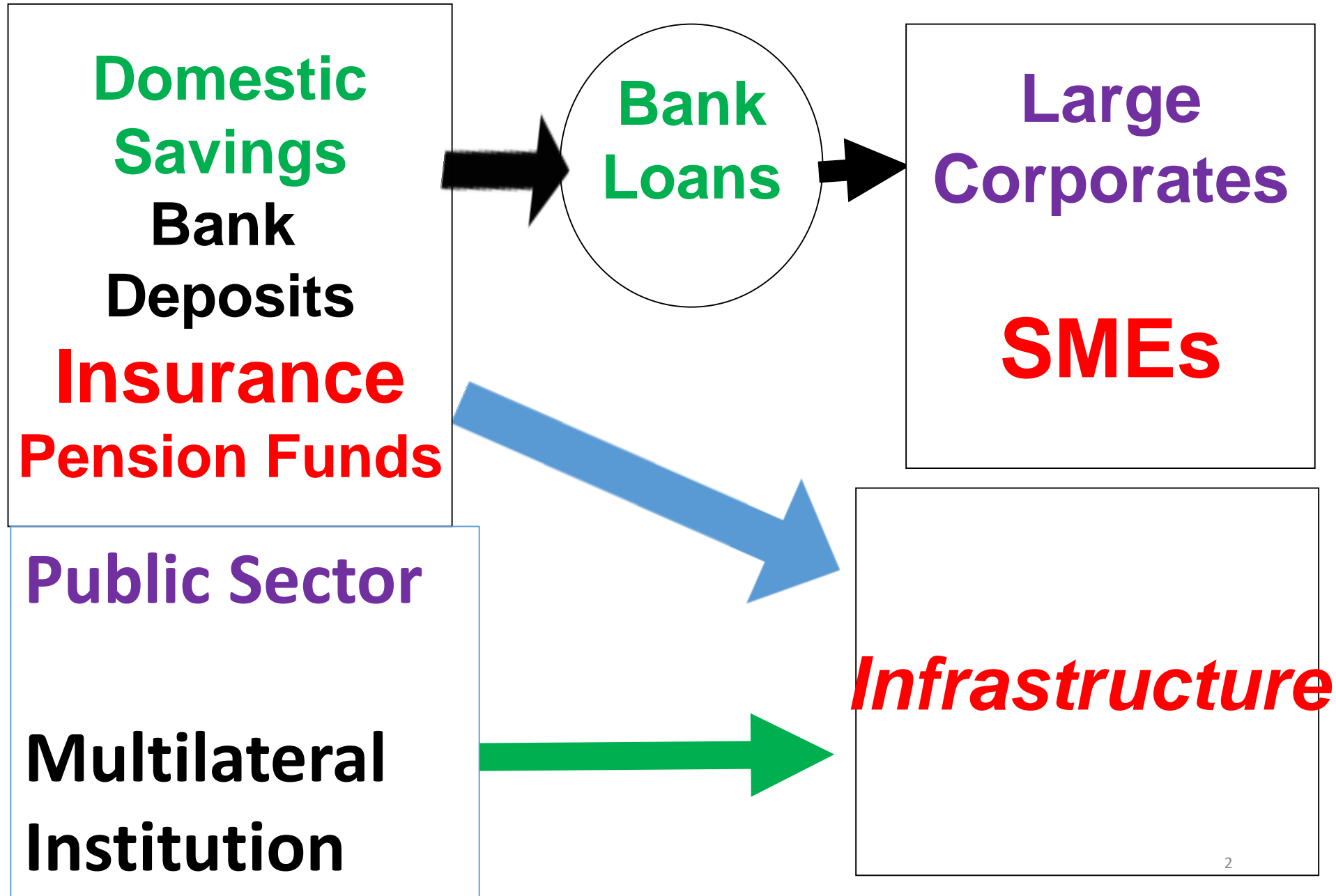# Quality Infrastructure and Private Financing by Use of Spillover Revenues
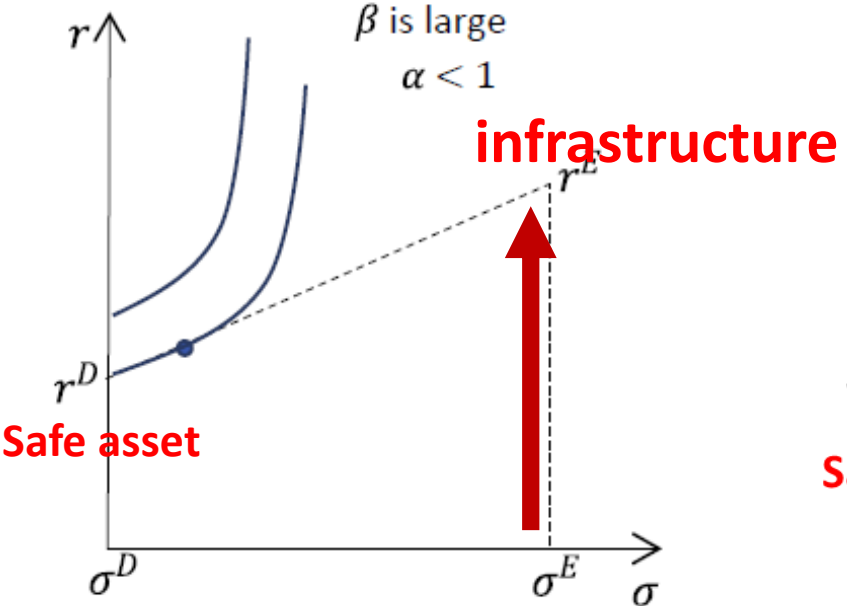
Naoyuki YOSHINO
Dean & CEO
Asian Development Band Institute (ADBI)
Professor Emeritus, Keio University, Japan
ADBI, Tokyo, Japan,

