

Private Financing into infrastructure and Sustainable Growth

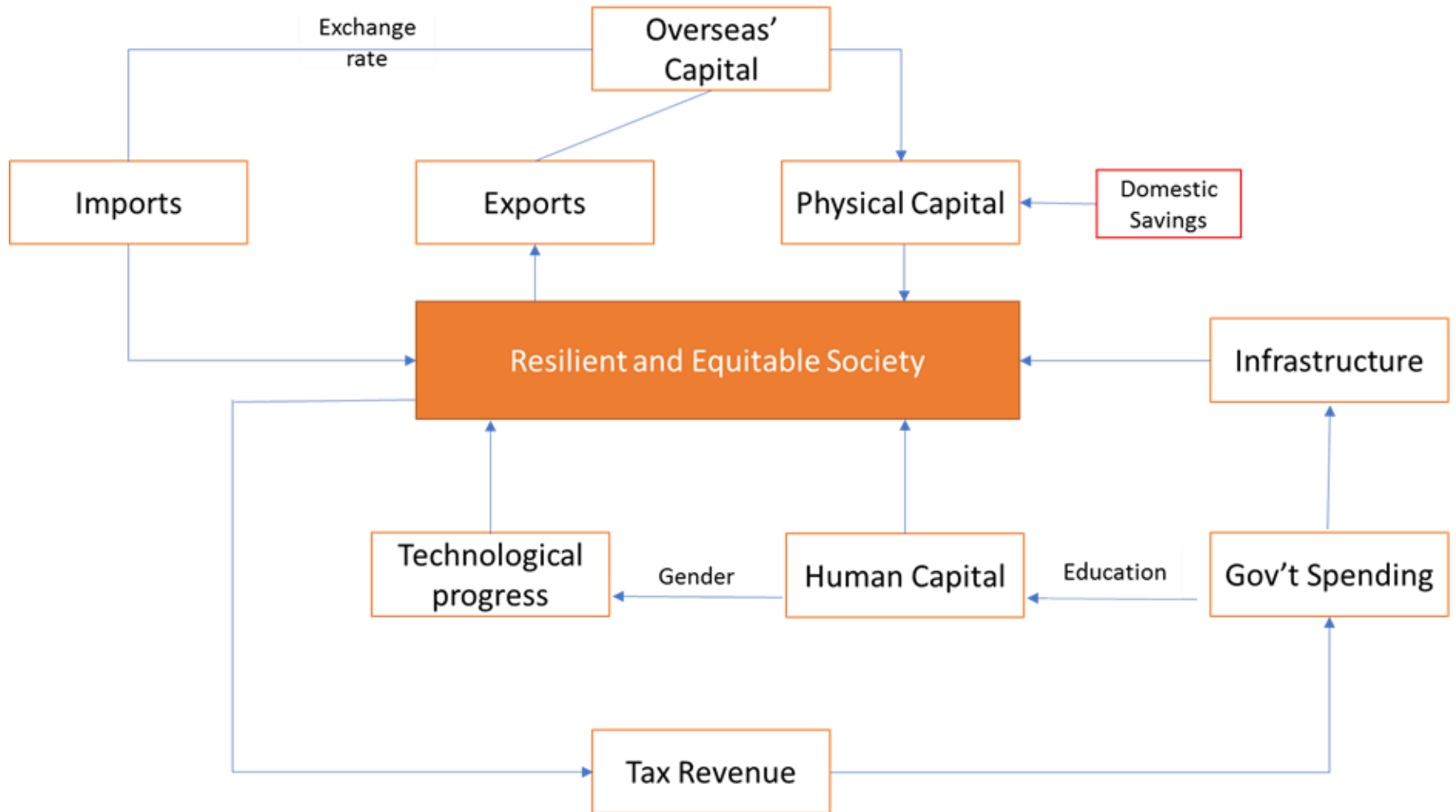
Naoyuki YOSHINO

Dean & CEO

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Professor Emeritus, Keio University, Japan

Tokyo, Japan 2019



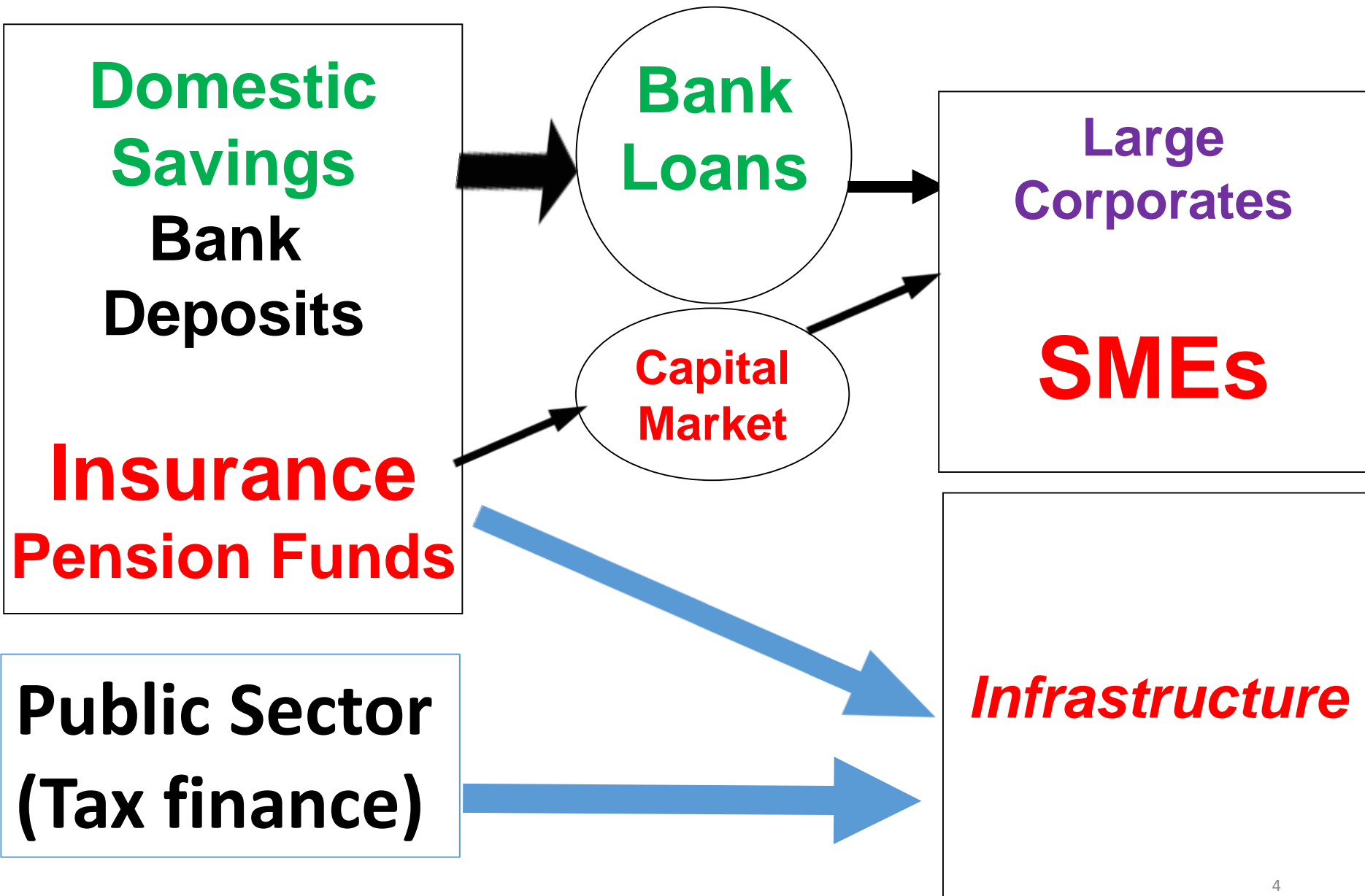
Infrastructure Investment Needs in Asia-Pacific (2016-2030)

(\$ billion in 2015 prices, annual average)

