

Infrastructure Investment, and the 4th Industrial Revolution in Financial Sector

Naoyuki Yoshino

Dean and CEO

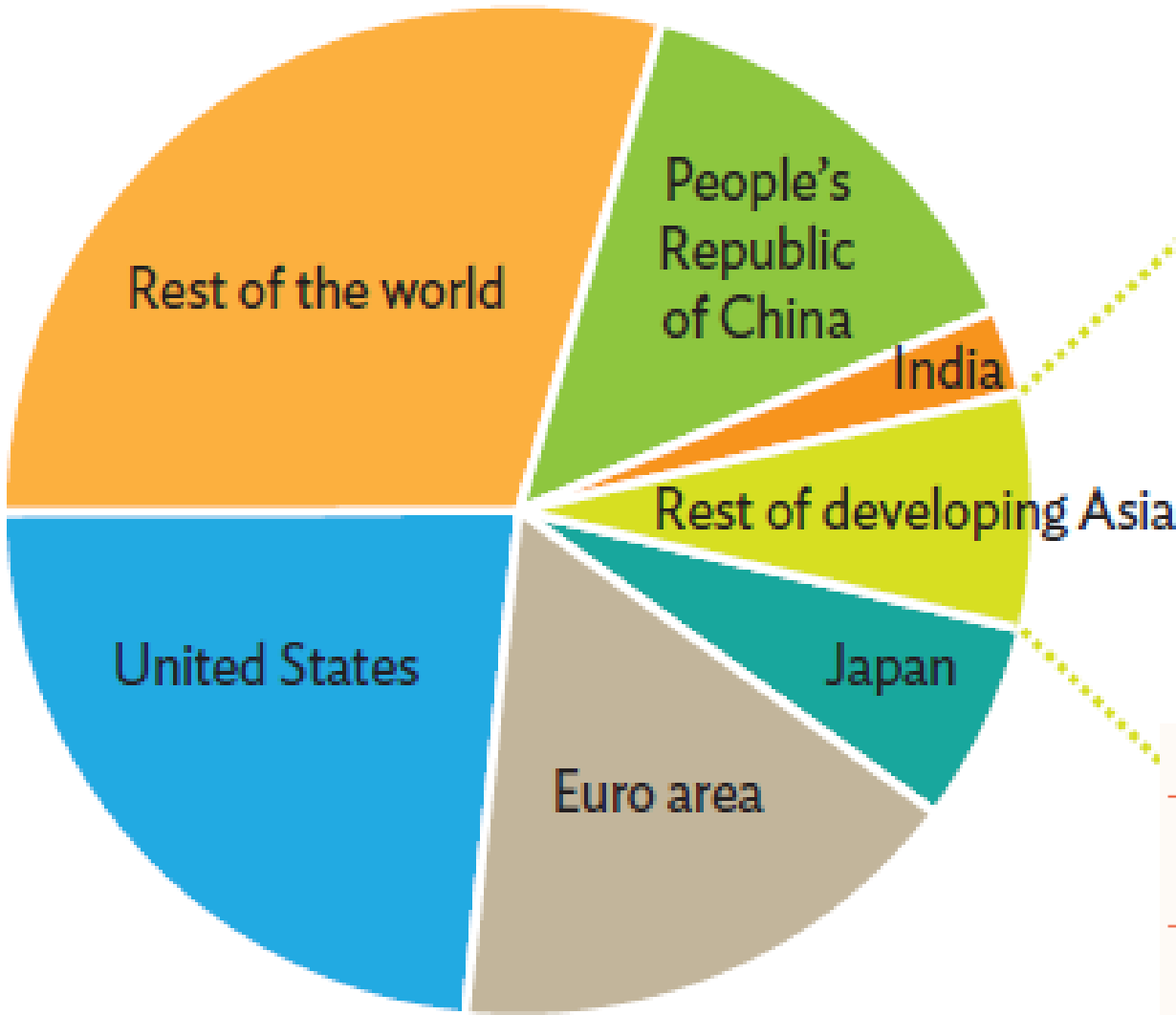
Asian Development Bank Institute (ADBI)

Professor Emeritus of Keio University

Outlines

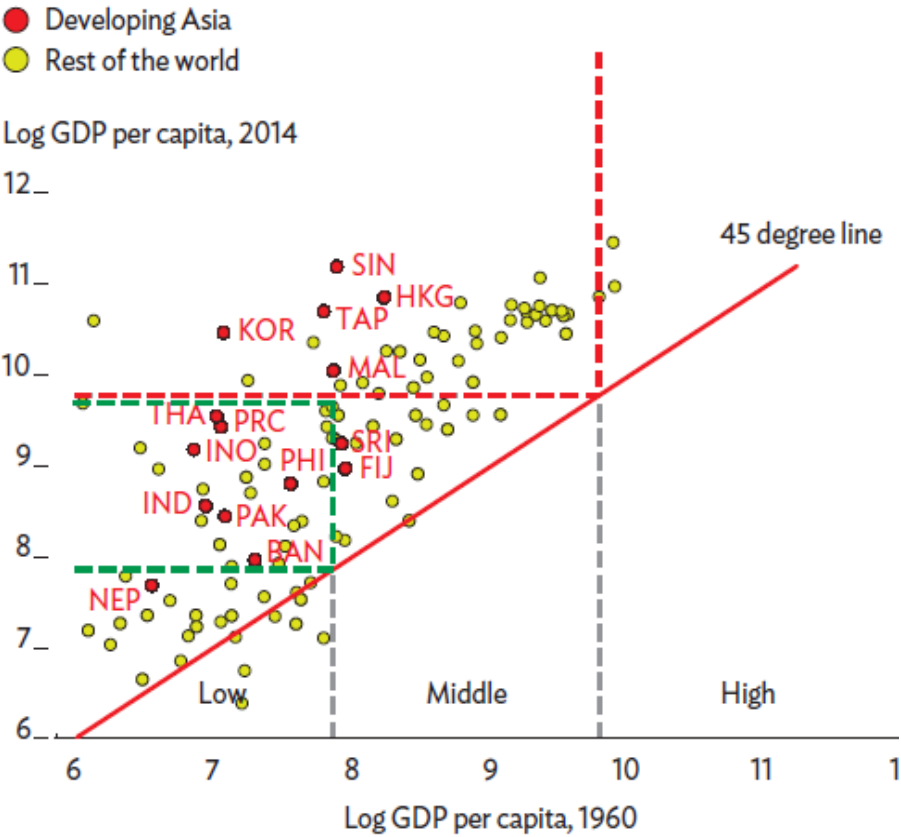
- 1, Asia's Sustainable Growth**
- 2, Asset Price Bubble and Households' Debt**
- 3, Infrastructure Investment and
One Belt and One Road**
- 4, Community Financing for Green Energy**
- 4, Fin Tech Revolution and Education**
- 5, Aging population and Future Issues**

1.0.2 Global shares of income, 2015



Note: Weights are based on gross national income

2.1.2 GDP per capita, PPP (2011 \$)

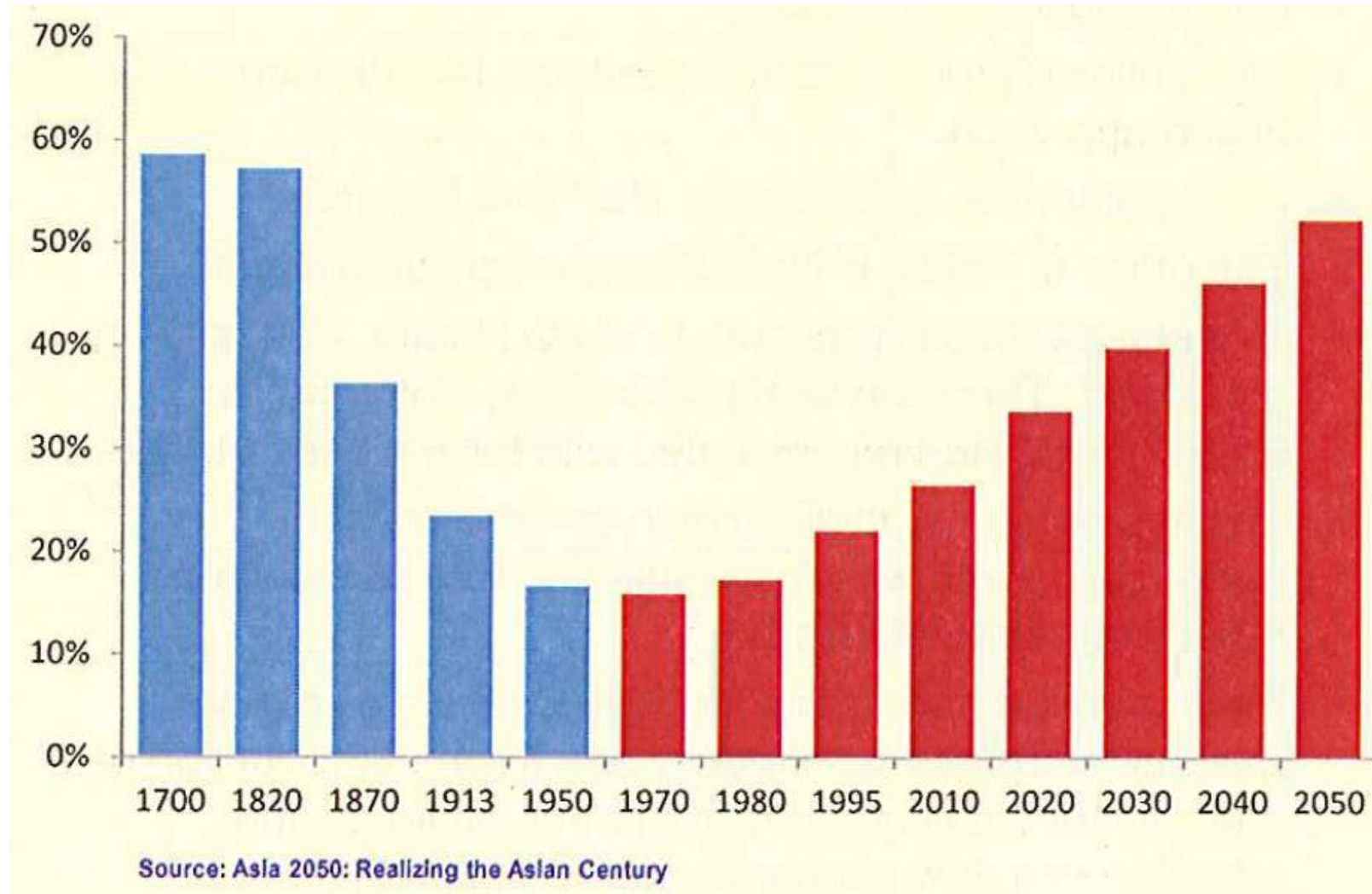


GDP growth in the major industrial economies (%)

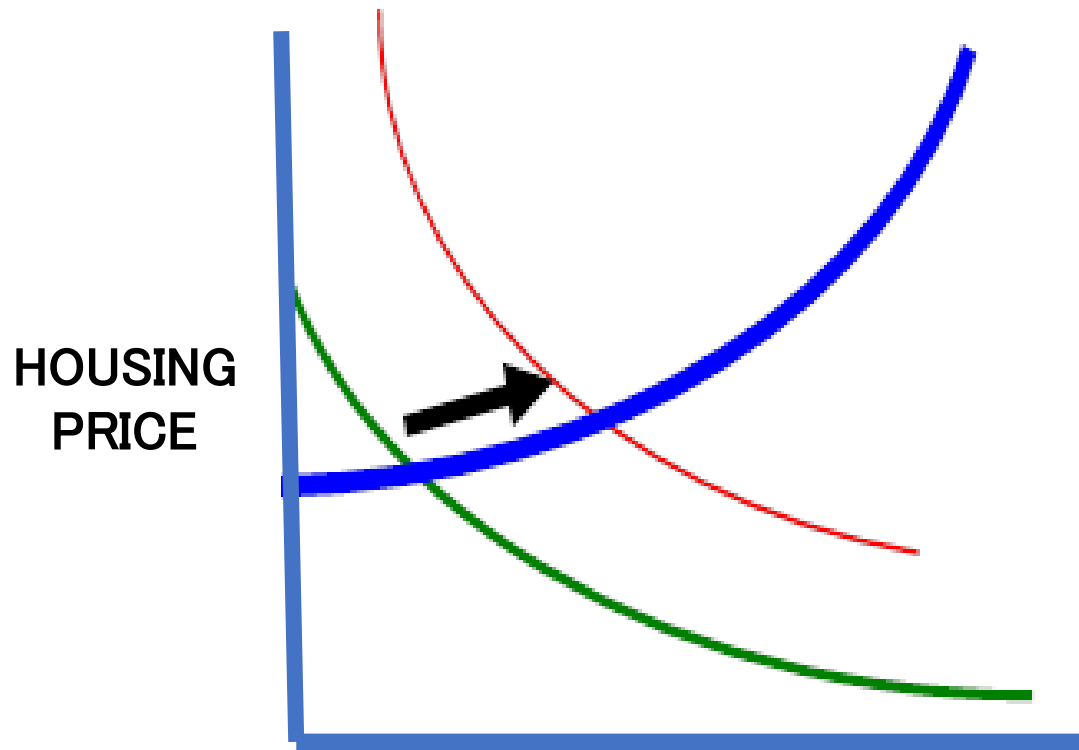
Area	2015	2016	2017	2018
	Actual		ADO projection	
Major industrial economies	2.2	1.6	1.9	1.9
United States	2.6	1.6	2.4	2.4
Euro area	1.9	1.7	1.6	1.6
Japan	1.2	1.0	1.0	0.9

