

December, 2017

## Digital Asia 5.0

### -Innovation changes economic power relationships

- India, Philippines and Vietnam to post high growth in 2030
- India to overtake Japan in terms of economic scale by 2028
- China's growth rate to slow to 2.8% despite high productivity

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The Japan Center for Economic Research on Dec. 5 released its third Medium-Term Asian Economic Forecast for 2017 through 2030, titled “Digital Asia 5.0 – Innovation changes economic power relationships.”

Since the end of World War II, Asia has experienced numerous upheavals, from regional wars to economic crises. While the engines of growth have shifted time and again, the Asian economy as a whole has steadily expanded. The main growth drivers have adapted their industrial structures to new innovation, such as information technology devices, and expanded their economies by exporting new equipment and devices to advanced countries, especially the U.S.

The first center of growth was Japan, which kick-started its economy by tapping special demand sparked by the Korean War in 1950. Japan led the region's growth until the Vietnam War escalated around 1965. We call this initial period Asia 1.0.

Demand linked to the war in Vietnam launched the Newly Industrializing Economies (NIEs), such as South Korea and Taiwan, into a period of high growth. Their economies expanded rapidly through the introduction of export-oriented industrialization policies. Japan also achieved relatively high growth by leading the development and manufacturing of audio-visual products, such as radios, television sets and video tape recorders. This period, which lasted until 1985, was Asia 2.0.

The Plaza Accord of 1985 was a turning point for Japan. As the yen had rapidly appreciated against the dollar, investment flowed from Japan into Southeast Asian countries such as Thailand and Malaysia, as well as China. The transfer of production from Japan to these countries accelerated. Furthermore, the rise of the personal computer industry fueled the growth of these other economies. We consider this period Asia 3.0. However, when the Asian currency crisis hit in 1997, the ASEAN economy started to stall. China went on to strengthen its position as the “world's factory.”

The PC and mobile phone industry helped China establish a dominant position in manufacturing. We call this period Digital Asia 4.0. And now, we see the region moving into a new era: “Digital Asia 5.0.” Led by the proliferation of smartphones, digital technologies are spreading into a host of industries and transforming lifestyles.

We have compiled forecasts for Asian economies on the assumption that their ability to adapt to innovation, including digital technology, will have a significant influence on their economic trajectories.

Generally, the production volume of an economy, or its scale -- gross domestic product -- is determined by the multiplication of labor input, capital stock and productivity (total factor productivity, or TFP). TFP has a close relationship with innovation, and to estimate it, we used a “quality of infrastructure index” and a “quality of education and research index,” along with “market openness” and “resource rent.”<sup>1</sup> Labor input was calculated by multiplying the number of employed people by working hours and educational level (length of education). Investment input was estimated using economic growth rates and income levels, with capital stock data published by the International Monetary Fund.

Our forecasts for 2017 to 2030 cover 11 key Asian markets: China, India, the NIEs (South Korea, Taiwan, Hong Kong and Singapore), and the ASEAN5 (Indonesia, Thailand, Malaysia, the Philippines and Vietnam). Japan and the U.S. are also included for the sake of comparison.

### Baseline Scenario

In estimating productivity growth, the infrastructure quality index was estimated from urbanization rates. As for the quality of education and research index, we assumed that children's capacity for reading, mathematics and science is affected by the education levels of their parents. The resource rent was calculated using United Nations product price forecasts and the U.S. energy information bureau's crude oil and natural gas production outlook. We worked on the assumption that the market openness index will remain unchanged during the forecast period.

The productivity growth leaders in 2030 will be China (1.6%), Thailand (1.5%) and Vietnam (1.5%). Quality of infrastructure is seen contributing significantly to the growth of productivity (Fig. 1). As urbanization progresses, the development and utilization of communications infrastructure, such as the internet, will also proceed. In China and Vietnam, the contribution of education quality is higher than in Thailand. In Vietnam, resource rent contributes negatively, hampering overall productivity growth.

