The way to induce private financing into Green Investments and Green Bonds

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Outline

1, Green Projects and the way to increase rate of return

2, Community-based Crowd Funding

3, ESG Investment and Optimal Portfolio

4, Green bonds

5, GHG Tax

6, Green Central Bank

7, SMEs' efforts to reduce GHG emission

Green energy projects are categorized into two groups based on scale:

A) large projects: Hydro-power

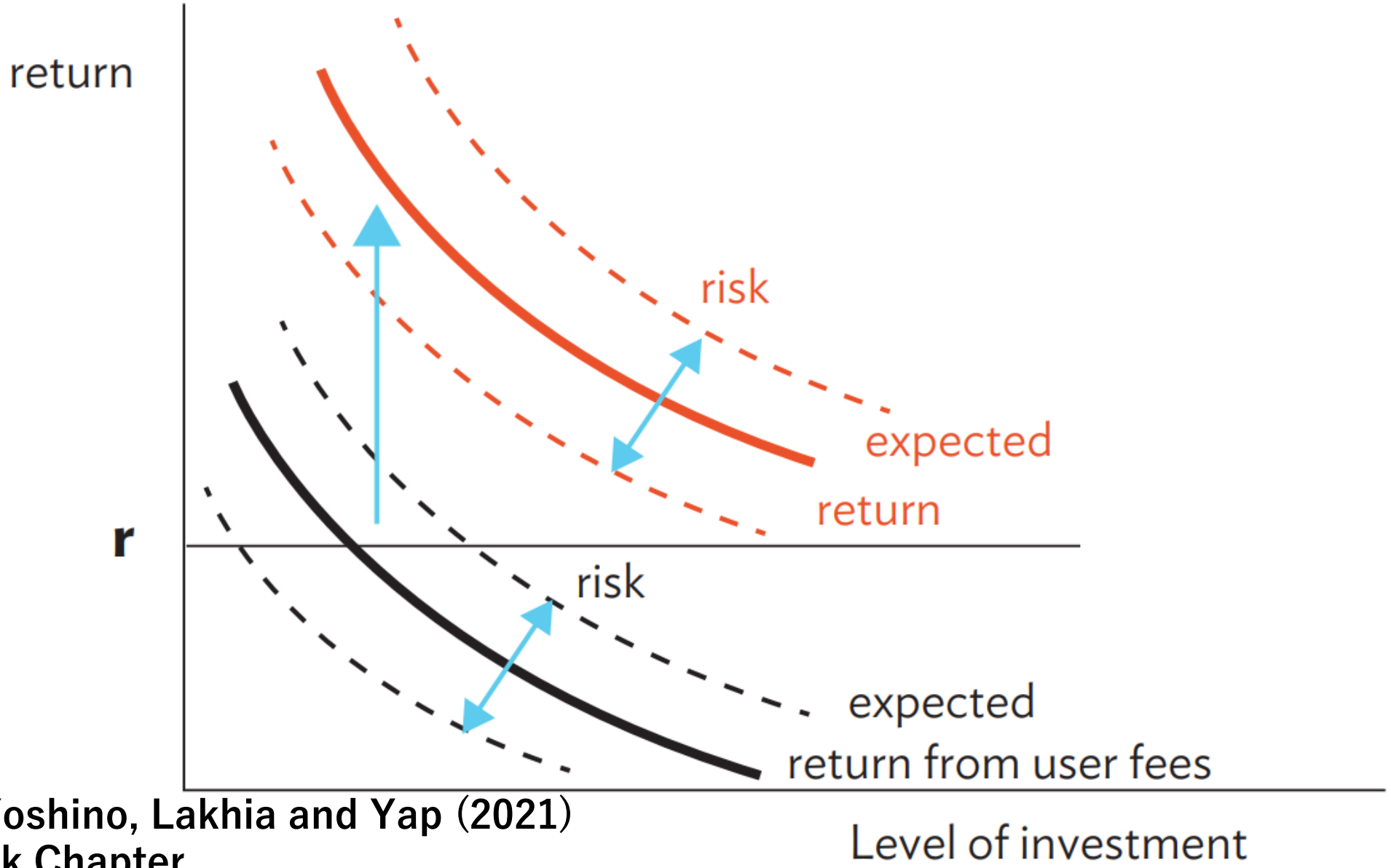
B) Community type green energy projects (Hometown Crowd Funds)

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

Bank loans are not so much suitable for financing energy projects, because these projects span over long time (10-20 years). Maturities of bank deposits are usually short to medium term (1-5 years).

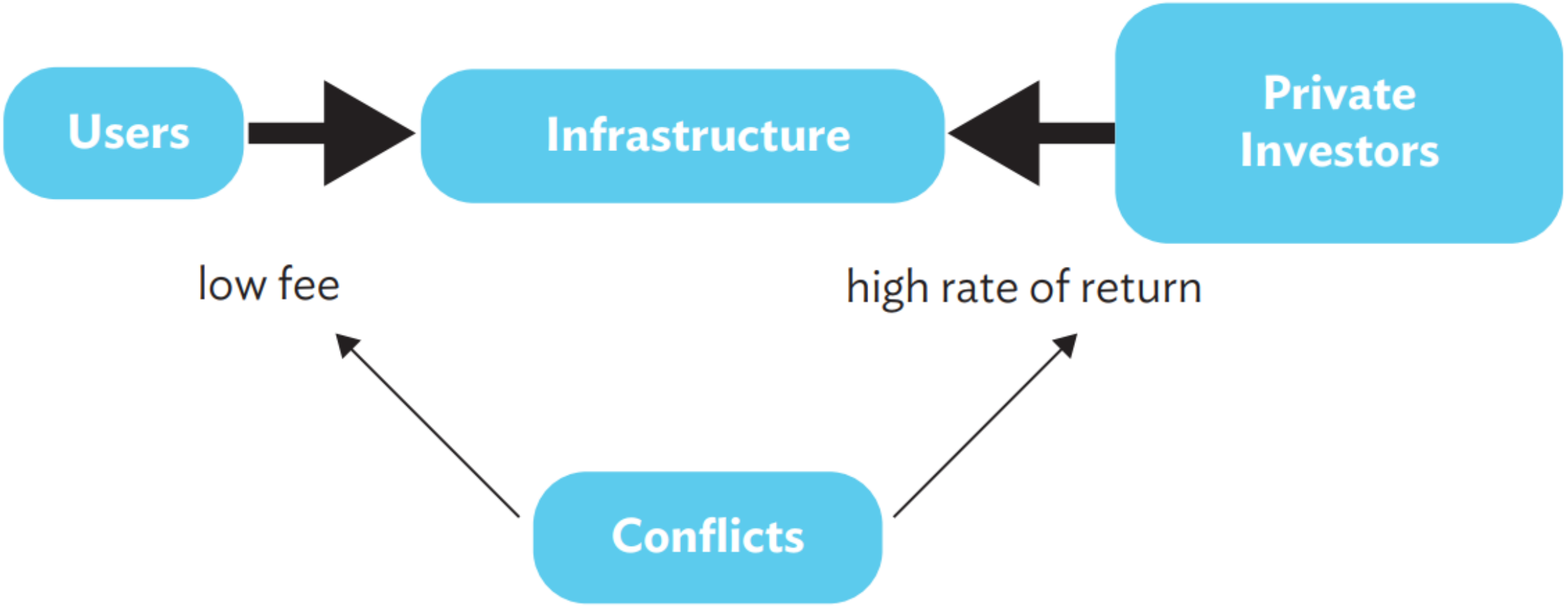
Hydropower plant

Figure 5.2: Expected Rate of Return and Risk Profile of Project Bonds versus Benchmark Yield