Chile, Santiago, August-2019
nyoshino@adbi.org
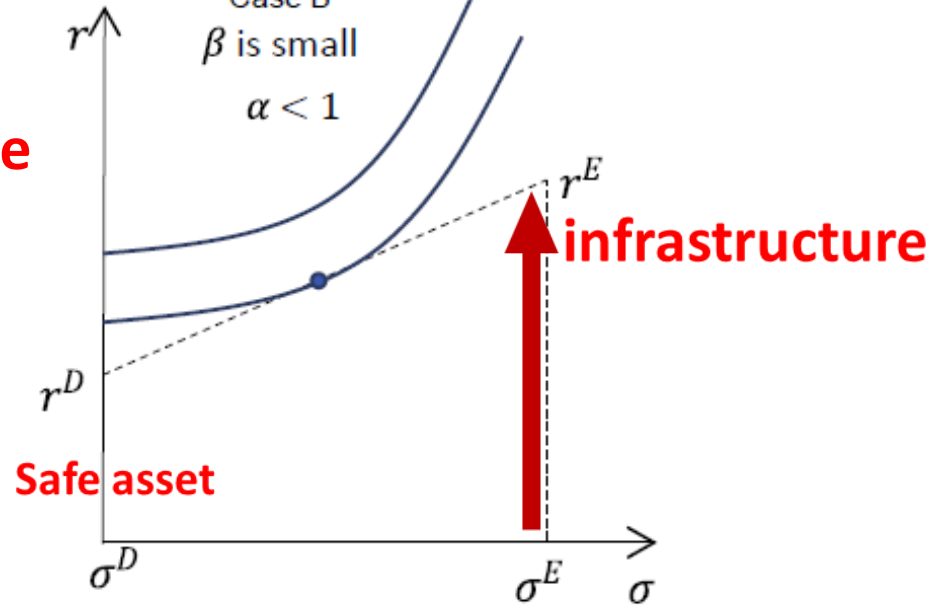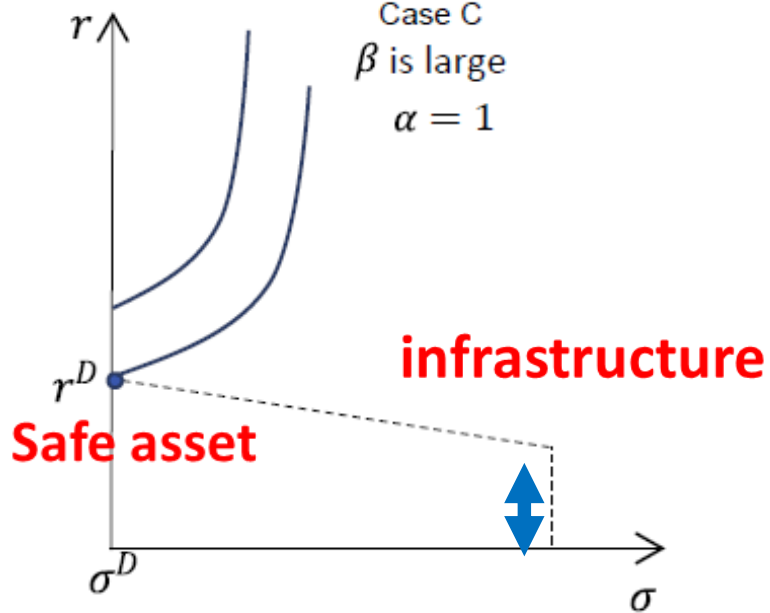
Circulation of Savings into Domestic Investment

Domestic Savings
Bank Deposits
Insurance
Pension Funds

Public Sector

Multilateral Institution

Bank Loans

Large Corporates

SMEs

Infrastructure

2

Case A
β is large
$\alpha < 1$

infrastructure

r^E

r^D

Safe asset

σ^D σ^E σ

Case B
β is small
$\alpha < 1$

infrastructure

r^E

r^D

Safe asset

σ^D σ^E σ

Case C
β is large
$\alpha = 1$

infrastructure

r^D

Safe asset

σ^D σ

Case D
β is small
$\alpha = 1$

infrastructure

r^D

Safe asset

σ^D σ

3
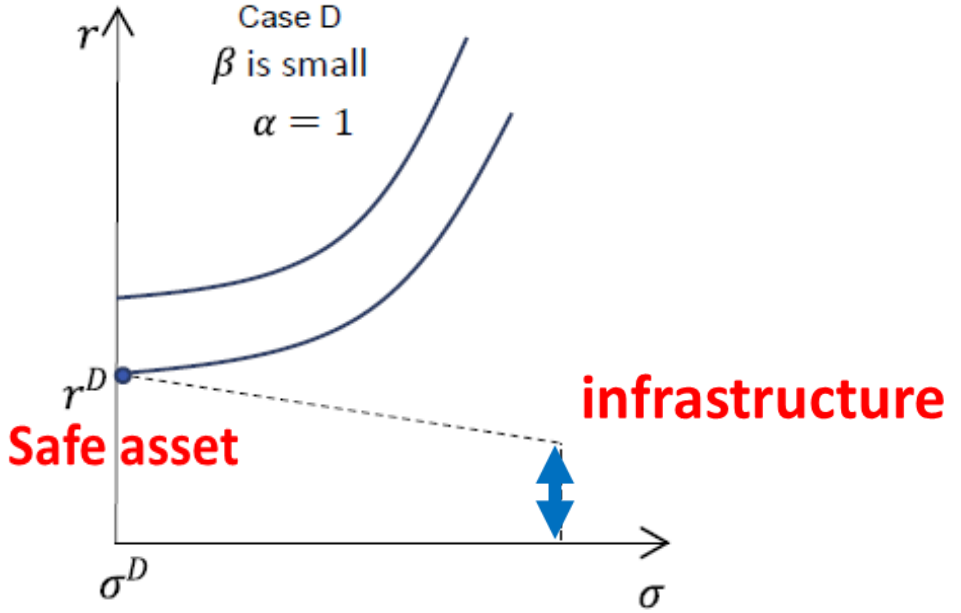
Spillover Effects of Infrastructure Investment

