THE LONG-TERM GROWTH PROSPECTS OF THE PEOPLE'S REPUBLIC OF CHINA

Dominik Peschel and Wenyu Liu

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CURRENCY EQUIVALENTS

(As of 1 December 2022)

Currency unit – CNY
CNY1.00 = $0.1410
$1.00 = CNY7.0924

ABBREVIATIONS

ADB	–	Asian Development Bank
BIS	–	Bank for International Settlements
COVID-19	–	coronavirus disease
FAI	–	fixed asset investment
FDI	–	foreign direct investment
GDP	–	gross domestic product
GFCF	–	gross fixed capital formation
IMF	–	International Monetary Fund
ICOR	–	incremental capital output ratio
IP	–	intellectual property
NBS	–	National Bureau of Statistics
OECD	–	Organisation for Economic Co-operation and Development
PRC	–	People's Republic of China
PPP	–	purchasing power parity
R&D	–	research and development
SOE	–	state-owned enterprise
SME	–	small and medium-sized enterprise
TFP	–	total factor productivity
UN	–	United Nations
US	–	United States

EXECUTIVE SUMMARY

Economic growth in the People's Republic of China (PRC) has moderated over the past decade, even before the coronavirus disease (COVID-19) pandemic. A critical question is to which level of gross domestic product (GDP) growth the country will return to after COVID-19 and how its long-term growth prospects are, given its rapidly aging society, a continued dependence of growth on investment, and a changed international environment.

This paper estimates the country's potential GDP growth up to 2040 based on a Cobb-Douglas production function, estimating all input factors separately with newest available data. Many assumptions in the past, e.g., on the demographic development, have often been too optimistic, resulting in inflated growth estimates. According to our estimate, potential GDP growth averages 5.3% in 2020–2025, declining gradually to 2.0% in 2036–2040.

Compared to three earlier papers that also use the production function approach (each using different specifications)—Bailliu et al. (2016), Roberts and Russell (2019), and Higgins (2020)—our estimate of future potential growth is lower than Bailliu et al. (2016) and closer to the other two.

Our estimates of the different input factors allow us to analyze the drivers of the growth moderation and to use these insights for policy recommendations. Capital and total factor productivity (TFP) are identified as the major contributors to growth in the future. Meanwhile, a shrinking working-age population will increasingly weigh on growth, while the contribution of human capital to growth is comparatively small.

To increase potential growth, this paper suggests reforms in four areas—labor, human capital, capital, and TFP:

Labor. Given rapid demographic aging, mitigating the impact of the declining labor force is key. One measure is to raise the retirement age, in particular the actual average retirement age that is in the mid-50s. Other measures to cope with an aging working force include improving health care, raising female workforce participation rates, and increasing labor mobility.

Human capital. The PRC has room to catch up with advanced economies in both years of and quality of education, especially in rural areas. Furthermore, education can be improved by expanding early child development, enhancing the quality of tertiary education, strengthening technical and vocational education and training, and increasing on-the-job training.

Capital. Changes to the allocation of capital and credit are considered to be one of the biggest factors to raise potential growth. State-owned enterprise (SOE) reforms are needed. This requires clarifying SOEs' scope and function, leveling the playing field for the private sector, separating social functions from SOEs, and improving SOE management. Moreover, credit allocation needs to be shifted in favor of the private sector, in particular micro and small businesses. To this end, the implicit guarantees of SOEs need to be removed, while banks must strengthen their credit risk assessment capabilities and increase their operational efficiency.

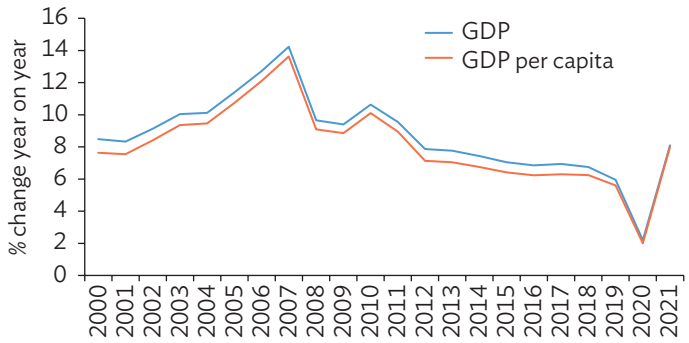
Total factor productivity. First, to facilitate the sectoral labor shift, residence permit restrictions should be loosened to facilitate labor migration to urban areas and the access to basic social services should be made easier for labor migrants. Second, to increase the country's attractiveness for foreign direct investment (FDI) inflows, the negative list for FDI should be shortened and joint venture requirements reduced. Third, advancing trade and investment agreements could help increase openness and facilitate domestic reforms. Finally, to improve the country's research and development (R&D) effectiveness, the prevailing misuse of R&D funds must be addressed, the share of basic research increased, the quality of patents issued raised, and intellectual property (IP) rights protection strengthened.

I. INTRODUCTION

The long-term economic growth prospects of the PRC matter, not only for the country but also for the world. While some worry about the PRC "growing old before becoming rich," others see the PRC emerging as the world's biggest economy.[1] A third group highlights adverse effects on global growth in case the PRC's economic growth slows (IMF 2016; Ahmed et al. 2019). However, there is no consensus on the PRC's long-term growth prospects.[2] This paper discusses the assumptions and findings of different approaches to long-term growth forecasts for the PRC, estimates the country's potential growth until 2040, and provides policy recommendations to raise it.

The PRC has had a long stretch of high growth from the end of the 1970s until 2010, which is exceptional in international perspective.[3] At the same time, domestic debt has increased sharply over the past decade, and economic growth has been on a moderating trend, even before the COVID-19 pandemic hit the economy.[4] The big question is which growth rate the PRC can sustain over the next 2 decades and how the decline in potential growth evolves. Answers to these questions would be helpful for economic policy making and social planning.

Figure 1: Real GDP Growth, 2000–2021



GDP = growth domestic product.

Note: In recent years, the population size virtually stagnated so that GDP growth and per capita GDP growth aligned.

Source: National Bureau of Statistics (NBS) via CEIC Data Company (accessed 10 June 2022).

Economic growth moderated in the past decade, well before the COVID-19 pandemic in 2020 (Figure 1). After years of two-digit growth rates, GDP growth slowed from 9.0% in 2011 to 6.0% in 2019 in line with potential growth moderating (as our estimates in part III show). On the demand side, growth in both household income and consumption has softened in the decade before COVID-19, while investment growth has been on a declining trend (Figures 2 and 3).

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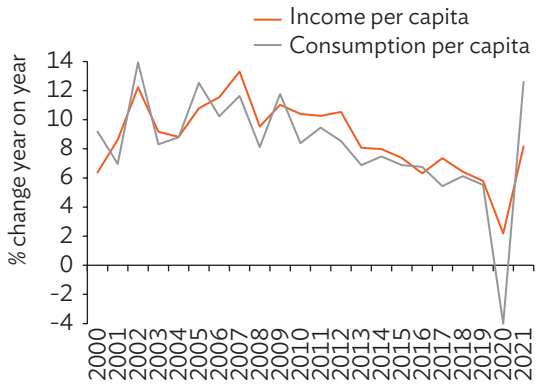
1 See for instance Economist (2019) as an example for the discussion on aging, and Zhu and Orlik (2022) on the PRC's changes to emerge as the world's biggest economy.

2 For economists, usually not the absolute size of an economy matters, but GDP per capita. Thus, the important question is not if the PRC takes over as the world's biggest economy in the coming decades, but how fast GDP per capita—a measure for the stage of development of an economy when adjusted for purchasing power parity (PPP)—evolves. Dollar, Huang, and Yao (2020) forecast the PRC's per capita GDP (PPP adjusted) relative to the US to rise from about one-quarter in 2018 to around two-thirds in 2049.

3 See for instance Summers and Pritchett (2014). Johnson and Papageorgiou (2020) provide a table of the fastest-growing economies per decade. The PRC comes first for the 1980s and 1990s, and third for the 2000s (following two commodity exporters).

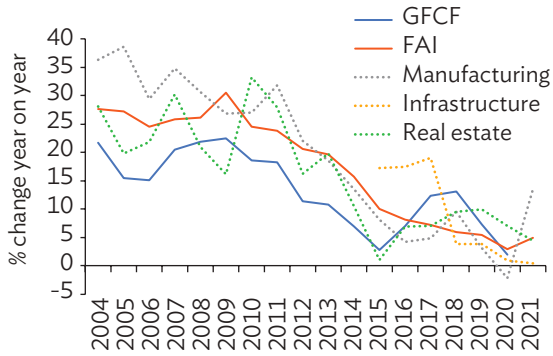
4 In this paper, projections start in 2020 to avoid distortions from the COVID-19 pandemic.

Figure 2: Real Growth in Income and Consumption, 2000–2021



Sources: NBS via CEIC Data Company (accessed 27 May 2022); and ADB calculations.

Figure 3: Growth in Investment by Category, 2004–2021



FAI = fixed asset investment, GFCF = gross fixed capital formation.

Note: Growth rates in GFCF and FAI differ, among others, due to different scope of data. A breakdown by sector is only available for FAI.

Sources: NBS via CEIC Data Company (accessed 26 May 2022); and ADB calculations.

Understanding the country's future potential growth is critical for designing economic policies. Potential growth is a theoretical construct, an estimate of the output that the economy would have produced if labor and capital had been employed at their maximum sustainable rates, i.e., rates that are consistent with steady growth and stable inflation (Powell, Sheiner, and Wessel 2021).[5]

Part II will discuss different approaches to estimating long-term growth. The production function approach, the method we chose for our model in part III, first estimates input factors—labor, human capital, capital stock, and total factor productivity (TFP)—and then combines them into one production function. While this approach yields a better understanding of the drivers of potential growth, it requires estimating the trends in many variables, which can be a challenge (Arsov and Watson 2019).[6] Lardy (2019) points out the challenges as follows: (i) it is extremely data intensive and requires innumerable judgement and assumptions; (ii) it requires reasonable accurate historical data (on the capital stock, labor force, and human capital); and (iii) projections require many judgements, with capital stock growth and improvements in human capital being difficult to estimate, and future TFP growth being an even greater challenge.

Our estimate of potential growth indicates that, GDP growth will decline notably within this decade without major reforms, which are needed in particular to the country's capital and credit allocation, as are measures to address the shrinking labor force. Furthermore, TFP growth will be much lower in future, calling for improvements in R&D efficiency.

The remainder of this paper is organized as follows: Part II discusses the diverging views on the PRC's long-term economic growth potential, including different approaches to forecasting long-term growth. Part III specifies a production function and estimates potential growth for 2020–2040. Part IV develops policy recommendations based on the findings in the previous part. Part V concludes with an outlook on policy challenges and reforms to boost potential growth.

[5] For the PRC, such approach faces limitations given the drivers of inflation in the PRC—a detailed discussion can be found in ADB (2021a)—and the fact that labor market statistics have shortcomings (ADB 2020a).

[6] For different ways to estimate potential growth, see Guisinger, Owyang, and Shell (2018) for the US.

II. DIVERGING VIEWS ON THE PRC'S LONG-TERM GROWTH

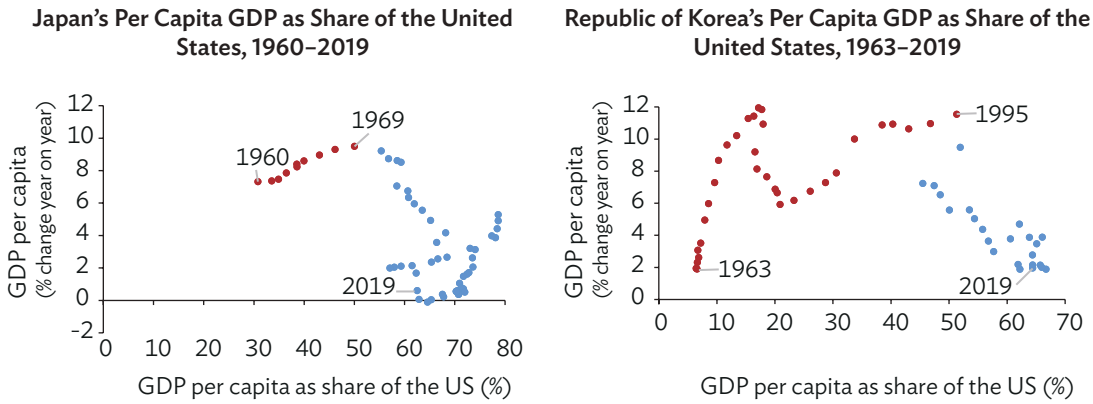
A. Conditional Convergence

The neoclassical growth model predicts poor countries to grow faster than rich ones, leading to a convergence toward rich countries' levels of per capita GDP over time. In modern forms of the model, the convergence arises due to diminishing returns to investments in physical and human capital, and poor countries' ability to imitate advanced countries' technological innovations. However, this convergence holds empirically only conditionally, i.e., poor countries tend to grow rapidly only if they first create reasonably well-functioning legal, political, and market institutions (Barro 2017).[7]

Barro (2016) predicts convergence to prevail in the long run and a growth rate of 3%–4% over the next 2–3 decades. For his model of the PRC's past growth rates and his explanation of the country's historical growth pattern, see Appendix 1.

In East Asia, Japan and the Republic of Korea initially caught up rapidly to the US, before the process slowed after their growth peaked in 1969 and 1995, respectively (Figure 4).

Figure 4: Japan's and the Republic of Korea's Catch-Up Process to the United States, 1960s–2019



GDP = gross domestic product, US = United States.

Note: Growth in per capita GDP (at 2017$, purchasing power parity adjusted) is a 10-year moving average. Red dots indicate the rising growth rates and blue dots declining ones.

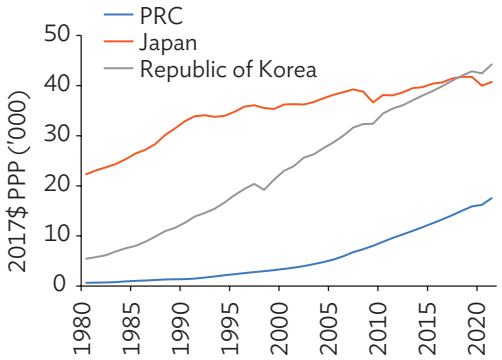
Sources: Jiang and Yi (2015); Penn World Table 10.0; and ADB calculations.

Thanks to faster GDP growth, the PRC caught up and narrowed the distance in terms of GDP per capita (adjusted for purchasing power parity) to Japan and the Republic of Korea over time, especially in the past 2 decades, as well as to the US (Figure 5).

[7] For a recent discussion, see Johnson and Papageorgiou (2020), and specifically on the PRC, Barro (2016).

Figure 5: PRC's Per Capita GDP in Comparison

Compared to Japan and Republic of Korea, 1980–2021

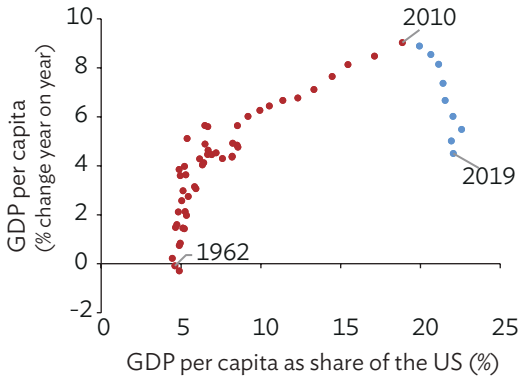


PRC = People's Republic of China, PPP = purchasing power parity.

Estimates start after 2020 for the PRC and the Republic of Korea, and 2015 for Japan.

Source: IMF, World Economic Outlook Database 2022.

As Share of US Per Capita GDP, 1962–2019



GDP = gross domestic product, US = United States.

Notes: Growth in per capita GDP (at 2017$ PPP) is a 10-year moving average. Red dots indicate rising growth rates and blue dots declining ones. GDP growth rates in Penn World Table differ from official ones.

Sources: Jiang and Yi (2015); Penn World Table 10.0; and ADB calculations.

B. Approaches to Long-Term Economic Growth Forecasts

There is a range of opinions on the PRC's long-term growth. Table 1 summarizes a selection of forecasts from different years, using different approaches and time frames.

Table 1: Selected Long-Term Growth Forecasts for the PRC

Study	Approach	Years	Result
Summers and Pritchett (2014)	Presents basic evidence on regression to the mean in country growth rates. Then uses regressions that predict countries' growth rates based on their past growth	2013–2033	Using regressions analysis, the authors predict GDP growth per capita to be 3.9% on average over a 20-year horizon. For a 10-year horizon (different regression), they predict 5.0% in 2013–2023 and 3.3% in 2023–2033.
Barro (2016)	Conducts conditional convergence and cross-country growth regressions to determine economic growth	2015–2035	GDP growth per capita is estimated at 3%–4% over the next 2 to 3 decades
Bailliu et al. (2016)	Uses a Cobb-Douglas production function to forecast the PRC's potential growth until 2030	2015–2030	GDP growth is forecast to decline gradually over 15 years to around 5%
Zhu et al. (2019)	Predicts potential growth by examining past sectoral transitions	2018–2030	Potential growth in the baseline scenario will slow, but remain robust at around 4% by 2030
Roberts and Russell (2019)	Extrapolates growth trends in input factors (labor, capital, and TFP)	2020–2030	The PRC's GDP growth is estimated to around 4%–5% in 2020-2030
Higgins (2020)	Growth accounting of contributions from labor force growth, capital accumulation, and TFP	2018–2038	In the "pretty good" scenario, the PRC's real per capita income growth averages 3.8% in 2018–2028, slowing to 2.1% in 2028–2038

Study	Approach	Years	Result
Sasaki et al. (2021)	Follows approach in Zhu, Zhang, and Peng (2019), but adopts different industry-level convergence rates rather than a fixed rate	2020–2035	The size of the PRC's economy can potentially double by 2035 (implying an average growth rate of about 4.8% until 2035)—as long as the country follows the catch-up process achieved by other East Asian economies.

GDP = gross domestic product, PRC = People's Republic of China, TFP = total factor productivity.

Note: Only studies that are further discussed in this paper.

Source: Authors' compilation.

There are three main approaches in the literature cited in Table 1:[8]

(i) **Conditional convergence:** Poor countries—once they have created reasonably well-functioning legal, political, and market institutions—tend to grow faster than rich ones, leading to a convergence toward rich countries' levels of per capita GDP over time (Barro 2017). For instance, Barro (2016) uses a cross-country data set on convergence, taking into account several factors, to forecast the PRC's growth rate, and concludes 3%–4% growth in the next 2 to 3 decades. Summers and Pritchett (2014) forecast 3.9% growth over the next 2 decades. At the same time, the convergence approach can only provide a rough estimate of potential growth (Maliszewski and Zhang 2015).

Maliszewski and Zhang (2015) further claim that the convergence path of the PRC might be different due to the size of the economy. Zhu, Zhang, and Peng (2019) argue that it is unlikely that the PRC will follow the East Asian economies' growth paths due to the changing global environment and the size of its economy. However, it seems unlikely that in the long run a country can sustain an economic growth rate exceeding all other countries' experiences and keep constantly growing at a high rate (Summer and Pritchett 2014; Barro 2016). Hence, the convergence approach should be able to provide at least a rough idea of how the PRC's long-run growth will evolve. Also, other East Asian economies' growth path might be the best comparator given their geographical proximity and their similar development pattern via industrialization and export-led growth in earlier stages. In this context, Higgins (2020) points out to the similarities between the PRC and Japan and the Asian Tigers with respect to the development of the share in global manufacturing exports as well as similarities with respect to their high investment share in GDP.[9]

(ii) **Sector-based approach:** Another approach, using sectoral catch-up, deploys a similar idea as convergence: dividing the economy into different sectors, productivity of those that are further from the international frontier (i.e., frequently those in advanced economies) will gradually catch up. Zhu, Zhang, and Peng (2019) highlight that sectoral transition is a key driver of the PRC's potential growth. Sasaki et al. (2021) follow this approach, but use differentiated industry-level convergence rates. Both papers reach similar conclusions, though the estimate by Sasaki et al. (2021) comes in slightly higher.

