

# Global Imbalance and Demographic Changes

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# 1. Introduction

1. The joint communique of the G20 Finance Ministers and Central Bank Governors Meeting in June 2019 endorsed the view that there still exists global imbalances which remain large and persistent.
  - They are centering on advanced economies with shrinking tendency among emerging economies.
  - It is noted that there are two categories of global imbalances; one is based on fundamental factors, while the other arises from excessive and risky factors.
  - Before the global financial crisis we observed that the global imbalances peaked out in 2007/2008 and shrunk sharply in 2009.

# 1. Introduction

2. In the current bilateral US-Japan trade talk, the issue on “currency clause” has emerged as one of the agenda for negotiations.

- Both the KORUS and the USMCA included the “currency clause”.

3. The US Treasury adopts the three criteria to identify currency manipulation for the 20 trading partner countries with bilateral trade value exceeding \$ 40 billion.

- Bilateral trade balance surplus more than \$20 billion

- Current account surplus more than 2% of nominal GDP

- Intervention in the foreign exchange market more than 2% of nominal GDP within one year

# 1. Introduction

4. Moreover the US Department of Commerce made an announcement to reexamine the use of countervailing duty against subsidy and currency manipulation.

5. In our view, currency manipulation may be associated with the size of intervention in the foreign exchange market with the aim of avoiding the relative price changes affecting the competitiveness of exports and trade protectionism (currency and trade war).

- Collins and Gagnon (2019) pointed out that Singapore, Norway and Macao met the criteria for manipulation put forth by Bergsten and Gagnon (2017).

# 1. Introduction

6. However, we should take into account the needed changes in exchange rates as following;

- To the extent that widening global imbalance fueled the financial crisis, the reduction of global imbalance requires the right speed of adjustment toward full employment by mobilizing various policies including the changes in exchange rates to achieve the successful rebalancing (King(2010)).
- Lower natural interest rate in one country may induce its currency depreciation which may not be associated with currency war (Clarida(2017)).

# 1. Introduction

7. According to the consensus view among economists, the current account balance is basically determined by the difference between domestic saving and investment.

- We argue here that in economic growth, external balance is determined by the difference of fundamental determinants of economic growth between home country and trading partner countries.

8. Our presentation today also focus on the effects of demographic changes on the future development of current account balance in four major countries/area(Japan, US, EA and China), based on neoclassical growth model in an open economy.

## 2. Aging Process

1. According to the UN World Population Prospect (2019), Japan is a front-runner of demographic changes.

- Working age population (15-64 year old) began to decline in 1995; its decline has accelerated in the 2010s, despite the slight increase in labor participation rate (Figure 1).
- Old-age dependency ratio (65 year old and more) reached at 43% in 2015.
- Life expectancy will be extended from 81/87 year old in 2015 to 86/92 year old in 2060 with about 20% of population enjoying a “100 year life”.
- Biological healthy age will be 76/79 year old in 2060, while it was 72/75 year old in 2016. In 1970 the biological healthy age was 65 year old which corresponds to today's retirement age.

## 2. Aging Process

2. In the US, the working age population will continue to moderately increase coupled with the decline in labor participation rate (Figure 2).

- It is assumed here that immigration will continue to increase on the past trend, despite the radical changes in immigration policy under Trump administration.

3. In the Euro area, the working age population will moderately decrease (Figure 3).

4. In China, the working age population peaked out in mid-2010s; it will sharply decline after 2020, coupled with the declining tendency of labor participation rate (Figure 4).



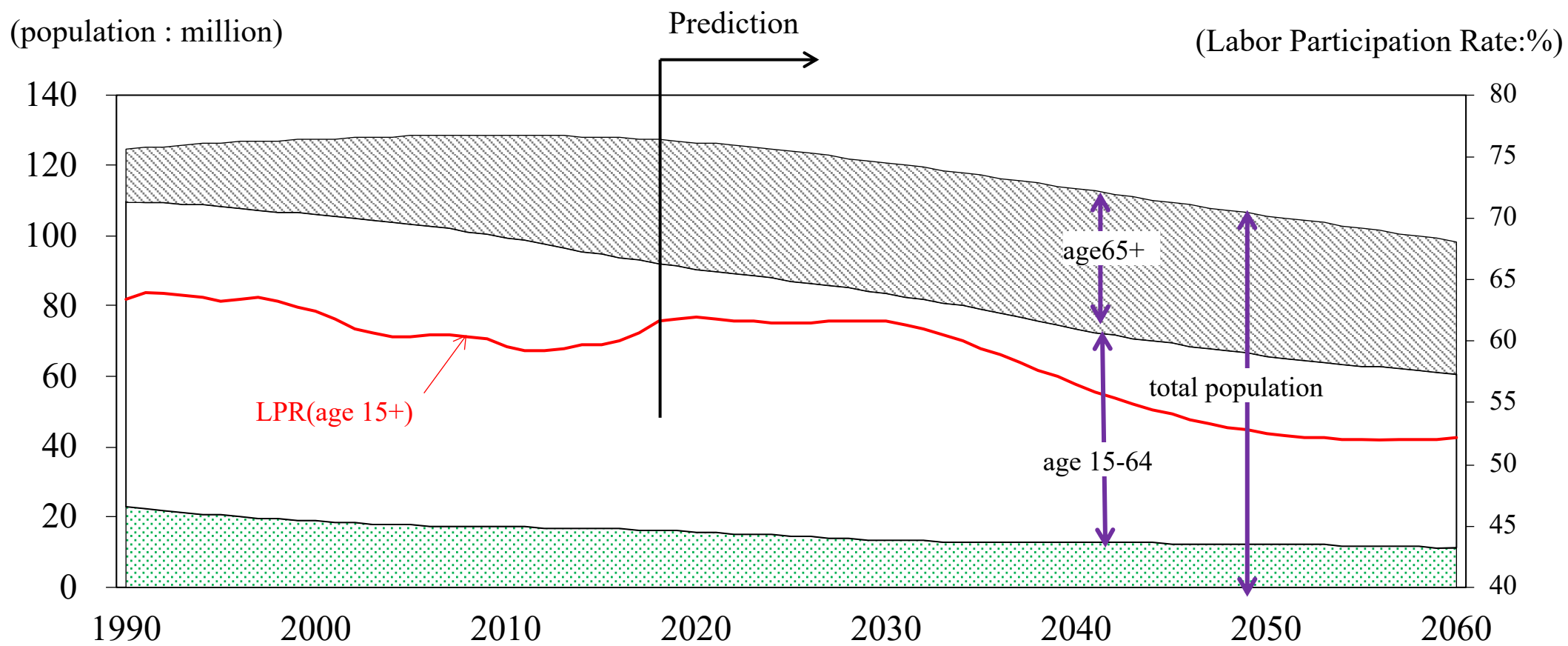
## 2. Aging Process

5. It is interesting to note that in Japan secular stagnation began in mid-1990s, when the working age population started to decline.

- The natural interest rate registered sharp decline since mid-1990s and hovered around in negative territory after end-1990s according to the JCER estimate; currently it stands at negative 0.5% (Figure 5).

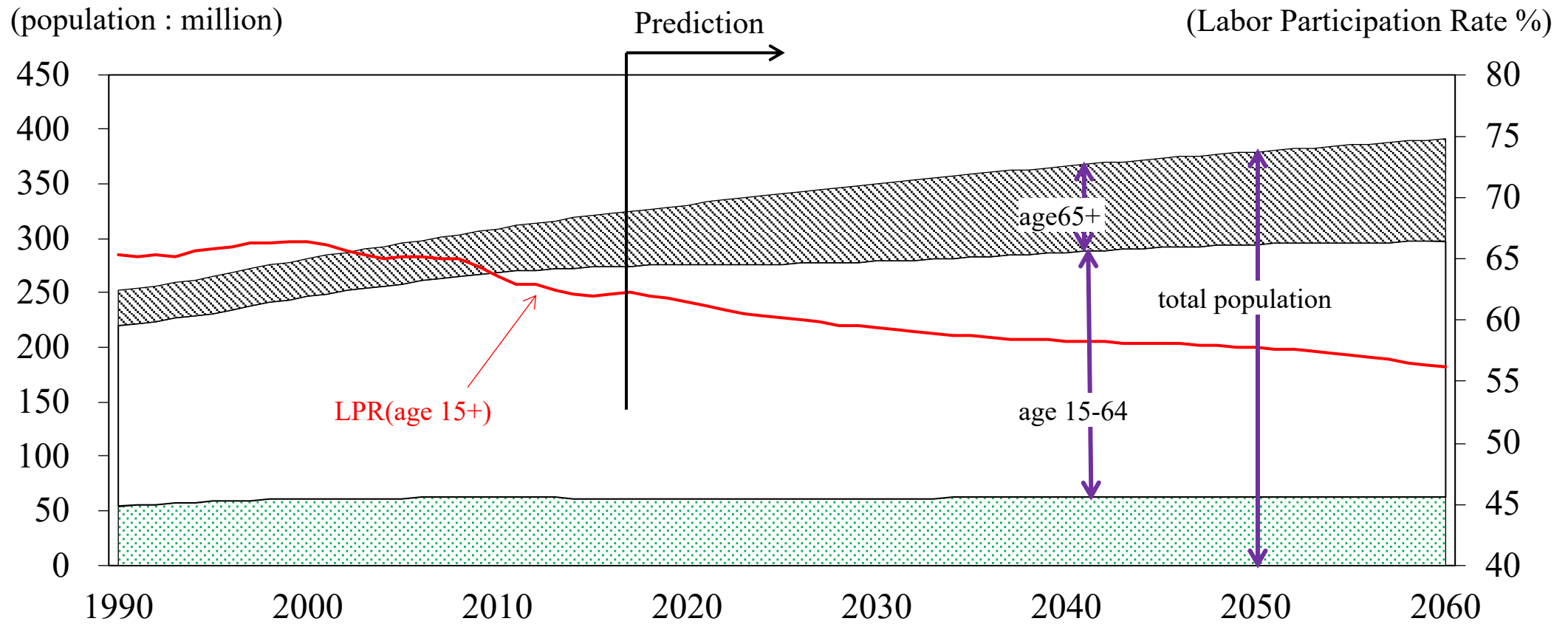
- Negative natural interest rate implies that future real per capita consumption growth rate will be negative (lowering living standards), while the neutral nominal interest rate remains in the negative territory, given low inflation expectation (0.1%) measured by inflation swap rate in the recent period.

# Figure 1. Total population, working age population and labor force in Japan (1990-2060)



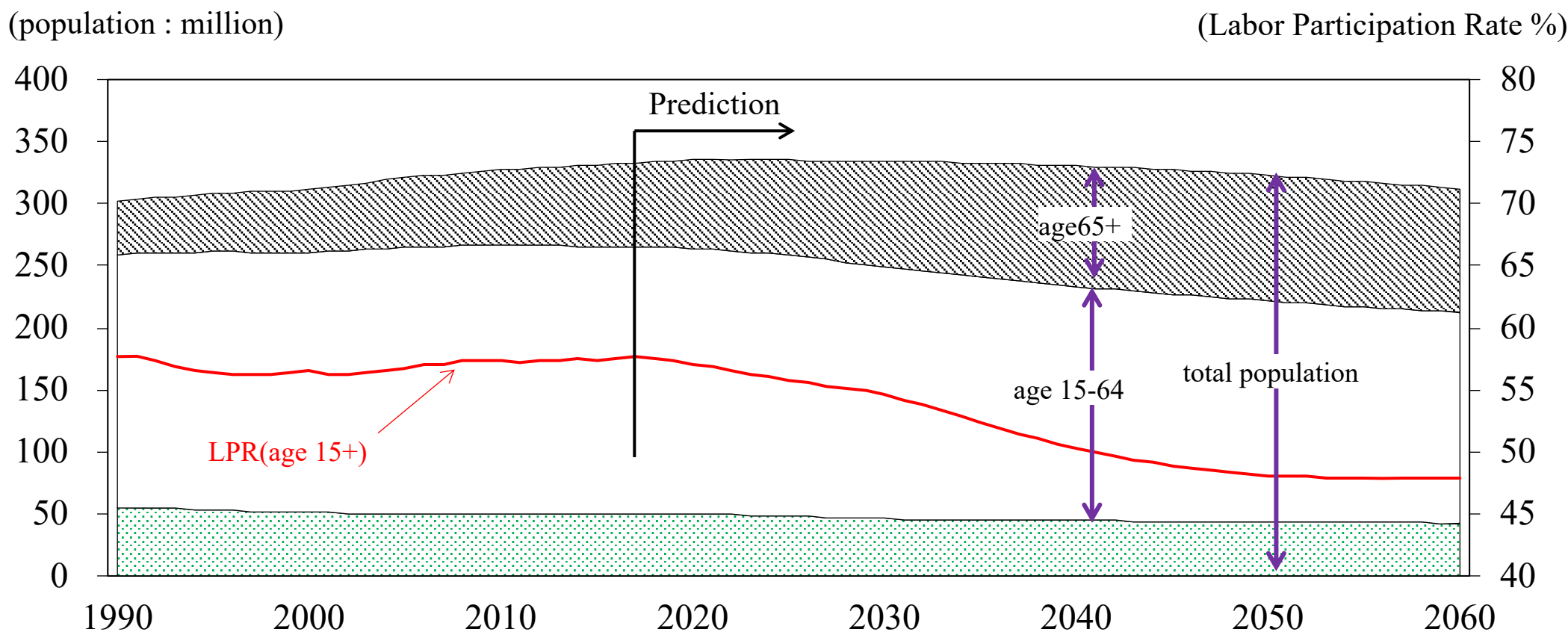
Source: UN Population Prospect, ILOSTAT, Japan Center for Economic Research

# Figure 2. Total population, working age population and labor force in US (1990-2060)



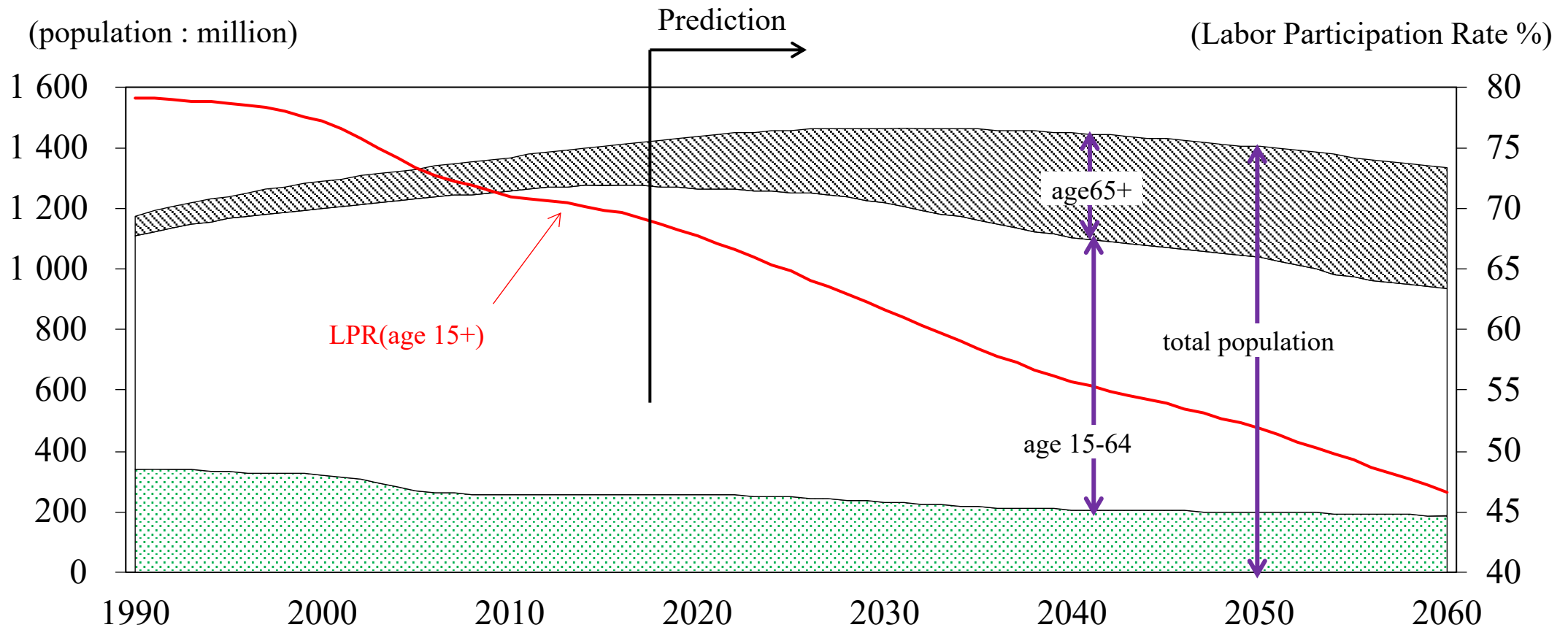
Source: UN Population Prospect, ILOSTAT, Japan Center for Economic Research