	Baseline Total	% of GDP	Climate Adjusted	% of GDP
Central Asia	33	6.8	38	7.8
East Asia	919	4.5	1071	5.2
South Asia	365	7.6	423	8.8
Southeast Asia	184	5.0	210	5.7
The Pacific	2.8	8.2	3.1	9.1
Asia & Pacific	1503	5.1	1744	5.9

Source: Meeting Asia's Infrastructure Needs, ADB (2017)

Circulation of Savings into Domestic Investment



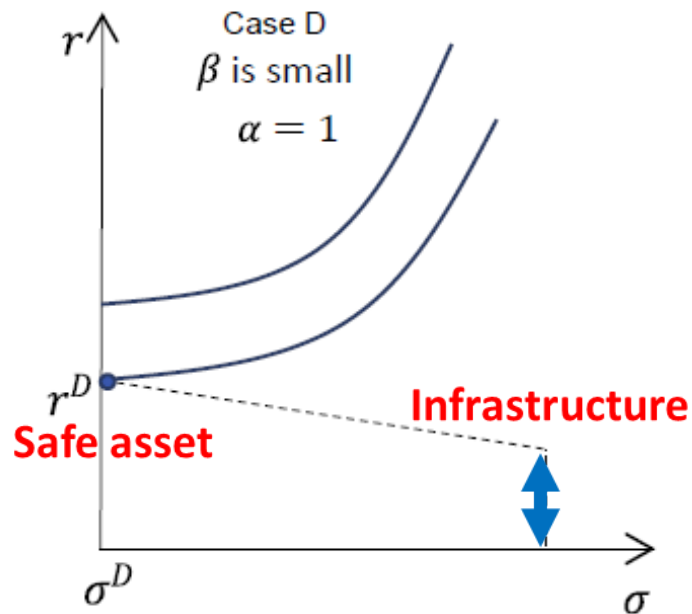
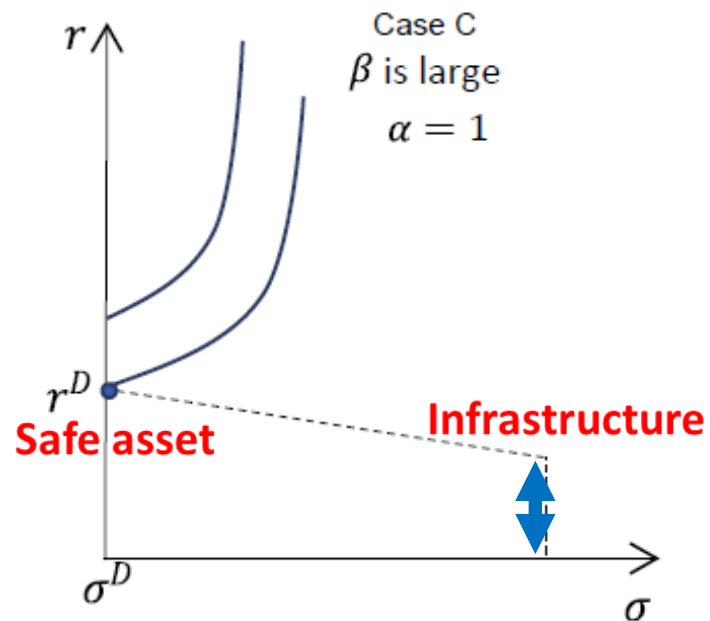
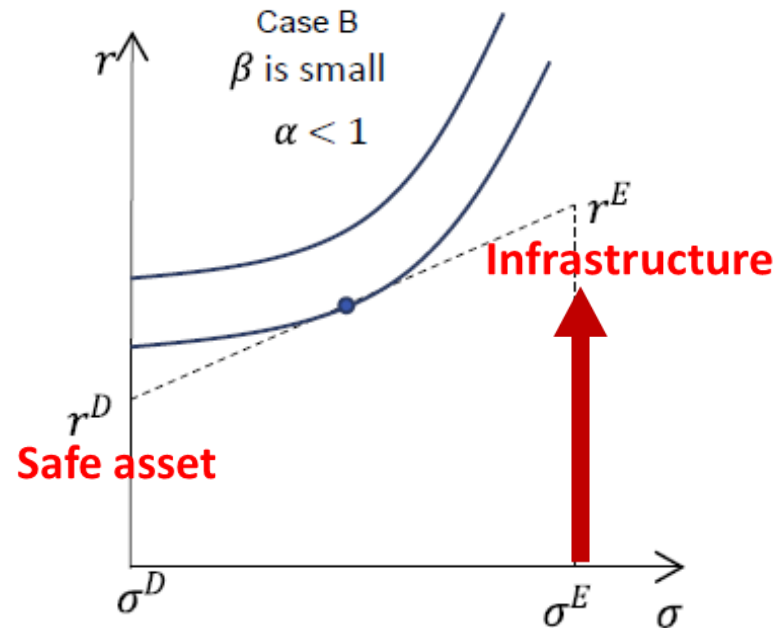
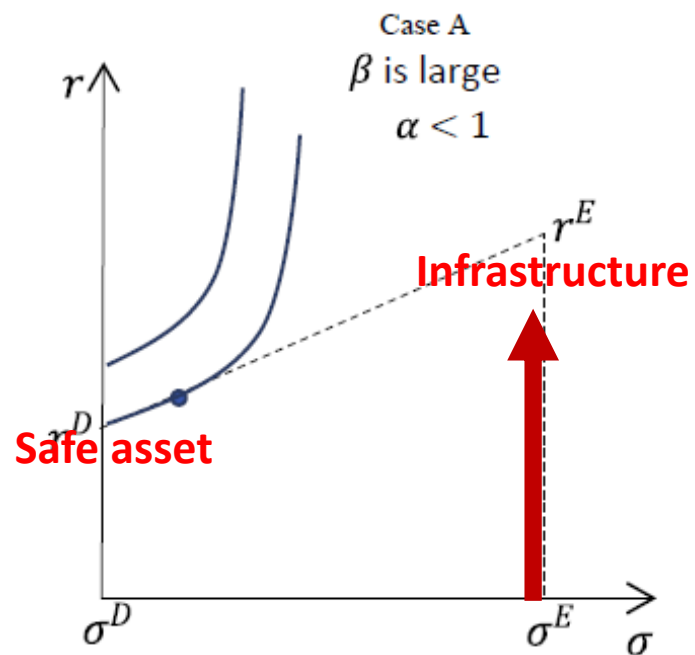
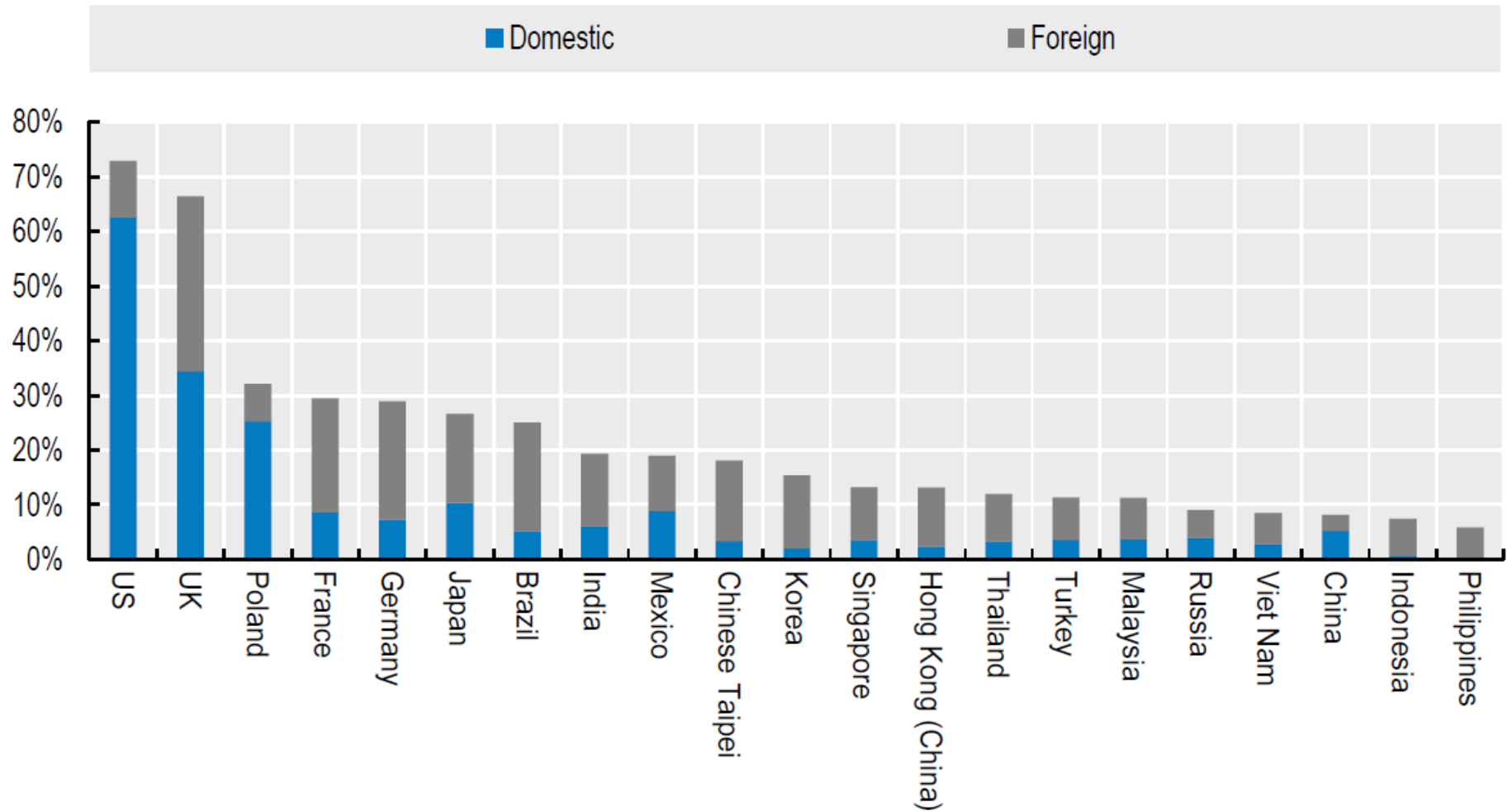