Electricity
Water Supply
Road, Railways

Non-affected region

(User charges)
(low rate of return)

Spillover effect

↑ Employment

Non-affected region

Private investment
SME development

Spillover effect
Increase of property tax revenue

5
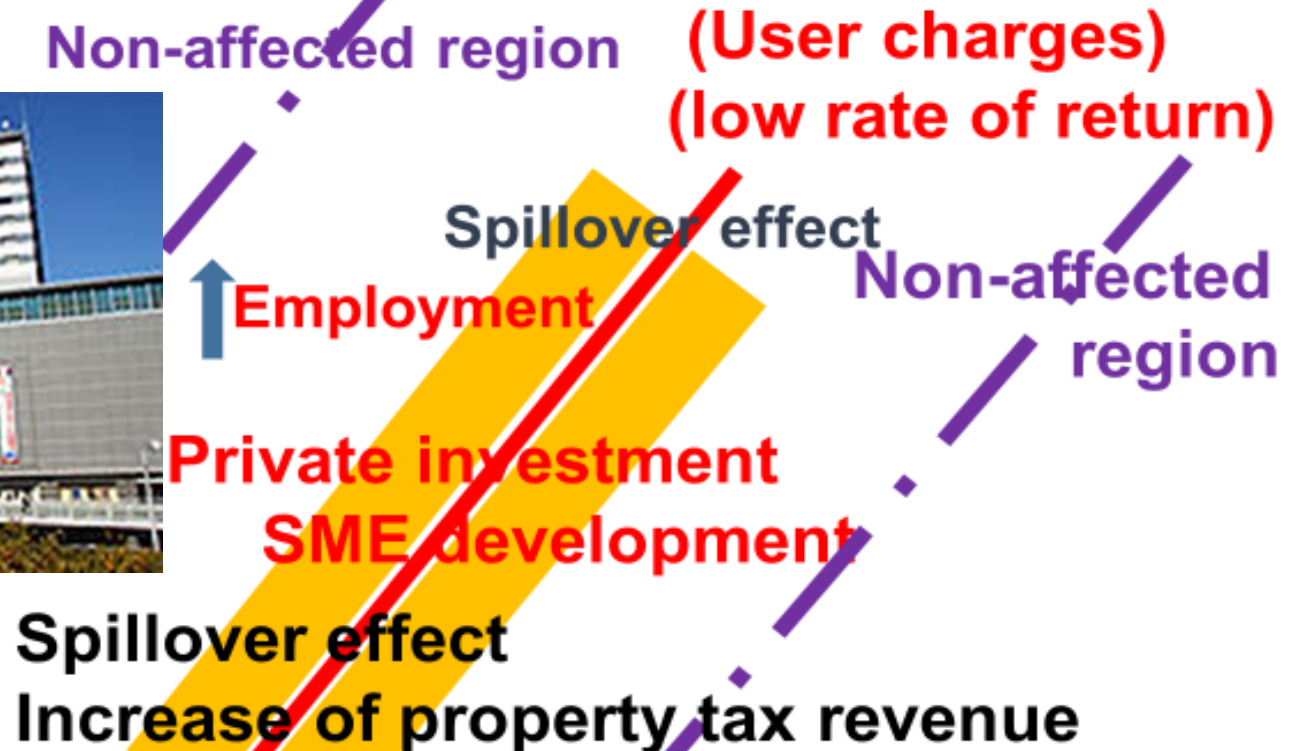
User Charges are not enough

**Increase in tax revenues
by spillover effects**

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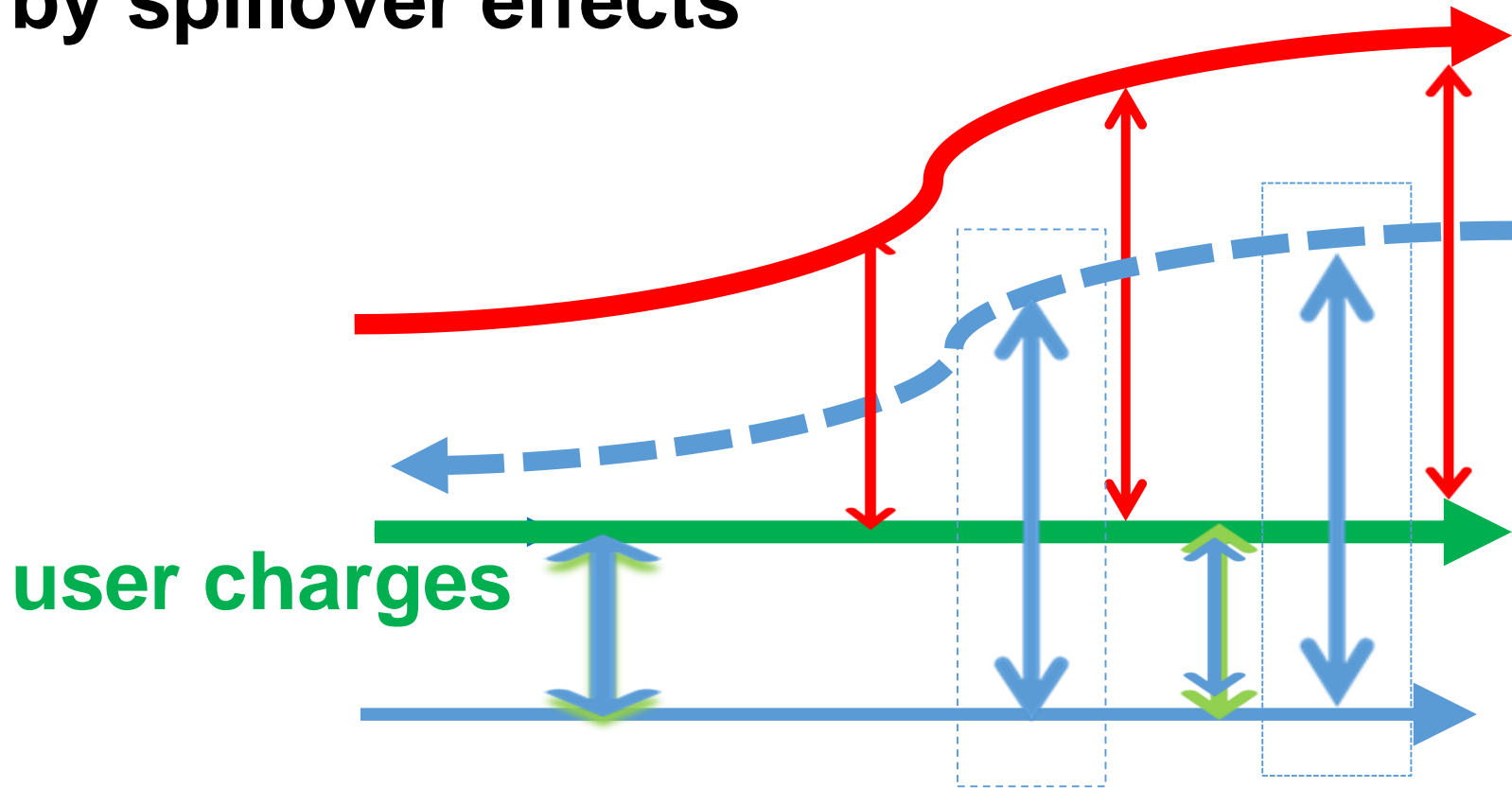
The Southern Tagalog Arterial Road (STAR Highway), Philippines, Manila
Tax Revenues in three cities
Yoshino and Pontines (2015)
ADBI Discussion paper 549