Source: Yoshino, Lakhia and Yap (2021)
ADB Book Chapter

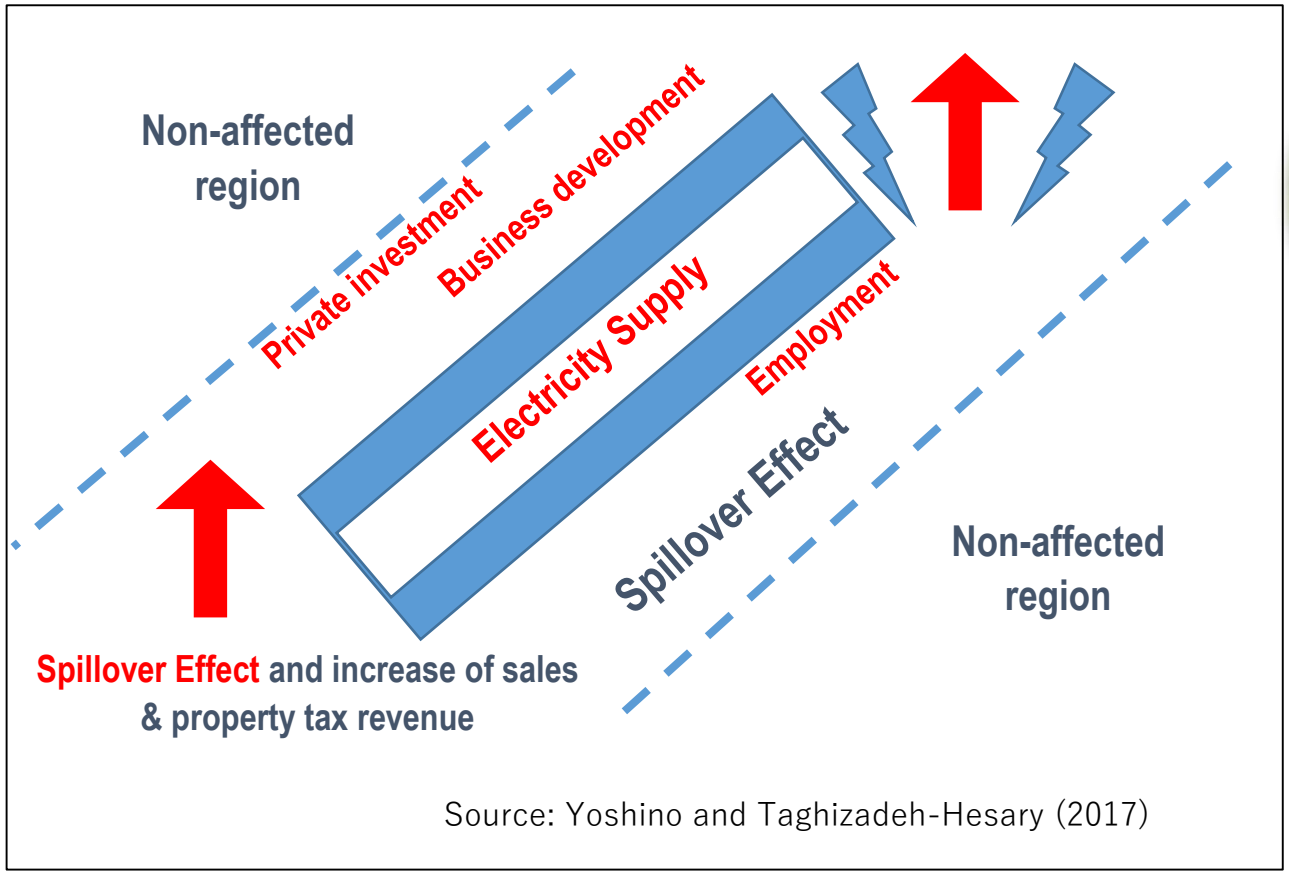
Figure 5.6: Conflict of Interest between Users and Investors



Source: Yoshino, Lakhia and Yap (2021) ADB Book Chapter

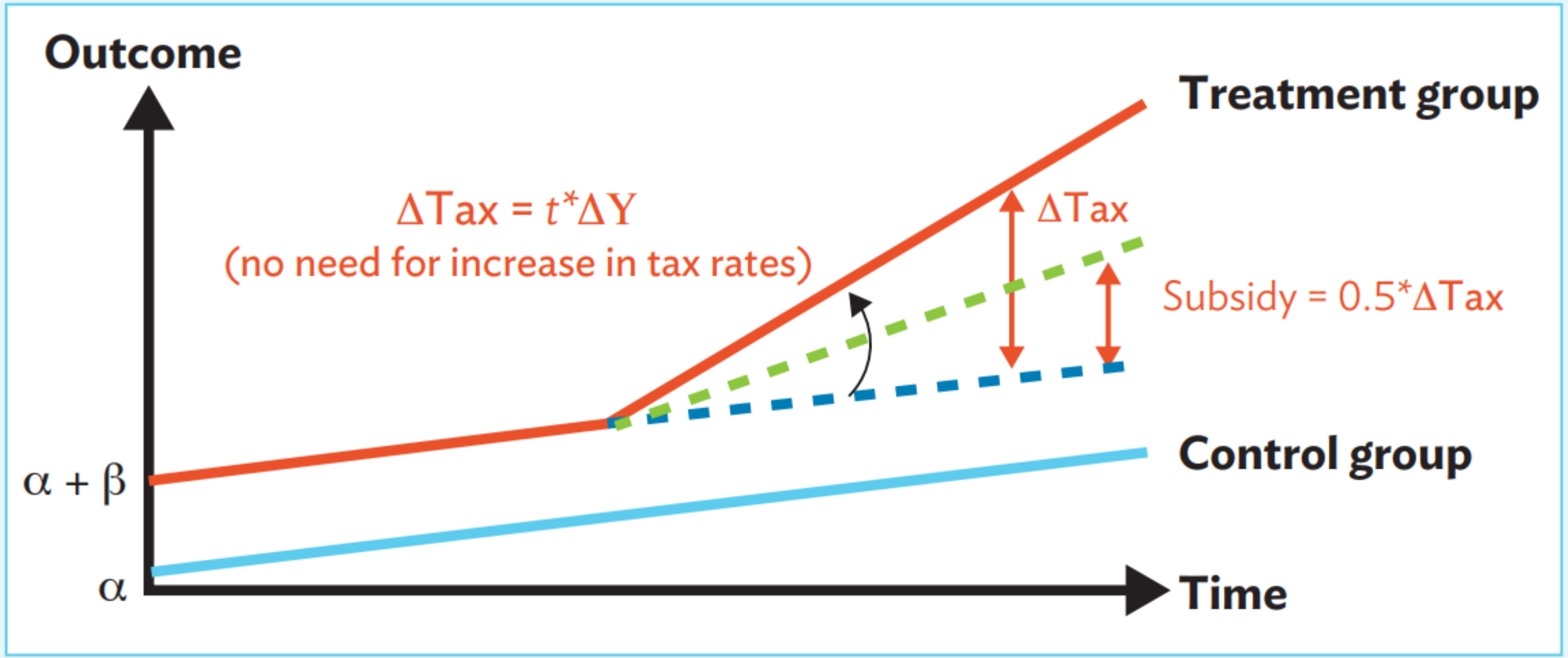
Injection of increased tax revenues—increased owing to the spillover effect from energy projects—in order to increase the rate of return for private investors