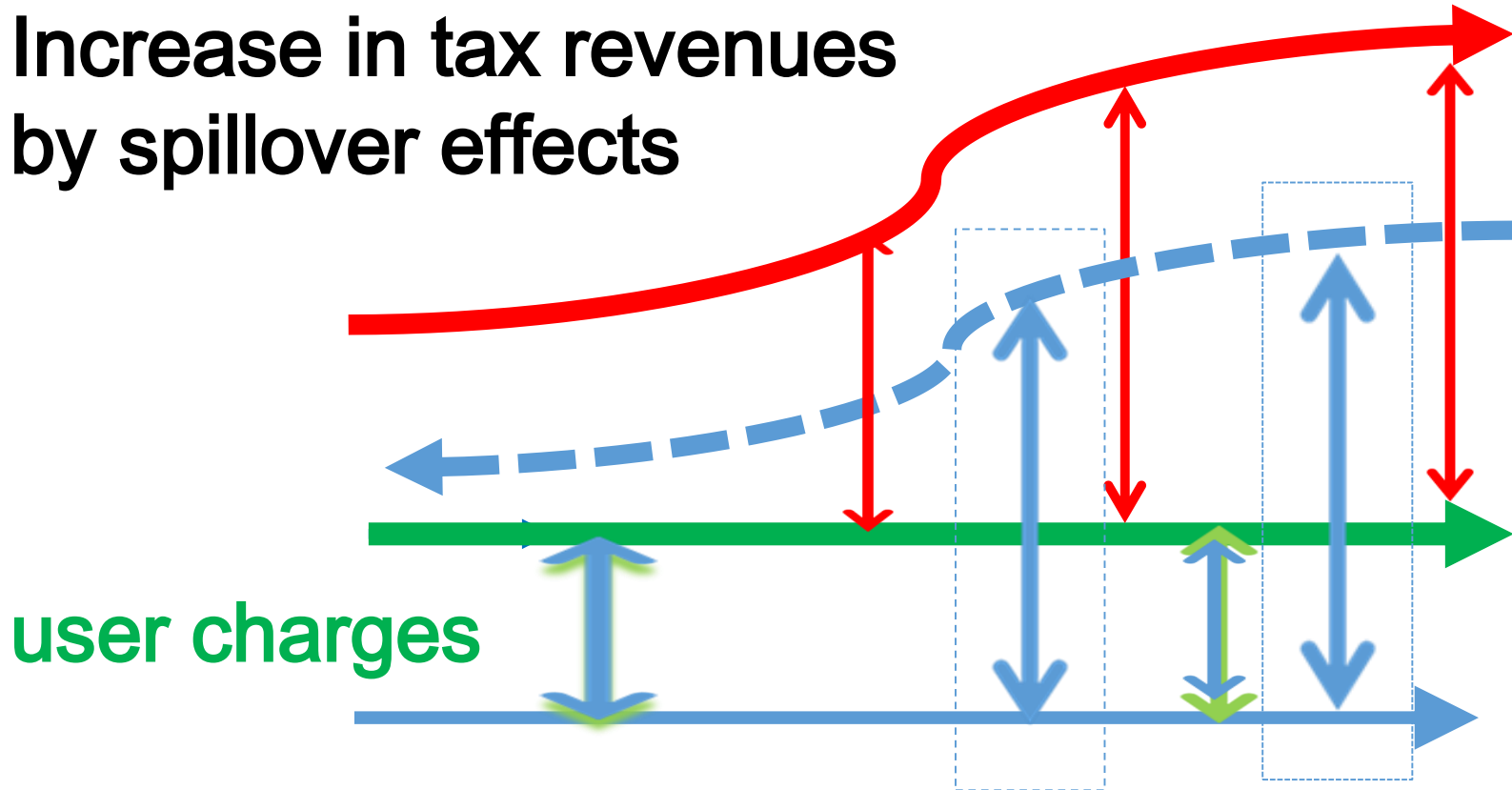
Figure 20. Institutional investors, domestic versus foreign, as of end 2016



