests.

“China dream”, “great renaissance of the Chinese nation” need a wise, and peaceful foreign policy across the world to ensure the growth miracle’s continuing!

4.5 Evaluation

Based on the current situation and historical statistics, I would like to make an evaluation in this session so that to find out the answer for the main question of my thesis: Can China’s growth miracle continues?

4.5.1 Challenges can be overcome

After examining the challenges lying ahead for stopping the growth miracle from the factors of capital, labor, energy, and productivity, I believe that the bright prospects can be seeing in labor, energy supply, and productivity’s liftup.

1) Resolve labor-shortage in manufacturing

A rosy future for China’s manufacturing is supported by continuously growing labor high quality labor market. Recent statistic shows that dramatic changes in China's demography is ongoing, specifically a decline of its labor supply just happened in 2012. A recent study shows that by 2025, the country could face a shortfall of 28 million workers if not any changes to be made in policy or the birth rate. (Fortune, 2013) Many people start to worry that this scenario will make the "China price" a thing of the past and that will definitely be a heavy blow for Chinese manufacturing. However, the potential labor crisis for China’s manufacturing is responded by a call for speeding up urbanization by Chinese government. In China, people’s identity is labeled by two types—urban and rural. People with rural identity are barred from equal rights of living, working, and even having compulsory education in cities as urban citizens, unless paying an extremely higher price. In other words, the labor flow in China is never free, and it is restricted by the system of identity registration (which is called HuKou). Those who have rural identities cannot freely join the labor market. Moreover, the fact that current migrant workers whose status are still rural but live in cities as marginal urban residents with constrained rights and access to services is blamed for resulting social problems. To remain the regulation of identity status registration without further urbanization will result in social tensions, as well as labor shortage. By the end of last year urbanization rate in China was 52.57 percent, according to data from the National Bureau of Statistics (NBS). This number is still lagged far behind developed nations, such as US’s 82 percent, and Japan’s 91.3 percent. The plan which released from Chinese government is to achieve a

67percent urbanization rate by 2030, which means the country would shift 280 million people to cities within following two decades. (Xinhua, Urbanization to fuel China's economic growth, 2013) Predictable, the seeing labor shortage can be solved by further urbanization.

2) Secure energy supply for its consumption

China's growth miracle has been associated with spectacular growth in Chinese energy consumption. Energy security is not a small challenge for China to meet its energy demand for urbanization and economic development. However, in my opinion, this challenge can be overcome.

Energy security can be seen as the ability of a country to procure sufficient, affordable and reliable energy supplies. Chinese government is placing an increasing emphasis on energy security. The current fact is China produces most of the coal it consumes but draws over half of its oil supplies from overseas. The IEA projects that, by 2035, China will import nearly 12.8 million barrels per day, or 84 percent of its total supply. (The Australian National University , 2011) Chinese government has adopted a variety of supply-side policies to ensure its access to oil supplies over the next several decades. National oil companies of China are encouraged by government to invest overseas and gain greater access to recourses. This year China and Russia signed a bevy of energy deals that will further tighten their energy relationships. This means as the world's largest energy producer, Russia can become the backbone of China's future energy supplies.

Maximizing energy efficiency is also meaningful for energy security. In China's 11th Five-Year period (2006-2010), a significant achievement with a 19.06 percent reduction in energy intensity had been made. The government target for another 16percent reduction by the end of 12th Five-Year period. Since the 11th Five-Year period, the government started to shut down some inefficient industries, consequently many industries have to retrofit their factories to improve energy efficiency. Besides great potential in efficiency improvement, current economic slowdown contributes also to the reduction of energy intensity. Due to the unbalanced regional development, especially between eastern and middle to western part of China as we've discussed in the first part of chapter 2, one of China's key strategies these year is develop middle and western regions. In eastern regions, traditional industrial sectors start to be replaced by service sectors. Some energy-intensive industries have been moved out to the less-developed middle and western regions. On one hand, it is a response to the reform call for economy restructuring. Rapid growth of domestic market, especially service sector

requires economy restructuring. On the other hand, by relocating the energy-intensive industries to the less-developed central and western regions, the new machinery and technology can be adopted to improve energy efficiency. It is deemed that the energy efficiency trend is upward.

3) Boost productivity

China's leaders recognize the importance of productivity to China's economic future. One of the key objectives of the 12th Five-year plan (2011-15) is shifting the growth pattern towards efficiency-focused growth. It's predictable in the following years policy makers will give more pressure to companies to raise their productivity. Supportive policies will be made to give incentives to companies.

China's labor productivity has improved a lot over the past decades, but it is still far behind the productivity performance of developed economies. Improvements in productivity can come from investment in infrastructure, education, and technological progress, and China is doing well in investment, R&D input and technological updating these years. Now productivity growth is restricted by financial system and state owned enterprises which dominate in the protected sectors of China's economy. And the new round reform is announced financial reform and state owned enterprises' restructuring are included.