Asia's GDP Share in the World

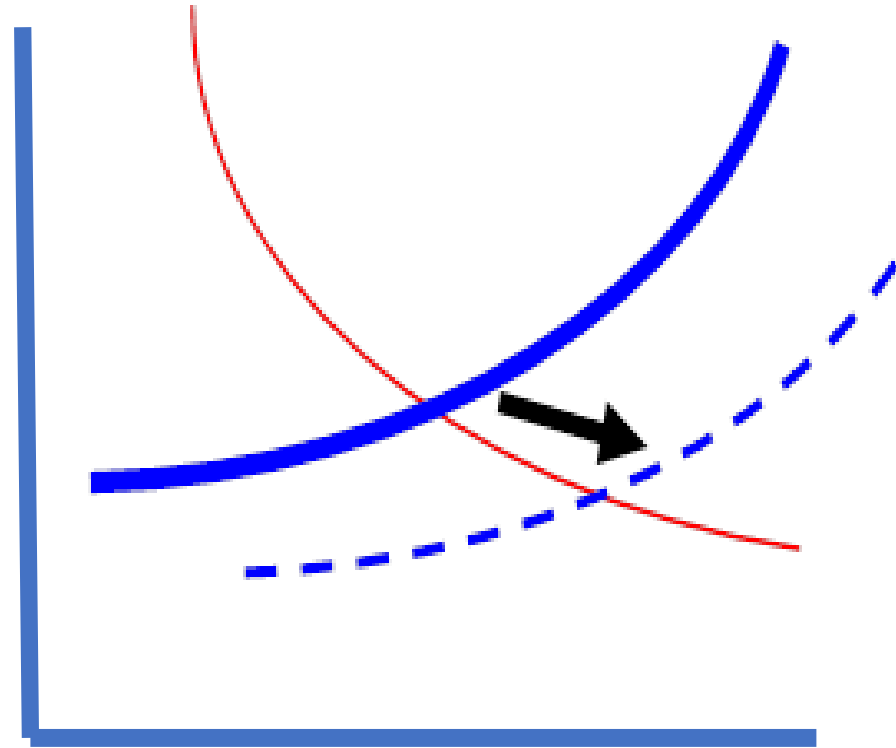
High savings rate, Good education



Bubble : Housing and Real estate market



日本のバブル 1985年～1990年
米国のバブル 2002年～2006年



日本のバブル 1991年～2001年
米国のバブル 2007年～2010年

Bubble Indicators

Bank based financial Market of Asia

(i) the ratio of banks' real estate-related loans to the loans of banks overall, In Japan, this ratio rose from 16% to 32.6%,

$$L_r > L_{total}$$

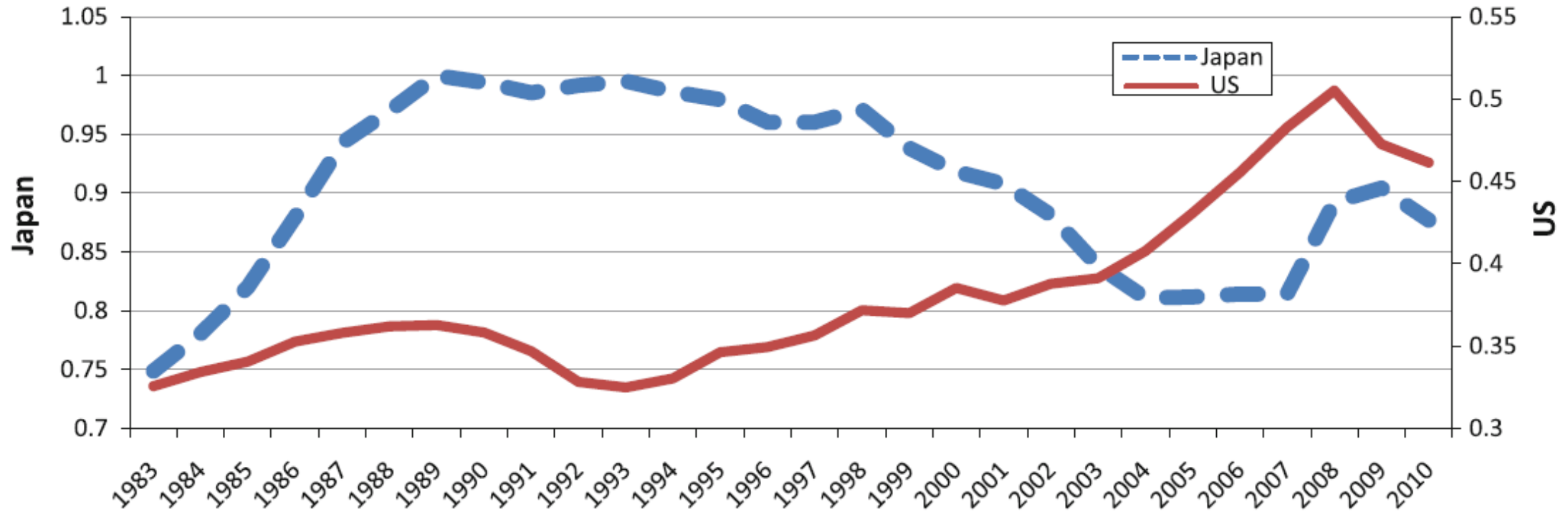
(ii) Comparison of the pace of growth in banks' real estate lending with the real economic growth rate,

$$\Delta L_r / L_r > \Delta Y / Y$$

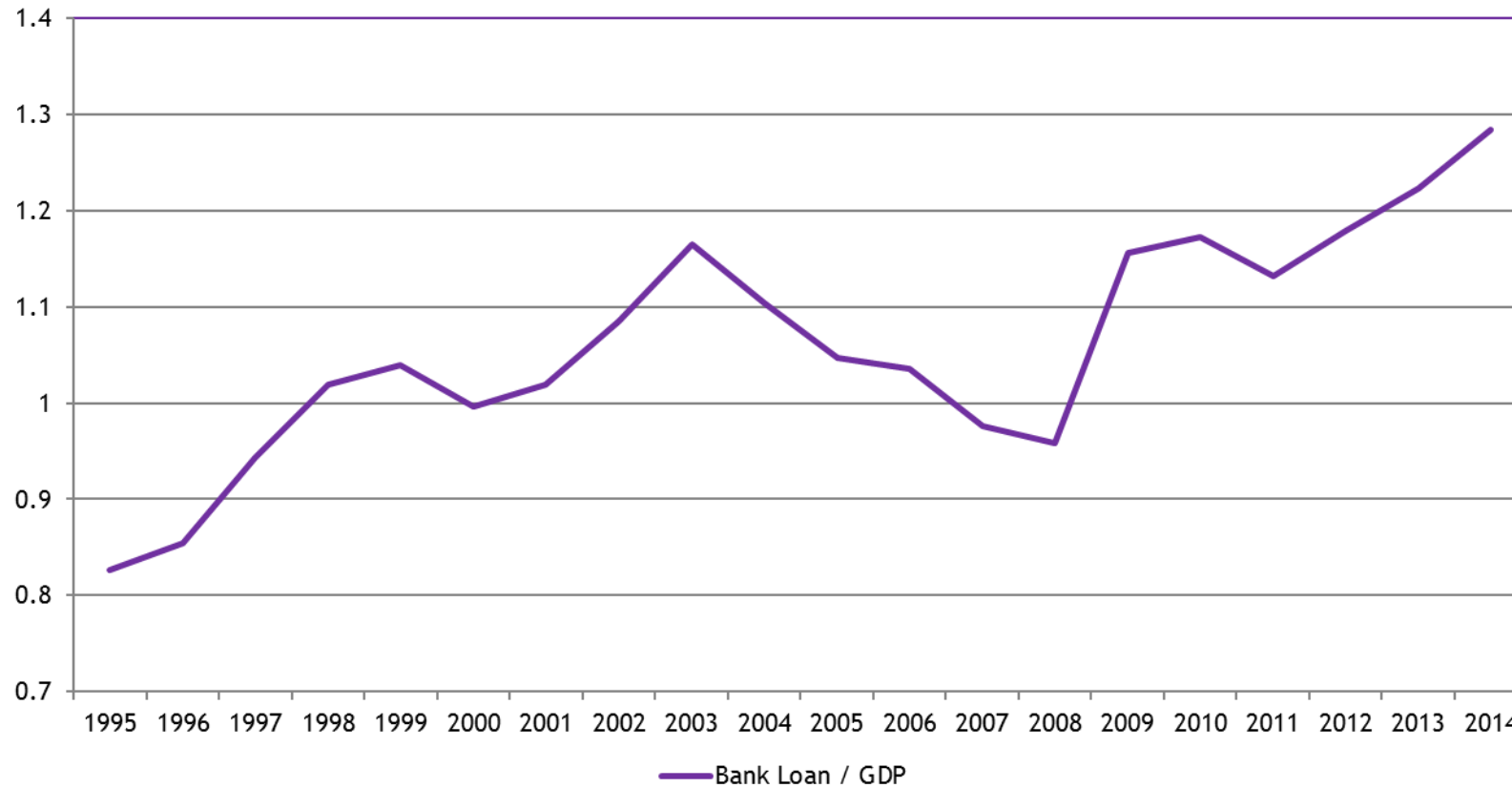
(iii) The rise in the housing prices compared with the average income of workers

$$P_h > \alpha Y$$

Growth rate of Real estate loans / GDP Growth



China's Bank Loan/GDP ratio



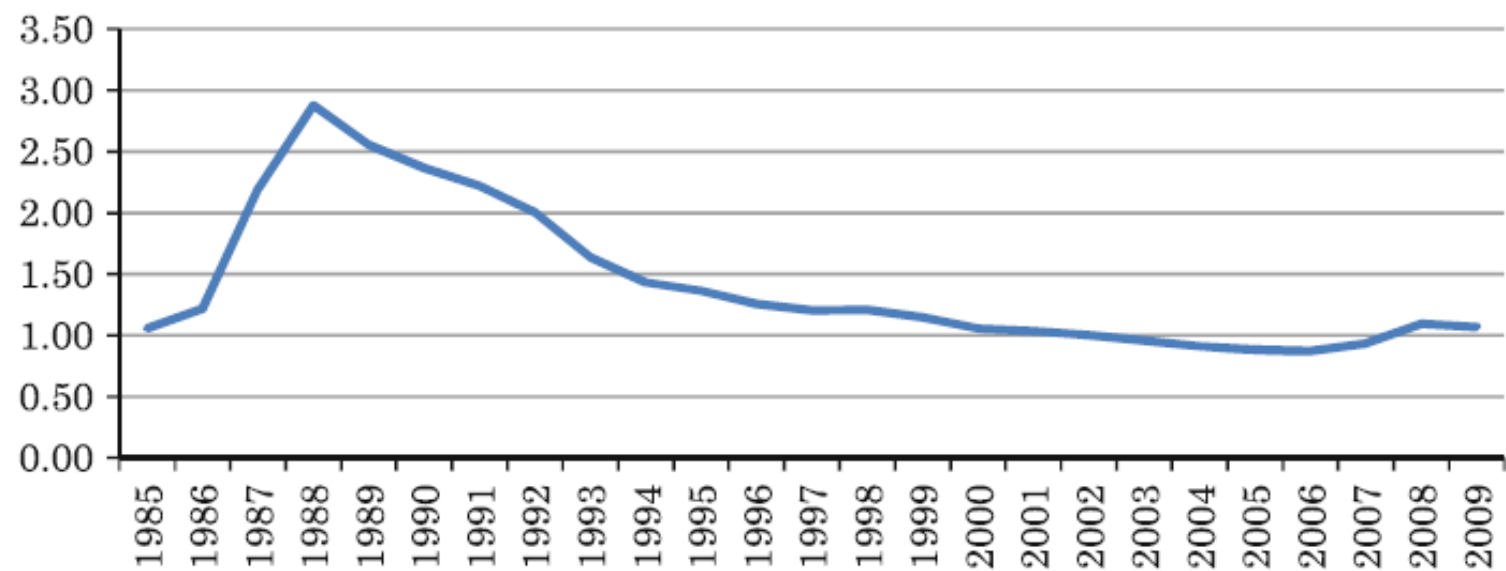
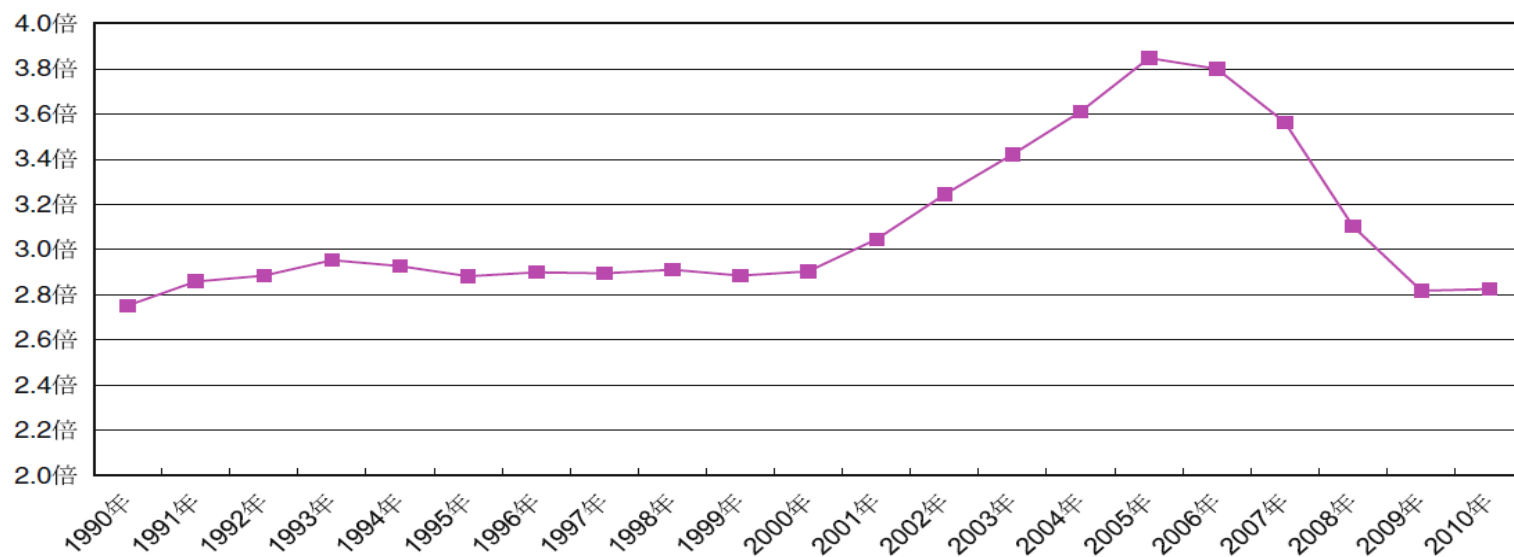
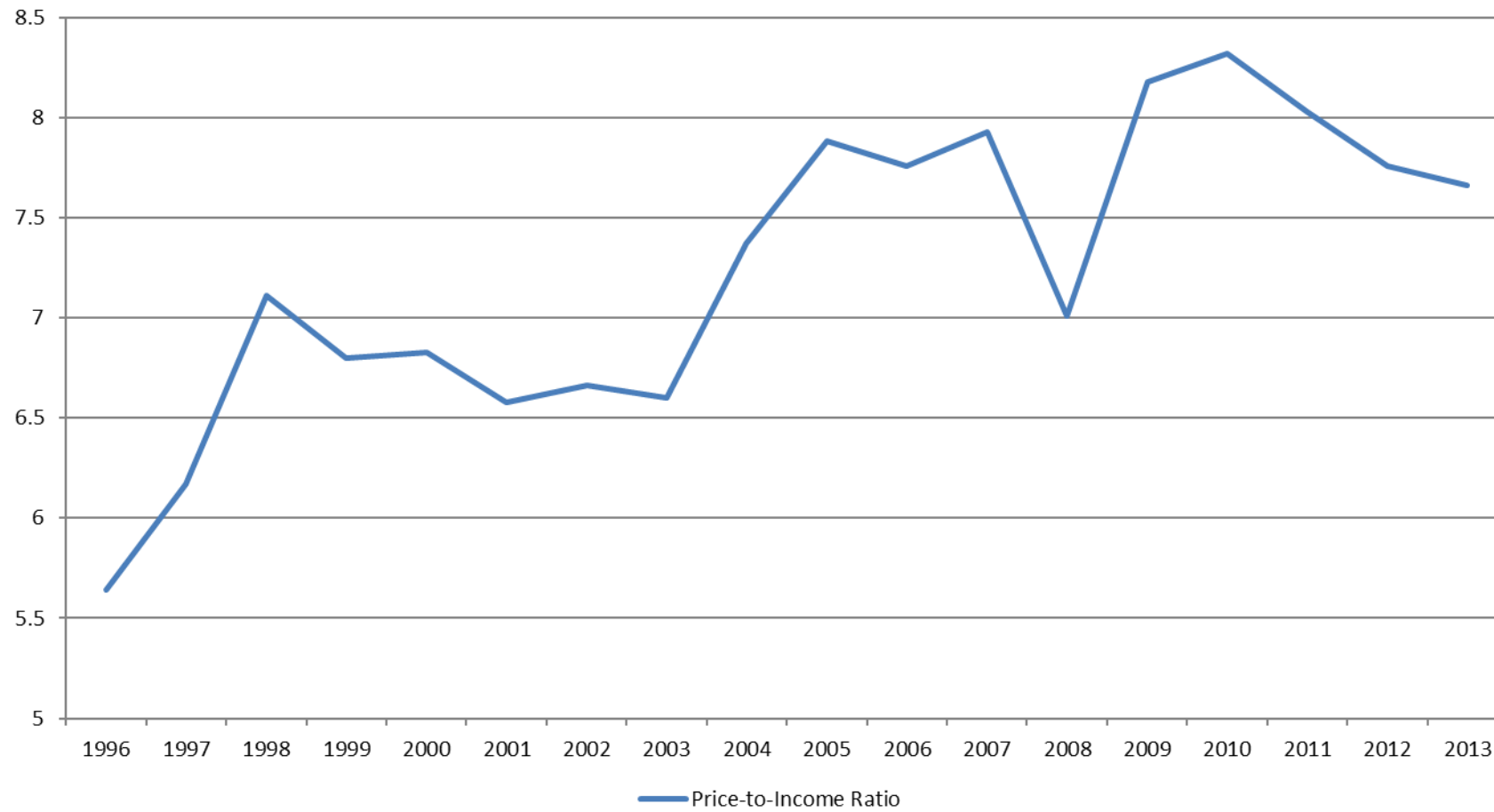