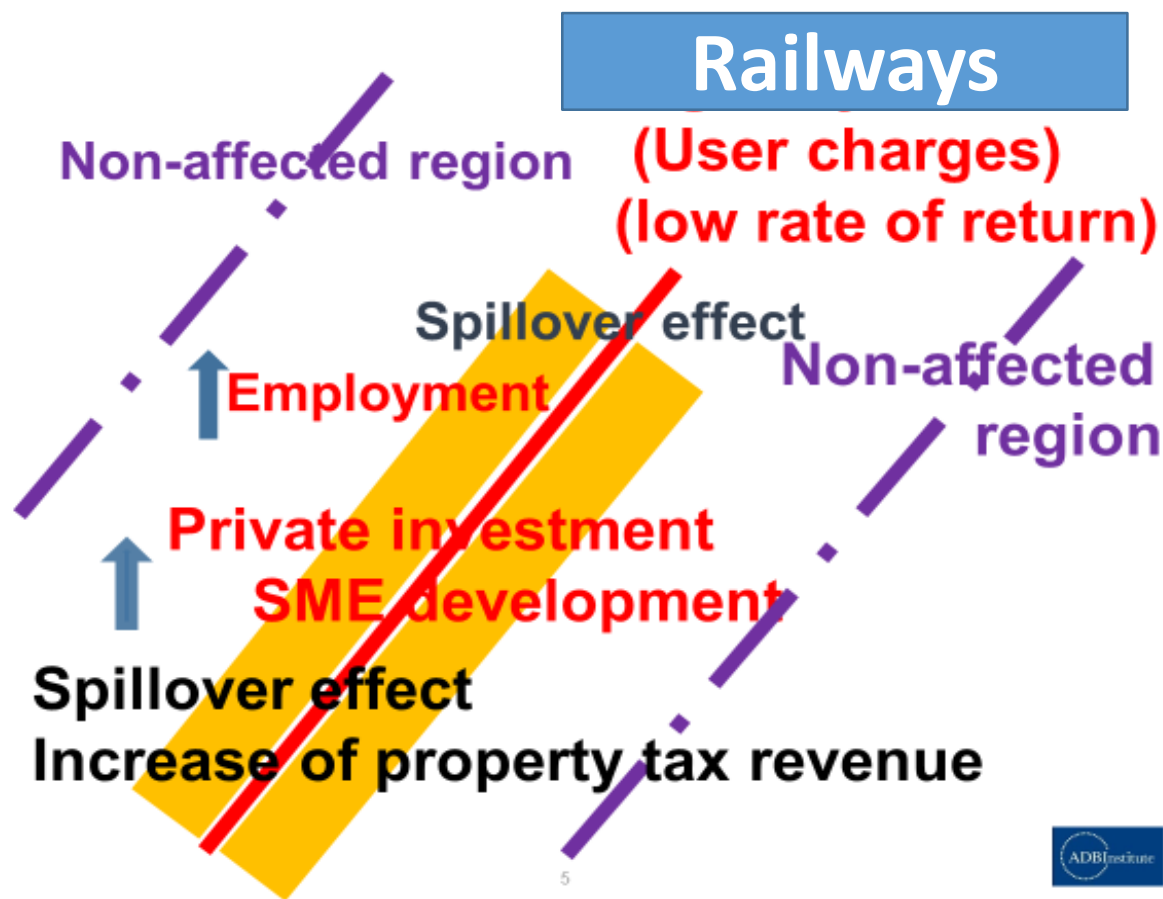
Source: FactSet, OECD calculations. See methodology for details.

User Charges are not enough

Increase in tax revenues
by spillover effects



Spillover Effects of Infrastructure Investment



$$\frac{dY}{dK_G} = \eta_{K_G} \frac{Y}{K_G} + \eta_{K_P} \frac{\eta_{K_G} \eta_{K_P} + \beta_{K_G}}{\eta_{K_P} (1 - \eta_{K_P}) + \beta_{K_L}} \frac{Y}{K_G} + \eta_L \frac{\eta_{K_G} \eta_L - \beta_{K_G}}{\eta_L (1 - \eta_L) + \beta_{K_L}} \frac{Y}{K_G}$$

The Southern Tagalog Arterial Road (STAR Highway), Philippines, Manila

Tax Revenues in three cities

Yoshino and Pontines (2015)
ADBI Discussion paper 549

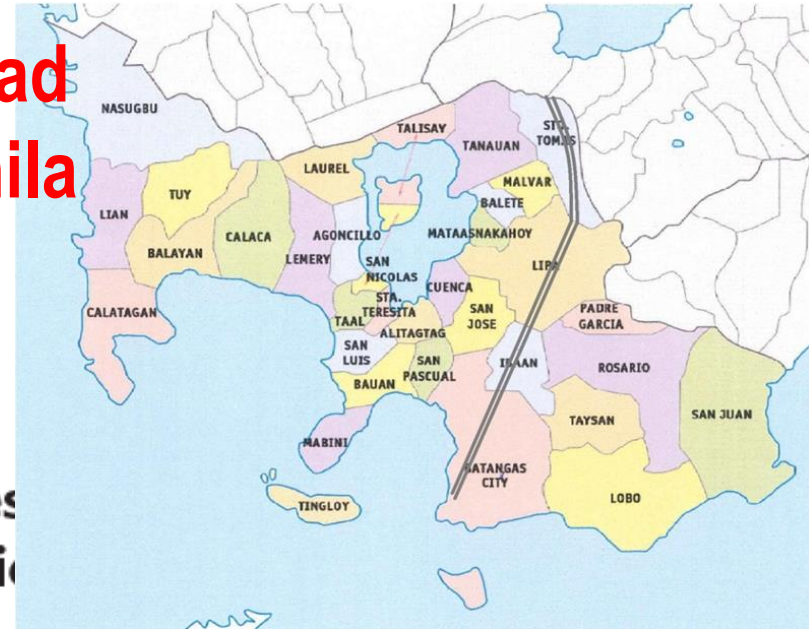


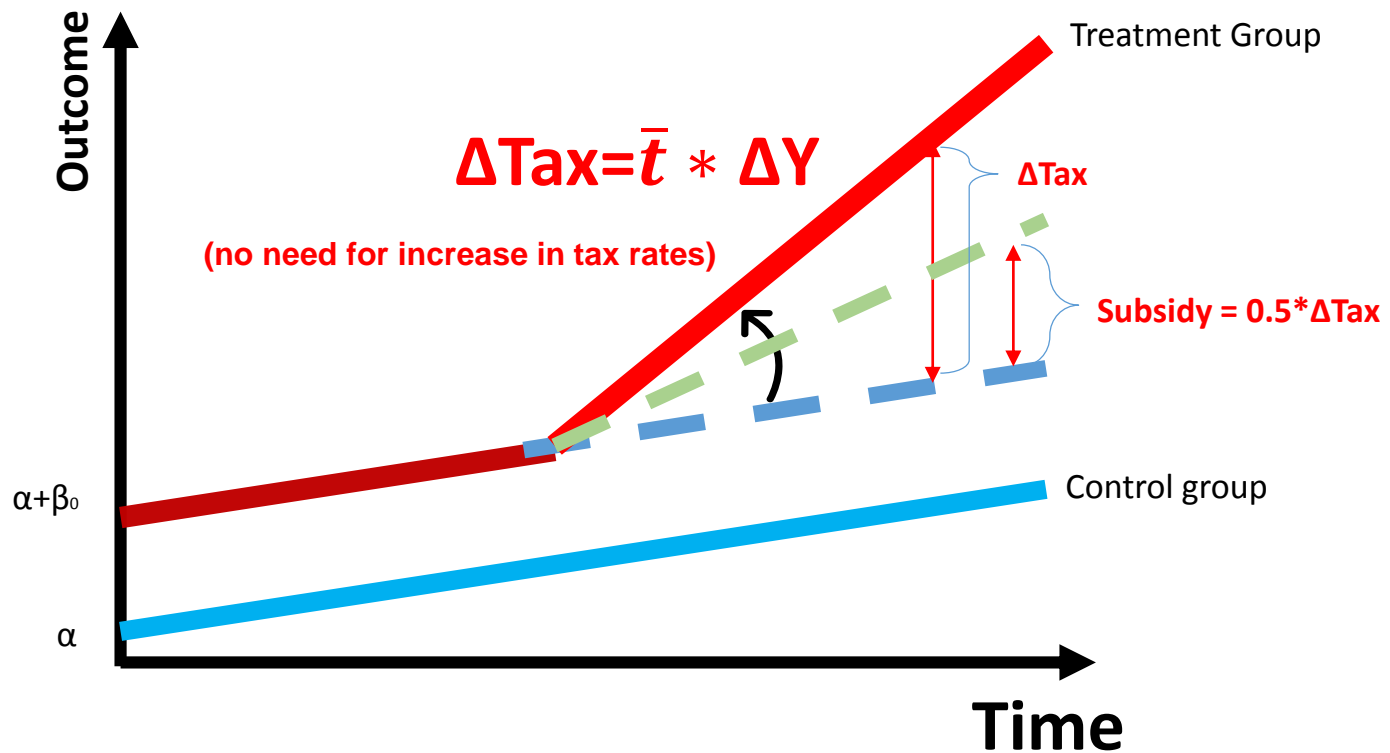
Table 3.3 Calculated Increase in Business Tax Revenues for Beneficiary Group Relative to Nonbeneficiary Group

	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 City	490.90	622.65	652.83	637.89	599.49	742.28	1,208.61

