RIETI International Symposium

**Information Technology and
the New Globalization:
Asia's economy today and tomorrow**

Handout

SEKINE Toshitaka

Director-General, Research and Statistics
Department, Bank of Japan

August 1, 2017

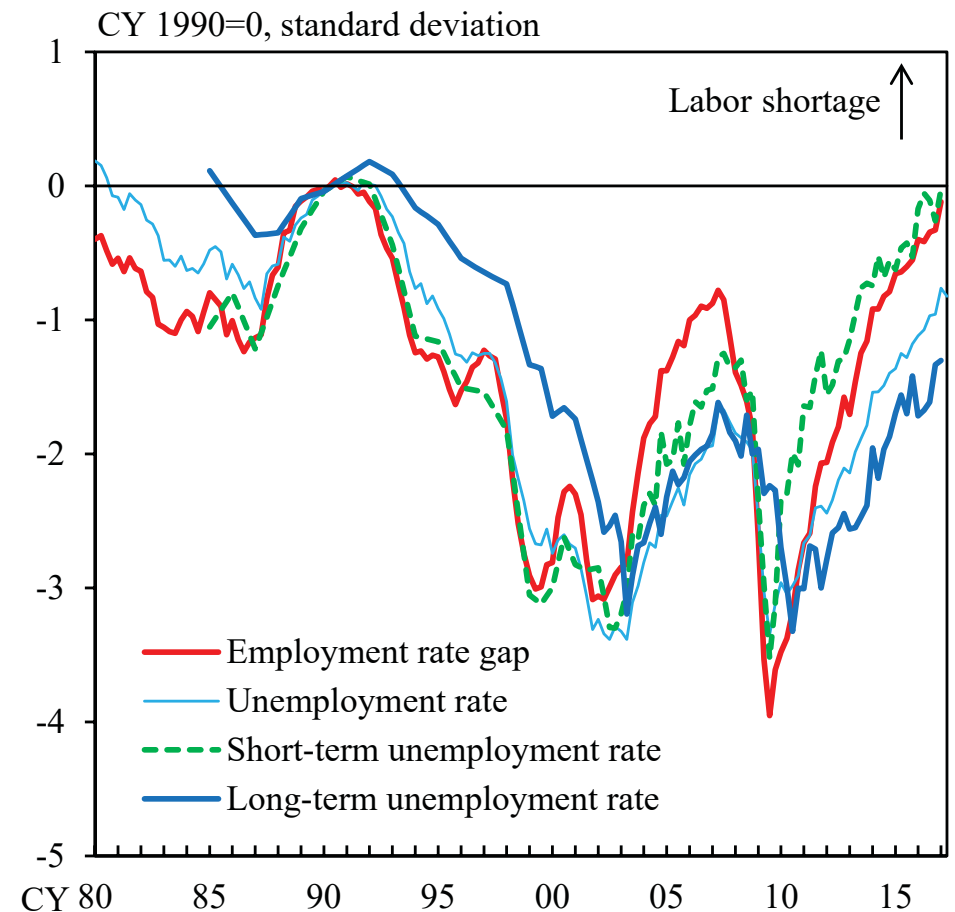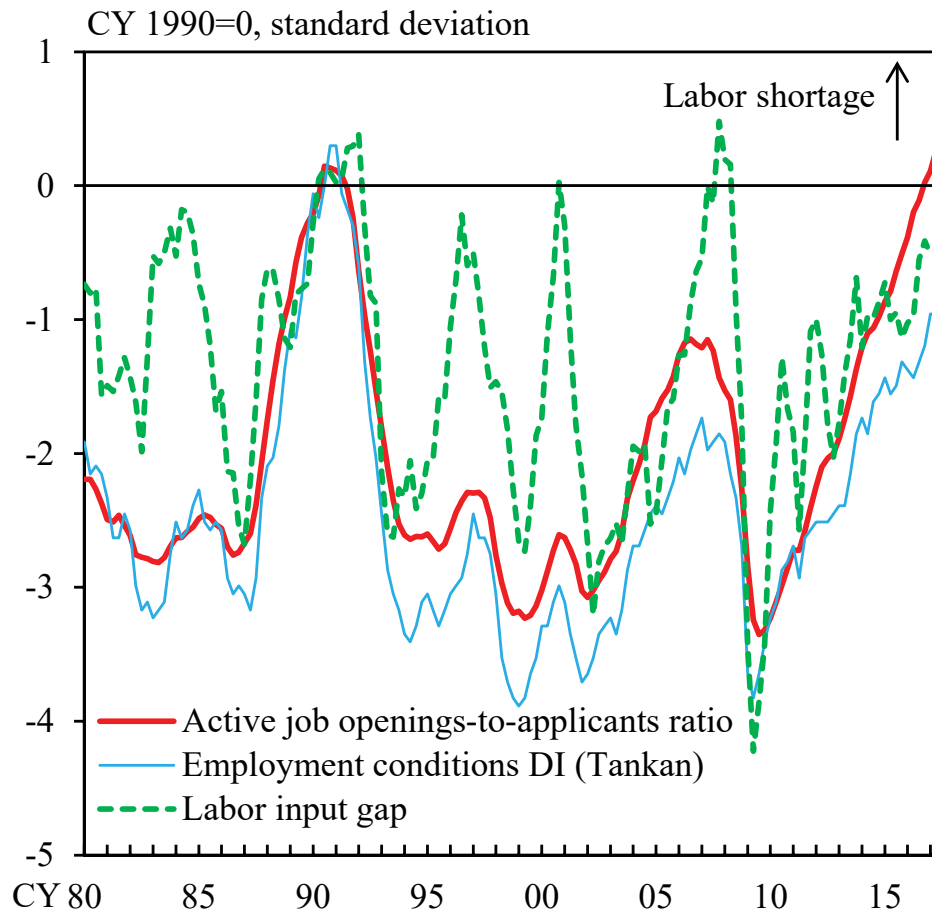# Productivity and Price Dynamics:
A Bank of Japan economist's point of view