Fig. 9 Housing price/income ratio of Japan



PRC: House Price / Income ratio



Private Debt

$$\Leftrightarrow L_n = (1+r)^n L_0 - (1-c) \left\{ (1+r)^{n-1} Y_1 + (1+r)^{n-2} Y_2 + \dots + (1+r)^0 Y_{n-1} + Y_n \right\}$$

$$\Leftrightarrow L_n = (1+r)^n L_0 - (1-c) \left\{ (1+r)^{n-1} (1+a) + (1+r)^{n-2} (1+a)^2 + \dots + (1+a)^n \right\} Y_0$$

$$\Leftrightarrow L_n = (1+r)^n L_0 - \frac{(1-c)(1+a)}{(r-a)} \left\{ (1+r)^n - (1+a)^n \right\} Y_0$$

$$L_n = (1+r)^n L_0 - \frac{(1-c)(1+a)}{(r-a)} \left\{ (1+r)^n - (1+a)^n \right\} Y_0 < 0$$

$$\boxed{\frac{L_0}{Y_0} < \frac{(1-c)(1+a)}{(r-a)} \left\{ 1 - \left(\frac{1+a}{1+r} \right)^n \right\} \dots (2)}$$

$$\frac{L_0}{n} + rL_0 = \beta Y_0 \dots (3)$$

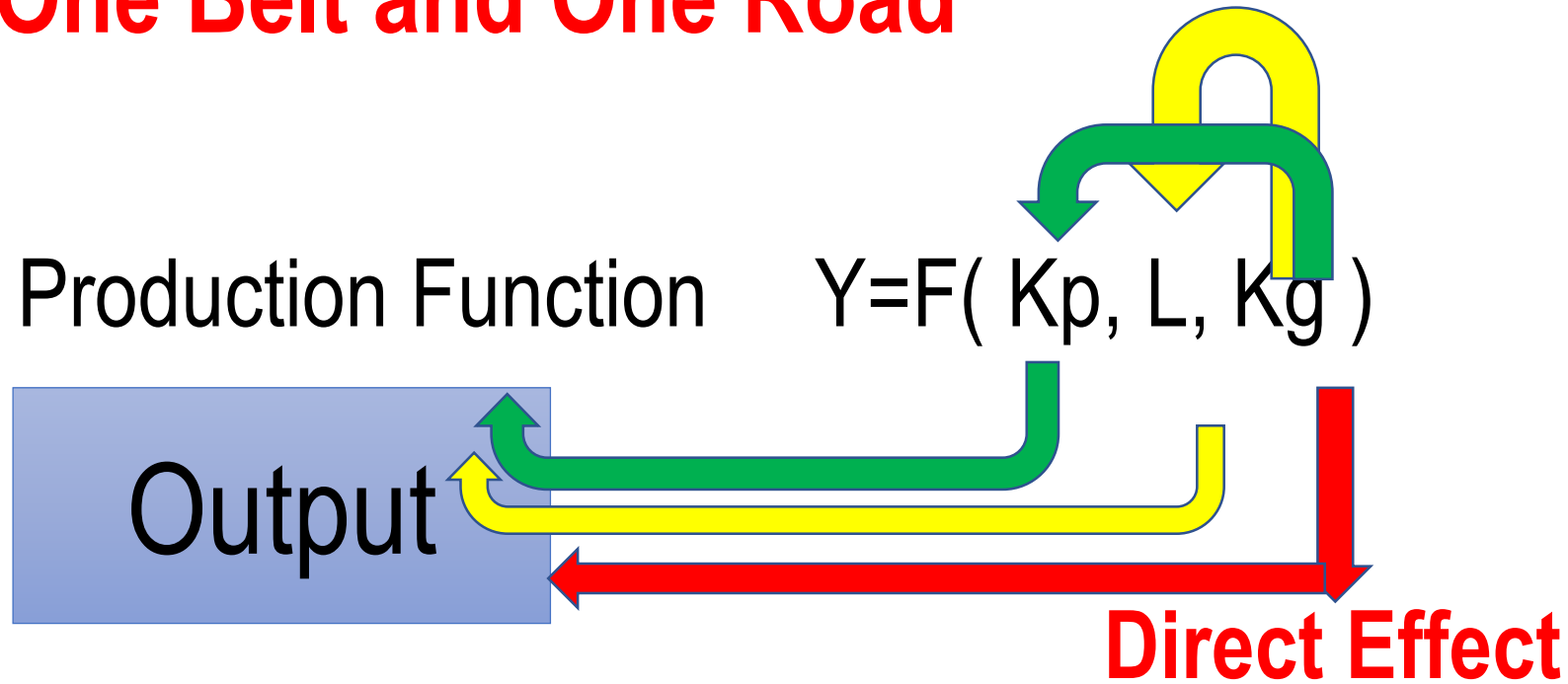
$$\frac{L_0}{Y_0} = \frac{n\beta}{nr+1} \dots (4)$$

$$\frac{n\beta}{nr+1} < \frac{(1-c)(1+a)}{(r-a)} \left\{ 1 - \left(\frac{1+a}{1+r} \right)^n \right\} \dots (5)$$

$$\boxed{\beta < \frac{(1-c)(1+a)}{(r-a)} \left\{ 1 - \left(\frac{1+a}{1+r} \right)^n \right\} \frac{nr+1}{n} \dots (6)}$$

- 1, Ceiling Interest rate
- 2, Registration by FSA
- 3, Tears of Borrowing
- 4, Central data registration
- 5, Borrowing amount Compared to Sales
- 6, Growth of Income (Growth of business)

Direct Effect and Spill-over Effects One Belt and One Road



Y = Output, K_p = private capital, L = labor
 K_g = public capital (infrastructure)



NAOYUKI
YOSHINO

Asian Development
Bank Institute and
Professor Emeritus,
Keio University, Ja-
pan