# Figure 3. Total population, working age population and labor force in Euro Area (1990-2060)



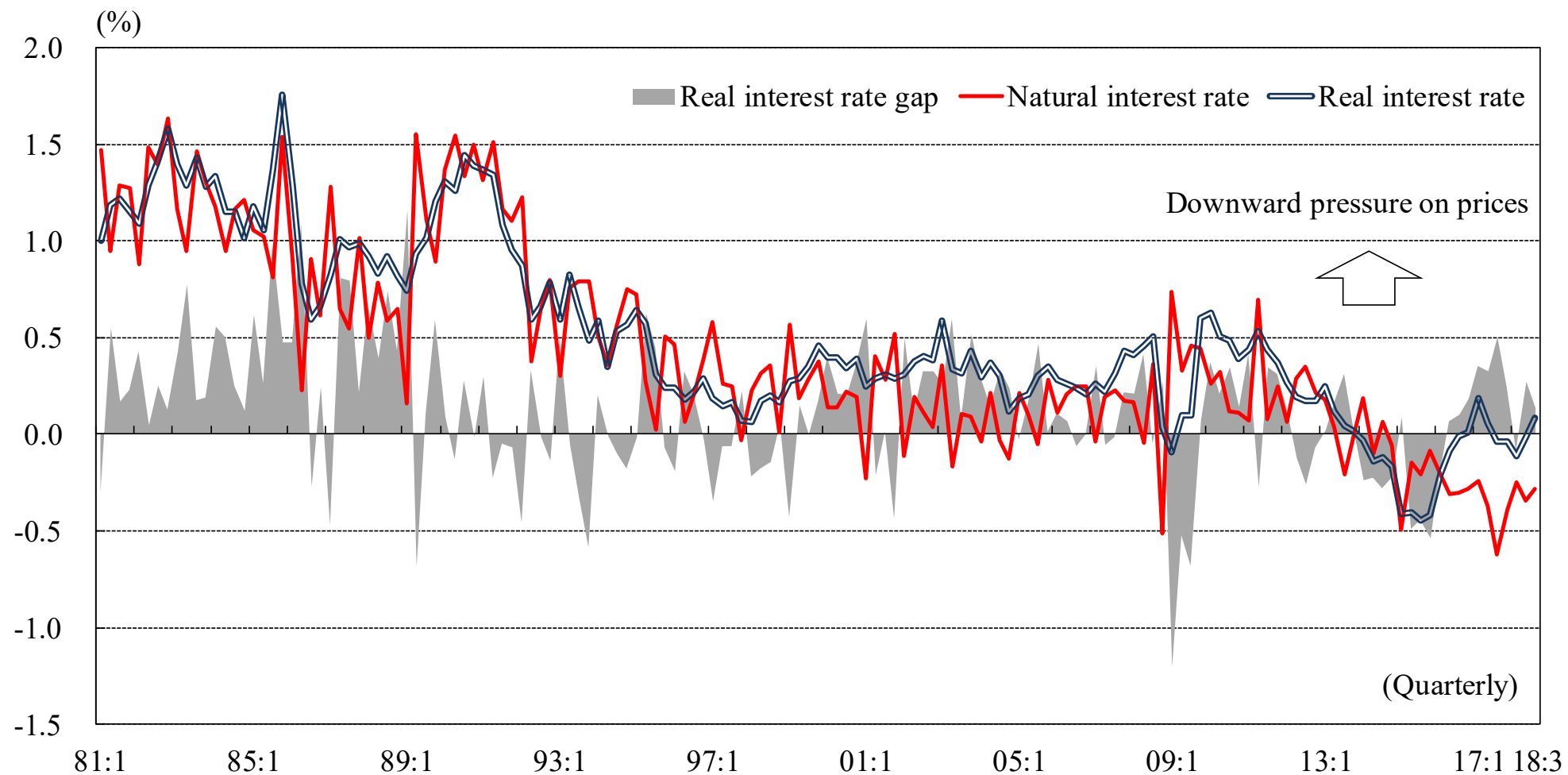
Source: UN Population Prospect, ILOSTAT, Japan Center for Economic Research

# Figure 4. Total population, working age population and labor force in China (1990-2060)



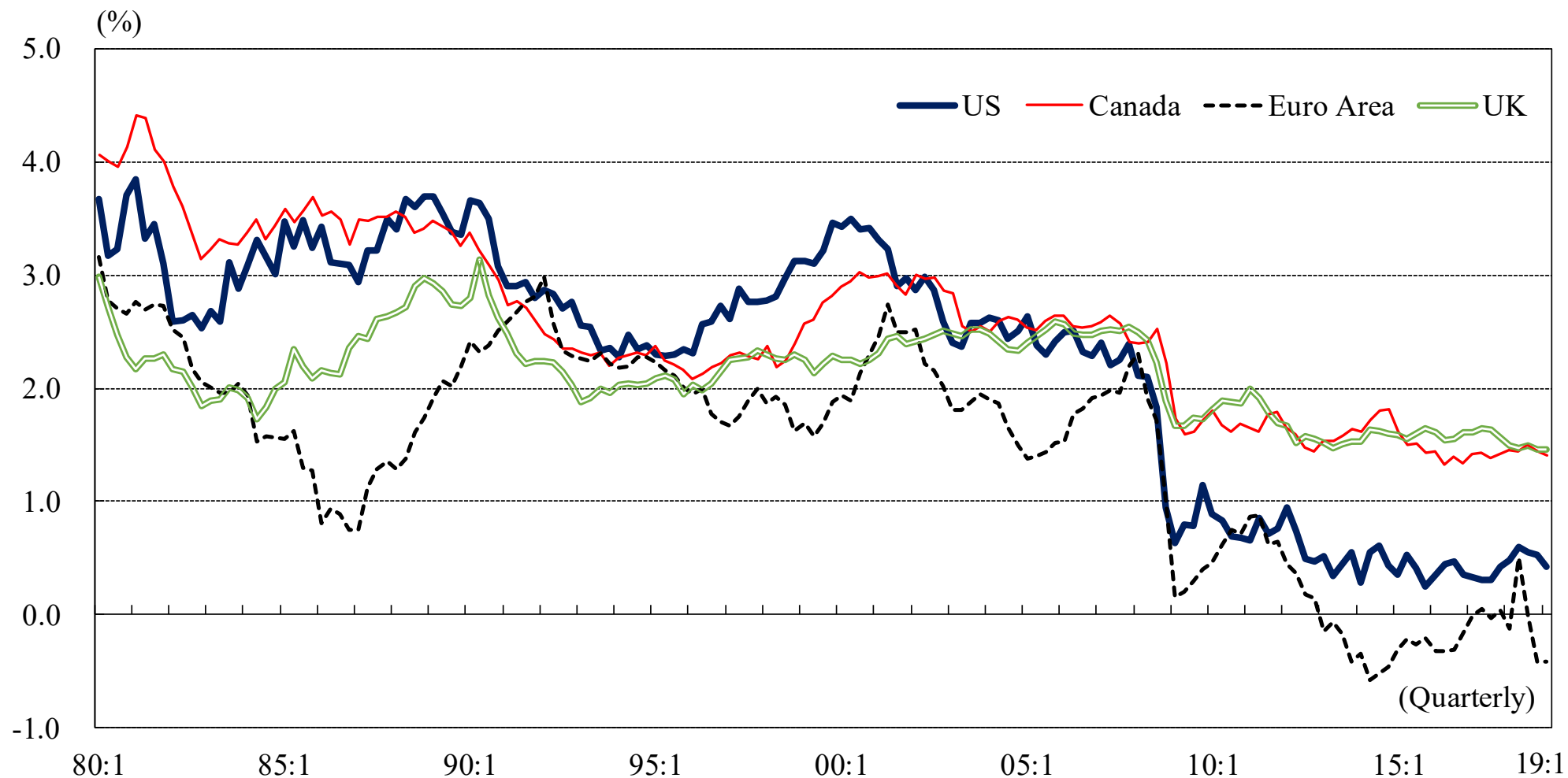
Source: UN Population Prospect, ILOSTAT, Japan Center for Economic Research

# Figure 5. The Natural Interest Rate in Japan



Source: Japan Center for Economic Research

# Figure 6. The Natural Interest Rate in Main countries



Source: Federal Reserve Bank of New York,  
Holston, Laubach, and Williams (2017)

### 3. Theoretical Framework

1. The model is a simple extension of the Solow growth model to an open economy, characterized by exogenously given net national saving ratio, labor force growth rate combined with labor augmenting technological progress (See, Hamada=Iwata(1986), Hamada=Iwata(1989), Iwata(1991) and Iwata(1997)).
2. Under the assumption of the same production function with the Harrod neutral technological rate of changes in the four countries/area without financial frictions(one money in the world and no home bias of asset holdings in the absence of asymmetric information), the rate of return on capital converges to the world rate of return on capital.



### 3. Theoretical Framework

$$P = F(K, AL) = ALf(k), \quad P^* = F(K^*, A^*L^*) = A^*L^*f(k^*) \quad (1)$$

$$r = r^* \Leftrightarrow f'(k) = f'(k^*) \quad (2)$$

As a result, the capital-labor ratio is also equalized.

$$\frac{K}{AL} = \frac{K^*}{A^*L^*} \quad (3)$$

Net borrowing from abroad can be defined as following;

$$\frac{dD}{dt} = \frac{dK}{dt} - S \quad (4)$$

### 3. Theoretical Framework

3. Then, we can obtain the results as following;

$$\frac{dD}{dt} = (s^* - s) \frac{KK^*}{K_w^2} Y_w + (n - n^*) \frac{KK^*}{K_w} + (g - g^*) \frac{KK^*}{K_w} + \left( \frac{sK^* + s^*K}{K_w} \right) rD \quad (5)$$

$D$ : net foreign debt;  $K$ : net capital stock;  $K_w$ : world net capital stock;

$Y_w$ : world net national product;  $s$ : net national saving ratio;

$n$ : labor force growth rate;  $g$ : labor augmenting technological progress;

$r$ : the rate of return on capital stock

: asterisk(\*) stands for weighted average values of three trading partner countries/area and subscript  $w$  indicates the world total value

### 3. Theoretical Framework

4. Alternatively, the current account deficit of home country normalized by capital stocks can be expressed in more simple way as below;

$$\frac{dD}{dt} / \frac{KK^*}{K_w} = \left( \frac{S^*}{K^*} - \frac{S}{K} \right) + (n - n^*) + (g - g^*) \quad (6)$$

5. Within the two-country model framework, the current account surplus/deficit can be explained by the fundamental determinants of economic growth, in addition to the earnings on net foreign asset (or repayment on foreign borrowing). Namely,

- difference of net national saving ratios
- difference of labor force growth rates
- difference of labor augmenting technological rates of change
- earnings/repayment on net foreign asset/borrowing

### 3. Theoretical Framework

6. Higher the national saving ratio, more likely the country tends to register current account surplus.

- Higher the labor force growth rate and technological rate of changes, the country tends to register current account deficit, reflecting the stronger demand for domestic investment.

7. Japan's net national saving ratio has declined moderately as a trend, mainly reflecting decreasing trend of household's excess saving ratio (Figure 7, 8).

- Yet, the rise of non-financial corporate excess saving ratio after mid-1990s compensated the decline of households excess saving ratio (Figure 8).

- Government excess saving ratio continued to register sizable negative values, mainly due to the increasing social security benefit payments in an aging society.

### 3. Theoretical Framework

8. US's net national saving ratio remained at low level, mainly reflecting the excess investment ratio by government sector.

- Both non-financial corporate and household's excess saving ratio remained close at zero (Figure 9).

9. In the Euro area, net national saving ratio remained stable, except for the period of global financial crisis due to the worsening government excess saving ratio (Figure 10).

10. China's net national saving ratio has accelerated rapidly since 2000 and declined after 2007, reflecting the worsening non-financial corporate excess saving ratio (Figure 11).

- China's net national saving ratio peaked out in 2007; it is still highest among four countries/area.

# 3. Theoretical Framework

11. Labor force will diminish sizably, except for the US (Figure 12).

- Labor force growth rate will become negative in Japan after 2020; the labor force in 2060 will shrink to about 60% the size in 2015.
- China's labor force growth rate became negative after 2015; the size of decline from 2018 to 2060 will be the largest; its size will be below 50% in comparison with that in 2015.
- US labor force will remain stable with slight upward trend.
- Euro area started to moderately decline in 2018 and will continue to slide down.

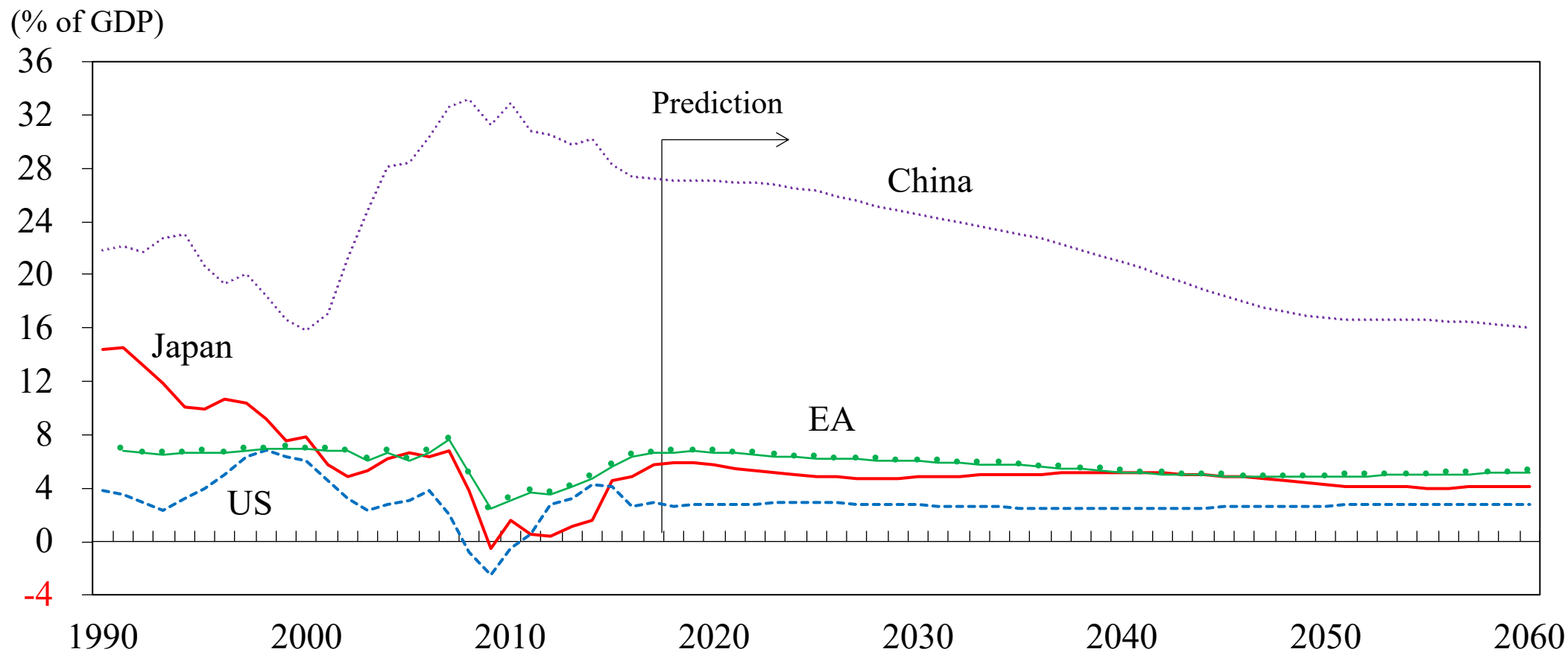
### 3. Theoretical Framework

12. Labor augmenting technological progress in China was so rapid during the 2000s, far exceeding those of advanced countries. But after the great financial crisis it started to decelerate significantly (Figure 13).

