Infrastructure Investments for Sustainable Growth and Fiscal Sustainability in ASIA

December 12, 2023, JEF Conference Naoyuki YOSHINO

Professor Emeritus of Economics. Keio University Former Dean & CEO, Asian Development Bank Institute (ADBI) yoshino@econ.keio.ac.jp

Outline

- 1, Long—term Impact of Infrastructure Port and Logistics
- **2, Past Deficiencies of PPP**
- **3, Spillover Tax Revenues Empirical estimates**
- **4, Land Acquisition (Land Trust)**
- **5, Environmental Issues**
- 7, Fiscal Sustainability in Asia

Spillover Effects of Infrastructure



Spillover effect (Externality Effects) → Increases in various tax revenues

Economic Effects of infrastructure

- Effects on GDP
 - L= Labor
 - Kp = Private Capital
 - Kg = Infrastructure

Agricultural sector Manufacturing sector

Services' sector

(GDP) Y = F(Kp, L, Kg,)

Increase in Tax Revenues = tY Property Tax, Corporate Tax Income Tax, Sales Tax

Spillover effects of Japan 1956-2010 Direct Effect = 32% Spillover Effects = 68%

	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85
Direct effect of infrastructure investment	0.696	0.737	0.638	0.508	0.359	0.275
Spillover effect through private capital (Kp)	0.452	0.557	0.493	0.389	0.270	0.203
Spillover effect through employment (L)	1.071	0.973	0.814	0.639	0.448	0.350
Spillover effects of infrastructure investment (percentage)	68.644	67.481	67.210	66.907	66.691	<mark>6</mark> 6.777
	1986-90	1991-95	1996-2000	2001-05	2006-10	
Direct effect of infrastructure investment	0.215	0.181	0.135	0.114	0.108	
Spillover effect through private capital (Kp)	0.174	0.146	0.110	0.091	0.085	
Spillover effect through employment (L)	0.247	0.208	0.154	0.132	0.125	
Spillover effects of infrastructure investment (percentage)	66.222	66.200	66.094	66.122	66.139	

Source: (Nakahigashi and Yoshino, 2016[3]).

Figure 5.6: Conflict of Interest between Users and Investors



Yoshino, N., S. Lakhia, and J. T. Yap. (2021). "Financing Sustainable Infrastructure Investment in ASEAN+3". in Guinigundo, D., Kawai, M., Park, C. Y., Rajan, R. S. Redefining Strategic Routes to Financial Resilience in ASEAN+3. Manila, Philippines, ADB.

PPP = Public Private Partnerships

Realizing The Potential of Public Private Partnerships to Advance Asia's Infrastructure Development

Akash Deep Jungwook Kim Minsoo Lee

ADB (2019)

Cancelled PPP Projects by Region, 1991–2015 (% share to total cancelled projects)



Injection of a fraction of tax revenues gained from spillover effect





Level of investment

The Southern Tagalog Arterial Road (STAR Highway), Philippines, Manila Tax Revenues in three cities Yoshino and Pontines (2015) ADBI Discussion paper 549

Table 3.3 Calculated Increase in Business Tax Revenues for the Beneficiary Group Relative to Nonbeneficiary Group 4 (P million)

NASUGBU

TUY

BALAYAN

CALACA

m

TALISAY

LAUREL

LEMERY

AGONCILLO

SAN

MABINI

TINGLOY

SAN

STA. TERESITA

ALITAGTAG

BAUAN PASCUAL

SAN

STO

PADRE

GARCIA

TAYSAN

ROSARIO

LOBO

SAN JUAN

MALVAR

ILAAN

CITY

TANAUAN

BALETE

MATAASNAKAHOY

SAN

JOSE

CUENCA

	t-2	t-1	t	t+1	t+2	t+3	t+4
Lipa City	134.36	173.50	249.70	184.47	191.81	257.35	371.93
Ibaan	5.84	7.04	7.97	6.80	5.46	10.05	12.94
Batangas	490.90	622.65	652.83	637.89	599.49	742.28	1,208.61
City	\leftrightarrow	Constr	uction		eration p	eriod	$ \Longleftrightarrow $





Table 4. Numerical estimation of the difference-in-differences coefficient using regional data for Uzbekistan (2005–08 and 2009–12)

Region group	Outcome	Pre-railway period	Post-railway period	Difference
Non-affected group	Average GDP growth rate (%)	8.3	8.5	0.2
Difference	Average GDF growth fate (%)	1.2	9.4	2.0

Source: Yoshino and Abidhadjaev (2017).

Note: The affected group includes the regions of Samarkand, Surkhandarya, Tashkent, and the Republic of Karakalpakstan. The rest of the observations are included in the non-affected group. GDP = gross domestic product.