MASAKI
NAKAHIGASHI

Niigata University, Ja-
pan



VICTOR
PONTINES

The SEACEN Research
and Training Centre,
Malaysia

Spring 2017 Vol.1/No.2

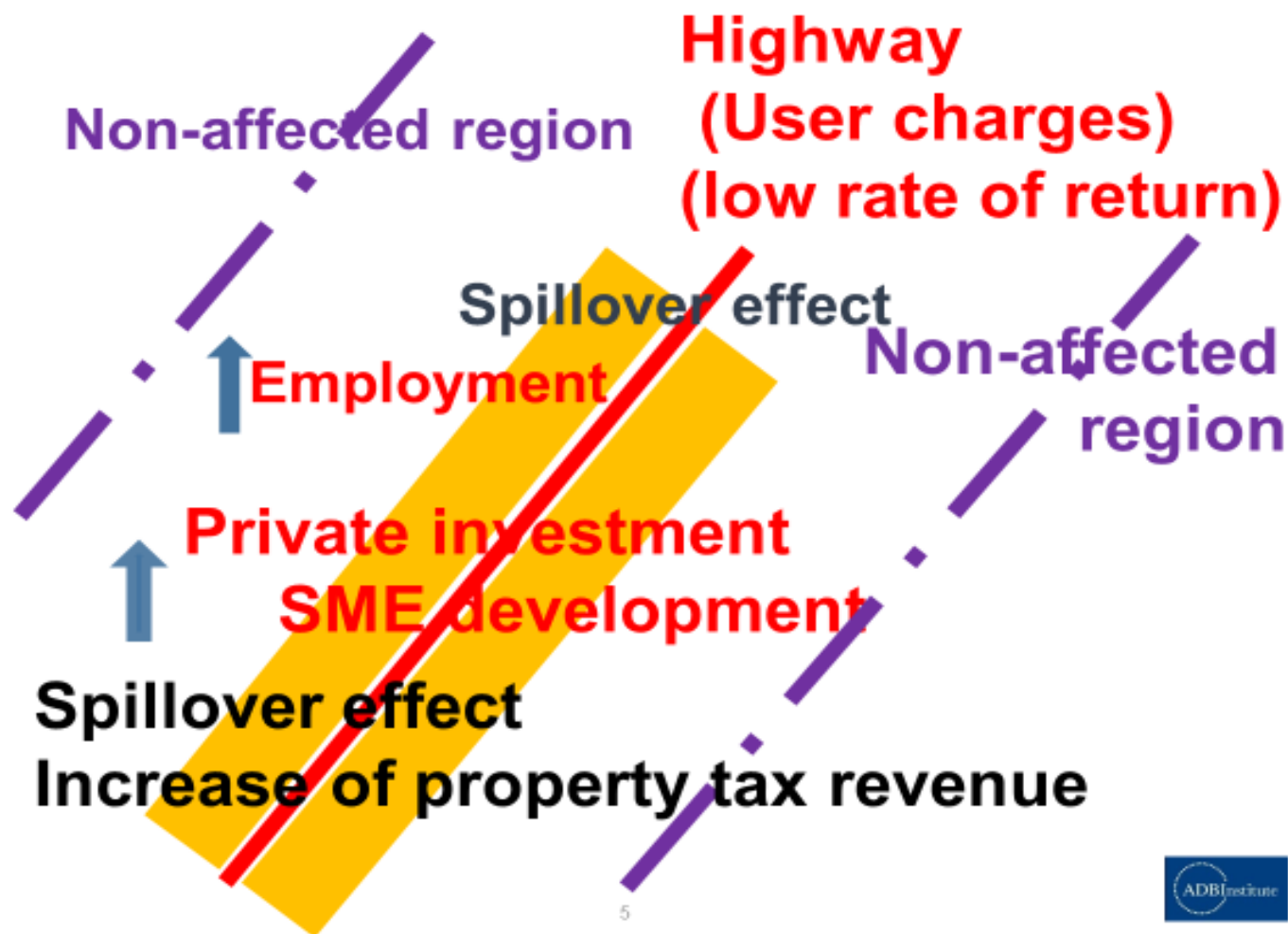
NOMURA JOURNAL OF ASIAN CAPITAL MARKETS

Attract Private F Infrastructure In Injecting Spillov

Need for Infrastructure Investment

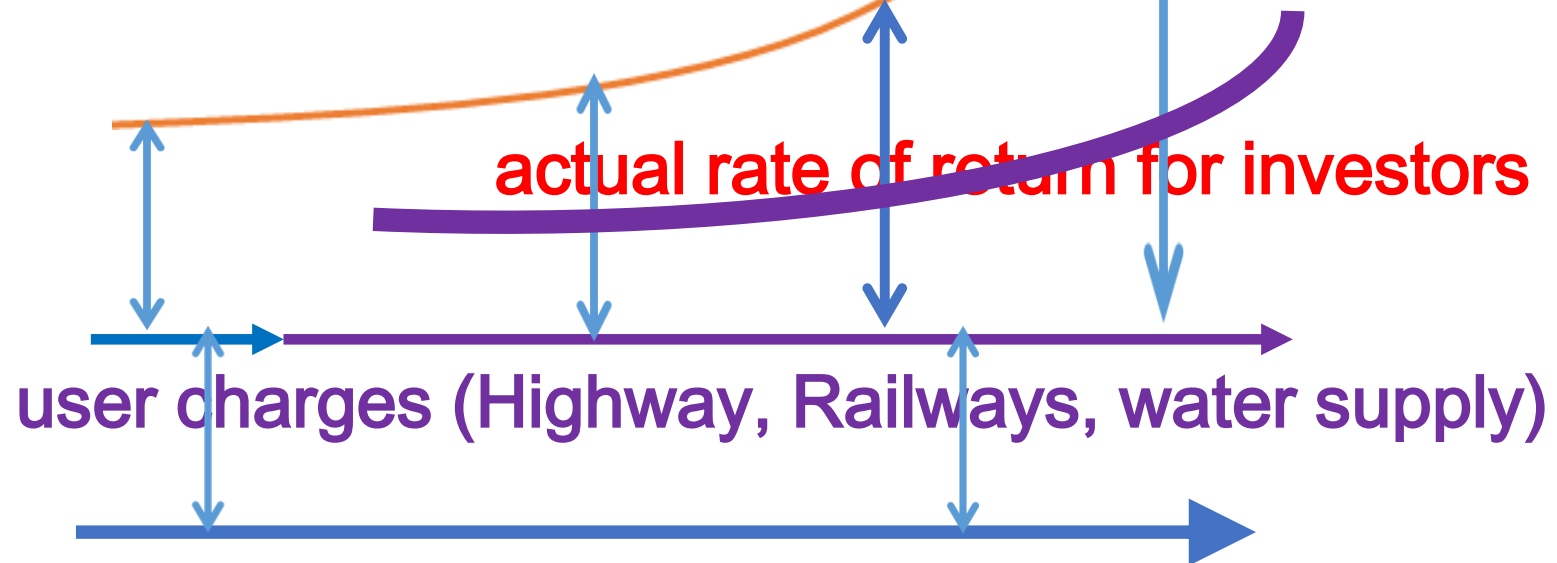
In Southeast Asia, USD 8 billion in infrastructure investments are implemented every year. However, it is expected that USD 210 billion infrastructure investment is needed every year. Public money is insufficient to satisfy Asia's infrastructure needs. In many developing countries in Asia, we observe heavy traffic congestion in cities; highways, trains and various modes of public transport are lacking. Public-Private Partnerships (PPPs) have been promoted for infrastructure development in India, Thailand and other places in Asia. However, most PPP projects were disappointing since the rate of return on infrastructure depends mainly on user charges, such as train fares and highway tolls. When the region was hit by economic crisis after the Lehman shock, the private sector withdrew from infrastructure investment. Risks associated with infrastructure were so large that private investors were hesitant to put their money in infrastructure.

It is well known that good infrastructure creates huge spillover effects in the



Injection of Increased Tax revenues

Increase of tax revenues by spillover effect



Infrastructure Revenue Bond

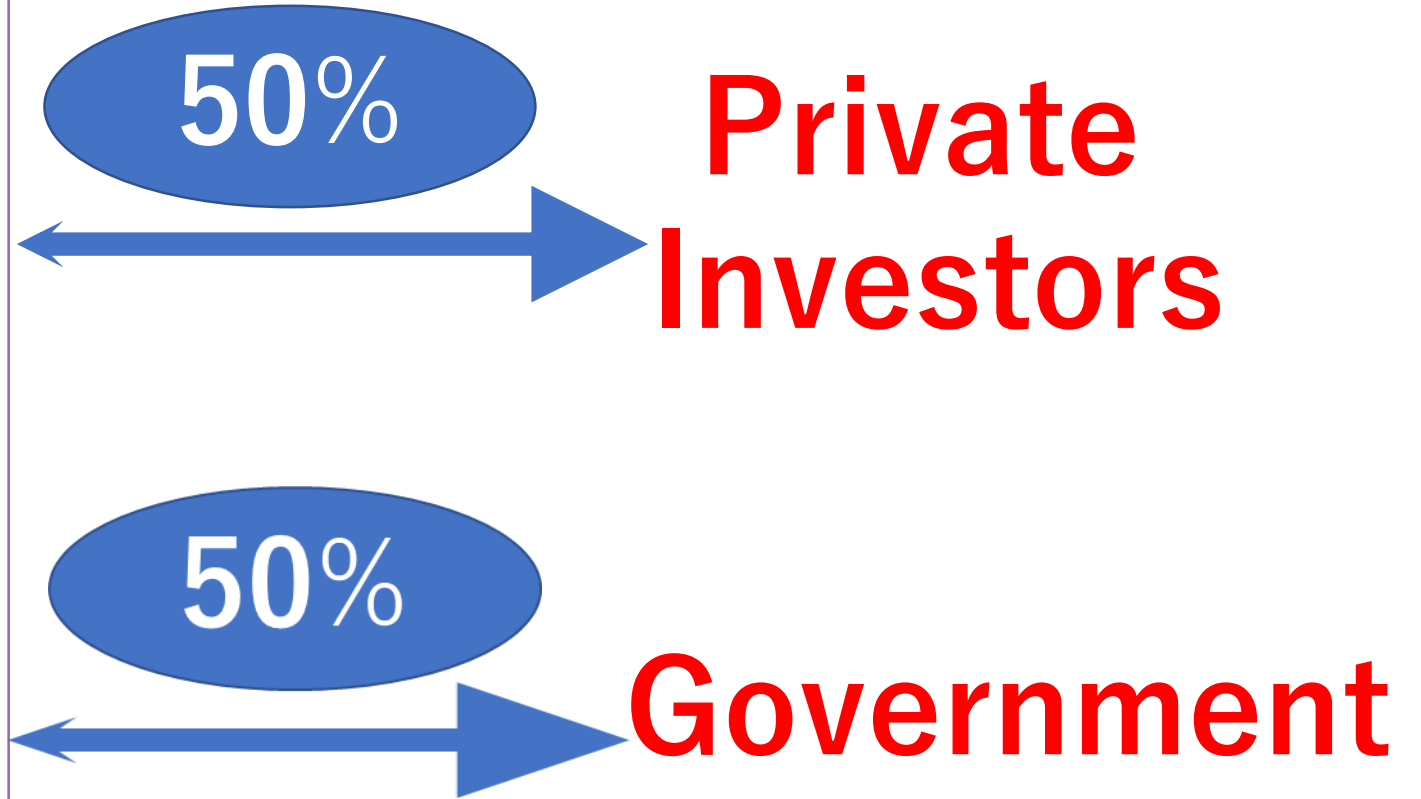
**Revenue
Bond
(user charges)
and
(Spillover effects)**

50%

**Private
Investors**

50%

Government



Journal of Asian Economics 49 (2017) 1–11



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Journal of Asian Economics

Full length article

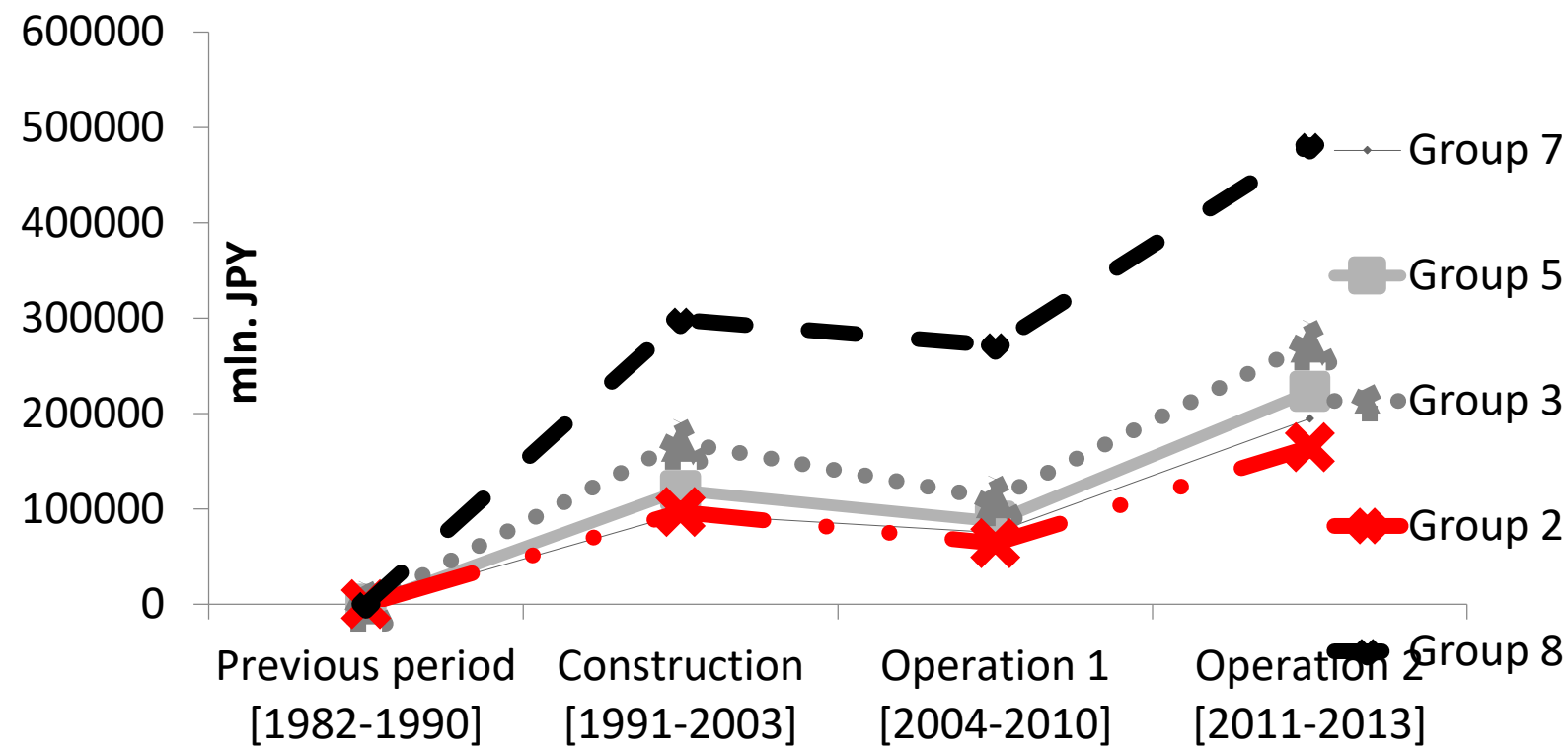
An impact evaluation of investment in infrastructure: The case of a railway connection in Uzbekistan[☆]

Naoyuki Yoshino^a, Umid Abidhadjaev^{b,*}

Japanese Bullet Train



Total tax revenue, mln. JPY



American Journal of Economics 2016, 6(4): 189-199
DOI: 10.5923/j.economics.20160604.02

**Explicit and Implicit Analysis of Infrastructure
Investment: Theoretical Framework and Empirical
Evidence**

Naoyuki Yoshino¹, Umid Abidhadjaev^{2,*}

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²Keio University, Graduate School of Economics, Tokyo, Japan

One Road and One Belt

Infrastructure & Education

- Steady state equation in logarithmic form

$$\begin{aligned}
 \ln y(2010) - \ln y(1991) = & \\
 (1 - e^{-\lambda t}) \left(\frac{\theta}{1-\theta-\beta-\alpha} \right) \ln(\varphi) + & \\
 (1 - e^{-\lambda t}) \left(\frac{\beta}{1-\theta-\beta-\alpha} \right) \ln(1 - \varphi) + & \\
 (1 - e^{-\lambda t}) \left(\frac{\theta+\beta}{1-\theta-\beta-\alpha} \right) \ln(\tau) + & \\
 (1 - e^{-\lambda t}) \left(\frac{\alpha}{1-\theta-\beta-\alpha} \right) \ln(s(1 - \tau)) - & \\
 (1 - e^{-\lambda t}) \frac{\alpha+\beta+\theta}{(1-\theta-\beta-\alpha)} \ln(n + \delta + g) - & \\
 (1 - e^{-\lambda t}) \ln y(1991) &
 \end{aligned}$$

NOTE:

Context: 44 developing countries, 1991-2010

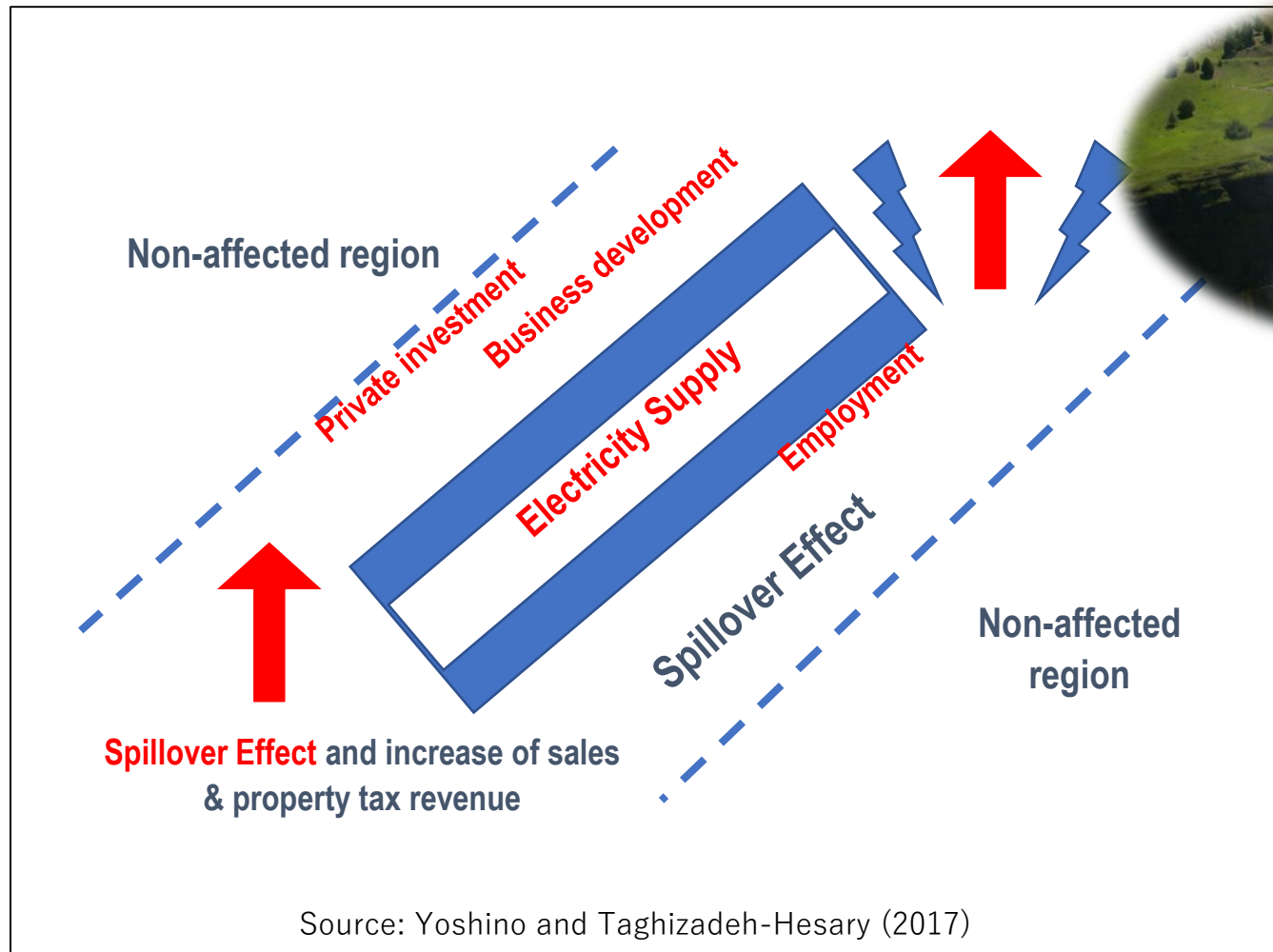
Methodology: Production function approach