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

	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**

Estimation results of Increased tax revenues

Figure 2. Changes in Tax Revenues by C[...]

Highspeed[...]

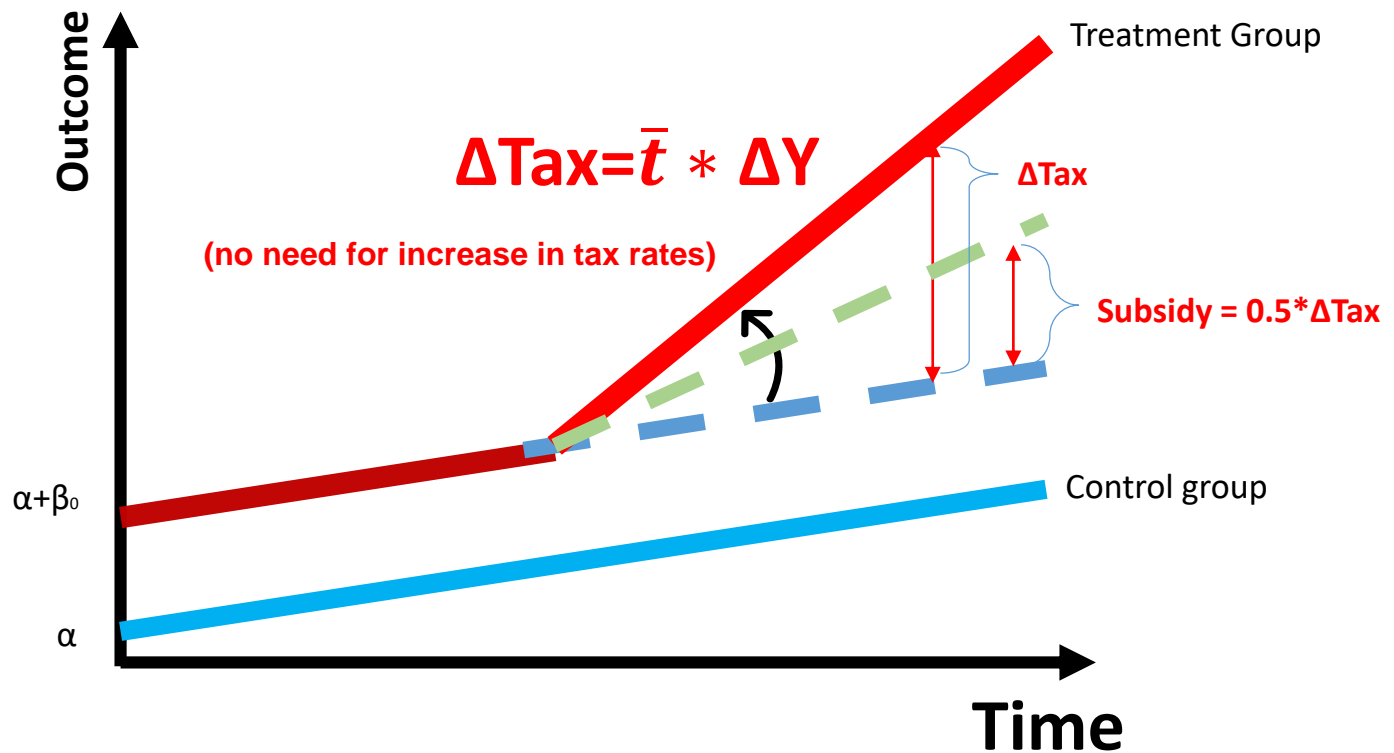|	Δ Total Tax	Δ Personal Income Tax	Δ Corporate Tax	Δ Other Taxes
■ Construction (1991–2003)	94,896	7,447	3,435	84,012
■ Operation 1 (2004–2010)	75,131	−23,843	−6,883	105,858
■ Operation 2 (2011–2013)	194,790	49,860	80,998	65,102
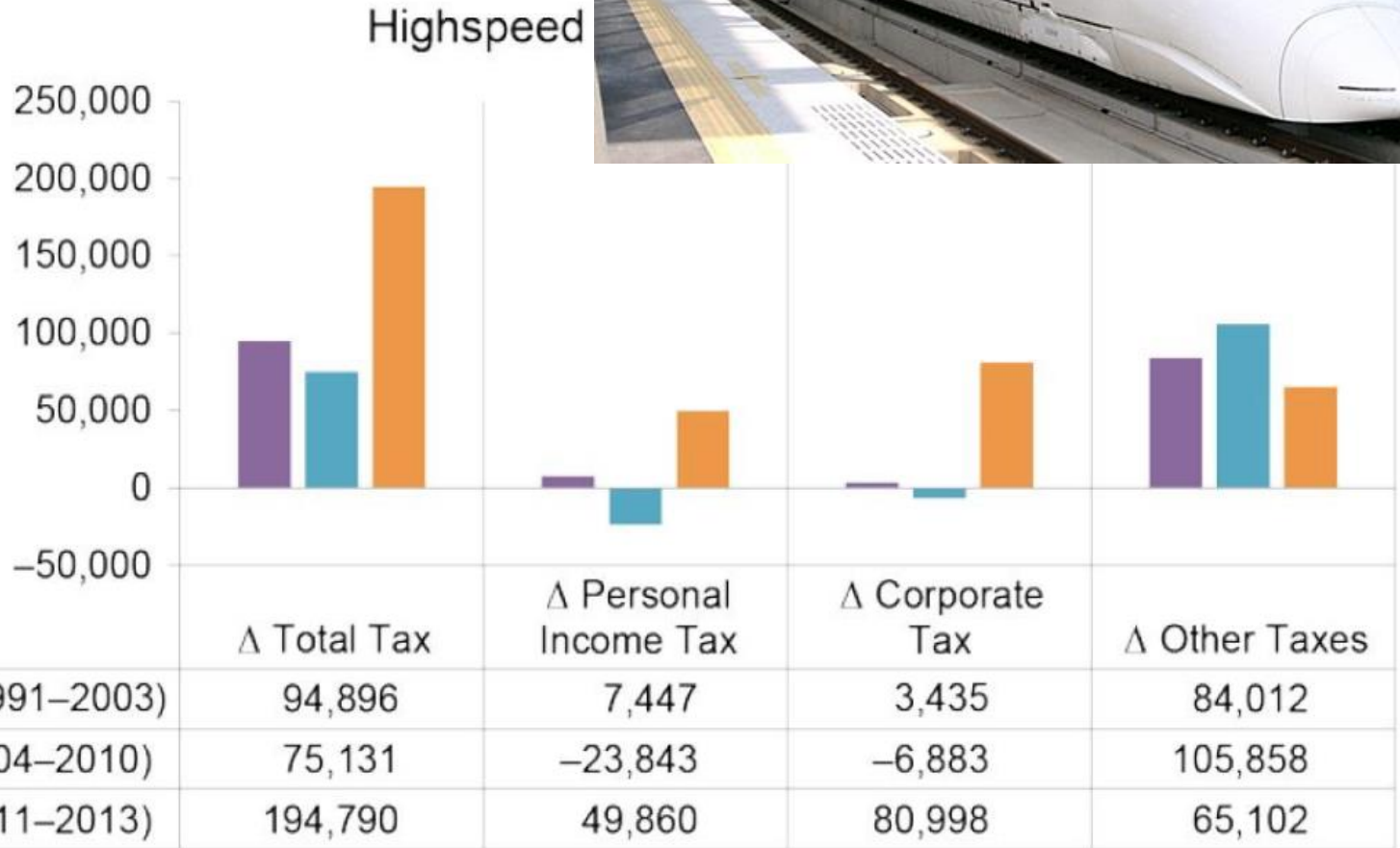
Source: Yoshino and Abidhadjaev (2017b)

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

$\Delta Tax = \bar{t} * \Delta Y$

(no need for increase in tax rates)

ΔTax

Subsidy = 0.5*ΔTax

Treatment Group

Control group

Outcome

Time

$\alpha + \beta_0$

α

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

Traditional Cost-Benefit Analysis by ADB

| Project Costs	Present Value	Years 0	Years 1	Years 2	Years 3–25
Capital Costs					
Civil works		2,138			
Machinery and equipment		363			
Land and resettlement		320			
Consultant services		42			
Total Capital Costs	2,627	2,863	0	0	0
Operating Costs					
Fuel			35	35	35
Labor (surplus)			27	27	27
Labor (scarce)			28	28	28
Other			56	56	56
Total Operating Costs	1,316	0	146	146	146
Project Benefits					
Avoided road transport costs			280	280	280
Additional net output			259	259	259
Total	4,857	0	539	539	539
Net Benefits	914.9	(2,863)	393	393	393

Table 2. Japanese Macroeconomic Estimates of Spillover Effects

	1956–1960	1961–1965	1966–1970	1971–1975	1976–1980	1981–1985
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 (%)	68.644	67.481	67.210	66.907	66.691	66.777

	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010
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 (%)	66.222	66.200	66.094	66.122	66.139

