

China's Shift from the Demographic Dividend to the Reform Dividend

从人口红利到改革红利

Lu Yang Cai Fang

陆旻

蔡昉

Institute of Population and Labor Economics

Chinese Academy of Social Sciences (CASS)

中国社会科学院人口与劳动经济研究所

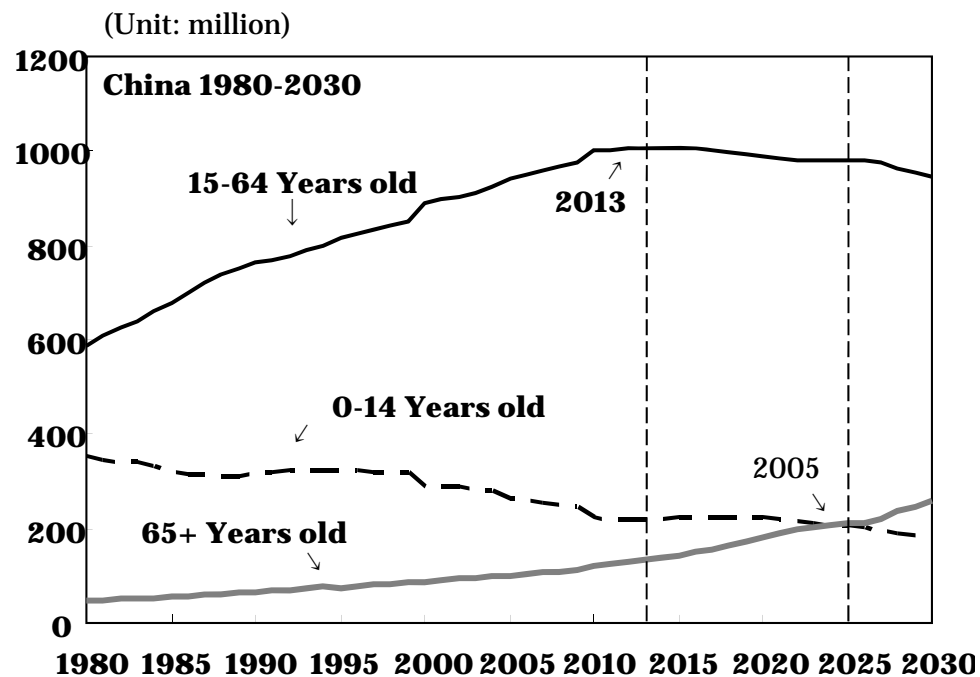
Demographic Dividend

- A country's economic growth rate depends on its long term potential level.
- 'Demographic dividend' refers to the positive impact on economic growth that is generated by a specific structure of population characterised--a relatively large working-age population and a relatively low dependency ratio in total population.
- It worth noting that economic literature has found that long term economic growth usually relies on the promotion of TFP. But, the demographic dividend will boost a country's economic even if TFP remained unchanged. There were many examples in real economy.

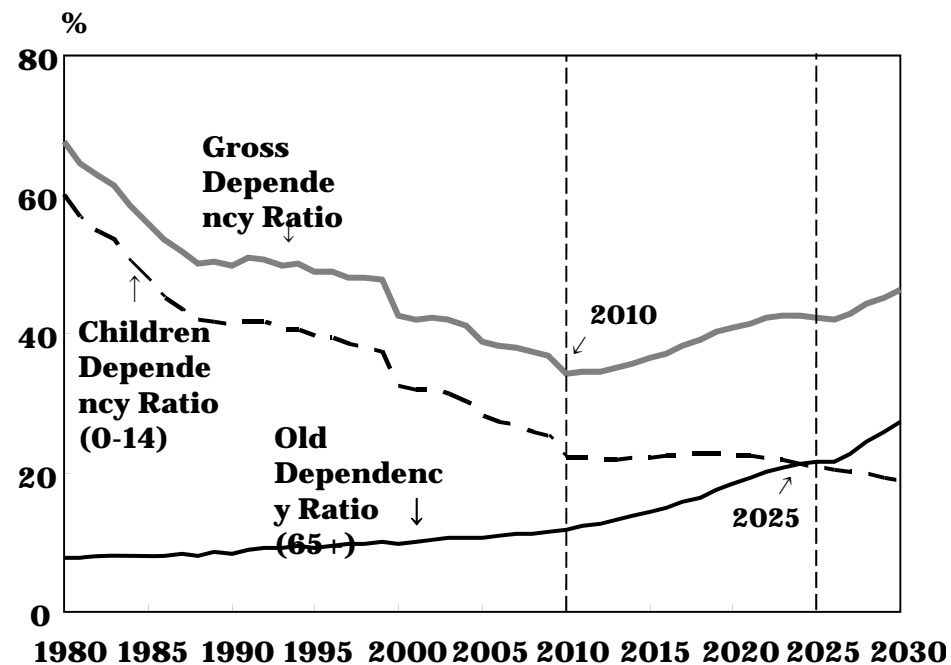
Demographic Dividend

- In theory, population growth goes through three stages in economic development:
 - 1) First stage:** high fertility rate, high death rate and low growth rate;
 - 2) Second stage:** high fertility rate, low death rate and high growth rate;
 - 3) Third stage:** low birth rate, low death rate and low growth rate.

The demographic dividend often appears at the end of the second stage or the start of the third stage.