Point of novelty and findings:

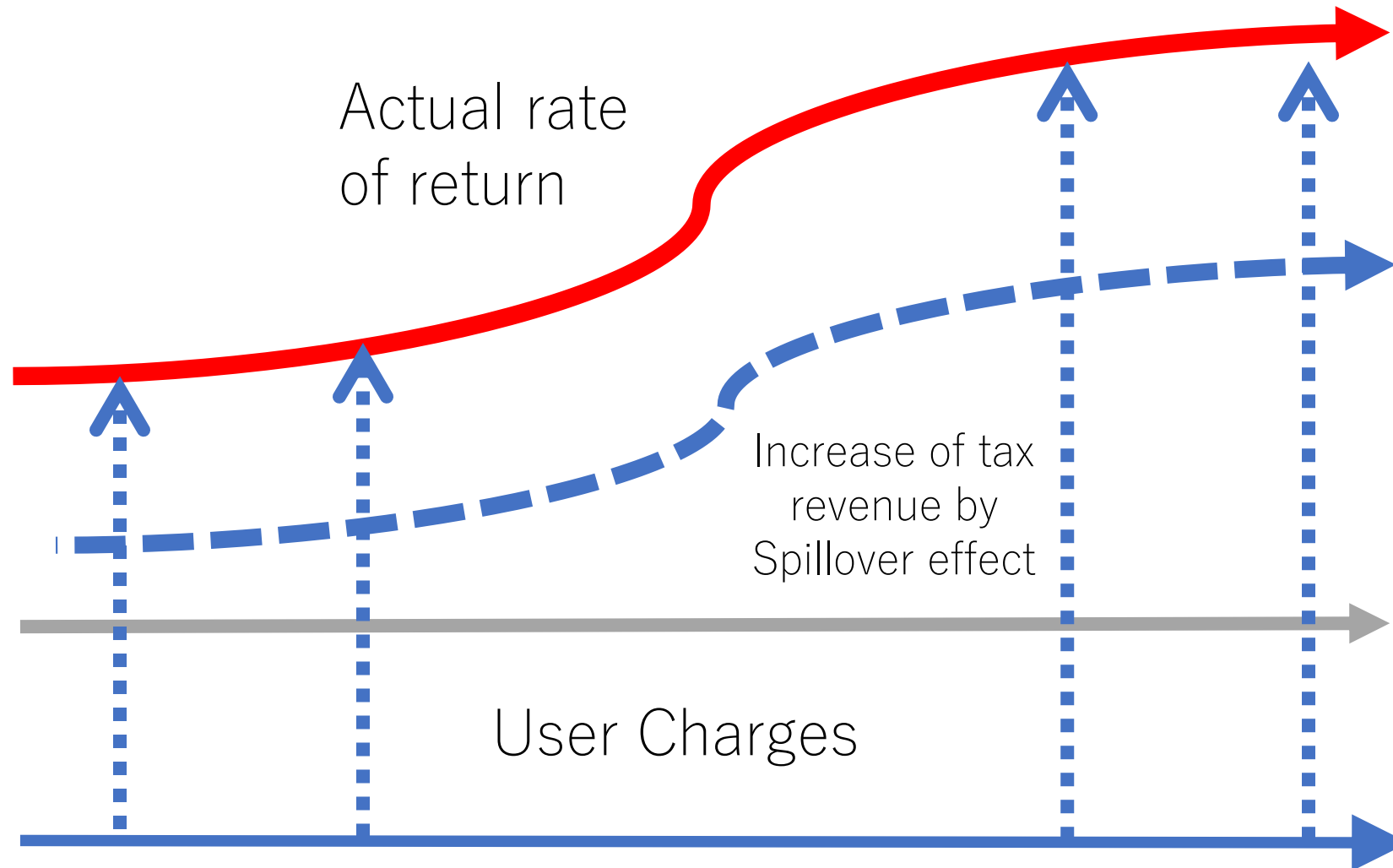
Study incorporated infrastructure variable into neoclassical growth framework and demonstrated that controlling for share of working age population with university level of education infrastructure investment to GDP ratio constituted statistically significant determinant of accumulated growth rate of GDP per capita

Estimation of The Neoclassical Growth Model with Infrastructure Investment			
Dependent variable: log difference GDP per capita in 1991-2010			
Regression number	REG.1	REG.2	REG.3
Variables	Coef.	Coef.	Coef.
lnY_1991	-0.06	-0.14	-0.14
	(-0.54)	(-1.35)	(-1.38)
ln(n+g+d)	-3.09	-5.75	-4.36
	(-0.59)	(-1.23)	(-0.77)
ln(Kg)	0.23	0.31	0.53
	(1.17)	(2.00)	(3.30)
ln(Sec)			0.00
			(0.46)
ln(Kg)xln(Sec)	0.20		
	(1.59)		
ln(Uni)			0.21
			(2.07)
ln(Kg)xln(Uni)		0.24	
		(2.76)	
Constant	-0.28	0.56	0.48
	(-0.33)	(0.69)	(0.57)
Number of observations	44.00	44.00	44.00
R-squared	0.21	0.30	0.30
F-statistic	2.62	4.14	3.29

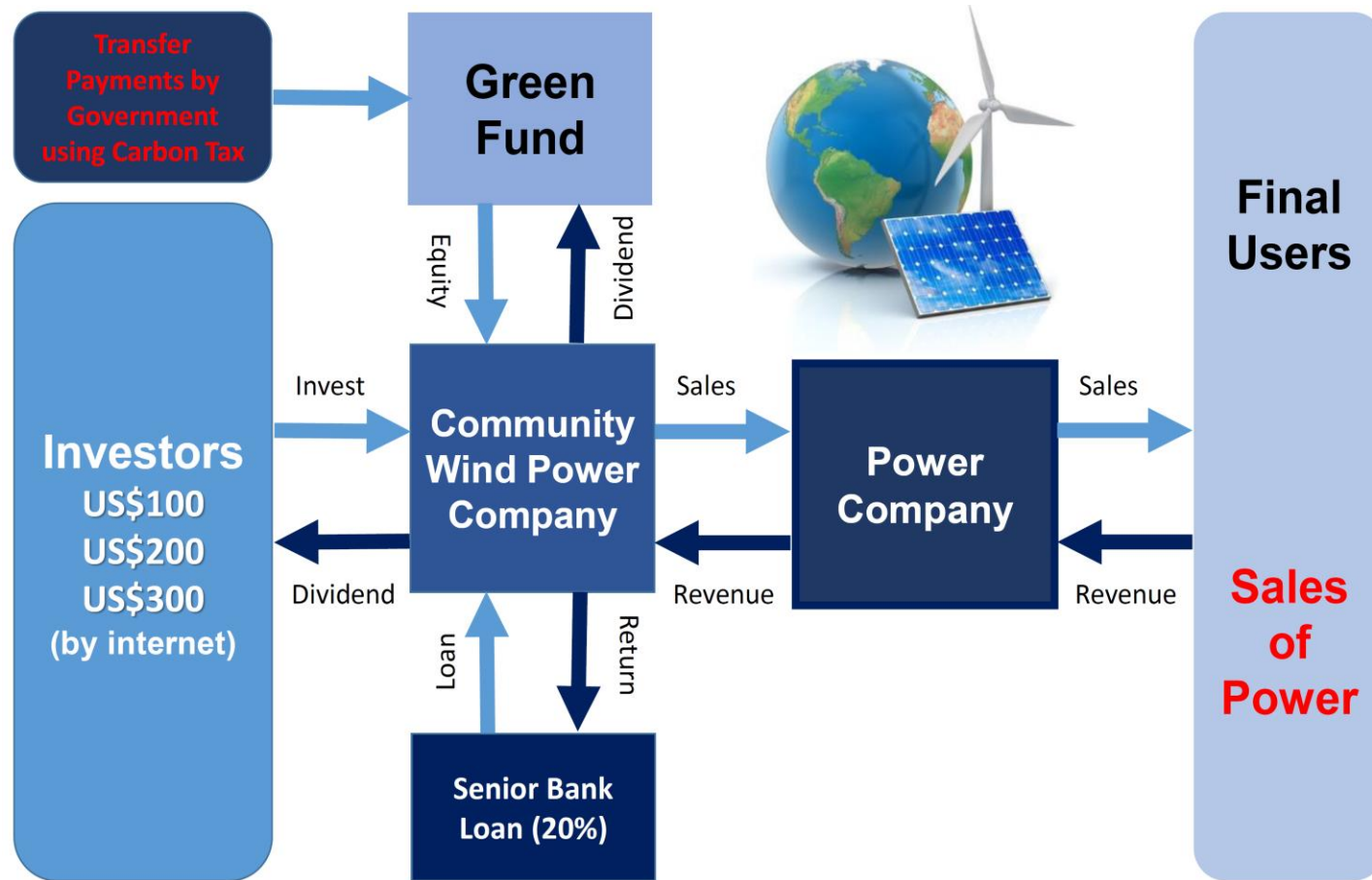
Injection of Increased tax revenues into hydropower projects in order to increase the rate of return for private investors



Injection of Increased tax revenues into hydropower projects in order to increase the rate of return

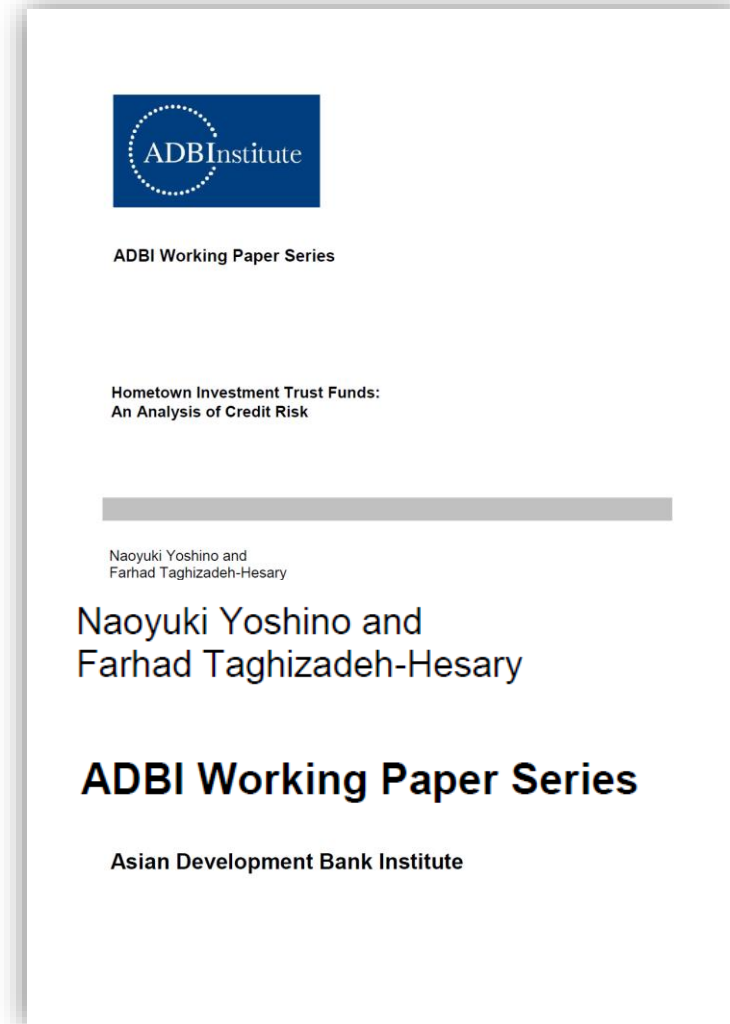
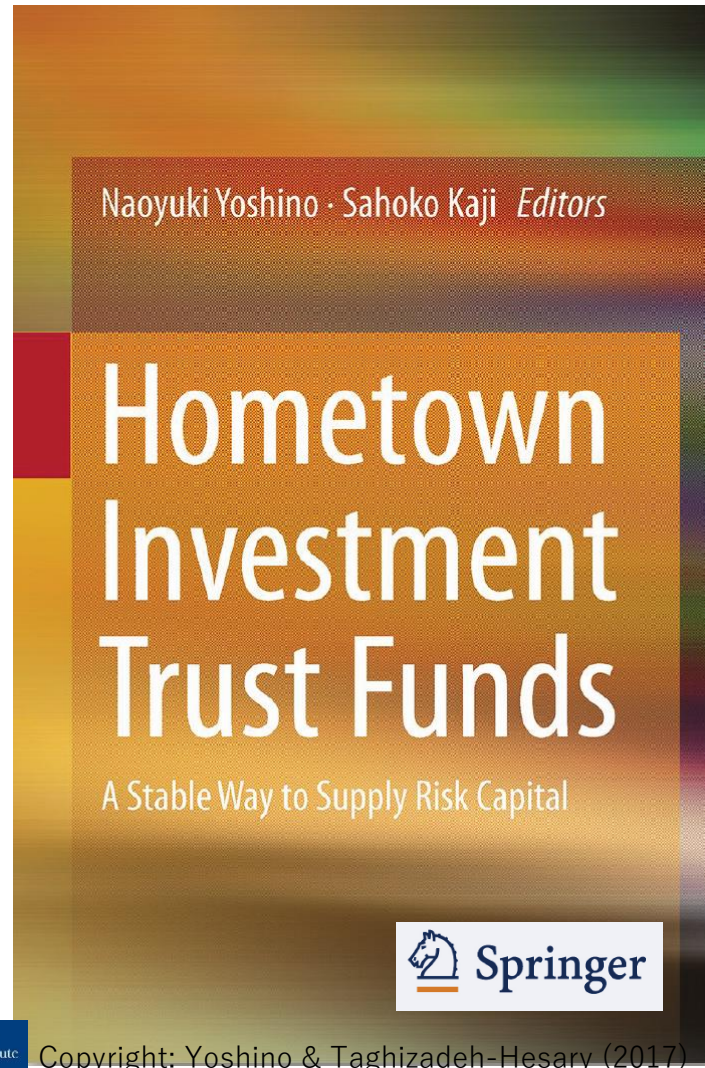