As catch-up processes and their speed depend on many variables, projections based on these processes tend to be highly uncertain (Higgins 2020). Also, as seen above, results are sensitive to the selection of the convergence rates in different sectors.

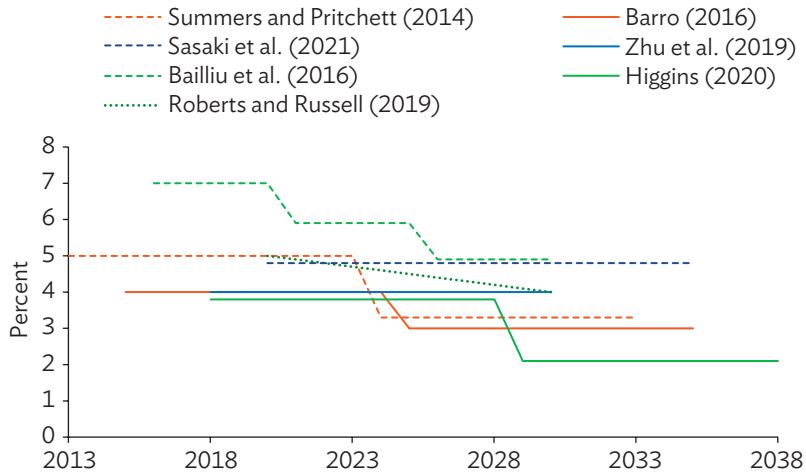
[8] Another approach to estimate potential output uses statistical techniques to decompose output into trend and cyclical components, with the trend component assumed to be potential output (Arsov and Watson 2019)—see World Bank (2019 and 2021) applying this approach to the PRC's case. Growth accounting using a Cobb-Douglas function is the approach mostly used to estimate potential growth for advanced economies (Arsov and Watson 2019).

[9] We will discuss this in the part III when looking at capital formation and the expansion path of the capital stock.

(iii) **Extended Solow model**[10]**:** Bailliu et al. (2016), Roberts and Russell (2019), and Higgins (2020) adopt a Cobb-Douglas production function with labor (quality and quantity), capital, and TFP as input factors to forecast long-term growth. The challenge of this approach is that it needs several assumptions on the trend of the input variables. Here, the three papers take different routes: Roberts and Russell (2019) extrapolate trends based on the past 10 years, Higgins looks at comparator groups and develops different scenarios, and Bailliu et al. (2016) estimate the trend of each input factor separately.

In Figure 6, we cluster the seven selected studies according to the approach used.

Figure 6: Long-Term Growth Forecasts, 2013–2038



Note: Convergence approach in orange, sector-based approach in blue, and production function approach in green. Barro (2016) provides a range of 3%–4% for the entire period (split in two periods in the chart for better comparison).

Sources: Authors' compilation from Summers and Pritchett (2014); Barro (2016); Bailliu et al. (2016); Zhu, Zhang, and Peng (2019); Roberts and Russell (2019); Higgins (2020); Sasaki et al. (2021).

The results using the convergence approach (Summers and Pritchett 2014; Barro 2016) vary only slightly for the future and are lower than the forecasts from the sector-based approach (Zhu, Zhang, and Peng 2019; Sasaki et al. 2021) that are within a range of 4%–5%. However, estimates based on a production function differ more widely, given different assumptions and data availability at different points in time, all of which can influence the estimates of input factors.

The Cobb-Douglas production function warrants further research given that the estimates of the studies cited above differ most widely and given recent data updates, such as the 2020 census results, updated capital stock estimates (IMF 2021a), and a new data set on educational attainment (Barro and Lee 2021). Given the moderation in actual GDP growth in recent years, even before the COVID-19 shock on the economy, it seems warranted to re-estimating potential growth using these data updates (and others). Using the approach by Bailliu et al. (2016), we modify it as needed to integrate data updates and newer findings and developments.

[10] See Mankiw, Romer and Weil (1992) for a version with human capital.

III. MODEL SPECIFICATION AND RESULTS

A. Functional Form

We adopt a Cobb-Douglas production function to estimate GDP growth:[11]

$$Y_t = A_t K_t^{\alpha} (L_t h_t)^{1-\alpha} \quad (1),$$

where Y is GDP, A is productivity, K is (physical) capital stock, L is labor, h is human capital, α is the share of capital income in GDP, and (1-α) is the share of labor income in GDP.

By log-linearization, we get

$$\ln(Y_t) = \alpha \ln(K_t) + (1\text{-}\alpha) \ln(L_t) + (1\text{-}\alpha) \ln(h_t) + \ln(TFP_t) \quad (2),$$

where TFP is total factor productivity.

Then, taking the first difference of equation (2), we obtain growth rates:

$$\widehat{Y_t} = \alpha\widehat{K_t} + (1-\alpha)\widehat{L_t} + (1-\alpha)\widehat{h_t} + \widehat{TFP_t} \quad (3).$$

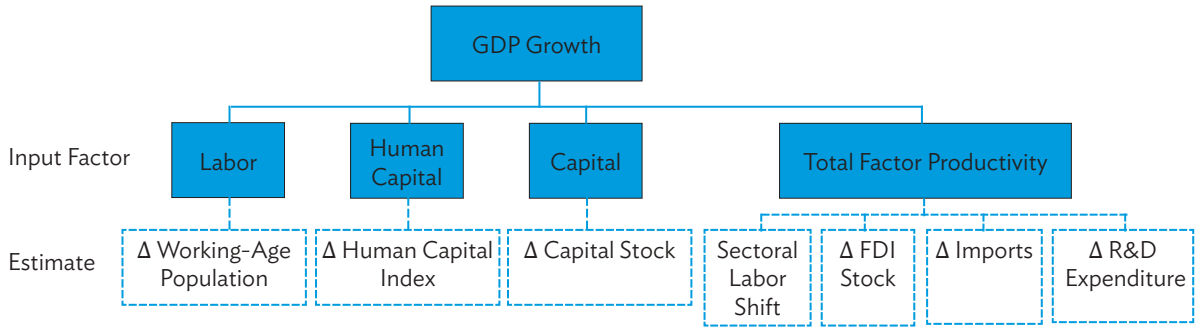
Equation (3) derives the GDP growth rate. To abstract from the business cycle, all factor inputs are assessed at their trend level:

$$\widehat{Y_t^*} = \alpha\widehat{K_t^*} + (1-\alpha)\widehat{L_t^*} + (1-\alpha)\widehat{h_t^*} + \widehat{TFP_t^*} \quad (4),$$

where X* denotes the trend level of variable X.

Figure 7 illustrates the input factors of GDP growth in the model.

Figure 7: Input Factors of the Cobb-Douglas Function



FDI = foreign direct investment, GDP = gross domestic product, R&D = research and development.
Source: Authors.

[11] See for instance Bailliu et al. (2016).

In the following, we discuss the input factors and their estimates and forecasts. Challenges relate to estimating the capital stock and (future) TFP. A possible approach to estimate TFP, but only looking backward, is to calculate the residual,[12] i.e., the difference between actual economic growth and the part of growth explained by capital, labor, and human capital input. Conversely, we need to use a combination of variables that can be forecast to obtain an estimate of future TFP growth.[13]

B. Labor

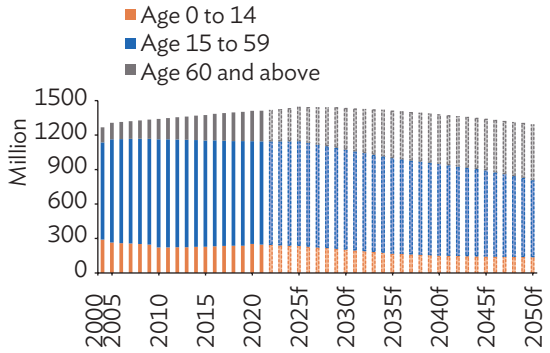
As for the growth of working-age population, we assume in line with Bailliu et al. (2016) that—at full employment and an unchanged labor participation rate—the trend labor growth is measured by the growth rate of the working-age population, as shown in the equation:

$$\widehat{L_t^*} = \widehat{P_t^{15-59}} \quad (5).$$

We consider the working-age population as the group of people between the ages of 15 and 59. While there are plans in the 14th Five-Year Plan to gradually raise the legal retirement age, the actual retirement age in the PRC is far below 60 (Economist 2021) so that in our model an extension of work life beyond 60 does not seem warranted.

The PRC's working-age population started to fall in 2012. From its peak in 2011 until 2021, the working-age population declined by 42 million. In 2021, it accounted for 64% of total population, down from an average of 69% in 2000–2010. The ratio is projected to fall to 61% in 2030 and further to 52% in 2050 (Figure 8).

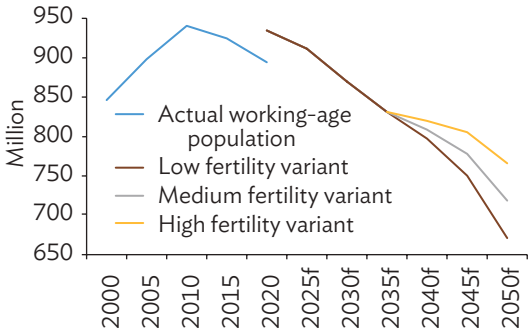
Figure 8: Working-Age Population, 2000–2050



Note: No data available between 2000 and 2005. Until 2021 actual figures from NBS, from 2022 based on forecast from United Nations (UN) (2019), low fertility variant (using linear extrapolation).

Sources: NBS via CEIC Data Company (accessed 2 December 2022); UN (2019), World Population Prospects; and ADB calculations.

Figure 9: Impact of Fertility Assumptions on Working-Age Population Projections up to 2050



Note: Actual figures in blue from NBS until 2020, forecast from UN (2019), with variants overlapping until 2035. NBS figures take into account the 2020 Census (with its downward revisions).

Sources: NBS via CEIC Data Company (accessed 2 December 2022); and UN (2019), World Population Prospects.

[12] So-called Solow residual, named after the economist Robert Solow.

[13] Here, we need to briefly address concerns about GDP growth data itself. The latest World Penn Tables data set shows lower GDP growth (especially in recent years) than official statistics, which we use. Chen et al. (2019) find that GDP growth rates were overstated for 2008–2016. On the other hand, Clark, Pinkovskiy, and Sala-i-Martin (2020) find for up to 2015 that official GDP growth figures may be understated.

Projections from UN (2019) show that the PRC's working-age population will decline in all (i.e., low, medium, and high) fertility scenarios (Figure 9). In the low-fertility scenario, the working-age population will continue to decline fast after 2035, while in the other two scenarios the decline decelerates. According to data from NBS, the PRC's birth rate—the number of live births per 1,000 of population per year—fell to a historical low of 7.5 in 2021, down from 14.6 in 2012, which was the highest rate reported within the past 2 decades. This sharp decline happened despite attempts to increase it by adopting the Two-Child Policy in 2015 and even a Three-Child Policy in 2021. Thus, we use the low fertility variant from the UN for our estimates.

C. Human Capital

The qualitative component of human capital is determined by years of schooling and returns to education.

For educational attainment, we use the Barro-Lee data set (2021) ending in 2015.[14] We construct five age groups: 15–24, 25–34, 35–44, 45–54, and 54–59. Based on the PRC's education system, we assume 6, 12, and 16 years of education for the completion of primary, secondary, and tertiary education. In line with Bailliu et al. (2016), we assume those who have attended but not completed primary, secondary and tertiary education received 3, 9, and 14 years of education, respectively (and the assumed return for no education is zero). As for returns to education, we assume different annual returns to education for primary, secondary and tertiary education as follows: 7.69%, 8.92%, and 13.38% (Bailliu et al. 2016), which averages 10%.[15]

While the returns-to-education approach provides a detailed picture, several steps are needed to obtain the human capital index and its forecast (Appendix 2).[16] One critical assumption is higher education attainment rates and their development. Bailliu et al. (2016) forecast secondary and tertiary school attainment on the relationship between school enrolment rates and per capita income of high-income countries. However, the PRC's tertiary school enrolment rate has grown rapidly from 24.2% in 2010 to 58.4% in 2020 (Figure 10). High-income countries achieved a tertiary school enrolment rate of about 58% in 2001, with GDP per capita closed to $40,000 (in 2017$, PPP-adjusted), while the PRC's purchasing-power-adjusted GDP per capita was only $16,000 in 2020—when the PRC already had reached 58%. We account for that in our estimate (see Appendix 2 for details).

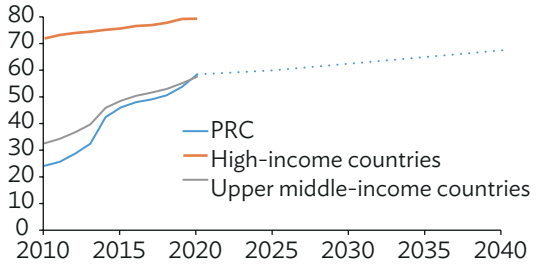
The human capital index is shown in Figure 11. The trend of the index is rising from 2000 to 2040. According to our estimate, a 11% average return to education—instead of the assumed 10% return—would increase the human capital index by 0.27 on average.

[14] In the data set, data are available every 5 years (i.e., for 2000, 2005, 2010, and 2015) for five age groups: 15–24, 25–34, 35–44, 45–54, and 54–64. Gaps for years are filled by linear extrapolation. Furthermore, we approximate values for the age group 54–59 as Barro-Lee (2021) extended the age group to 64.

[15] Ma and Iwasaki (2021) conducted a meta-analysis of 213 studies on returns to education, confirming that a majority of previous studies reported about 10% (while some more recent estimates vary greatly).

[16] Roberts and Russell (2019) estimate trend growth of labor quality by adjusting for average years of schooling and use that estimate as the combined contribution from labor and human capital. Higgins (2020) includes average hours worked and total employment as labor inputs besides human capital.

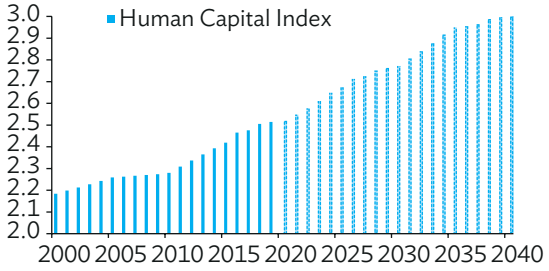
Figure 10: Tertiary School Enrollment, 2010–2040



PRC = People's Republic of China

Sources: World Bank, World Development Indicators Database 2022; and authors' estimates.

Figure 11: Human Capital Index, 2000–2040



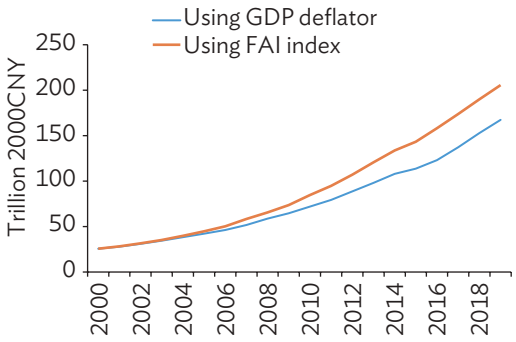
Source: Authors' estimates.

D. Capital

The capital stock and its growth rate need to be estimated for the production function. The so-called perpetual inventory method is frequently used to determine the capital stock each year: capital stock at a starting point plus investment (each year) minus depreciation of the capital stock. Estimating the PRC's capital stock is challenging for the following reasons: first, the capital stock must be estimated for the starting date (no related statistics exist); second, estimates of the depreciation rate differ widely—Herd (2020) provides an overview. Finally, fixed asset investment (FAI) data frequently differs from that on gross fixed capital formation, which can be only partly explained by their different methodology (Brooks and Barnett 2006).

We use the capital stock estimate by the International Monetary Fund (IMF), which covers the period 1960–2019. Since these estimates are in current CNY, we have to address price effects. To do so, we deflate the capital stock growth with the GDP deflator (Figure 12), which results in an estimate close to that in Bailliu et al. (2016) for 2000–2014. Using the FAI index as deflator would yield a higher estimate—we further discuss deflator choices and cross-checks in Appendix 4.

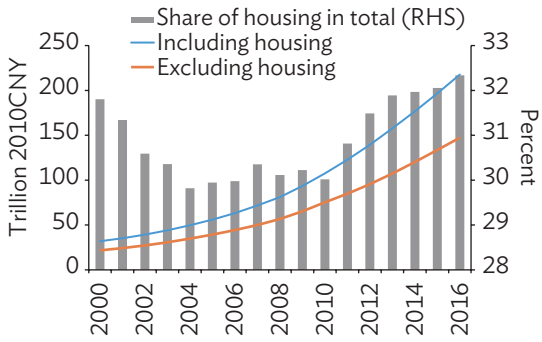
Figure 12: Capital Stock Estimates with Different Deflators, 2000–2019



FAI = fixed asset investment, GDP = gross domestic product.

Sources: IMF Investment and Capital Stock Dataset (2021); NBS via CEIC Data Company (accessed 26 May 2022); and authors' calculations.

Figure 13: Estimated Capital Stock with and without Housing, 2000–2016



Note: In constant 2010 prices; different from Figure 12.

Sources: Herd (2020) via World Bank's Development Data Hub (https://datacatalog.worldbank.org/); and authors' calculations.

Another potential challenge comes into bearing when separating the capital stock into housing and nonhousing. The argument behind this is that housing is not productive to produce goods and services, and hence should be excluded from the capital stock (Bailliu et al. 2016). For that reason, Higgins (2020) uses a subset from Penn World Table that estimates the flow of services from the capital stock, but concedes that the results would be basically the same using the capital stock series. We use the growth rate of the entire capital stock (including housing) for 2001–2019. Figure 13 shows Herd's (2020) estimates of capital stock with and without housing as well as the share of housing in the capital stock, which varies over time. In Appendix 4, we provide a discussion on that issue.[17] Furthermore, Box 1 will discuss overinvestment.

As mentioned, the future growth rate of the capital stock is key for our estimate —and this rate is expected to decline. In 2001–2019, the GDP-deflated capital stock grew annually by 10.4% on average. In the future, the growth rate of the capital stock should decline as the capital stock ages and depreciation increases, while investment as a share in GDP is forecast to fall (Figure 14).

In order to estimate the future growth rate of the capital stock, we apply two methods. First, we look at the historical investment pattern of Japan and the Republic of Korea (Figures 14 and 15) and estimate the PRC's share of investment in GDP based on the development pattern of these two countries. Second, we forecast the PRC's future capital-labor ratio in line with the previous development of the comparators and compare the results with the first method as a cross-check.

