Estimations on GDP growth in China's "new normal" period

Yan Kun, Liu Chenjie*

This paper studies China's potential GDP growth in the "New Normal" period, and estimates the potential growth rate from the perspectives of demographic dividends, capital stock, and total factor growth rates, according to the neoclassical growth equation. Meanwhile, based on China's current situation, the following factors are also taken into account: (1) political level, which is the requirement for building a moderately prosperous society; (2) the potential demand from new urbanization in China; (3) constraints in China's development, which are from resources, environment, and debt stress. Overall, the potential GDP growth in the "New Normal" period is changing along with changes in demographic structure, capital endowment, environmental requirements, and other constraints. We believe that a reasonable economic growth rate in the "New Normal" period should be around 7.5% in 2014, with an average growth of 6.5% for the period of 2016-2020, and the trend will then continue downward. On the basis of our analysis, we make some suggestions regarding macro-control, social welfare policy, and relative reform measures.

Keywords: new normal, potential growth, new urbanization, environmental constrictions

1. Introduction

"New Normal," an important economic term in recent years, was first used by Mohamed El-Erian, former CEO of the American Pacific Investment Management Company (PIMCO). Carrying different meanings in different fields though, "New Normal" is commonly described in macro-economic circles as a slow and painstaking process of economic recovery from a crisis. Currently, China's economic growth has entered a period in which it must simultaneously deal with a slowdown in economic growth, make difficult structural adjustments, and absorb the effects of previous economic stimulus policies. In the medium and long term, economies that have stepped over the "Middle-income Trap" all share one common character and that is they have provided continuous incentive and open and transparent supervision mechanism to help accelerate vertical social mobility. To correct the disequilibrium in the different aspects of economic development and promote vertical social mobility, the priority does not lie in the gain or loss in the temporary economic growth, but rather in how to adapt to the new normal

* Yan Kun (Corresponding Author, email: yankun@cass. org. cn), Research Fellow, Chinese Academy of Social Sciences; Liu Chenjie, Post Doctorate, Chinese Academy of Social Sciences.

of economic growth, how to work out the moderate economic growth rate under the new normal, and a package of systematic reforms to be conducted in the context of steady and robust economic growth. This paper attempts to measure the reasonable growth rate of China's economy in the economic "New Normal."

Concerning China's economic growth in the new normal period, discussions have been conducted by many scholars from various perspectives. Liu (2014) believes that in the coming 10 years, China will enter the economic new normal and during this period, the average economic growth rate will slow down to around 6%. By the year of 2023, the consumption rate and the proportion of added value of the service industry in GDP will rise to 60% and 57% respectively. Analysis by Yuan (2010, 2012), on the basis of historical statistics based off Mitchell and Madison, has shown that after 1970s, the slow-down of the economic growth of developed economies is closely related to the decline of the growth rate of productivity while the drop of productivity growth is due to service-oriented industrial structures as a systematic factor. And in the coming 10 years, the weight of the service industry as part of the overall economic structure will continue to increase and structural factors will possibly hamper the transition from high-speed growth to the "New Normal." Chen (2012) contend that the slowdown of China's economic growth is a long-term trend. Under the base case, it has been estimated that the average potential economic growth rate in the "Twelfth Five-Year Plan" period and the "Thirteenth Five-Year Plan" period will decline by 2.3% and 4% compared with that in the period between 2000 and 2012. The reasons for this include the significant decline of the growth rate for exports and investment in the total demand, gradual loss of low-production cost as an advantage, and notable drop in the growth rate of Total Factor Productivity (TFP) and slightly reducing the role of government in promoting economic growth. Zhang & Liu (2012) hold that China will experience a stage of transformation of economic growth. Growth driven by higher investment and exports has gradually lost the support of government intervention to improve efficiency. However, urbanization and the development of the service industry will open up a stage of steady economic growth. The main characteristics of this stage are improved efficiency and optimized structures. Cai(2010, 2012) proposes that the trait of "getting old before getting rich" has taken shape for a China that is facing challenges including the premature loss of first-time population dividends, difficulties with exploiting the second-time population dividends, and a lack of resources to go towards nursing the elderly. [1] The probability is relatively high that the economic growth rate will drop to a new level and stay there for some time in the coming years. Bjork (1999), Mitchell (2007), and Young (2003) have all verified the economic growth path in a period of significant structural demographic change with international comparative historical data. The Bank of Japan

[1] Cai defines Lewis Turning Point as the situation of growth speed of labor demand surpassing that of supply and the increase of wages. In that situation, wages of agricultural labors have not decided by the marginal productivity of labors, and there exist differences between the marginal productivity of agriculture and modern sectors. Only when both the wages of agricultural and modern economic sectors are decided by the marginal productivity of labors and the marginal productivities of these two sectors equal, the dual economy really goes to an end.