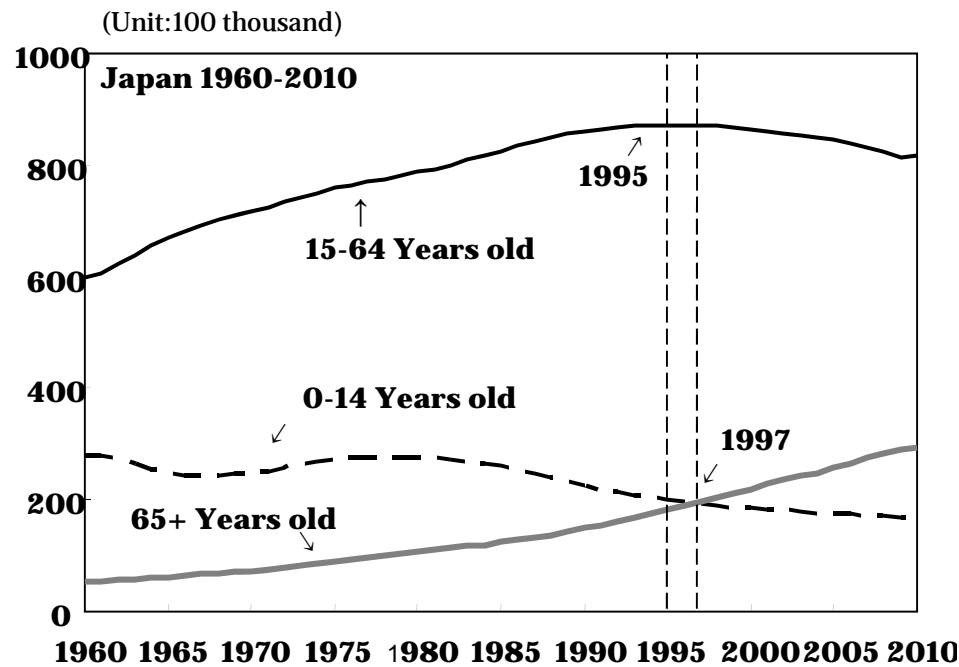
(A) Working-age population



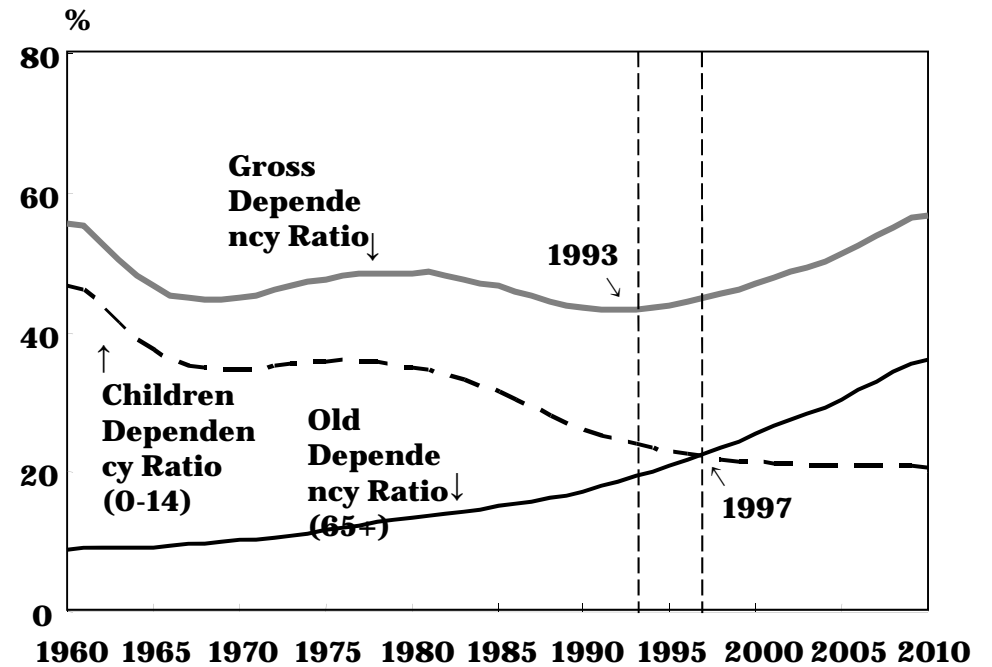
(B) Population dependence ratio

Fig. 1 China's demographic transition: 1980-2030

Sources: Lu Yang and Cai Fang, "Population Change and Its Impacts on Potential GDP Growth Rate: Comparison between China and Japan", *The Journal of World Economy*, 2014, 1, pp.3-29.



(A) Working-age population



(B) Population dependence ratio

Fig. 2 Japan's demographic transition: 1960-2010

Sources: Lu Yang and Cai Fang, "Population Change and Its Impacts on Potential GDP Growth Rate: Comparison between China and Japan", *The Journal of World Economy*, 2014, 1, pp.3-29.