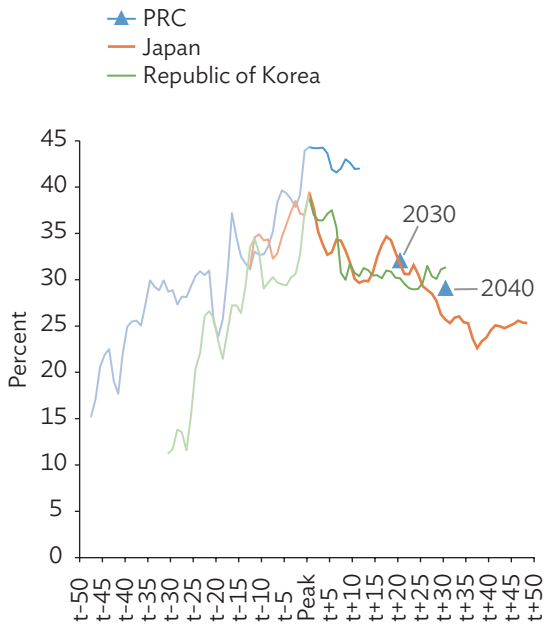
Share of investment in GDP. Though the share of gross fixed capital formation (GFCF) in GDP has been higher in the PRC than in the Republic of Korea and Japan, it started to decline after 2010, broadly following the experience of the two comparators (Figure 14).[18] Twenty years after their respective peak in Japan and the Republic of Korea, the share of GFCF in GDP was about 30% on average and only slightly lower—28% on average—30 years after. According to our projection for the PRC, the share of GFCF in GDP will reach 32% by 2030 (i.e., 20 years after the peak) and 29% by 2040 (or 30 years after), taking into account that it peaked at a higher rate in the PRC (Figure 14).[19] This implies an annual growth rate of the capital stock of 4.2% on average in 2020–2040.

[17] The cross-checks in Appendix 4 show that the deflator choice matters for the capital stock growth rate, while the exclusion of housing hardly affects the estimate of the growth rate.

[18] Dollar and Wei (2007) argue that the PRC's capital allocation has been inefficient and could be improved—we will discuss both issues in part IV.

[19] Backing out the (growth in) capital stock from a projection of the capital-labor ratio, Bailliu et al. (2016) forecast a decline in the investment rate to around 25% of GDP by 2030. According to our estimate, the decline until 2030 will be less pronounced, as GFCF still stood at 42% of GDP in 2020 and 2021.

Figure 14: Gross Fixed Capital Formation, 1960–2021

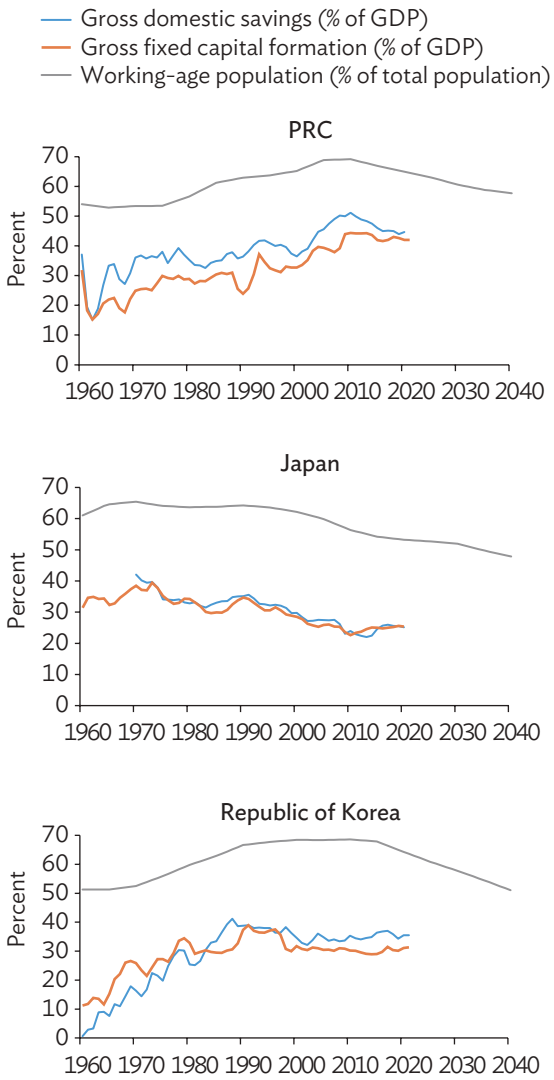


GDP = gross domestic product, PRC = People's Republic of China.

Note: Gross fixed capital formation as a share in GDP peaked in Japan in 1973, in the Republic of Korea in 1991, and in the PRC in 2010. Data for the PRC starts in 1962 (to exclude distortions from the Great Leap Forward).

Sources: NBS and OECD via CEIC Data Company (accessed 31 August 2022); and authors' calculations.

Figure 15: Capital Formation and Labor Supply, 1960–2040



GDP = gross domestic product, PRC = People's Republic of China.

Note: Working-age population refers to age 15–59 for all three countries. Gross domestic savings for Japan is only available from 1970 onward.

Sources: NBS, OECD and World Bank via CEIC Data Company (accessed 31 August 2022); UN (2019), World Population Prospects (low fertility variant); and authors' calculations.

In the two comparator countries, the decline in GFCF as share in GDP happened quickly. Such a drop in GFCF (as share in GDP) has not happened in the PRC. However, such adjustment might happen in the PRC in the future as accumulated debt has risen sharply after 2008, forcing adjustment to the investment-led growth model of the 2010s (Box 1 at the end of this part).

Capital-labor ratio. Another way to estimate the future growth rate of the capital stock goes via the capital-labor ratio. The PRC's current capital-labor ratio is close to that of Japan and higher than that of the Republic of Korea at the comparable GDP per capita level. In order to forecast the future capital stock, we use Japan's and the Republic of Korea's expansion paths of their capital-labor ratios at similar GDP per capita levels, but assume slightly higher ratios for the PRC given the historical precedent. This yields an annual capital stock growth of 4.2% on average in 2020–2040.

Result. The forecast of capital stock derived from the share of GFCF in GDP approach and from the capital-labor ratio both yield virtually the same average growth rate of the capital stock for 2020–2040, only the dynamics over time differ slightly. The contributions to GDP growth are initially higher with the first method (GFCF)—which we use—but they also decline faster.

E. Total Factor Productivity

To explain the past trend of the contribution of total factor productivity (TFP) to growth and to forecast TFP growth over the next 2 decades, we follow Bailliu et al. (2016) and decompose TFP improvement into four factors: (i) foreign direct investment (FDI), (ii) import growth, (iii) research and development (R&D) expenditure, and (iv) sectoral labor shift.

Foreign direct investment

We look at FDI as a driver of TFP growth. Lee, Lee, and Kim (2011) found a positive correlation between growth in FDI stock and TFP of 0.0218, i.e., a 10% increase in the FDI stock improves TFP by about 0.2%. Following Bailliu et al. (2016), we deflate the nominal FDI stock, denominated in US dollar, by the consumer price index (CPI) for the US to obtain an estimate of real FDI stock growth. We assume the same coefficient from Lee, Lee, and Kim (2011) for the forecast and assume that growth in the PRC's FDI stock will slow gradually to the simple average of the current real growth rates in Japan's and the Republic of Korea's FDI stock, which averaged close to 5% in 2015–2020. We assume the PRC's real growth in FDI stock will slow from 8.4% in 2015–2020 to 5.0% by 2030 and then marginally ease further to 4.0% in 2040 (Figure 16).

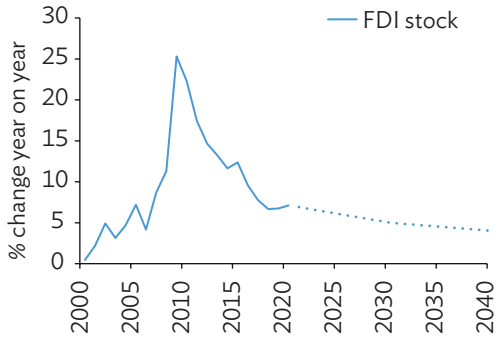
Import growth

We use the import index from the CPE Netherlands Bureau for Economic Policy Analysis to get the growth rate of imports in real terms. In 2001–2019, annual real import growth averaged 3.8% (Figure 17).[20] It is forecast to decline to 2.5% by 2030 and further to 2.0% by 2040. We further assume, in line with Lee, Lee, and Kim (2011), that a 1% increase in real import growth raises TFP by 0.068 percentage points.[21]

[20] The index is based on 2010 prices. Using the GDP deflator to calculate real import growth in 2003–2013, Bailliu et al. (2016) forecast a slightly higher contribution of real import growth to future TFP growth than we do.

[21] We use the regression result for the biggest sample, i.e., all countries covered in Lee, Lee, and Kim (2011).

Figure 16: Real Growth in FDI Stock, 2000–2040

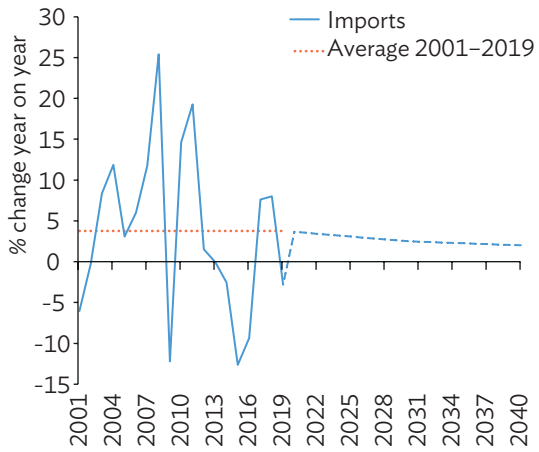


FDI = foreign direct investment.

Note: In 2000$. Forecast starts in 2021. Possible distortions from COVID-19 for 2020 do not affect the assumed trend.

Sources: United Nations Conference on Trade and Development via CEIC Data Company (accessed 26 May 2022); and authors' estimates.

Figure 17: Real Import Growth, 2001–2040



Note: Index is based 2010 = 100. Forecast starts in 2020 to avoid distortions from COVID-19, which would be sizable.

Sources: CPE Netherlands Bureau for Economic Policy Analysis, World Trade Monitor; and authors' estimates.

Research and development

R&D is the major contributor to TFP improvement. In the PRC, annual R&D expenditure increased rapidly from less than 1% of GDP in the early 2000s to 2.2% of GDP in 2019. We assume annual R&D to reach 2.5% of GDP in 2030, and, by 2040, the current 2.6%-of-GDP level of high-income countries (Figure 18).

We assume that a 1% increase in R&D spending raises TFP by 0.4 percentage points for 2000–2019 and 0.23 points in 2020–2040. The elasticity chosen has a substantial effect on the TFP's contribution to growth because R&D is its biggest component. However, estimates of the elasticity of R&D expenditure on GDP growth vary widely.[22]

For 2000–2019, we use a coefficient of 0.4, which lies in between Griffith et al. (2004) and other estimates that are much lower.[23] For 2020–2040, we assume a coefficient of 0.23, which—except for one outlier—is the highest elasticity reported in the compilation by McMorrow and Roeger (2009).[24] As access to technology, industry-specific knowledge, and some markets has become more restrictive in recent years, the return to R&D should decline given complementarities of inputs for technological

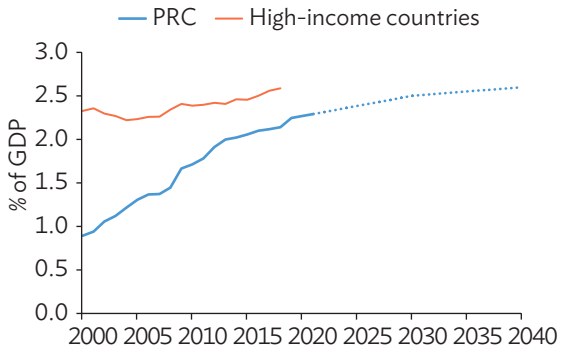
[22] Griffith et al. (2004) found a coefficient 0.669 on lagged level of R&D intensity, which Bailliu et al. (2016) uses. Haider, Kunst, and Wirl (2020) refute the finding in Griffith et al. (2004) that the elasticity is higher for countries that are further away from the international frontier. Also, the mentioned elasticity of nearly 0.67 seems to be very high and pertains only to the manufacturing sector (McMorrow and Roeger 2009; CBO 2005). Other estimates are much lower, frequently roughly ranging 0.1–0.2 for studies using economy-wide data (McMorrow and Roeger 2009).

[23] The choice of elasticity does not affect past TFP growth, which is estimated as a smoothed residual. Using a lower coefficient would only increase the unexplained part of the TFP estimate for 2001–2019.

[24] CBO (2005) states that the evidence is mixed on the question of whether the return to R&D has changed over time.

products.[25] In addition, top-down research decisions impose costs on research quality (Acemoglu, Yang, and Zhou 2022).

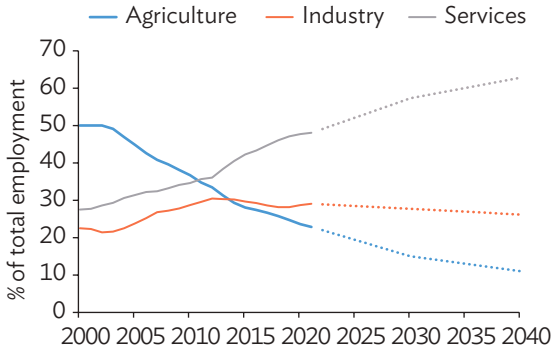
Figure 18: R&D Expenditure, 2000–2040



GDP = gross domestic product, PRC = People's Republic of China, R&D = research and development.

Sources: National Bureau of Statistics via CEIC Data Company; World Bank, World Development Indicators (both accessed 28 May 2022); and authors' estimates.

Figure 19: Employment by Sector, 2000–2040



Sources: Ministry of Human Resources and Social Security via CEIC Data Company (accessed 28 May 2022; and authors' estimates.

Sectoral labor shift

The share of employment in primary industry has been falling from 50.0% in 2000 to 22.9% in 2021. Meanwhile, the share of employment in tertiary industry rose from 27.5% to 48.0% during the same period (Figure 19).

We estimate the historical contribution of sectoral labor shifts by conducting a counterfactual scenario in two steps following Bailliu et al. (2016). First, we derive the productivity for primary, secondary, and tertiary industries from GDP and employment of each sector. Second, we conduct a counterfactual scenario by keeping the employment shares for all three sectors unchanged at 2000 levels while applying the productivity derived in the first step. We then calculate GDP growth in the actual and the counterfactual scenario. The difference (actual growth minus counterfactual) is the estimated contribution of sectoral labor shift to TFP growth.

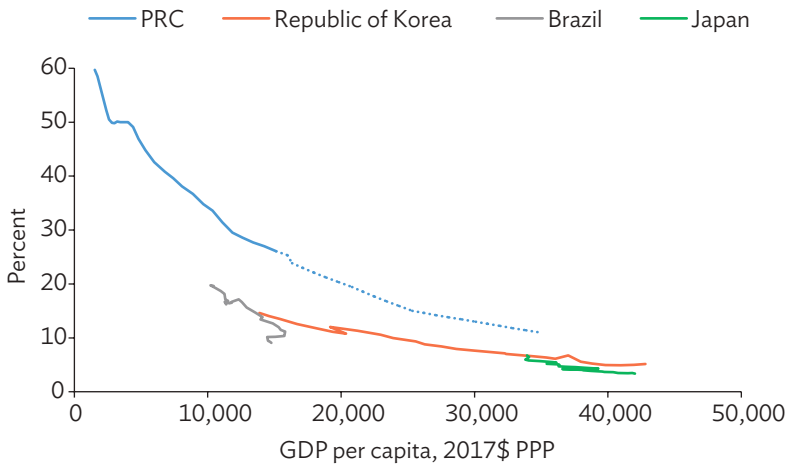
To estimate the future contribution of the sectoral labor shift to growth, we need to forecast the development of each sector's employment share. To do so, we draw on the experience of selected countries, including Japan, the Republic of Korea, and Brazil to forecast the share of agriculture in employment (Figure 20).[26] With rising GDP per capita, the agricultural share of employment tends to fall. Data from selected countries suggest that when GDP per capita reaches $30,000 (in 2017$ PPP), the agricultural share of employment is around 7%. However, as the PRC still has a larger share of workforce in the primary sector than these countries, the decline in the share of employment in agricultural will likely be more gradually, falling to 15% in 2030 and further to 11% in 2040 according to our estimates.

[25] PRC companies prefer to focus on developing new technologies and products with clear commercial application (Zheng, Zhuang, and Wang 2020).

[26] Brazil is chosen to compare adjustment in the primary sector at a per capita GDP in the range of $10,000–$15,000 (PPP).

Further, we assume—unlike Balliu et al. (2016) but in line with newer research by Rozelle et al. (2020)—that the employment share of the secondary sector, having peaked in 2012, will continue to decline at the average rate in 2012–2021. Finally, the share of tertiary employment, calculated as the residual, is expected to rise from 48% in 2021 to 57% in 2030 and 63% by 2040.

Figure 20: Share of Agriculture in Total Employment



GDP = gross domestic product, PPP = purchasing power parity, PRC = People's Republic of China.
Note: Blue dashed line shows the forecast for the PRC up to 2040.
Sources: World Bank, World Development Indicators; and authors' estimates.

To estimate the future contribution of the sectoral labor shift to growth, we create an alternative scenario, under which the productivity of the three sectors is frozen at the 2019 level—the year 2019 is chosen to avoid distortions by the COVID-19 shock on the economy—while the employment shares of each sector change. We assume that the total employment will decline at the same rate as the working-age population. We then calculate a baseline scenario of the level of GDP, where both the sectoral employment shares and the sectoral productivity are fixed at 2019 levels (while the decline in total working-age population is taken into account). Finally, we get the contribution of the sectoral labor shift to TFP growth as the difference in GDP growth between the alternative and the baseline scenario.

For 2001–2019, we obtain TFP growth as the residual from equation (3) above. From the actual GDP growth, we deduct the contribution of capital, labor, and human capital to growth, assuming a capital and labor share of output of 0.5 (Bailliu et al. 2016; ILO 2019).[27] Then, we apply an Hodrick-Prescott (HP) filter to the residual and get the trend TFP (Figure 21).[28]

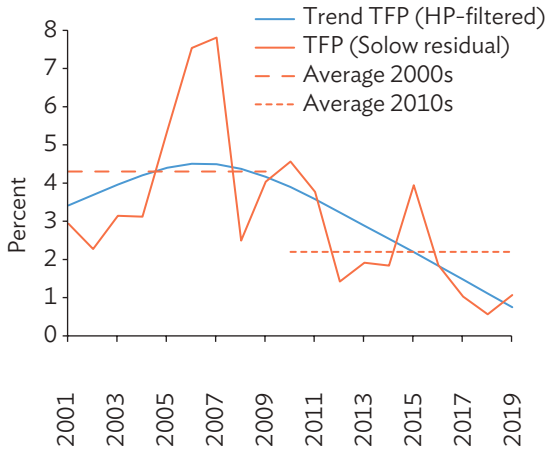
As illustrated in Figure 21, TFP growth slowed in 2001–2019. Based on our estimates, the slowdown stems mainly from contribution of the sectoral labor shift fading away. This is consistent with findings by

[27] Lardy (2019) discusses the labor share based on NBS data. The range quoted was 54% in 2002, falling to 47% in 2011. The share recovered to 52% by 2015. However, wage growth in the second half of the 2010s was lower than that of nominal GDP (Peschel 2021). The assumed 0.5 takes this into account.

[28] Bailliu et al. (2016) show similar results for (the residual measuring) TFP growth up to 2015 when their data end. Using data from World Penn Table (that assumes lower GDP growth rates for the PRC), IMF (2022a) finds a similar pattern of change in TFP growth—i.e., a notable decline in the 2020s—but at lower rates. Furthermore, estimates by Brandt et al. (2022) confirm that, comparing the 2000s to the 2010s, annual TFP growth per worker has declined by 2 percentage points on average.

