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Estimating Japan's Gross Domestic Income Based on Taxation Data

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The views expressed in this presentation are those of the author's and do not necessarily reflect those of the Bank of Japan.

Two reasons why I got started on this analysis

(1) FY2013

- **Household saving rate** was **-1.3 percent**(-3.6 trillion yen; It was negative for the first time since FY1994).
- **Currency and deposits of households** **increased** by more than 17 trillion yen.

(2) FY2014

- **Operating surplus and mixed income** **decreased** by 2.4 trillion yen.
- Both **corporate profits** and **corporate tax revenue** **increased**.



- Consistencies of **3 ways of measuring GDP** and **net lending / borrowing for households** need to be checked.
- We try to estimate GDP from the income side using taxation data.

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1 Introduction

How the Official Series Compiles GDE, GDP and GDI in Japan (1)

- The three aggregates -- **GDE**, **GDP** and **GDI** -- are conceptually the same.
- In reality, there may be some discrepancy among them due to differences in data sources, timing and estimation methods.

In Japan

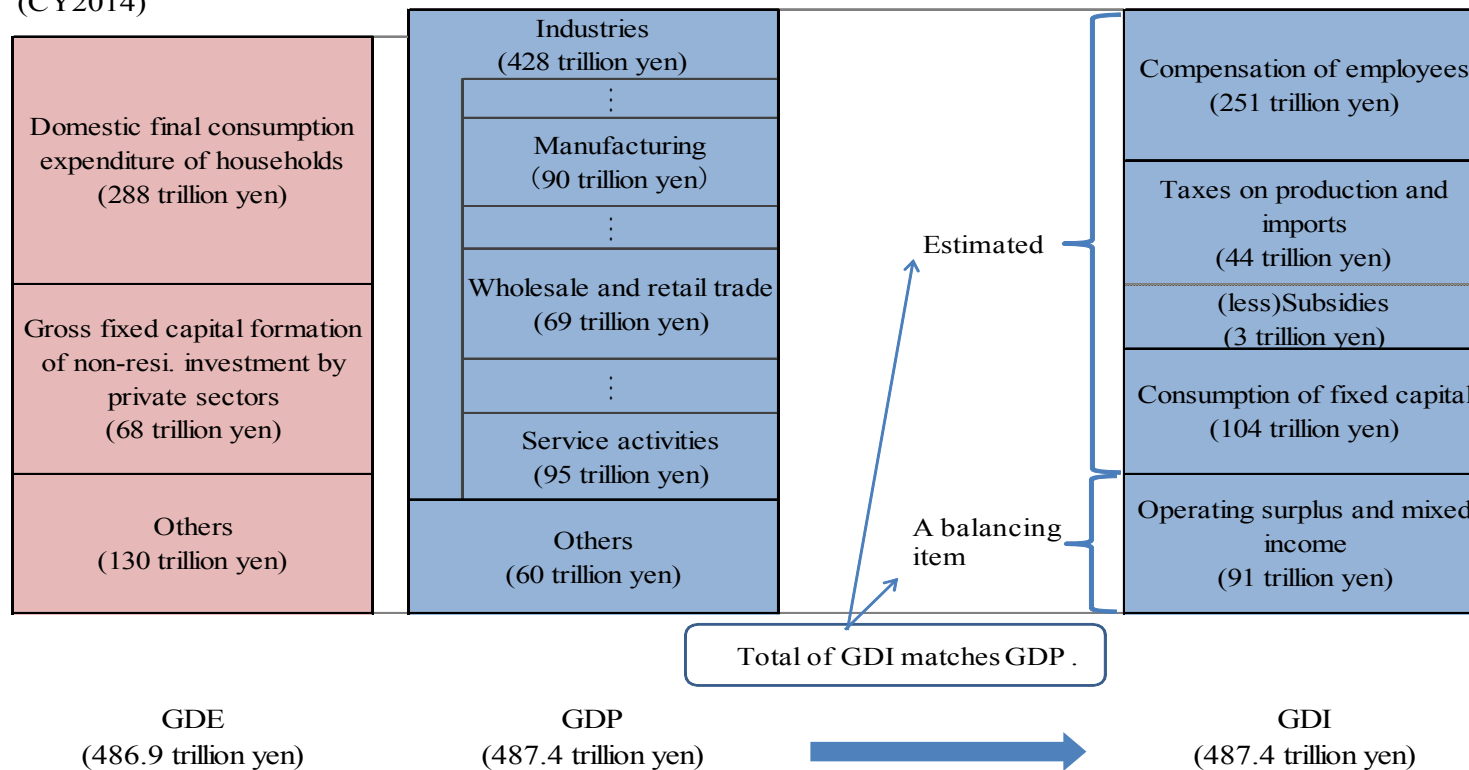
- In the quarterly estimates, only GDE and compensation of employees are compiled and published.
 - In the annual reports, GDE, GDP and GDI are available.
- ⇒ We focus on the annual reports today.

How the Official Series Compiles GDE, GDP and GDI in Japan (2)

- There is a slight discrepancy between GDE and GDP.
 - GDE and GDP are estimated independently.
- GDI is equal to GDP.
 - GDI is not estimated independently.

• Figure 1 : GDE, GDP and GDI

(CY2014)



How the Official Series Compiles GDE, GDP and GDI in Japan (3)

(1) GDE: Commodity flow approach (2) GDP: Value added approach

- Both outputs serve as control totals.
- Using a wide variety of statistical surveys.



However, households and enterprises have recently **become more reluctant to respond to statistical surveys.**

3) GDI: Its level becomes equal to that of GDP by adjusting **operating surplus and mixed income as a balancing item.**

(Our novel approach - with reference to the case of the United States)



We try to calculate each component **using taxation data** and estimate **GDI independently.**

2 Estimation for each GDI component

2.1 Compensation of Employees (1)

National Accounts Versus *Municipal Tax Survey*

- National Accounts: Multiplying cash earnings per employee by the number of **all employees**.
Using sample surveys (**statistical survey**).
- *Municipal Tax Survey*: Records wages and salaries of **all taxpayers** who pay local income tax.
This is a complete survey (**administrative data**).

The difference in wage and salaries has disappeared, whereas the number of employees of the National Accounts has continued to exceed that of the *Municipal Tax Survey* by about 20%.