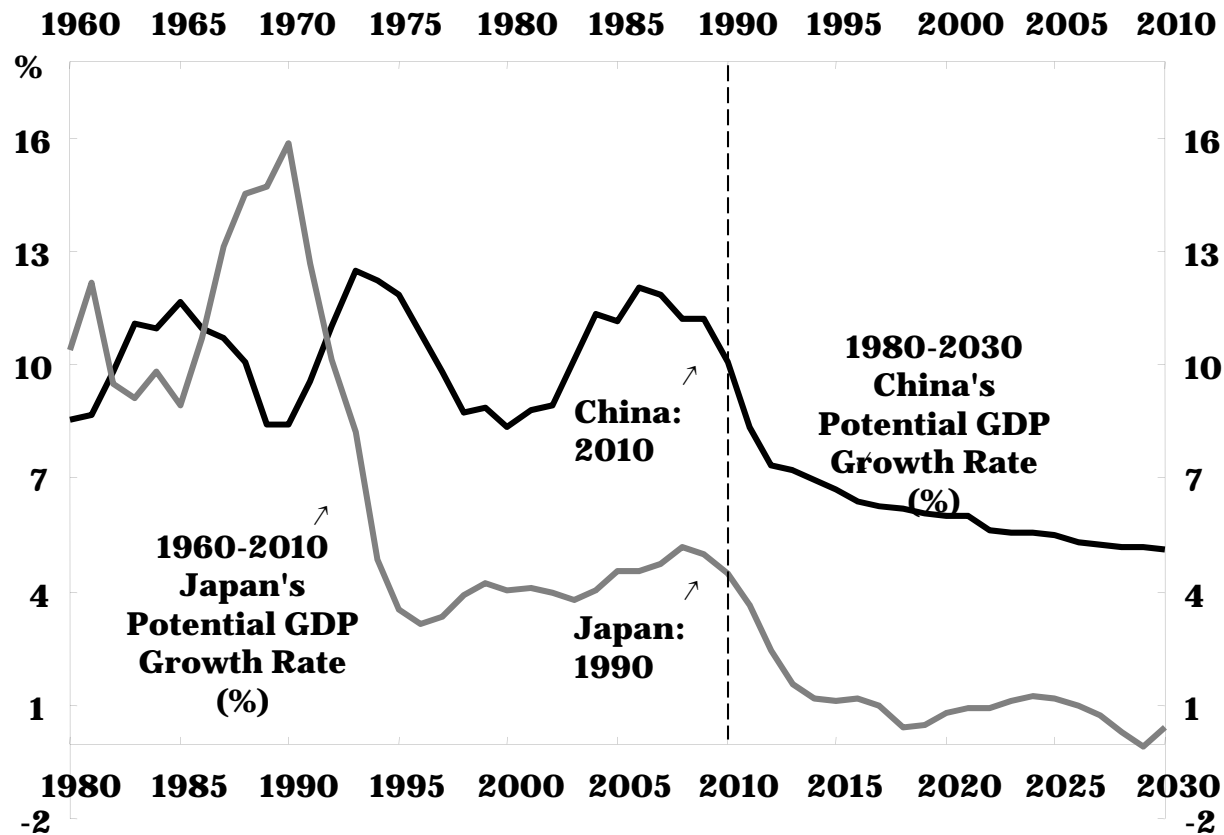


Fig. 3 The potential growth rate: China 1980-2030 vs. Japan 1960-2010

Sources: Lu Yang and Cai Fang, “Population Change and Its Impacts on Potential GDP Growth Rate: Comparison between China and Japan”, *The Journal of World Economy*, 2014, 1, pp.3-29.

The Mechanism

A country's economic growth rate is depends on its potential growth rate. Potential growth rate is deduced from a standard Cobb-Douglass production function.

$$Y = AK^\alpha (hL)^{1-\alpha} \quad (1)$$

$$Y / hL = A(K / hL)^\alpha \quad (2)$$

$$y = Y / hL \quad k = K / hL \quad (3)$$

$$\Delta y_t / y_{t-1} = \Delta A_t / A_{t-1} + \hat{\alpha} \Delta k_t / k_{t-1} + \varepsilon_t \quad (4)$$

The Mechanism

Step I: Estimate Total Factor Productivity

$$g(A) = \hat{\Delta}A_t / A_{t-1} + \varepsilon_t = \Delta y_t / y_{t-1} - \hat{\alpha} \Delta k_t / k_{t-1}$$

Step II: Estimate Potential Employment

$$L_t^* = population_{15+,t} \times Tr_{15+,t} \times (1 - NAIRU_{15+,t})$$

Step III: Estimate Potential GDP growth Rate

$$\Delta Y_t^* / Y_{t-1}^* = (\Delta y_t^* / y_{t-1}^* + 1) \times (h_t L_t^* / h_{t-1} L_{t-1}^*) - 1$$

The Mechanism

- By deduced from a CD production function, it can be clearly discovered that the demographics will mainly affect capital and labor.

(1) L: When other factors remain unchanged, increases in working-age population will cause the labour supply boosts. Labour participation rate and natural unemployment rate is a function of age.

(2) K: Decreases in population dependence ratio will cause increases in saving rate and capital formation rate, which conductive to capital formation.

To a great extent, TFP was mostly driven by the institutional factors rather than the demographic changes. (assume TFP remain unchanged)

Data

- **1: Y and K (1980-2010)**

- 1) Real GDP (at constant 2005 national prices)

- 2) Real Capital Stock (at constant 2005 national prices)

Data Sources: Penn World Table (PWT 8.0)

- **2: K : 2011-2050** ('perpetual inventory method')

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

- 1) K is the measures of real capital stock at year t

- 2) I is the real capital formation in year t

- 3) δ (=5 per cent) is the rate of depreciation

Note: K is a weighted sum of all past levels of capital formation and depreciated value of the initial real capital stock.

Hypothesis 1: the capital formation rate of GDP is a function of the population dependency ratio.

$$C_t = 62.733 - 0.399D_{t-1} \quad (1980-2010)$$

Data

- **3: *L* and *P* (1980-2010)**

- 1) *L* stands for total number of employment

- 2) *P* stands for total number of population

Data Sources: China Statistical Yearbook (NBS various years)

- **4: *P* (2011-2050)**

- **Data Sources:** the forecast data provided by Guo Zhigang(2013).

- **5: *L** (1980-2050)**

- 1) *L** stands for ‘potential employment’

$$L_t^* = population_{15+,t} \times Tr_{15+,t} \times (1 - NAIRU_{15+,t})$$

*Population*₁₅₊ is population aged 15 years above; *Tr*₁₅₊ is labour force participation rate for aged 15 years above; *NAIRU* is natural rate of unemployment.

Note: The labour force participation rate/Natural rate of unemployment is a function of the population’s age and sex.

Data

- **6: *h* (1980-2010)**

1) *h* stands for human capital

Data Sources: (1) data cited from the index of *hc* in the PWT 8.0.

(2) The *hc* index, in fact, is a re-estimated dataset built on the education returns estimated by Psacharopoulos (1994), and the average years of schooling provided by Barro and Lee (2012).