(2004, 2010), Zheng (2006), and Wang (2001) have respectively proved, with the empirical data of emerging economies, that the traits of potential growth rates for economies in a period characterized by significant change depend heavily on resource factors. Besides, many other scholars and organizations have conducted detailed studies on the "New Normal" of China's economic growth. Nevertheless, these studies typically focused on one single dimension, such as population structure, TFP, or industrial structure. By contrast, we study the reasonable growth rate of China's economy in the "New Normal" period according to the neoclassical growth equation (the supply side of growth), then attempts to carry out diversification analysis from the political, social, and environmental angles on the basis of the present situation in China, and probe into various growth constraints to be faced in the coming period of new normal. Specifically, we measures the potential growth rate according to the neoclassical equation from the perspectives of population dividends, capital stock, and total factor productivity, and conduct comprehensive analysis based on considerations of such empirical factors as demand from the political domain, the new urbanization process, and various restraints to which China is subject in its development.

2. China's potential economic growth rate in the "new normal"

Generally speaking, to estimate the output and potential economic growth rate with production functions, we usually choose to use the Cobb-Douglas production function because it can estimate the contribution degree of all input factors (such as capital, labor, and technological progress) towards economic growth. Its functional form is:

$$Y=AK^{\alpha}L^{\beta}$$

in which, Y stands for total output, K represents capital stock, L means labor population, α and β represent respectively the elasticity of capital and labor to total output, and A stands for TFP.

Taking the logarithm on both sides, we can get:

$$\ln(Y)=\ln(A)+\alpha\ln(K)+\beta\ln(L)$$

If we assume the production function to be the normal scale elasticity ($\alpha+\beta=1$), then the production function can be transformed to be:

$$\ln\left(\frac{Y}{L}\right)=\ln(A)+\alpha\ln\left(\frac{K}{L}\right)$$

2.1. Capital stock (*K*)

This paper estimates K with perpetual inventory method, and the function is:

$$K_t=K_{t-1}(1-\delta_t)+I_t$$

in which K_t represents capital stock in the period of t, K_{t-1} stands for the capital stock in the period of t-1, or the capital stock of the previous period. δ_t stands for the depreciation rate of period t and I_t represents net investment in period t.

Concerning the estimation of China's fixed capital stock in the base year, there is somewhat of a difference between scholars in terms of their estimation methods and conclusions. For example, Chow (2002) used the net investment in the fixed assets owned by the entire population to retrace the capital stock of the whole society according to certain proportions and obtained the actual capital stock of each year by deflating the accumulative total based on fact that accumulative deflator can be calculated with the accumulated index. Young (2000) utilized the depreciation-discounting method to estimate the capital stock in the base year and estimated that the capital stock in China was 81.5 billion yuan in the year of 1952 (with 1952 as the base year). J. Zhang & Y. Zhang (2003) took the year of 1952 as the base year and calculated the fixed asset stock using net capital and fixed asset price index in the city of Shanghai. This paper, referring the year of 1978 as the base year, and according to the basic methods proposed by Zou (2004), worked out the estimated national capital stock of that year. With regard to the price index, the paper continued to use the fixed asset investment price index method conceived by Guo & Jia (2004). In terms of depreciation rates, Wang & Fan (2000) adopted a depreciation rate of 5%. The project team of the business management department of the People's Bank of China (2011) assumed the depreciation rate to be 6%. And the project team at the Macro-economic Research Institute of National Development and Reform Commission (2008) believed that there would be an accelerated trend for the depreciation rate and it would remain stable in a piece-wise interval. This paper, with the reference of the aforementioned research findings, has chosen the depreciation rate accordingly of different periods including 5% from 1978 to 1990, 6% from 1991 to 2000, 6.5% from 2001 to 2010, and 7% from 2011 to 2020.

To obtain the growth rate of future investments, we use the estimated output of return on capital (ROC) to calculate. We mainly referred to the calculating method of return of capital proposed by Bai, Qian & Xie (2007) and extended it to the year of 2012. The unexplained variable is the growth rate of newly increased investment (I), and by conducting estimation to the time series data from 1982 to 2012, we got the following basic equation: I_t=-6.67+0.92×ROC, in which the value of t are 19.73 and 2.25 respectively and R^2=0.87.