Figure 2 Wages and salaries

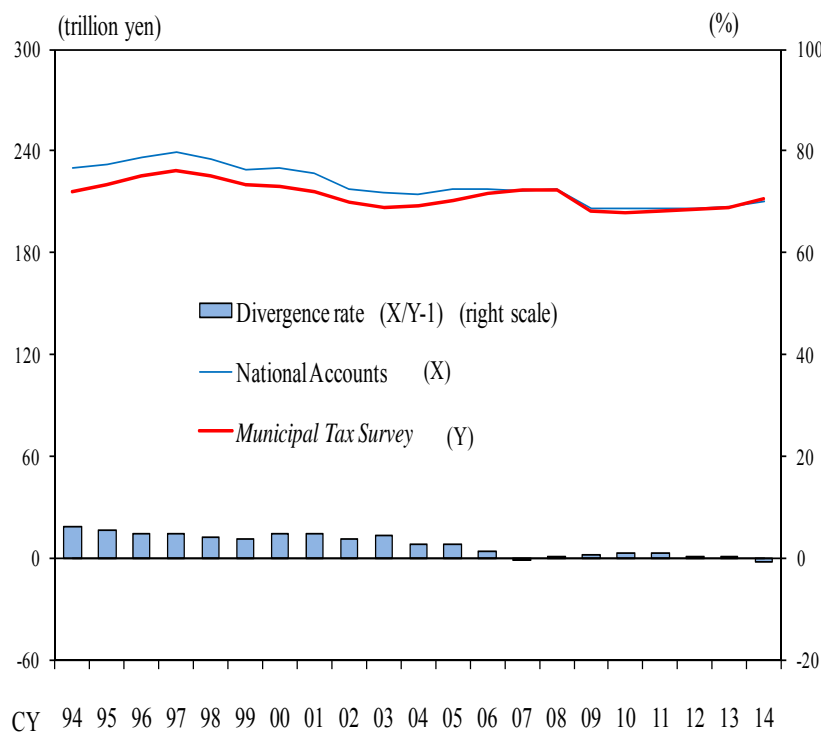
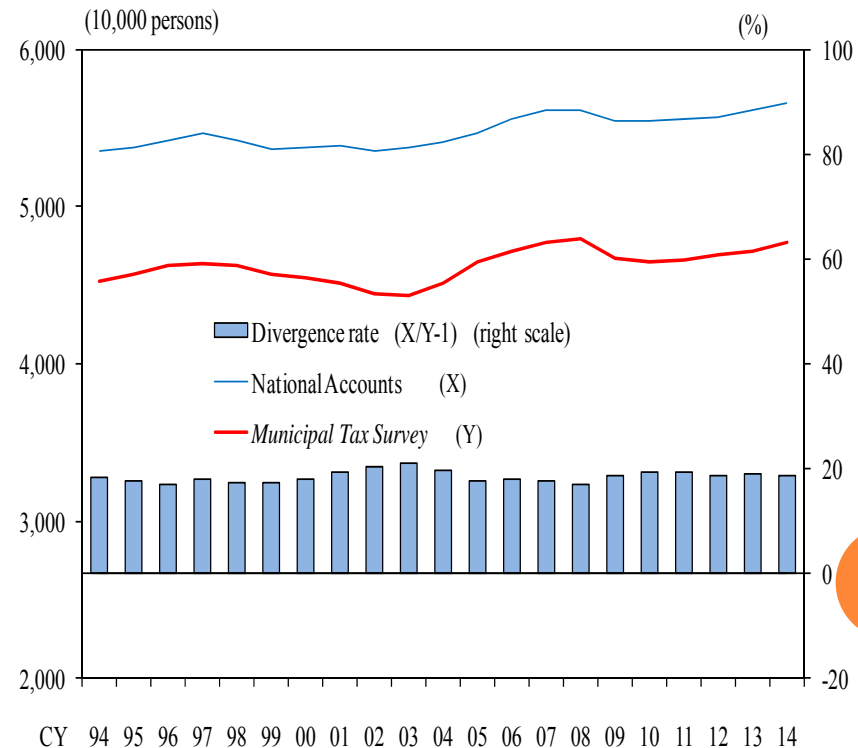


Figure 3 Number of employees



2.1 Compensation of Employees (2)

Our estimated wages and salaries

$$\begin{aligned}
 &= \text{income of taxpayers of local income tax} && \rightarrow (1) \\
 &+ \text{income of non-taxpayers of local income tax} && \rightarrow (2) \\
 &+ \text{income of small differences in coverage and definition} && \rightarrow (3)
 \end{aligned}$$

Table 1

Our estimate and the official series were almost at the same level in 1994. However, as time goes by, our estimate has come to take a larger amount compared with the official series.

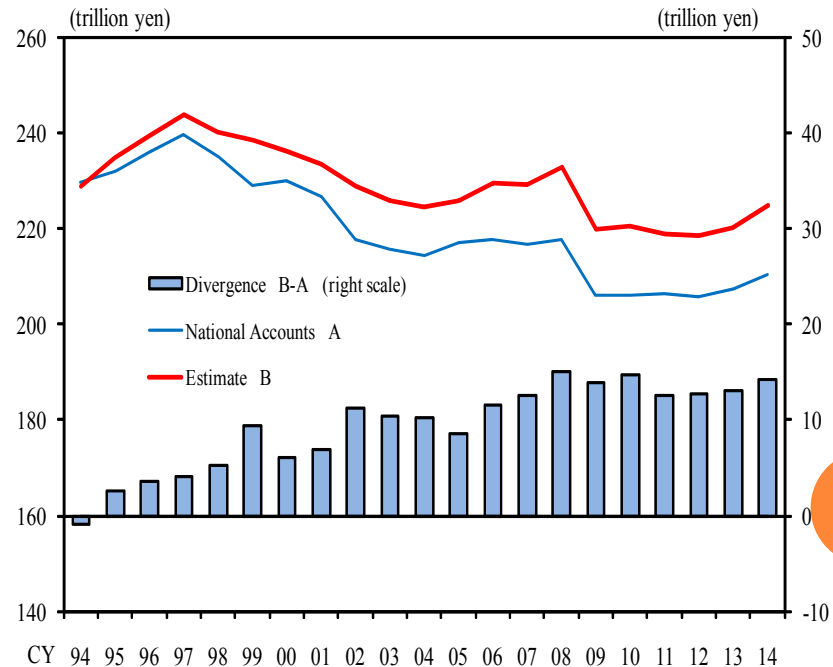
Figure 4

Table 1 Estimated Wages and Salaries

(2014CY, trillion yens)

| | | |
|---|-------|-----|
| Taxpayer of local income tax | 211.9 | (1) |
| Non-taxpayer of local income tax | 13.3 | (2) |
| Adjusting small differences such as bonuses for directors | -0.4 | (3) |
| Estimated total value (A) | 224.7 | |
| Official total value (B) | 210.6 | |
| Divergence (A-B) | 14.2 | |

Figure 4 Estimated and Official Wages and Salaries



2.2 Operating Surplus (1)

- We attempt to estimate net operating surplus using operating profits (not as a balancing item) from (1) the *Financial Statements of Corporations* and (2) **corporate tax revenue**.

(2 points)

(1) In stead of using **corporate taxation data** directly, **we use the *Financial Statements of Corporations***.

• Corporate income captured by taxation data is quite different from operating surplus in the National Accounts.