- In the US, Japan and the Euro area, we see converging tendency after the great financial crisis to a lower level.

13. We may note that the difference of net national saving ratios is larger (Figure 7) than the differences both of labor force growth rate and labor augmenting technological rate of change (Figure 12, 13).

# Figure 7. Net National Saving Ratio Japan, US, EA and China (1995-2060)

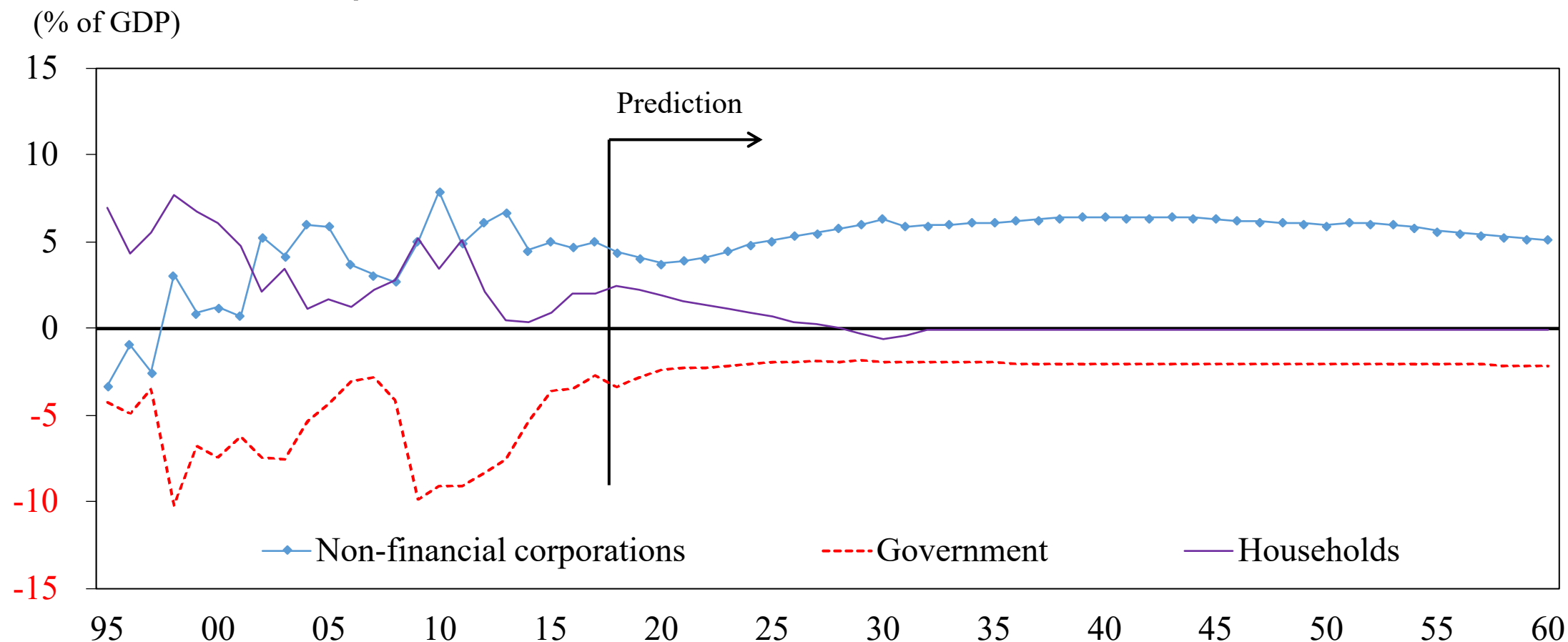


Source: OECD EO Database

Note: China's depletion rate is the average of other countries'.

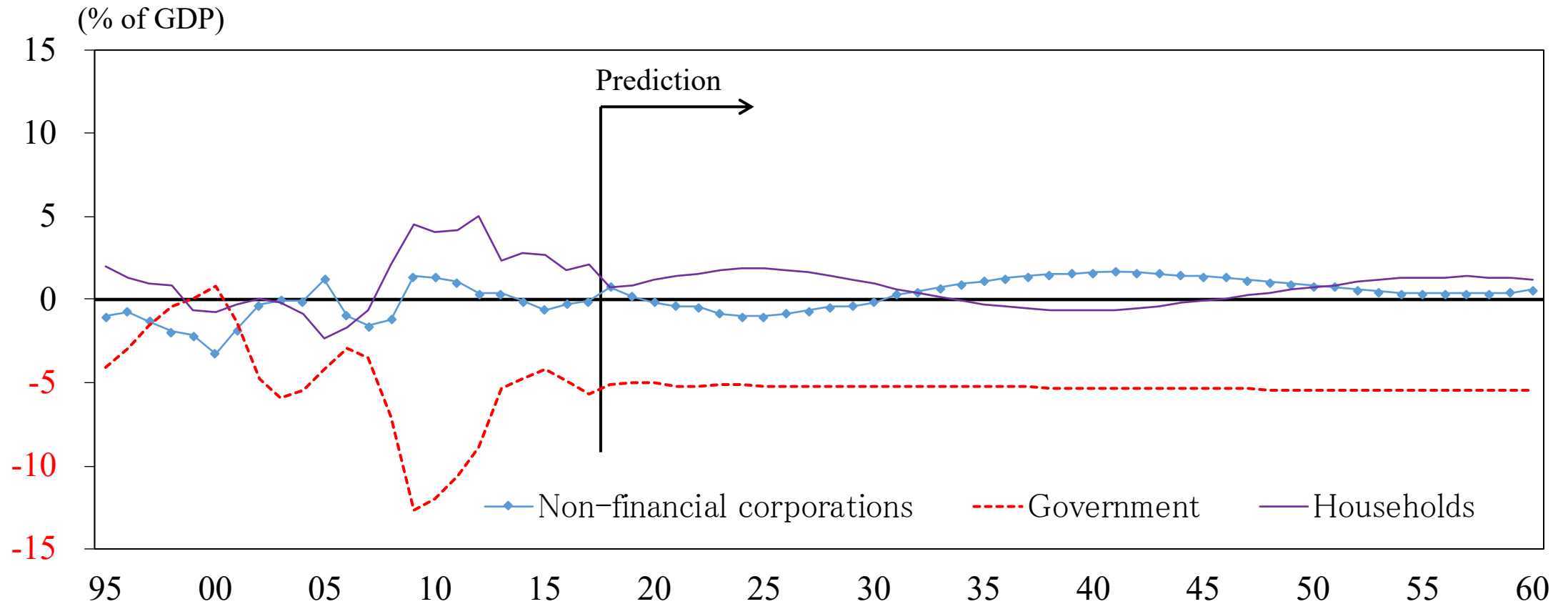


Figure 8. Investment-Saving Balance by sectors  
(household, corporate and Government)  
in Japan (1995-2060)