The next productivity growth tier will include Indonesia (1.4%), Taiwan (1.4%), India (1.3%) and Malaysia (1.2%). In Indonesia and India, infrastructure quality is a

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<sup>1</sup> Regarding the “quality of infrastructure index” and “quality of education and research index,” we referred to “The Global Innovation Index” published by Cornell University, INSEAD and the World Intellectual Property Organization. To gauge “market openness,” we used data from the “Index of Economic Freedom” published by The Heritage Foundation. We used “resource rent” from the World Bank.

major contributor. In Taiwan and Malaysia, education quality is a bigger factor. As for the U.S., South Korea, the Philippines, Hong Kong, Singapore and Japan, their rates are projected at about 1.2% or less. Barring the Philippines, there is relatively little room for further productivity improvements (Fig. 2). The quality of education in the Philippines is the lowest among the countries we analyzed, and we operated on the assumption that future growth is not a given.

Fig.1 TFP growth and each factor's contributions (2030)

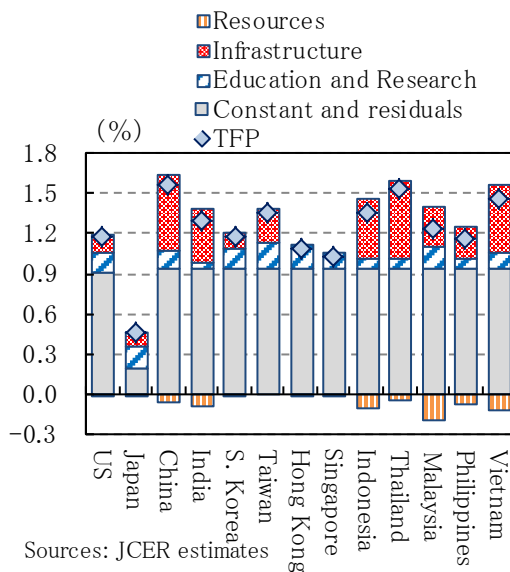
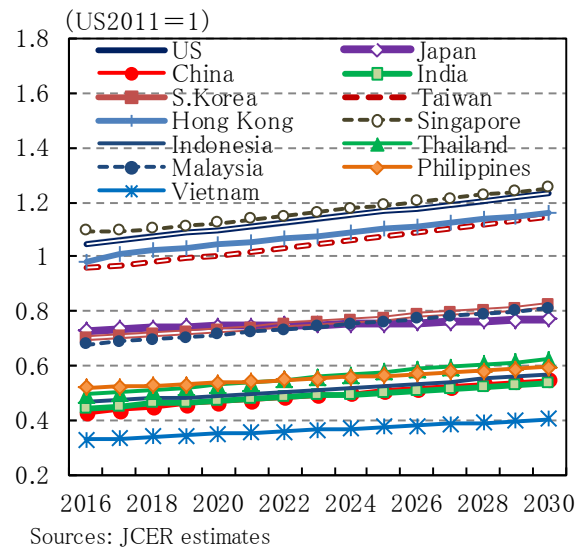


Fig.2 Level of TFP



The economic growth rate breakdown (real GDP growth rates) for 2030 differs from that of productivity growth. The high growth group will include the Philippines (6.4%), India (5.2%) and Vietnam (5.0%) over the next 10 years (Fig. 3). China, which had nearly the same growth rate as India in 2016 -- 6.7% -- will slow down to 2.8% in 2030. Although China can count on high productivity growth, its capital stock adjustment is more advanced (Fig. 4). China's investment ratio to GDP is more than 40%, which stands out compared with other countries. The rate is expected to decline at a pace of 1 point per year and settle around the mid-20% level by 2030.

Although the Philippines' TFP growth rate is low, its capital stock is seen growing at a rate of 6-8% per year. India and Vietnam also boast high capital stock growth, after the Philippines. Among these three countries, India has a relatively large contribution of labor input to GDP growth. In India, the number of employed people is rising in line with the increasing population, and the average length of education is also improving quickly (Fig. 5).