Spill over effects of electricity supply



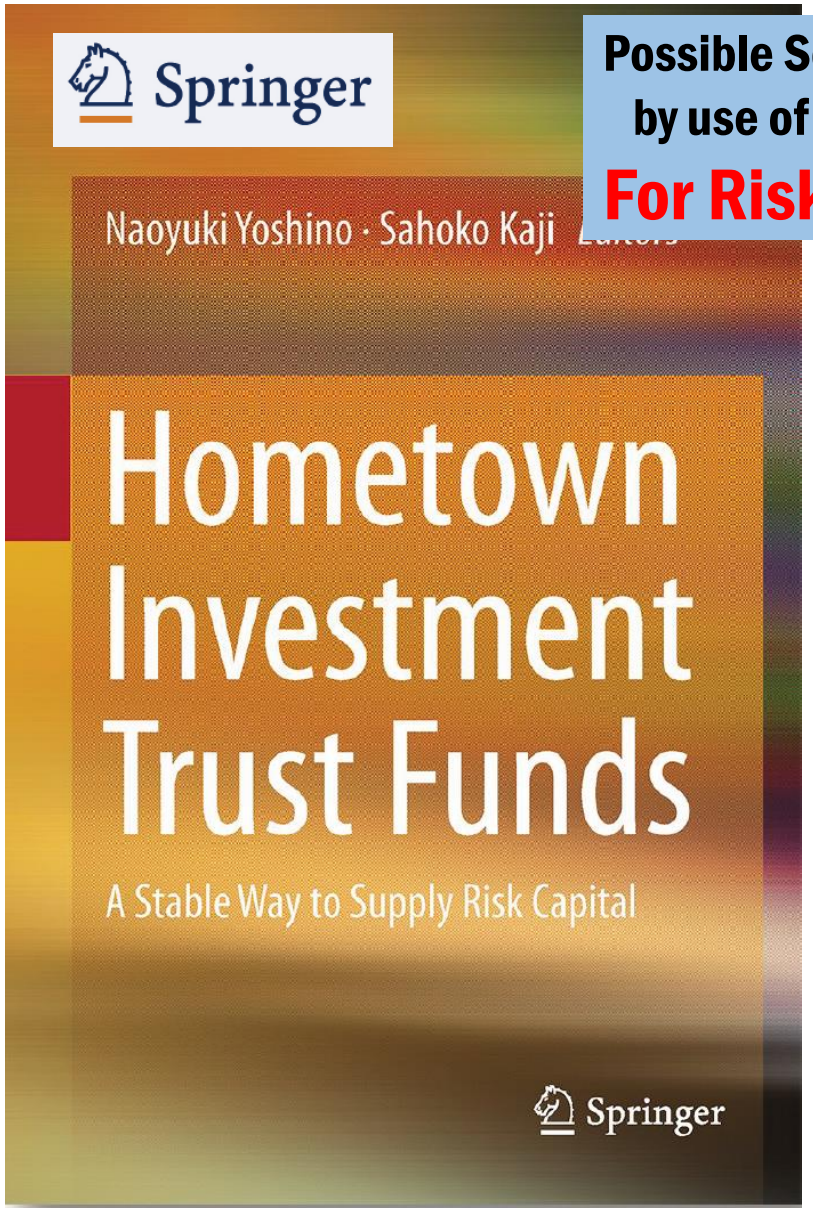
Source: Yoshino and Taghizadeh-Hesary (2017)

Diagram of Spillover Tax Revenues



Source: Yoshino, Abidhadjaev, and Nakahigashi (2019).