(2) We **correct sampling errors** associated with the *Financial Statements of Corporations* by using **comprehensive corporate tax revenue data**.

• The *Financial Statements of Corporations* is a sample survey and may contain some sampling errors.

2.2 Operating Surplus (2)

• We estimate net operating surplus and consumption of fixed capital together (gross operating surplus), not separately. (**another key point**)

- Figure 5 shows that the gap between net operating surplus and operating profits is relatively small.
 - Figure 6 shows that consumption of fixed capital exceeds depreciation by a great deal.
- This is because gross fixed capital formation / non-financial assets in the National Accounts exceeds capital investment / non-financial assets in the *Financial Statements of Corporations* by a great deal (See Figures 7 and 8).

National Accounts versus *Financial Statements of Corporations*

Figure 5 Net operating surplus and operating profits

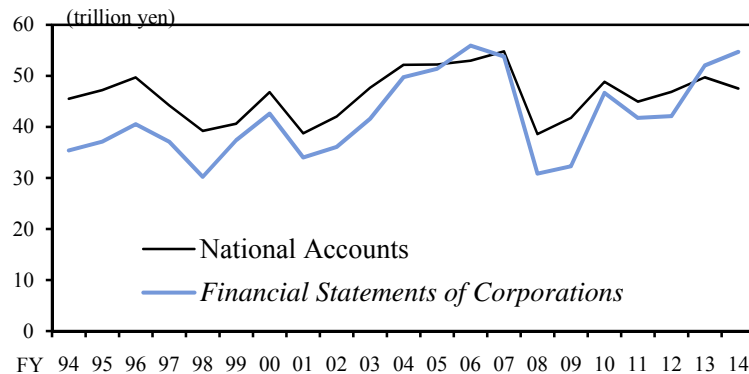


Figure 6 Consumption of fixed capital and depreciation

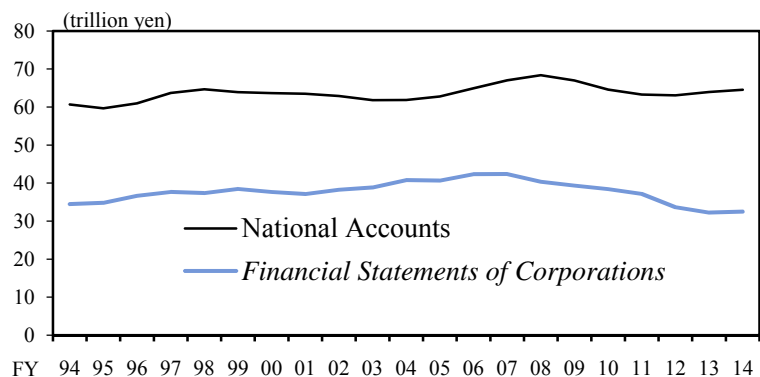


Figure 7 Gross fixed capital formation and capital investment

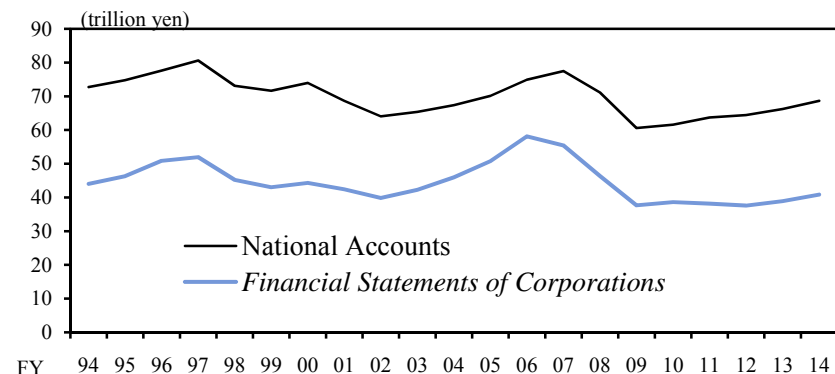
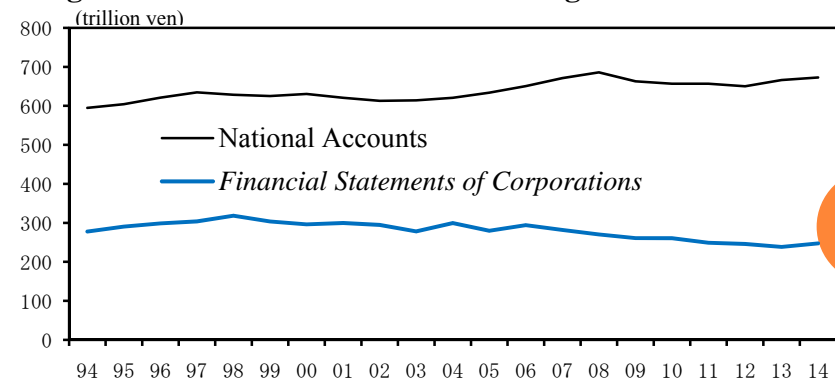


Figure 8 Non-financial assets excluding land



2.2 Operating Surplus (3)

- Table 2 is a simple illustrative example to demonstrate how specific figures are treated differently by the National Accounts and the *Financial Statements of Corporations*.
- When we compare the sum of net operating surplus and consumption of fixed capital with the sum of operating profits and depreciation, the gap (10 in the example) remains unchanged in both periods 1 and 2. **This gap is equal to the amount by which gross fixed capital formation exceeds capital investment.**

Table 2 Difference of SNA Account and Corporate Account

(2 period example)

| | | | |
|---|---------------------|-----------|-----------|
| Assumption 1: Gross output and corporates' revenue are 100 in both the accounts. | | | |
| Assumption 2: Purchase expenses are 50 in both the accounts. | | | |
| Assumption 3: Depreciation rates are 50% in both the accounts. | | | |
| Assumption 4: The allocation of purchase expense is different between the accounts. | | | |
| GDP statistics (SNA account) | | period 1 | period 2 |
| Gross output | (a1) | 100 | 100 |
| Intermediate input | (a2) | 30 | 30 |
| Consumption of fixed capital | (a3) | 0 | 10 |
| Net operating surplus | (a4 = a1 - a2 - a3) | 70 | 60 |
| Gross fixed capital formation | | 20 | 20 |
| Fixed assets (end of the period) | | 20 | 30 |
| <u>Gross operating surplus</u> | (a5 = a3 + a4) | <u>70</u> | <u>70</u> |
| Corporate Account | | | |
| Revenue | (b1) | 100 | 100 |
| Current expense | (b2) | 40 | 40 |
| Depreciation | (b3) | 0 | 5 |
| Operating profits | (b4 = b1 - b2 - b3) | 60 | 55 |
| Capital investment | | 10 | 10 |
| Fixed assets (end of the period) | | 10 | 15 |
| <u>Operating profits + Depreciation</u> | (b5 = b3 + b4) | <u>60</u> | <u>60</u> |

2.2 Operating Surplus (4)

- We estimate the operating surplus according to the following formula.