According to the model estimation results (the residual is steady), we substitute the average value of the original data of return on capital in China from 2002 to 2012 in the abovementioned equation, and we get the average growth rate of investment in the past 10 years, which was 17%. Since the global financial crisis in 2008, the return on capital in China has tended to gradually fall. So we also extrapolated the return of capital in the coming 10 years according to the average decrease rate from 2008 to 2012 (0.7%) and substituted the results in the equation of the growth rate of newly increased investments; we found that the growth rate of investment from 2014 to

2020 would be 12.7%. Since Cai (2012) forecasted that the growth rate of new investments in China would be 13% in the coming 10 years, which is close to our estimation, this paper assumes the future average growth rate of new investments to be 13%.

In accordance with the data of the current stock of fixed capital, deprecation rate, and newly increased investment, we can calculate the data of the capital stock in China from 2014 to 2020.

2.2. Supply of total labor (*L*)

According to the data from China's population census conducted in 2010, China's total population was 1.34 billion and the average life expectancy rose from 67.8 years in 1981 up to 73.5 years in 2010. As the forecast issued by the United Nations Population Program in 2010 showed, the degree of the aging population in China tended to be higher than that anticipated from the data of China's population census and its analysis results found that in 2020 the proportion of population at the age of 65 or above in the total population will be 9.4% in China and the proportion of the aging population would possibly go up to 13.6% by 2020, 18.7% by 2030, 26.8% by 2040, and 30.8% by 2050. After 2015, the size of China's working-age population (ages between 15 and 65) will stop growing and the aging population process will further accelerate to finally catch up and surpass the average level of developed countries (See Figure 1). Concerning the data involving labor force (*L*), this paper mainly refers to Cai's (2012) analysis, which showed that the working-age population aged 15 to 59 is continuing to decrease (according to the calculation through Cai's population equation, the average growth rate of working-age populations will be -0.28% from 2016 to 2020).

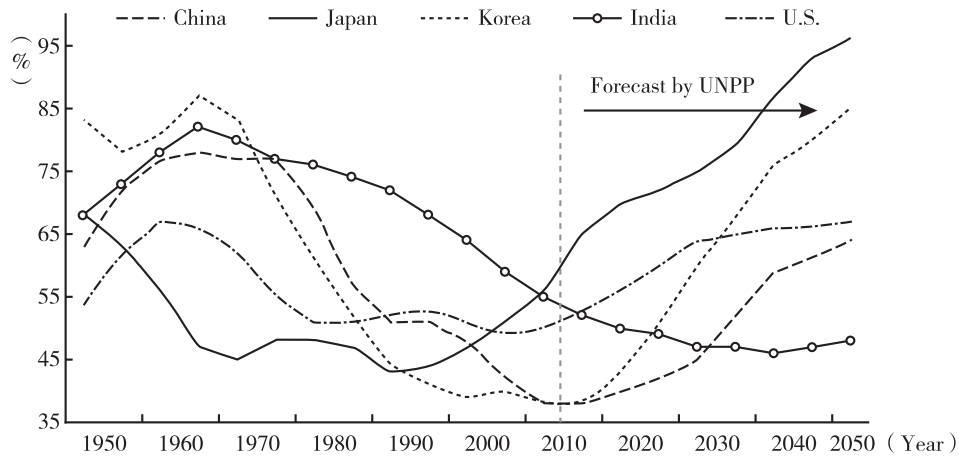

Figure 1. Population dependency ratio in China, Japan, South Korea, India and U.S.

Source: United Nations Population Program (http://www.un.org/esa/population/unpop.htm), calculated and prepared by the authors.

2.3. Productivity

Louis (2009) believes that China's fast growth rate of TFP from 1994 to 2009 was mainly attributed to factors such as reform of state-owned enterprises, China's entry into WTO and similar factors; however, in the coming 10 years, the impact of those factors on China's TFP growth rate will be reduced, because he thinks China's TFP growth rate will be declining annually. From the perspective of structural analysis, the improvement of productivity largely originates from the productivity increase of the sectors themselves and better optimized resource allocation of different sectors (the distribution of labor force in agricultural production and non-agricultural production for example). We assume that there are only two sectors in the economy—Sector 1 and Sector 2—and then whole-society productivity can be shown as follows:

$$P^t = \frac{Y^t}{L^t} = \frac{Y_1^t + Y_2^t}{L^t} = \frac{Y_1^t}{L_1^t}\frac{L_1^t}{L^t} + \frac{Y_2^t}{L_2^t}\frac{L_2^t}{L^t} = P_1^t S_1^t + P_2^t S_2^t$$