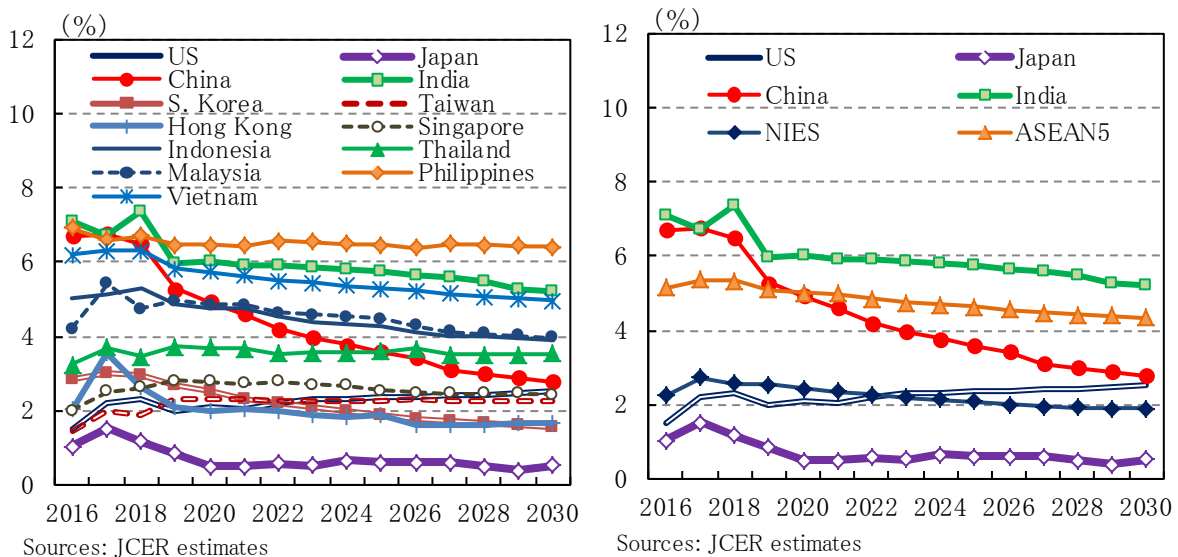
The growth rate for the ASEAN5 in 2030 will be 4.4%, higher than the NIEs (1.9%), China and Japan (0.5%), and the U.S. (2.5%). The bloc will be a high growth region, next to India, thanks in part to the brisk rates of the Philippines and Vietnam. Indonesia, Malaysia and Thailand will chip in with growth rates of 3-4%, higher than China. Thailand has high productivity growth, but labor input is lower than Indonesia and

Malaysia. The number of employed workers is on a downward trend, and education length will have to offset this.

Regarding the NIEs, Singapore's growth rate in 2030 will be 2.4%, Taiwan's 2.2%, Hong Kong's 1.7% and South Korea's 1.6%. Only in Singapore, employed people contribute positively. In Taiwan, the growth of TFP compensates for the decrease in employed people. In the U.S., the growth rate will be 2.5%, next to China, with an increase in employed people. In Japan, which will have the lowest growth rate, labor input is negative, and neither TFP nor the capital stock is likely to grow much.

We also assessed economic scale (nominal GDP based on market dollar conversion) and prosperity (nominal GDP per capita) from the GDP growth rate outlook.

Fig.3 Real GDP growth rate



Although China's growth rate will decelerate toward 2030, its economic scale, which was about 60% of the U.S. in 2016, will approach 80% by 2030. But like Japan, which approached 70% of America's scale in the mid-1990s, China will not be able to catch up with the U.S. -- though it will get closer than Japan did at its peak.

China will remain the second-largest economy, well ahead of Japan. In fact, it will be 4.4 times larger than Japan, widening the gap from 2.3 times in 2016. China can be expected to continue accounting for about half of Asia's growth in the coming years.

But India is set to take over China's role as Asia's main growth driver in the 2030s. India, whose economy was equivalent to about 50% of Japan in 2016, will surpass Japan in 2028 and be 1.2 times larger in 2030. Now the world's seventh-largest economy, India is poised to move into third place.