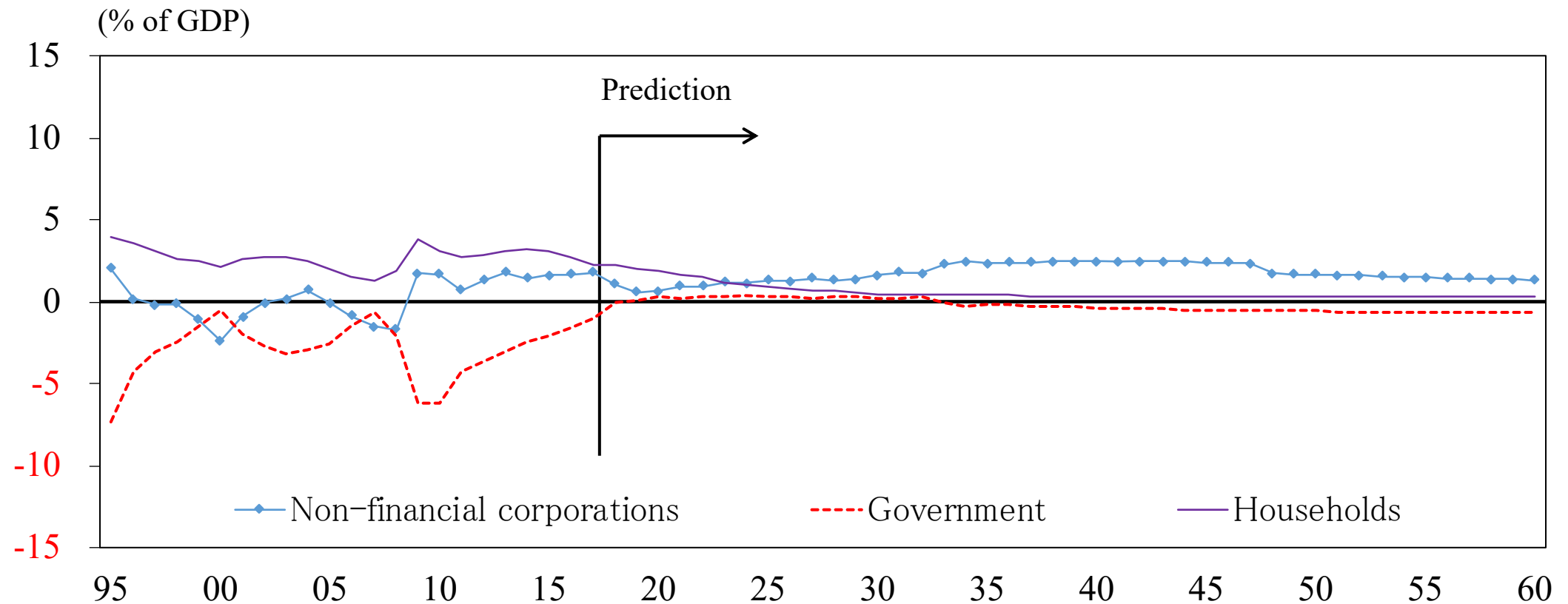
Source: OECD stat

# Figure 9. Investment-Saving Balance by sectors(household, corporate and government) in US (1995-2060)



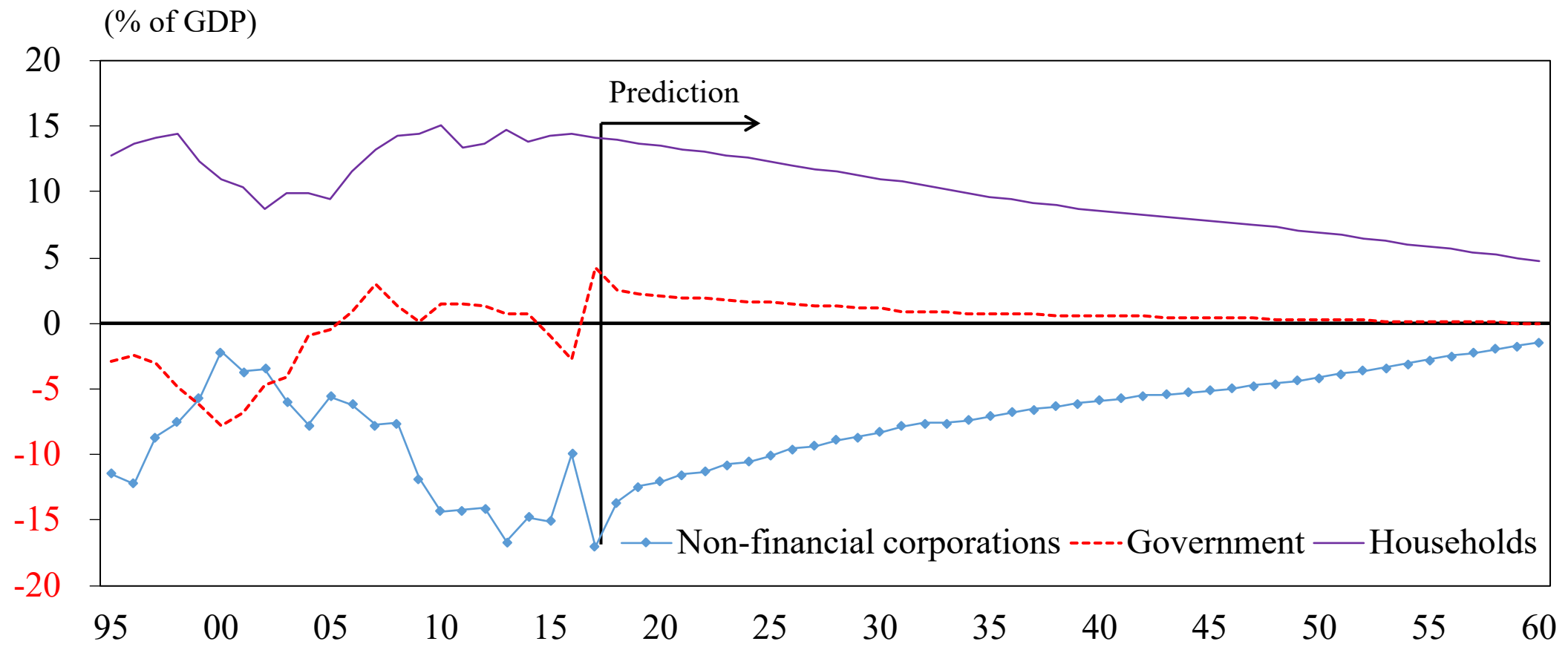
Source: OECD stat

# Figure 10. Investment-Saving Balance by sectors(household, corporate and government) in Euro Area (1995-2060)



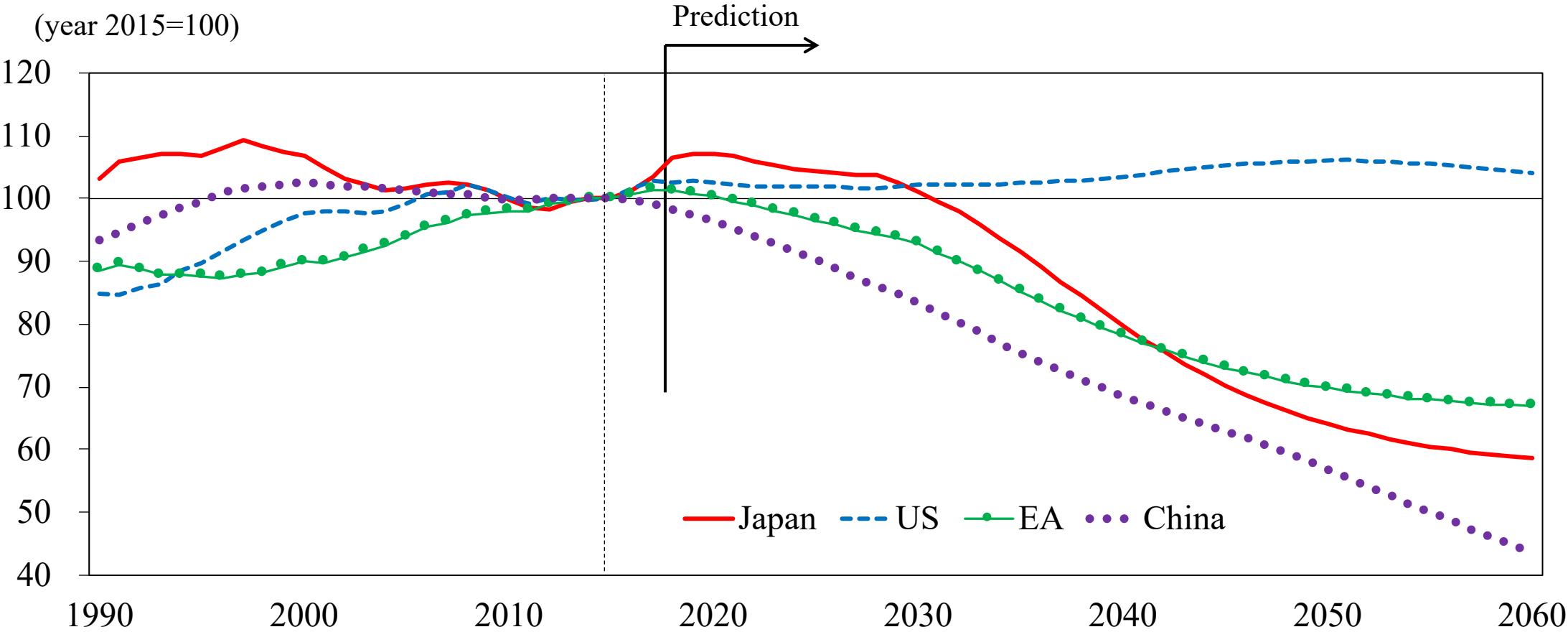
Source: OECD stat

# Figure 11. Investment-Saving Balance by sectors(household, corporate and government) in China (1995-2060)



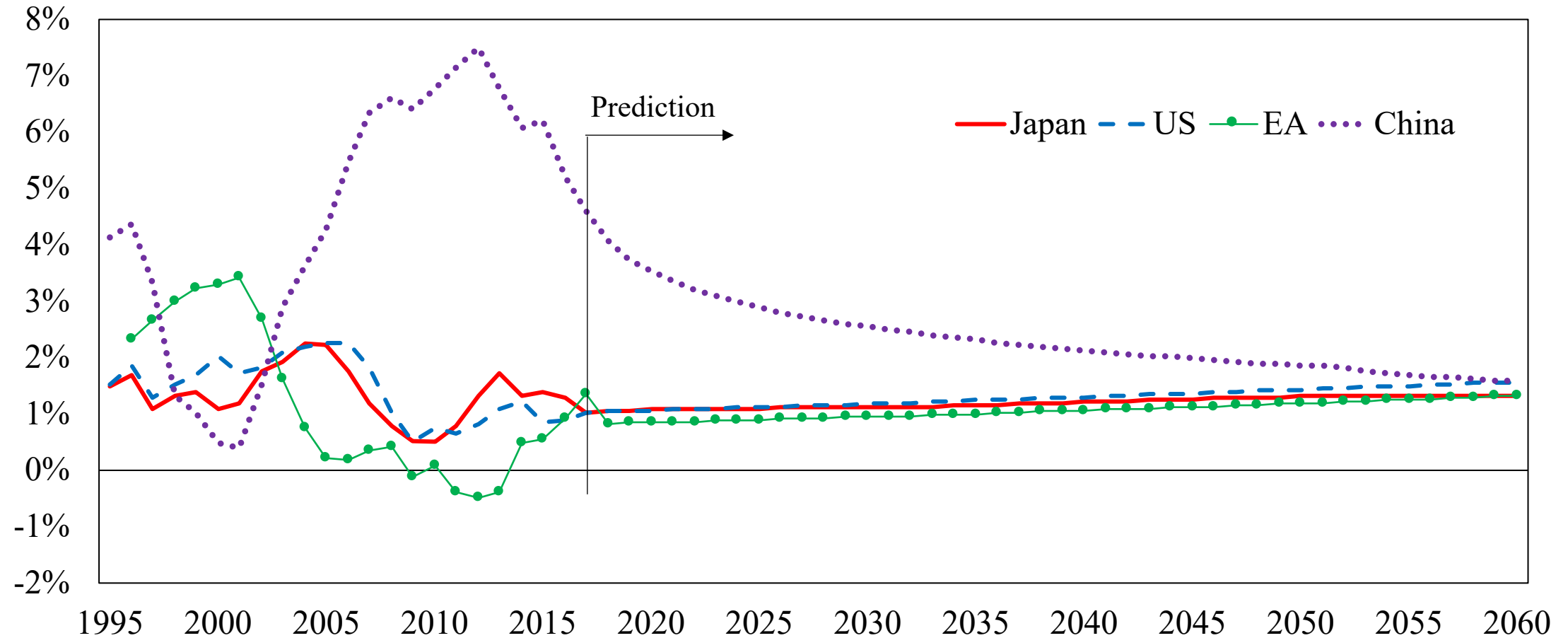
Source: OECD stat

# Figure 12. Labor force development in Japan, US, EA and China (1995-2060)



Source: OECD stat, ILO stat

# Figure 13. Labor augmenting technological progress in Japan, US, EA and China (1995-2060)



Source: Japan Center for Economic Research

## 4. Theoretical Estimates

1. We can estimate the theoretical values of current account balance of each country/area with the other three partner countries/area by using the weighted average values of fundamental determinants based on equation (6).

- To obtain the theoretical value of current account balance, we used the panel estimation results, employing the net national saving ratios, the capital dilution factors such as labor force growth rates and labor augmenting growth rates (See Annex1).

- The coefficients of panel estimates on net national saving ratios and the capital dilution effect are statistically significant with right signs. But the coefficients of the two variables deviate from the theoretically expected values of one. We adopted the Random Effect case for obtaining theoretical values.

## 4. Theoretical Estimates

2. We observe that the past trends of current account surplus/deficit in Japan, the US, the Euro Area and China are broadly consistent with the estimates based on theoretical model, although there exists significant gaps between the theoretical estimates and actual figures in Japan and the Euro Area in recent periods.

- The theoretical estimates of current account surplus in Japan and the Euro Area are much smaller than the actual ones (Figure 14, 15, 16, 17).

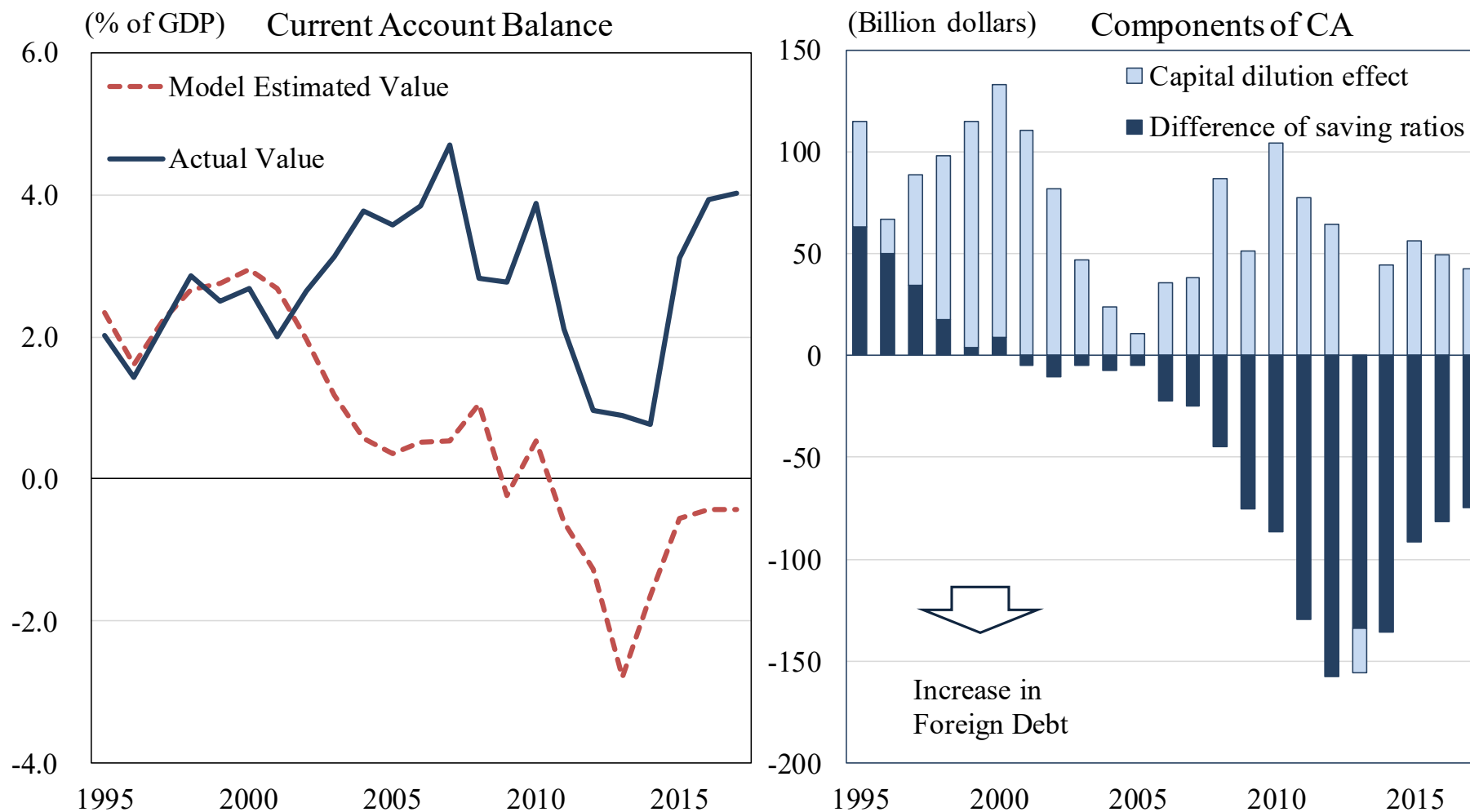


## 4. Theoretical Estimates

- The gaps can be attributable to the non-identical production function, barriers of free flow of trade and capital movements across countries, the asymmetry of information, the home bias and changes in exchange rates, in addition to the neglect of the rest of the world (the four countries/area's coverage of world GDP is about 70%).

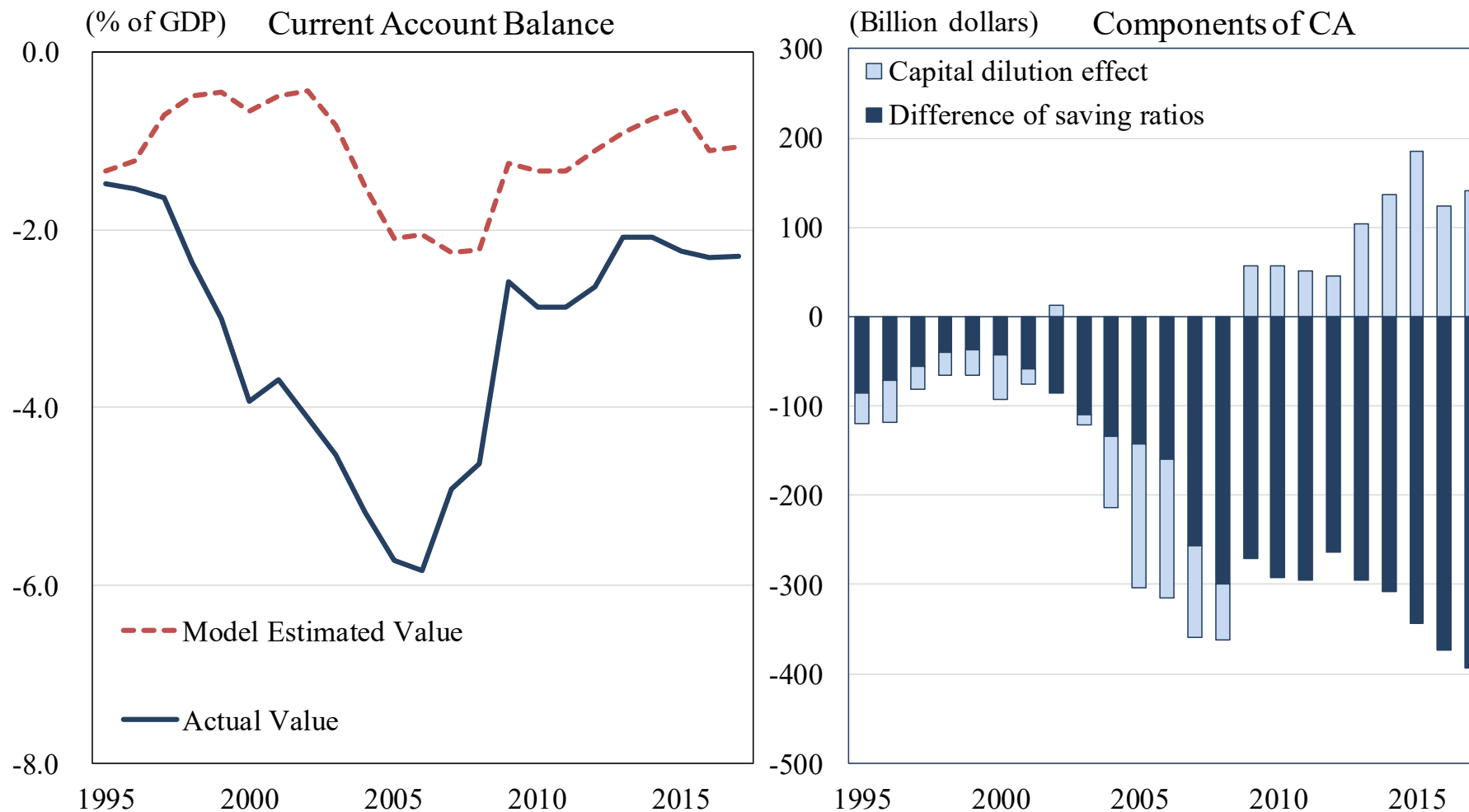
3. It is worthwhile noting that the difference of net national saving ratios in the US and China seems to be dominant in determining the long-term trend of external balance with the opposite direction, as indicated by the contribution of net national saving ratios in accounting for current account surplus/deficit.