in which P^t is the productivity at the time of t, Y^t and L^t are the total output, and labor input respectively at the time of t, S_1^t and S_2^t are the distribution of the labor force in Sectors 1 and 2 at the time of t. Then, relative to the time of t-1, the change of productivity at the time of t can be expressed by:

$$P^t - P^{t-1} = (P_1^t - P_1^{t-1})S_1^t + (P_2^t - P_2^{t-1})S_2^t + P_1^{t-1}(S_1^t - S_1^{t-1}) + P_2^{t-1}(S_2^t - S_2^{t-1})$$
$$P^t - P^{t-1} = (P_1^t - P_1^{t-1})S_1^{t-1} + (P_2^t - P_2^{t-1})S_2^{t-1} + P_1^t(S_1^t - S_1^{t-1}) + P_2^t(S_2^t - S_2^{t-1})$$

In order to write off the influence of different times on weight, we adopted the average value of the two times as the weight:

$$P^t - P^{t-1} = (P_1^t - P_1^{t-1})\overline{S}_1 + (P_2^t - P_2^{t-1})\overline{S}_2 + \overline{P}_1(S_1^t - S_1^{t-1}) + \overline{P}_2(S_2^t - S_2^{t-1})$$

To further extend the model to more sectors, we then can get:

$$P^t - P^{t-1} = \sum_{i=1}^{n}(P_1^t - P_1^{t-1})\overline{S}_1 + \sum_{i=1}^{n}\overline{P}_1(S_1^t - S_1^{t-1})$$

The first term on the right side of the above equation represents the efficiency promotion within the sectors themselves and the second term stands for the efficiency promotion brought about by the redistribution of resource factors among sectors. According to the calculations carried out by He(2014), the efficiency promotion effect of the redistribution of resource factors (mainly referring to the transfer of the labor force from agricultural sectors to non-agricultural sectors) has been reduced in recent years. Meanwhile, the size of the surplus rural labor force that can be transferred to cities and towns is also shrinking. As a result, future efficiency promotion

will be largely dependent upon the improvement of efficiency within the sectors themselves and will be more difficult than ever.

With the data acquired by Louis (2009) and through the HP filter analysis of the trend of TFP, we obtain the trend of the growth rate of total factor productivity in China from 2011 to 2020. We find that the annual average growth rate of TFP in China will be 3.20% from 2011 to 2015 and from 2016 to 2020 the annual average growth rate of TFP will drop to 2.70%. α and β respectively represent capital-total output elasticity and labor-total output elasticity, and we also assume the production function is within the normal scale elasticity. So, α+β=1. Then we assume that α, the capital-total output elasticity remains unchanged, which means the value calculated with historical data is used as the predicted future value (a kind of handing that is similar to the method of Cai (2012)).

By measuring and calculating the capital stock, labor factor, and total factor productivity, we can estimate that the average potential GDP growth rate in the "Twelfth Five-Year Plan" period is 7.62% and during the "Thirteenth Five-Year Plan" period, i.e. the new normal period, the number will decline further to 6.71% (See Table 1).

Table 1
China's potential economic growth rate in the new normal measured and calculated based on growth accounting equation

Major indicators	Year		
	1995-2009	2011-2015	2016-2020
Potential GDP growth rate (%)	9.82	7.62	6.71
Potential labor growth rate (%)	0.90	-0.76	-0.72
TFP growth rate (%)	3.89	3.20	2.70
K/L growth rate (%)	13.32	18.35	14.67

Source: Estimated by the author.

3. Comprehensive consideration of the new normal economic growth based on current situation

In this section, we conduct a detailed analysis of the factors that influence China's reasonable economic growth in the economic new normal, mainly including the overall objective of building moderately prosperous society in an all-around way as a political demand, development potential of the new urbanization, as well as the stress of resource, environment, and debts currently faced by China.

3.1. Demand of the political domain: to realize the overall objective of building a moderately prosperous society in an all-around way

At the 18th National Congress of CPC, the work report clearly put forward that "we should

ensure to realize by 2020 the grand objective of building a moderately prosperous society in an all-around way," and "double the gross domestic product and per capita income of urban and rural residents compared with 2010." Here the so-called "double" refers to the real increase after adjusting for inflation.

For the requirement of the overall objective of building a moderately prosperous society in an all-around way for GDP, we assume the GDP growth of 2014 and 2015 to be 7.5% and 7.2%, respectively, because the real growth of GDP in 2011, 2012, and 2013 are 9.3%, 7.8%, and 7.7%, respectively. In this way, an average GDP growth of 6.5% from 2016 to 2020 would be enough to achieve the goal of doubling GDP by 2020.