Possible Solutions
by use of community funds
For Risky businesses



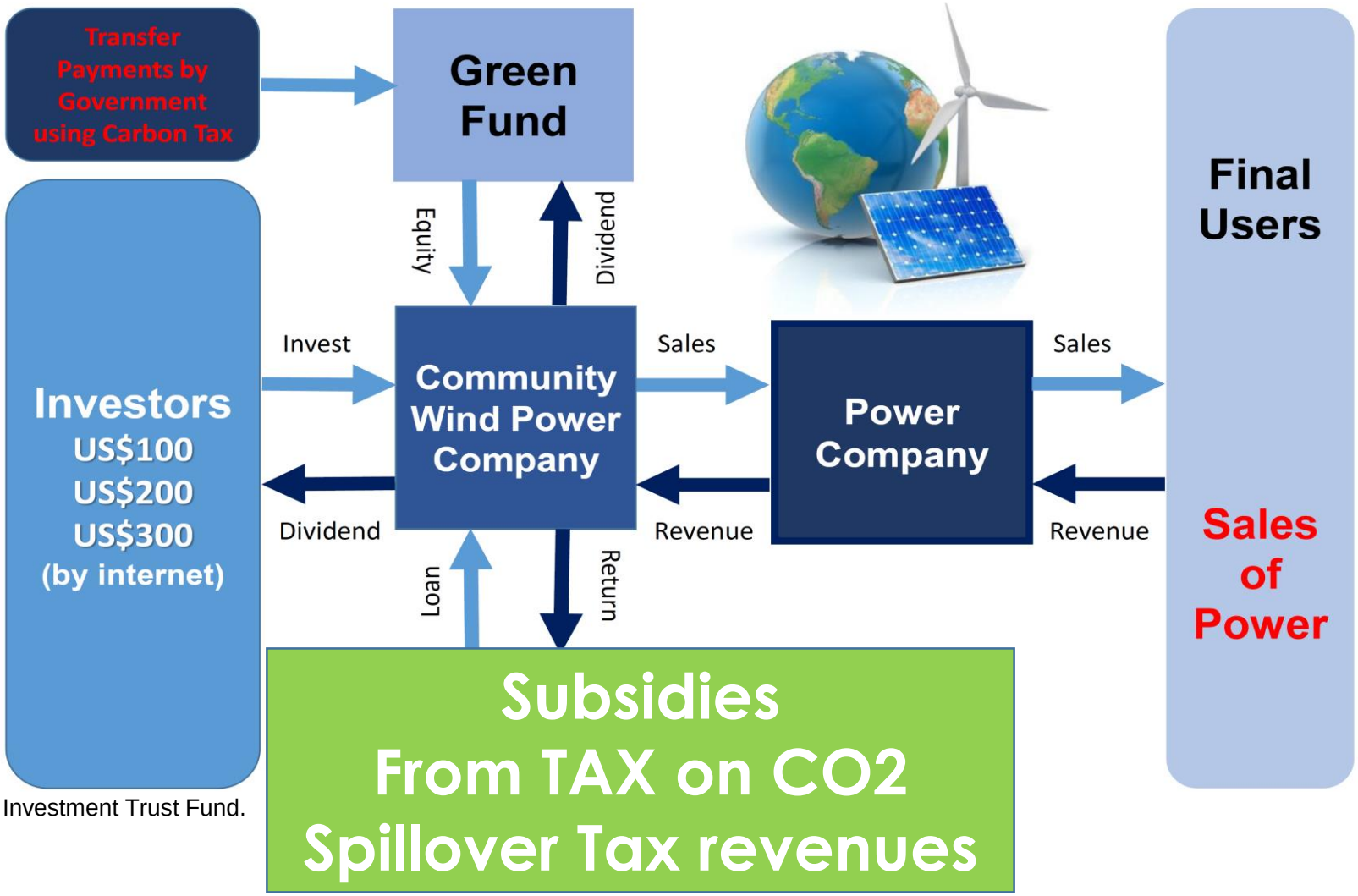
Hometown Investment Trust Funds

A Stable Way to Supply Risk Capital
Yoshino, Naoyuki; Kaji Sahoko (Eds.), 2013,

ADBI Working Paper Series

Naoyuki Yoshino and
Farhad Taghizadeh-Hesary

Financing Scheme for Renewable Energy Projects Using HITs and Carbon Tax



HIT = Hometown Investment Trust Fund.
Source: Authors.

Source: Yoshino, Taghizadeh-Hesary, and Nakahigashi (2019). “Modelling the social funding and spill-over tax for addressing the green energy financing gap”

Current ESG investment: distort asset allocation

1, Traditional asset allocation :

two parameter approach

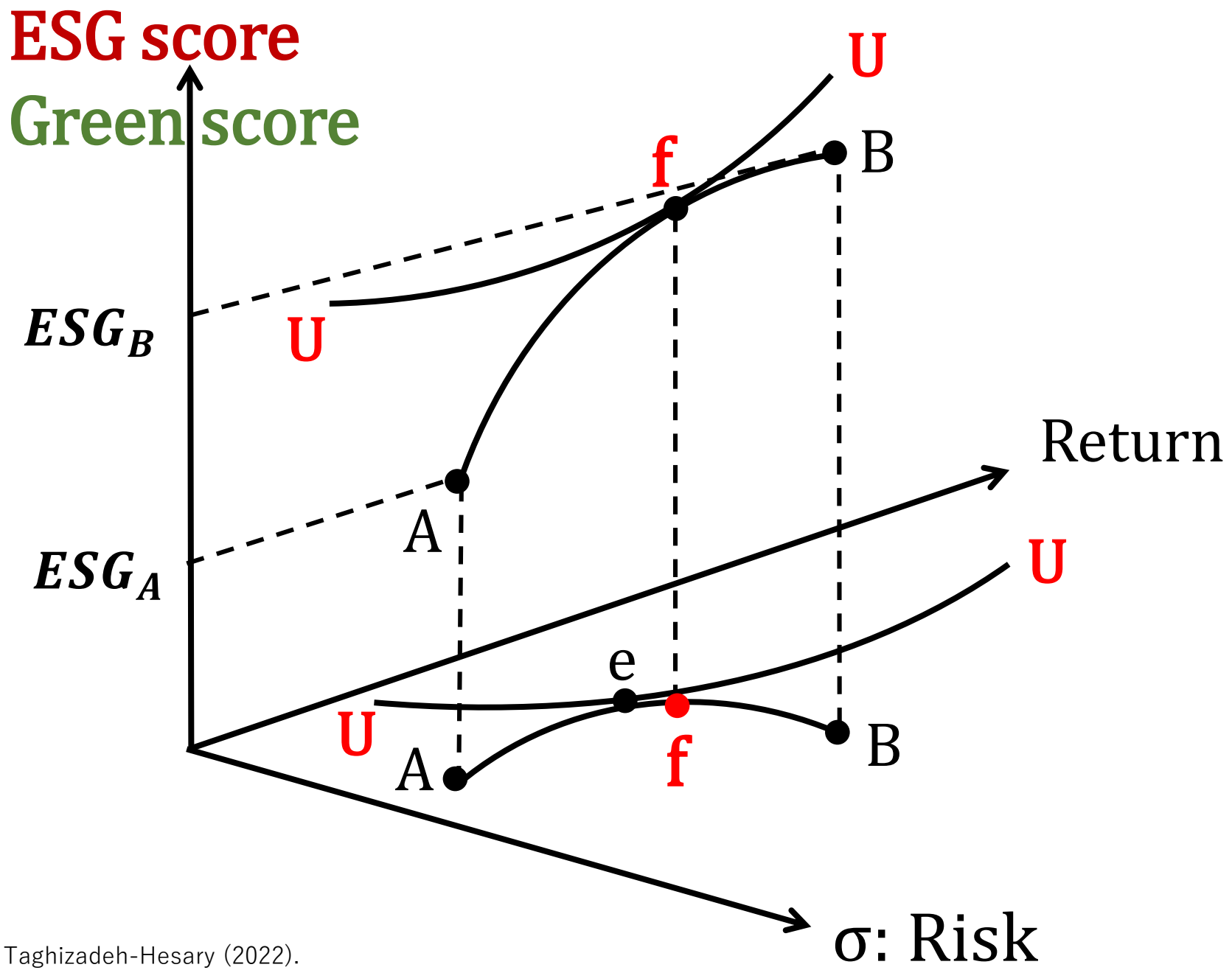
(i) Rate of return (R), (ii) Risks (σ^2)