- **7: *h** (2011-2050)**

1) Forecast data for the average years of schooling, by each five years, were estimated by the similar method provided by Barro and Lee (2012).

2) The data for other years were filled in by a smoothing method, and the index of *hc* during 2011–50, ultimately, could be obtained.

Table 1 Baseline Scenario without any kind of reform dividend

Index (%)	1980 —1990	1991 —2000	2001 —2010	2011 —2015	2016 —2020	2021 —2025	2016 —2030
China's Potential GDP Growth Rate: 1980-2030							
Real GDP growth rate	9.20	10.46	10.48				
Potential Growth Rate	9.92	10.37	10.67	7.75	6.70	5.95	5.47
Potential Employment	3.37	1.67	1.10	0.33	-0.14	-0.46	-0.62
TFP growth rate	4.01	3.66	3.72	2.37	2.37	2.37	2.37
China's per capita GDP: 2011-2050 (2005 US Dollar)							
per capita GDP	1012	2414	5764	10698	14739	19802	26177

Reform Dividend

- **‘Reform dividend’**: The supply of factors of production and the improvement of TFP are all commonly faced with a so-called institutional barriers. Therefore, removing these barriers by reforms will help to improve potential growth rate. The greater the presence of institutional barriers is, the more radical reforms are needed, and the more significant will be the impact on the improvement of the potential growth rate, should reforms be implemented to overcome those institutional barriers. This outcome can be called the reform dividend.
- This paper provide simulations of the growth effects both for the short term and for the long term generated by various of reform measures.

1. Relaxing Fertility Policy

- The population prediction depends on the value of the TFR (total fertility rate) - the actual average number of children born to a woman over her lifetime.
- In the existing 'selective two-child policy', however, the TFR will theoretically not be more than two. That means the fertility rate could not reach the replacement level.
- **Hypothesis 1:** TFR will be increased from 1.4 to 1.6, 1.77 and 1.94.
- **Mechanism:** The impact on the potential growth rate of relaxing fertility policy has different **short-term** and **long-term** effects.
 - 1)** Newborn babies only increase the population dependency ratio; they cannot increase the working-age population in the short term.
 - 2)** babies will grow into adults (needing at least 15 years to reach working age), and then enter the labour market, and then help increase the potential growth rate.

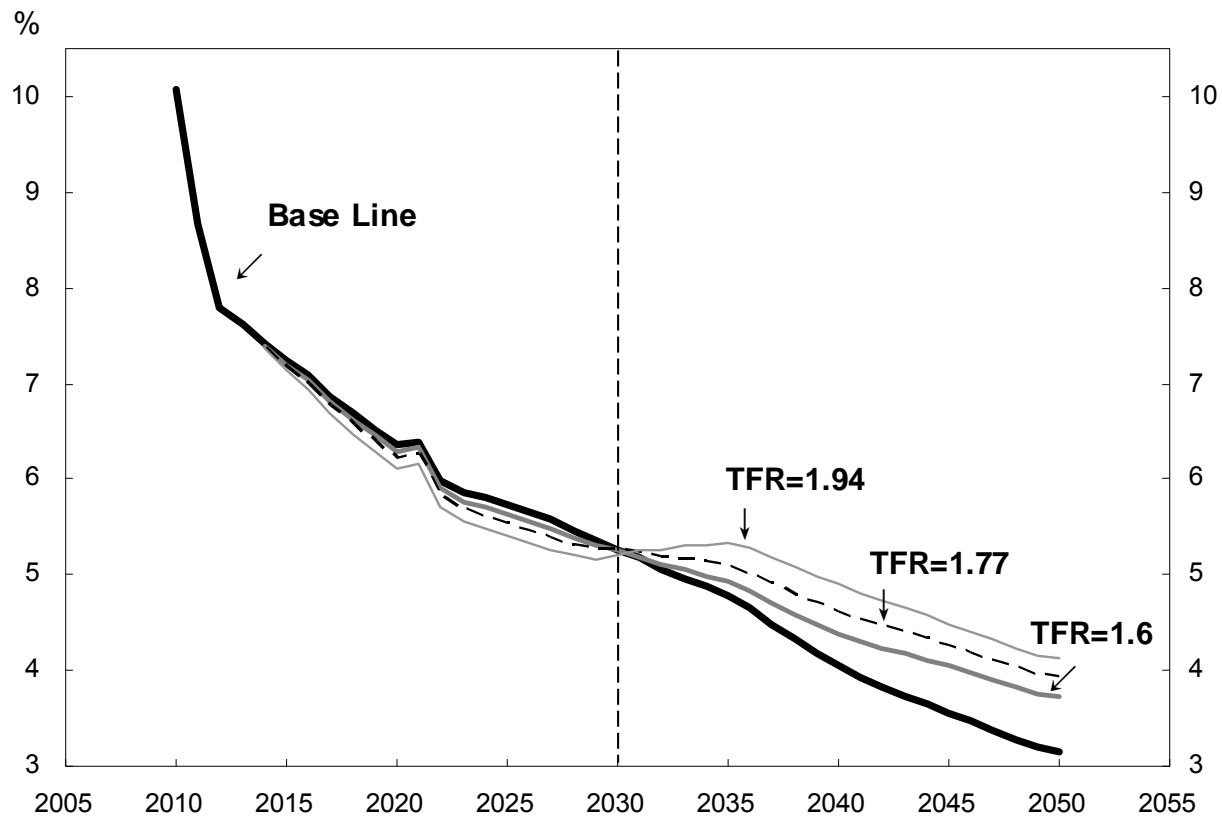


Figure. 4 China's Potential GDP Growth Rate in different TFR: 2011-2050

Source: Authors' simulations.