Construction

Operation period

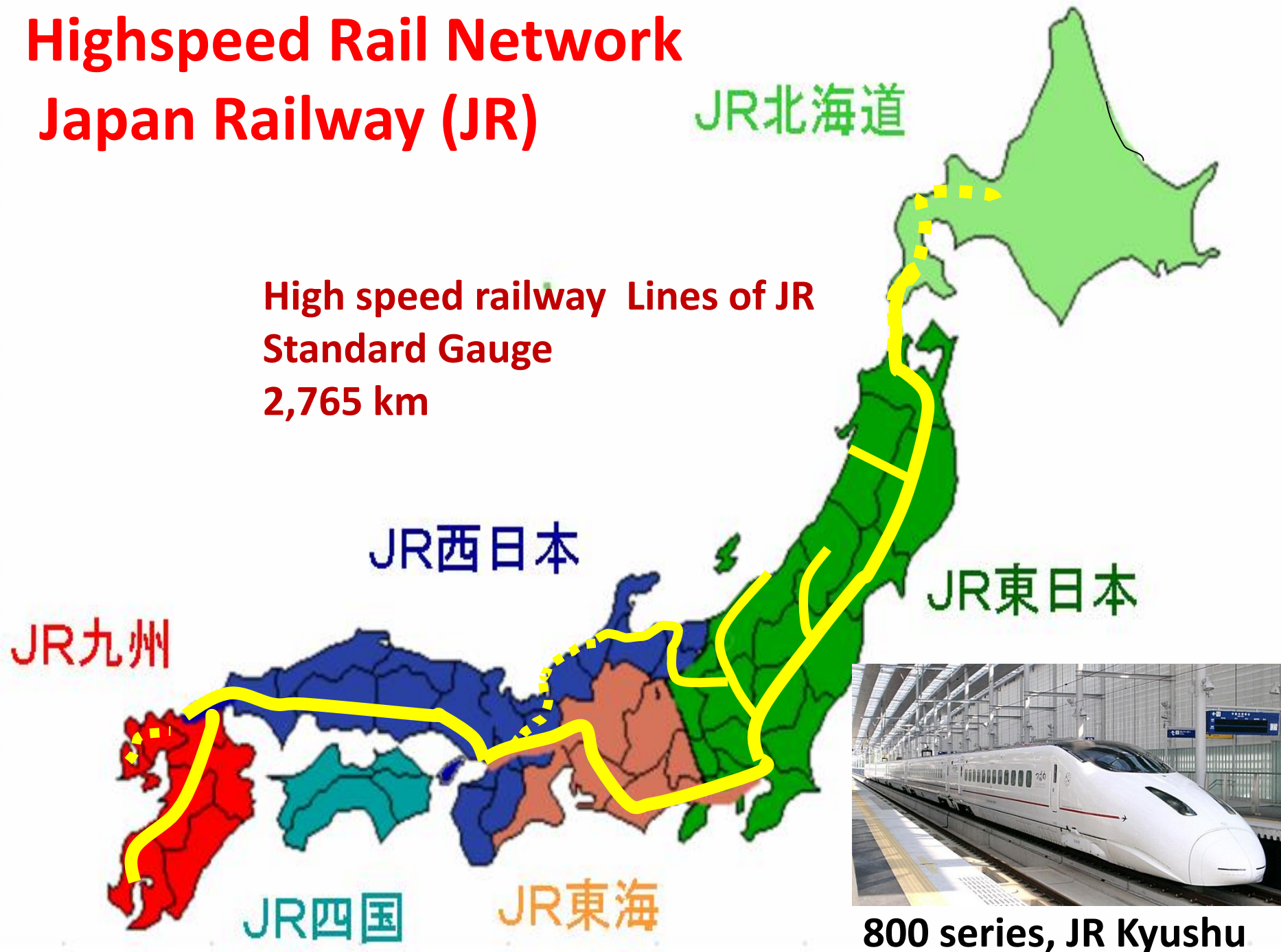
Concept of subsidy based on additional flow of tax revenue due to infrastructure



$$Outcome = \alpha + \beta_0 D_i + \sum_{t=1}^N \beta_0 * D_i * T_t + \epsilon_{i,t}$$

Highspeed Rail Network Japan Railway (JR)

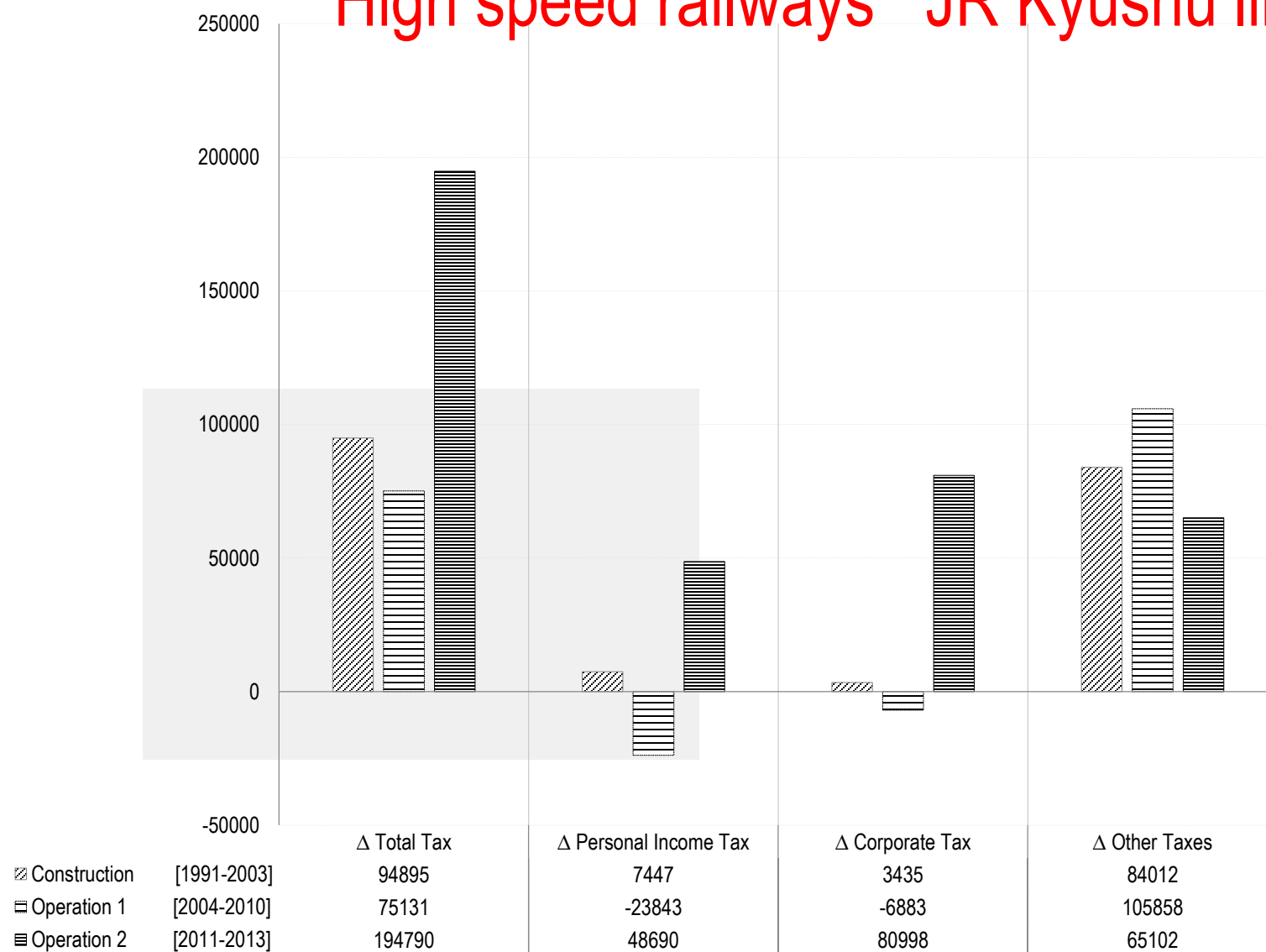
High speed railway Lines of JR
Standard Gauge
2,765 km