Prior to corporate tax adjustment

Equation (1) $GOS = \pi^F + \delta^F + I^S - I^F$

Equation (2) $NOS = GOS - \delta^S$

GOS : gross operating surplus, π^F : operating profits, δ^F : depreciation, I^S : gross fixed capital formation, I^F : capital investment, NOS : net operating surplus, δ^S : consumption of fixed capital

After corporate tax adjustment

- Assuming that the deviation is largely due to the sampling error of the *Financial Statements of Corporations* and that the error is proportional to the sampling error of the tax.

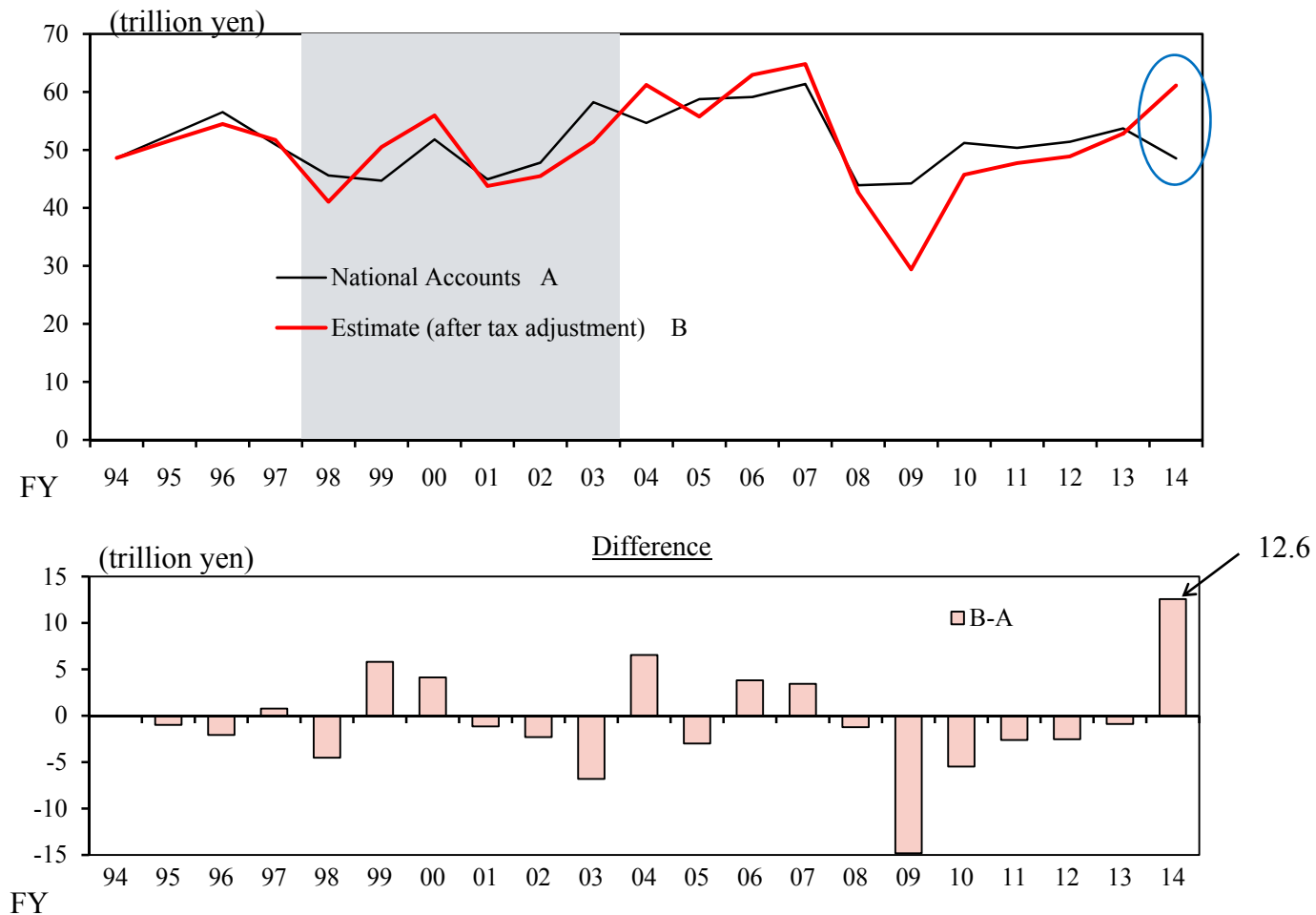
Equation (3) $\pi = \pi^F \times \frac{\tau}{\tau^F}$ ← We substitute π to π^F in equation (1).

π : adjusted operating profits, τ : actual corporate tax revenue from the government
 τ^F : corporate tax from the *Financial Statements of Corporations*

2.2 Operating Surplus (5)

- Our estimate do not differ much from that of the National Accounts statistics.
The average divergence between these two series for the entire sample period is as small as -0.5 trillion yen or -1.2% . However, **2014 observes a significantly wider gap.**