2. Increase labour participation rate

- Theoretically, if other conditions remain unchanged, an increase in the labour force participation rate will boost the potential growth rate by increasing the number of potential employment L^* .
- **Hypothesis 2:** on the basis of the TFR=1.6, labour force participation rate increased 1 percentage point, 2 percentage points and 5 percentage points, respectively.
- **Simulation Results:**
 - 1) China's average potential growth rate will be increased by 1 percentage point during the Twelfth Five-Year Plan period (2011-2015) if labour force participation rate can be increased by 5 percentage points each year.
 - 2) However, the net effect will decline. the average net effect of the potential growth rate will decrease from 0.18 during the period 2016–20 to 0.06 percentage points in the period 2045–50.

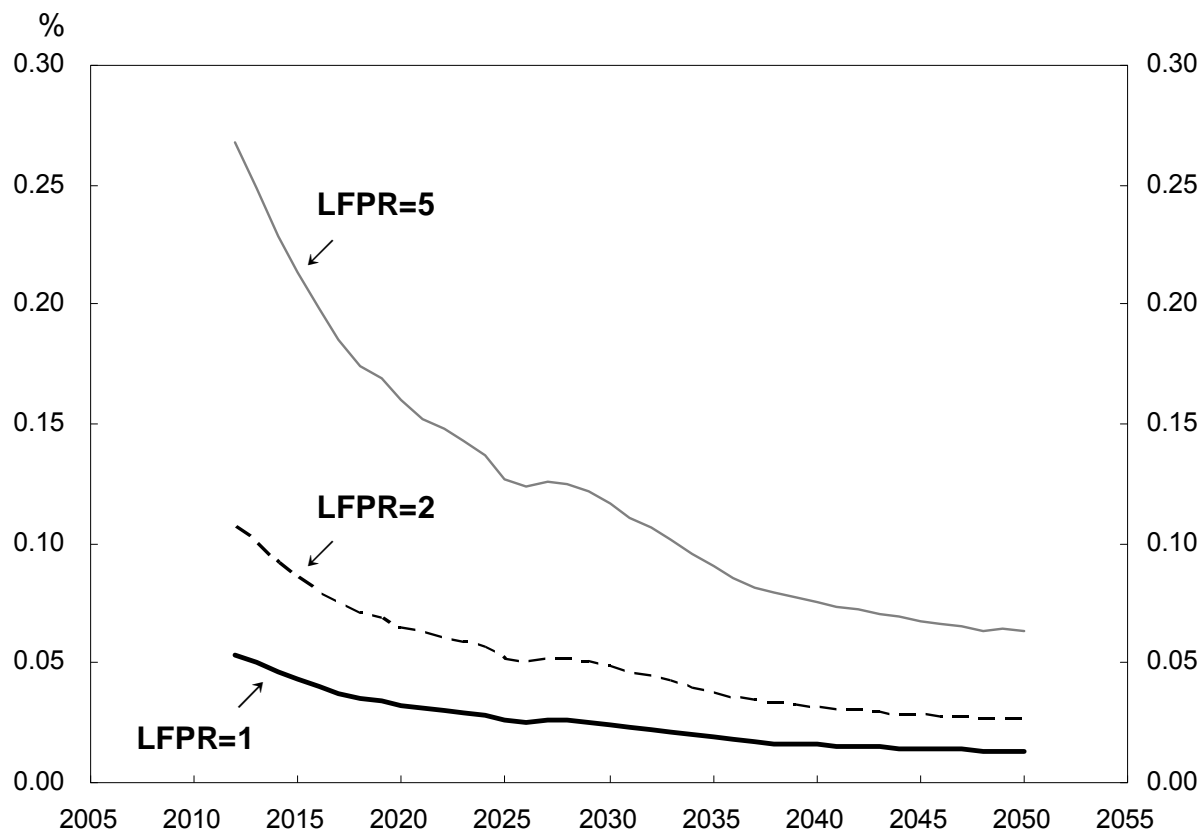


Figure. 5 *The Net Effects of the Potential Growth Rate Produced by Increasing the Labour Force Participation Rate (baseline TFR=1.6)*

Source: Authors' simulations.

3. Increase total factor productivity (TFP)

- Theoretically, if other conditions remain unchanged, an increase in the TFP will boost the potential growth rate.
- **Hypothesis 3:** The baseline scenario was keeping TFR at a constant level of 1.6. It's necessary to estimate the net effect of the potential growth rate by assuming TFP increased 0.5 percentage points and 1 percentage point, respectively.
- **Simulation Results:**
 - 1) China's average potential growth rate will rise to 0.568 percentage points during the Twelfth Five-Year Plan period (2011-2015) if TFP can be increased by 0.5 percentage points every year.
 - 2) Notably, the 'growth effect' generated by TFP is an incremental curve — on the basis of the same scenario, the average net effect of the potential growth rate will increase from 0.568 during the period 2011–15 to 0.869 percentage points in the period 2045–50.