Rozelle et al. (2020) showing that employment in the secondary sector—having a higher productivity than the service sector—declined after 2012, while low-skill services absorbed part of the laid-off industrial workers. While we assume the sectoral labor shift to continue, it should slow down after 2030 when the employment share of agriculture declines at a slower rate, resulting in a downward shift in TFP growth (chart 22).

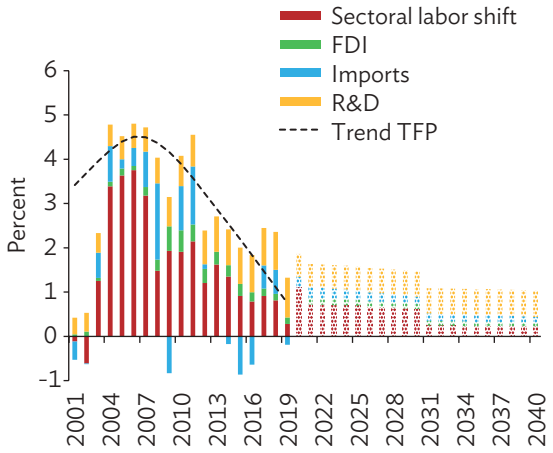
Figure 21: Total Factor Productivity Growth, 2001–2019



HP = Hodrick-Prescott, TFP = total factor productivity.

Source: Authors' calculations.

Figure 22: Decomposition of TFP Growth, 2001–2040



FDI = foreign direct investment, R&D = research and development, TFP = total factor productivity.

Note: Forecast starts in 2020.

Source: Authors' estimates.

TFP growth averaged 3.2% in 2001–2019, with the sum of the four components adding up to 2.7% on average (Figure 22). The sectoral labor shift contributed on average 1.6 percentage points and R&D 0.7 points. Real imports and FDI together only contributed half a percentage point, with imports slightly more than FDI (0.3 versus 0.2 points), while half of a percentage point remains unexplained on average.[29]

For 2020–2040, potential annual TFP growth is estimated to average 1.3%, mainly driven by R&D (0.6%), followed by the sectoral labor shift, real imports, and FDI. The contribution of R&D to TFP stems from steady growth in R&D expenditure, resulting in R&D accounting on average for nearly half of TFP growth in 2020–2040, with a higher share in the 2030s when the contribution from the sectoral labor shift wanes.[30]

Our TFP forecast is lower than that of Bailliu et al. (2016), mainly due to different assumptions adopted with respect to the elasticity of R&D on TFP growth and regarding the sectoral labor shift. Our forecast is roughly in line with that by Roberts and Russell (2019) extrapolating long-term trends. Higgins (2020) projects in the "pretty good" scenario TFP growth to ease from 1.4% in 2018–2028 to 1.0% in 2028–2038—our estimates are only slightly higher for comparable periods.

[29] The unexplained part mostly disappears when looking from 2003 onward—Figure 22 shows a big gap between sum of the components and the overall for 2001–2002.

[30] CBO (2005) notes that research by Griliches (1991) argued that R&D spending, assuming high social returns from R&D, could account for almost three-quarters of TFP growth during the postwar period.

F. Results

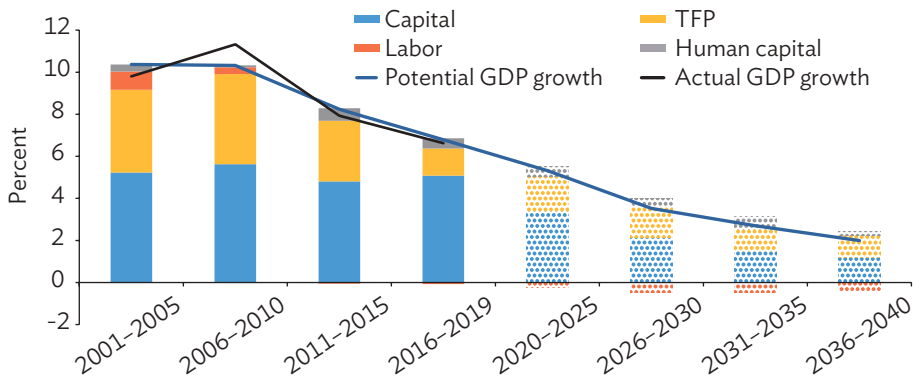
We use equation (4) to model GDP growth in 2001–2019 and then forecast potential growth for 2020–2040:[31]

$$\widehat{Y_t^*} = \alpha\widehat{K_t^*} + (1-\alpha)\widehat{L_t^*} + (1-\alpha)\widehat{h_t^*} + \widehat{TFP_t^*} \quad (4),$$

where $\widehat{Y_t^*}$ is the model-fitted GDP growth, and α and (1-α) are capital and labor share of GDP, with α assumed to be 0.5; $\widehat{K_t^*}$ is the trend growth in capital stock; $\widehat{L_t^*}$ is the trend labor growth (i.e., the growth rate of the working-age population); and $\widehat{h_t^*}$ is the trend human capital growth, which is derived from the growth rate of human capital index, while $\widehat{TFP_t^*}$ is the trend TFP growth derived from an HP-filtered TFP growth estimate.[32]

The decomposition of contributions to GDP growth for 2001–2019 is illustrated in Figure 23. As in other studies (Bailliu et al. 2016, Roberts and Russell 2019, and Higgins 2020), capital and TFP are key drivers of growth in 2001–2019. The contribution of human capital was relatively small. For the 2010s, a declining population aged 15–59 (Figure 8) ceases the demographic dividend of the 2000s (and earlier). The adverse effects of a declining labor-age population will show more strongly after 2025.

Figure 23: Decomposition of Contributions to Potential GDP Growth, 2001–2040



GDP = gross domestic product, TFP = total factor productivity.

Note: Forecast starts in 2020. The future contribution of capital to growth is derived from the projected share of gross fixed capital formation in GDP.

Source: Authors' estimates.

Actual GDP growth averaged 9.0% in 2001–2019, the same average as potential growth according to our model. For the period 2006–2010 our estimate of potential growth—which abstracts from business cycles—is below actual GDP growth. This is consistent with actual growth exceeding its medium-term potential before the global financial crisis (World Bank 2019; Lardy 2019).

[31] Due to the significant impact of the COVID-19 on the economy in 2020–2022, we use actual data until 2019 to avoid distortions from the pandemic.

[32] In growth accounting, the contribution of TFP growth to GDP growth is calculated as a residual i.e., the difference between actual GDP growth and the part of GDP growth explained by changes in capital and labor (including human capital). However, when estimating future potential GDP growth, TFP growth cannot be calculated as a residual. Hence, we estimate the past TFP trend growth by smoothing the residual by an HP filter and find a set of proxy variables that match the TFP trend growth. We can then forecast TFP growth based on the projections of these variables.

As for the forecast, the main findings are as follows:

(i) Potential GDP growth is estimated at 5.3% on average in 2020–2025 and then to decline gradually to 2.0% on average in 2036–2040.

(ii) Consistent with results from Bailliu et al. (2016), Roberts and Russell (2019), and Higgins (2020), capital and TFP are major contributors to potential growth in the long run. The contribution of capital is forecast to gradually decline from 3.4 percentage points on average in 2020–2025 to 1.2 percentage points on average in 2036–2040.

(iii) The contribution of TFP to growth is estimated to be smaller in the next 2 decades because of a much smaller contribution from the sectoral labor shift and lower returns to R&D. Despite that, R&D expenditure will be the main driver of TFP growth in 2020–2040.[33]

(iv) A shrinking working-age population will increasingly weigh on growth, while human capital will contribute on average about 0.4 percentage points to growth in 2020–2040.

In a nutshell, the decline in potential growth stems from a lower contribution of capital to growth, a shrinking working-age population dragging on growth, and lower TFP growth.

Table 2 shows that our estimate comes in lower than Bailliu et al. (2016), see Appendix 3 for details. For the period up to 2030, our estimate is broadly in line with Roberts and Russell (2019), while being higher than Higgins (2020). At the same time, our forecast for 2031–2040 averages 2.3%, which is only slightly higher than that of Higgins (2020) for 2029–2038.

Table 2: Comparison of Selected Long-Term Growth Estimates for the PRC

Study	Period	GDP growth
Bailliu et al. (2016)	2021–2025	5.9%
	2026–2030	4.9%
Roberts and Russell (2019)	2020–2030	4%–5%
Higgins (2020)(pretty good scenario)	2018–2028	3.8%
	2029–2038	2.1%
Authors' forecast	2020–2025	5.3%
	2026–2030	3.5%
	2031–2035	2.7%
	2036–2040	2.0%

GDP = gross domestic product, PRC = People's Republic of China.

Note: Only studies that apply a similar methodology.

Sources: Bailliu et al. (2016); Roberts and Russell (2019); Higgins (2020); and authors' estimates.

G. Potential Impact of Recent Developments

Despite the declining trend in potential growth, actual GDP growth will almost certainly be below the forecast potential for the period 2020–2025. COVID-19 has weighed on economic growth in recent years and will likely continue to do so in 2023 (ADB 2022a). An ailing property market has also dragged down growth, especially in 2022. In addition, the trade conflict and technological competition with the US is another point adversely impacting GDP growth. These three factors—and how they are taken into account—could also influence the potential growth estimate.

[33] As mentioned, there is a high uncertainty about the elasticity of R&D spending on TFP growth.

COVID-19. The economic effects of COVID-19 are assumed to be temporary. We assume that the country's zero-COVID policy will be loosened at one point in time, and thus expect the adverse effects of COVID-19-related restrictions be confined to the 2020–2025 period of our estimate. However, there are possible channels for COVID-19 to affect long-term growth. First, there could be scarring effects from human capital loss via the impact of COVID-19-related lockdowns on schooling. Second, the pandemic could delay investment given increased uncertainty. Finally, COVID-19 might have adversely impacted labor force participation rates, possibly even in the longer run.

The adverse effects of COVID-19 on schooling have been less pronounced in the PRC than in other countries in the region (ADB 2022b).[34] Also, in the case of the PRC, it seems unlikely that COVID-19 much delayed investment decisions as FDI recovered quickly from an initial shock in 2020 and domestic manufacturing investment, driven by an export boom, grew solidly in the past couple of years. The housing market slump is not primarily caused by COVID-19 but by borrowing curbs on developers (Box 1). As for labor market participation rates, the effects should be limited as state-owned enterprises tend not to shed staff during economic downturns, while labor migrants—though hit hard by COVID-19-related restrictions— will likely remain in the labor market, waiting for economic conditions to brighten. However, COVID-19 adversely affected household consumption, which in turn hit services and, together with the export boom and strong growth in industry in recent years, partly reversed the economy's transition to services.[35]

Property market. The recent property market downturn continues to weigh on economic growth. Rogoff and Yang (2022) estimate that the direct value added of the real estate sector (domestic content only) accounted for 11.8% of the economy in 2021, but when taking its connections to other sectors into account, the figure more than doubles to 25.4% (including imported content accounting for about 3 percentage points). Thus, property market investment affects economic growth beyond construction. The current housing market downturn in the PRC mainly stems from government deleveraging efforts by imposing borrowing curbs on developers.

In our model, the decline in potential growth in the latter half of the 2020s is mostly driven by a lower contribution from capital to GDP growth. While the future workforce can be determined with a high degree of certainty (absent pension reforms), the contribution of capital to growth could fall faster in case the deleveraging the property market leads to a faster-than-expected decline in overall investment (as a share in GDP). For a discussion on the role of investment and debt, see Box 1.

Technological competition and potential decoupling. Our assumptions take into account that barriers to acquire technology have increased and that there will likely be less knowledge exchange between the PRC and the rest of the world, lowering returns to R&D expenditure (and TFP growth) in the future. While the discount applied is already substantial, a technological decoupling could have adverse effects on potential growth stronger than assumed.[36]

Comparison. Our model predicts potential growth of 5.3% on average in 2020–2025 (from 6.8% in 2016–2019), declining to 3.5% in 2026–2030.[37] On average, our estimate of potential growth is 4.4% for 2020–2030. This is broadly in line with recent estimates that could take COVID-19 and a more restricted access to technology into account. Wang and Zhang (2022) see potential GDP growth at 4.0%–4.5% in this decade. Zhu, Ng, and Ge (2021) estimate potential growth at 5.3% in 2021–2025 and 4.4% in 2026–2030 (with a higher contribution of TFP than our estimate).

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[34] In the model, returns to education are assumed to be fix over time (but differ by level of schooling); adjusting them over time (possibly accounting for effects from COVID-19) is beyond the scope of this paper. At the same time, the contribution of human capital to growth is small so that the results of the model would not change substantially.

[35] See discussion in Box 3 later in part IV.

[36] Technological decoupling—i.e., the undoing of cross-border trade in high-tech goods and services—could have a substantial adverse impact on the PRC's GDP growth depending on the coalitions of countries (Cerdeiro et al. 2021).

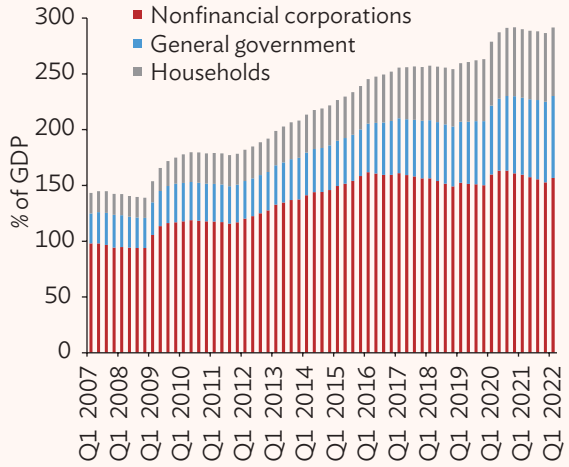
[37] In our model, we assume a gradual decline in the share of GFCF in GDP by 2030. As we know (and take into account) the actual GFCF in 2020–2021 (at 42% of GDP), the effects of a falling GFCF share will show more strongly after 2025, explaining the drop in potential growth in 2026–2030.

Box 1: GDP Growth, Investment, and Debt

According to our estimate, potential growth averages 4.4% in 2020–2030 and 2.3% in 2030–2040. An important question is if potential growth can be achieved. In theory, actual growth should be able to reach potential growth. While not being an input factor in the estimate of potential growth, debt—especially at an excessive level—can potentially hurt growth (Reinhart and Rogoff 2010; Cecchetti, Mohanty, and Zampolli 2011).[a]

In the People's Republic of China (PRC), debt more than doubled from 139% of gross domestic product (GDP) at the end of 2008 to 287% by the end of 2021 (Figure B1). It seems unlikely that the PRC can continue to accumulate debt at the speed witnessed in 2009–2019 (without COVID-19), when debt rose by 124 percentage points of GDP, or on average over 11 points per year. Extrapolating this trend would result in a debt-to-GDP ratio of about 500% by 2040. Even Japan, the highest-indebted country covered by the Bank for International Settlements (BIS) statistics, only had debt equivalent to 420% of GDP by the end of 2021.

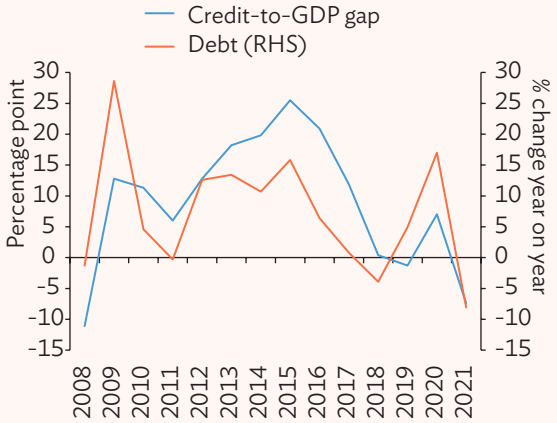
Figure B1: Debt Structure, 2007–2022



GDP = gross domestic product.

Source: Bank for International Settlements. https://www.bis.org/statistics/totcredit/totcredit.xlsx (accessed 2 December 2022).

Figure B2: Credit Gap and Change in Debt, 2008–2021



GDP = gross domestic product.

Note: Credit-to-GDP gap is the difference between the credit-to-GDP ratio (for the private nonfinancial sector) and its long-run trend; debt of private nonfinancial sector.

Source: Bank for International Settlements (accessed 6 October 2022).

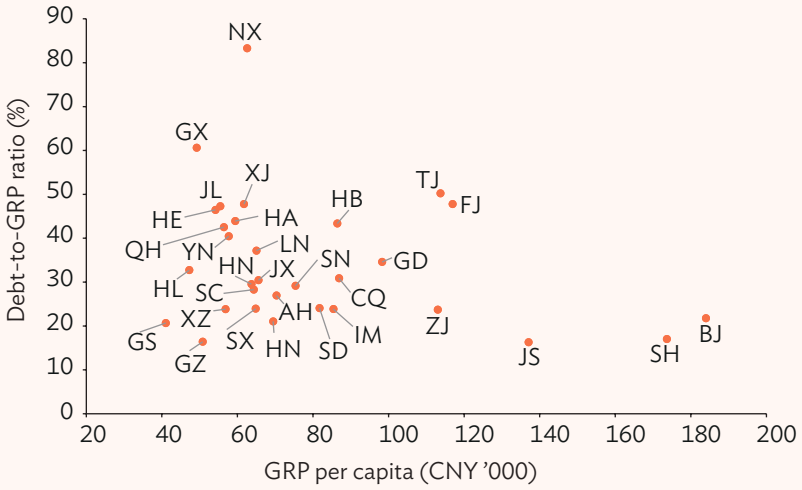
Economic growth in the 2010s could have been driven by unsustainable overinvestment. The BIS provides estimates of the credit gap—i.e., the difference between the ratio of total credit relative to GDP and its long-run trend—for several countries, including the PRC (Figure B2). In our context, credit gap analysis can be useful as overinvestment must be financed. A positive credit gap can be a sign of overinvestment. The credit gap shot up after 2008 and came down rapidly in 2017–2018. So, we might have seen about a decade of overinvestment. In 2018 infrastructure investment slowed sharply (Figure 3 in the main text) and new asset management rules—aiming to curb shadow bank financing—were announced (Economist 2018), which could help explain the quick narrowing of the gap. As for debt, deleveraging efforts targeting state-owned enterprise debt showed some effects in the second half of the 2010s before the COVID-19 shock on the economy drove up debt again (Figures B1 and B2).

Continued on next page

Box 1 *continued*

For several reasons it seems unlikely that the PRC can continue their investment pattern for another 2 decades. First, housing demand is about to peak in 2022 (Yao 2022). In this respect, one can interpret the government curbs on developers' borrowing as an attempt to prevent them from overbuilding as well as to rein in growth generated by inefficient investment.[b] Second, the country's physical infrastructure (airports, high-speed railway, highways, etc.) is already well developed. Continuing to invest in it at high rates will not only yield declining returns to investment in terms of GDP growth, but would also overstretch local governments' capacity for additional debt. As local governments receive a substantial share of their revenue from land sales, the current property market downturn puts pressure on local government finances. In addition, many infrastructure projects with high returns have been undertaken already so that remaining projects are less attractive. Finally, many provinces—especially poorer ones—have already accumulated a sizable stock of public debt, which makes it more difficult for them to shoulder additional debt (Figure B3). [c]

Figure B3: Public Debt and Gross Regional Product Per Capita by Province, 2021



AH = Anhui, BJ = Beijing, CQ = Chongqing, FJ = Fujian,GD = Guangdong, GRP = gross regional product, GS =Gansu, GX = Guangxi Zhuang Autonomous Region, GZ= Guizhou, HA = Henan, HB = Hubei, HE = Hebei, HI= Hainan, HL = Heilongjiang, HN = Hunan, IM = Inner Mongolia Autonomous Region, JL = Jilin, JS = Jiangsu, JX= Jiangxi, LN = Liaoning, NX = Ningxia Hui Autonomous Region, QH = Qinghai, SC = Sichuan, SD = Shandong, SH = Shanghai, SN = Shaanxi, SX = Shanxi, TJ = Tianjin, XJ = Xinjiang Uygur Autonomous Region, XZ = Tibet Autonomous Region, YN = Yunnan, ZJ = Zhejiang.