Financing Scheme for Renewable Energy Projects Using HITs and Carbon Tax

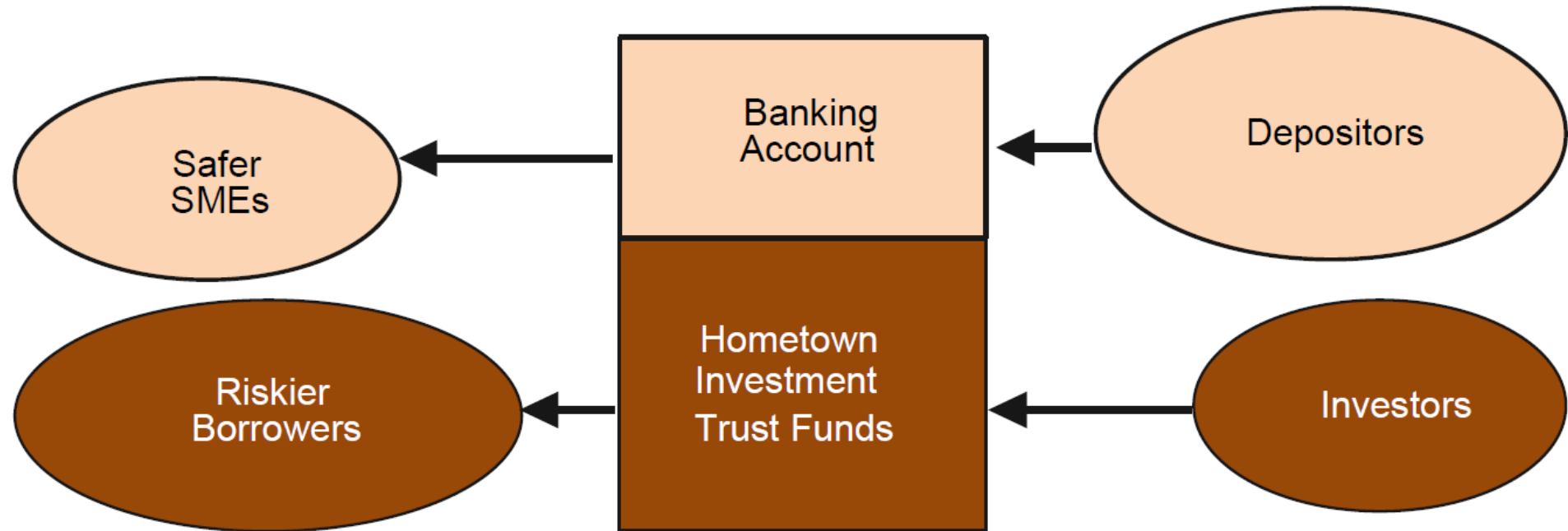


HIT = Hometown Investment Trust Fund.
Source: Yoshino and Taghizadeh-Hesary (2017)

4- “Hometown investment trust funds”: community based solution for financing smaller scale energy projects (solar, small hydro,···)



Hometown investment trust funds a new way to finance for Wind power generators, solar power panels etc.



SME =small and medium-sized enterprise.

Source: Yoshino and Taghizadeh-Hesary (2014).

Example of implementation of hometown investment trust funds in green energy projects: Solar roof project

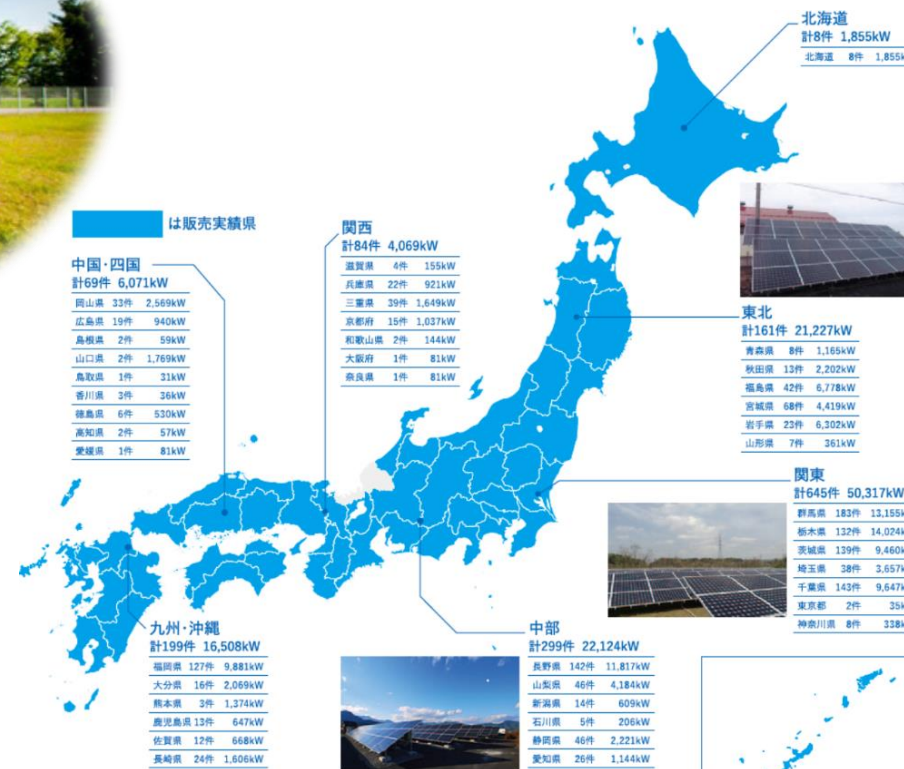


- Business owner: Easley Co., Ltd.
- Region: Nagano prefecture
- Installation location : Roof of private building around Chino city
- Installation period:
From December 17, 2015 to March 31, 2016
- Operation period: 10 years
- Number of applicants: 74 people



Expansion of Solar power projects throughout Japan by utilization of hometown investment trust funds

Solar Power projects in Japan



4th Industrialization and Financial Technology

- 1, Purchase of various financial products through mobile phone**
- 2, People can access to financial products all over the world**
- 3, Branch offices are no longer important**
- 4, Individual behavior can be monitored by record of credit cards**
- 5, Financial Literacy and financial education become important**
- 6, Transfer of payments and remittances are handled by Fin Tch**
- 6, Book market – Amazon can sell various books by internet**

Many books stores in Japan had been closed

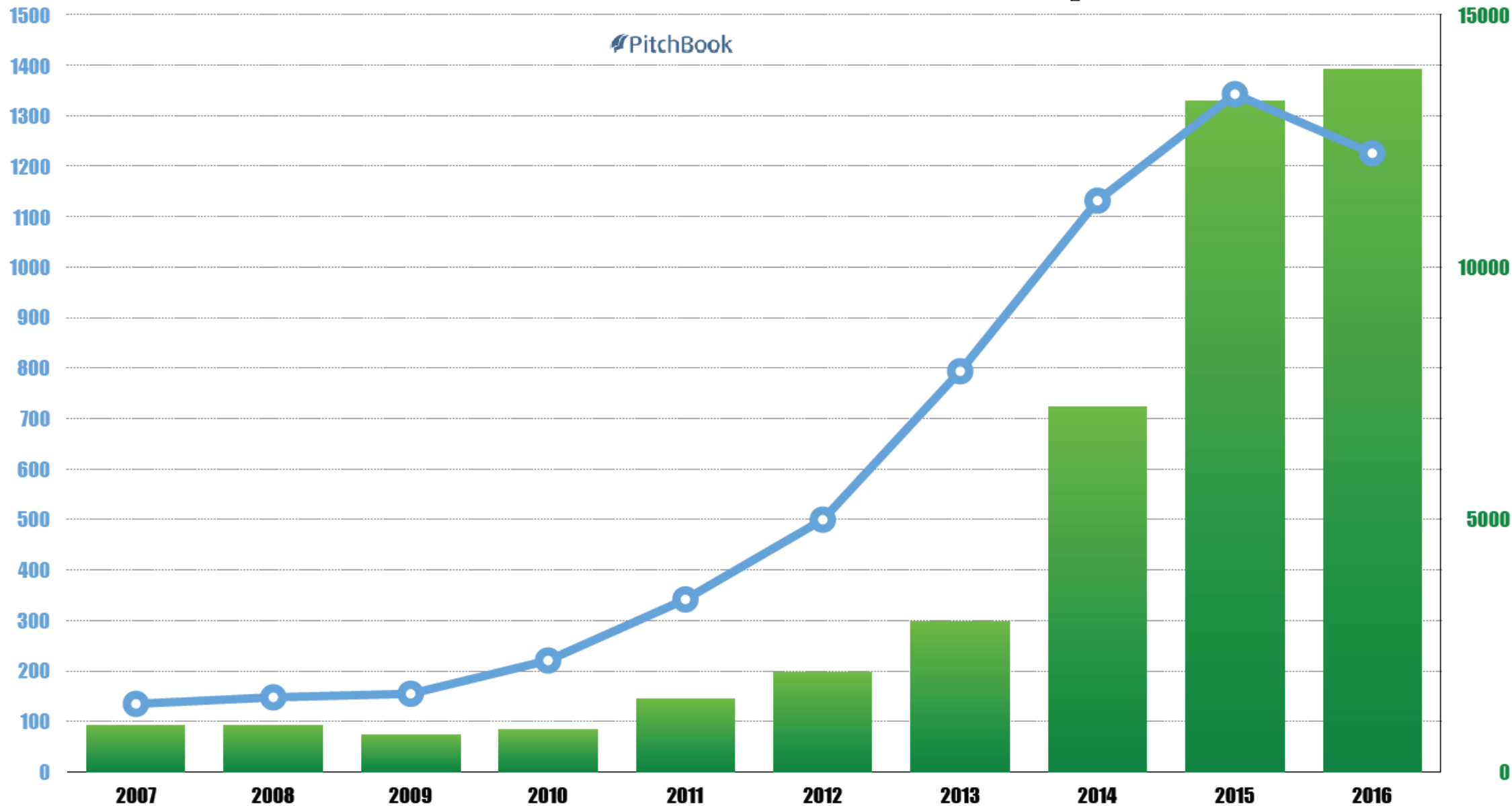
- 7, Identification number and protection of secrecy of individuals**
- 8, Financial regulation by international coordination**

Deal Count

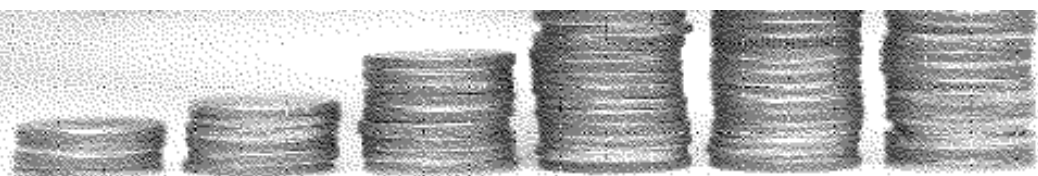
Global VC Investments in “Fintech” Startups

Total Amount Invested (\$M)

PitchBook







Promoting Better Lifetime Planning *through* Financial Education

Editors

Naoyuki Yoshino

Asian Development Bank Institute, Japan

Flore-Anne Messy

Organisation for Economic Co-operation and Development, France

Peter J Morgan

Asian Development Bank Institute, Japan



Committee for the Promotion of Financial Education

Chair Person, Naoyuki YOSHINO

Central Bank of Japan

Financial Services Agency (FSA)

Ministry of Education

Consumer Affairs Agency (Government of Japan)