August 1, 2017

Toshitaka Sekine

Research and Statistics Department
Bank of Japan

Historically tight labor market conditions

CY 1990=0, standard deviation

Labor shortage ↑

Active job openings-to-applicants ratio
Employment conditions DI (Tankan)
Labor input gap

CY 80 85 90 95 00 05 10 15

CY 1990=0, standard deviation

Labor shortage ↑

Employment rate gap
Unemployment rate
Short-term unemployment rate
Long-term unemployment rate

CY 80 85 90 95 00 05 10 15

Notes: 1. Figures for each labor slack measure are normalized by the standard deviation after 1990.

2. Figures for active job openings-to-applicants ratio and unemployment rate for 2017/Q2 are April-May averages.
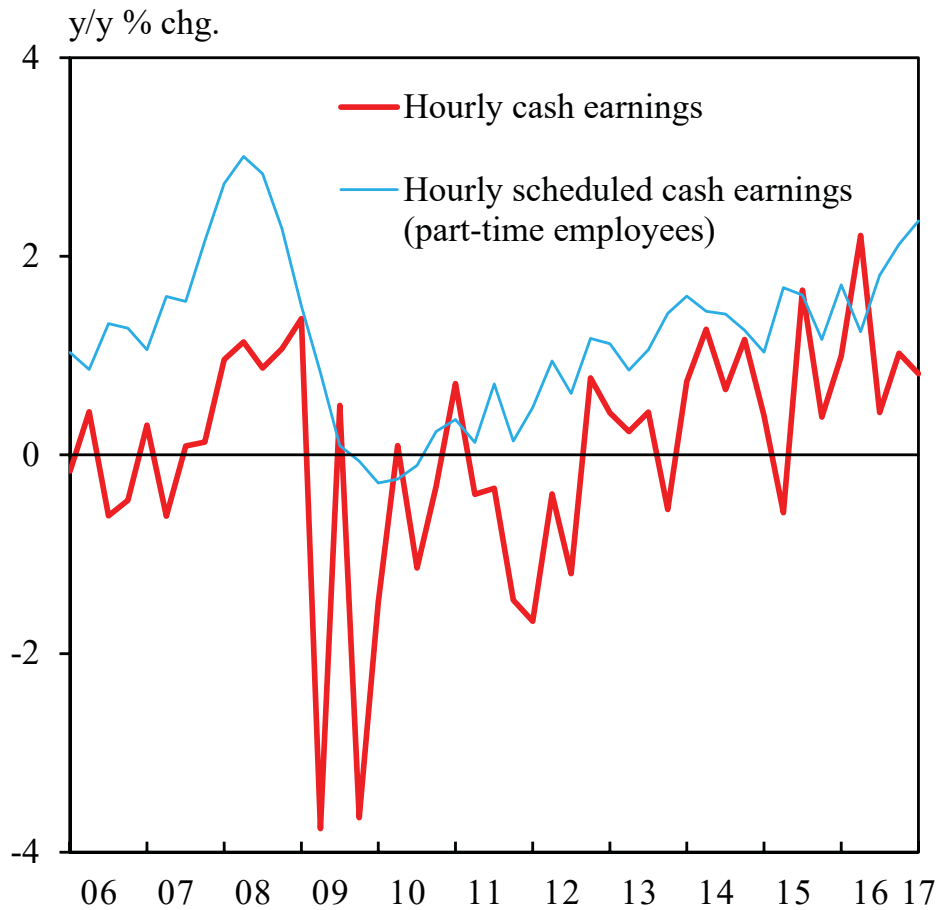
3. The labor input gap and employment rate gap are based on staff estimations.