GRP = Gross Regional Product.

Note: Official public debt (general and special local government debt outstanding) only.

Sources: Ministry of Finance and National Bureau of Statistics via CEIC Data Company (accessed 10 October 2022); and ADB calculations.

In sum, the growth model of the 2010s cannot be extended for another 2 decades. Reforms are needed, including improving investment efficiency and reducing the capital intensity of growth.

Notes:

[a] See Pettis (2022) on ways how debt can hurt GDP growth in the case of the PRC.

[b] Pettis (2022) sees this as an example of agents in an economic sector adjusting behavior to avoid potential losses. Before the government clampdown there was the assumption prevailing that the debt of developers would be resolved through implicit government guarantees; now property developers, homebuyers, suppliers, contractors, banks, local governments, etc., change behavior to protect themselves from defaults (such as withholding payments), which would lead to losses on their side. These behavioral changes cause economic growth to slow.

[c] Specifically, more local governments are approaching the 10% threshold. In 2016, the PRC created rules requiring fiscal consolidation in case local government interest payments breach thresholds: (i) interest payments on general government bonds exceed 10% of finance spending in the general public budget, or (ii) interest payments on (local government) special bonds exceed 10% of spending in the government fund budget (He 2022; State Council 2016).

IV. REFORMS TO BOOST LONG-TERM GROWTH

A. Reform Areas

This part outlines possible reforms to enhance the country's long-term growth potential.

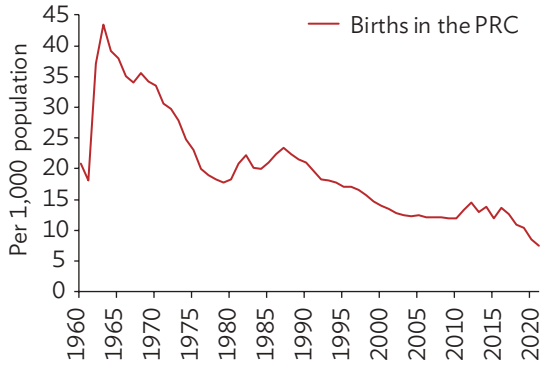
The advantage of using a Cobb-Douglas production function is that it allows for a breakdown of the drivers of economic growth. Our model provide a baseline for long-term growth—absent major reforms and shocks[38]—which can help guide policy making. Potential growth, though hard to change, can be increased, in particular by structural reforms. Mirroring the model's input factors, we focus on reforms pertaining to labor, human capital, capital stock, and TFP.

B. Labor

The model assumes that the work force grows at the same rate as the working-age population. If the retirement age is raised, the working-age population would increase as more people were captured by the working-age bracket. In practice, such reforms are more complex because currently the retirement age for men is 60 years, and for women in blue-collar and white-collar jobs 50 and 55 years, respectively, while the average retirement age is only in the mid-50s (Economist 2021).

Another issue is demographics. Given the current low birth rates, an increase in fertility could slow the speed of decline of the workforce in the future, but not reverse trend in the foreseeable future. As we only look at until 2040—not a long horizon in terms of demographics—and birth rates are known up to 2021, a gradual increase in the birth rate will hardly affect our projections. Also, the introduction of the universal Two-Child Policy in 2015 had shown no lasting effect (Figure 24), and the experience from other countries shows that the fertility rate remains low once it has declined (Figure 25).

Figure 24: Birth Rate, 1960–2021

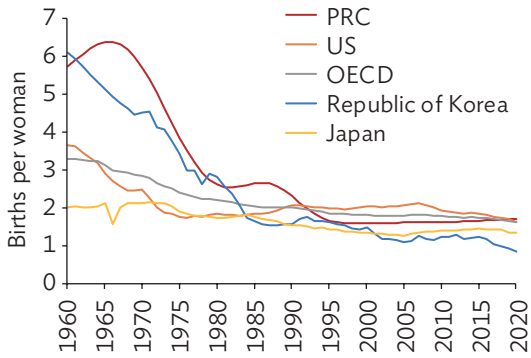


PRC = People's Republic of China.

Note: Live human births per 1,000 population.

Source: NBS via CEIC Data Company (accessed 2 December 2022).

Figure 25: Fertility Rate for Selected Countries, 1960–2020



OECD = Organisation for Economic Co-operation and Development, PRC = People's Republic of China, US = United States.

Source: World Bank, World Development Indicators (accessed 11 July 2022).

[38] In the baseline model, we assume no major structural reforms and do not take into account business cycles.

Against this background, the government should take measures that could mitigate the impact of demographic aging on the labor force:

(i) **Extend work life.** While the legal retirement age should be increased, it is important that people actually work longer. Reforms must start with people actually continuing to work beyond their mid-50s—otherwise an extension of the statutory retirement age by some years comes to nothing.[39]

(ii) **Improve health conditions of the workforce.** Improved health care and promoting healthy aging is needed to cope with an aging workforce. While the focus should be on a safe and secure working environment, occupational health services, and occupational disease prevention, efforts are needed to scale up screening, early diagnosis and controlling chronic conditions, as well as detecting cognitive impairment and depression at the primary care level (Bai and Lei 2020).

(iii) **Raise female workforce participation.**[40] Possible measures include strengthening equal employment opportunities, increasing maternity leave, and improving support for childcare, elderly care, and single mothers (ADB 2021b).

(iv) **Increase labor mobility.** This includes further relaxing the household registration system (*hukou*), improving access to social services for labor migrants (including the access to education for their children), and ensuring the portability of social security benefits so that people do not have substantial disadvantages when moving.[41]

(v) **Increase family support.** A massive shift of policy priorities and resources must take place to support families in order to raise the birth rate.

C. Human Capital

Reforms focusing on increasing human capital can be rolled out faster than those aiming at the labor force. Despite significant improvements over time, the PRC's educational attainment lags behind those in advanced economies, suggesting room for catching up. While the forecast takes into account an increase in the years of education—which serve as a proxy for the increase in human capital—quality of education is also important. An increase in human capital based on better—not necessarily more—education would contribute to higher potential growth.[42]

As mentioned, increasing average years of schooling is important for raising human capital. The PRC saw significant improvement in education attainment levels over the past decades: the average years of schooling has increased substantially from 5.7 years in 1980 to 8.7 years in 2015 (Figure 26). However, there is still a gap to advanced economies like Japan, the Republic of Korea, and the US. As a result, in 2015 only 37.4% of the PRC's labor force had completed upper secondary education, compared with 65.5% across G20 countries and 100% in Japan (Figure 27). Similarly, only 18.2% of the PRC's labor force

[39] Such reforms tend to raise the statutory retirement age only by some years and are usually implemented gradually.

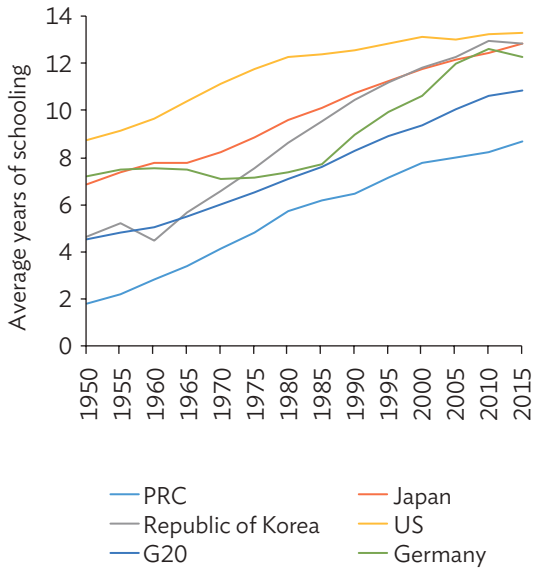
[40] According to household survey data by the Southwestern University of Finance and Economics, the labor force participation rate of women aged 16–64 declined from 61.6% in 2011 to 58.2% in 2017, while that of men showed a much smaller decline from 76.6% to 76.0% during the same period (Dong and Joffre 2019).

[41] Immigration of skilled people into areas with labor shortage would mitigate such shortages. Though unpopular, extending working hours would also mitigate the effect of a shrinking workforce. We do not further elaborate on these options as immigration into the PRC has—leaving other challenges aside—high language barriers. As for extending working hours, diminished productivity in some areas might stem from insufficient work or inadequate qualification of employees, which cannot be addressed by simply extending work hours.

[42] Quality of education is hard to measure. Though it is not directly an input factor in the model—while years of schooling are—improving education increases potential growth because it raises work force skills and thereby productivity.

had completed tertiary education in 2015, which is lower than across G20 countries at 29.8% and much lower than in Japan, the Republic of Korea, and the US. However, tertiary education attainment has been rising in the PRC, reflected in a growing number of new college graduates. A record number of 10.76 million was expected by the government in 2022 (Cheng 2022).

Figure 26: Comparison of Average Years of Schooling, 1950–2015

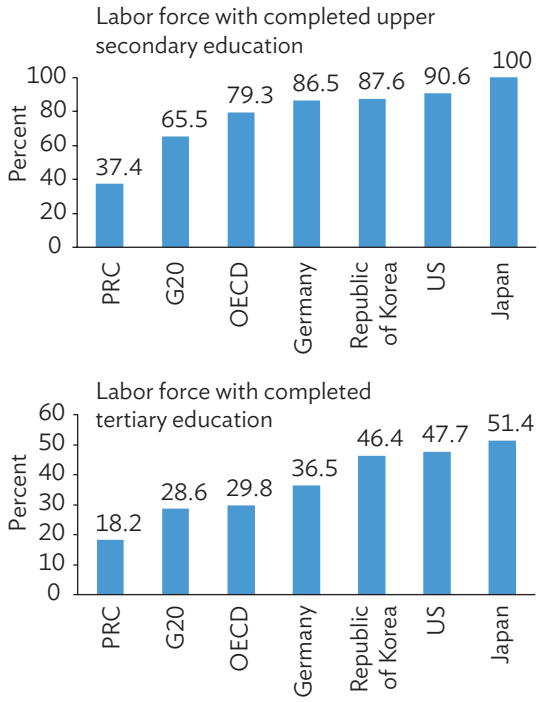


PRC = People's Republic of China, US = United States

Note: For age group 15–64.

Source: Barro and Lee (2021).

Figure 27: Comparison of Education Attainment, 2015



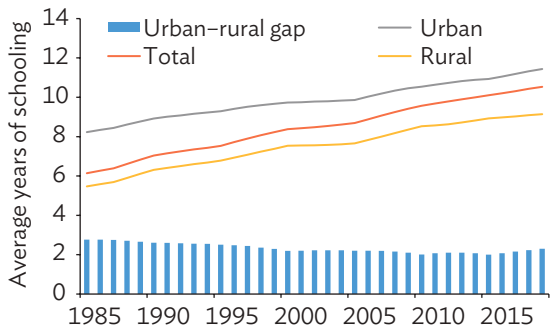
OECD = Organisation for Economic Co-operation and Development, PRC = People's Republic of China, US = United States.

Source: Li et al. (2017)

There is a disparity in years of schooling between rural and urban areas in the PRC. The average years of schooling for the urban working-age population was 11.4 years, versus 9.1 years in rural areas in 2019 (Li 2021).[43] The urban–rural gap in years of schooling has been narrowing since 1985, but has widened again after 2015 (Figure 28). Also, there is a gap in the working-age population's senior secondary and tertiary school completion rates (Figure 29).

[43] The China Human Capital Report defines working-age population in the PRC as ages 16–54 for female and 16–59 for male.

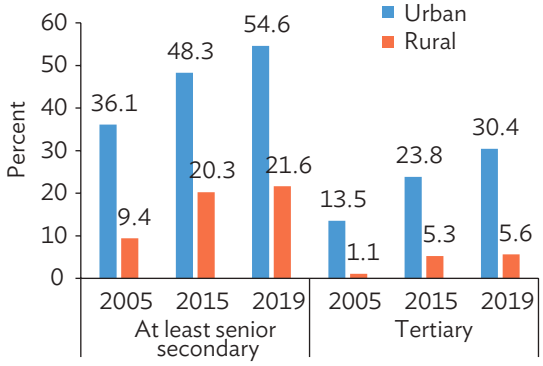
Figure 28: Years of Schooling, 1985–2019



Note: Working-age population defined as 16–54 for female and 16–59 for male.

Source: Li (2021).

Figure 29: Urban and Rural School Completion Rates, 2005, 2015, and 2019



Note: Working-age population defined as 16–54 for female and 16–59 for male.

Source: Li (2021).

Against this background, the following policy recommendations are made:

(i) **Increase years of schooling.** Greater efforts are needed to increase years of schooling, especially in rural areas, to bolster higher educational attainment. Experiences from high-income countries show that those without post-secondary qualifications are most likely to face job loss and encounter long-term unemployment (ADB 2020b).

(ii) **Improve rural education and support children of migrant worker.** More funding from the central government should be allocated to rural education and children of migrant workers should get more support from the government to get easier access to education in cities (Li et al. 2017).

(iii) **Improve the quality of education and qualification of the workforce.** This includes expanding early child development, improving the quality of tertiary education, strengthening technical and vocational education and training (TVET), and increasing on-the-job and lifelong training opportunities (see Appendix 5 for a discussion of these recommendations).

D. Capital

Overview

Changes to the allocation of capital and credit might be one of the biggest factors raising potential growth in the PRC, but they are challenging to implement because they require adjustments to economic structures as well as policy changes. The banking system is predominately state-owned, with large commercial banks providing about half of all loans. Bank loans, in turn, account for the vast majority of company financing. Moreover, the state-owned banking sector dominates credit allocation and prefers to lend to state-owned enterprises (SOEs) as these frequently benefit from government support.[44]

[44] Credit flows to SOEs were 83% of total credit to nonfinancial enterprises in 2016 [latest available data] (Lardy 2019).

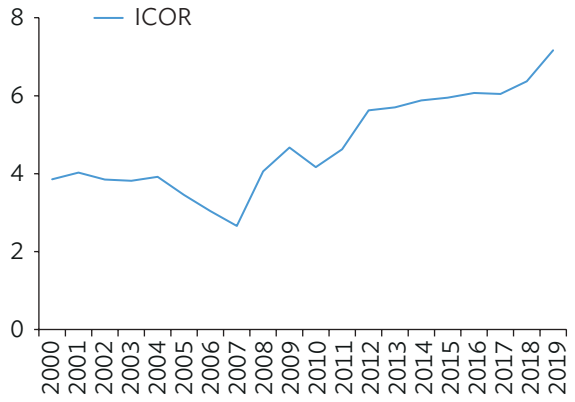
In the following, we look at capital allocation and its efficiency as well as at credit allocation. Box 3 at the end of this section will cover structural change.

Returns to investment

The impact of investment on growth has declined in the PRC after the global financial crisis. The incremental capital output ratio (ICOR), which measures how much capital is needed to generate one extra unit of output, has increased. In 2000–2009, the ratio averaged 3.7, followed by 5.8 on average in 2010–2019 (Figure 30).[45] In 2019, it exceeded 7.[46] Thus, more capital is needed to generate growth.

An obvious question is why returns to capital have decreased and the ICOR has increased. Marginal productivity of capital generally declines with a higher capital stock per worker. Real return on capital has trended down in the PRC the last quarter century (IMF 2022a). The decline, in particular over the last decade, could be driven by the composition of investment[47] and/or the ownership of investment. The state holding share in total investment picked up after 2015, while that of privately held companies slightly eased, raising concerns over allocation efficiency (Figure 31).

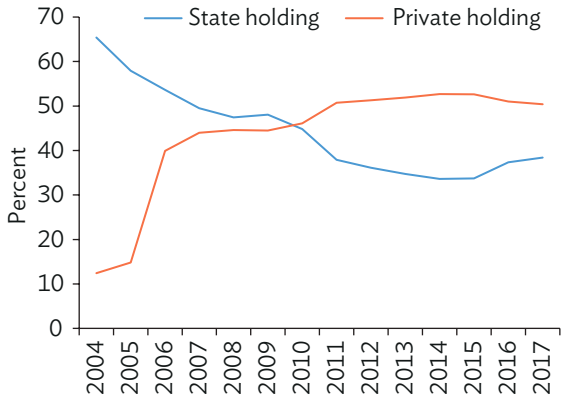
Figure 30: Incremental Capital Output Ratio, 2000–2019



ICOR = incremental capital output ratio.

Sources: NBS via CEIC Data Company (accessed 20 September 2022); and ADB calculations.

Figure 31: Fixed Asset Investment by Ownership Type, 2004–2017



Note: Shares do not add up to 100% as there are other categories in the statistic.

Sources: NBS via CEIC Data Company (accessed 26 September 2022); and ADB calculations.

[45] Calculated as investment ratio (GFCF as % of GDP) divided by GDP growth (Kwan 2004).

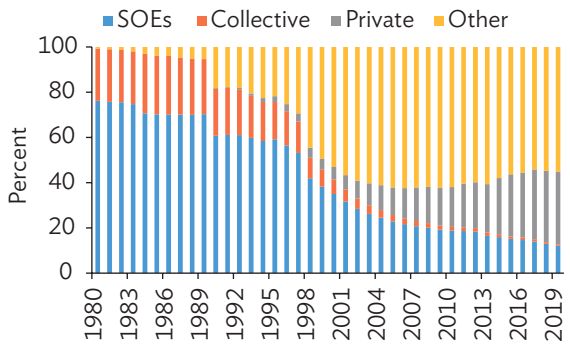
[46] As GDP growth slowed sharply in 2020, while investment was the main contributor to growth as consumption took a hit from COVID-19, the ratio spiked that year, but reversed in 2021 (not shown in chart).

[47] The available statistics on investment are sketchy. Estimates from Herd (2020) until 2016 show that the share of capital formation in the business sector declined over time and the shares of infrastructure and housing increased, while the capital-output ratio in the infrastructure sector increased the most, followed by the housing and the business sector, which explains the rise in the ICOR (Brandt et al. 2020).

State-owned enterprises and supply-side structural reforms

The share of employees working at SOEs has declined over time (Figure 32). At the same time, SOE assets (as % of GDP) are several times higher in the PRC than in other countries (IMF 2021b) and have increased after the global financial crisis (Figure 33). However, information is only readily available on industrial state holding enterprises, i.e., enterprises where the state has a dominant equity share or otherwise actual control.[48] These tend to be less efficient than private enterprises and about one in four of them is loss-making (Box 2).

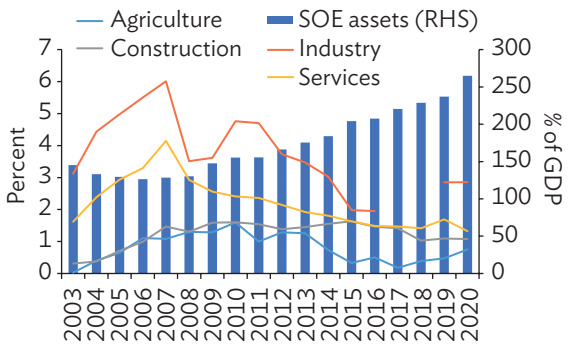
Figure 32: Employment by Category of Employer, 1980–2019



SOE = state-owned enterprise.