Bankers Association of Japan

Securities Dealers Association

Insurance Association

Trust Bank Association

Investment Trust Association

Financial Planners Association, NGOs

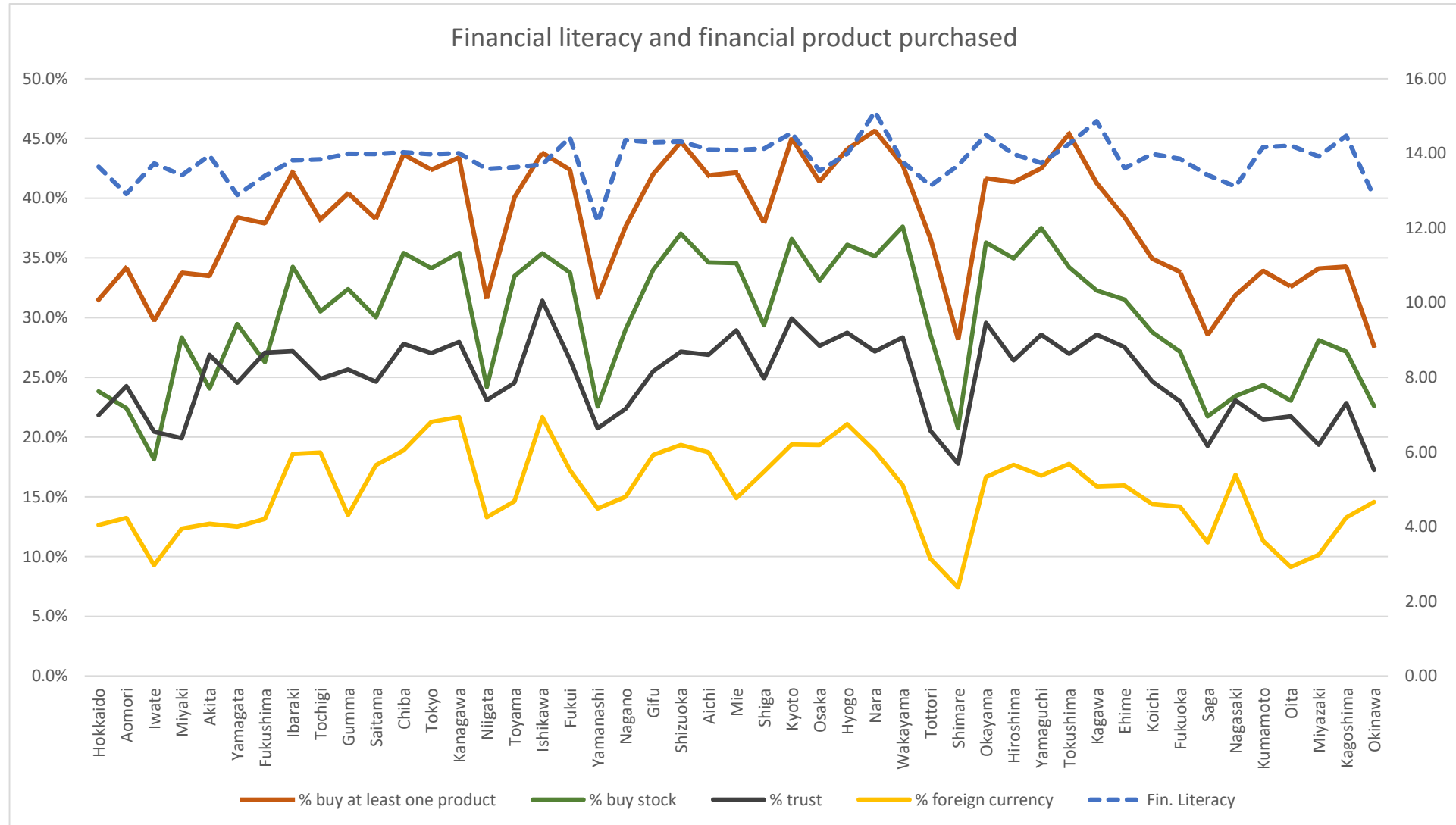
Distribution of high financial literacy scores

Table: Proportion of those who had high score (21/25-25/25), roughly top 20% (as figure 35 in BoJ book)

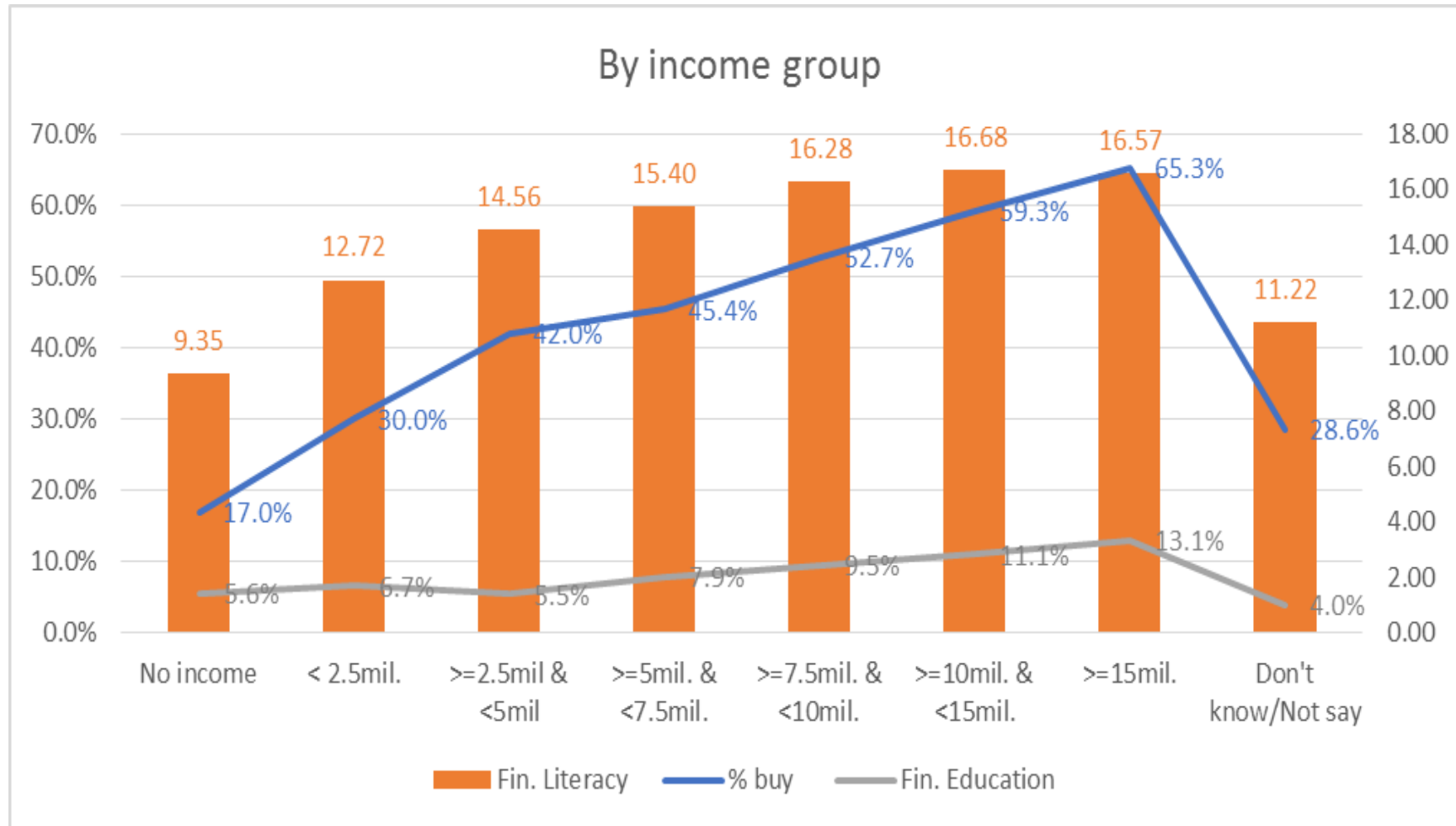
	All	Male	Female
All	20.9%	26.5%	15.5%
Age<30	10.1%	12.9%	7.2%
Age>=30&Age<40	16.6%	22.7%	10.3%
Age>=30&Age<40	20.7%	26.6%	14.8%
Age>=50&Age<60	25.8%	30.8%	20.9%
Age>=60&Age<70	28.1%	35.1%	21.9%
Age>=70	23.9%	31.8%	16.8%

Source: Authors

Regional Disparities in Japan



Distribution of financial literacy, product purchases and education by income group



Source: Authors

Financial Regulation of Fin Tech Industry

<Single Regulator>

Banks, Insurance, Trust Funds,
Finance companies, Securities

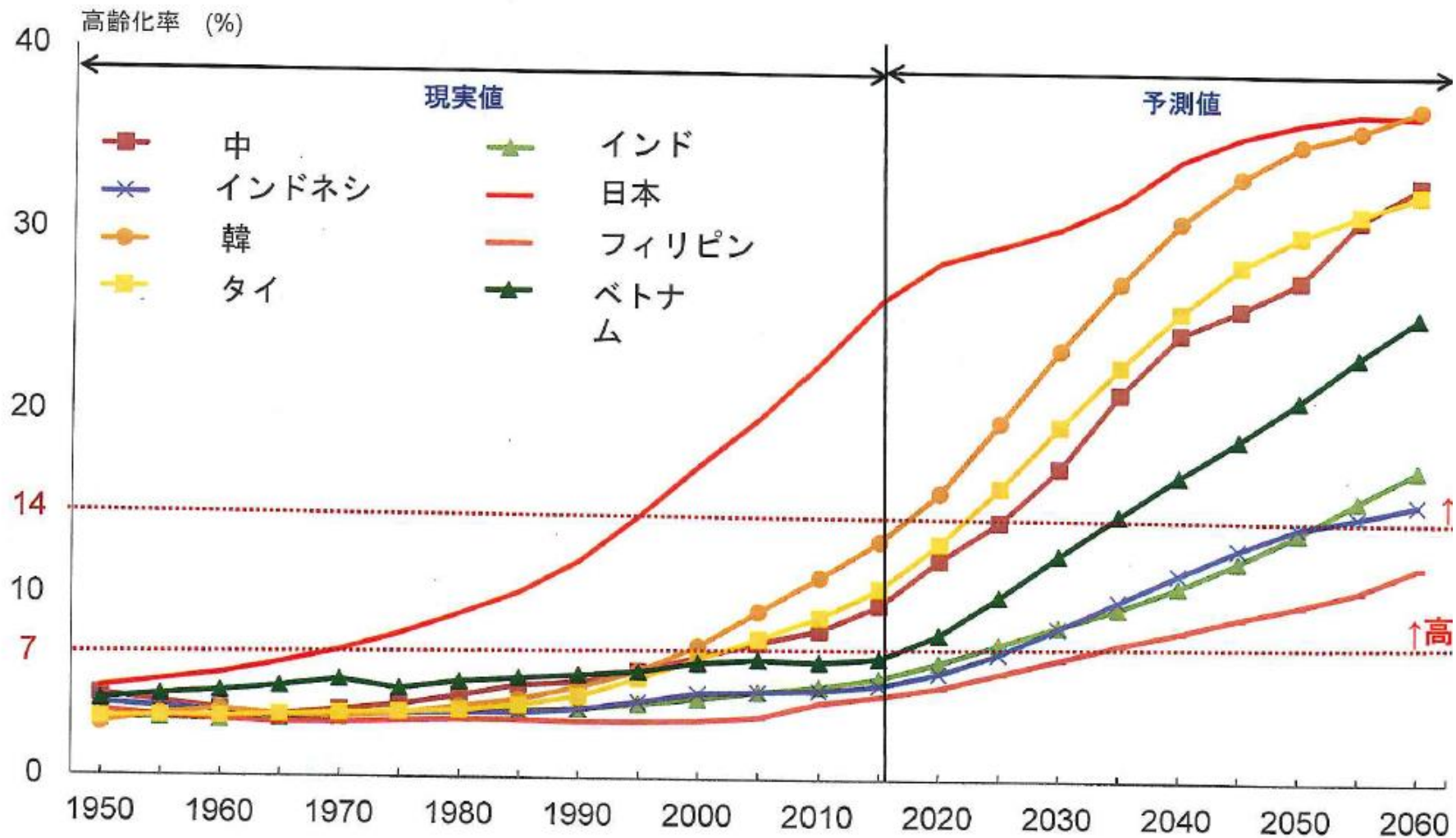
<IT Industries come into financial service>

Cash transfer

Purchase of various goods through internet

Deposit taking

Population Aging in Asian Countries





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Japan and the World Economy

journal homepage: www.elsevier.com/locate/jwe

Declined effectiveness of fiscal and monetary policies faced with aging population in Japan[☆]

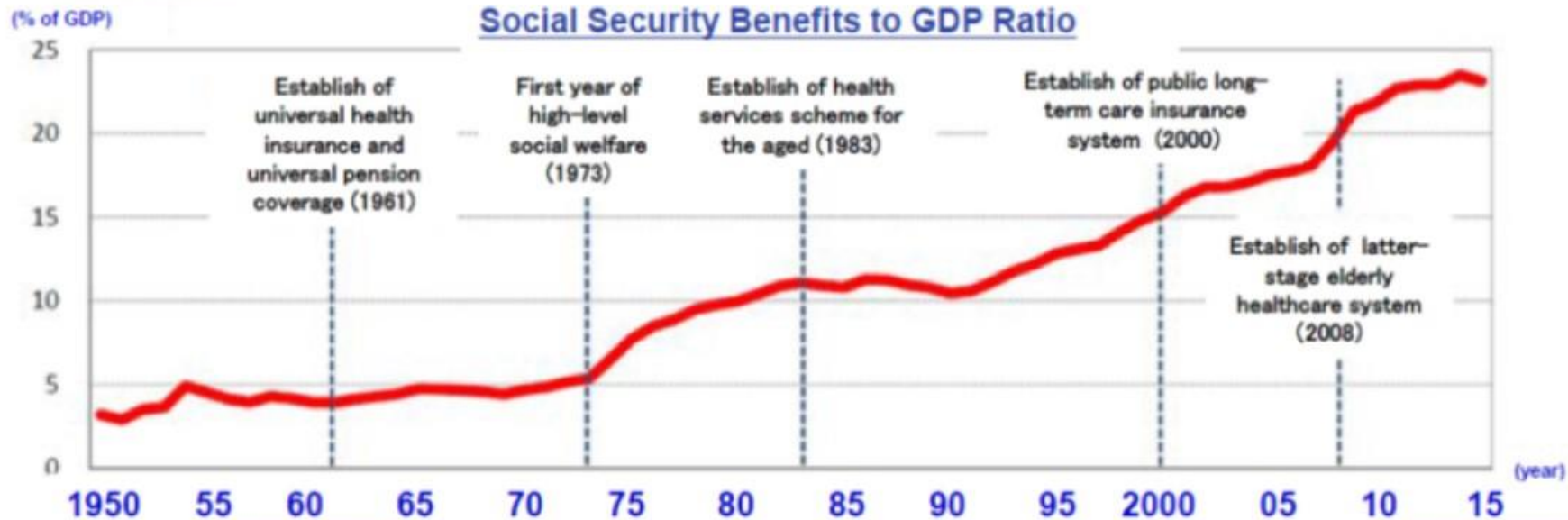
Naoyuki Yoshino^a, Hiroaki Miyamoto^{b,*}

^a Asian Development Bank Institute, Japan

^b International Monetary Fund, United States

Increase in Social Security Benefits and the demographic transition in Japan

- ✓ With the rapid progress of aging population, social security benefits have been increased.