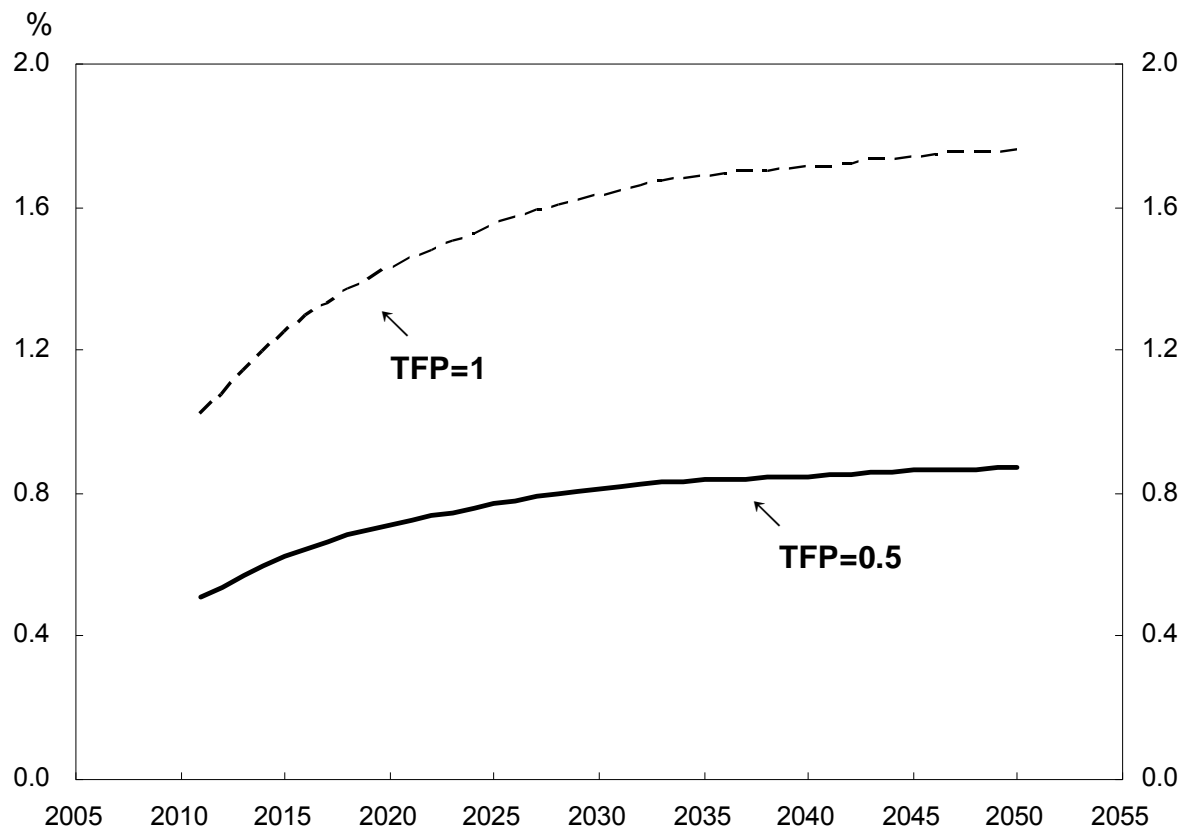


Figure. 6 *The 'Growth Effect' Generated by Increasing TFP (baseline TFR=1.6)*

Source: Authors' simulations.

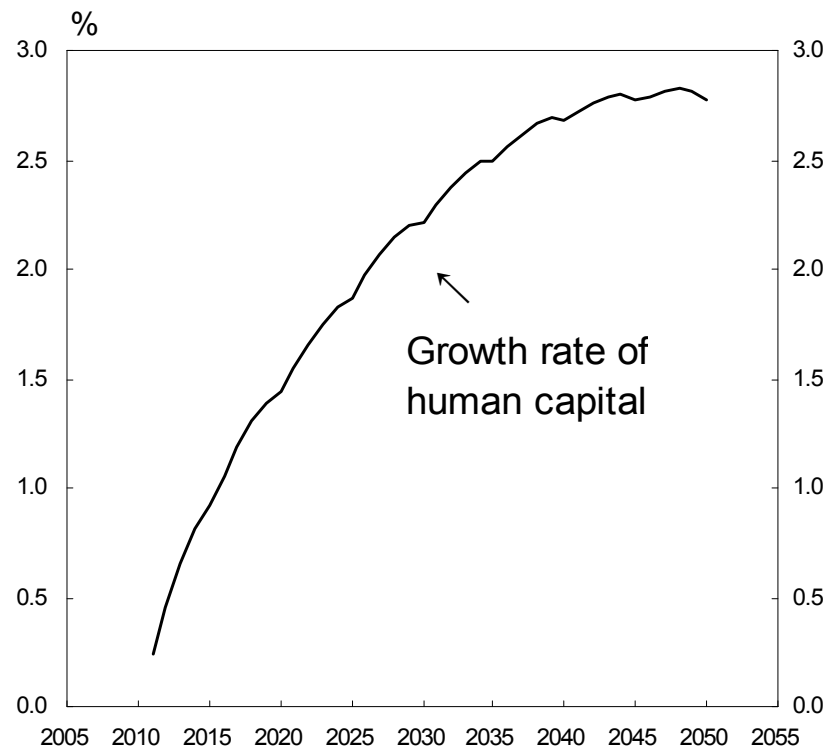
4. Improve the human capital: Education versus Training

- **Hypothesis 4 (Education):**

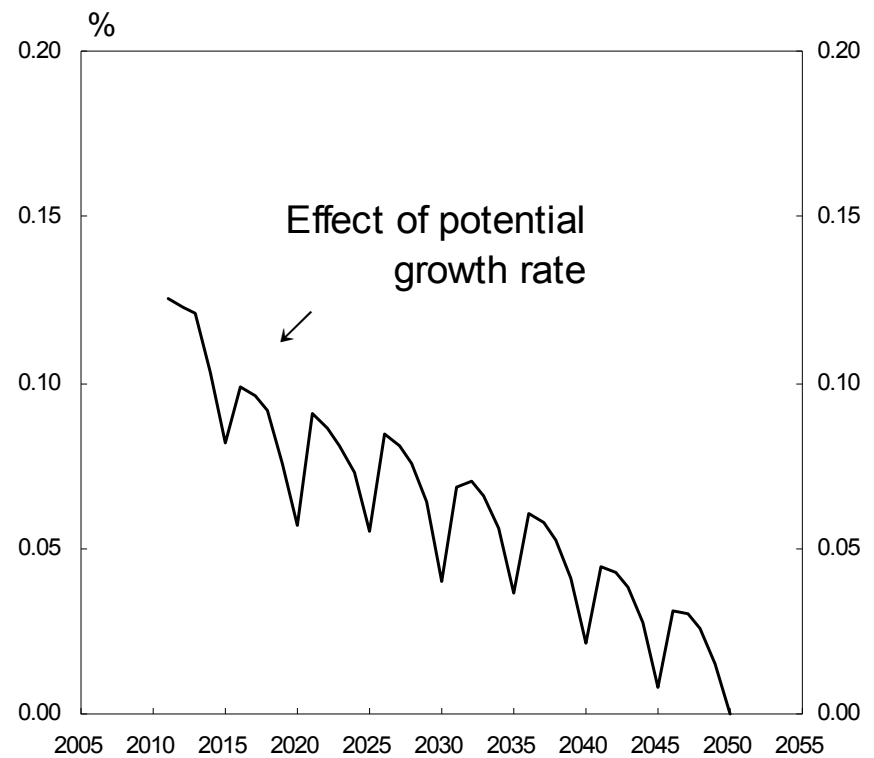
In 2050, the graduation rates for middle school and high school are increased from 95 per cent and 90 per cent, to 98 per cent and 95 per cent, respectively.