2, ESG component is added for the asset allocation

(iii) ESG 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



Source: Yoshino, Yuyama, and Taghizadeh-Hesary (2022).
“Carbon tax and ESG investment/Green investment in the Covid-19 pandemic” (in Japanese)

Table 1: ESG scores and evaluation methodologies provided by the major ESG rating agencies

ESG Scores	Overview of Rating Methodology
Bloomberg ESG Disclosure Scores	Evaluating by degree of ESG disclosure
FTSE Russell's ESG Ratings	Evaluating by ESG risks based on disclosure and commitment to policy development and improvement
ISS Quality Score	Evaluating governance (board composition, shareholder and takeover defenses, compensation and remuneration, and audit and risk monitoring)
MSCI ESG Ratings	Evaluating by 37 key ESG issues
RobecoSAM Corporate Sustainability Assessment	Evaluating by economy, environment and society. Governance is included in the economy.
Sustainalytics' ESG Risk Ratings	Evaluating by ESG measures, disclosures, and the level of the problem
Thomson Reuters ESG Scores	Evaluating by 10 categories (environment (resource use, emissions, and innovation), society (employees, human rights, local communities, and product responsibility), and governance (management, shareholders, and CSR strategy).

Source: Bloomberg, ESG rating organization websites, and Yuyama *et al.* (2020).

The evaluation methodologies and criteria for ESG scores vary from one evaluating organization to another. For example, (1) some agencies use their own criteria to evaluate a company's ESG efforts, (2) some agencies assign a score based on the degree of disclosure, (3) some agencies use a score based on whether or not the company has an ESG policy, (4) some agencies use a score based on actual ESG activities such as carbon dioxide reduction by judging from performance, and so on (Table 1). It also raises issues whether ESG scores actually reflect ESG activities and outcomes by companies (Chatterji et al. 2009, Drempetic et al. 2019).

Table 3: Empirical Application of the theory

ESG Score	No Rating	RobecoSAM	Sustainalytics	Bloomberg
ESG score of company A	-	8.6	9.6	2.9
ESG score of company B	-	1.8	1.3	3.9
Value of α	0.57	0.71	0.74	0.54

(Source) Based on each company's 2019 actual stock returns, standard deviation, covariance, and ESG score.

Author's calculations based on equation (12) from Bloomberg data

- The allocation of assets between A and B changes which ESG rating agencies' ESG score is used for the portfolio allocation.
- The higher ESG score value is the higher α, and thus the higher the investment allocation. For example, since Sustainalytics is the highest ESG score for Company A, investors following this rating will have the highest allocation to Company A.
- On the other hand, the Bloomberg score is lower for Company A than for Company B, resulting in a smaller investment allocation.
- If we do not take into account the ESG score, the investment allocation to Company A is 0.57

Optimal portfolio allocation can be achieved by taxing waste products

1, By taxing wastes such as CO2, NOX, plastics etc. by the identical international tax rate, investors only need to look at “after tax rate of return” and “risks” as they have conventionally done.

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

$$\tilde{R}_t^A = R_t - T_A \quad (16)$$

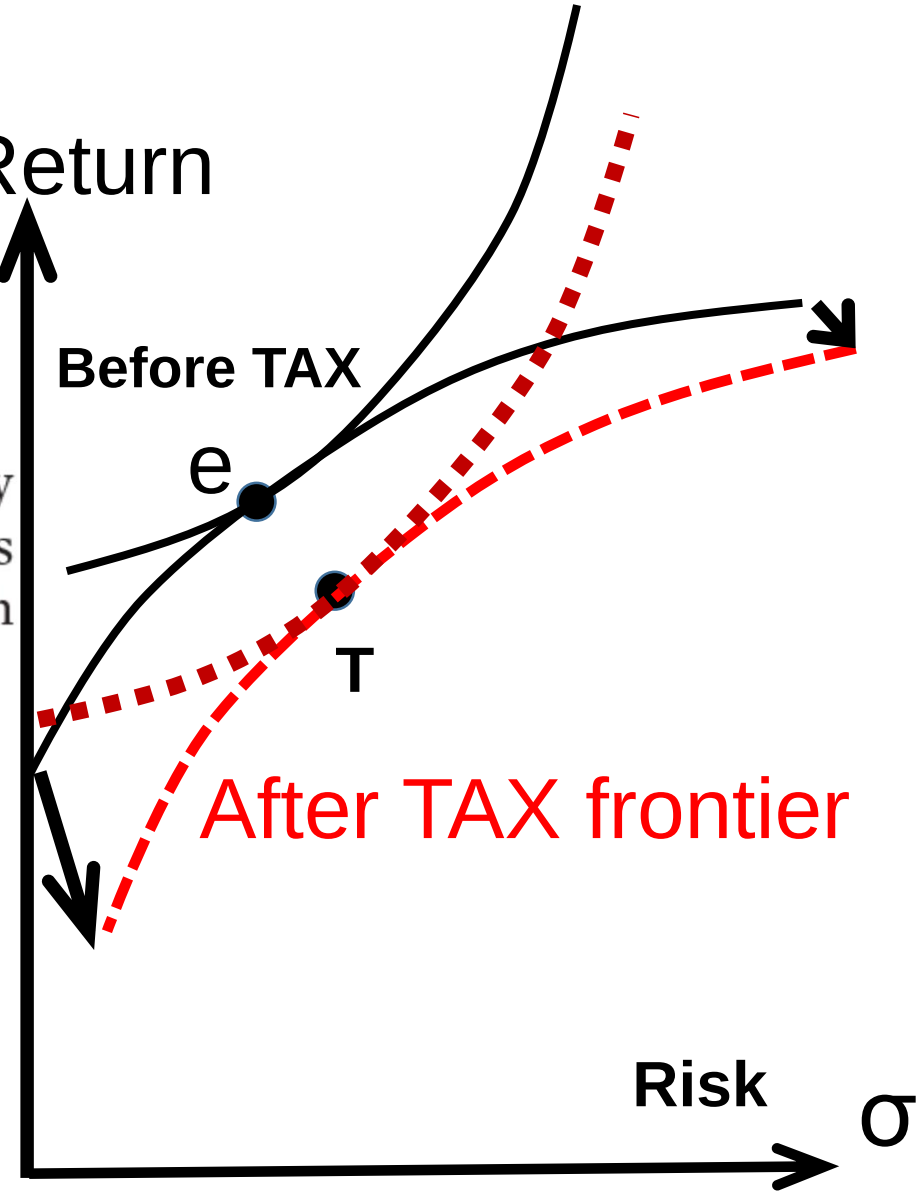
$$\tilde{R}_t^B = R_t - T_B \quad (17)$$