There are other looming shifts in economic power: Indonesia will catch up with South Korea around 2030. The Philippines will overtake Thailand in 2027 and also Taiwan in 2029. Malaysia will widen the gap with Singapore, and Vietnam will overtake Singapore in 2027. The center of gravity in Asia is shifting from the east to

the south -- India and ASEAN -- both in terms of population and economic size.

As for prosperity, Malaysia will become a high-income country in 2023, with nominal GDP per capita over \$12,000. Two years later, China will also become a high-income country. But China will not catch up with Malaysia by 2030. Thailand is likely to fall short of high-income status.

Indonesia will be an upper middle-income country in 2019, with GDP per capita of over \$4,000. The Philippines will reach that level in 2022, with Vietnam following in 2028. The Philippines will overtake Indonesia in 2029. India will not yet reach the upper middle-income level despite its fast growth. Singapore will be the only Asian state to catch up with the U.S., widening the gap with Hong Kong and Japan. Hong Kong will pull further ahead of Japan, with South Korea gaining ground from behind.

Fig.4 Contributions to GDP growth (2030)

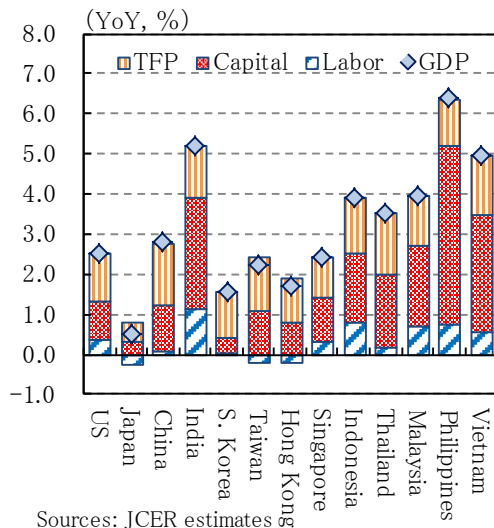


Fig.5 Contributions to labor input growth (2030)

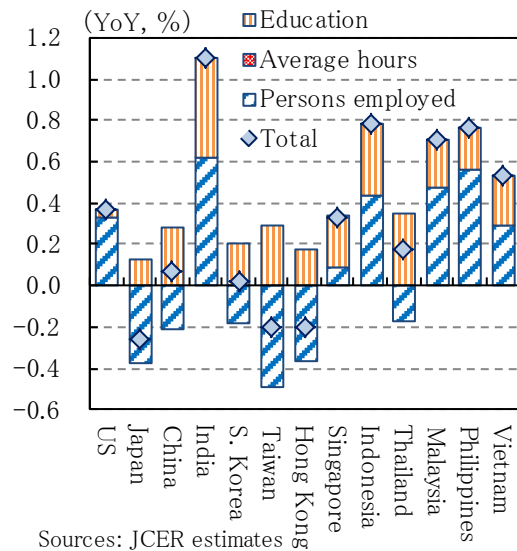
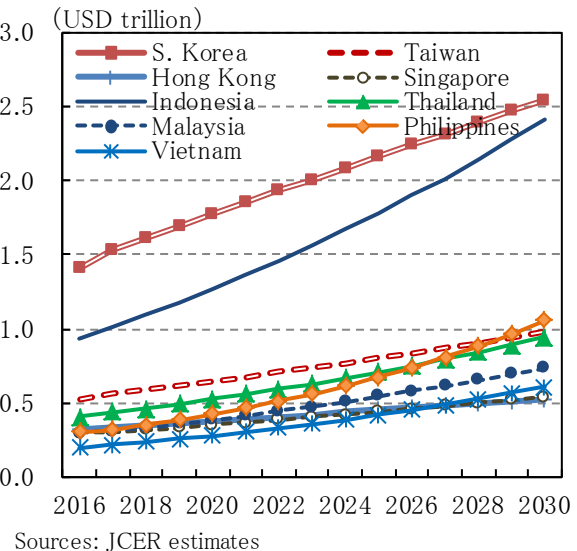
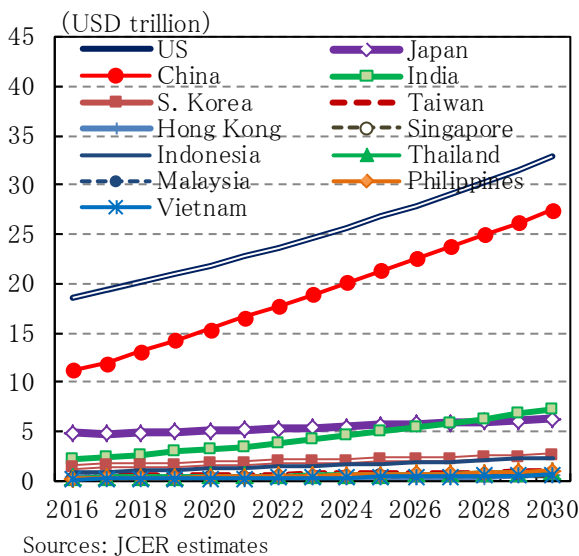