Year	1960	1970	1980	1990	2000	2010	2015
Topics, etc.	Establish of universal health insurance and universal pension coverage	First year of high-level social welfare	Establish of health services scheme for the aged	The bubble economy period	Establish of public long-term care insurance system	Establish of latter-stage elderly healthcare system	Last year
Life expectancy (Men)	65.3	69.3	73.4	75.9	77.7	79.6	80.8
Life expectancy (Women)	70.2	74.7	78.8	81.9	84.6	86.3	87.1
Aging rate	5.7	7.1	9.1	12.1	17.4	23.0	26.7
Total fertility rate	2.0	2.13	1.75	1.54	1.36	1.39	1.46

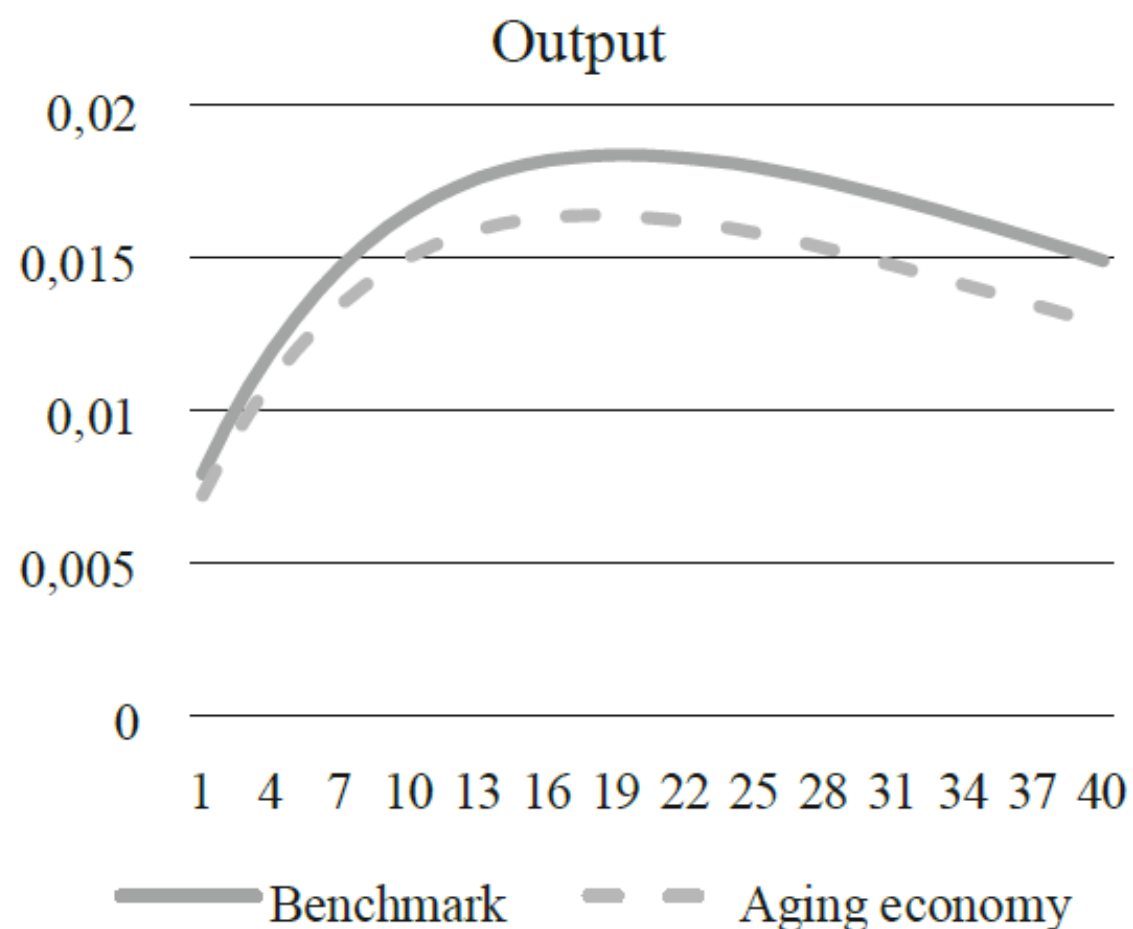
Household's problem (2.1)

- Worker's problem:

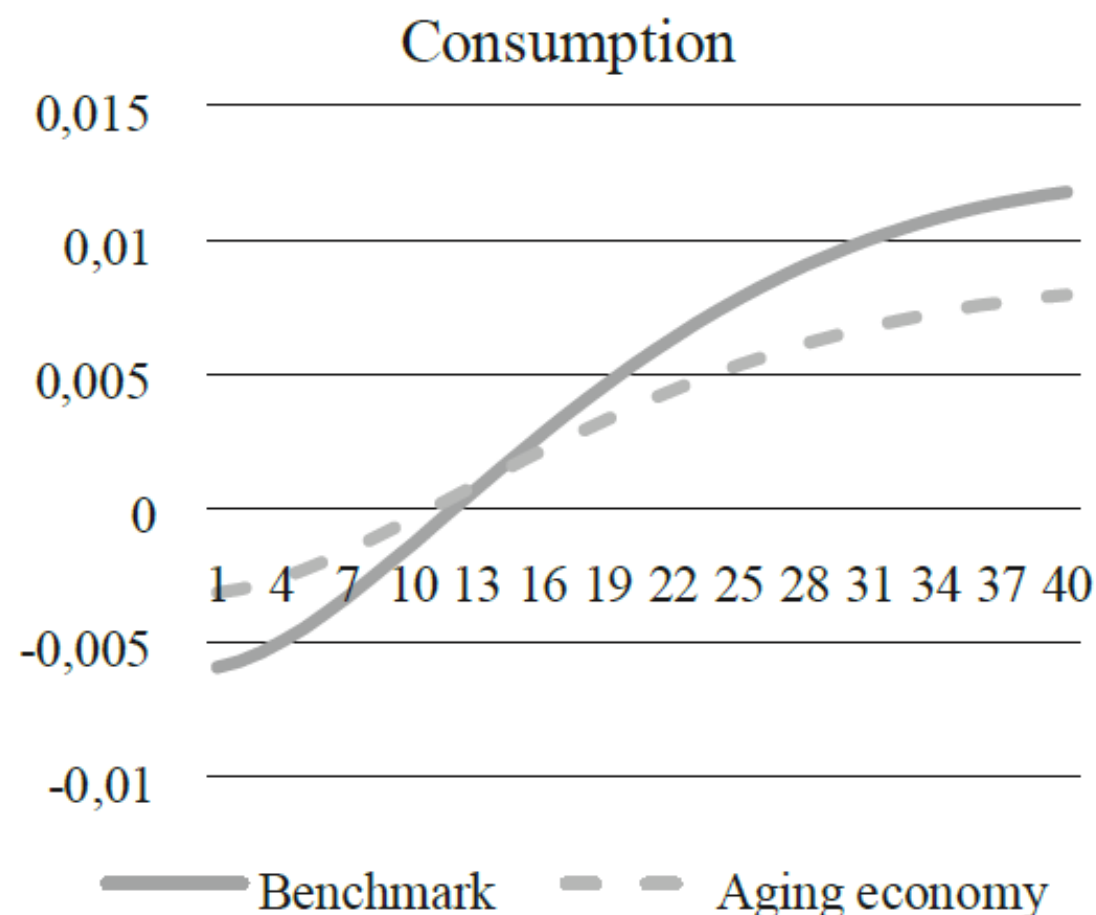
$$\begin{aligned} \max \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t & \left\{ \frac{1}{1-\sigma} \left[\left\{ \omega c_{w,t}^{\frac{\zeta-1}{\zeta}} + (1-\omega) g_t^{\frac{\zeta-1}{\zeta}} \right\}^{\frac{\zeta}{\zeta-1}} \right]^{1-\sigma} + \frac{m_{w,t}^{1-\gamma}}{1-\gamma} - \frac{h_{w,t}^{1+\mu}}{1+\mu} \right\} \\ \text{s.t. } c_{w,t} + k_{w,t} + m_{w,t} + b_{w,t} &= w_t h_{w,t} + r_{k,t} k_{w,t-1} + (1-\delta) k_{w,t-1} \\ &+ R_{t-1} \frac{b_{w,t-1}}{\pi_t} + \frac{m_{w,t-1}}{\pi_t} + d_{w,t} - \tau_{w,t} \end{aligned}$$

- Retiree's problem:

$$c_{r,t} = S.$$



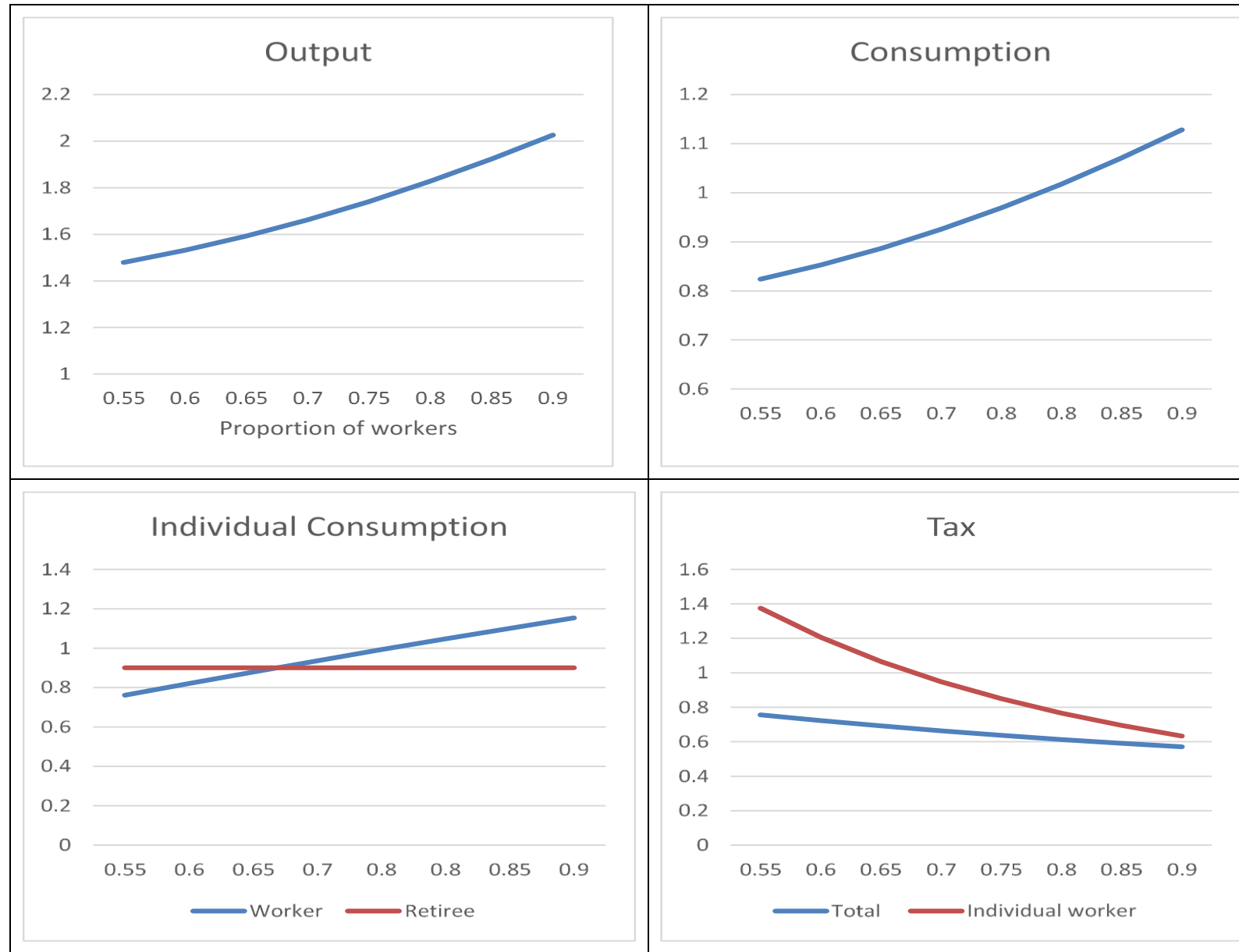
(a) Effects of an expansionary monetary policy



(b) Effects of a positive government investment shock

Aging Population Productivity based wage rate and postpone retirement age

Yoshino-Miyamoto
(2017) Japan and the
World Economy
Yoshino-Farhad-
Miyamoto (2017) Credit
and Capital Markets



Source: Yoshino and Miyamoto (2016).

1, Infrastructure Finance

How to attract private finance ?

How to achieve high rate of return ?

2, SMEs and Start up Finance

Finance, Human capital development

Crowd funding (Hometown Trust Funds)

3, Avoid massive capital inflow and outflows

Increase domestic Savings

4, Long term savings to finance infrastructure and corporate bonds

5, Income disparities are increasing

Tax compliance, Progressive tax rate

Land tax, wealth tax, inheritance tax

6, Central – Local government relations

7, Education, Human Capital Development

Continental Europe, zero tuition

8, Good Governance

9, Environmental Protection

Year	Producers	CPI	BM	Money	Exchange	Stock	Land	Oil	Year
(0)	(1)	(2)	(3)'	(4)	(8)	(9)	(10)	(11)	
1984	0.30	2.11	5.40	7.80	251	11,061	86.5	:	1984
1985	-1.70	1.95	4.08	8.40	201	12,935	92.9	:	1985
1986	-5.20	0.00	6.12	8.70	160	18,032	106.2	:	1986
1987	-1.70	0.46	7.40	10.40	122	24,195	133.7	:	1987
1988	-0.60	0.79	10.31	11.20	126	28,865	171	:	1988
1989	2.70	2.81	10.77	9.90	143	34,968	212.8	:	1989
1990	1.30	3.17	11.09	11.70	136	26,872	276.8	:	1990
1991	0.40	2.90	1.94	3.60	125	23,350	285.3	:	1991
1992	-1.00	1.50	-2.29	0.60	125	17,189	241	:	1992
1993	-1.80	1.20	3.40	1.10	112	19,641	197.7	:	1993
1994	-1.40	0.50	4.60	2.10	99	19,509	174.9	:	1994
1995	-1.00	-0.30	5.20	3.20	103	19,868	151.4	:	1995
1996	-1.50	0.40	9.00	3.30	116	19,361	134.5	:	1996
2008	3.10	1.10	0.80	2.10	90.28	8,830	82.4	:	2008
2009	-5.20	-1.70	0.50	2.70	92.13	10,540	73.5	:	2009
2010	0.70	-0.40	0.90	2.80	81.51	10,210	69.6	116.94	2010
2011	1.40	-0.10	2.80	2.70	77.57	8,440	68.2	123.41	2011
2012	-1.10	-0.30	2.10	2.50	86.32	10,430		108.46	2012
2013	1.90	0.90	3.30	3.60	105.4	16,320		105.95	2013
2014	2.70	2.90	3.60	3.40	119.8	17,360		53.69	2014
2015	-3.20	0.20	4.90	3.70	120.4	19,000		36.75	
2016	-4.30	-0.40	6.80	3.40	103.63	16,610		40.76	