For the requirement of the overall objective of building a moderately prosperous society in an all-around way for per capita income of urban and rural residents, we assume the real growth of per capita income of urban and rural residents in 2014 and 2015 to be 7.5% and 7.2%, respectively, since the figures for the year of 2011, 2012, and 2013 are 9.9%, 10.2%, and 8.1%, respectively. A 6.0% real growth of per capita income of urban and rural residents from 2016 to 2020 would be adequate for doubling the per capita income of urban and rural residents by 2020. With the systematic reform of income distribution and development of the tertiary industry, the real growth rate of per capita income for urban and rural residents will generally be slightly higher than that of current GDP growth.

As a result, from the political perspective, to achieve "the grand objective of building a moderately prosperous society in an all-around way by 2020" as put forward in the work report delivered by the 18th National Congress of CPC, we can complete the expected target by achieving an average real economic growth rate of 6.5% after China enters the economic new normal.

3.2. Economic and social development potential: a study based on the new-type urbanization strategy

From the perspective of economic and social development potential, China is currently at a critical juncture of building new-type industrialization, informationization, urbanization, and agricultural modernization in all aspects. At the beginning of 2014, China released the *National New Urbanization Plan (2014-2020)*. Urbanization is a natural historical course that occurs along with industrial development and in which non-agricultural industries and rural populations migrate to and concentrate in cities and towns. According to the overall layout and plan of building socialism with Chinese characteristics through "Five in One," promoting urbanization in a proactive, proper, and solid manner will be of great realistic meaning and far-reaching historical significance for building a moderately prosperous society in all aspects, accelerating the process of socialist modernization and achieving the great rejuvenation of the Chinese nation. So, it is necessary to conduct comprehensive consideration, from the angles of modern urbanization, industrialization, informationization, and agricultural modernization and conduct a quantitative

survey on the targeted GDP growth that is demanded by the new-type of urbanization as the economic growth mechanism enters the new normal.

In reference to the methods by Zhu (2011) and Jian (2010), we set up a provincial-level panel data model to analyze the internal relationships between urbanization and economic growth. In this paper, we select the data for the urbanization rate, and provincial GDP from 1978 to 2013 and mark them as *u* and *g*, respectively. We find the regression equation set as follows:

$\ln(g_{it}) = \alpha_i + \beta_i \ln(u_{it-1}) + e_{it}$, in which i=1,2,3,…,31; t=1978,…, 2013

We conduct comparative analysis on 31 provinces and cities with relevant data and we use the fixed effect model to conduct an analysis. First, we need to test the stationarity of the data of provincial-level urbanization rates and provincial-level GDP.

Table 2
Panel data unit root test results

Test Method		lnu	lng	lnu (-1)	lng (-1)
Of Same Root	LLC Test	0.0000	0.9987	0.0000	0.0000
	Breitung Test	0.0003	1.0000	0.0000	0.0000
	Hadri Test	0.0000	0.0000	0.0000	0.0000
Of Different Roots	Im-Pesaran-Skin Test	0.9367	1.0000	0.0000	0.0000
	Fisher-ADF Test	0.9968	1.0000	0.0000	0.0002
	Fisher-PP Test	0.9970	1.0000	0.0000	0.0000

As the test results (See Table 2) show, though not all the test directions are the same, given the high risk of type II errors for rejecting the null hypothesis, ln(u) and ln(g) in the panel data can be regarded as non-stationary data when the significance level is 5%. Furthermore, we conduct the panel data co-integration test (Table 3) on ln(u) and ln(g), in order to see if there is a co-integration relationship between each non-stationary time series.

Table 3
Panel data co-integration test results

Co-integration test	Value of P	Test result
Pane v-Statistic	0.2809	Accept
Panel rho-Statistic	0.1828	Accept
Panel PP-Statistic	0.0000	Reject
Panel ADF-Statistic	0.0000	Reject
Group rho-Statistic	0.0000	Reject
Group PP-Statistic	0.0000	Reject
Group ADF-Statistic	0.0000	Reject

With the small sample, the results, obtained through Panel ADF-Statistics, are of more referential significance. In this paper, Panel ADF-Statistics all pass the 5% significance level test, so it can be assessed that there is a long-term and stable co-integration relationship between China's urbanization level and economic growth.