Figure 9 Estimated and Official Net Operating Surplus

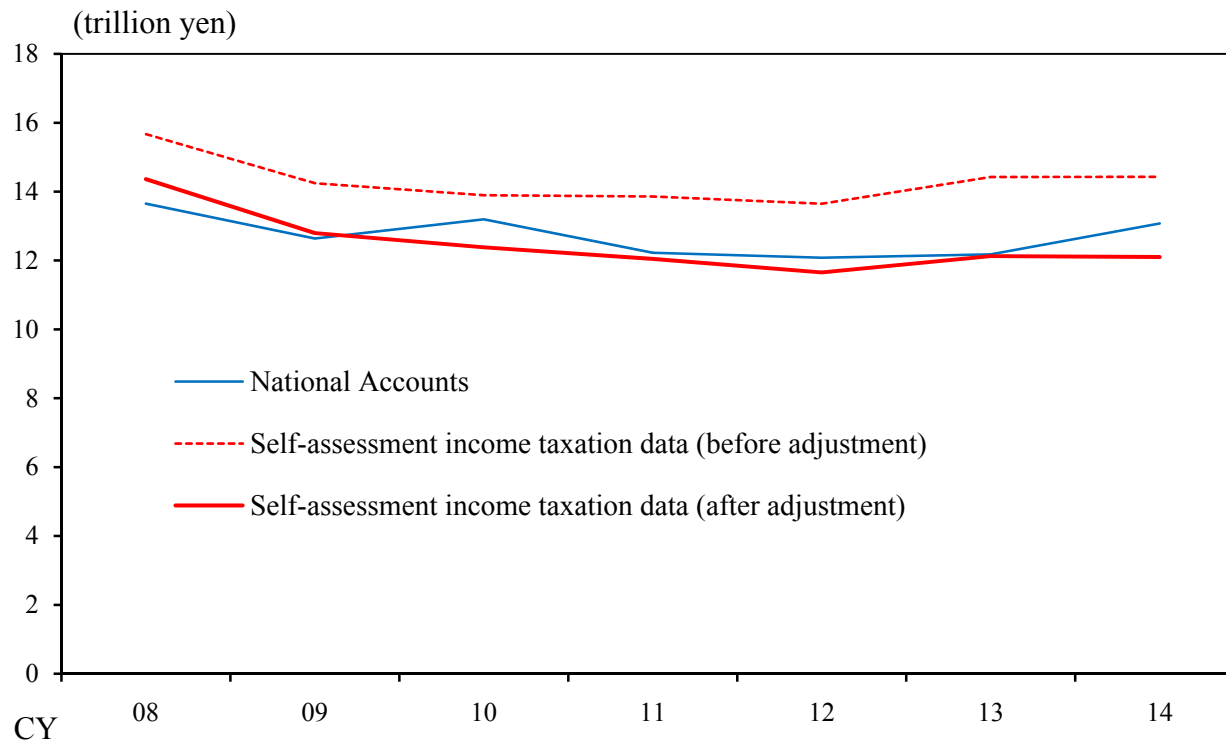


2.3 Mixed Income

- We estimate mixed income of households using self-assessment income taxation data of private unincorporated enterprises from the **National Tax Agency**.
- We subtract any rent from land that households receive and add the amount of an income deduction for income earners.

→ **Our estimate is only about 10 trillion yen and does not differ much from that of the National Accounts.**

Figure 10 Estimated and Official Mixed Income of Households



3 Estimated GDI and Official GDE

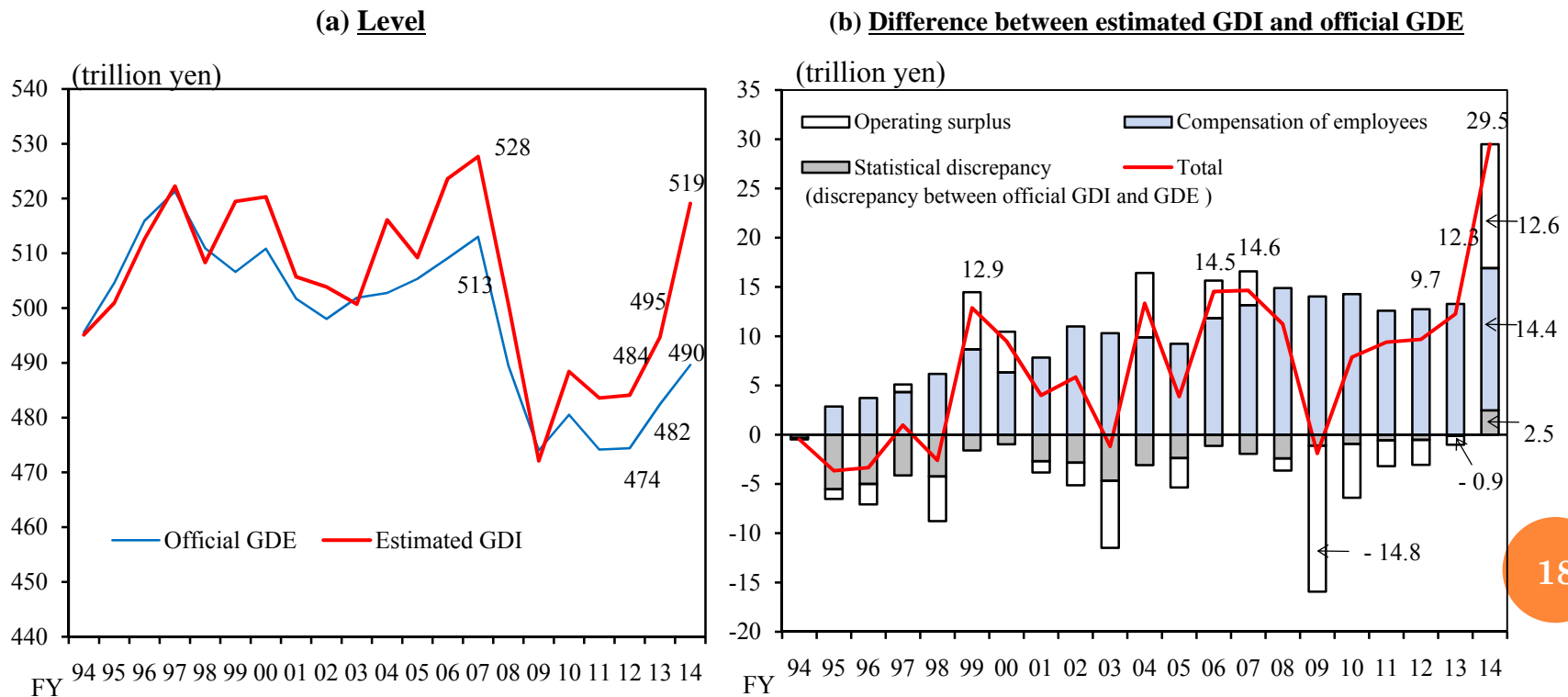
Estimated GDI and Official GDE

- Our estimated GDI is larger than the Official GDE.
- The difference between these two series is divided into (1) that between our estimated GDI and the official GDI (= GDP), and (2) that between the official GDI (= GDP) and GDE.

(1) **mainly owes to compensation of employees. As for 2014, operating surplus also made a large contribution.**

(2) is not so large (Statistical discrepancy in Figure 11 [b]).