Connectivity enhances economic impacts Infrastructure connection with other countries

Changes in Tax Revenues Resulting from the High-Speed Railway in Japan (¥ million)



Policy Implications

Digital Infrastructure India's case

- One way to ensure that private sector remains attracted to infrastructure development is to provide a steady stream of income for them. We argue that that could be achieved by sharing the spillover effects of ICT infrastructure on taxes obtained by the government with the investors/operators of the infrastructure
- The amount of tax revenues to be shared by the gov't with the investors can be calculated using

Based on our estimation, if 50 % of increased tax revenues were returned to mobile operators, the rate of return will rise about 14.2%



Source: Yoshino et. al. (2019)

CITY AIR NEWS

DEDICATED TO LATE SHRI H.R. DHIMAN (JOURNALIST)

STRAIGHT FORWARD

(https://www.cityairnews.com/)

Business (https://www.cityairnews.com/sections/business)

BIF Broadband India Forum Hosts Professor N Yoshino for a Roundtable discussion on Spillover effects of Digital Infrastructure and Financing



Broadband India Forum (BIF), an independent policy forum and knowledgebased think-tank organised a Round Table Discussion with Prof. N Yoshino, Adjunct Professor at GRIPS and Professor Emeritus (Economics) at Keio University, and former Dean/CEO of the Asian Development Bank Institute championing G20 goals on "The Spill over Effects of Digital Infrastructure and Financing" to address the challenges of attracting private investment in ICT infrastructure development.



ORIGINAL ARTICLE

Financing infrastructure using floating-interest-rate infrastructure bond[†]

Naoyuki Yoshino^{1*}, Dina Azhgaliyeva² and Ranjeeta Mishra²



Figure 4. The proposed floating-rate infrastructure bonds to make spillover tax return in practice.

Figure 5.9: Land Trust for Infrastructure Investment



- 3. Future tax revenues can be used for repayment
- 4. Land owners keep their ownership

Source: Yoshino and Lakhia (2020).

Policy Recommendations

- 1, User Fees + Spillover Tax Return
- 2, Incentives to develop the region
- 3, Private Infrastructure Finance
- 4, Floating Infrastructure Bond
- 5, Land Trust
- 7, Cross-border Connectivity

Environmental Issues associated with Infrastructure

$f(Y, CO_2) = F(L K)$ Y= Output CO_2 emissions L= labor K= capital,

Sustainable Development Series Editors: Parkash Chander · Euston Quah SPRINGER REFERENCE

Jeffrey D. Sachs · Wing Thye Woo Naoyuki Yoshino Farhad Taghizadeh-Hesary *Editors*

Handbook of Green Finance

Table 1: Rating methods	provided by major	r ESG rating agencies
-------------------------	-------------------	-----------------------

ESG Score	Evaluation criteria overview
Bloomberg ESG Disclosure	Evaluated based on the degree of disclosure. Environmental
Scores	aspects are evaluated based on the degree of disclosure.
	ESG risks are evaluated based on disclosure, commitment to policy
ETSE Russell's ESG Ratings	formulation and improvement, etc. In terms of the environment, in
TISE Russell's LSG Ratings	addition to disclosure, we evaluate the existence of policies and
	commitments to improvement.
MCCI FCC Dation	Evaluated based on 37 key ESG issues (ESG key issues). The
MSCI ESG Ratings	environment side is also evaluated by setting a key issue.
	Based on ESG measures, information disclosure, and the level of
Sustainalytics' ESG Risk Ratings	problems. The same is true in terms of the environment.
	10 items: for the Environment factor, resource use, emissions, and
	innovation; for Society factor, employees, human rights, local
Thomson Reuters ESG Scores	communities, and product responsibility; and on Governance,
	management, shareholders, and CSR strategy. Regarding the
	environment, evaluated based on actual carbon emissions and
	whether or not there is a policy.

(Source) Created by the authors after processing part of the data of Yoshino and Yuyama (2021), Yuyama (2020), and each rating agency.