Up next, to see which form of the panel data model the sample data accords, we resort to the usual method of covariance tests for analysis.

$$F_2 = \frac{(S_3 - S_1)/[(N-1)(K+1)]}{S_1/[NT - N(K+1)]} \sim F((N-1)(K+1), NT - N(K+1))$$

$$F_1 = \frac{(S_2 - S_1)/[(N-1)K]}{S_1/[NT - N(K+1)]} \sim F((N-1)K, N(T-K-1))$$

in which S_1, S_2, and S_3 are the residual sum of squares of the three model forms in the hypothesis test and F_1 and F_2 equal 8.56 and 33.78 respectively, both larger than the corresponding F-statistics. As is shown in the test results, the fixed effect varying coefficient model should be chosen as the analysis model.

According to the fixed effect varying coefficient model of the panel data, we analyze from the perspective of elasticity and found, as Table 4 shows, that every single percentage point increase in China's urbanization rate can maintain 7.1% in GDP growth (according to the objective of new-type urbanization plan, the provincial average annual growth of urbanization rate is expected to be 0.9% from 2014 to 2020). So, given the current economic and social development potential, the requirements of industrialization, informationization, urbanization, and agricultural modernization for building modern urbanization will keep China's GDP growth at around 6.4% in the "Thirteenth Five-Year Plan" period.

Table 4
The urbanization rate elasticity to GDP growth in all provinces

Province/City	Elasticity	Province/City	Elasticity	Province/City	Elasticity
Beijing	11.6	Anhui	2.6	Sichuan	4.7
Tianjin	13.5	Fujian	6.9	Guizhou	5.7
Hebei	1.5	Jiangxi	3.9	Yunnan	2.7
Shanxi	5.7	Shandong	5.7	Tibet	1.5
Inner Mongolia	11.6	Henan	3.8	Shaanxi	5.7
Liaoning	7.9	Hubei	9.1	Gansu	4.7
Jilin	13.4	Hunan	4.7	Qinghai	9.0
Heilongjiang	11.3	Guangdong	7.9	Ningxia	3.9
Shanghai	29.6	Guangxi	2.6	Xinjiang	5.7
Jiangsu	5.9	Hainan	5.7	National Weighed Average (Weighed on GDP)	7.1
Zhejiang	7.4	Chongqing	3.6		

3.3. Restraints in China's development: debt stress and environment stress

Currently, China is experiencing the "three superposed periods" in which the economic growth is shifting gear; economic structure is adjusting, and the early-stage stimulating policies are digesting. China's economic growth is facing various stresses highlighted by debt stress (by the end of 2013, the proportion of the full-caliber debts in GDP reached 230% including debts of residents, non-financial enterprises, and governments; the debt ratio of enterprises ranked first place among all the emerging market economies) and contributes greatly to environmental stress.

For the factors related to debt stress, we believe that debt risk that constrains economic growth concentrates mainly in three fields: real estate, local government financing platforms, and some cyclical industries that have excess capacity. Specifically speaking, (1) real estate and land are the major collateral subjects in the financial system and the drastic fluctuation of their asset prices can trigger huge financial risks. At the same time, "land finance" has made a considerable part of financial resource actually available to local governments influenced by the price of land. Thus, real estate can be regarded as a major field in which financial risk is concentrated. Due to the enormous scale of newly started real estate construction projects in 2013, the pressure of supply and inventory will probably go up significantly in the second half of 2014, and some of the second and third-tier cities may face down-side risks of housing prices because of the stress of inventory accumulation. Meanwhile, it is currently difficult for real estate developers to acquire the typical channels for financing, as many real estate companies have financed capital by means of credit products or special collective investments of fund subsidiaries, which are prone to initiating chain financial risks. (2) The soft budget constraint of local government financing platforms and implicit governmental guarantees have made financing platforms insensitive to the cost of financing, leading to rapid expansion of bond-issuing scales. The debt problem at the basic-level governments such as county, township, and village should be particularly more worthy of concern. As economic growth slows down, fiscal expenditures will be increased rigidly and the contradiction of fiscal revenue and expenditures of local government will be increasingly stronger. Some local government financing platforms may face capital chain rupture and the probability of local debt risk may increase. All this will trigger the chain reaction of fiscal and financial fields. (3) In some cyclical industries of excess capacity, most of the enterprises are state-owned which are under the policy pressure of offering job opportunities. However, due to economic structure adjustment, they are currently having operational difficulties. On one hand, national finances and state-owned enterprises are closely related by innumerable links, so if they face big operational problems, government finance will honor their "paternalism" by offering help, which increases financial risks. On the other hand, these enterprises in the industries of excess capacity would finance a great deal of projects through a shadow banking system, such as trusts, financial management firms, and other institutions to relieve cash flow pressure, which can increase the risk of debt default, hence causing big financial risks.