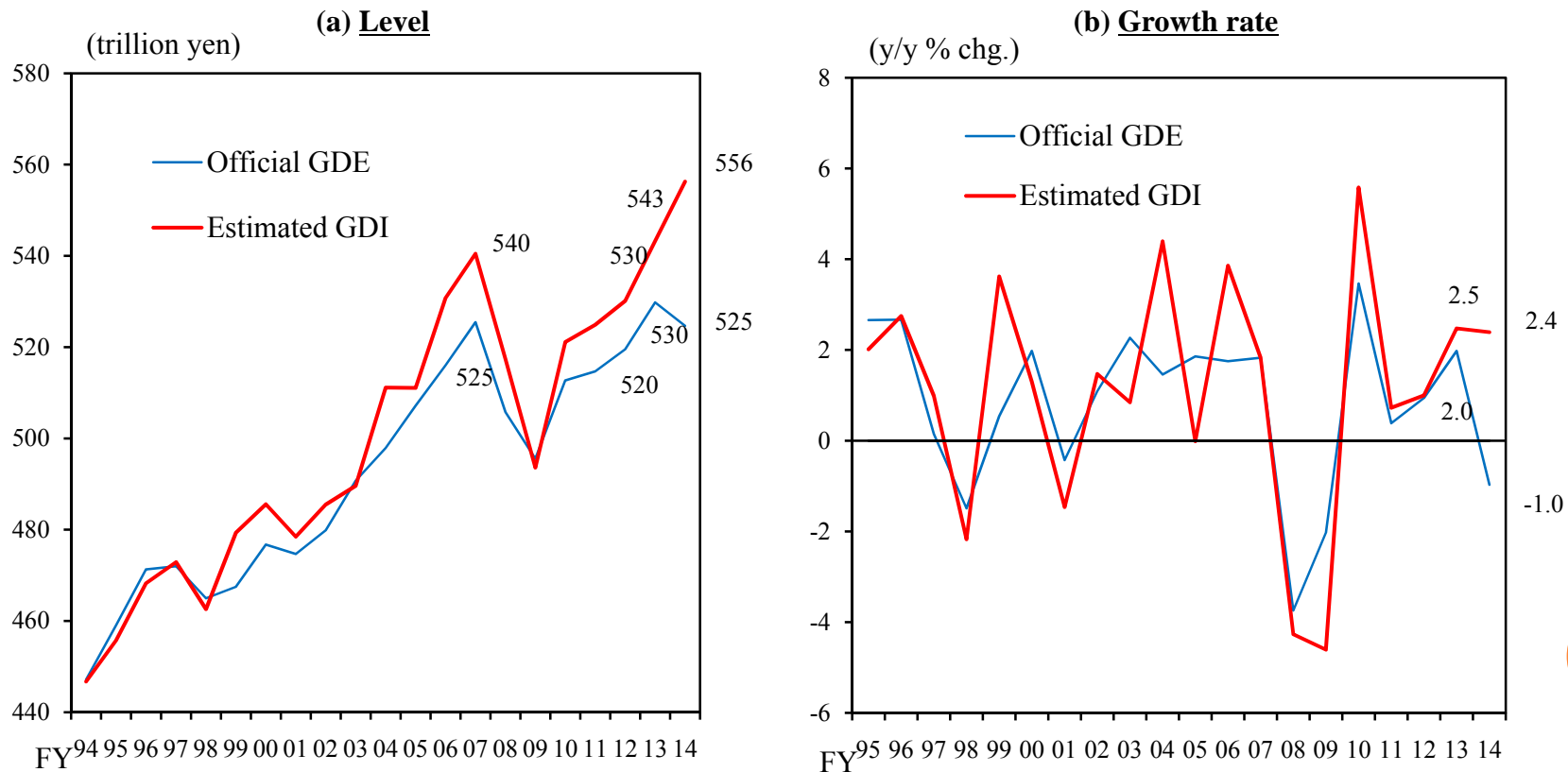
Figure 11 Estimated GDI and Official GDE



Estimated Real GDI and Official Real GDE

- The reading of 2014 exceeded the previous peak of 2007 by a wide margin, whereas real GDE of the National Accounts did not surpass the 2007 peak.
- In our calculation, **real GDI grew by 2.4% in 2014, which is a sharp contrast to a contraction by -1.0% in GDE.**

Figure 12 Estimated Real GDI and Official Real GDE

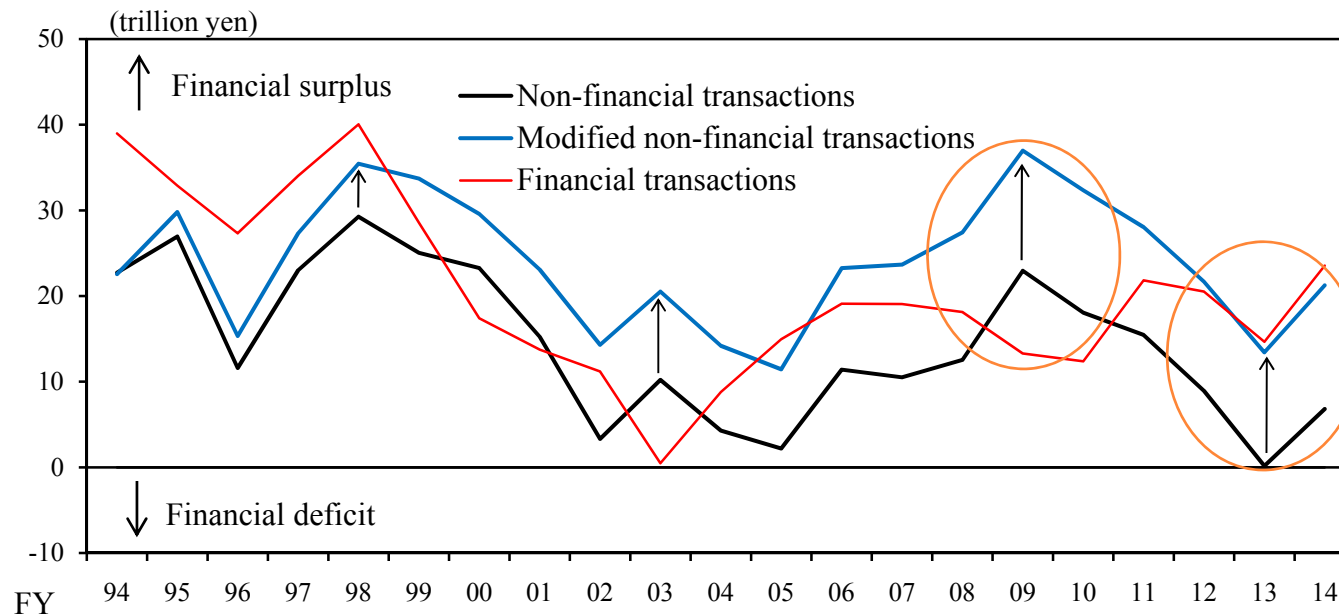


Results for the initial question

(1) When using our estimate for compensation of employees, **discrepancy between non-financial and financial transactions accounts for households narrows for FY2013.**

However, we need to make other adjustments in order to decrease the remaining discrepancy between the two transactions accounts.

Figure 13 Net lending/borrowing for households



(2) **Our estimate of net operating surplus increases in FY2014.**

This is the same result as corporate profits in many statistical surveys and corporate tax revenue also increased in FY2014.