GDP

GDP	Term	Connectivity spillover effect	Regional spillover effect
Launching Effects	Short	2.83***[4.48]	0.70[0.45]
	Mid	2.5***[6.88]	0.36[0.29]
	Long	2.06***[3.04]	-0.42[-0.29]
Anticipated (1 year)	Short	0.19[0.33]	0.85[1.75]
	Mid	0.31[0.51]	0.64[1.30]
	Long	0.07[0.13]	-0.006[-0.01]
Postponed Effects		1.76*[1.95]	-1.49[-0.72]
Anticipated (2 years)	Short	-1.54[-1.66]	1.42[0.78]
	Mid	0.32[0.44]	0.84[1.42]
	Long	0.11[0.15]	0.10[0.16]
Postponed Effects		-0.14[-0.20]	-1.71[-1.35]
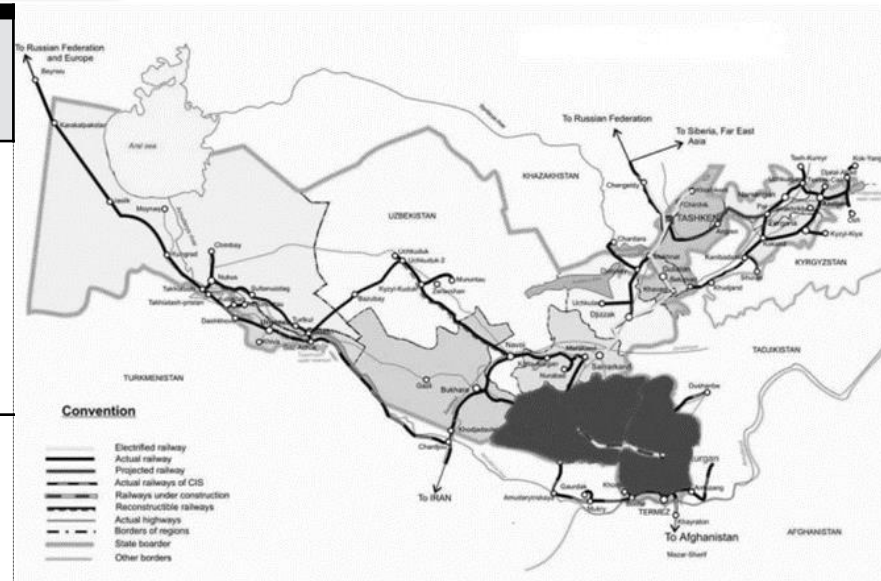
Give incentives to operating companies
SOE Reform → Increase efficiency and rate of return

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
	$(50, r)$ perating Investors Entity	$(50, \alpha r)$ Operating Investors Entity
	$(100, r)$ perating Investors Entity	$(100, \alpha r)$ Operating Investors Entity

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	-0.14	-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

Start up businesses and SME promotion
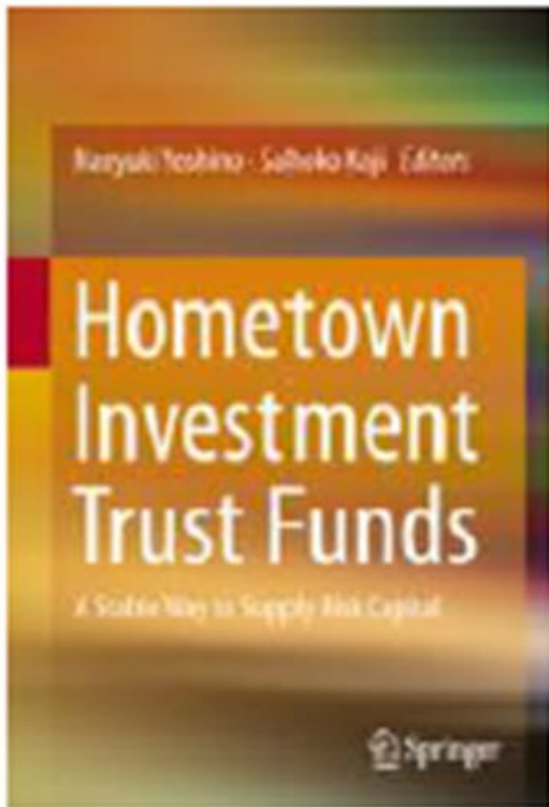
Springer

Hometown Investment Trust Funds (Springer)