Current ESG (Green) investment: distort asset allocation

1, Traditional asset allocation :

two parameter approach

(i) Rate of return (R), (ii) Risks (σ^2)

- 2, ESG component is added for the asset allocation (iii) ESG (or Greenness) multi-factor model
- 3, ESG criteria is different from one rating agency to another

4, Each Investor changes its' asset allocation based on specific criteria of ESG given by rating agency



		Traditional	Rating	Rating	Carbon Tax
		case	Agency X	Agency Y	Case
		Evaluates only against traditional risk/return without considering ESG	Use of ESG rating agency X (cases where Company A's ESG score is high)	Use of ESG rating agency Y (Cases where Company B's ESG score is High)	Cases where carbon tax is imposed (assuming that carbon emission of company A is larger)
	ESG score of Company A	_	9	0.4	_
	ESG score of Company B	—	6	4.2	—
Rerutn	Company A's expected return E (_{RA,} _{t+1})	2.5%	2.75%	2.25%	2.125%
	Company B's expected return E (_{RB,} _{t+1)})	1.5%	1.35%	1.65%	1.425%
Risk	Company A's expected risk ($\sigma_{A, t+1}$)	1.6	1.44	1.76	1.84
	Company B's expected risk ($\sigma_{B, t+1}$)	1.3	1.43	1.17	1.37
	α estimates	0.57	0.70	0.44	0.47

Table 4: Examples of Differences in ESG Ratings and Carbon Taxes Impacting Investmer

Optimal portfolio allocation can be achieved by Net taxation on carbon emission

Net Carbon Tax

= Carbon Emission – Greenness efforts

1, By taxing carbon emission by identical international tax rate, the investors can only look for "after tax rate of return" and "after tax risks" as they were conventionally focused on.

2, Firm level - International carbon taxation will lead to optimal asset allocation and achieve sustainable growth

Optimal portfolio allocation can be achieved by Net taxation on carbon emission Asian Economic Papers (MIT Press), fall 2023



Satellite photo can measure the amount of CO2 emission.



All the schools at Yokohama City measure CO₂ Emission





Debt/GDP Ratio (IMF, 2019)





World Bank, Uneven Recovery, April 2021

Box II.B.5. The fiscal arithmetic of debt sustainability: How relevant is it for emerging markets and developing economies?

To understand the conditions for debt sustainability, the traditional accounting identity decomposes the changes in the government debt-to-GDP ratio into:¹⁶

$$d_t - d_{t-1} = \left(\frac{r_t}{1+g_t}\right) d_{t-1} - \left(\frac{g_t}{1+g_t}\right) d_{t-1} - P_t \tag{1}$$

where *d* is the debt-to-GDP ratio, *r* is the real interest rate, *g* is the real growth rate, *p* is the primary surplus (the fiscal surplus excluding interest payments on the government's debt).¹⁷ The first term on the right-hand side reflects the interest cost of financing the debt; the second term reflects the erosion of the debt ratio that stems from the growth of output (the denominator in the debt ratio). The difference between the interest rate and the rate of economic growth is a key determinant of changes in the debt-to-GDP ratio.

To avoid debt explosion:

$$d_t = d_{t-1} \rightarrow \left(\frac{r_t - g_t}{1 + g_t}\right) d_{t-1} = P_t \tag{2}$$

meaning, the primary surplus must be sufficient to pay for debt service.

Domar Condition : Fiscal Sustainability

The Domar condition is often used to judge whether the budget deficit is sustainable. The Domar condition is obtained from the government budget constraint:

$$G_{t} + r_{t}^{B} B_{t-1} = \Delta B_{t} + T_{t},$$
where G_{t} is government spending, B_{t} is the revenues, and r_{t} is the interest rate for public can obtain
$$b_{t} - b_{t-1} = g_{t} - t_{t} + \frac{r_{t} - \eta_{t}}{1 + \eta_{t}} b_{t-1},$$
Explosion (Unstable)
$$r_{t} > \eta_{t} (\text{growth rate})$$

$$b_{t-1} = g_{t} - f_{t} + \frac{r_{t} - \eta_{t}}{1 + \eta_{t}} b_{t-1},$$

Interest Rate $(r_t) > \text{growth rate of the economy}(\eta) \rightarrow \text{Unstable}$ Interest Rate $(r_t) < \text{growth rate of the economy}(\eta) \rightarrow \text{Stable}$





Optimal fiscal policy rule for achieving fiscal sustainability: the Japanese case

Holders of Japanese Government bonds	% of total	Holders of Greek Government bonds	% of total
Bank and postal savings	45	Overseas investors	33
Life and non-life insurance	20	Domestic investors	21
Public pension funds	10	European Central Bank	18
Private pension funds	4	Bilateral loans	14
Bank of Japan	8	Social pension funds	6
Overseas investors	5	International Monetary Fund	5
Households	5	Greek domestic funds	3
Others	3		

Table 1 Holders of Japanese and Greek Government bonds

156 Global Business and Economics Review, Vol. 21, No. 2, 2019

an.