Above all, the catching-up of the economy will experience the contradiction between the

high cost of financing and gradually dropping returns on capital in the transition from high-speed growth to medium-high speed growth. As we calculate, by 2013, China's nominal return of capital is 9% and the current comprehensive financing cost is around 7%. These two figures are increasingly close. According to the international experience of interest rate marketization, we anticipate that the risk-free return rate (cost of financing) may still go up by 1or 2 percentage points in the coming years. However, the changing trends of China's nominal returns of capital and the economic potential output are the same, with both likely to decline in the coming years. Hence, if there will be no significant technological progress going on, we will see that the cost of financing exceeds the return of capital in China in the coming 3 to 4 years, which will make it harder for actual economic operation. Nevertheless, technological progress can not have any tendency variation with stimulating policies in the short term, but rather it needs support from various aspects including the stimulation of endogenous institutions.

As for economies such as Japan and South Korea that have completed structural transformation successfully, their GDP growth rate all dropped by about 50% in the period of economic growth transitioning from high-speed growth to medium-speed growth. In the process, sectors of high pollution, high energy consumption, and low efficiency gradually shrank and industries of emerging consumers, technology, and energy-saving and environmental protection products achieved considerable development, becoming the leading industries of the economy. Given that China currently faces pressure restraints from real estate, local government financing platforms, and some industries of excess capacity and wider development space should be provided for emerging industries. Taking economies that have had successful transformation for reference, we conclude that the economic growth in the transition period would be appropriate to be 50%-60% of the high speed growth rate (10%), so we would expect 5%-6% at best.

For the factors related to environment stress, China has set itself the target of reducing by 2020 its carbon emission of per unit of GDP by 40%-45% compared with the 2005 level. With that restraint, we attempt, on the basis of the study of Yuan(2010), to measure the influence of future environmental stress on China's economic growth in the "New Normal" period; this include adding environment variables into traditional economic growth theory and a survey of the change of the economic growth target. To that end, we selected the data sample from 1960 to 2012 for empirical analysis. In order to separate the effect of carbon emissions on economic growth from the rest, we set up the state space model to present the dynamic effect of carbon emissions on economic growth.

The measurement equation is as follows:

$$\ln\left(\frac{GDP}{L}\right)_t = c_0 + \alpha_t^{(k)} \ln\left(\frac{K}{L}\right)_t + \alpha_t^{(CO_2)} \ln\left(\frac{CO_2}{t}\right)_t + \alpha_t t_{1960-2012} + \mu_t (C_0')$$

The state equation is as below:

$\alpha_t^{(k)} = \alpha_t^{(k)}(-1), \alpha_t^{(CO_2)} = \alpha_t^{(CO_2)}(-1), \alpha_t = \alpha_t(-1)$

in which $\ln(\frac{GDP}{L})$, $\ln(\frac{K}{L})$, and $\ln(\frac{CO_2}{L})$ respectively represent the logarithm of per capita GDP, per capita capital stock, and per capita carbon emission; the parameter $\alpha_t^{(\cdot)}$ is the elasticity of each variable; t stands for the time trend from 1960 to 2012; the corresponding parameter α_t represents the technological progress factor in the long-term growth; c_0 is the intercept of the equation; and μ_t (C_0') is the residual term of the measurement equation.

As for the source of the related data, the data of capital stock and labor force comes from estimations conducted in the second part of the paper; data of GDP was attributable to *China Statistical Yearbooks*; and the data of China's carbon emissions were acquired from the Carbon Dioxide Information Analysis Center (CDIAC) of United States Department of Energy. The estimation results are shown in Table 5.

Table 5
Maximum likelihood estimation results of parameters of measurement equation

	Coefficient	Standard deviation	z-statistic	Concomitant probability
Constant term	-2.67	0.2279	-12.9879	0.0000
	Final state	Mean square error	z-statistic	Concomitant probability
Elasticity of per capita capital stock	0.53	0.0377	25.7898	0.0000
Elasticity of per capita carbon emission	0.17	0.0590	3.9868	0.0002
Technological progress factor	0.02	0.0027	8.9770	0.0000

Given the target that China proposes to decrease carbon emissions of per unit GDP by 40%-45% by 2020 in relation to 2005 levels, reaching the target in 15 years means that from now on the carbon emissions of per unit GDP needs to be declining at a rate of 2.3% annually. We take as the base year 2012 with its potential growth rate, various parameters, and elasticity, and measure the influence of tightening carbon emissions on China's economic growth in the new normal period. Here, we conduct trend extrapolation on parametric elasticity of carbon emissions and find it to be a probable scenario that since the beginning of 2013, the role of resource and environment consumption in driving economic growth would gradually decline to a sustainable level.