# Figure 14. Actual and Theoretical Value of Current Account Balance in Japan



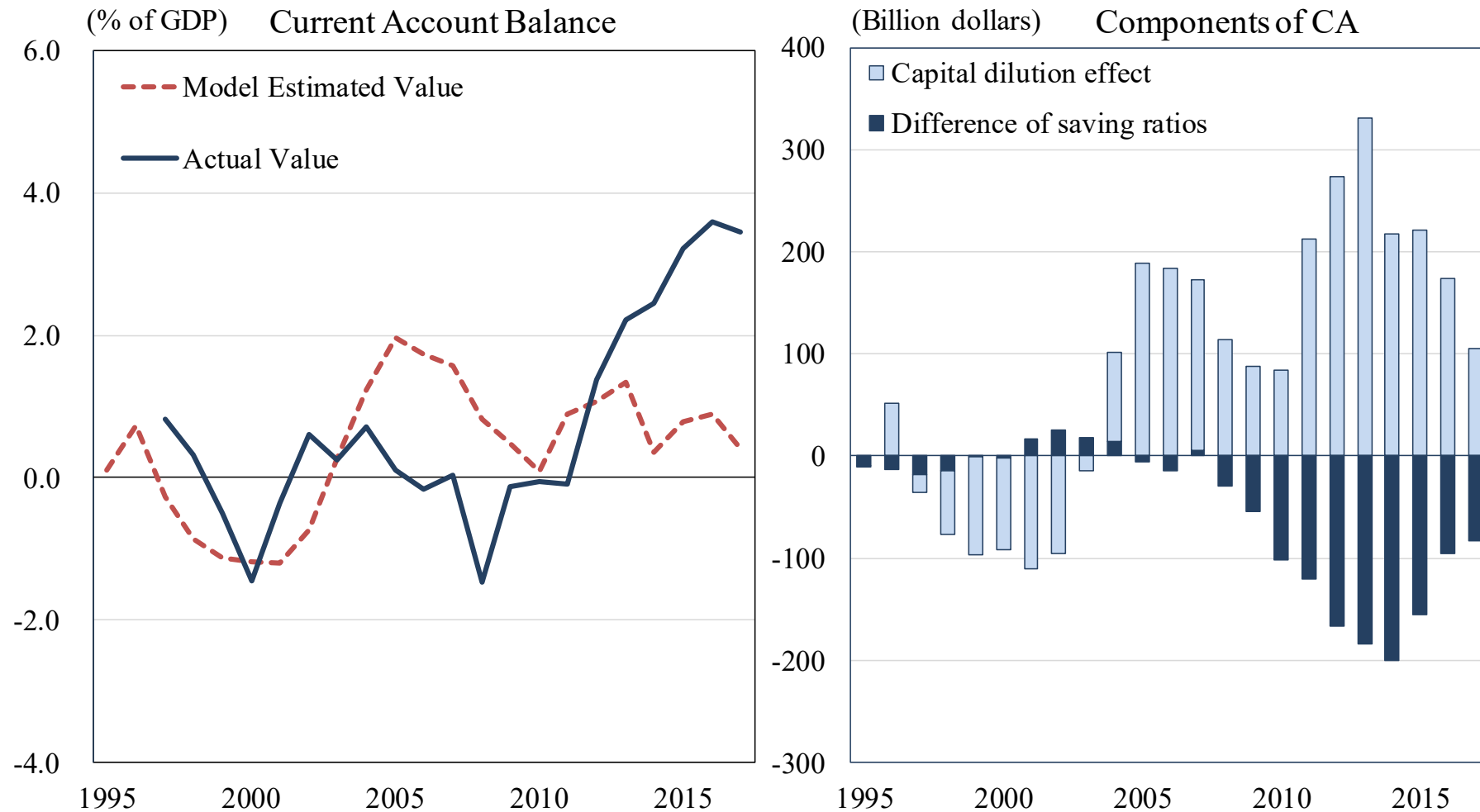
Source: Japan Center for Economic Research

# Figure 15. Actual and Theoretical Value of Current Account Balance in US



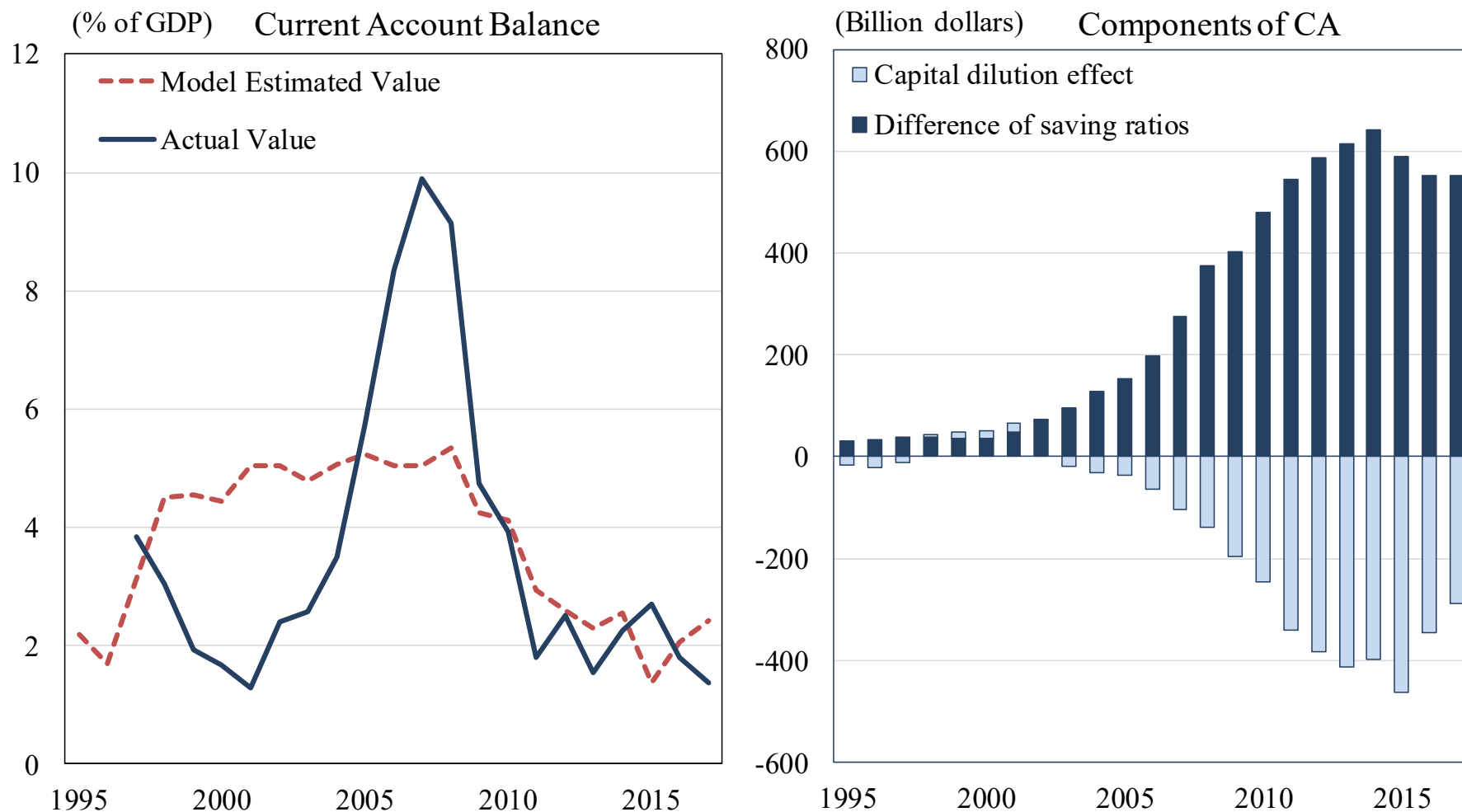
Source: Japan Center for Economic Research

# Figure 16. Actual and Theoretical Value of Current Account Balance in Euro Area



Source: Japan Center for Economic Research

# Figure 17. Actual and Theoretical Value of Current Account Balance in China



Source: Japan Center for Economic Research

## 5. Prediction to 2060

1. Under the assumption of exogenously given variables such as the net saving ratios, labor augmenting technological changes and the labor force growth rates over the future, we can predict the future development of current account surplus/deficit in the four economic giants countries/area based on equation (6).
2. On the future development of labor force, we adopt the forecast from the UN World Population Prospect (2019) and the ILO Prediction. On the labor force participation rate we assumed that it will gradually become lower in the process of aging.
3. On the labor augmenting technological progress, we employ the long-term forecast figures on global economy in 2060 under preparation by the Japan Center for Economic Research.
  - In the long run, labor augmenting technological progress will converge to the value of ranging from 1% to 2% (Figure 13).

## 5. Prediction to 2060

4. On the future development of net national saving ratios, we borrowed the results of the panel regression analysis by employing the ratios of elderly and youth in total population and per capita GDP as explanatory variables (Umeda, Kawamoto, Sakamaki and Hori (2017))

- Among the explanatory variables, we used the aging effect in predicting the future development of net national saving ratios (Annex 2, Figure 7). The 1% rise of dependency ratio of elderly will push down the net national saving ratio by 0.83%.

## 5. Prediction to 2060

5. We recognize that it is extremely difficult to predict the future changes in net national saving ratio; the rate of time preference may rise in the process of increasing share of aged people with higher probability of death; it can be “inverted U curve” in the process of wealth accumulation.

- However the effect of demographic changes on household saving can be captured by observing the individual's life cycle saving pattern; it peaks at prime age (25-54 years old) and the dissaving will dominate after retirement except very rich individuals.
- Iwata and Samikawa (2018) predicted that the household saving ratio in Japan will decline by 3% in 2050 by decomposing the effect of demographic changes into difference of saving ratio by age and other economic factors.



## 5. Prediction to 2060

6. According to the prediction results from 2018 to 2060, current account balance in the US continues to register deficit of about 2-3% of nominal GDP (Figure 18).

- Mirror image of the US deficit is the current account surpluses by Japan and China. Euro Area's surplus will decline moderately.

7. What is important is the accumulation of foreign debt/asset.

- The ratio of US foreign debt to nominal GDP will rise to about 100%. Its interest payment will amount to more than 3% of nominal GDP (Figure 21), given the assumption of the interest rate being equal to the rate of return on capital (Figure 20).

- Japan's net foreign asset ratio will increase to close to 200% which is double those of China and the Euro Area.

## 5. Prediction to 2060

8. The assumed interest rate may be too high, because it neglects both the risk premium on risky assets and the safety premium on safe assets.

- In addition, both the difference between the rate of return on foreign assets and that on domestic assets and the currency revaluation will significantly affect the outcome. The US primary income account registers surplus in 2018, despite net foreign debt of about 50% of nominal GDP.
- Japan's primary income account in 2018 stands at 4% of nominal GDP which is larger than the current account surplus.

## 5. Prediction to 2060

9. However, we may note that diminished rate of return dominates within the framework of Solow model with exogenously given saving ratio, due to the increasing capital intensity. Its negative effect on the rates of return on capital ranges from 2% to 5%.

- Within the framework of OLG model with endogenously determined saving ratio, we can show that the decreasing labor force will lower the rate of return on capital (Iwata and Samikawa(2018)).
- Despite the capital dilution effect, the natural interest rate will show slight upward trend, due to the increase of capital income share arising from increase in intangible asset investment.

## 5. Prediction to 2060

10. Aside from the standard case, we carry out the two different scenarios;

Case 1 the US: larger budget deficit leading to more than 10% of nominal GDP

Case 2 China: persistently large non-financial corporate dissaving standing at 15% of nominal GDP

11. In case 1, the US net national saving ratio will decline close to negative 3% in 2060,

- As a result, the US current account deficit will rise to more than 3% of nominal GDP with the net foreign debt ratio reaching at the level of 120%.

- The trading partner countries' current account surplus will rise by about 1%.

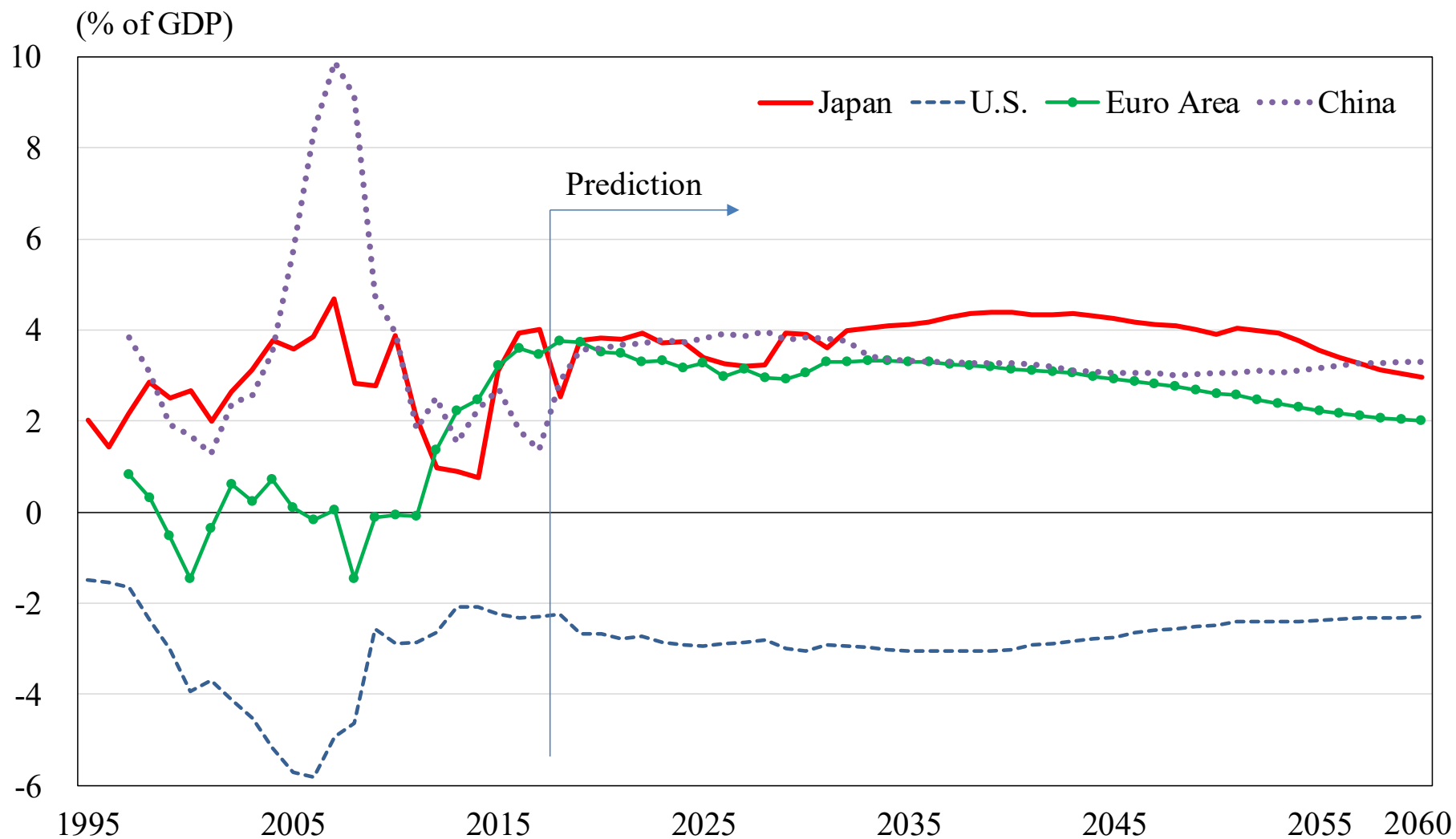
## 5. Prediction to 2060

- Historical episode in mid-1980s tells us that such a large size of persistent US current account deficit seems to be unsustainable; in 1987, the US's current account deficit recorded 3.3% of nominal GDP.

12. In case 2 China's net national saving ratio will come down to the US ratio. The current account surplus will diminish by about 3% of nominal GDP.