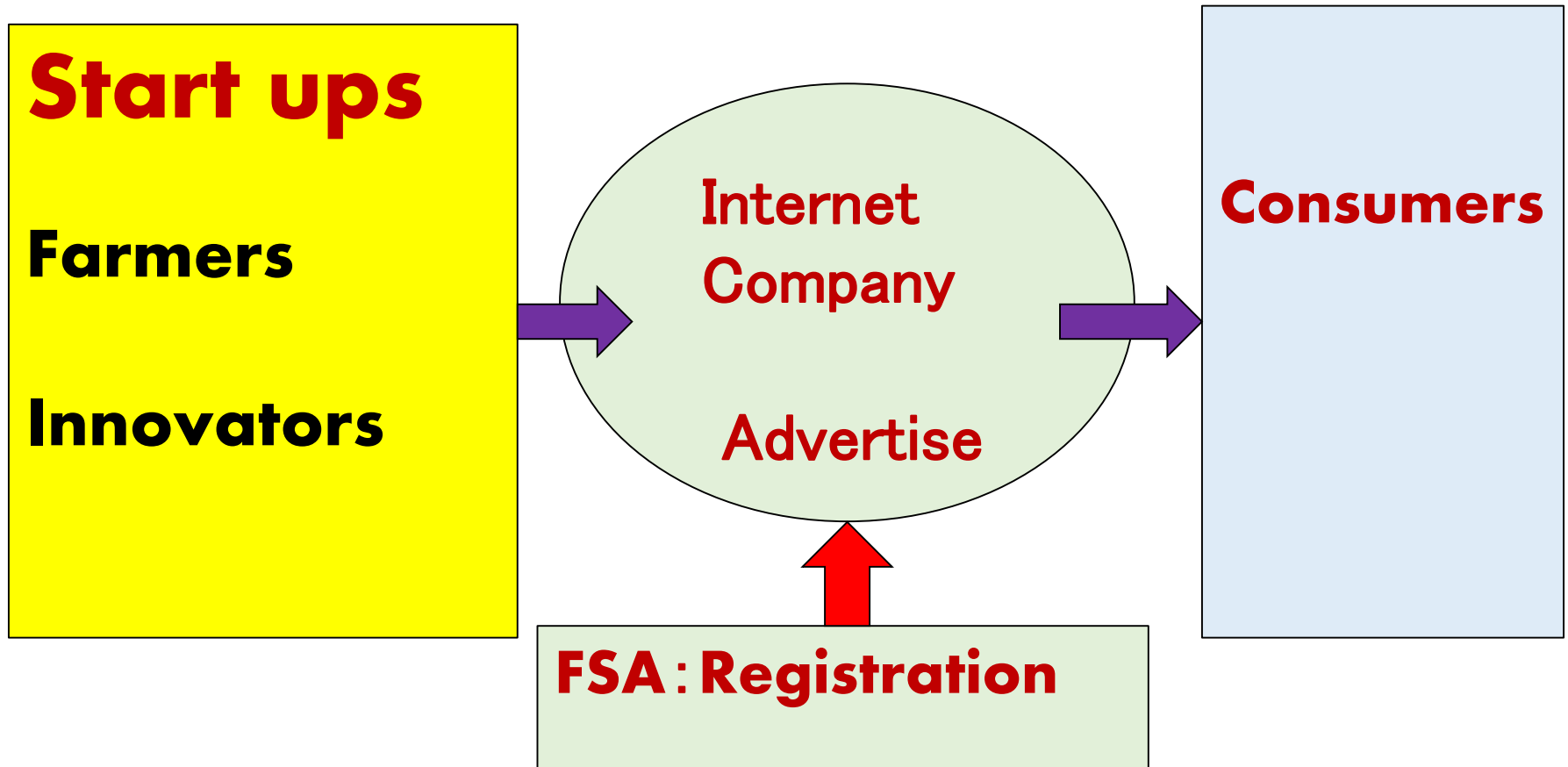**A Stable Way to Supply Risk Capital**

Yoshino, Naoyuki; Kaji Sahoko (Eds.) 2013,

Japan, Cambodia Vietnam, Peru, Mongolia

Access to Digital Technology, Internet

(1) Purchasing Type of Hometown Trust
(2) Investment Type of Hometiwn Trust

（1） Internet On-line trading

Start ups

Farmers

Innovators

Internet Company

Advertise

Consumers

FSA：Registration

Internet Sales of Products
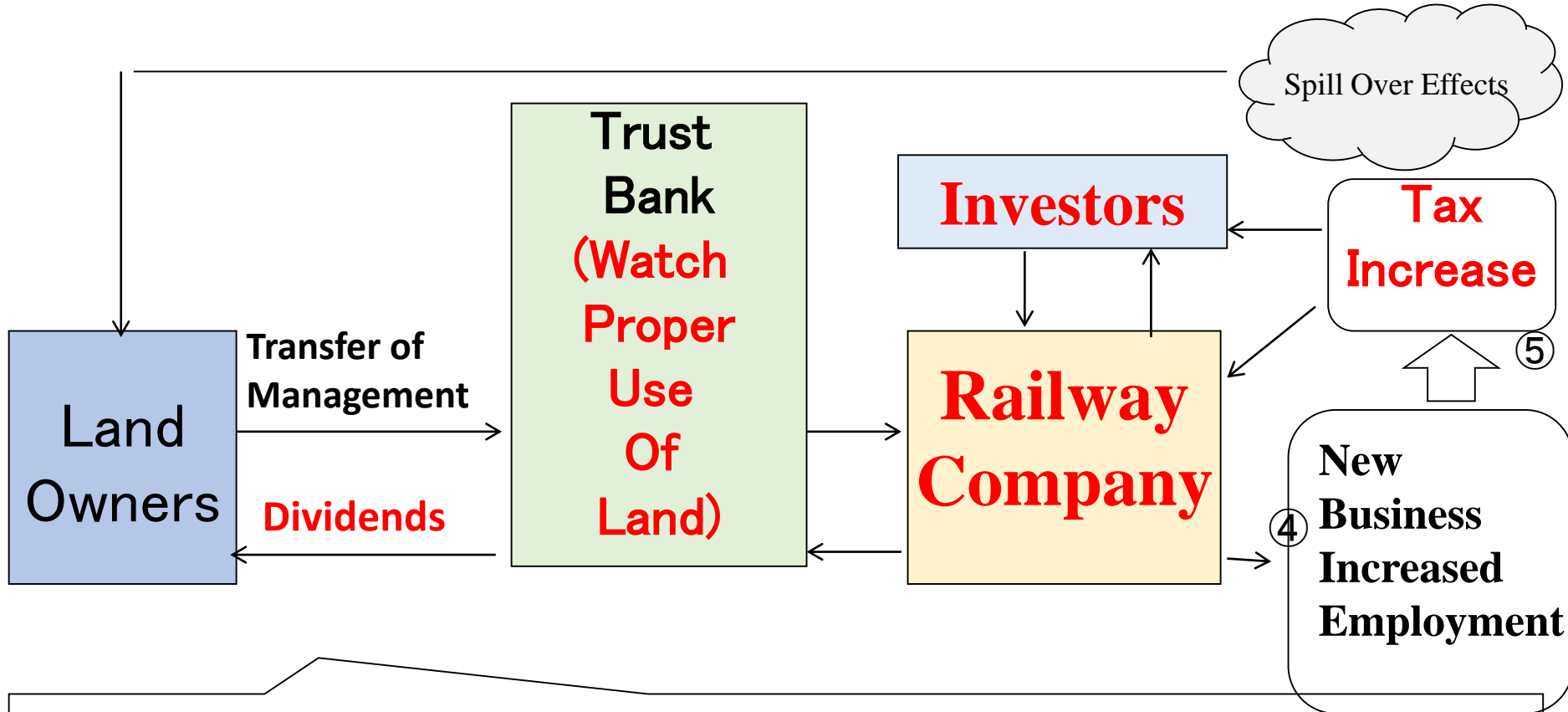
Agricultural Funds