Sources: Ministry of Human Resources and Social Security via CEIC Data Company (accessed 16 September 2022); and ADB calculations.

Figure 33: SOE Assets, and Return on Assets by Sector, 2003–2020



GDP = gross domestic product, SOE = state-owned enterprise.

Note: Nonfinancial SOEs only. No data on return on assets of industrial SOEs in 2017–2018.

Sources: Ministry of Finance and NBS via CEIC Data Company and WIND (accessed 2 December2022); and ADB calculations.

The return on assets (ROA) of SOEs in the service sector has first risen before the global financial crisis and—after a rise followed by a long-stretched decline—stood in 2020 again approximately at its 2003 value (Figure 33). The ROA of industrial SOEs has declined over time until the mid-2010s, and then improved by nearly 1 percentage point from 2.0% in 2015 to 2.9% in 2018–2019, reflecting supply-side structural reforms in 2016–2018.[49]

Supply-side structural reforms focused on the steel, coal and electricity sectors, and zombie enterprises therein. In 2016, the National Development and Reform Commission released detailed 5-year plans for the steel and coal industries, aiming at consolidating the sector. Other industries targeted for capacity reduction included cement, glass, and agriculture (Boulter 2018). At the same time, SOEs in the service sector have gained less attention and have not seen their ROA rise (Figure 33). Positive effects of structural reforms included closing some zombie firms and highly environment-polluting, energy-inefficient companies. It should also be noted that the government invested in industrial upgrading so that supply-side reforms were not limited to closing firms. The reforms also contributed, as part of a

[48] SOEs are enterprises whose entire assets are state-owned and are registered as an unincorporated economic organization.

[49] Kroeber (2020, chapter 14) notes that supply-side structural reforms started to collide with economic growth targets in 2018 and were shelved. Boulter (2018) notes that the profit margin in the steel sector improved in 2016–2018.

broader deleverage campaign, to a [temporary] stabilization in corporate debt (Boulter 2018 and Figure 41). The overall positive experience of supply-side structural reforms suggests exploring possibilities to extend them to other industries.

There remain several SOE-related issues that need to be addressed. Data available on industrial state holding enterprises paints the following picture (Box 2):

(i) The share of state holding enterprises in industry declined rapidly in the early 2000s, while in the 2010s this development decelerated.

(ii) The share of loss-making industrial state holding enterprises declined in the first decade of the 2000s, but this trend stopped in the 2010s and the share has hovered around at one in four. Annual losses by industrial state holding enterprises averaged 0.5% of GDP in the 2010s.

(iii) Industrial state holding enterprises have, on average, lower returns on assets and on equity than their private peers.

(iv) Industrial state holding enterprises used to have a higher liabilities-to-asset ratio as well as a higher liabilities-to-equity ratio than their private peers. However, industrial state holding enterprises have reduced their liabilities-to-asset ratio in recent years, while that of private industrial companies rose sharply in 2018.

There are reform needs with respect to SOEs. Four areas are frequently highlighted:[50]

(i) **Clarify SOEs' scope and function.** While the function and scope of SOEs needs clarifications, in particular the areas in which the government wants to retain SOEs should be small and well-specified. Competition should be strengthened by making market entry easier for private companies in the other areas. This could increase pressure on inefficient SOEs to increase their efficiency. Monopolies should be kept to a minimum and the use of administrative monopolies (i.e., exclusive rights granted by regulations) reduced.

(ii) **Level the playing field.** There should be a level playing field for the private sector to compete with SOEs, in particular in terms of access to land and credit. This includes removing implicit guarantees for SOEs and their preferred access to bank credit.

(iii) **Separate social functions from SOEs.** In the PRC, many SOEs also perform social functions, such as stabilizing employment and providing social services that are in other countries frequently fall into the category of basic public service. Social functions should be separated from SOEs to increase their competitiveness and better realize economies of scale and scope.

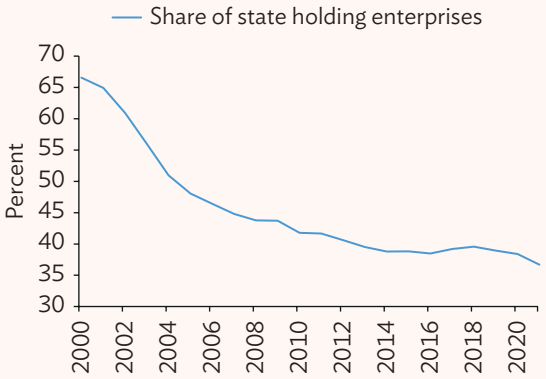
(iv) **Improve SOE management.** The management and supervision of SOEs must be strengthened to raise their efficiency. Elements such as aligning incentive mechanisms and gradually adopting market-based salaries are mentioned in the 14th Five-Year Plan.

[50] See for instance more comprehensive discussions in World Bank and DRC (2013 and 2019); IMF (2019, 2021b, and 2021c); ADB (2021d); and OECD (2022a).

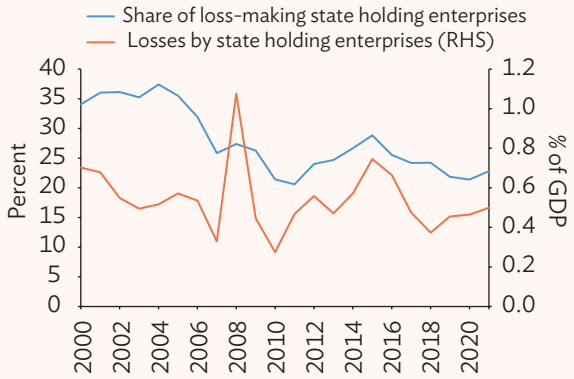
Box 2: Industrial State Holding Enterprises

Figure B4: Industrial State Holding Enterprises

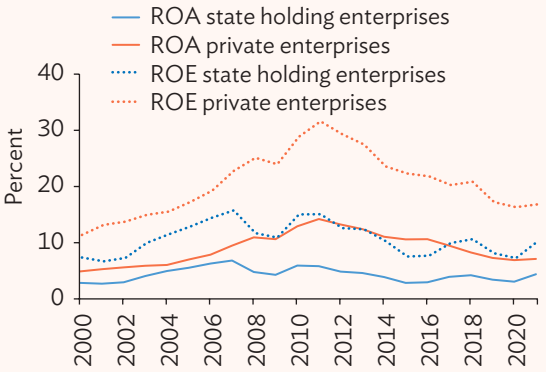
The share of state holding enterprises in industrial assets fell sharply in the 2000s.



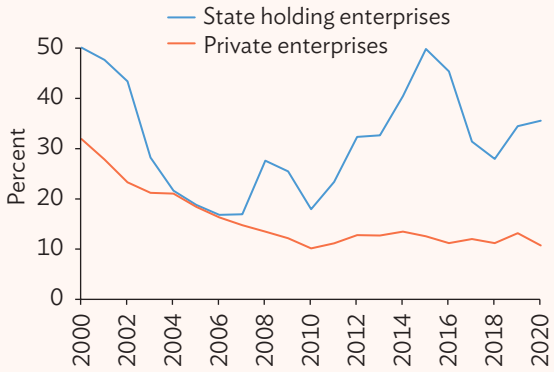
Since the global financial crisis, the share of loss-making state holding enterprises hovers around one-quarter.



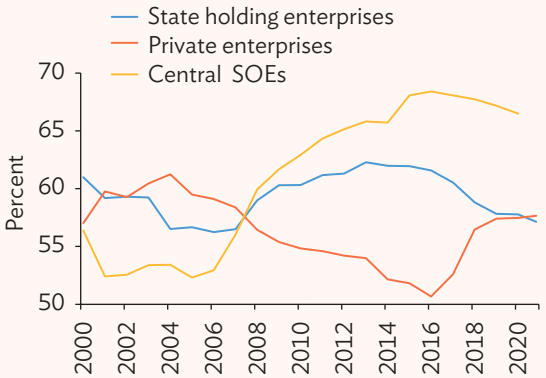
Private industrial enterprises have higher returns on assets and on equity.



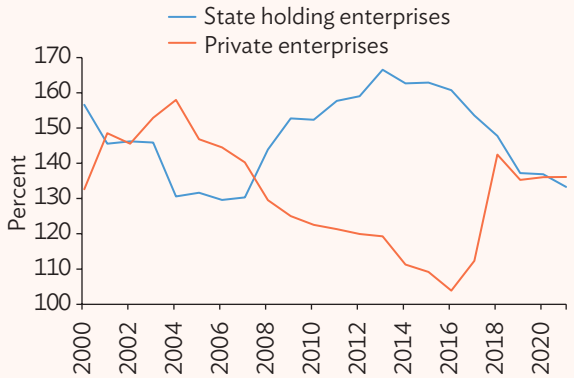
State holding enterprises pay a higher share of their pre-tax profits on interest payments.



The liabilities-to-asset ratio of central SOEs has been higher than those of industrial state holding enterprises after 2008.



Liabilities-to-equity ratios of state-holding enterprises and private enterprises have converged in recent years.



GDP = gross domestic product, ROA = return on asset, ROE = return on equity, SOE = state-owned enterprise.

Note: The data is not controlled for industry. IMF (2022b) controls capital productivity in manufacturing for industry composition of SOEs, with similar results to the ones in the chart above on return on assets. Central SOEs under the State Council include non-industrial SOEs.

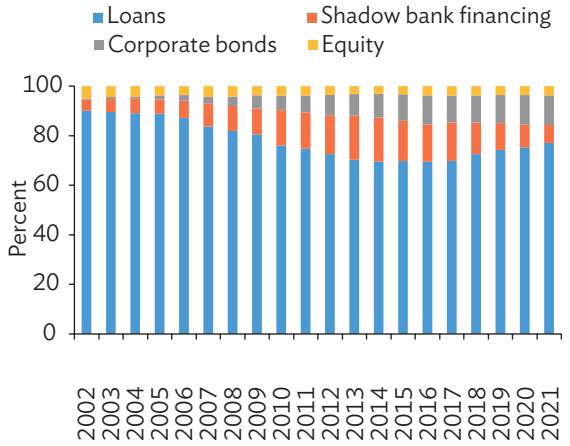
Sources: NBS and Ministry of Finance via CEIC Data Company and WIND (accessed 16 September 2022); and ADB calculations.

Credit allocation

While credit allocation can theoretically be analyzed from various angles, there is only limited credit-related information available for the PRC. Furthermore, many relevant statistics end in 2019 (by the latest). Thus, in the following we analyze broad trends in credit, using available information on business loans, the banking sector structure, and the evolution of key interest rates and debt.

From the statistics on total social financing—a broad credit aggregate including bank loans, shadow bank financing, equity financing, and government and corporate bonds (and some smaller other items)—some broad trends relevant to company financing can be inferred.

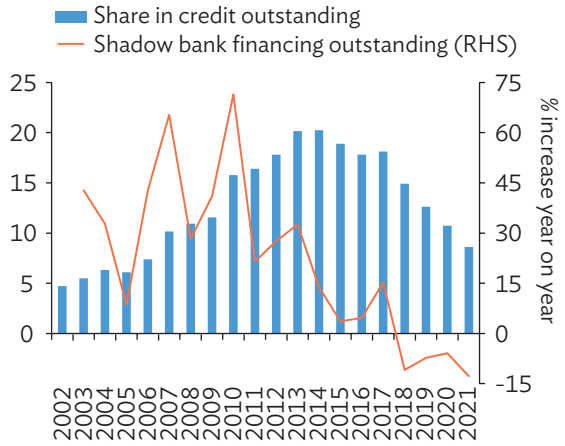
Figure 34: Selected Financing Sources, 2002–2021



Note: Loans by financial institutions. The sum of the four categories is normalized to 100%. Shadow bank financing comprises entrust loans, trust loans, and banks' acceptance bills.

Sources: People's Bank of China via CEIC Data Company (accessed 20 September 2022); and ADB calculations.

Figure 35: Shadow Bank Financing, 2002–2021



Note: Credit defined as the sum of loans by financial institutions and shadow bank financing outstanding. Definition of shadow bank financing as in Figure 34.

Sources: People's Bank of China via CEIC (accessed 20 September 2022); and ADB calculations.

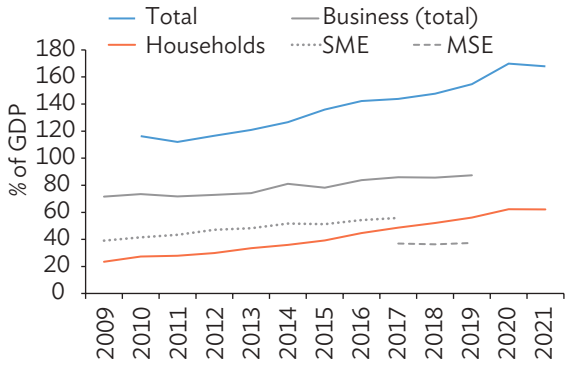
The share of equity financing has stayed very low, while bond financing could gain share over time (Figure 34). Secondly, shadow bank financing—judging from the regulated part covered by the statistics—has been reined in since the mid-2010s (Figure 35). The share of shadow bank financing in overall credit—defined here as sum of bank loans plus regulated shadow bank financing—has fallen to below 9% in 2021, down from about 20% in 2013 and 2014.

Business loans. In 2019, outstanding business loans equaled to 56.4% of bank loans (or 87.3% of GDP). Among business loans outstanding, the top three categories were manufacturing (9.6%); transport, storage, and postal services (9.1%); and leasing and commercial service (8.4%). Three other categories had a share more than 5%: real estate (6.4%), water conservancy, environment and utility management (6.2%), and wholesale and retail trade (6.1%). These top six categories accounted for nearly half (45.8%) of business credit outstanding.

Total loans have risen faster than business loans up to 2019, the latest available year (Figure 36). Small and medium-sized enterprise (SME) loans grew as percentage of GDP but, after 2012, expanded only broadly in line with business credit so that its share in business loans stagnated and even declined as a share in total

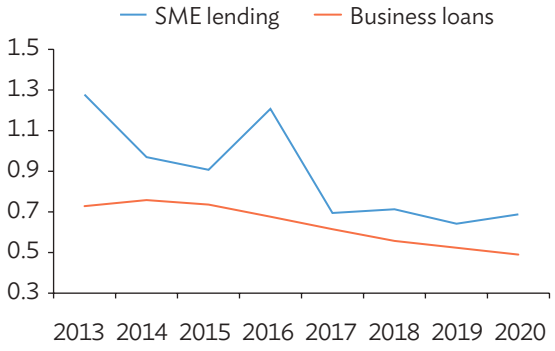
loans. In 2017, there was a changed in statistical categories and SME loans were discontinued. Loans to micro and small business, a newly introduced category, have remained virtually flat as a percentage of GDP.

Figure 36: Loans Outstanding by Category, 2009–2021



GDP = gross domestic product, MSE = micro and small enterprise, SME = small and medium-sized enterprise.
Note: Total domestic loans and household loans by financial institutions from People's Bank of China; others from OECD.
Sources: OECD (2022b), People's Bank of China via CEIC (accessed 20 September 2022); and ADB calculations.

Figure 37: Maturity of Financing, 2013–2020

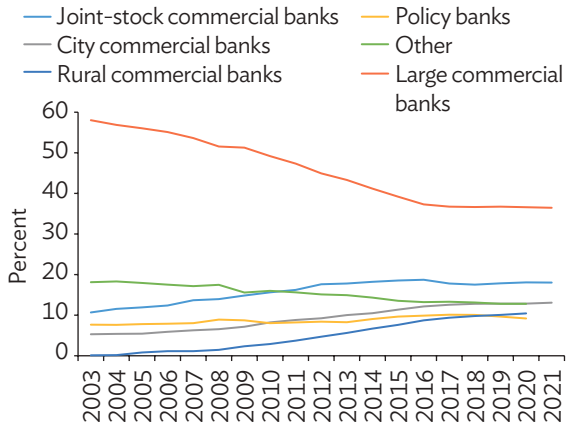


Note: Chart shows the ratio of short-term loans to medium- and long-term loans. Short-term loans have a maximum maturity of 1 year.
Sources: OECD (2022b); and ADB calculations.

In terms of maturity, SMEs have become slightly less dependent on short-term lending (Figure 37). However, after 2017 there has been no further progress, which may be explained by rising economic uncertainty.

Banking sector structure. The share of assets of large (state-owned) banks has declined until the mid-2010s, but stabilized after (Figure 38). Conversely, rural and city commercial banks as well as joint-stock commercial banks could gain share until the mid-2010s.

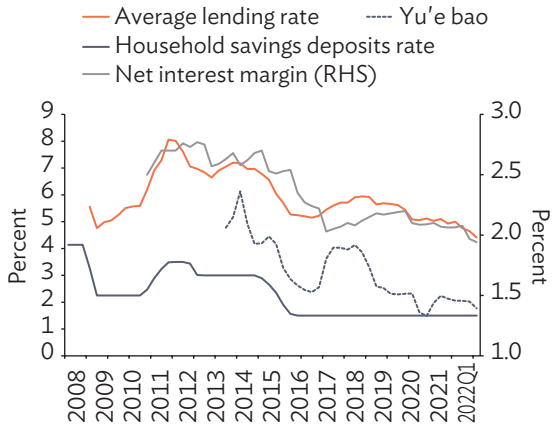
Figure 38: Market Share by Type of Bank, 2003–2021



Note: By assets. Large commercial banks comprise ICBC, BOC, CCB, ABC, and BoCom.

Sources: China Banking and Insurance Regulatory Commission via CEIC (accessed 20 September 2022); and ADB calculations.

Figure 39: Key Interest Rates, 2008–2022

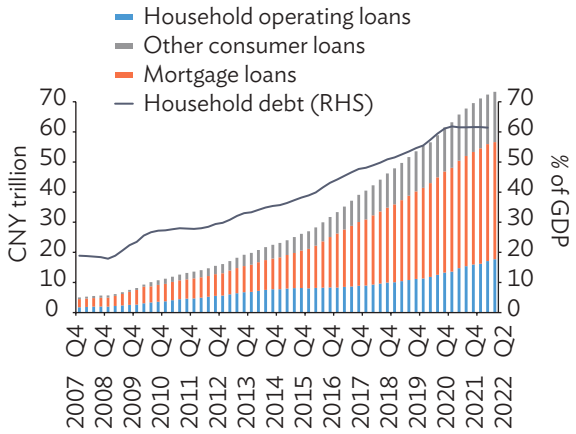


Note: Quarterly data; last observation Q2 2022. Yu'e bao is a popular money market account in the People's Republic of China.

Sources: People's Bank of China and China Banking and Insurance Regulatory Commission via CEIC and WIND (accessed 20 September 2022); and ADB calculations.

Financial repression and asset price inflation. Banks' net interest margin tends to move with the average bank lending rate (Figure 39). This rate has been on a declining trend since 2012, while the household deposit rate has remained unchanged for several years at a low level. As a result of a lack of suitable forms of investments—given low deposit rates, an uncertain outlook on the stock market, and a closed capital account—household purchased property, which not only drove up property prices but also resulted in a bigger share of credit flowing to households (Figure 36). This resulted in a pickup in household debt driven by mortgage borrowing in the second half of the 2010s (Figure 40). Meanwhile, corporate debt as percentage of GDP has declined in the second half of the 2010s, before picking up again in the wake of the COVID-19 pandemic (Figure 41).