Equations (16) and (17) show the after-tax rate of return of company A and company B. We can compute the optimal allocation of assets between company A and company B as in equations (18) and (19), which show the optimal rate of return and risks, respectively:

$$\tilde{R}_t = \tilde{\alpha}_t \tilde{R}_t^A + (1 - \tilde{\alpha}_t)\tilde{R}_t^B \quad (18)$$

$$\tilde{\sigma}_t^2 = \tilde{\alpha}_t^2(\tilde{\sigma}_t^A)^2 + (1 - \tilde{\alpha}_t)^2(\tilde{\sigma}_t^B)^2 + 2\tilde{\alpha}_t(1 - \tilde{\alpha}_t)\tilde{\sigma}_t^{AB} \quad (19)$$

$$\tilde{\alpha}_t = \frac{\frac{1}{2\beta}\left(\tilde{R}_t^A - \tilde{R}_t^B\right) - (\tilde{\sigma}_t^B)^2 - \tilde{\sigma}_t^{AB}}{(\tilde{\sigma}_t^A)^2 - (\tilde{\sigma}_t^B)^2 - 2\tilde{\sigma}_t^{AB}}$$

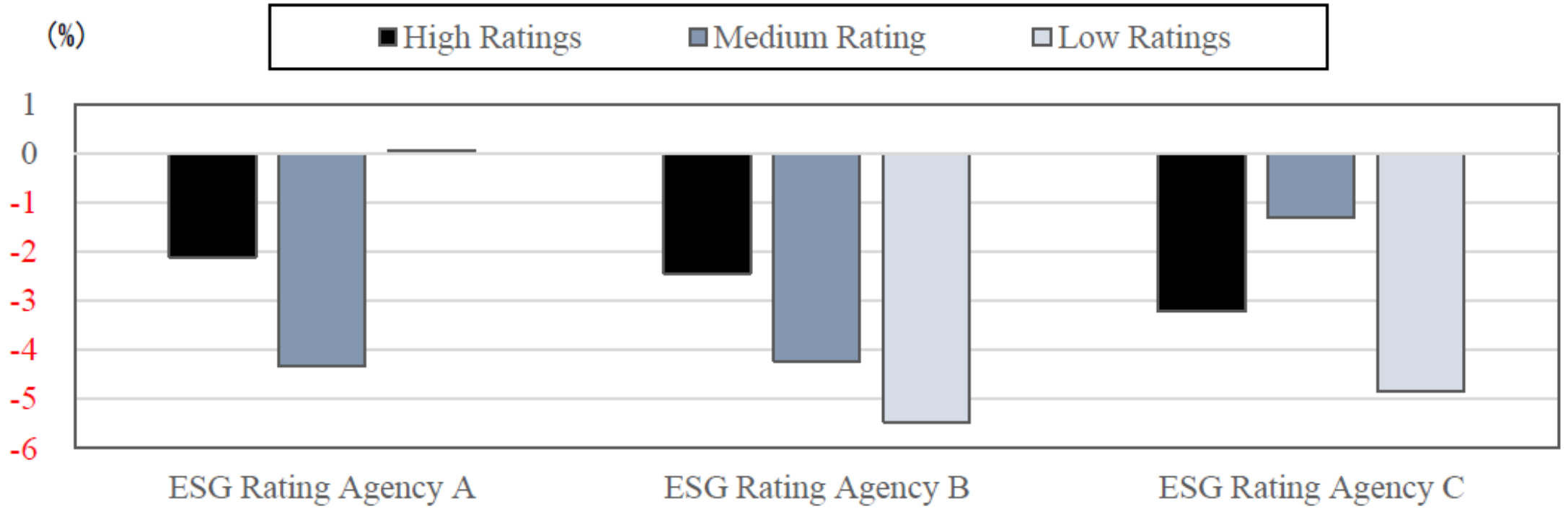


Satellite photos can measure the amount of CO2 exposure

Shinagawa Bay, Tokyo

Source: Earth Science and Remote Sensing Unit, NASA Johnson Space Center.
https://eol.jsc.nasa.gov/SearchPhotos/ (Astronaut Photo ISS064-E-20814 JAPAN)

ESG Investment and Stock Prices



Note: Only stocks covered by each ESG rating agency are aggregated. The estimation period is the first quarter of 2020 (December 30, 2019 to March 31, 2020).

Source: Authors' calculations from Bloomberg data.

Figure 8: ESG score (high-medium-low quintile) and stock returns (first quarter of 2020)

Greenness, mood, and portfolio allocation: A cross-country analysis YOSHINO and Mumtaz (2021)

Table 1
Returns, risk, greenness, mood, and portfolio allocation .

	Developed countries		Developing countries		
	Japan	South Korea	Malaysia	Indonesia	Philippines
R_A	3.38%	5.46%	7.61%	6.35%	8.44%
R_B	7.93%	8.03%	13.03%	3.94%	12.84%
σ_A^2	2.44%	6.52%	10.38%	8.34%	11.45%
σ_B^2	13.87%	13.09%	15.83%	4.03%	14.48%
$Greenness_A$	−0.0156	−0.0361	−0.2012	−0.4334	−0.2102
$Greenness_B$	−0.0146	−0.0351	−0.1977	−0.3103	−0.2512
$Mood$	120	104	57	44	39
α	0.64	0.62	0.52	0.56	0.55
$\hat{\alpha}$	0.83	0.75	0.67	0.68	0.69
$\hat{\alpha}-\alpha$	0.19	0.13	0.15	0.12	0.14

June 2018
Green Bond Principles
Voluntary Process Guidelines for Issuing Green Bonds

International Capital Market Association

ICMA Paris Representative Office

62 rue la Boétie

75008 Paris

France

Tel: +33 1 70 17 64 70

greenbonds@icmagroup.org

- **renewable energy** (including production, transmission, appliances and products);
- **energy efficiency** (such as in new and refurbished buildings, energy storage, district heating, smart grids, appliances and products);
- **pollution prevention and control** (including reduction of air emissions, greenhouse gas control, soil remediation, waste prevention, waste reduction, waste recycling and energy/emission-efficient waste to energy);
- **environmentally sustainable management of living natural resources and land use**