Fig.6 Economic scale (Nominal GDP in market U.S. dollars)



### Innovation Acceleration Scenario

We also envisioned a scenario in which Chinese and Indian innovation accelerates toward 2030, compared with the baseline scenario. Startups are sprouting as venture capital investment flocks to both countries, stoking digital innovation. Following the U.S., both nations are home to growing numbers of unicorn companies -- unlisted ventures valued at more than \$1 billion.

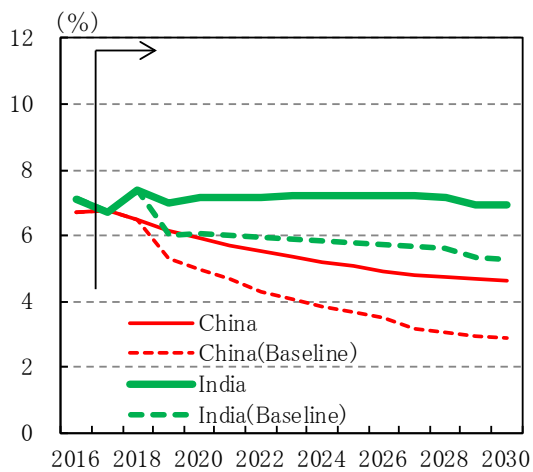
This led us to assume that China's and India's quality of infrastructure indexes and quality of education and research indexes -- major variables of TFP -- could prove to be higher than in the baseline scenario. China would catch up with the U.S. in 2030 by both metrics, while India would catch up with Malaysia in education and its infrastructure level would reach the current level of Thailand.

If things play out this way, China's growth rate in 2030 would rise to 4.6%, higher than Malaysia's and Indonesia's. India's would be 6.9%, higher than that of the Philippines. China's TFP contribution to GDP growth would be 2.9% (versus 1.6% in the baseline scenario). India's TFP contribution would be 2.2% (versus 1.3%).

In terms of economic scale, China would surpass the U.S. in 2029 and become the world's largest economy. India would overtake Japan in 2026, two years earlier than in the baseline scenario. India would be 1.4 times larger than Japan in 2030.

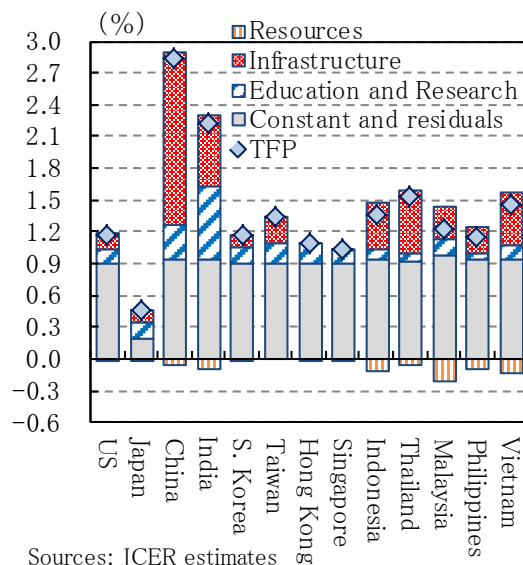
Regarding nominal GDP per capita, China would overtake Malaysia in 2023, and by 2030 would be about a quarter of the U.S. and about half of South Korea. India would become an upper middle-income country in 2028 and overtake Vietnam in 2029.