4.5.2 Possible stubborn challenges

The stubborn challenges which won't be easy to get over with can be categorized into following three aspects:

1) Private consumption's expansion

Although, it has been pointed out by previously Premier Wen Jiabao China should make greater effort to enhance the role of domestic demand, and this could be a top national long-term strategic policy for economic growth. To let Chinese consumers spend is never a simple task. Income insecurity and lack of social welfare safety are both the reasons behind China's high savings rate. The habit of saving is a precaution against foreseeable private expenditure burden. And the increasingly defensive saving strategy of the Chinese is best explained by the rising private burden of expenditures on housing, education, and health care. (Prasad, 2009) And according to McKinsey Global institute (2009), The high saving rate is caused by China's structural features. (Hao, 2010) It restricts private consumption's share of national

income, while favoring large, especially state-owned industrial companies which enjoy preferential financing from state-controlled banks. The institute also states that better health care and pension system won't guarantee a rise in private consumption significantly before 2025. The reason is the offset effects from growing payroll taxes and ever-increasing living expenditures.

Therefore, to expand private consumption in China is not only about the improvement of welfare system, whether economic restructuring can be implemented to the fullest extent would also matter. And that seems not going to happen in the near future.

2) Reform's deepening and expansion

Due to more and more shown economic and social conflicts in recent years, China's new leadership who is believed to determine the country's future raised the agenda of another round reform. Two developments are expected from the current system: one is deeper market reform, another is to build the rule of law and democracy. And further economic and political reforms are in order. However, as a socialist country, reform's deepening and expansion is difficult in China. A pressing difficulty is the more the government intervenes, the more corruption will spread, the less implementation can be achieved. Therefore, a brilliant plan only is still far from implementing it in a good way. Over the years, China's competitive advantage has been based on power. Classes possess power obtain more and more power. Tons of barriers and opposition are in front of implementing further reform. The issue is whether the new leadership can follow the map to deepen and expand the reform, facing such barriers. To build a new market economy on the basis of rule of law and political reform, persistent efforts need to be made in the following decades.

3) Greenhouse gas emissions

In China, sales of indoor air purifiers in major cities are skyrocketing. Residents begin to see them as vital equipment for their homes. To keep up with its fast economic growth, China has been adding electricity generating capacity as fast as they can, and it is also reported exports account for one-third of China's emissions. The growing middle class has become increasingly fed up with air. They doubt what good is it to enter the middle class if the price is breathing hazardous air?

The breakout of "Beijing cough" is a game-changer for China, this time Chinese government has to commit to reduce their levels of air pollution, so that the residents in urban can breathe.

And carbon tax regime on coal is committed to be imposed. Although, for a country whose primary fuel recourse and power generation both are based on coal, this is quite a step. To build sustainable growth and caps on emissions into all their economic development plans this step is just the beginning. Considering hard cap on greenhouse gas emission is contradictory to its economic growth. China has been hesitant to engage in formal agreements to reduce greenhouse gas emissions. To breathe clean air in China, there is still a long way to go.

4.5.3 Outlook up to 2040

A working paper published by OECD in the end of 2011 which made an economic projection to 2050 can give some hints. As we can see from chart 4.5.3-1, the largest growth is observed in India and Africa, and China's growth rate will gradually reduce to around 3% in 2050 as table 4.5.3-1 shown. This slowdown is in accordance with the general economic growth trend which has been experienced by developed countries. One thought here is China's economy is slowly become more normal.

Trend in real Gross Domestic Product valued at market prices by region, in billions USD

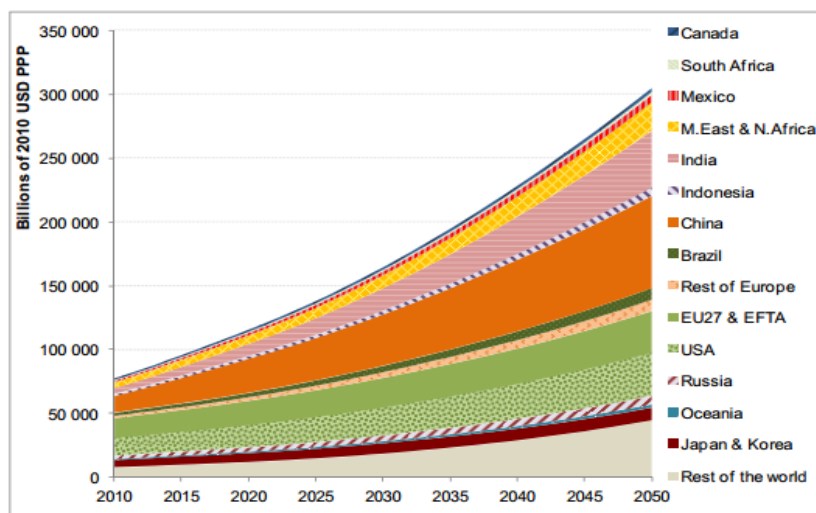


Chart 4.5.3-1 China and other major economies' economic growth outlook (Chateau, 2011)