Index of *hc*: The growth rate of the human capital index, *hc*, shows a monotonically increasing trend, but its marginal growth gradually declined.

Simulation Results: Human capital also generates a positive effect on China's potential growth rate, however, the marginal growth effect will decline with the increase of human capital.



(A) *Growth Rate of human capital*



(B) *'Growth Effect' by Training*

Figure. 7 *The 'Growth Effect' Generated by Increasing Human Capital (baseline TFR=1.6)*

Source: Authors' simulations.

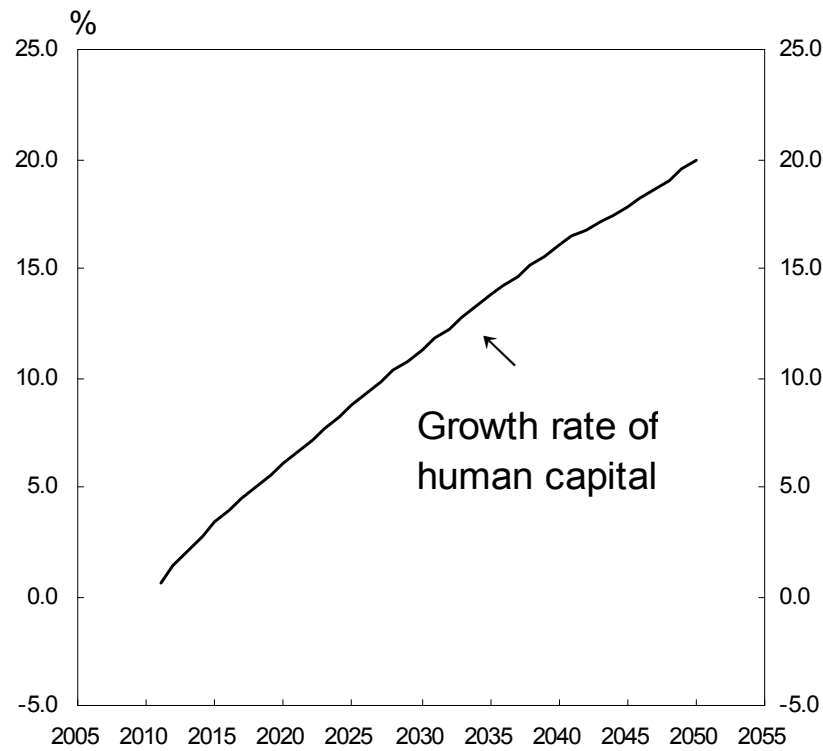
4. Improve the human capital: Education versus Training

- **Hypothesis 5 (Training):**

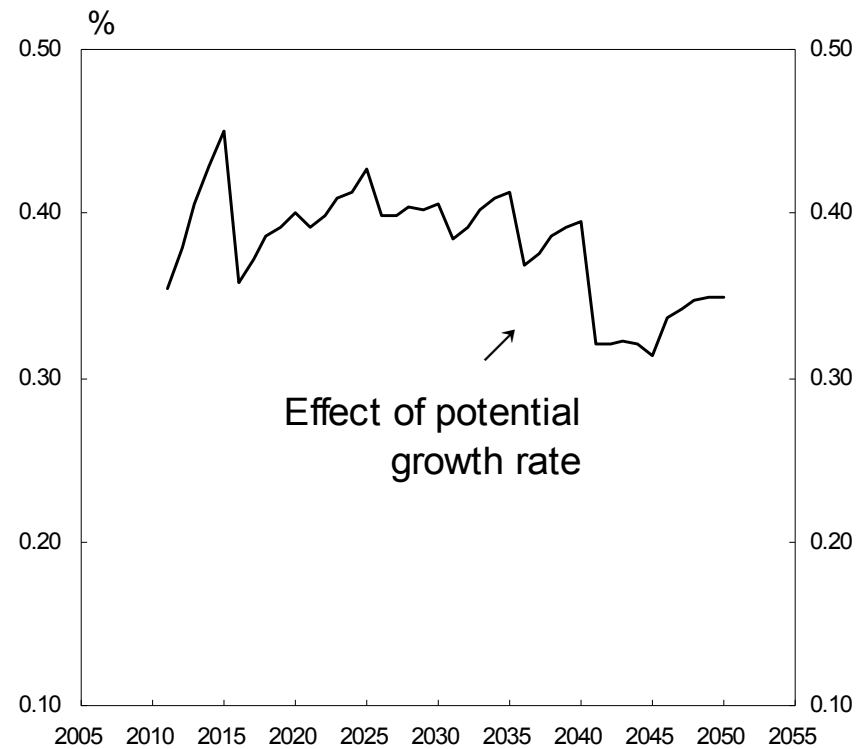
With other conditions remained unchanged, a typical worker in the labour market can access training opportunities of 1.2 months every year. In other words, for a typical worker, in each 10 years their years of schooling will rise by one year due to training programs.