Beans and Wine

Dec 11 2013 , Tehran - I
IRAN

Financing for Start-ups along Railway (Hometown crowd funding)
(2) Investment Type

Land Trust for Infrastructure Investment

Spill Over Effects

Land Owners → Transfer of Management → Trust Bank (Watch Proper Use Of Land) → Railway Company

Investors

Tax Increase ⑤

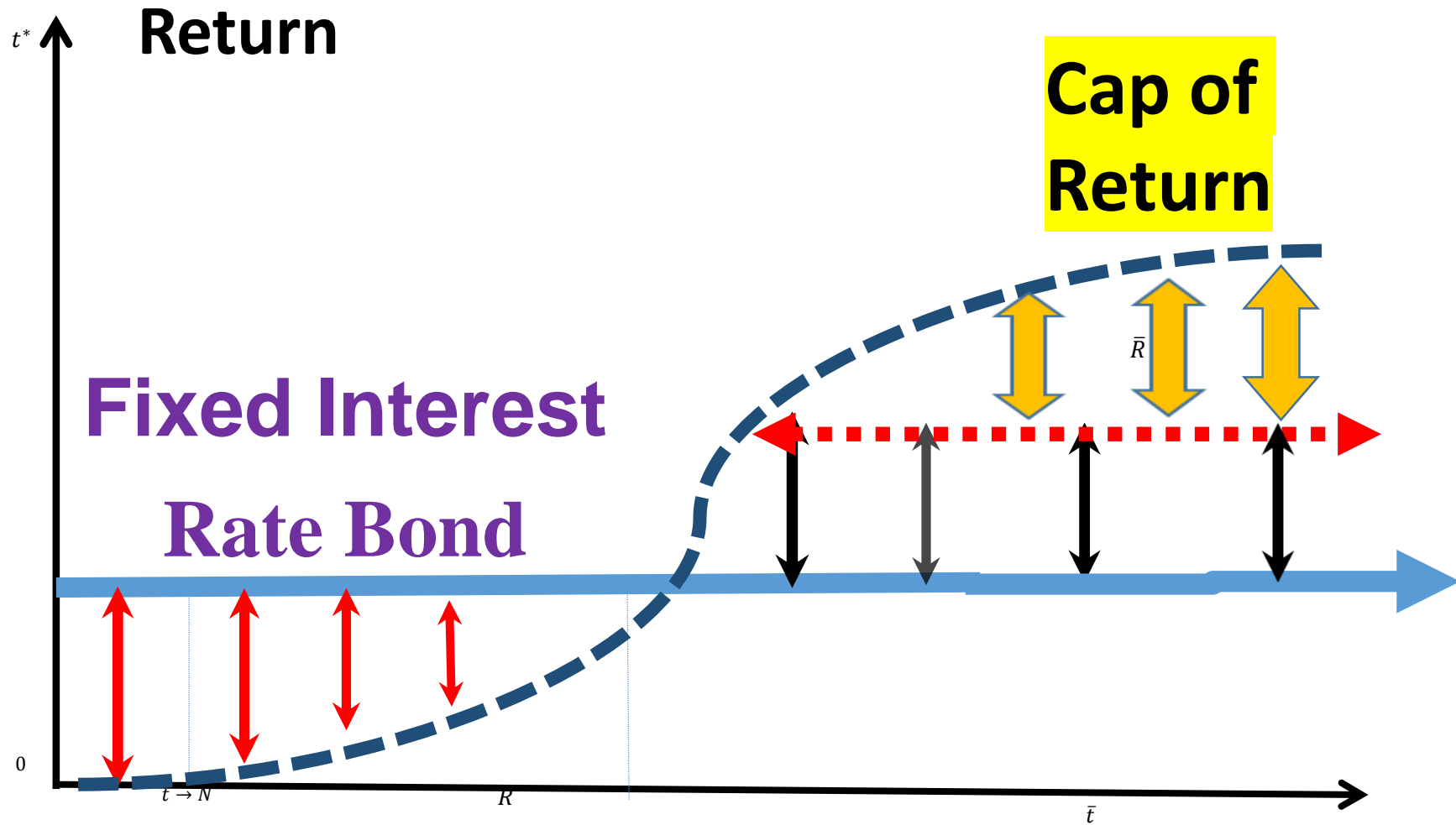④ New Business Increased Employment

Dividends

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

Infrastructure bond and Equity Investment

YOSHINO Naoyuki, and Farhad Taghizadeh–Hesary, (2019) "Modelling the social funding and spill-over tax for Addressing the green energy financing gap", *Economic Modelling*, 2019,

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Yoshino, Naoyuki, and Umid Abidhadjaev. 2017a. "An Impact Evaluation of Investment in Infrastructure: The Case of a Railway Connection in Uzbekistan." *Journal of Asian Economics* 49: 1–11.

Yoshino, Naoyuki, and Umid Abidhadjaev. 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.

Yoshino, Naoyuki, and Masaki Nakahigashi. 2004. "The Role of Infrastructure in Economic Development." *ICFAI Journal of Managerial Economics 2*: 7–24.

Yoshino, Naoyuki, Masaki Nakahigashi, and Victor Pontines. 2017. "Attract Private Financing to Infrastructure Investment by Injection of Spillover Tax Revenues." *Nomura Journal of Asian Capital Market* 1 (2): 4–9.

Yoshino, Naoyuki, Umid Abidhadjaev and Makaki Nakahigashi (2018), "Closing the Asian Infrastructure Gap", HORIZONZ, Journal of International Relations and Sustainable Development, Issue No.10, Winter 2018.

Yoshino, Naoyuki, Matthias Helble and Umid Abidhadjaev (2018), Financing Infrastructure in Asia and the Pacific: Capturing Impacts and New Sources, Asian Development Bank Institute.