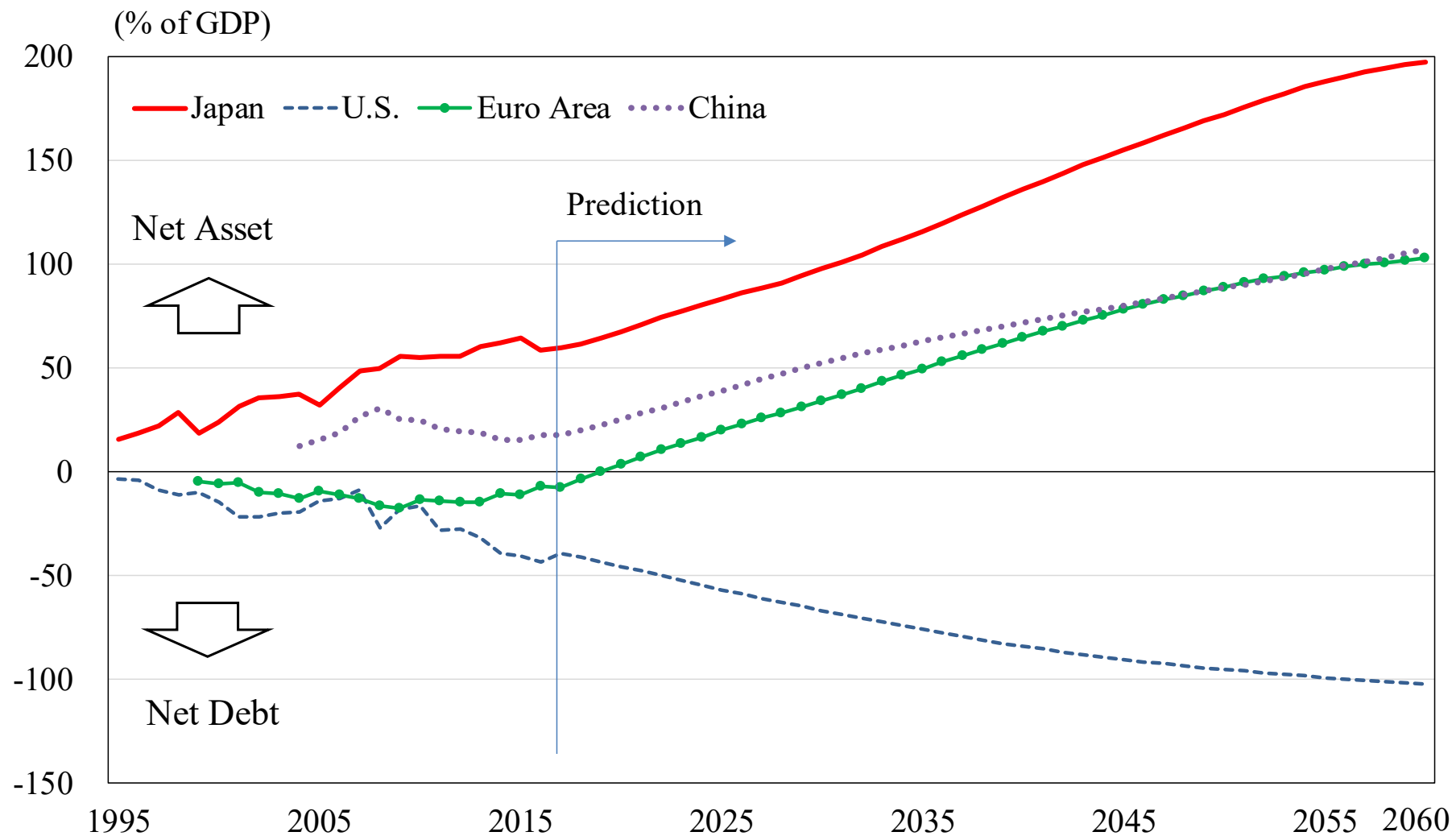
- Its impact on the US current account balances will be remarkably large; the US current account deficit will shrink to about 1% of nominal GDP.
- US net foreign asset debt ratio will come down to below 100%, while China's net foreign asset ratio will become below that of the Euro Area.

# Figure 18. Prediction of Current Account Balance

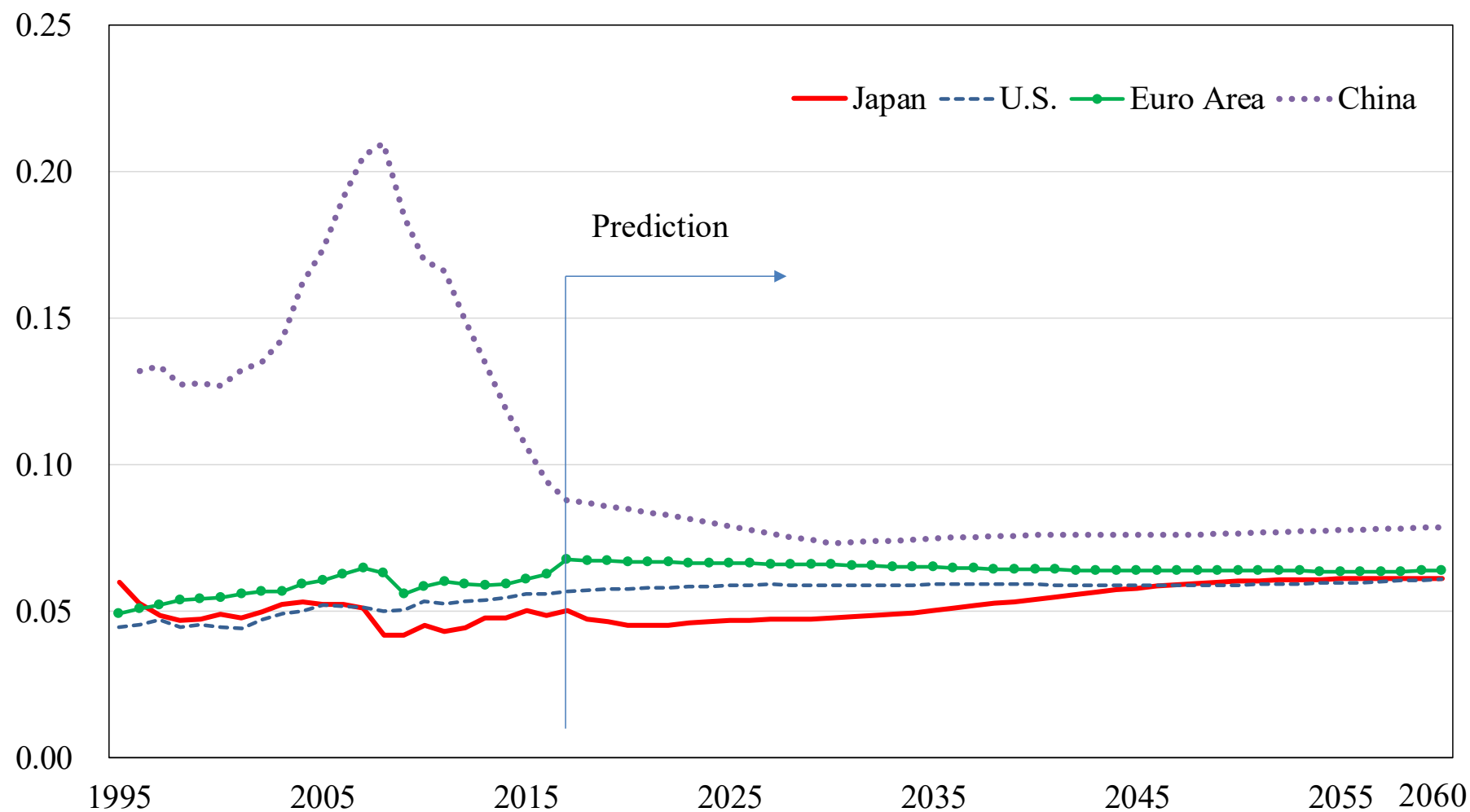


Source: IMF, Japan Center for Economic Research

# Figure 19. Prediction of Net Foreign Asset /Debt



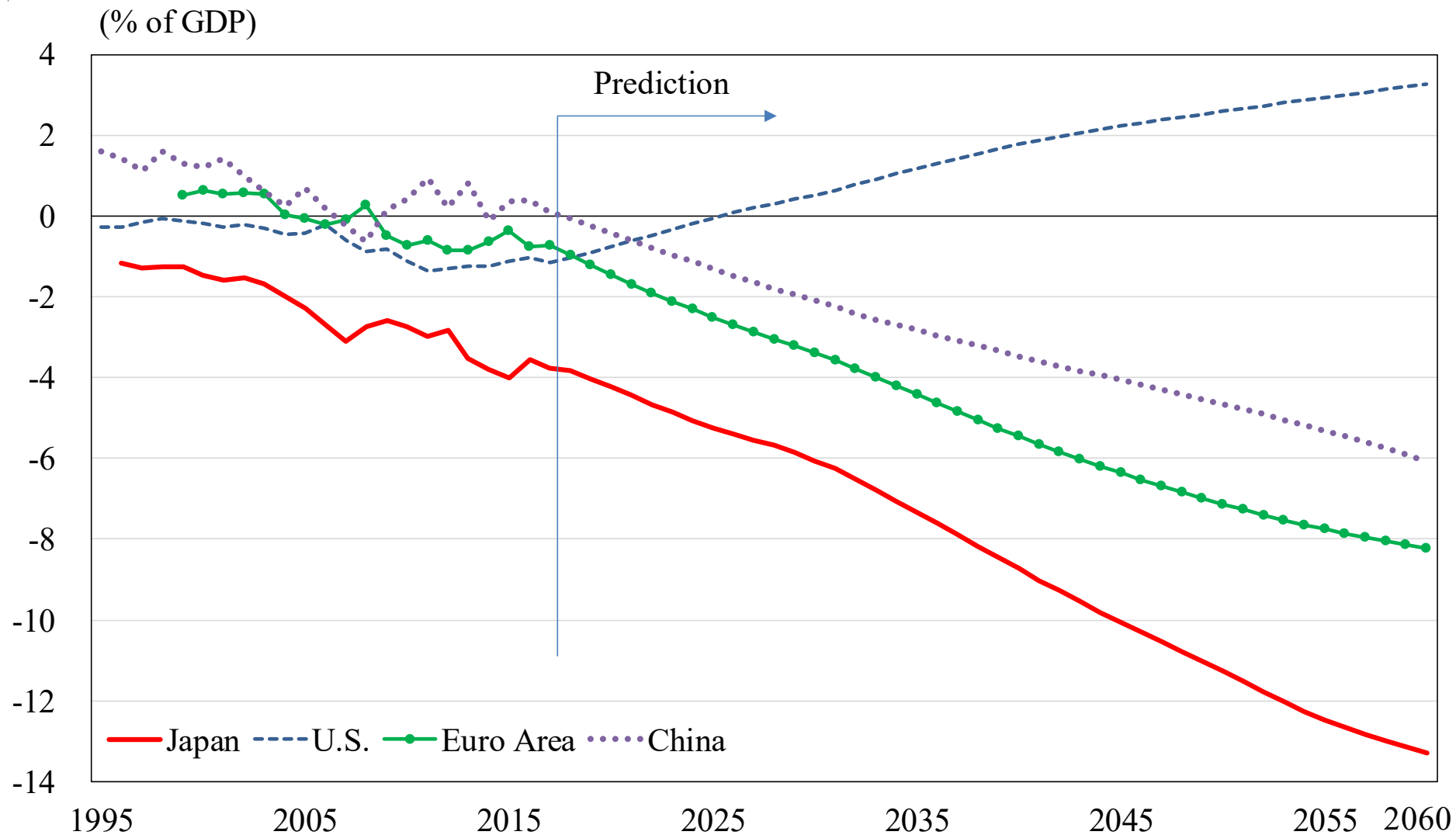
# Figure 20. Rate of Return on Capital : $\alpha Y/K$



Source: IMF, Japan Center for Economic Research



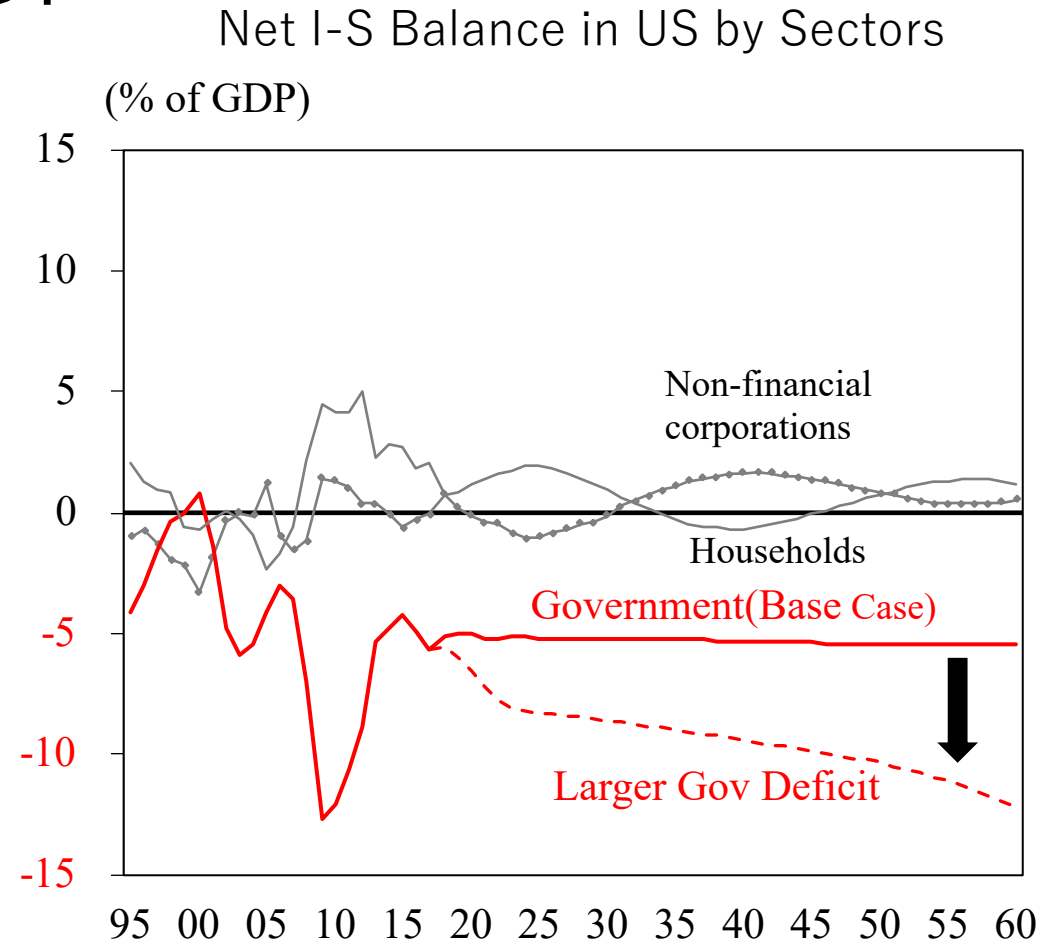
# Figure 21. Interest Payment on Net External Borrowing