Simplified Assumption: In order to simplify our hypothesis, we assume that the time for training equals the years of schooling.

Simulation Results: the marginal growth effect generated by increasing the amount of training does not appear to produce a significant decreasing trend.



(A) *Growth Rate of human capital*



(B) *'Growth Effect' by Training*

Figure. 8 *The 'Growth Effect' Generated by Increasing Human Capital (baseline TFR=1.6)*

Source: Authors' simulations.

5. Combination Policies

- In the previous section, we have discussed the short-term and long-term effects on the potential growth rate of improving the TFR, TFP, human capital (enrolment rate versus training) and the labour force participation rate. We noted that a single factor may have a limited effect on increasing the potential growth rate; however, choosing a combination of policies to expand the 'growth effect' will work well.
- **Hypothesis 6 (Combination Policies):**
 - Scenario A: TFR=1.6, LFPR \nearrow 1 percentage point,
TFP \nearrow 0.5 percentage points,
Increasing human capital by education.
 - Scenario B: Based on Scenario A, but replace education by training.
 - Scenario C: Based on Scenario B, and TFR raised from 1.6 to 1.94.

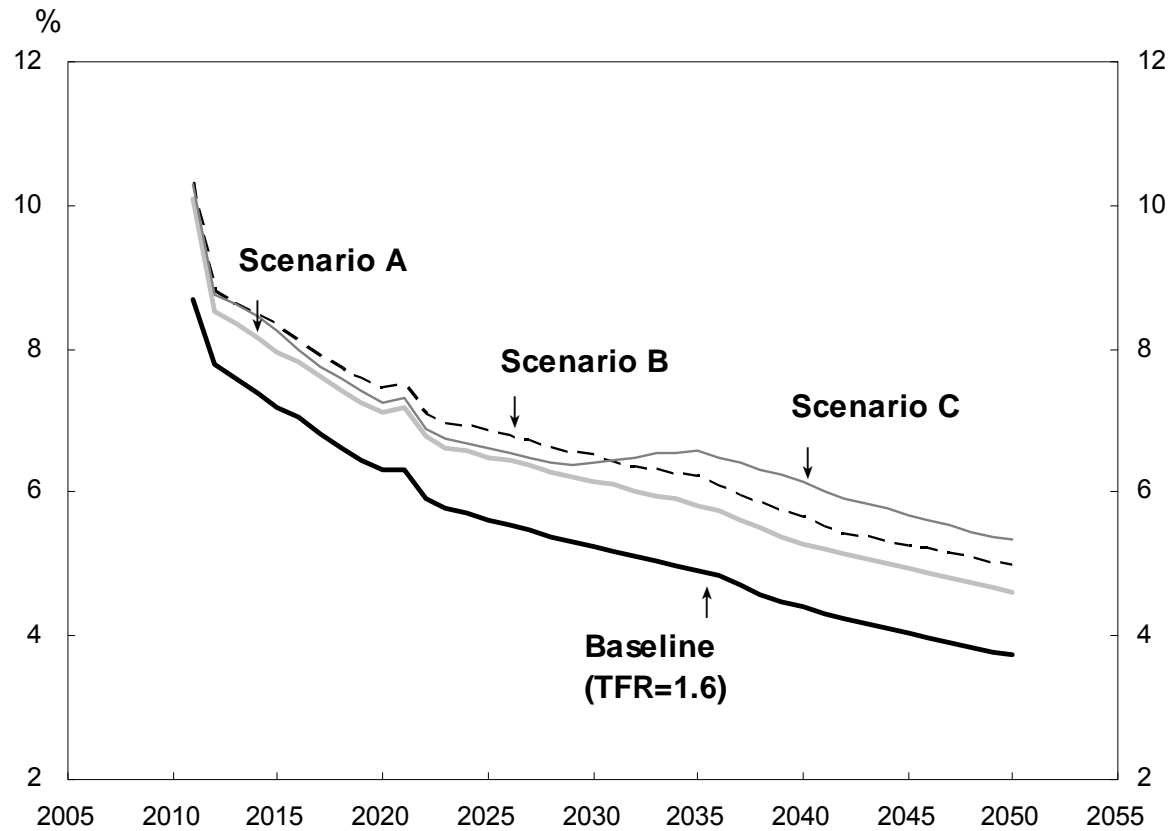


Figure. 9 *The Long-Term ‘Growth Effect’ Generated by Combination Policies (baseline TFR=1.6)*

Source: Authors’ simulations.

Table 2 Combination Policies and the net effect

Index (%)	2011 –2015	2016 –2020	2021 –2025	2026 –2030	2031 –2035	2036 –2040	2041 –2045	2046 –2050
Net Potential Growth Rate generated by combination Policies								
Baseline (TFR=1.6)	1.15	0.96	0.98	1.04	1.47	1.72	1.67	1.64

Net Effects: 1-2 percentage point

Conclusion

- As the end of 'demographic dividend', China's potential growth rate decreases; however, this does not mean the Chinese Government is powerless.
- The new stage of development requires China to accomplish a fundamental transformation of its economic growth pattern from sole reliance on inputs of capital and labor to greater improvements in TFP.

Conclusion

- 1. (Population)** Chinese Government should continue to stick to and improve its current family-planning policy.
- 2. (TFP)** Improving the market mechanism that plays an essential role in the allocation of resources.
 - 1) Mixed Ownership Reform
 - 2) Financial System Reform
 - 3) Household Registration System Reform
- 3. (Human Capital)** Chinese Government and enterprises should provide a variety of training programs for employees.

Thank you!