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.
Asia’s GDP Share in the World
High savings rate, Good education

Source: Asia 2050: Realizing the Asian Century
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

0  Housing price/income ratio of USA
PRC: House Price / Income ratio
Private Debt

1. Ceiling Interest rate
2. Registration by FSA
3. Tears of Borrowing
4. Central data registration
5. Borrowing amount
6. Growth of Income

Compared to Sales

(Growth of business)

\[ L_n = (1 + r)^n L_0 - (1 - c)(1 + a) \left\{ (1 + r)^{n-1} Y_1 + (1 + r)^{n-2} Y_2 + \cdots + (1 - r) Y_{n-1} + Y_n \right\} \]

\[ L_n = (1 + r)^n L_0 - (1 - c)(1 + a) \left\{ (1 + r)^n Y_0 - (1 + a)^n \right\} Y_0 \]

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

\[ \frac{L_0}{Y_0} < \frac{(1 - c)(1 + a)}{(r - a)} \left\{ 1 - \left( \frac{1 + a}{1 + r} \right)^n \right\} \]

\[ \frac{L_0}{Y_0} < \frac{(1 - c)(1 + a)}{(r - a)} \left\{ 1 - \left( \frac{1 + a}{1 + r} \right)^n \right\} \]

\[ \frac{n \beta}{nr + 1} < \frac{(1 - c)(1 + a)}{(r - a)} \left\{ 1 - \left( \frac{1 + a}{1 + r} \right)^n \right\} \]

\[ \beta < \frac{(1 - c)(1 + a)}{(r - a)} \left\{ 1 - \left( \frac{1 + a}{1 + r} \right)^n \right\} \frac{nr + 1}{n} \]
Direct Effect and Spill-over Effects
One Belt and One Road

Production Function
\[ Y = F(K_p, L, K_g) \]

Output

\[ Y = \text{Output}, \ K_p = \text{private capital}, \ L = \text{labor} \]
\[ K_g = \text{public capital (infrastructure)} \]
In Southeast Asia, USD 8 billion in infrastructure investments are implemented every year. However, it is expected that USD 230 billion in 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, and various modes of public transport are lacking. Public-Private Partnerships (PPPs) have been proposed 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 tolls, 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 Non-affected region (User charges) (low rate of return)

Spillover effect

Employment

Private investment
SME development

Spillover effect
Increase of property tax revenue

Need for Infrastructure Investment

Highway

Non-affected region
Injection of Increased Tax revenues

Increase of tax revenues by spillover effect

actual rate of return for investors

user charges (Highway, Railways, water supply)
Infrastructure Revenue Bond

Revenue Bond
(user charges)
and
(Spillover effects)

50%  
Private Investors

50%  
Government
Full length article

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

Naoyuki Yoshino\textsuperscript{a}, Umid Abidhadjaev\textsuperscript{b,*}
Explicit and Implicit Analysis of Infrastructure Investment: Theoretical Framework and Empirical Evidence

Naoyuki Yoshino¹, Umid Abidhadjaev²,*

¹Asian Development Bank Institute, Tokyo, Japan
²Keio University, Graduate School of Economics, Tokyo, Japan
Infrastructure & Education

• Steady state equation in logarithmic form

\[ \ln y(2010) - \ln y(1991) = \]
\[ (1 - e^{-\lambda t}) \left( \frac{\delta}{1 - \theta - \beta - \alpha} \right) \ln(\varphi) + \]
\[ (1 - e^{-\lambda t}) \left( \frac{\beta}{1 - \theta - \beta - \alpha} \right) \ln(1 - \varphi) + \]
\[ (1 - e^{-\lambda t}) \left( \frac{\theta + \beta}{1 - \theta - \beta - \alpha} \right) \ln(t) + \]
\[ (1 - e^{-\lambda t}) \left( \frac{\alpha}{1 - \theta - \beta - \alpha} \right) \ln(s(1 - t)) - \]
\[ (1 - e^{-\lambda t}) \frac{\alpha + \beta + \theta}{1 - \theta - \beta - \alpha} \ln(n + \delta + g) - \]
\[ (1 - e^{-\lambda t}) \ln y(1991) \]

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

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<th>Estimation of The Neoclassical Growth Model with Infrastructure Investment</th>
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<td>Dependent variable: log difference GDP per capita in 1991-2010</td>
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<tr>
<td>lnY_1991</td>
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<tr>
<td>(1.54)</td>
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<tr>
<td>ln(n+g+d)</td>
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<tr>
<td>(0.59)</td>
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<tr>
<td>ln(Kg)</td>
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<td>(1.17)</td>
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<td>ln(Sec)</td>
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<td>(0.46)</td>
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<tr>
<td>ln(Kg)ln(Sec)</td>
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<td>(1.59)</td>
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<td>ln(Uni)</td>
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<td>(2.07)</td>
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<td>Constant</td>
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<td>(0.33)</td>
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<td>F-statistic</td>
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</table>
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.