Fig.8 Growth rate of China and India



Sources: JCER estimates

Fig.9 Contributions to TFP growth (2030)



Sources: JCER estimates

Fig.10 Economic scale

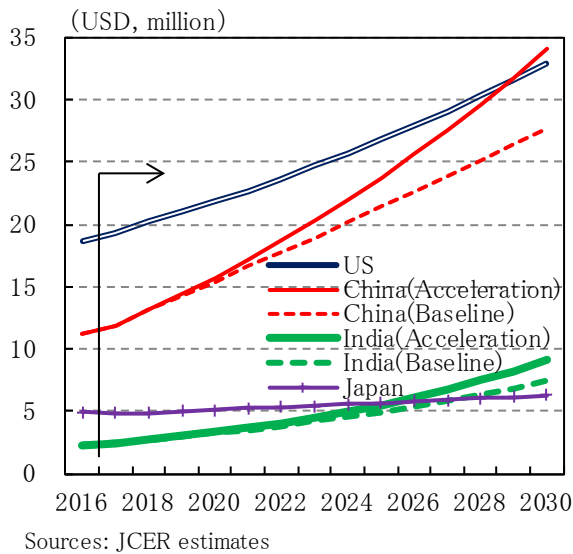
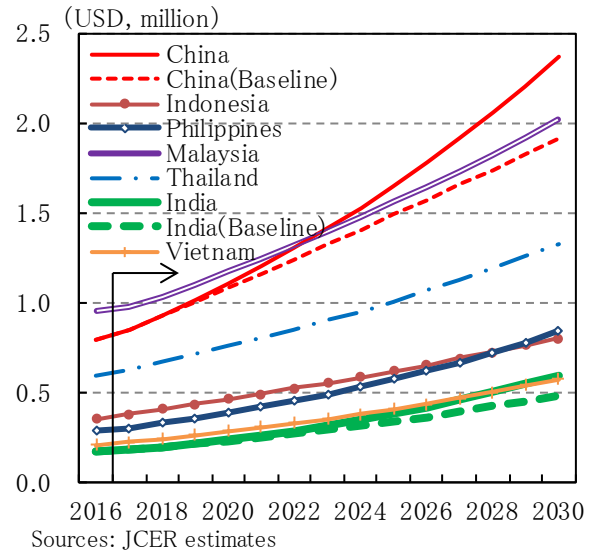


Fig.11 Prosperity



### China Crisis Scenario

Yet, there are also concerns about China's excessive production capacity and debt. There are many signs that China could be headed for a financial crisis. For example, the investment ratio to GDP exceeds 40% since 2008, and the total debt to GDP ratio of the government and private sector is now over 250%. As overheated investment leads to an expansion of debt, it would not be surprising to see China enter a debt adjustment phase.

Using our macroeconomic model, we simulated a situation in which the adjustment phase starts in China in 2020 -- following similar periods of investment adjustment in other Asian countries during the currency crisis of 1997. We calculated the average adjustment process of the ASEAN4 (excluding Vietnam) and three NIEs economies (excluding Taiwan). And as a result, we assumed that China's capital stock growth rate, which was around 6% in 2020, would fall rapidly to the 1% level over two years, before gradually recovering and reaching around 2% in 2030.

At the same time, the TFP growth rate would also decline steeply during the first and second years of a crisis, as efficiency would be lost due to the slowdown in the capital stock utilization rate. As such, China's growth rate in 2021 and 2022 would be minus 4.0% and minus 3.3%, respectively. From the third year onward, the growth rate would return to a level close to the baseline scenario.

China's economic scale would remain at two-thirds of the U.S. in 2030, while becoming 3.4 times larger than Japan. China's nominal GDP per capita would be 20% lower than the baseline scenario. China would not be able to join the high-income country club in 2030, and would be stuck behind Malaysia and slightly ahead of Thailand. The renminbi rate against the dollar would be 8.3 yuan, declining by 20% in 2030 compared with 2016.