4. Figures for the short- and long-term unemployment rates up through 2001 are not seasonally adjusted, since they are on a semiannual or annual basis.
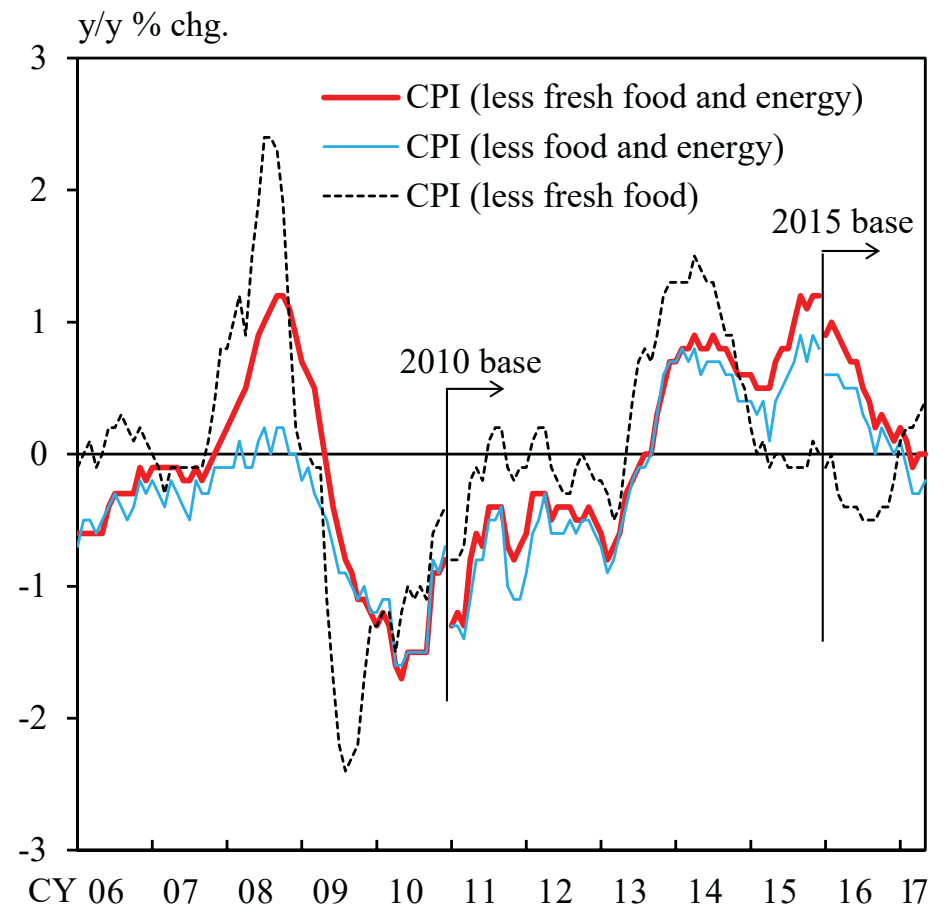
Sources: Ministry of Health, Labour and Welfare; Bank of Japan; Ministry of Internal Affairs and Communications, etc.

Yet, little wage and price inflation

Hourly Cash Earnings

y/y % chg.

- Hourly cash earnings
- Hourly scheduled cash earnings (part-time employees)

CPI

y/y % chg.

- CPI (less fresh food and energy)
- CPI (less food and energy)
- CPI (less fresh food)