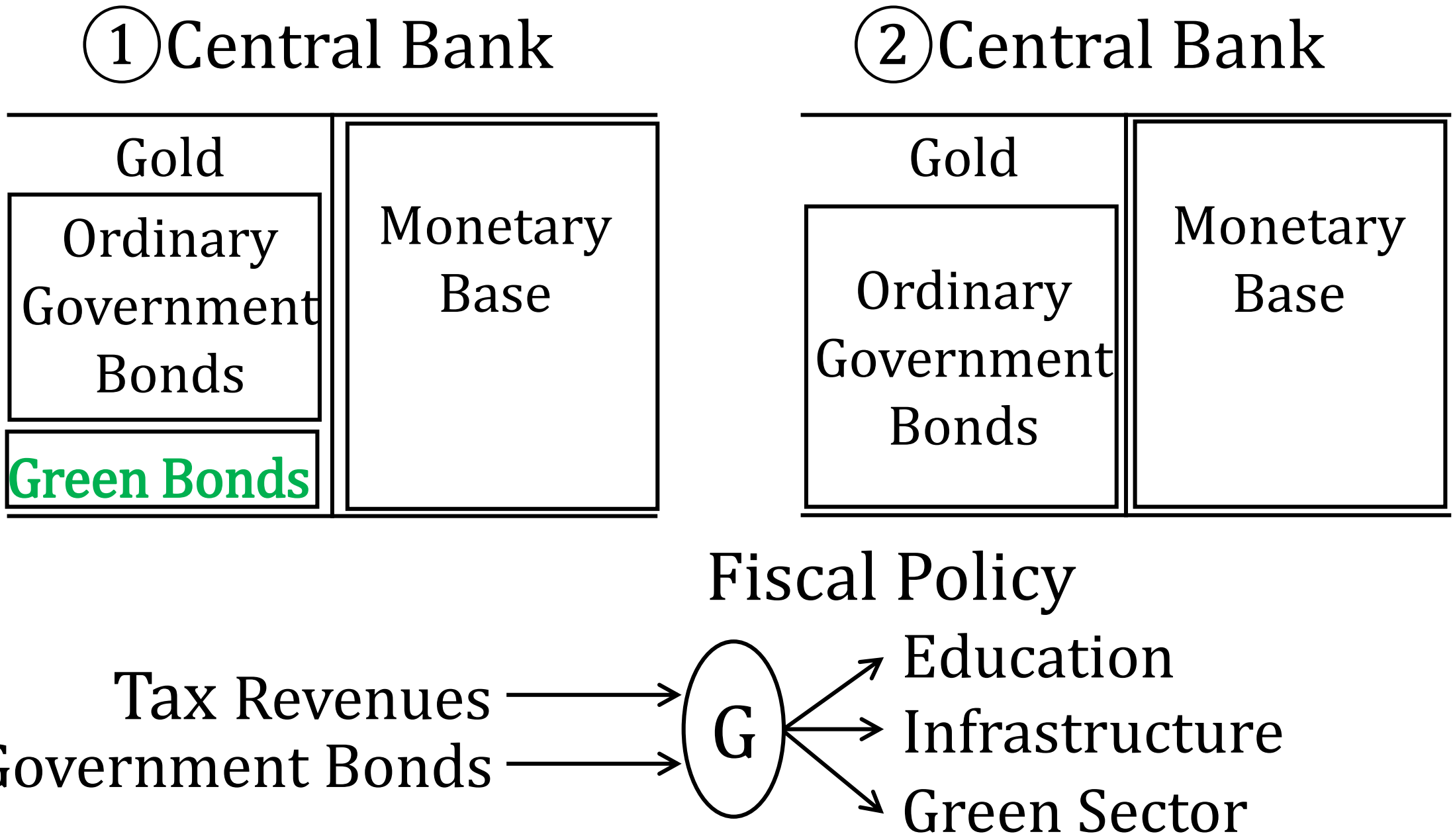
Green Bond Principles (GBP) 2018

(i) renewable energy
(ii) energy efficiency
(iii) pollution prevention and control
(iv) environmentally sustainable management of living natural resources and land use
(v) terrestrial and aquatic biodiversity conservation
(vi) clean transportation
(vii) sustainable water and wastewater management
(viii) climate change adaptation
(iX) eco-efficient and/or circular economy adapted products, production technologies and processes
(X) green buildings which meet regional, national or internationally recognized standards or certifications.

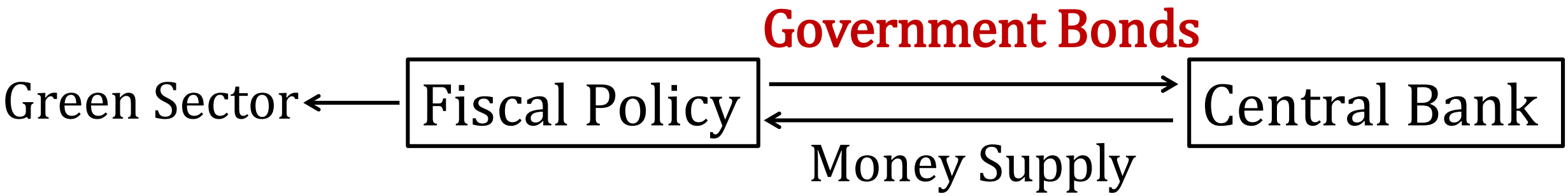
Source: The Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds, ICMA, June 2018

Green Central Bank

Green bonds Ordinary Government Bonds	**Money Supply**


①Central Bank
Gold
Ordinary Government Bonds
Green Bonds
Monetary Base
②Central Bank
Gold
Ordinary Government Bonds
Monetary Base
Fiscal Policy
Tax Revenues
Government Bonds
G
Education
Infrastructure
Green Sector