Fig.12 Growth Rate

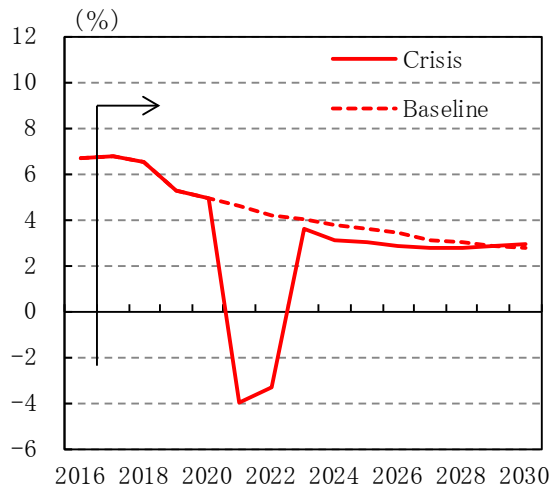


Fig.13 Economic scale

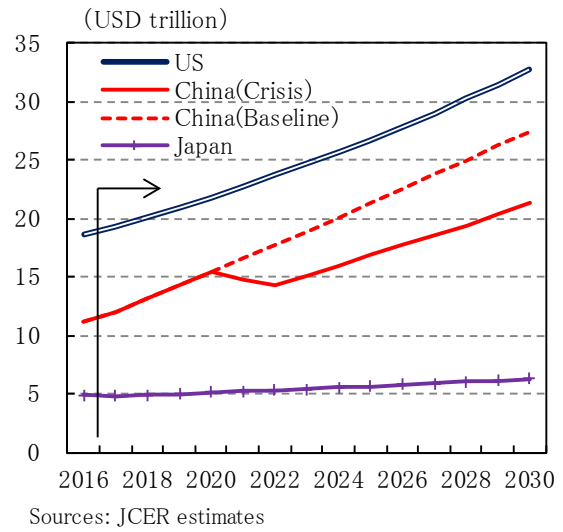


Fig.14 Prosperity

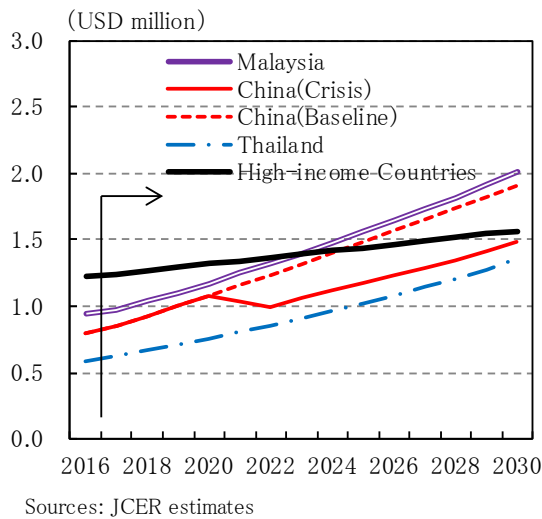
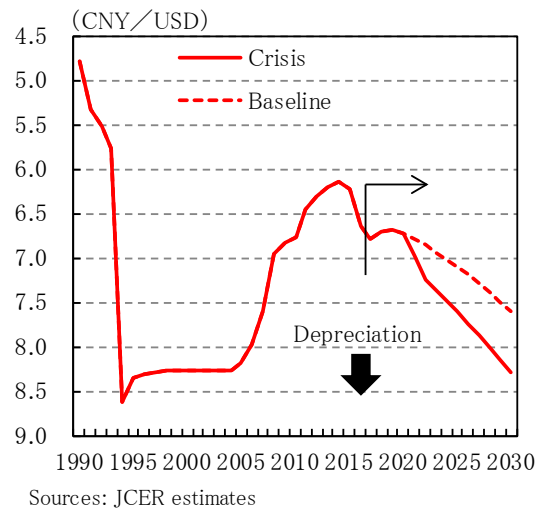


Fig.15 Currency rate



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