2015 base

2010 base

CY 06 07 08 09 10 11 12 13 14 15 16 17

06 07 08 09 10 11 12 13 14 15 16 17

Notes: 1. In the left chart, Q1 = March-May, Q2 = June-August, Q3 = September-November, Q4 = December-February.
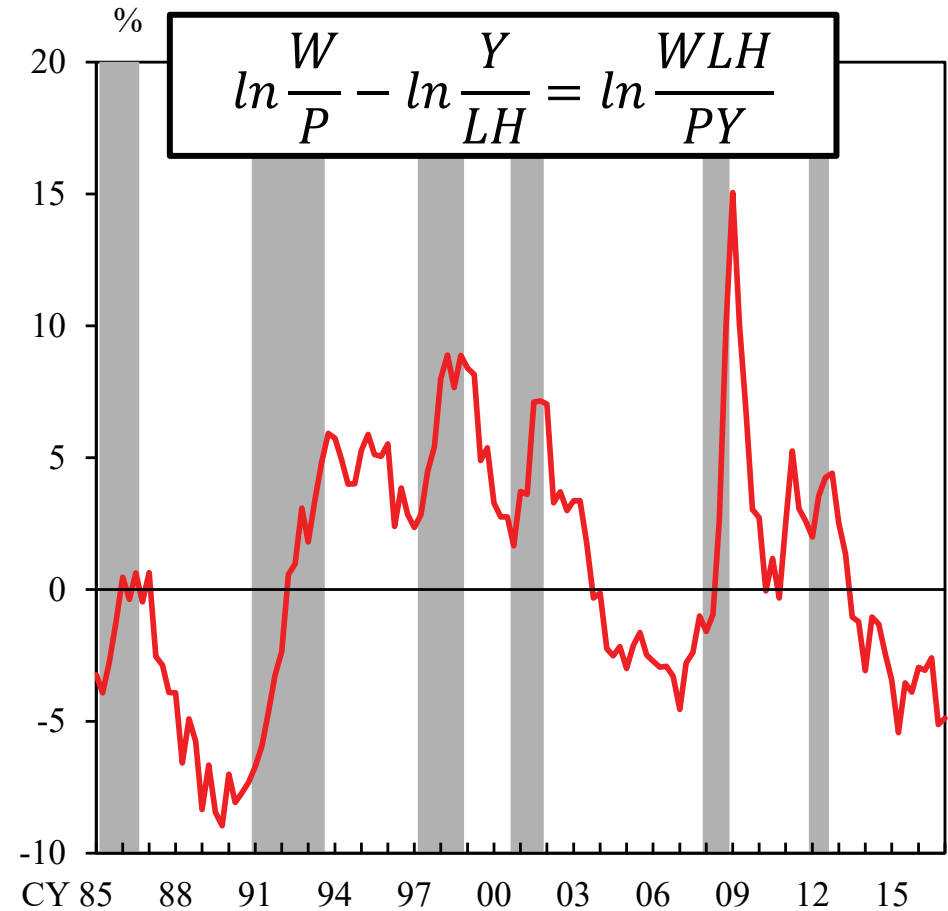   2. Figures for CPI are adjusted for changes in the consumption tax rate.
Sources: Ministry of Internal Affairs and Communications; Ministry of Health, Labour and Welfare.

3

Real wage and labor productivity

Real Wage and Labor Productivity

s.a., average of 1980/Q1-2017/Q1 =100

- Real wages
- Labor productivity
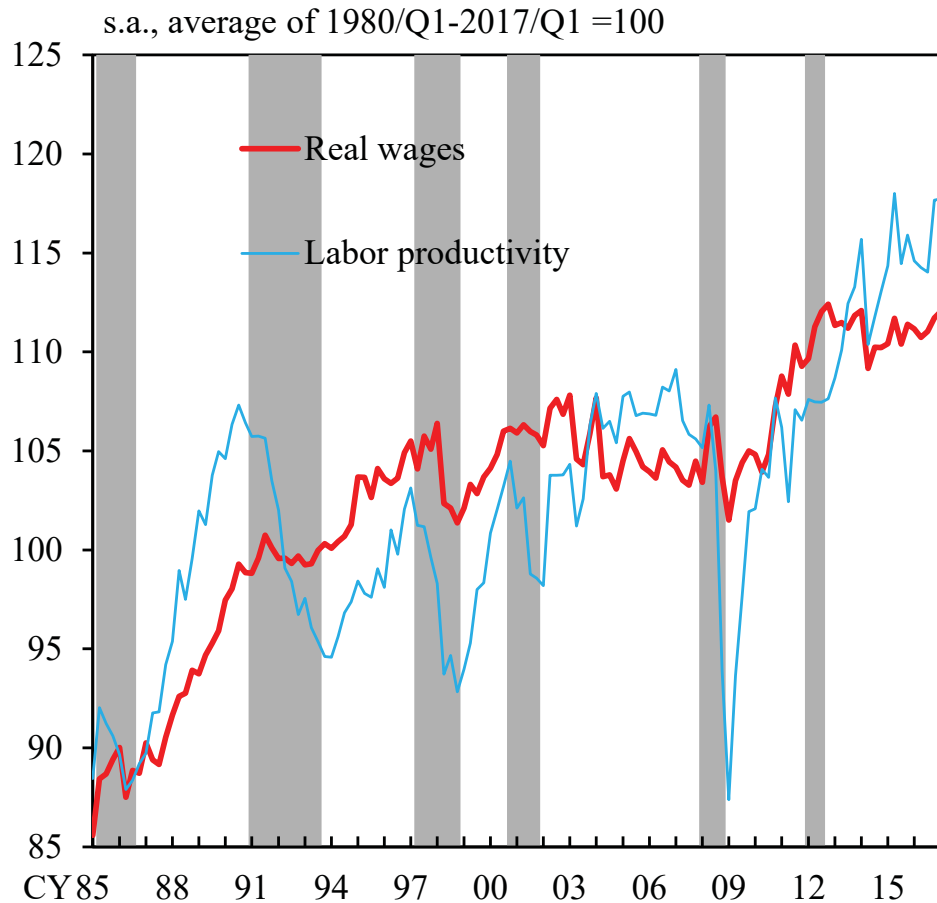
Real Wage Gap (Labor Income Share)