Introduction of the SNA2008 (1)

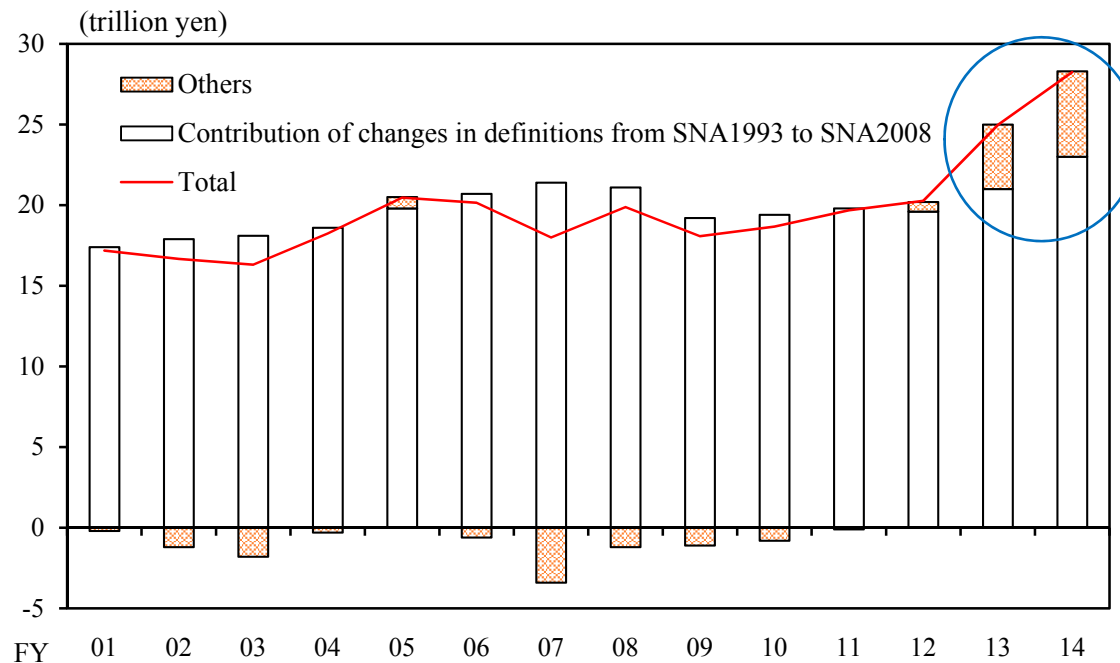
- In December 2016, the National Accounts had a comprehensive revision including the introduction of the SNA2008.
- The revision pushed up GDE to a large extent.

Contribution of difference before and after revision is attributable to the following two factors.

(1) **Changes in definitions from SNA1993 to SNA2008**

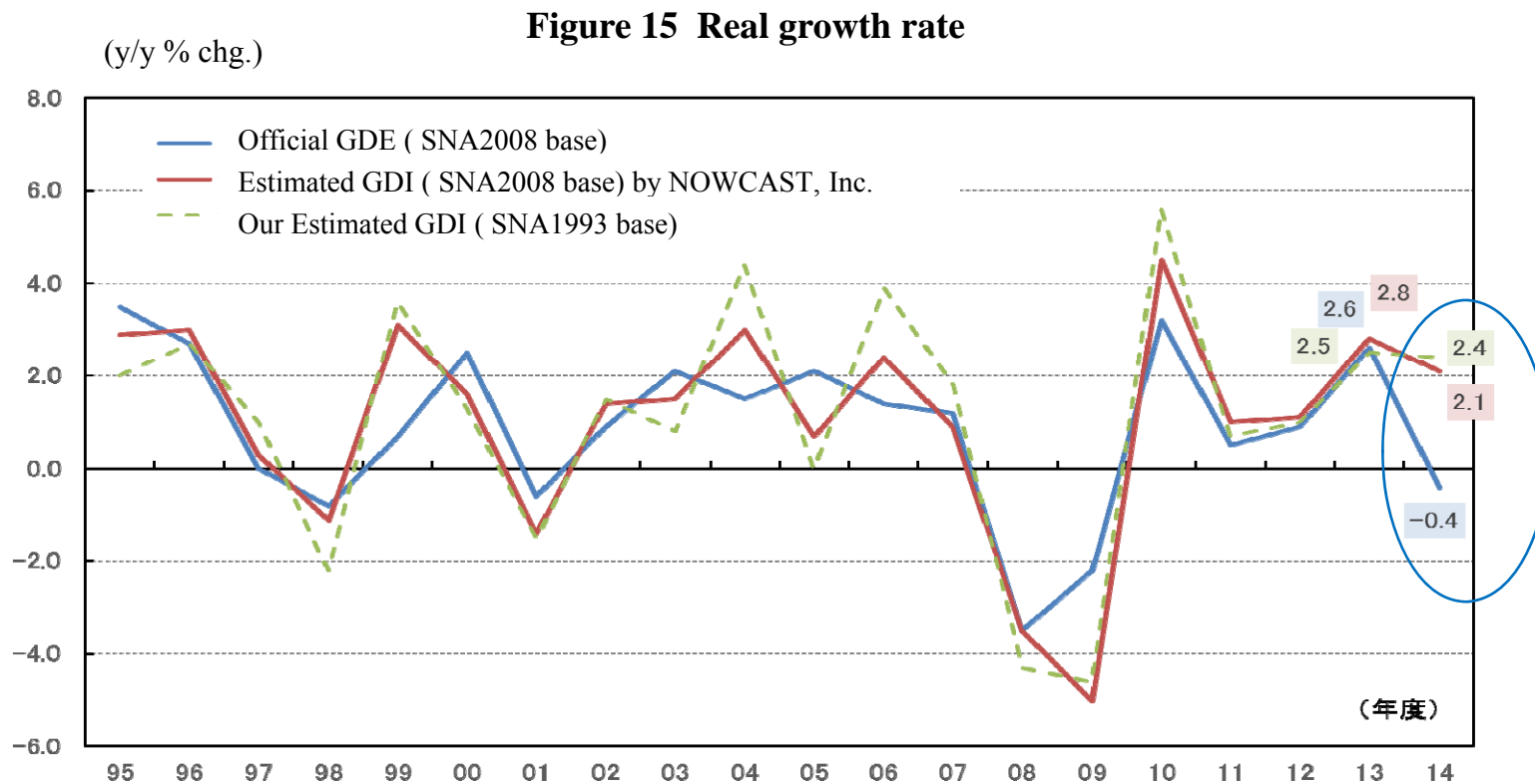
(2) **Others including changes in data sources**

Figure 14 Difference between annual report for 2014 (SNA1993 base) and that for 2015 (SNA2008 base)
(official GDE)



Introduction of the SNA2008 (2)

- NOWCAST, Inc. (private company) started to compile and publish the estimated GDI of SNA2008 base using our estimation method.