Table 6
Influence of tightening carbon emissions standards on potential economic growth after capital stock, labor and technological progress are controlled

	2013	2014	2015	2016	2017	2018	2019	2020
Parametric elasticity of carbon emission	0.149	0.145	0.141	0.137	0.133	0.129	0.125	0.121
Annual average growth of carbon emission (%)	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Potential economic growth(%)	7.9	7.5	7.2	6.9	6.7	6.4	6.1	5.8

As the measured results show (See Table 6), with the influence of stress on resources and environment put into comprehensive consideration, in the new normal period, China's economic growth will likely drop steadily to an average growth of around 6.4% from 2016 to 2020.

4. Conclusions and suggestions

Above all, considering such factors as potential economic growth, the political demand of building a moderately prosperous society in an all-around way, economic and social development potential, as well as debt stress and environment stress in regards to economic development, we know that in the new normal China's economic growth will change with the change of factors such as resource endowment, environmental requirements, and growth restrictions. We conclude that China's reasonable economic growth in the new normal period will go down from approximately 7.5% in 2014 to an average rate of about 6.5% during the period from 2016 to 2020, with a steady downward growth trend. Without doubt, our measurements and calculations are based on the factors that have long-term influence on economic growth, since some cyclical factors may cause stronger fluctuations in the actual economic growth.

As potential economic growth gradually goes down, it is of more urgency to carry forward economic structural adjustments in an all-around way and give full play to the role of institutional dividends. The ultimate reform goal of the economic system is to be able to provide economic activities with unremitting incentives and long-lasting supervision, to promote the equality of opportunity, and to accelerate the vertical mobility of economy and society. Historically, there are many countries and regions that have successfully stepped into the ranks of middle-income economies, but very few of them have then succeeded in stepping over the "middle-income trap" and entering the ranks of developed economies. In making the grand "Chinese Dream" come true, every endeavor should be made to ensure the success in striding over the "middle-income trap," avoid stagnant economic growth, achieve sustainable and high-quality economic growth, and make people happy and rejuvenate the nation. To adapt to the new normal of China's economic growth and jump over the "middle-income trap," China needs an economic system that can offer unremitting incentives and a supervision mechanism that is open and transparent so as to promote the accelerated vertical mobility of society and avoid class solidification. To put it into details, we think headway should be made steadily in the following aspects.

4.1. To improve the level of macro-control, maintain reasonable economic growth in the new normal, and save time for reform

The most important problem to overcome is the issue of macro-control, as an important means of ironing out the short-term economic fluctuations. The policy aimed at solving this problem needs to pay attention to how it treat the moving-down of the pivot of economic growth in a reasonable and objective manner and adapt to the adjusted goal of economic growth in the new

normal period. Since the potential economic growth rate in the new normal period will change continuously, current macro-control policies should first find out the different rates of potential economic growth varying in each stage and strive to keep the short-term economic growth fluctuating within that range in order to win time for reform.

4.2. To attach more efforts in improving people's livelihood with social policies serving as backup

China should further accelerate the establishment of social security measures in all aspects to support modern urbanization, increase spending on social security for vulnerable groups, carry out more technical training for the in-service staff, and thus maintain social stability in the new normal period when the overall economic growth declines. Specifically speaking, we must accelerate implementing the incorporation of urban and rural social security systems, promote the accelerated implementation of targets of affordable housing projects and increase spending on the building of social justice systems such as health care and education. In the new normal, the level of employment is an important factor influencing social stability, so we should attach more efforts to monitoring the related indicators and at the same time ensure corresponding social aid and security measures.

4.3. To accelerate the implementation of reform measures and improve the level of technological progress

Compared with the last 10 years, the technological progress effects brought about by the effective allocation of resource factors between sectors is weakening, and future technological progress will be more reliable in regards to the improvement of efficiency within sectors themselves, so we need more reform and decentralization to promote technological progress. To this end, we suggest to further simplify administrative examinations and approval, further reduce the requirements for market access, attach more efforts in reform of state-owned enterprises, incentivize the development of small and medium sized enterprises with fiscal taxation and financial measures, and accelerate merging and reorganization within industries with the help of related policies so as to neutralize the stress of overcapacity and improve industry efficiency.

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