%

$$ln\frac{W}{P} - ln\frac{Y}{LH} = ln\frac{WLH}{PY}$$

Notes: 1. The real wage gap is defined as the deviation of real wages from labor productivity.

2. Real wages = personnel expenses / number of employees / GDP deflator

3. Labor productivity = (operating profits + personnel expenses + depreciation expenses) / number of employees / GDP deflator
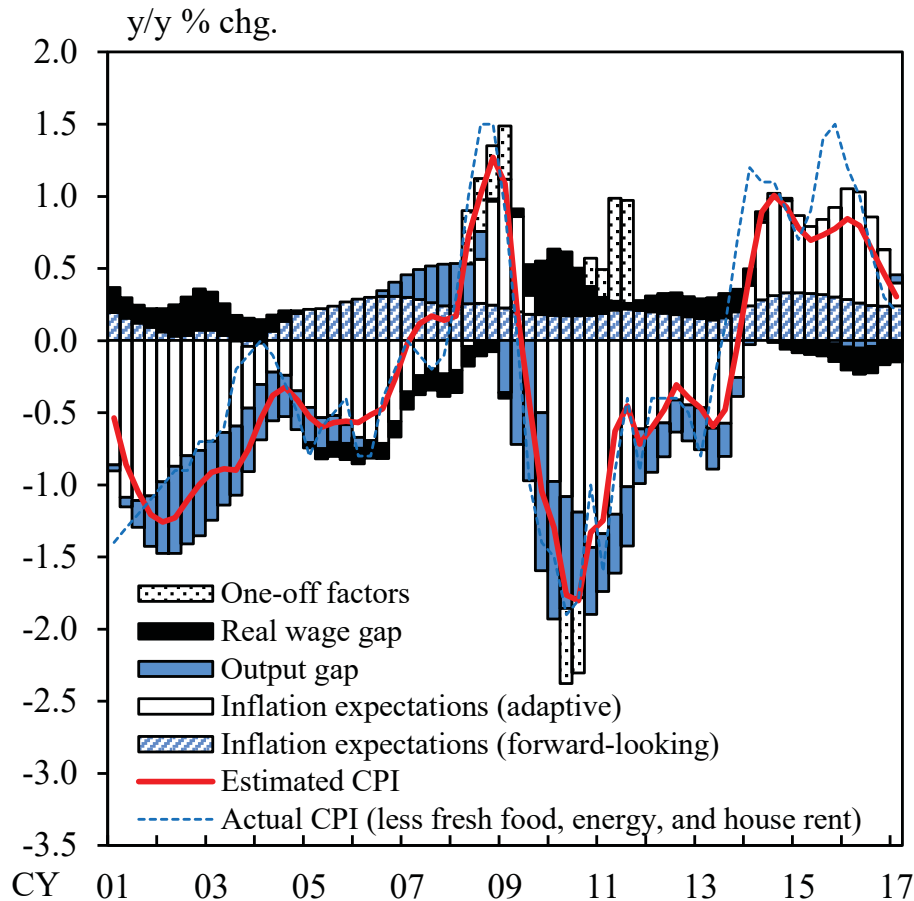
4. Variables such as personnel expenses are based on the "Financial Statements Statistics of Corporations by Industry, Quarterly" and exclude "finance and insurance."

5. Shaded areas indicate recession periods.

Sources: Ministry of Finance; Cabinet Office.

4

Augmented Phillips curve

Effects of Real Wage Gap on the Inflation Rate

y/y % chg.