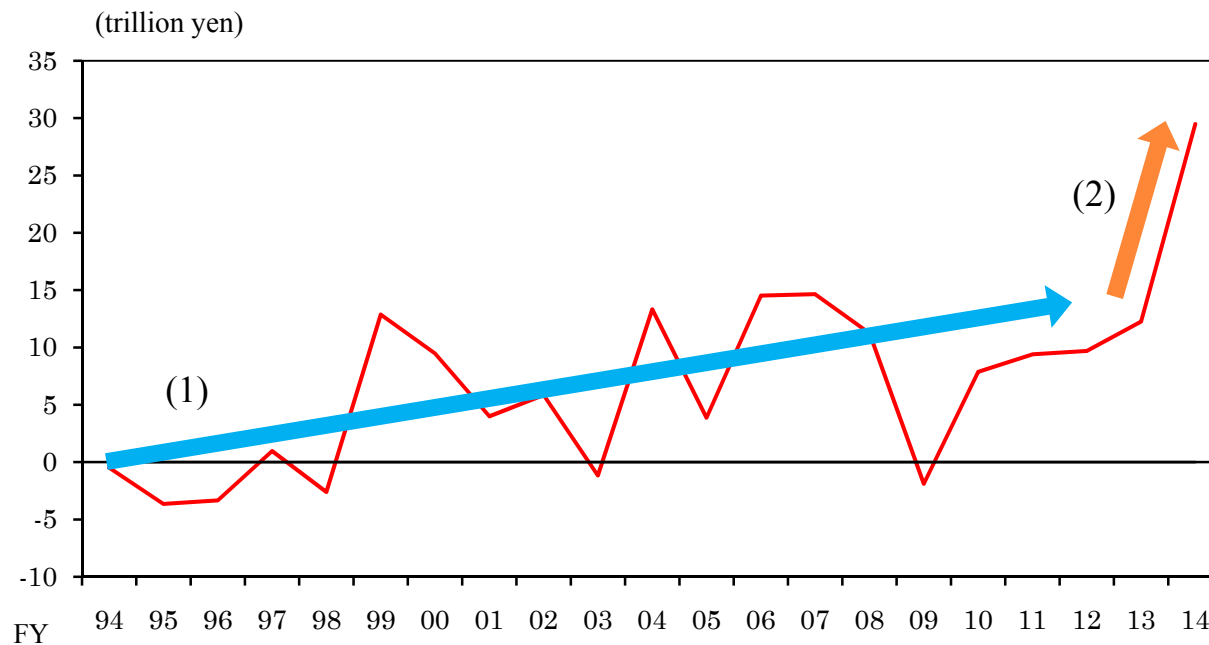


4 Factors of Divergence between Our Estimated GDI and Official GDE

Difference between Estimated GDI and Official GDE

- (1) **Between FYs 1994 and 2013**, we can see a gradual increase in the difference between the estimated GDI and the official GDE.
- (2) Then, **in FY2014**, we can see a rapid increase.

Figure 16 Difference between estimated GDI and official GDE



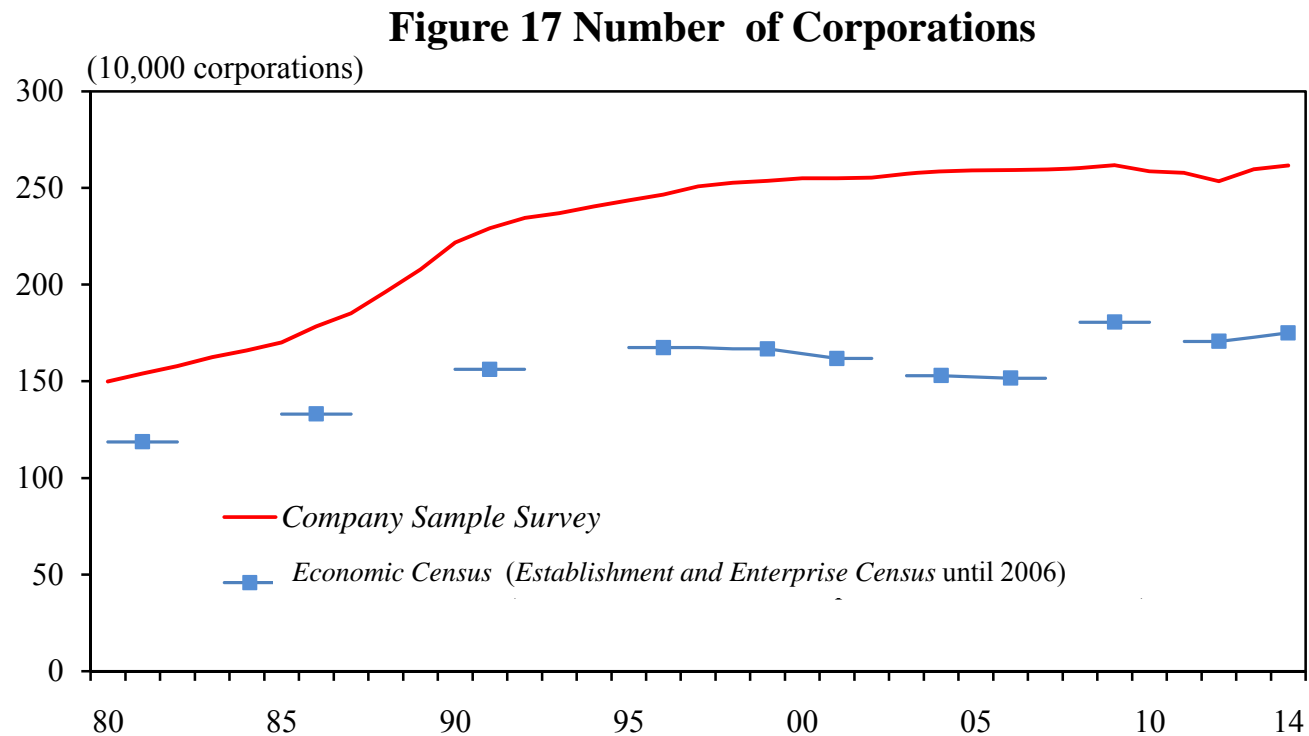
Factors of Divergence between Estimated GDI and Official GDE (1)

(1) Number of corporations

The difference between *Economic Census* (statistical survey) and *Company Sample Survey* (taxation data survey) expands gradually in the long run.

(Data of 2014)

- *Economic Census* ··· **1.75 million**
- *Company Sample Survey* ··· **2.62 million**



Factors of Divergence between Estimated GDI and Official GDE (2)

(2) Effects of the consumption tax hike in 2014

- In source surveys of the National Accounts, companies are supposed to report their nominal values with the consumption tax included and the National Accounts are then compiled as such.
- If a certain number of those companies had excluded consumption tax when reporting, there could have been a disruption in the data series when the consumption tax rate was raised from 5% to 8% in 2014. This would have resulted in the growth rate of the corresponding year appearing lower than the actual growth rate.

5 Concluding Remarks

Concluding Remarks

- Further development of our GDI estimation based on taxation data will require the following **two practical issues to be resolved**.

(1) The long time lag in the availability of taxation data needs to be overcome. Taxation data cannot be used for the annual report of Japanese National Accounts, which is usually published in December of the following year.

(2) We need to explore how to estimate GDI on a quarterly basis.

Thank you for your attention