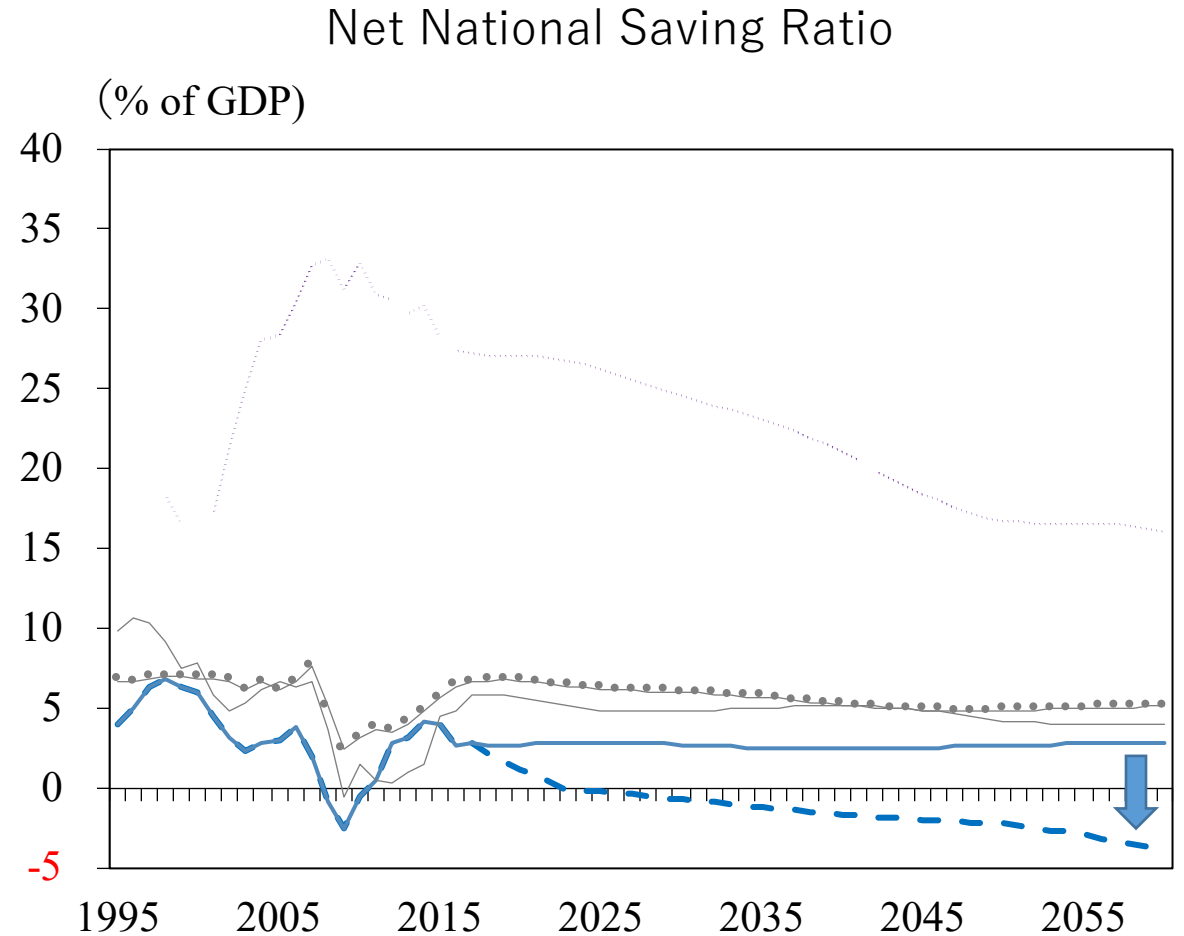
Source: IMF, Japan Center for Economic Research

# Figure 22. Net National Saving Ratio (Case1)

## US larger budget deficit leading to 10% of nominal GDP

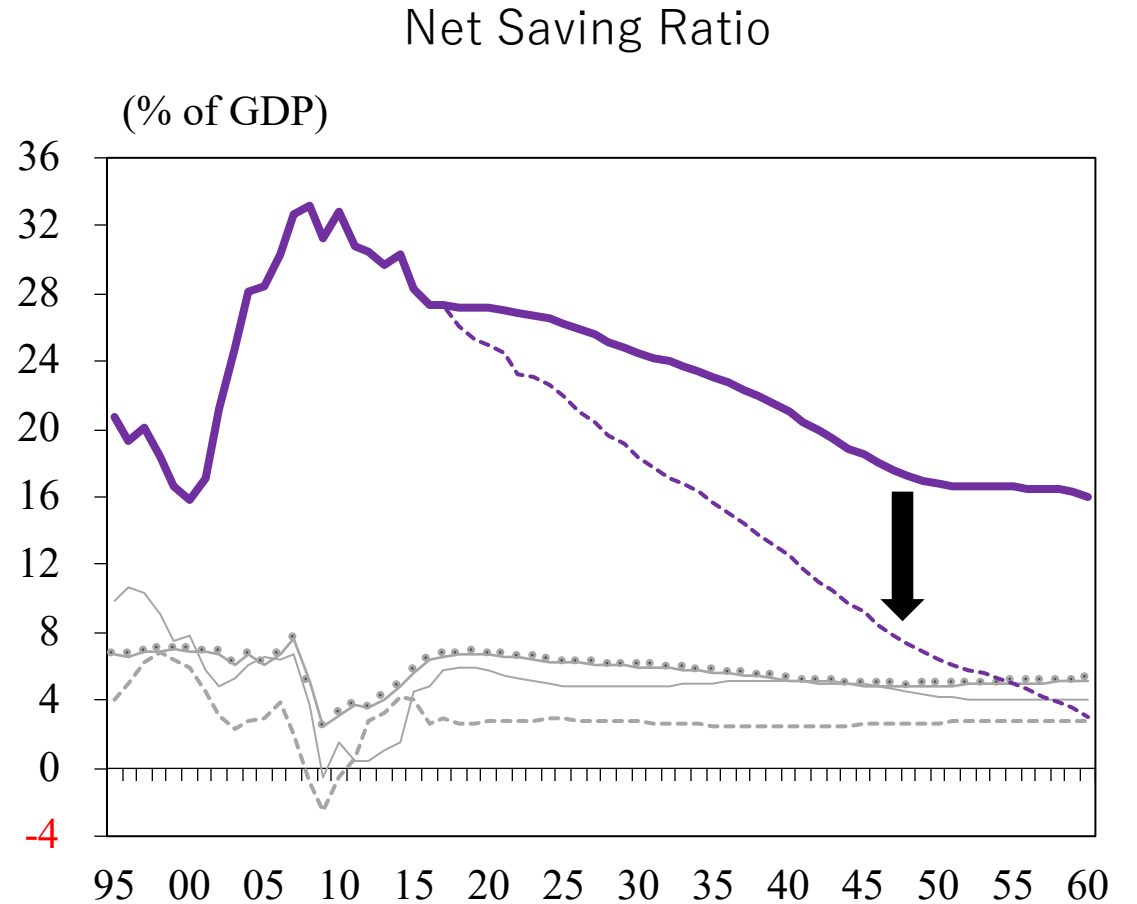
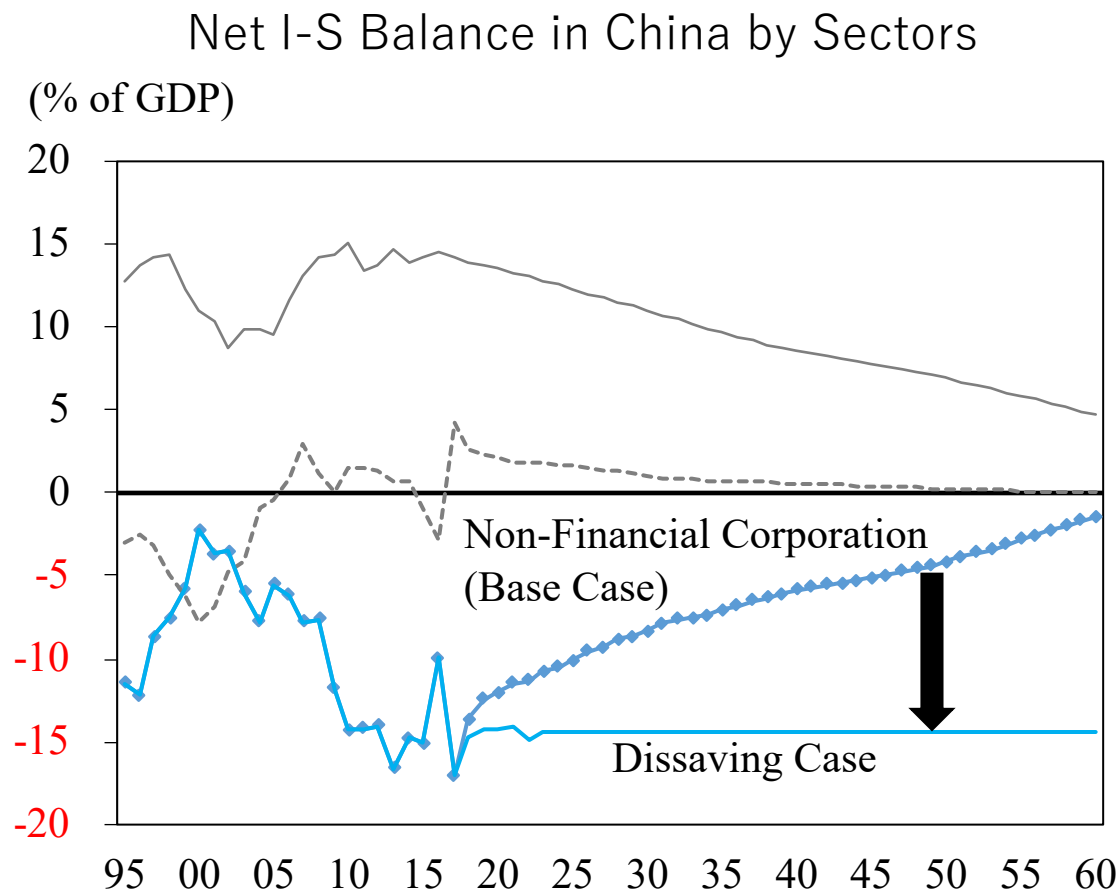


Source: OECD EO Database

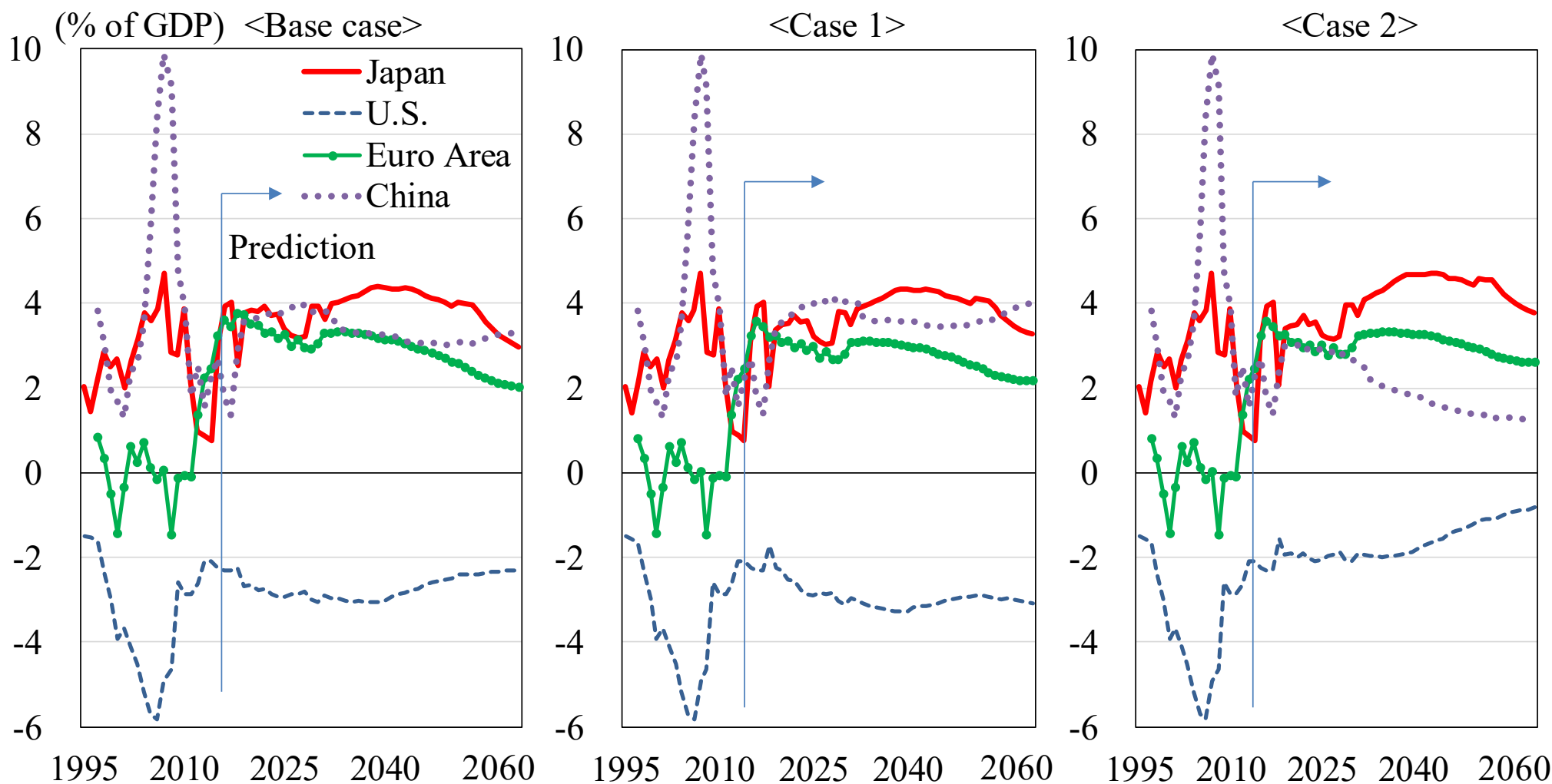


# Figure 23. Net National Saving Ratio (Case2)

## China: persistently large corporate dissaving

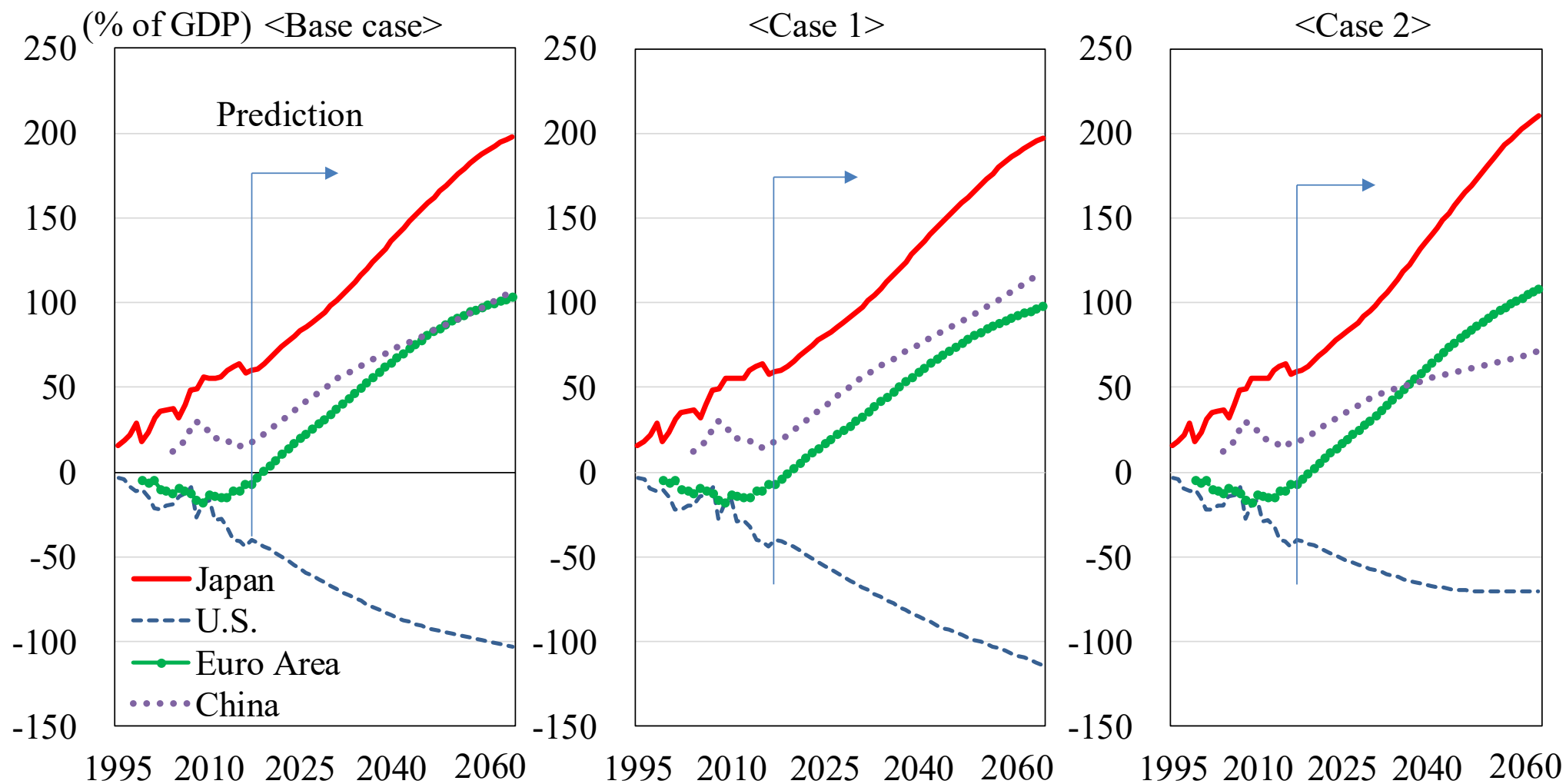


# Figure 24. Current Account Balance (3 cases)



Source: IMF, Japan Center for Economic Research

# Figure 25. Net Foreign Asset/Debt (3 cases)



## 6. Evaluations

1. We presented three scenarios on external imbalance over the future. We should take into account a number of issues which were neglected in our forecast exercise.
2. First, the implications of the acceptance of foreign workers and the longer life expectancy for saving ratios combined of reform of the way of working (changes in retirement age in accord with changes in biological healthy age) for the forecast outcome.
  - Tentative analysis shows that the changes in labor force growth rates exerts limited influence on external balance.