Legend:
- One-off factors
- Real wage gap
- Output gap
- Inflation expectations (adaptive)
- Inflation expectations (forward-looking)
- Estimated CPI
- Actual CPI (less fresh food, energy, and house rent)

(a) Specifications

$$\pi_t = \beta_0$$
$$+ \beta_1 \times \pi^e_t$$
$$+ (1-\beta_1) \times (\pi_{t-1} + \pi_{t-2})/2$$
$$+ \beta_2 \times ygap_t$$
$$+ \beta_3 \times (wgap_{t-2} + wgap_{t-3})/2$$
$$+ \Omega \times (\text{dummy variables for one-off factors})$$

π: CPI less fresh food, energy, and house rent (seasonally adjusted q/q % changes, annualized).
π^e: medium- to long-term inflation expectations (%).
ygap: output gap (%). wgap: real wage gap (%).

(b) Estimation Results

β_0	-0.30 **
β_1	0.30 ***
β_2	0.19 ***
β_3	0.05 *
Adj. R^2	0.62
S.E.	0.36

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
S.E. represents the standard errors for the estimated y/y % changes.
Estimation period: 1997/Q1-2017/Q1.

Notes: 1. Figures for medium- to long-term inflation expectations are the expectations for the CPI 6 to 10 years ahead and are based on the "Consensus Forecasts."
2. In the estimations, dummy variables are included in order to control for the estimated effects of one-off factors such as the introduction of a subsidy for high school tuition.
3. The output gap is based on staff estimations.
4. The CPI figures are adjusted for changes in the consumption tax rate.
5. The effects of the constant term are evenly allocated to the contributions of inflation expectations (forward-looking and adaptive).

Sources: Ministry of Internal Affairs and Communications; Ministry of Finance; Consensus Economics Inc., "Consensus Forecasts," etc.

Substitution or technological change?