Figure 40: Household Loans by Type, 2007–2022

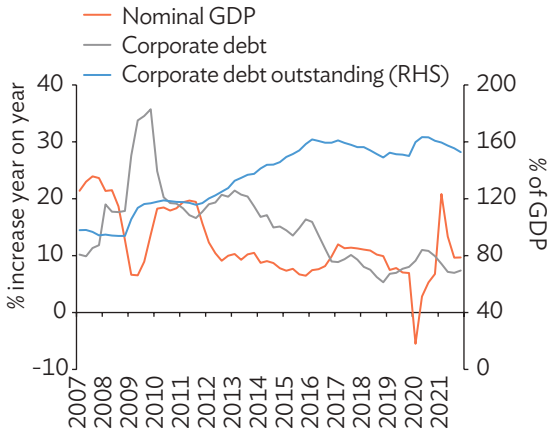


GDP = gross domestic product.

Note: Missing data points before 2013 were estimated by linear extrapolation. Household debt from Bank for International Settlements (BIS).

Sources: People's Bank of China via CEIC; BIS (both accessed 2 December 2022); and ADB calculations.

Figure 41: Corporate Debt, 2007–2021



GDP = gross domestic product.

Note: Nonfinancial corporates.

Sources: Bank for International Settlements and NBS via CEIC Data Company (accessed 19 September 2022); and ADB calculations.

From the information above, we can state the following on credit allocation in the PRC based on the available statistics:

(i) By type of financing, shadow banking financing captured by the statistics has declined and the reliance on bank loans has increased since the mid-2010s, while the shares of bond and equity financing virtually stagnated in recent years.

(ii) Business loans outstanding (as percentage of GDP) have hardly increased over the past decade. Most of the increase in loans taken were by households, which used the money mostly for mortgages in the second half of the 2010s (Figure 40).

(iii) Loans to SMEs could not increase their share after 2012 (until 2017, latest available data). Loans to micro and small enterprises have remained flat as percentage of GDP in 2017–2019.

(iv) The ratio of short-term to medium- and long-term SME lending stagnated after 2017, when economic conditions became fraught with higher uncertainty.

(v) Big banks could stabilize their asset share in the second half of the 2010s. The shares of city and rural commercial banks have not increased further.

(vi) Banks' profitability—as measured by the net interest margin—has declined over the past decade. Low deposit rates could not prevent this decline, which was driven by falling bank lending rates (Figure 39).

Against this backdrop, the following recommendations can be made:

(i) **Strengthen equity and bond financing.** Encourage equity financing and bond issuance as a way of corporate financing, especially for larger companies, while continue to rein in shadow banking.

(ii) **Shift business loans to the private sector.** Increase the share of loans to the private sector, while reducing that of SOEs. To do so, remove implicit guarantees for SOEs and end their preferential borrowing conditions (IMF 2019).

(iii) **Strengthen lending to micro and small enterprises.** Increase the share of business loans to micro businesses and small companies, especially those that got hit hard by the adverse impact of the COVID-19 pandemic on the economy.

(iv) **Move to longer-term financing.** A high share of short-term loans potentially leads to high transaction costs, while banks should concentrate on improving their ability to assess credit risks (ADB 2021c).

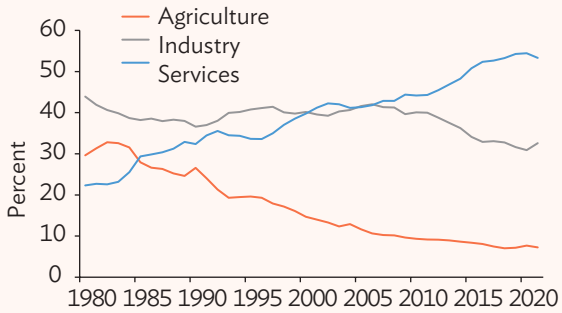
(v) **Improve banks' efficiency.** Lowering household deposit rates will likely not be a solution for falling net interest margins of banks, but could spur another round of property investment. Improving banks' (operational) efficiency is a better option (ADB 2021c).

Time frames regarding the implementation of these recommendations can be found in Appendix 6.

Box 3: Structural Change

Over the past 4 decades, the economy of the People's Republic of China (PRC) has shifted away from agriculture and toward services, with strong growth in the latter sector in the 2010s (Figure B5). At the same time, the share of industry just started to decline in the past decade, and even then showed signs of stabilization in recent years. These shifts are linked to the growth model of the economy. Efforts were made to increase domestic demand, especially after the global financial crisis that ended export-led growth—the PRC ran a current account surplus of almost 10% of gross domestic product (GDP) in 2007. However, in recent years the shift to services lost dynamics. Services could only improve their share in GDP marginally from 52.4% in 2016 to 53.3% in 2021 as household consumption stagnated as a share in GDP (Figure B6).

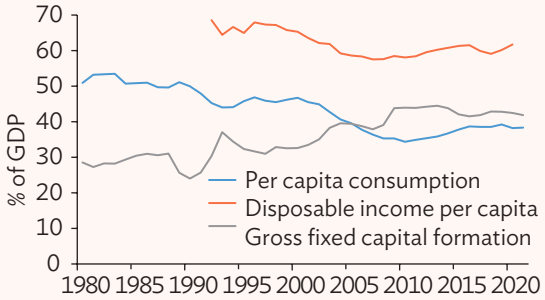
Figure B5: Sector Share in GDP, 1980–2021



GDP = gross domestic product.

Source: NBS via CEIC Data Company (accessed 13 July 2022).

Figure B6: Household Income and Consumption, and Investment, 1980–2021



GDP = gross domestic product.

Source: NBS via CEIC Data Company (accessed 14 July 2022).

In the first half of the 2010s, household consumption (as a share in GDP) picked up, which coincided with income inequality improving and wages in low-skill sectors outgrowing that in high-skill ones (Peschel 2021). However, the share of household consumption in GDP has not increased further in recent years, but de facto stagnated (38.7% of GDP in 2016 versus 38.4% in 2021) reflecting a stagnating disposable income share (61.6% of GDP in 2016 versus 61.7% in 2020).

Facilitating structural change from industry to services requires on the demand side stronger household consumption, for which increases in household income is crucial. In this context, more affordable housing could support household consumption. Second, there is a need to reduce income inequality to boost household consumption. Third, basic public services and social security need to be improved to reduce the need for precautionary saving. This requires higher transfers to less-developed regions and additional government spending to cope with needs of a rapidly aging society (Peschel 2021).

On the supply side the government would need to put greater emphasis on the service sector in economic planning. Currently, efforts in industrial policy go unmatched in the service sector that would benefit from a similar status to manufacturing in terms of fiscal incentives, resource allocation, and openness. The 14th Five-Year-Plan (2021–2025) envisages less reliance on heavy industries by proposing a new target to increase the share of the strategic emerging industries (i.e., advanced manufacturing, including high-end machinery and equipment, advanced materials, and electric vehicles) from 11.5% of GDP in 2019 to more than 17% of GDP by 2025 (ADB 2021d). While previous growth in services was concentrated in financial services and real estate, there is potential for the further development of the higher value-added services such as research and development, information and communication technology-related services, and consumer services (World Bank 2021).

E. Total Factor Productivity

Overview

This section discusses policies in areas which are covered by the explanatory variables in the model: (i) imports—which, in a broader sense, relates to trade openness; (ii) FDI; (iii) sectoral labor shift; and (iv) R&D. As mentioned above, the biggest influence on future TFP growth has R&D, followed by the sectoral labor shift. Imports and FDI let an economy benefit from imported technology. The sectoral labor shift in the PRC is purely domestic as immigration can be neglected by size. Finally, though R&D investment takes place in the country, research frequently has linkages with the rest of the world. Having said this, this section cannot exclusively focus on domestic policies but will also need to take into account, to the extent possible, how the PRC positions itself in an international context with respect to trade, FDI, and R&D. In the following, we will look at these issues, but before we briefly discuss policies supporting the sectoral labor shift.

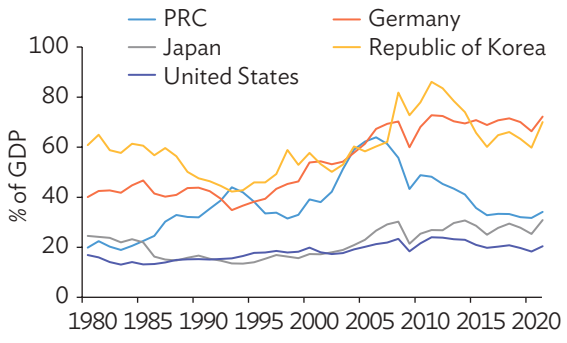
Sectoral labor shift

The share of industry in GDP has declined substantially in the decade after the global financial crisis (Box 3). As seen in the model above, the speed of migration from agriculture into industry and services is expected to moderate over time. This is because the share of workforce employed in agriculture has already fallen substantially. Also, industry has started shedding workforce so that the migration route from rural areas to comparatively well-paid industry jobs has narrowed. Thus, rural–urban migration in the future is more likely to take place into low-skilled service sector jobs, which depend on domestic consumption and tend to be more volatile.

Trade openness and foreign direct investment

Imports are frequently used for the production of exports in advanced economies exhibiting a high level of trade openness, which is measured as the sum of merchandise exports and imports as percentage of GDP. While the PRC's trade openness has risen sharply in the early 2000s up to 2007, reaching a level similar to Germany and the Republic of Korea, it has fallen back since and, by 2021, was much closer to Japan and the US (Figure 42).

Figure 42: Trade Openness, 1980–2021

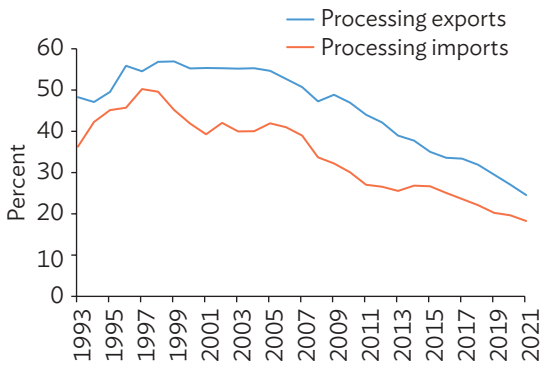


GDP = gross domestic product, PRC = People's Republic of China.

Note: Trade openness measured as sum of merchandise exports and imports as percent of GDP.

Source: World Bank, World Development Indicators (accessed 14 September 2022).

Figure 43: Processing Trade, 1993–2021



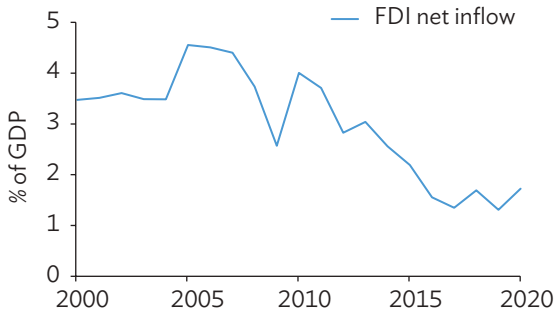
Note: Processing exports and imports as a share in total merchandise exports and imports, respectively.

Sources: General Administration of Customs via CEIC Data Company (accessed 14 July 2022); and ADB calculations.

In the case of the PRC, processing trade has declined over the past decade (Figure 43). This development was driven by the PRC establishing domestic manufacturing value chains and thus becoming less dependent on imports of intermediary goods for manufacturing exports. Also, wages in the PRC rose rapidly so that processing trade became less attractive for foreign companies.

FDI inflow into the PRC, measured as percentage of GDP, has declined over the past 2 decades, while the country's restrictions on FDI have remained high compared to OECD as well as non-OECD countries (Figures 44 and 45).

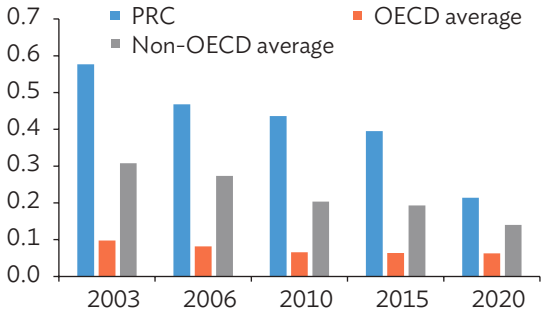
Figure 44: FDI Net Inflow into the PRC, 2000–2020



FDI = foreign direct investment, GDP = gross domestic product, PRC = People's Republic of China.

Sources: World Bank via CEIC Data Company (accessed 2 December 2022); and ADB calculations.

Figure 45: FDI Restrictiveness Index, 2003, 2006, 2010, 2015, and 2020



FDI = foreign direct investment, OECD = Organisation for Economic Co-operation and Development. PRC = People's Republic of China.

Note: Non-OECD comprises 46 economies.

Source: OECD Database, https://stats.oecd.org/Index.aspx?datasetcode=FDIINDEX (accessed 5 September 2022).

Research and development

One challenge for the PRC's R&D policy is misuse of funds. According to estimates by Boeing and Peters (2022), using PRC firm-level data for 2001–2011, 42% of grantees misappropriated R&D subsidies (accounting for 53% of total subsidies). This has reduced the effectiveness of the country's R&D policy by more than half (Boeing and Peters 2022).

Though the gap in R&D spending between the PRC and developed economies is expected to narrow over the next decades, expenditure on basic research (as % of GDP) in the PRC has remained low so far. In 2020, the PRC spent 0.14% of GDP on basic research, less than the US (0.5% of GDP), Japan (0.4% of GDP), or the Republic of Korea (0.7% of GDP) (OECD 2021). Furthermore, in the PRC, enterprises' basic research investment remains low as companies would focus on developing new technologies and products with clear commercial application instead of technologies that might become commercially viable in the long term (Zheng, Zhuang, and Wang 2020).

Zheng, Zhuang, and Wang (2020) see insufficient intellectual property (IP) rights protection as a contributing factor to the low quality of innovation in the PRC. As punishment for IP infringement is insufficient, companies would rather focus on imitation and application activities than on basic research and innovative products, which is costly when IP infringement make it difficult for companies to reap the rewards for their investment. Second, since companies would often split a patent into multiple small

ones, limited patent review resources would be consumed by low-quality patents (and high-quality ones losing out). Finally, there would be a notable gap in IP protection across regions in the PRC with differences in the level of economic development and market operation efficiency. Local protectionism would result in unequal IP protection, with IP infringement in less-developed regions likely to face less liability issues than in advanced regions.

Policy recommendations

Against the backdrop of a less dynamic sectoral labor shift in the future, the decline in the country's trade openness for more than a decade, persisting restrictions on FDI in many areas, and ongoing challenges to improve the quality of R&D in the PRC, the following policy recommendations can be made:

(i) **Loosen residence permit restrictions.** Loosening hukou (residence permit) restrictions could overall help improve labor allocation (Lam, Liu, and Schipke 2015). Also, the access of labor migrants to health services and education for their children in cities where they live needs to be improved. Furthermore, the portability of social security benefits, such as pensions and health insurance, should be increased.

(ii) **Facilitate new trade and investment agreements.** Looking forward, the PRC's commitments in the context of new trade and investment agreements can help increase openness and could also facilitate domestic reforms (IMF 2022a and 2022b). While there is an intention to advance innovation in multiple areas to become less dependent on foreign technology, it is recommended to specialize in a number of areas, while sourcing globally in others—an approach practiced by most advanced economies (ADB 2021d). This approach leaves room for imports into the PRC, making the country a trading partner for other countries.

(iii) **Loosen restrictions on foreign direct investment.** To potentially increase FDI inflow, loosen restrictions on such investments, e.g., by substantially revising and shortening the negative list for FDI. Another point is reducing joint venture requirements. Such requirements are frequent for multinational firms seeking FDI in the PRC to partner with a domestic company and form an international joint venture, which are characterized by explicit technology transfer requirements (Jiang et al. 2019).

(iv) **Strengthen IP rights protection.** The analysis above shows that strengthening IP rights protection is key to improve incentives for companies to invest in basic research and innovative products. IP protection standards need to be unified across the country and patent review strengthened. To this end, the country would need to invest in an IP rights protection regime in line with international best practices, including its institutional requirements. While this would not only help to increase the quality of patents, it would also be a step toward increasing companies' incentives to put innovation before application.

A table summarizing the policy recommendations mentioned in this chapter can be found in Appendix 6.

V. OUTLOOK ON POLICY CHALLENGES AND REFORMS

The previous chapter has presented an array of reforms pertaining to strengthening the labor force, human capital formation, capital and credit allocation, and measures to enhance TFP growth. These areas relate to big long-term challenges such as demographic aging, the urban–rural gap, improving the capital and credit allocation, and shifting the country's growth model toward domestic sources of growth. Finally, efforts to advance domestic technology depend on successful R&D policies.

Demographic aging is an issue that must be addressed. Some reforms, such as an increase of support for families, will only show effect in the long run. Therefore, mitigation measures are needed, such as extending the work life, which, besides changes to retirement rules, includes improving health care so that employees stay healthy. At the same time, raising the retirement age is unpopular but necessary given the rapid aging of society and rising life expectancy.

An aging society would benefit from increased labor mobility to better allocate the shrinking work force. *Hukou* restrictions should be loosened. In addition, the nearly 200 million migrant workers (and their families) would need better and easier access to the basic public services and education in the cities where they work. Furthermore, in terms of education, steps are needed to improve the quality of tertiary education and on-the-job training. Besides improvements in education, the mentioned reforms require changes to and the strengthening of social policies.

The urban–rural gap puts a burden on human capital formation and requires attention by policy makers. Increased efforts to boost education in rural areas are needed, as are steps to expand early childhood education. Such reforms would require higher fiscal transfers to poorer regions and need to be embedded in broader reforms of intergovernmental fiscal relations (Peschel 2021).

The capital and credit allocation must be improved. Measures are urgently needed to improve capital allocation and efficiency, thereby boosting potential growth. As analyzed above, the PRC's investment share in GDP will have to moderate as the level of debt has sharply risen over the past decade and further massive investment in the housing market and the country's infrastructure would not be sustainable.

SOE reforms are needed. Continuously loss-making SOEs will need to exit the market to avoid a zombification of the economy. In the coming years, when the work force will start to shrink quickly, there are ever-fewer arguments to continue sustaining loss-making SOEs. However, laid-off workers would need help and support to find and be qualified for new jobs, which requires temporary financial support and (re)training.

Credit will need to increasingly be allocated to the private sector, in particular to micro and small enterprises. To this end, banks will need to adjust their lending preferences, which realistically requires moving away from implicit guarantees for SOEs and their privileged access to credit. Such reforms not only take time to implement, but they also require willingness to advance them. These reforms might also have (unwanted) side effects, such as some SOEs going out of business. Furthermore, the banking sector will need to develop and improve credit risk assessment capabilities. In sum, reforms to raise capital efficiency require both high willingness and efforts. At the same time, they would have a major impact on potential growth.

With a declining share of industry and a rising share of services in the economy, growth should be driven less by investment and more by domestic consumption, fueled by an increase in household consumption—for which improvements in social policies are needed to reduce the need for precautionary saving.

Another area of reform is improving the domestic R&D efficiency. As seen in the analysis above, R&D reforms hinge upon complex institutional changes and enforcement issues. However, improving IP protection seems to be a crucial step for changing incentives (and potentially behavior) that are needed to improve the quality of domestic R&D. Furthermore, R&D (and TFP) benefits from access to foreign technology and an open exchange of ideas with the rest of the world.