Annual average real GDP growth rates, 2010-2050 Based on constant 2010 USD PPP

	2010-2020	2020-2030	2030-2050
China	7.2%	4.2%	3.0%
OECD	2.3%	2.2%	1.9%
USA	2.2%	2.3%	2.1%
Japan & S.Korea	2.1%	1.6%	1.0%

Table 4.5.3-1 China and other major economies' economic growth rates (Chateau, 2011)

I'm convinced that China's economic growth trend is following and will follow the path which has been experienced by other major economies. Since China, Japan and South Korea are all labeled as East Asia countries. An interesting find out which is presented by table 4.5.3-2, China's current economic growth trend just roughly follows Japan's, but 30years later than Japan. And similar story is happened with South Korea and Japan, the statistics has revealed that South Korea also followed the general growth trend Japan has experienced with a 15 years' delay. Based on the observation which has been shown in table 4.5.3, I made my prediction on China's long run growth. By 2040, China's economic growth rate may drop to around 4 percent, considered Japan's 4.4 percentage growth in 2010. The growth miracle will continue but at a slower pace.

Economic growth rate compared among Japan, S.Korea, and China

Japan	S.Korea	China
7.5%(1950-1975)	7.4%(1965-1990)	7%(1980-2005)
5.6%(1990)	4.0%(2005)	
4.4%(2010)	6.3%(2010)	4-6%(2020-2025)
		4%(2040)

Table 4.5.3-2 China's economic growth rate in 2040 (Source: World Bank)

Chapter 5 Summaries and conclusion

5.1 China's long-run economic outlook

In previous two chapters, China's ongoing situation and its long-run growth challenges has been reviewed. Under the global conditions, with current shrinking Eurozone economy, and other stagnant major economies, including United States and Japan, Chinese government has realized that the future of China is domestic demand and consumption. All major motors for growth will have to come from China's domestic economy. Therefore following the famous policy of reform and opening-up which is made in 1978, the curtain now is up on the new round reform has been initiated by the newly appointed president and premier.

Beside the seeable opportunities and stumbling-blocks preventing the economic growth in long-run, there are two key parameters to determine whether an economy will continue to grow or go over, that is how much it invests and how efficiently that investment creates growth. In long-run, reduction in the percentage of fixed investment in GDP is projected, but being the world most populous country, China has great private consumption potential. The growing middle class and urbanization of peasant workers can become the main consumption force. Therefore assuming that current efficiency of investment will be maintained, whether the Chinese government can expand and enrich middle class in China and reasonably boost urbanization is pivotal for its long-run economic scenario.

To wean off the economic reliance on exports and encourage the growth of the domestic market, reshape and rebalance in China's economy is in need. Considering the disappearing demographic dividend and aging population, China has to face the challenge of transformation from a country best known for its low-cost manufacturing to one respected for its innovative capacity in following decades. Human intellectual capital is key factor. Its steadily increasing in R&D investment will help, though it won't be a simple transformation.

Moreover, the side effects from past three decades' growth miracle have also become to restrain the further economic growth in China. Especially the issues of energy shortage and air pollution are outstanding. Vice versa, reshaping and rebalancing China's economy will ease the severe energy shortage and green house gas emissions.

In considering these aspects, it seems that the possibility that China will gradually correct its factors of distortions is more persuasive than the possibility that Chinese miracle will burst

into bubbles in long-run scenario. However tons of strategies will be necessary to influence the private decision on saving and investment, enhance its domestic market, and conduct transform in manufacturing.

5.2 Concluding remarks

This paper has brought some insights for China's future economic scenario by reviewing the driving force for its growth miracle in past three decades, finding the ongoing weakness and potential opportunities for maintaining its growth pace. It indicated that China's long-run growth trend follows the general economic growth trend. After its double-digit growth era, it will enter in the slowdown growing phase, which is similar to Japan in 1970s. Therefore, Japan's experience on rebalancing of economic growth could be revealing and applicable to China's current growth challenge. In light of China's developing restrains which are resulting from imbalanced but outstanding growth phase in last three decades, rebalancing in its economy is judged necessary by Chinese government too.

Shrinking labor force, increasing manufacturing costs, widened gap between urban and rural, energy shortage, severe air pollution...etc, these changes will surely decelerate China's growth potential. The recent 12th Five-Year Plan (2011-15) has set the goal to transform fast economic growth mode substantively to sustainable economic growth mode which combines consumption, investment, and exports in a harmonious way. The target in 12th Five-Year Plan is a guiding principle for Chinese government's future strategic moves.

Although the growth slowdown is imminent in China, government plan still reach far with all levers at hands. As the 12th Five-Year Plan presented, the general plan is to make smooth transition to a better balanced and slower growing economy. Besides, facing challenges and opportunities ahead China's economy still has huge potential to maintain a stable growth level.

All in all, considered both the pros and cons, China's economic growth miracle will surely quit from the double-digit growth era, while entering into a slowdown rebalancing phase.

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