Actual rate of return

Increase of tax revenue by spillover effect

User Charges

Copyright: Yoshino & Taghizadeh-Hesary (2017)
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.

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

Secure Energy
EARTH SAVING TECHNOLOGY FUND

Copyright: Yoshino & Taghizadeh-Hesary (2017)
Expansion of Solar power projects throughout Japan by utilization of hometown investment trust funds

Copyright: Yoshino & Taghizadeh-Hesary (2017)
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
7. Book market – Amazon can sell various books by internet
   Many books stores in Japan had been closed
8. Identification number and protection of secrecy of individuals
9. Financial regulation by international coordination
Global VC Investments in “Fintech” Startups

PitchBook

Total Amount Invested ($M)

Years: 2007 to 2016
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)

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<tr>
<th></th>
<th>All</th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td><strong>All</strong></td>
<td>20.9%</td>
<td>26.5%</td>
<td>15.5%</td>
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<tr>
<td>Age&lt;30</td>
<td>10.1%</td>
<td>12.9%</td>
<td>7.2%</td>
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<tr>
<td>Age&gt;=30&amp;Age&lt;40</td>
<td>16.6%</td>
<td>22.7%</td>
<td>10.3%</td>
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<tr>
<td>Age&gt;=30&amp;Age&lt;40</td>
<td>20.7%</td>
<td>26.6%</td>
<td>14.8%</td>
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<td>25.8%</td>
<td>30.8%</td>
<td>20.9%</td>
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<tr>
<td>Age&gt;=60&amp;Age&lt;70</td>
<td>28.1%</td>
<td>35.1%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Age&gt;=70</td>
<td>23.9%</td>
<td>31.8%</td>
<td>16.8%</td>
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</tbody>
</table>

Source: Authors
Regional Disparities in Japan

Financial literacy and financial product purchased

- % buy at least one product
- % buy stock
- % trust
- % foreign currency
- Fin. Literacy
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
Declined effectiveness of fiscal and monetary policies faced with aging population in Japan

Naoyuki Yoshino\textsuperscript{a}, Hiroaki Miyamoto\textsuperscript{b,*}

\textsuperscript{a} Asian Development Bank Institute, Japan
\textsuperscript{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.

### Social Security Benefits to GDP Ratio

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<tr>
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<td>Topics, etc.</td>
<td>Establish of universal health insurance and universal pension coverage</td>
<td>First year of high level social welfare</td>
<td>Establish of health services scheme for the aged</td>
<td>The bubble economy period</td>
<td>Establish of public long-term care insurance system</td>
<td>Establish of last stage elderly healthcare system</td>
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<td>Life expectancy (Men)</td>
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<td>Life expectancy (Women)</td>
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<td>Total fertility rate</td>
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<td>1.54</td>
<td>1.36</td>
<td>1.39</td>
<td>1.46</td>
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Household’s problem (2.1)

- Worker’s problem:

\[
\max E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{1}{1-\sigma} \left[ \omega c_{w,t}^{\bar{\zeta}} \right] \left[ (1-\omega) g_t^{\bar{\zeta}} \right] \right\} ^{1-\sigma} + \frac{m_{w,t}^{1-\gamma}}{1-\gamma} - \frac{h_{w,t}^{1+\mu}}{1+\mu}
\]

s.t. \( c_{w,t} + k_{w,t} + m_{w,t} + b_{w,t} = w_t h_{w,t} + r_{k,t} k_{w,t-1} + (1-\delta) k_{w,t-1} \)
\[
+ R_{t-1} \frac{b_{w,t-1}}{\pi_t} + \frac{m_{w,t-1}}{\pi_t} + d_{w,t} - \tau_{w,t}
\]

- 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
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<th>BM</th>
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