800 series, JR Kyushu

Estimation results of Increased tax revenues

High speed railways JR Kyushu line





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

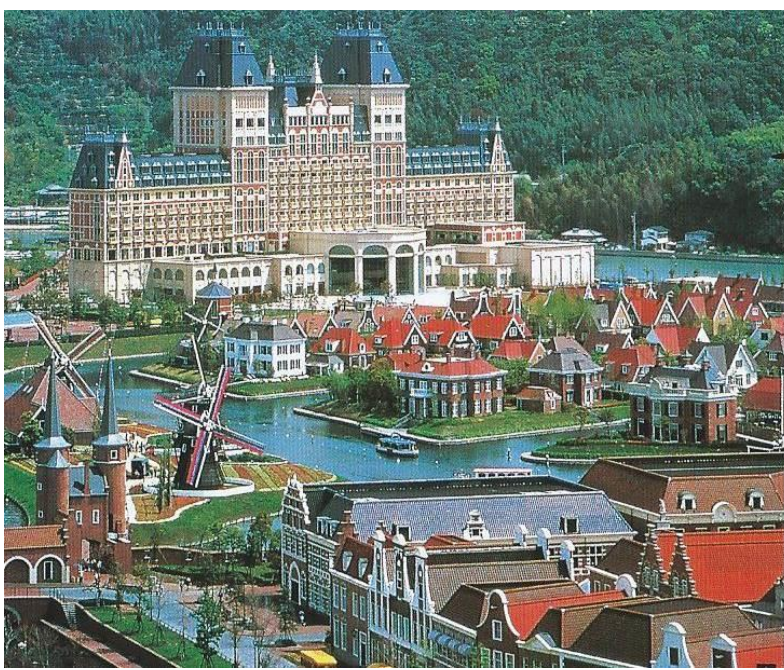
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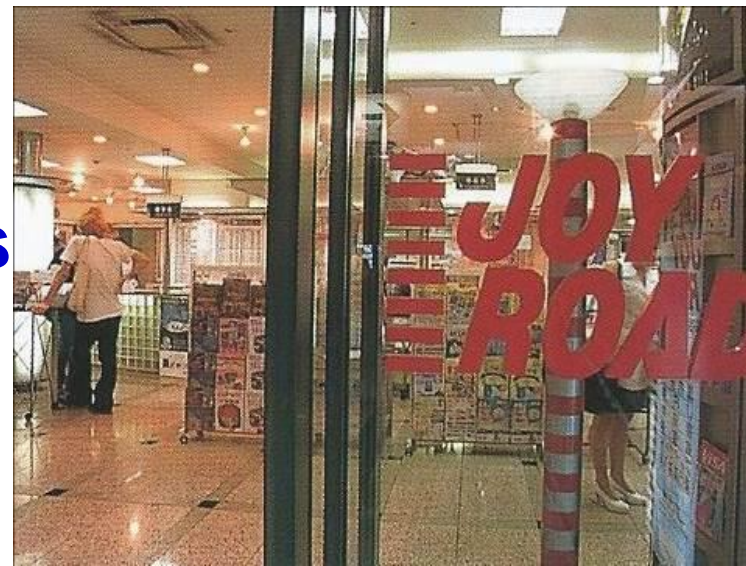
^b Keio University Mita Campus, Graduate School of Economics, Mita 2-Chōme-15-45, Minato, Tokyo, 108-0073, Japan

Railway Station in India





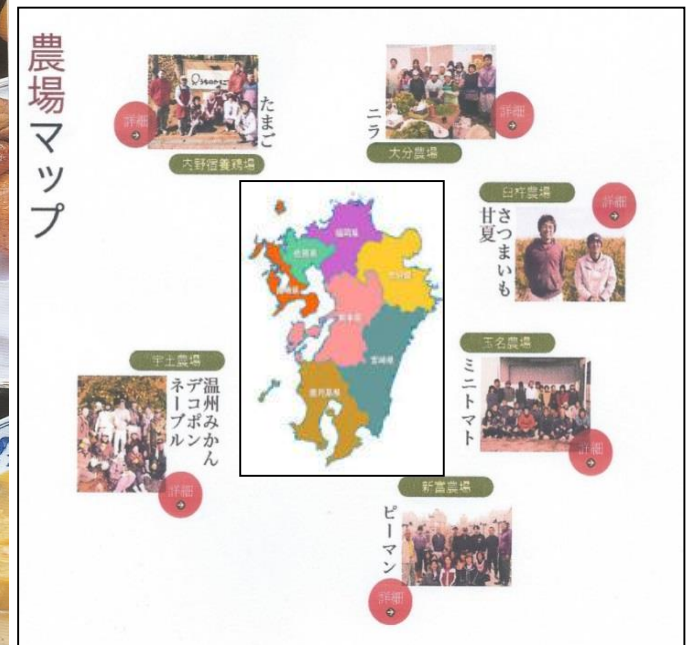
Hotel Business



Promote Tourism



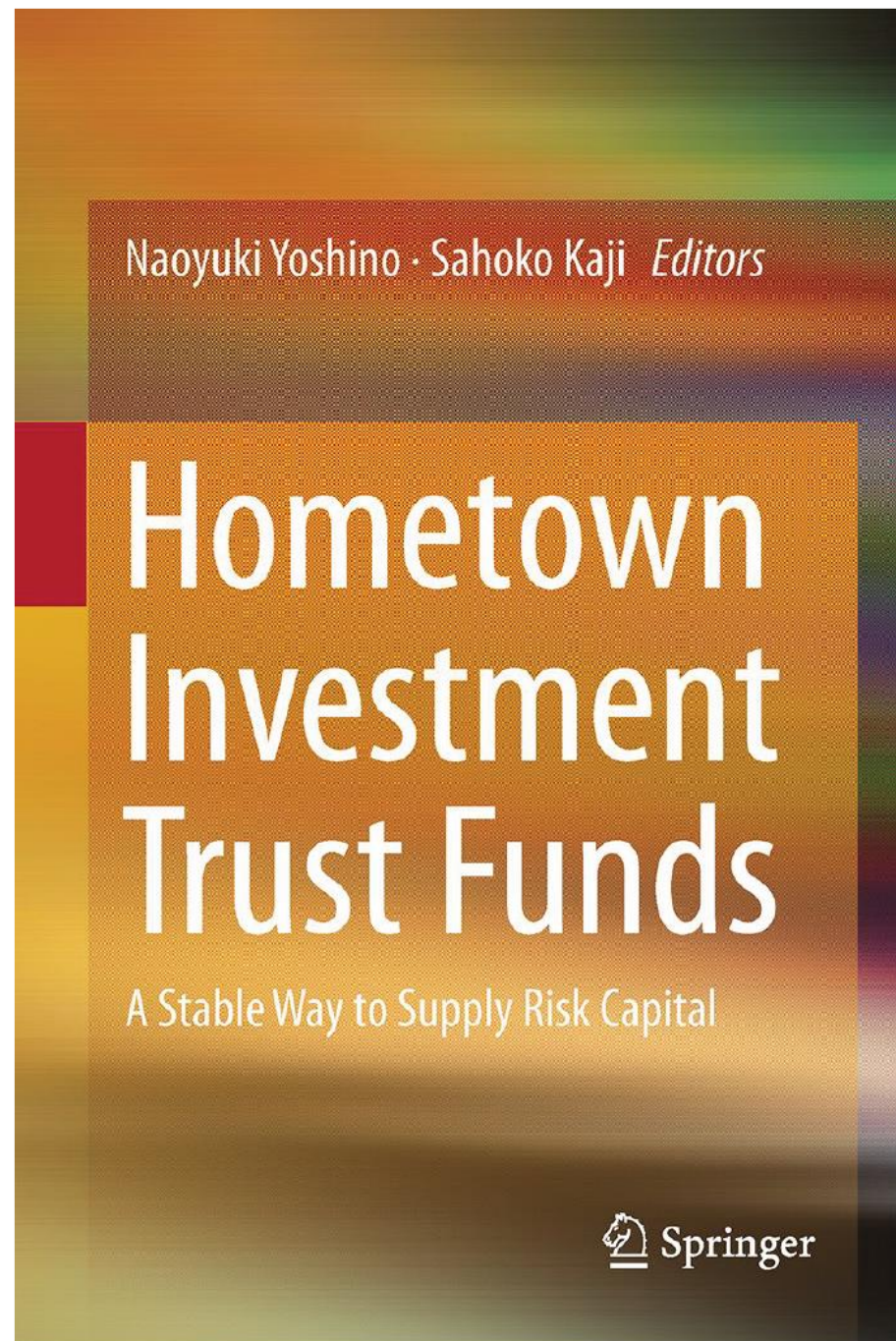
Restaurants at Various Stations



JR Farm

Hometown Investment Trust Funds

Stable Way to
Supply Risk
Capital
Yoshino,N
and
S.Kaji, 2013



Financing for Start-ups along Roads and Railways (Hometown crowd funding)