## 6. Evaluations

3. Second, the implications of labor augmenting technological changes arising from the disruptive technology (AI and Big Data).

- The disruptive technological changes may counterbalance the declining tendency of natural interest rates by enhancing the labor augmenting technological changes.
- We have taken into consideration the impact of disruptive technologies by assuming that the ratio of intangible assets to nominal GDP will increase by 1.5% annually. This leads to the increase of total factor productivity by about 1%.
- The capital income share may increase, corresponding to the rise in intangible investment, if the elasticity of substitution is larger than one: we allowed moderate rise of capital income shares which will overcompensate the capital dilution effect.

## 6. Evaluations

4. As a result, we have argued for the slight upward trend of natural interest rate over the future due to the capital dilution effect combined with the counter balancing rise in capital income shares.

5. Goodhart and Pradhan (2017) argued that the declining tendency of real interest rates will be reversed; it will rise over the future.

- The emergence of China as great economic power brought about large amount of saving and manufacturing labor force in world economy.
- It tended to depress the global real interest rates and real wages. Yet, the rapid aging process in China will reverse the past trends.
- According to their view, increase of the young and old generations implies inflation, while increase of the middle-age generation brings about deflation, due to the ample provision of labor and savings supply.



## 6. Evaluations

6. Our exercise shows that the non-financial corporate dissaving in China will play more important role in determining the net national saving ratio over the future.

7. Fourth, the implications of global imbalance for financial bubbles and crisis.

- King (2010) noted that global imbalance fueled risks of financial crisis in 2008/2009 and worked to delay the sustainable recovery.
- Ekholm (2011) was afraid of the risk of unstable dollar value in case the US current account deficit will become excessively larger.

## 6. Evaluations

- On the other hand, Borio and Disyatat (2011) argued that excessively elastic international monetary system in providing liquidity to the market is the main cause of bubbles, not the existence of external imbalance.

8. Finally, it should be noted that any nominal/real exchange rate changes as well as the associated valuation changes of net foreign assets/debts are assumed away in this model, although they may play an important role in enlarging or shrinking global imbalances before and after the financial crisis (Lane=Milesi-Ferretti (2014)).

# Annex1

The evolution of net foreign debt is described as the equation (6)'. The right side of this equation is divided into two parts;

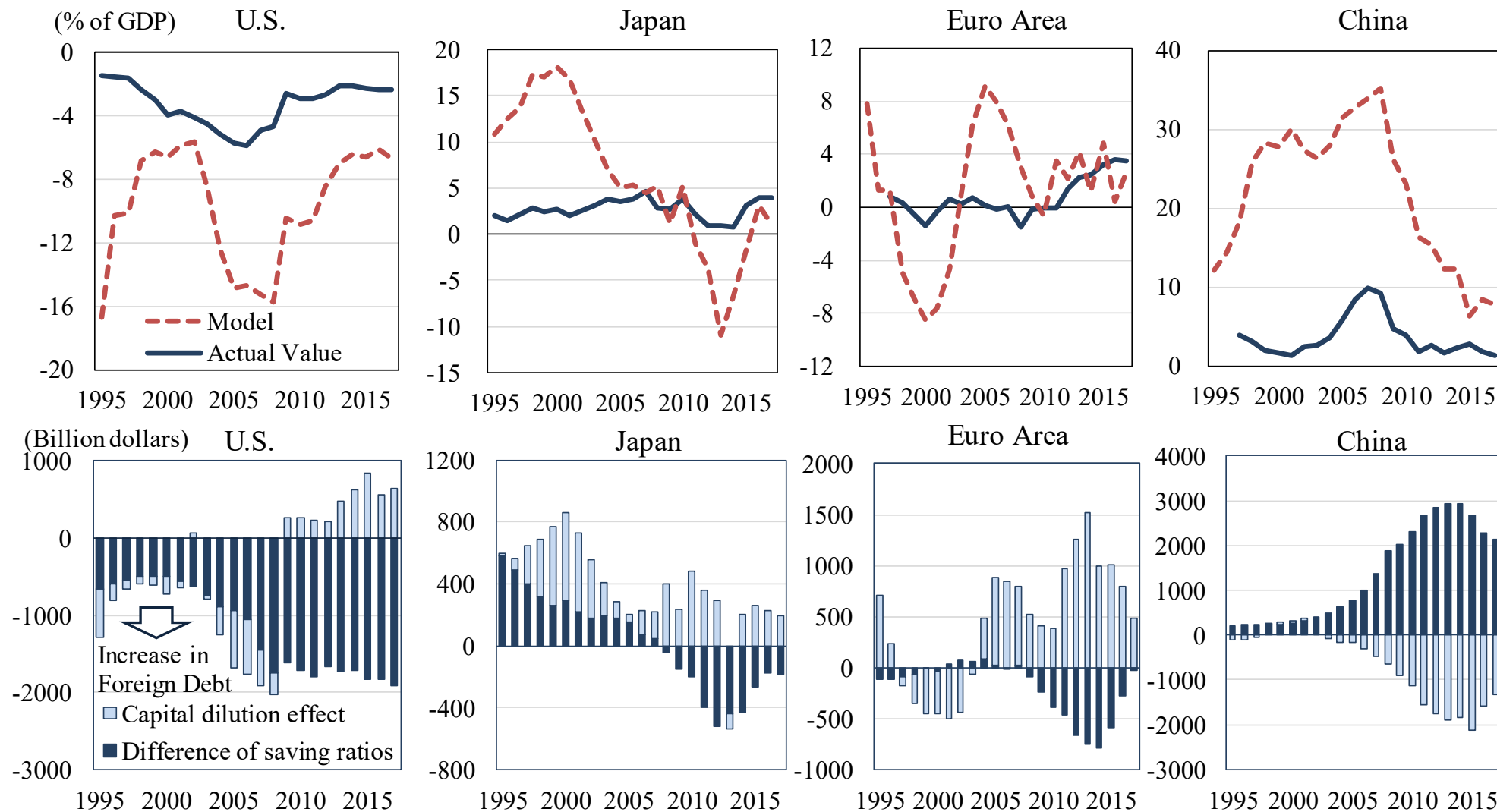
$$\frac{dD}{dt} = \underbrace{\left( \frac{S^*}{K^*} - \frac{S}{K} \right) \frac{KK^*}{K_w}}_{\text{Difference of Saving ratios}} + \underbrace{[(n - n^*) + (g - g^*)] \frac{KK^*}{K_w}}_{\text{Capital Dilution Effect}} \quad (6)'$$

The theoretical values of current account balances are diverged from actual ones, so we regressed  $dD/dt$  by the two parts above. The equation can be described as (7) (Figure A1, A2, A3).

$$\frac{dD}{dt} = \phi_1 \left( \frac{S^*}{K^*} - \frac{S}{K} \right) \frac{KK^*}{K_w} + \phi_2 [(n - n^*) + (g - g^*)] \frac{KK^*}{K_w} \quad (7)$$

: asterisk(\*) stands for weighted average values of three trading partner countries/area and subscript  $w$  indicates the world total value

# Figure A1. Actual and Theoretical Value of Current Account Balance



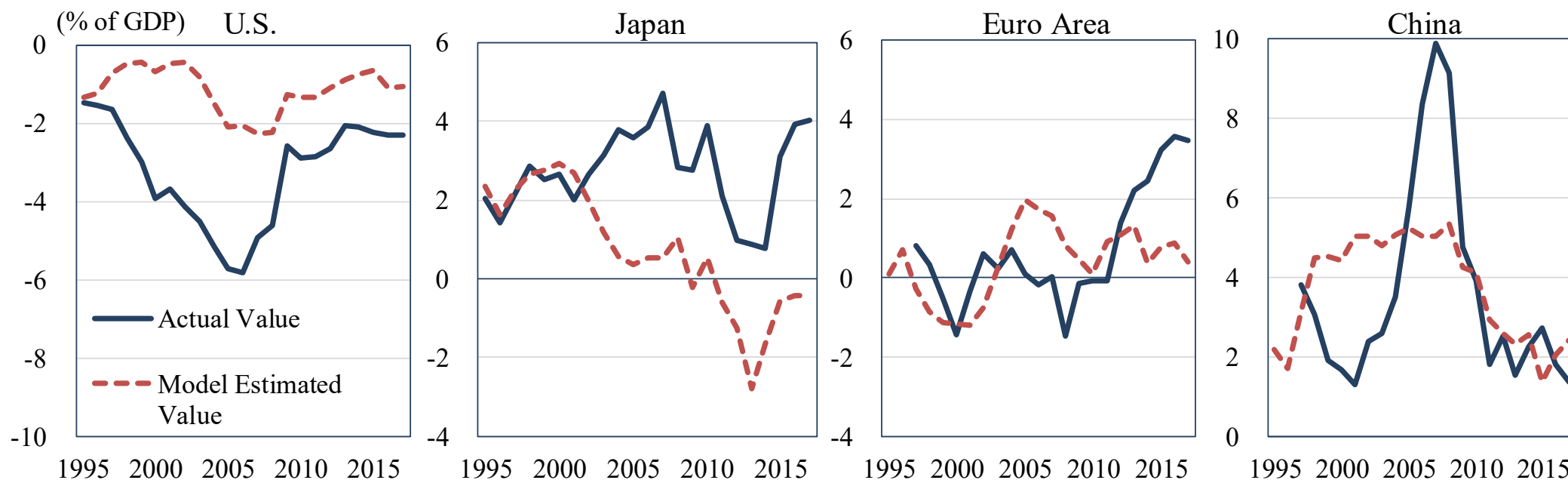
Source: IMF, Japan Center for Economic Research

# Figure A2. Panel Estimation Results of the eq.(7)

Dependent Variable: d (Net Foreign Debt)			
	Fixed Effect	Random Effect	Pooled OLS
Constant	0.362 (0.222)	0.230 (0.201)	0.202 (0.268)
Difference of Saving Ratios	-0.210 *** (0.051)	-0.269 *** (0.023)	-0.281 *** (0.033)
Capital Dilution Effect	-0.096 *** (0.035)	-0.218 *** (0.031)	-0.243 *** (0.046)
Sample period	1997-2017	1997-2017	1997-2017
R2	0.776	0.456	0.487
Adjusted R2	0.762	0.443	0.474
F-statistic	54.136	33.979	38.446
SE of regression	1.567	2.212	2.329

Note: \*\*\* indicates significance at the 1% level.

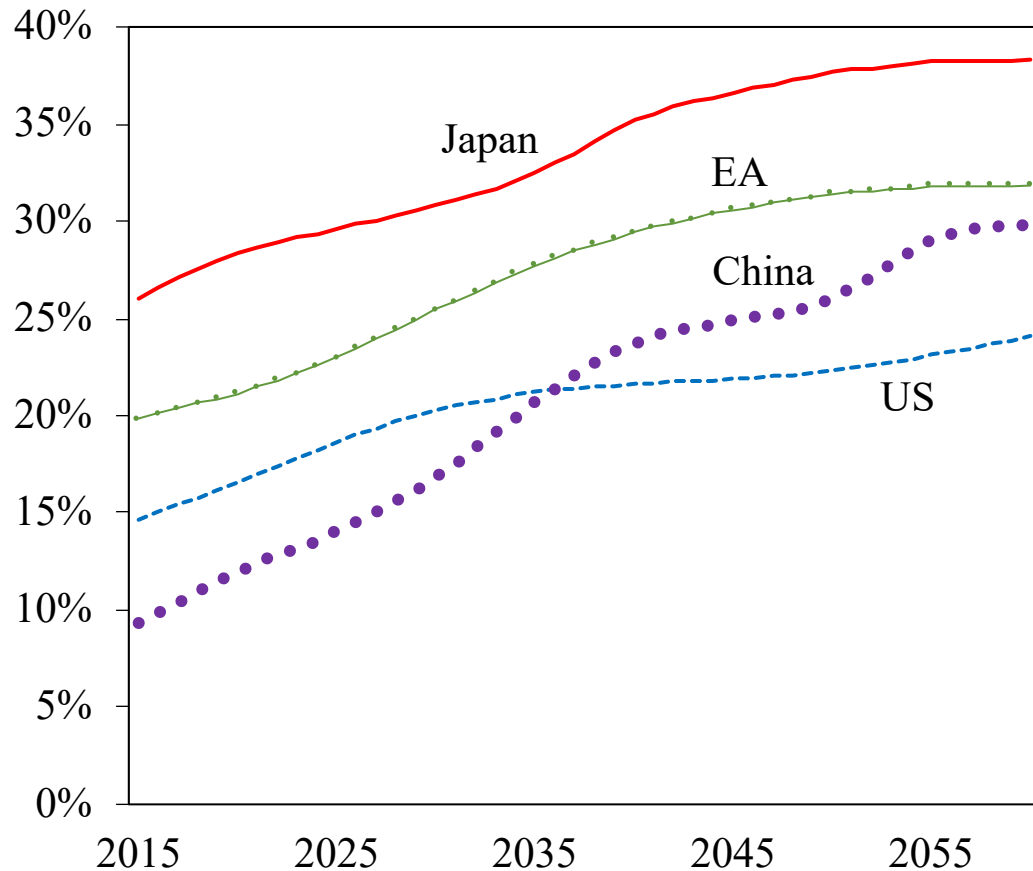
# Figure A3. Theoretical Value of Current Account Balance using Estimated Parameters



Source: IMF, Japan Center for Economic Research

# Annex2: Aging Ratio and Net Saving Ratio

Aging Ratio



Source: UN World Population Prospects

Results of Panel Regression

	National Savings Rate	
	Fixed Effect	Random Effect
Aging Ratio	-0.833*** (0.475)	-0.826*** (0.163)
Young Dependency Ratio	-0.255** (0.116)	-0.361*** (0.0461)
Ln(GDP per capita)	-2.675 (1.696)	
Constant	65.05*** (16.280)	50.58*** (4.377)
Num of Observations	287	301
Num of Nations	158	161
Hausman test		

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

( ): S.E. Observation Number

Aging Ratio: 65 years old or more population / Total Population

Young Dependency Ratio:

under 15 years old population / 15-64 years old population

Source) Umeda, Kawamoto, Sakamaki and Hori(2017)

“Population Aging and Domestic Investment—An Analysis Using International Panel Data—

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