(a) Substitution

(b) Harrod-neutral technical progress
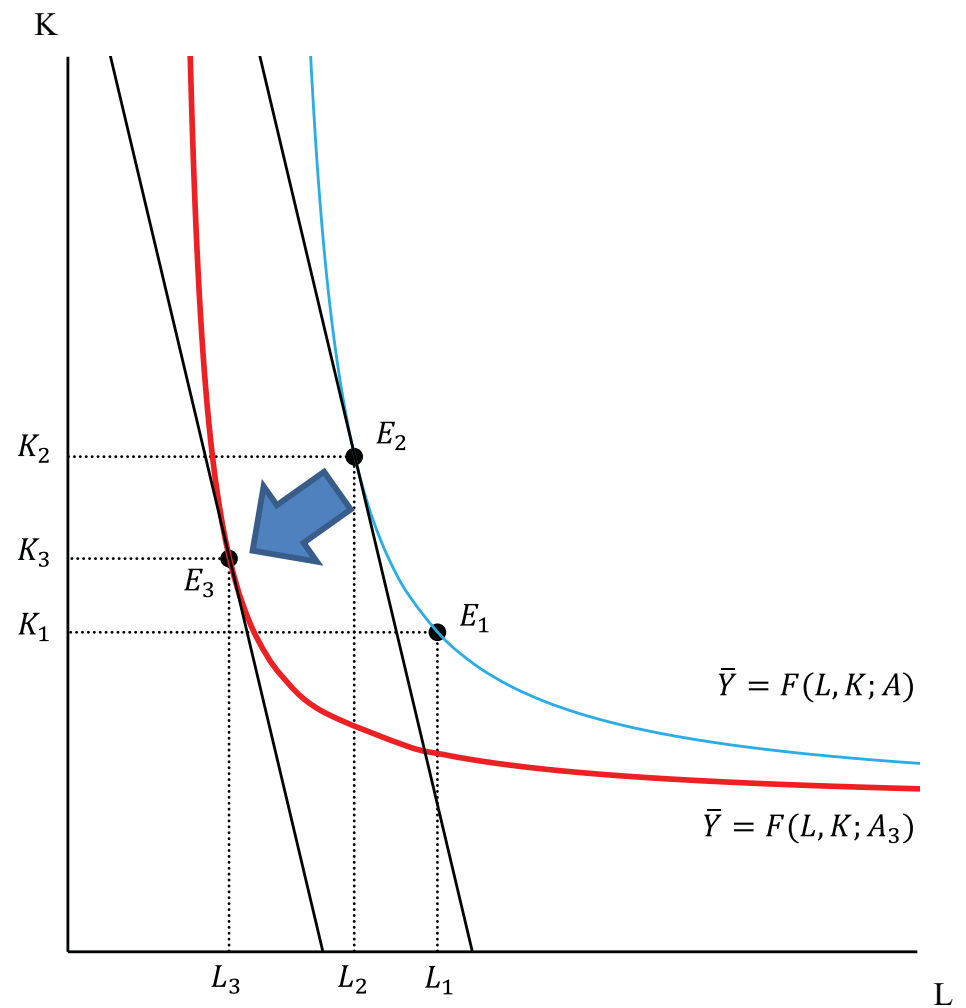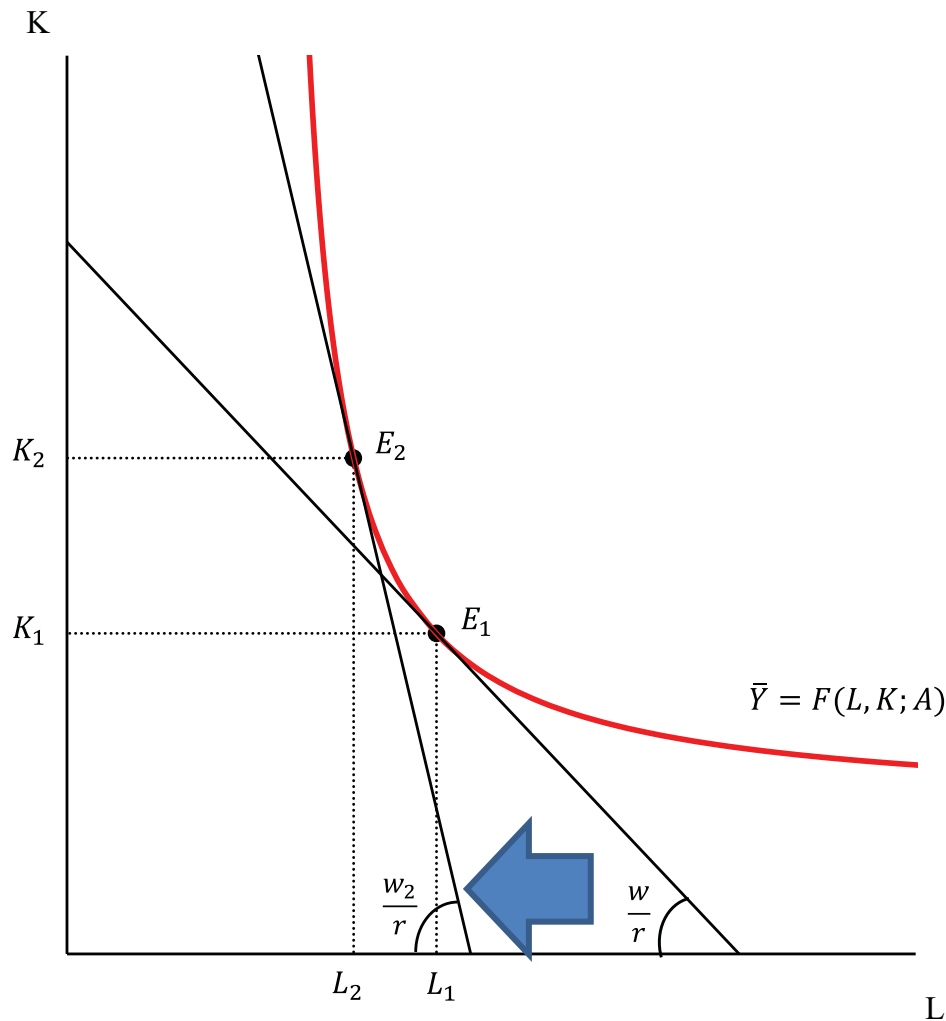
Substitution between labor and capital

Estimates of σ , Elasticity of substitution (panel estimation)

$$ln\frac{K_{it}}{L_{it}} = -\sigma \times ln\frac{r(K)_{it}}{w_{it}} + Const. + fixed\ effect_i + \varepsilon_{it}$$

		Case of all types of capital	Case of IT capital
All industries (24 industries)	σ	0.26	0.75
	(S.E.)	(0.03)	(0.04)
	Adj-R^2	0.99	0.95
	S.E. of regression	0.11	0.26
Manufacturings (14 industries)	σ	0.30	1.01
	(S.E.)	(0.04)	(0.06)
	Adj-R^2	0.98	0.95
	S.E. of regression	0.12	0.25
Nonmanufacturings (10 industries)	σ	0.22	0.51
	(S.E.)	(0.03)	(0.06)
	Adj-R^2	0.99	0.97
	S.E. of regression	0.10	0.24

Estimation period: 1995-2015. Cross-section fixed effects are included.