Macroeconomic Effect of Infrastructure Investment

Spillover Effects Estimated from a Macroeconomic Translog Production Function

	1956-60	1961-65	2001-05	2006-10
Direct effect	0.696	0.737	0.114	0.108
Indirect effect (K_p)	0.452	0.557	0.091	0.085
Indirect effect (L)	1.071	0.973	0.132	0.125
20% returned	0.305	0.306	0.045	0.042
Increment	43.8%	41.5%	39.0%	39.1%

Infrastructure & Education

Yoshino and Umid Abidhadjaev (2016)

Education

In a study of 44 companies, Professor Yoshino found that education played a significant role in impacting the quantum of the spillover effect. Secondary schools provided basic skills for blue collar workers. Universities provided education for highly skilled workers. Workers' education level impacted businesses' productivity.

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 (-0.54)	-0.14 (-1.35)	-0.14 (-1.38)
ln(n+g+d)	-3.09 (-0.59)	-5.75 (-1.23)	-4.36 (-0.77)
ln(Kg)	0.23 (1.17)	0.31 (2.00)	0.53 (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 (-0.33)	0.56 (0.69)	0.48 (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

Give incentives to operating companies

SOE Reform → Increase efficiency and rate of return

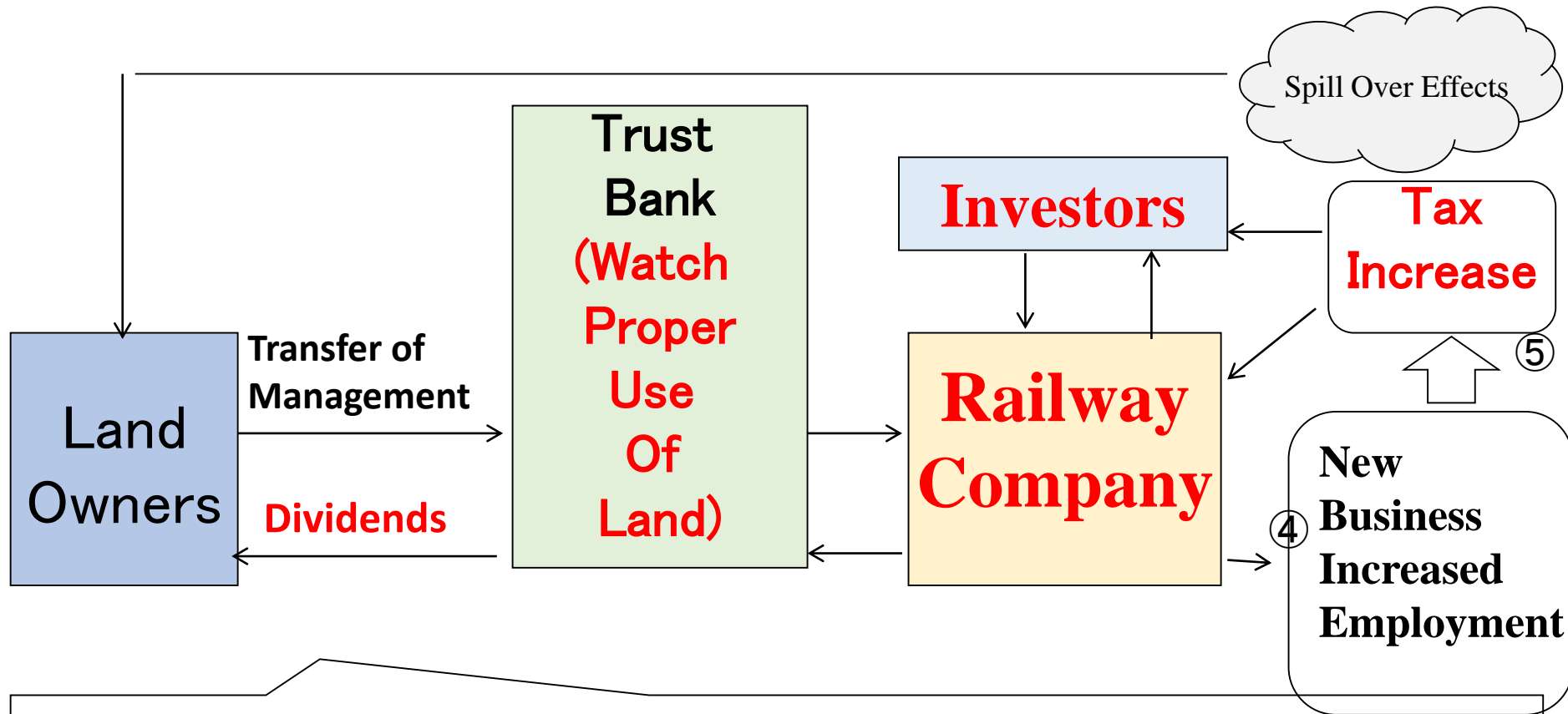
Payoff table for infrastructure operating entity and investors

INCENTIVE MECHANISM

In order to enhance efficiency and increase the rate of return on infrastructure development, it is necessary to vary the dividend payment for private investors based on the project's revenues, including both user fees and spillover tax revenues. It is also necessary for infrastructure operating entities to exert efforts to increase income. Table 5 shows the payoff matrix, depending on the presence or absence of effort by investors and the infrastructure-operating entity.