Optimal fiscal policy rule for achieving fiscal sustainability: the Japanese case



10-Year Government Bonds Yields

Revised Domar Condition
$$(-r_t)$$
.

$$\frac{\partial \Delta B_{C,t}}{\partial B_{C,t-1}} = \frac{\partial r_t^{C*}}{\partial B_{C,t-1}} B_{C,t-1} + r_t^{C*},$$
where

$$\frac{\partial r_t^{C*}}{\partial B_{C,t-1}} = -\frac{r_t^{C*}}{B_{C,t-1} - b_1 - f_1},$$

Fiscal SustainabilityCo ndition

$$\frac{\partial \Delta B_{C,t}}{\partial B_{C,t-1}} = \left(\frac{1}{1 - \frac{B_{C,t-1}}{b_1 + f_1}}\right) r_t^{C*}.$$
(17)

This implies

Including Foreign Investors

$$\frac{\partial \Delta B_{C,t}}{\partial B_{C,t-1}} \gtrless 0 \Leftrightarrow 1 \gtrless \frac{B_{C,t-1}}{b_1 + f_1}.$$

(18)

Comparison between Greece and Japan



Global Solutions Journal (2020)

Revisit Public Debt Stability Condition: Rethinking of the Domar Condition

Naoyuki Yoshino, Keio University

Hiroaki Miyamoto, Tokyo Metropolitan University

PUBLIC DEBT STABILITY IN THE PEOPLE'S REPUBLIC OF CHINA

RETHINKING THE DOMAR CONDITION AND ITS BOND MARKET APPLICATION

Naoyuki Yoshino, Akiko Terada-Hagiwara, and Hiroaki Miyamoto

NO. 37

August 2021

ADB EAST ASIA WORKING PAPER SERIES

Application to China (Central and Local Government)

Central Government Bond Market

 $G^{c} + r \times Bc + TRN = \Delta Bc + Tc + \Delta M$ Supply

Demand for Central Government Bonds

$$\Delta B_t^d = b_0 + b_1 \left(\sigma_t^B, \sigma_t^I \right) \left(r_t^B - r_t^I \right). \tag{4}$$

Local Government Bond Market G^L + r x B_L = ΔB_L+T_L + TRN + NTR Supply TRN=Transfer, NTR=Non tax revenues Demand for Local Government Bonds

$$\Delta B_t^d = b_0 + b_1 \left(\sigma_t^B, \sigma_t^I \right) \left(r_t^B - r_t^I \right). \tag{4}$$

REFERENCES

- Domar, E. D. 1944. The Burden of Debt and the National Income. *American Economic Review*, 34(4): 798–827.
- Krugman, Paul. 2020. The case for permanent stimulus. In *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*, edited by Richard Baldwin and Beatrice Weder di Mauro, 213–18. London: CEPR Press.
- Stiglitz, J. E., and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review*, 713: 393–410.
- Yoshino, Naoyuki, Farhad Taghizadeh-Hesary, and Masaki Nakahigashi. 2019. Modelling the Social Funding and Spill-over Tax for Addressing the Green Energy Financing Gap. *Economic Modelling*, 77: 34–41.

Yoshino, Mizoguchi and Taghizadeh-Hesary (2019). "Optimal fiscal policy rule for achieving fiscal sustainability: the Japanese case", *Global Business and Economics Review*, Vol.21, No.2, pp.156. Yoshino and Miyamoto (2020) "Revisit Public Debt Stability Condition: Rethinking of the Domar Condition after COVID-19", *Global Solutions Journal*, Germany.

Yoshino and Miyamoto (2021). "Reconsideration of the "Domar condition" to check sustainability of budget deficit", *Public Policy Review, Vol/17, No.3.*.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA https://doi.org/10.1080/1331677X.2023.2177180



∂ OPEN ACCESS



SMEs and carbon neutrality in ASEAN: the need to revisit sustainability policies

Naoyuki Yoshino^a, Ehsan Rasoulinezhad^b, Han Phoumin^c and Farhad Taghizadeh-Hesary^d

^aSchool of Economics, Keio University, Tokyo, Japan; ^bFaculty of World Studies, University of Tehran, Tehran, Iran; ^cSenior Energy Economist Economic Research Institute for ASEAN and East Asia, Jakarta, Indonesia; ^dSchool of Global Studies, Tokai University, Hiratsuka, Japan Finance Research Letters 31 (2019) 98–103



Contents lists available at ScienceDirect

Finance Research Letters

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

The way to induce private participation in green finance and investment

Farhad Taghizadeh-Hesary^{a,*}, Naoyuki Yoshino^{b,c}

^a Faculty of Political Science and Economics, Waseda University, Tokyo, Japan ^b Asian Development Bank Institute (ADBI), Tokyo, Japan ^c Keio University, Tokyo, Japan