<Green Bond purchaser by the Central Bank>



Joint Production Function

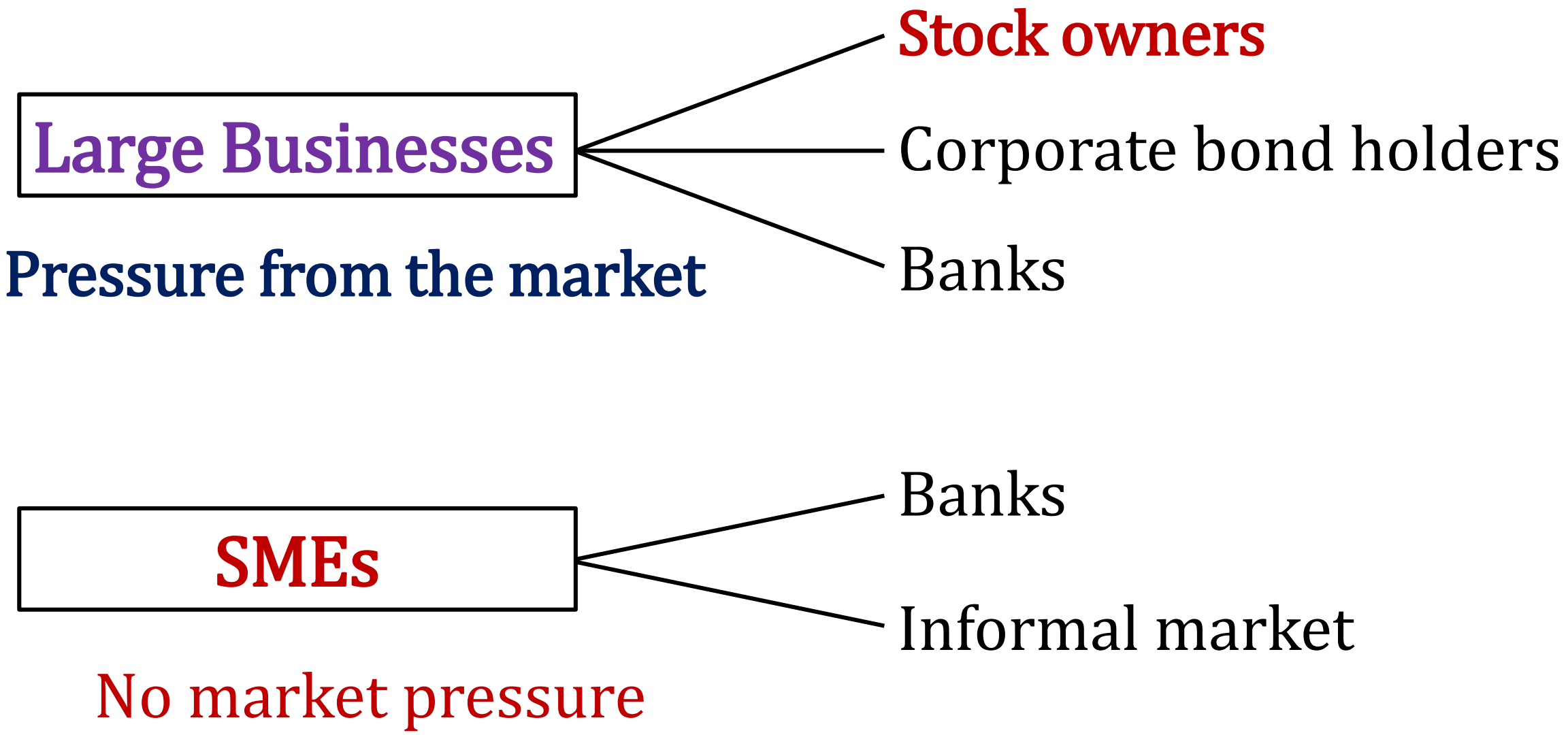
$$g(\boldsymbol{Y}, \boldsymbol{CO2}) = F(\boldsymbol{K}, \boldsymbol{L})$$

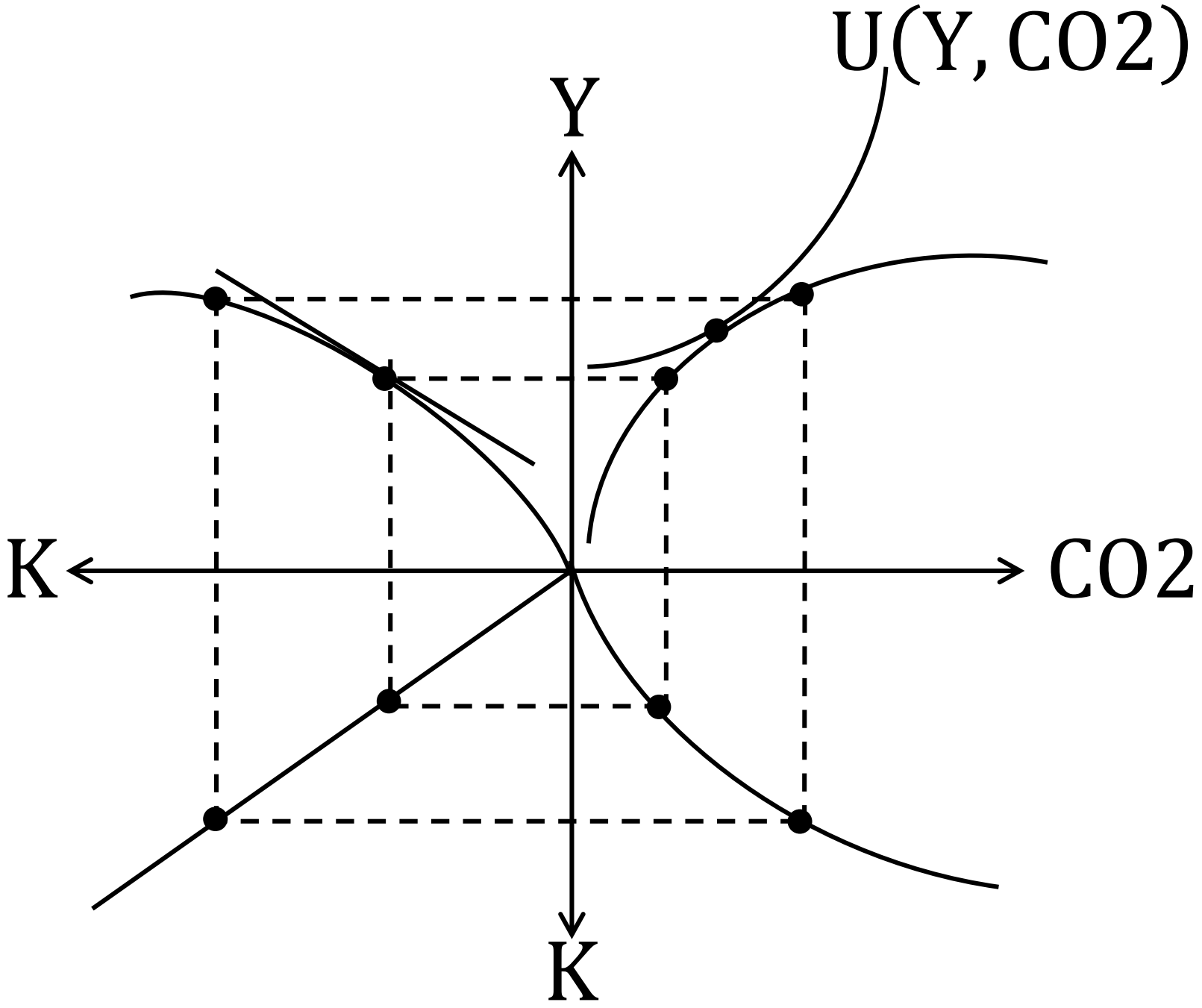
Output — Capital, Labor

$$\text{Profits} = P \times Y$$

$$\text{Costs} = r \times K + w \times L$$

No explicit costs for CO2.


Large Businesses
Stock owners
Corporate bond holders
Banks
Pressure from the market
SMEs
Banks
Informal market
No market pressure


U(Y, CO2)
Y
K
CO2
K

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

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ESG/Green Investment and Allocation of Portfolio Assets[1]

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The way to induce private participation in green finance and investment

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energies

Article

Sustainable Solutions for Green Financing and Investment in Renewable Energy Projects

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