As for the pacing of reforms, it must be noted that some reforms depend on many building blocks that require coordinated efforts over many years (see Appendix 6). One should also note that improving potential growth will likely mean less government influence as the SOE landscape will need to be streamlined, a bigger share of credit will need to go to the private sector, and households will need gain spending power to facilitate the transition to a consumption-based economy. To achieve the latter, the government will need to strengthen social policies and redistribution, requiring additional domestic resource mobilization and broader reforms to intergovernmental fiscal relations.

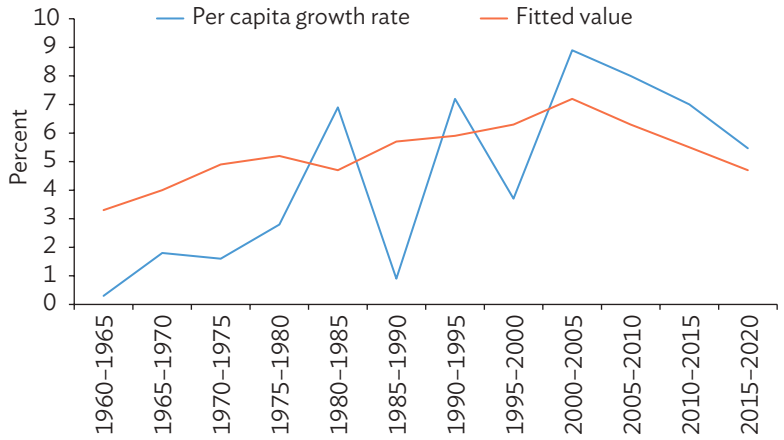
While there have been several challenges to the PRC's economic development in the past 4 decades, there were also many strong tailwinds, such as the demographic dividend and the country's accession to the World Trade Organization. As demographics has turned to headwinds (and will increasingly do so in the future) and debt has increased substantially after 2008, comprehensive domestic reforms have become a pressing issue as well as a big challenge. The strength of the PRC's economic development model has been flexibility, combined with the willingness to learn and to adjust. With this in mind, initiating comprehensive domestic reforms is key—adjustments can be done along the way.

APPENDIXES

Appendix 1: Barro's Estimate of Convergence

Barro (2016 and 2017) looks in greater detail at conditional convergence for the People's Republic of China (PRC). Fitting a model that considers several factors,[51] Barro estimates the past economic growth rates for the PRC and compares them to the actual growth rates (Figure A1), before providing explanations for the observed deviations from the forecast values (Table A1).

Figure A1: Real Per Capita GDP Growth in the PRC: Barro's Estimate of Convergence, 1960–2020



GDP = gross domestic product, PRC = People's Republic of China.

Sources: Barro (2017); NBS via CEIC Data Company (accessed 07 June 2022); and ADB calculations.

[51] Factors include life expectancy at birth, total fertility rate, indicators of rule of law and democracy, investment-to-GDP ratio, government-consumption-to-GDP ratio, female and male average years of school attainment, (trade) openness, and inflation.

Table A1: Barro's Explanation of the PRC's Per Capita Growth Pattern

Period	Deviation (percentage points)	Barro's Explanation
1960–1965	-2.9	The model omits some aspects of the PRC communist system that were adverse to economic growth through the late 1970s, e.g., the Great Leap Forward of 1958–1963 and the Cultural Revolution of 1966–1976.
1965–1970	-2.2	
1970–1975	-3.3	
1975–1980	-2.4	
1980–1985	2.1	The convergence effect is offset by changes in the explanatory variables: e.g., the predicted growth rate rises throughout because of higher life expectancy, through 2000 because of lower fertility, through 2005 due to greater international openness, through 2010 because of a higher ratio of investment to GDP, and up to 1995–2000 due to better law and order.
1985–1990	-4.8	
1990–1995	1.3	
1995–2000	-2.6	
2000–2005	1.8	
2005–2010	1.7	After 2005, the convergence force strengthens due to the sharply rising per capita GDP and partly because the explanatory variables provide less of an offsetting effect. The offset effect eventually tends to be capped because of limits to rising life expectancy, falling fertility, rising international openness, improving rule of law and ease of doing business, etc.
2010–2015	1.5	
2015–2020	0.8	

GDP = gross domestic product, PRC = People's Republic of China.

Note: Deviation is the difference between actual and fitted value (in percentage points).

Sources: Barro (2017), with authors' addition of the deviation for the 2015–2020 period.

Appendix 2: Human Capital Index

Constructing the human capital index

Following Bailliu et al. (2016), we construct a human capital index for each year t index as

$$h = e^{\varphi(s_t)} \quad (1),$$

where s is the total years of schooling and $\varphi(s)$ measures the efficiency of a unit of labor with s years of education relative to one without any schooling.

For each year t , the human capital index is constructed by combining educational attainment differentiated by age groups and their respective share in population as follows:

Equation (2) is the measure of education for each age group:

$$\varphi(s_i) = 0 * Ns_i + 0.0769*(6Cp_i + 3(Tp_i - Cp_i)) + 0.0892*(12Cs_i + 9(Ts_i - Cs_i)) + 0.1338 * (16Ct_i + 14(Tt_i - Ct_i)) \quad (2),$$

where Ns is the share of population with no education. Tp_i, Ts_i, and Tt_i are the share of age group i with highest education attainment level of primary, secondary, or tertiary. Cp_i, Cs_i, $and\ Ct_i$ are the share of population of age group i who has completed highest education attainment level of primary, secondary, or tertiary. P_i is the number of people in a given age group and p_t is the number of people in all age groups. Returns to education are assumed to be constant over time.

Equation (3) is the share of population in each age group in the overall population in year t:

$$\varphi(s_t) = \sum_{i=1}^{i=5} \frac{P_i}{P_t} * \varphi(s_i) \quad (3).$$

Substituting equation (2) into equation (3), and then (3) into (1), we obtain the human capital index.

Educational attainment

For the age group 15–24, total and completed primary school attainment data from 2016 to 2040 is assumed based on historical trend. For the older age groups, we know their primary school attainment rates and carry forward the rates as they age.

According to the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035, the gross tertiary enrollment in the People's Republic of China (PRC) is expected to reach 60% by 2025 (NDRC 2021). Furthermore, the PRC's Education Modernization 2035 Plan states that the country tertiary enrollment should increase to 65% in 2035 (State Council 2019). Given 58.4% gross tertiary enrollment in 2020, we assume enrollment for years between 2021 and 2025 in a way that it reaches 60% by 2025. Assuming a constant growth rate of 0.5 percentage points per year for 2026–2040, we project gross tertiary enrollment rate to be 67.5% in 2040 (see Figure 10, main text).[52] For total and completed tertiary school attainment, we simplify and assume it will follow the same growth rate as enrollment rate but with a 4-year lag (drop-out rates are very low for tertiary education).

[52] After it has risen sharply in the past decade, tertiary enrollment will now flatten as rural areas continue lagging behind.

Total secondary school attainment can be estimated as the residual of $Ns + Tp + Ts + Tt = 100$, where Ns is the share of population without formal education, which is forecast based on historical trend, and *Tp, Ts*, and *Tt* are shares of population that attended primary, secondary, and tertiary education, respectively. For age group 15–24, secondary completion rate is assumed to follow the growth rate of the total secondary attainment. For the other four age groups, i.e., 25 years and older, the highest-level school attainment is carried forward for 2015–2040 from previous levels as they age (as returning to tertiary education later in life is rare in the PRC).

Appendix 3: Comparison of Results

While Higgins (2020) and Roberts and Russell (2019) only provide aggregated results, Bailliu et al. (2016) provide details of their estimates. Here, we compare them to our findings.

For 2016–2019, our estimate of the capital contribution to growth is higher than the forecast in Bailliu et al. (2016), while our estimate of total factor productivity (TFP) is lower than theirs (Table A3.1). Also, our estimate of human capital, using the latest Barro-Lee data set, yields a lower contribution of human capital to growth for 2001–2019

Table A3.1: Comparison of Potential GDP Growth Estimates with Bailliu et al. (2016)

Period	Actual GDP growth	Authors' estimate	Bailliu et al. (2016)	Contribution							
				K	K Bailliu	L	L Bailliu	HC	HC Bailliu	TFP	TFP Bailliu
2001–2005	9.8%	10.4%	10.5%	5.2%	4.9%	0.9%	0.9%	0.3%	0.9%	3.9%	4.0%
2006–2010	11.3%	10.3%	11.3%	5.6%	6.0%	0.3%	0.4%	0.1%	0.7%	4.3%	4.1%
2011–2015	7.9%	8.2%	7.6%	4.8%	5.5%	-0.1%	-0.1%	0.6%	0.7%	2.9%	1.5%
2016–2019/2020*	6.6%	6.8%	7.0%	5.1%	3.3%	-0.1%	-0.1%	0.5%	0.6%	1.3%	3.3%
2001–2019/2020*	9.0%	9.0%	9.8%	5.2%	5.5%	0.4%	0.4%	0.4%	0.8%	3.2%	3.2%

GDP = gross domestic product, K = capital, L = labor, TFP = total factor productivity.

*Up to 2019 for our estimates and up to 2020 for Bailliu et al. (2016), using their forecast values.

Sources: Bailliu et al. (2016); and authors' estimates.

For the overlapping forecast period (2020–2030), we estimate a lower contribution from TFP to growth, while in our view the contribution of capital is higher in 2020–2025— the share of gross fixed capital formation has not fallen as fast as expected in Bailliu et al. (2016)—but close to Bailliu et al. (2016) for 2026–2030 (Table A3.2). While our estimates are quite similar for labor and human capital, the future total factor productivity growth is estimated much higher by Bailliu et al. (2016). We assume that the share of employment in industry will continue to fall, resulting in a smaller future contribution from sectoral labor shift to TFP growth. Also, we assume a lower contribution from research and development spending on TFP growth from 2020 so that our estimated TFP contribution to growth is only half of theirs.

Table A3.2: Contributions to Potential GDP Growth, 2020–2040

Period	Authors' forecast	Bailliu et al. (2016)	Contribution							
			K	K Bailliu	L	L Bailliu	HC	HC Bailliu	TFP	TFP Bailliu
2020/2021–2025*	5.3%	5.9%	3.4%	2.6%	-0.2%	-0.3%	0.5%	0.5%	1.7%	3.0%
2026–2030	3.5%	4.9%	2.1%	1.9%	-0.5%	-0.5%	0.4%	0.6%	1.5%	2.9%
2031–2035	2.7%		1.5%		-0.5%		0.6%		1.1%	
2036–2040	2.0%		1.2%		-0.4%		0.2%		1.0%	

GDP = gross domestic product, K = capital, L = labor, TFP = total factor productivity.

* 2020-2025 for authors' forecast and 2021–2025 for Bailliu et al. (2016).

Sources: Bailliu et al. (2016); and authors' estimates.

Appendix 4: Estimating Capital Stock Growth

The estimate of the growth rate of the capital stock determines the contribution of capital to gross domestic product (GDP) growth in the model. The capital stock growth rate is frequently sensitive to deflator choice. It could also be sensitive to the definition of capital stock, in particular if housing is included or not.

Deflator choice. To construct a time series in constant 2000CNY, Bailliu et al. (2016) first chose a starting value for the capital stock. Then, they use the contribution of investment to GDP growth to estimate investment each year, and deduct depreciation to obtain a capital stock estimate and its growth rate. Another route is to estimate investment via gross fix capital formation—as does IMF (2021a). Here, the capital stock estimate is available in current CNY only. Possible deflator choices are the fixed asset investment (FAI) deflator and the GDP deflator. According to our cross-check, contributions of capital to growth for past years change depending on the deflator. By using an FAI-deflated capital stock, the contribution of capital to growth increases, while the contribution of total factor productivity (TFP) to growth falls.[53] However, the contribution of capital to growth derived would be too high using the FAI deflator.

Housing stock. Separating the housing component from the capital stock is a challenge as the share of property investment has not been stable over time and the depreciation rates of housing and other components of the capital stock differ. Herd (2020) provides an estimation of capital stock in four sectors (housing, infrastructure, government, and business) from 1953 to 2016. The share of housing in total capital stock has first fallen in the early 2000s and then increased after 2010 (Figure 13, main text). In addition, there are several other factors making it difficult to estimate the future housing stock: (i) the share of housing in overall investment used to differ over time (Roberts and Russell 2019), (ii) demographics suggests that the need for new housing construction will decline, and (iii) recent government measures aimed at curbing investment growth in the property sector, possibly with lasting impact.

Bailliu et al. (2016) found that the slope of the capital stock with housing is steeper in, suggesting that the growth rate of the capital stock with housing is higher, which implies that the stock of housing has grown faster than the rest of the capital stock. Based on the data set by Herd (2020), we find that the average annual growth rate of the capital stock including housing is only minimally higher than that when excluding housing for 2001–2016 (12.75% versus 12.69%), implying that growth in the housing stock was not much faster. Thus, the choice of deflator has a much higher impact on the growth rate of the capital stock, and thus on the contribution of capital to growth than excluding the housing stock or not. Higgins (2020) reached a similar conclusion by cross-checking his results using different Penn World Table data sets.

[53] See Higgins (2020) for a related discussion.

Appendix 5: Improving the Quality of Education

The quality of education could be raised by expanding early childhood development, changing the focus of the education system, strengthening technical training, and promoting lifelong learning.

Early child development. Education and nutrition in the first years of life have lifelong effects on the brain and body (World Bank and DRC 2013). With respect to education, the 2015 Program for International Student Assessment science results show that students in the People's Republic of China (PRC) who received early child development (ECD) education perform 2.5 years ahead of those without (World Bank and DRC 2019). However, early childhood education is yet to be included in the PRC's compulsive education system. The country's investment in ECD education was only 0.4% of gross domestic product (GDP) in 2016, compared with 2.3% on average across Organisation for Economic Co-operation and Development (OECD) countries (World Bank and DRC 2019). Despite the PRC's early childhood education enrollment having increased from 56.6% in 2010 to 83.4% in 2019, the country still lags behind its neighbors, such as Japan (at 92%) and the Republic of Korea (at 94%) (ADB 2021e). In addition, Li et al. (2017) point out that over 30% of children aged 0–3 born and raised in the PRC's rural areas exhibit cognitive delay due to lack of modern parenting and stimulation. Therefore, the country should prioritize early childhood education and health programs, especially in rural areas (including lower tuition fees for preprimary schools and better rural preprimary school education).

Education system. The PRC's education system is considered as exam-driven, which can profit the development of persistence and self-control. However, it may inhibit intrinsic motivation and stifle creativity, which could be addressed by shifting to more balanced curricula and paying greater attention to develop higher-order skills (World Bank and DRC 2019). In turn, the country could benefit from a more innovative and creative labor force, which would support moving up the global value chain and help accelerate the pace of new technology adoption.

Since the expansion of college education in 1999, the PRC has witnessed a surge in tertiary school enrollment rates. Li et al. (2017) argues that the fast expansion of tertiary school enrollment rates was followed by a decline in quality of the country's college education. Loyalka et al. (2016) assesses samples of college students in engineering from the PRC, the Russian Federation, and the United States by testing their academic and thinking skills. The assessment shows that PRC students perform well in standardized tests, but show no further growth in cognitive skills after 2 years of college. Thus, while graduation rates are rising, the quality of tertiary education should not be neglected.

Technical and vocational education and training. Though the PRC has the largest vocational education system in the world by size, with over 11,000 vocational schools and 10 million graduates each year, the system has yet to meet labor market demands. The focus of the technical and vocational education and training (TVET) system needs to be market-oriented, and the school–industry link must be strengthened to raise its attractiveness for high school graduates (World Bank and DRC 2019). Moreover, at current stage, TVET and academic studies are seen as two separate systems in the PRC. Pathways between those two should be opened.

Lifelong learning. Finally, it is essential for workers to continue learning throughout their working life. The education and training received right before entering the work life and during the first years in the job are unlikely to suffice throughout work life. Thus, companies will have to provide on-the-job training opportunities. However, the lack of capacity by and incentives for small and medium-sized enterprises (SMEs) to offer this kind of training, given a high labor turnover, could be addressed by providing "training contracts" that would require workers to stay in the job for a certain period or pay back the training cost (World Bank and DRC 2019). Additionally, increasing public funding for job-related training can help retrain workers and upgrade their skills.

Appendix 6: Summary of Policy Recommendations

The following table summarizes the policy recommendations made in part IV.

Table A6: Summary of Policy Recommendations

Area	Measure	Time Frame for Implementation
Labor		
	Gradually raise the legal retirement age	Short term
	Focus on raising labor participation in the mid-50s	Short to medium term
	Improve health care and promoting healthy aging, focusing on safe and secure working environment, occupational health services, and occupational disease prevention	Medium to long term
	Raise female workforce participation by strengthening equal employment opportunities, increasing maternity leave, and improving support for childcare, elderly care, and single mothers	Medium to long term
	Undertake efforts to increase the birth rate	Long term
	Increase labor mobility by further relaxing the household registration system (hukou), and improve access to social services for labor migrants and their children	Medium term
Human Capital		
	Improve rural education, especially upper secondary attainment and tertiary education	Medium term
	Expand early child development	Medium to long term
	Improve the quality of tertiary education	Medium to long term
	Strengthen technical and vocational education and training (TVET)	Medium term
	Increase on-the-job and lifelong training opportunities	Short term
Capital		
State-owned enterprises (SOEs)	Clarify the scope and function of SOEs. The areas in which the government wants to retain SOEs, should be small and well- specified.	Short term
	Strengthen the market economy by making market entry easier for private companies. This includes to let nonessential loss-making SOEs leave the market. Monopolies should be kept to a minimum.	Medium to long term
	Level the playing field for the private sector to compete with SOEs, in particular in terms of access to land and credit. This would include removing implicit guarantees for SOEs and their preferred access to bank credit (more on that below).	Medium to long term
	Separate social functions from SOEs so that economies of scale and scope can be better realized under such separation.	Short to medium term
	Improve SOE management. The management and supervision of SOEs should be strengthened to raise their efficiency.	Medium term

Area	Measure	Time Frame for Implementation
Credit	Strengthen equity and corporate bond financing, especially for larger companies	Short to medium term
	Increase the share of businesses loans, in particular to micro and small enterprises (MSEs)	Medium to long term
	Increase the share of loans to the private sector (instead of SOEs)	Medium to long term
	Remove implicit guarantees for SOEs and end their preferential borrowing conditions	Medium term
	Move to longer-term financing, while banks should concentrate on improving their ability to assess credit risks	Short to medium term
	Improve banks (operational) efficiency	Medium term
Structural change (Box 3)	Focus more on service sector development to facilitate structural change from industry to services.	Short to medium term
	Address income inequality to boost household consumption	Medium to long term
	Strengthen basic public services to and social security to reduce the need for precautionary savings	Medium to long term
Total Factor Productivity		
Sectoral labor shift	Social security reforms (e.g., centralizing unemployment benefits and increase the portability of health insurance and pensions) to improve labor mobility	Medium to long term
	Loosen hukou (residence permit) restrictions to facilitate labor migration to urban areas	Short to medium term
Trade openness	Continue to engage in and advance international trade (and services) agreements	Medium to long term
	Specialize in certain industries and keep room to import in others	Medium to long term
FDI	Loosen restrictions on foreign direct investment (FDI) inflows by revising and shortening the negative list for FDI	Short to medium term
	Reduce remaining joint venture requirements that potentially hold back investors	Short to medium term
R&D	Rein in the misappropriation of research and development (R&D) funds	Short term
	Invest more in basic research, especially on enterprise level	Medium to long term
	Increase the quality of patents issued by strengthening their review	Medium to long term
	Strengthen IP rights protection	Medium to long term

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