N

Article

Sustainable Solutions for Green Financing and Investment in Renewable Energy Projects

Farhad Taghizadeh-Hesary ^{1,*} and Naoyuki Yoshino ^{2,3}

- ¹ Tokai University, Hiratsuka, Kanagawa 259-1292, Japan
- ² Asian Development Bank Institute, Chiyoda-ku, Tokyo 100-6008, Japan
- ³ Faculty of Economics, Keio University, Minato-ku, Tokyo 108-8345, Japan; yoshino@econ.keio.ac.jp
- * Correspondence: farhad@tsc.u-tokai.ac.jp or farhadth@gmail.com

Received: 21 August 2019; Accepted: 6 February 2020; Published: 11 February 2020



Finance Research Letters 38 (2021) 101695



Contents lists available at ScienceDirect

Finance Research Letters

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

Covid-19 and Optimal Portfolio Selection for Investment in Sustainable Development Goals

Naoyuki Yoshino^a, Farhad Taghizadeh-Hesary^{b,*}, Miyu Otsuka^c

^a Professor Emeritus, Keio University and Visiting Professor, National Graduate Institute for Policy Studies (GRIPS), Tokyo, Japan ^b Associate Professor, Social Science Research Institute, Tokai University, Hiratsuka-shi, Kanagawa-ken, Japan ^c Alumnus, Graduate School of Economics, Keio University, Tokyo, Japan **Monographic Section**



DOI: http://dx.doi.org/10.25115/eea.v39i3.4628

Volume 39-3, May 2021 // ISSN: 1133-3197

ESG/Green Investment and Allocation of Portfolio Assets¹

NAOYUKI YOSHINO¹, TOMONORI YUYAMA²

¹Department of Economics, Professor Emeritus, KEIO UNIVERSITY and Director of Financial Research Center at FSA, JAPAN. E-mail: yoshino@econ.keio.ac.jp
²Research Fellow of Financial Research Center at FSA and Director of the Macroeconomic and Market Analysis Office at FSA, JAPAN. E-mail: tomonori.yuyama@fsa.go.jp

References

- Yoshino, N., and U. Abidhadjaev. 2016. Explicit and Implicit Analysis of Infrastructure Investment: Theoretical Framework and Empirical Evidence. *American Journal of Economics* 6(4): 189, 199.
- _____. 2017a. An Impact Evaluation of Investment in Infrastructure: The Case of a Railway Connection in Uzbekistan. *Journal of Asian Economics* 49: 1–11. https://doi.org/10.1016/j.asieco.02.01.2017
- _____. 2017b. Impact of Infrastructure on Tax Revenue: Case Study of High-speed Train in Japan. *Journal of Infrastructure, Policy and Development* 1(2): 129–148. https://doi.org/10.24294/jipd .vli2.69.02.2017
- Yoshino, N., and N. Hendriyetty. 2020. The COVID-19 Crisis: Policy Recommendations for Japan. *The Economist's Voice* 17(1): 20200017. https://doi.org/10.1515/ev-2020-0017

- Yoshino, N., and V. Pontines. 2015. The "Highway Effect" on Public Finance: Case of the STAR Highway in the Philippines. ADBI Working Paper 549. Tokyo: Asian Development Bank Institute. https://doi.org/10.2139/ssrn.2697322
- Yoshino, N., U. Abidhadjaev, and M. Nakahigashi. 2018. Closing the Asia Infrastructure Gap: BRI, Public Investment, Private Financing and Spillover Effects. *Horizons: Journal of International Relations and Sustainable Development* Winter: 62–74.
- Yoshino, N., M. Helble, and U. Abidhadjaev. 2018. *Financing Infrastructure in Asia and the Pacific: Capturing Impacts and New Sources*. Tokyo: Asian Development Bank Institute.
- Yoshino, N., D. Azhgaliyeva, and R. Mishra. 2020. Financing Infrastructure Using Floating-Interest-Rate Infrastructure Bond. Journal of Infrastructure, Policy and Development 4:2. DOI: 10.24294/jipd.v4i2.1236
- Yoshino, N., M. Hossain, and F. Taghizadeh. 2020. Enhancing Financial Connectivity between Asia and Europe: Implications for Infrastructure Convergence between the Two Regions. *Asian Economic Papers* 19:2. https://doi.org/10.1162/asep_a_00773

Thank you for your attention

Naoyuki YOSHINO

yoshino@econ.keio.ac.jp

Professor Emeritus of Keio University, JAPAN Director/Financial Research Center/FSA/ Government of Japan Former Dean&CEO,Asian Development Bank Institute(ADBI)/