Note: All types of capital excludes residential and R&D stocks. IT capital consists of information and communication machinery and software.
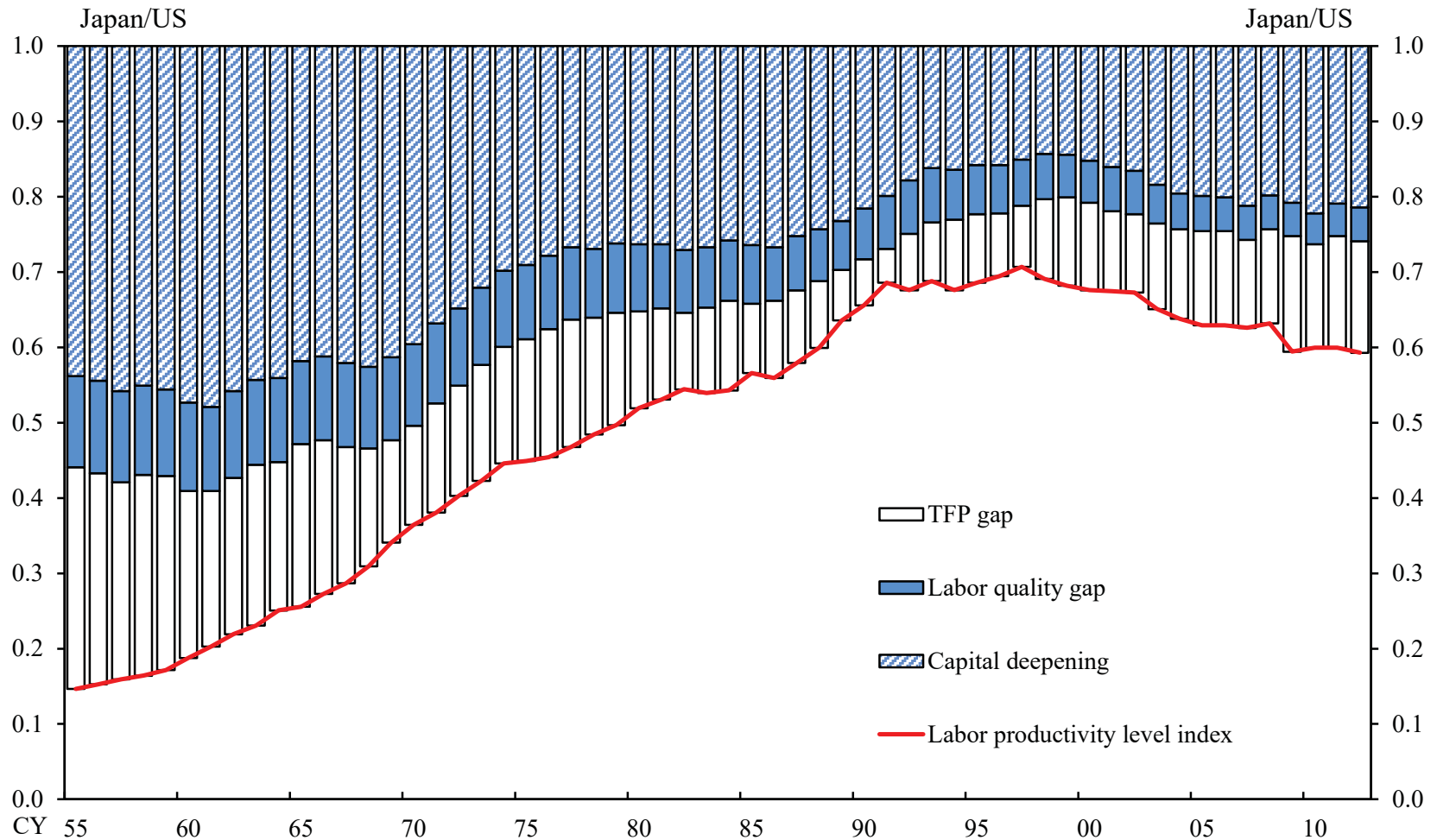
The following 5 industries are excluded in the analysis above: agriculture, forestry and fishing; mining; public administration; education; and human health and social work activities.

Sources: Cabinet Office; Bank of Japan; Ministry of Finance, etc.

How far can we go ?

Sources of Japan-U.S. Gap in Labor Productivity Level Index (Jorgenson, et al., 2016)

Source: Jorgenson, Nomura and Samuels (2016). "A half century of Trans-Pacific competition: price level indices and productivity gaps for Japanese and US industries, 1955–2012," in Jorgenson et al. (eds.) The World Economy – Growth or Stagnation? Chapter 13, pp.469-507.