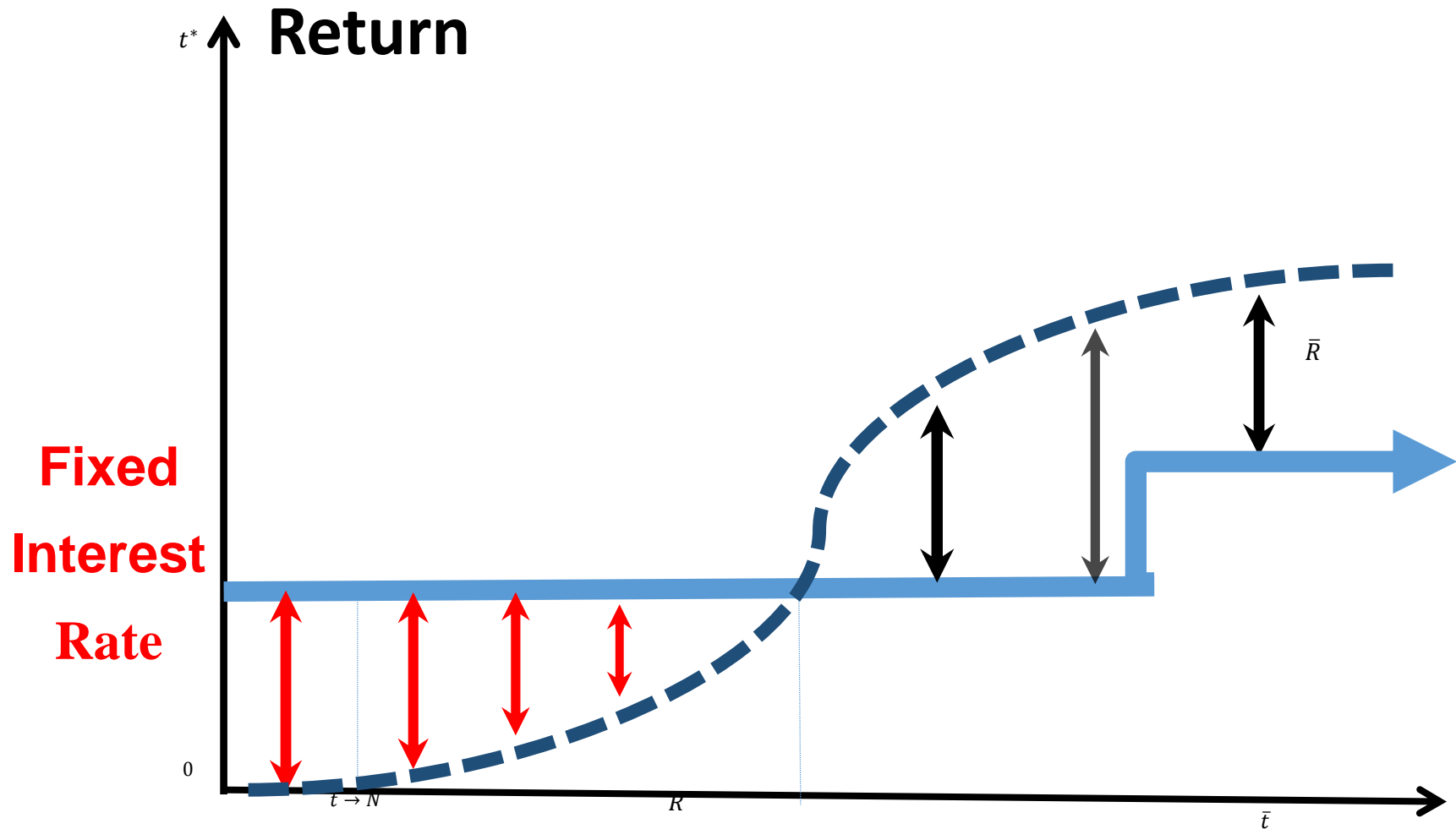
Normal Case	Effort Case
$(50, r)$ Operating Entity Investors	$(50, \alpha r)$ Operating Entity Investors
$(100, r)$ Operating Entity Investors	$(100, \alpha r)$ Operating Entity Investors

Land Trust for Infrastructure Investment



- 1, Reduction of Costs of Land Purchase
- 2, Leasing contract
- 3, future tax revenues can be used for repayment
- 4, Land owners keep their ownership

Long term infrastructure bond (Floating rate)



Green energy projects categorized into two groups based on scale:

A) large projects, such as Hydro-power:

**B) Community type green energy project
(Hometown Crowd Funds)**

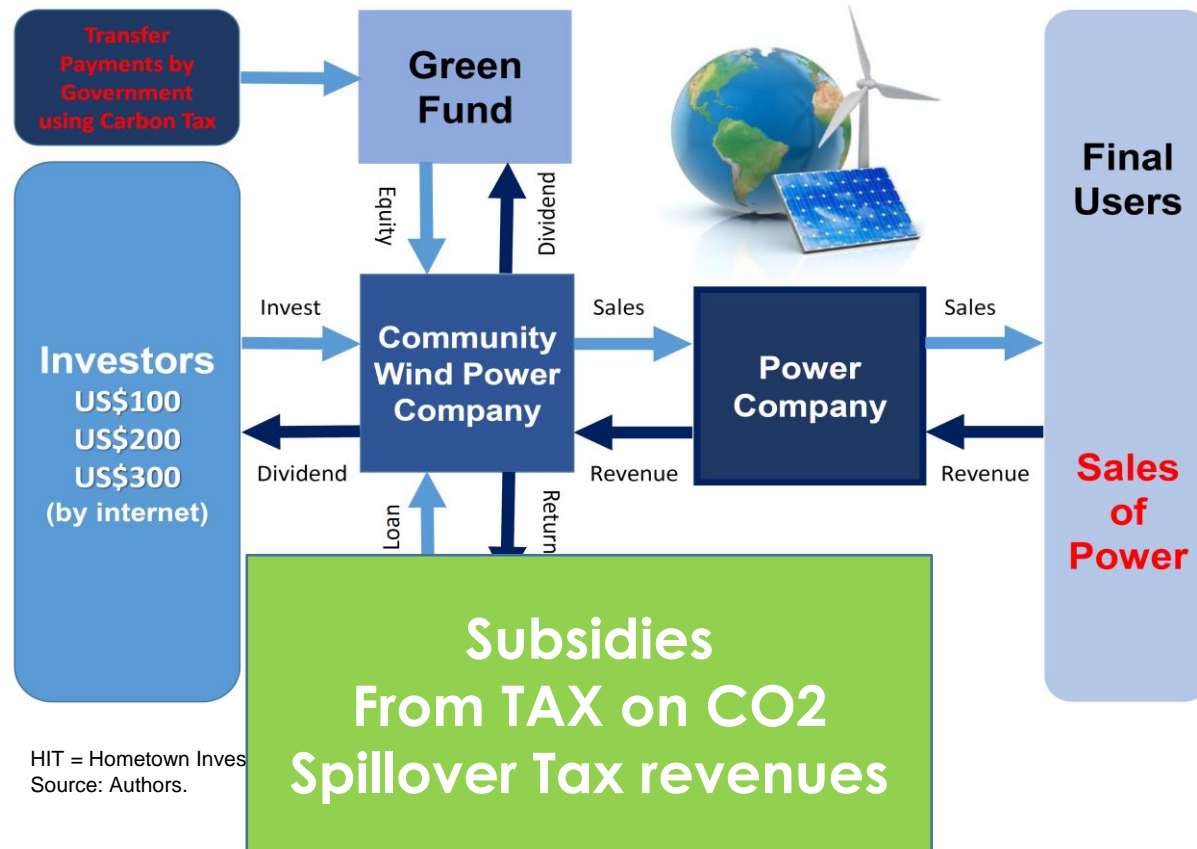
Large projects can be financed by i) insurance and pension funds, that have long-term Financing.

Bank loans are not so much suitable for these project, because energy projects are long-term (10-20 years),
However bank deposits are short to medium-term (1-5 years).

Hydropower plant



Financing Scheme for Renewable Energy Projects Using HITs and Carbon Tax





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Modelling the social funding and spill-over tax for addressing the green energy financing gap

Naoyuki Yoshino^a, Farhad Taghizadeh–Hesary^{b,*}, Masaki Nakahigashi^c

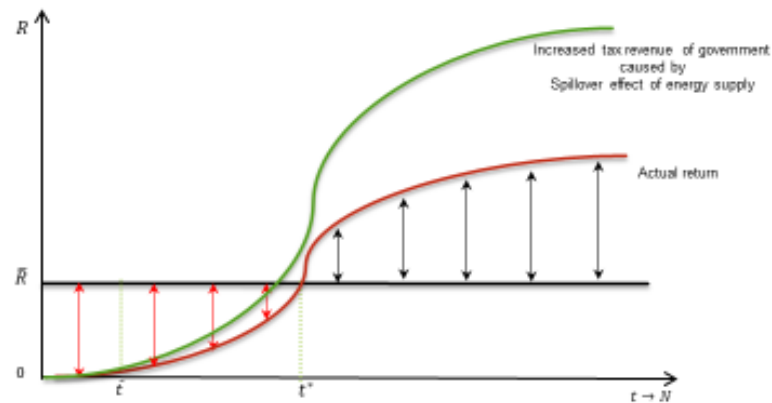
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Green Bond

Injection of spillover tax in low-carbon projects



Source: Authors' compilation, Note: GCGS= Green Credit Guarantee Scheme

$$\int_0^{t^*} (\bar{R} - \text{Actual return}) < \int_{t^*}^N (\text{Actual return} - \bar{R})$$

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Thank you for your Attention