東京財団政策研究所
THE TOKYO FOUNDATION FOR POLICY RESEARCH

第8回 BBLセミナー

内部化により歪みを除き
真に持続可能なSDG投資へ

2019年11月19日（火）12:15～13:30

Green Investment and Optimal Portfolio Allocation

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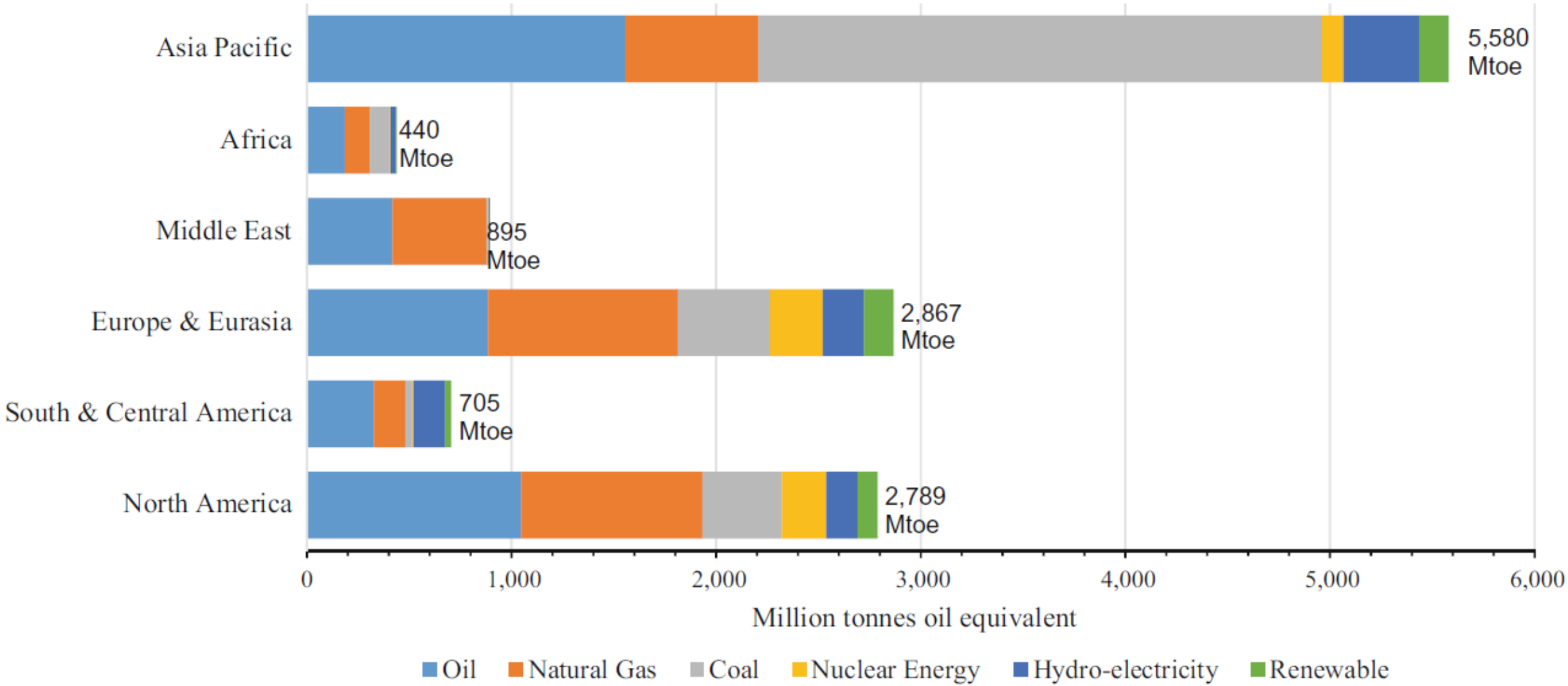
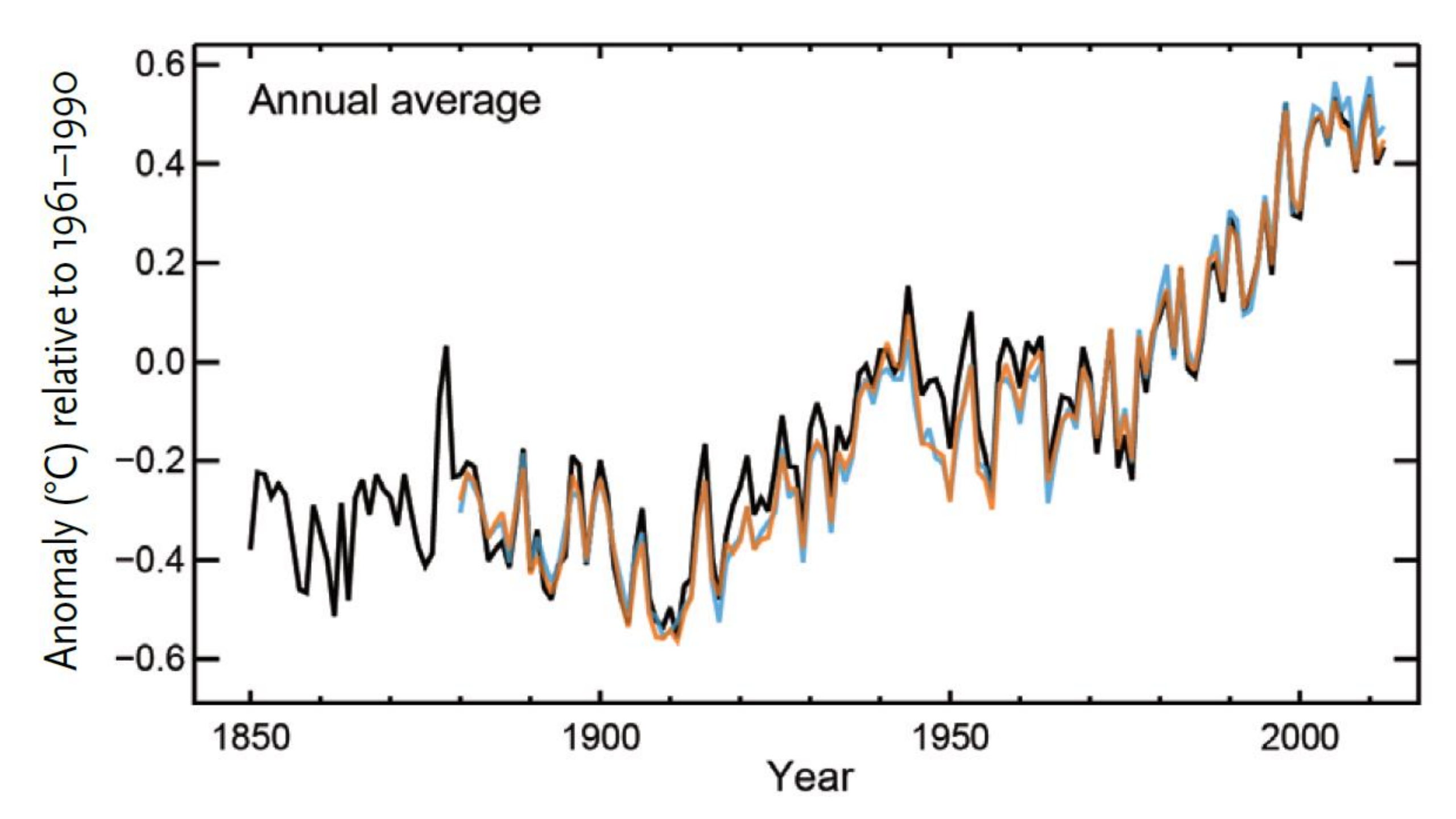
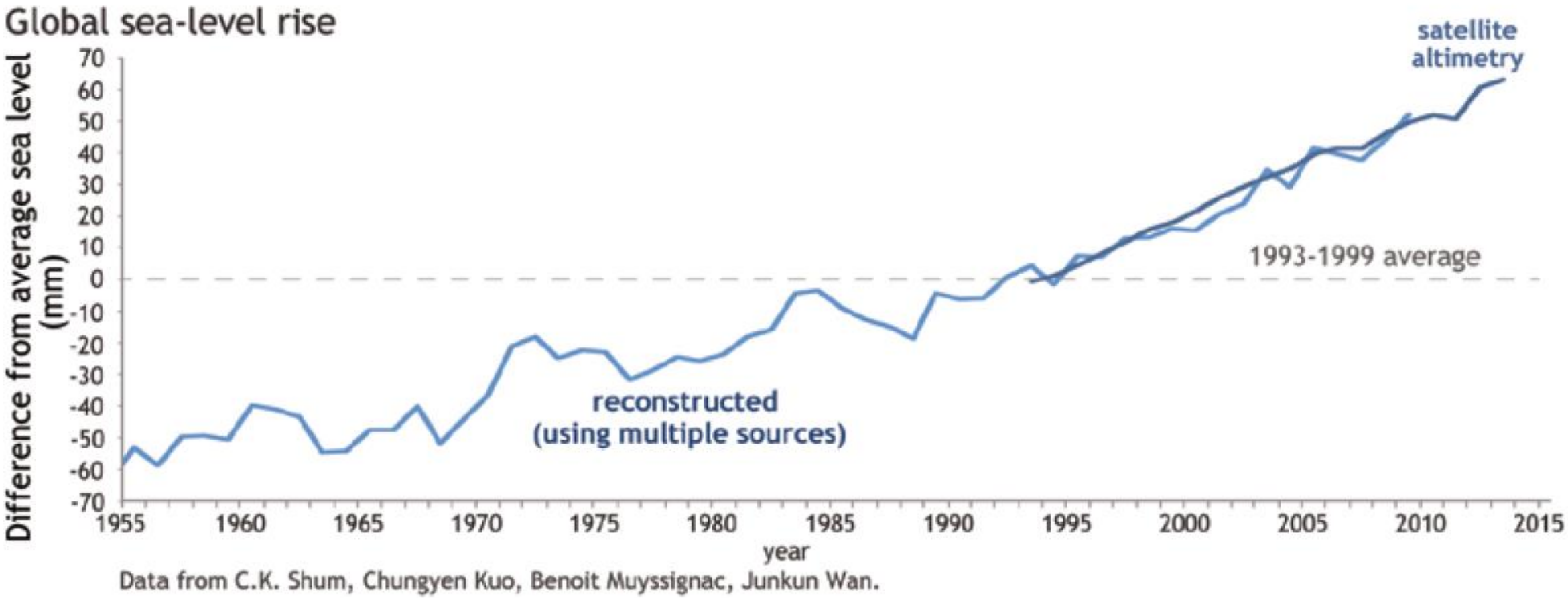
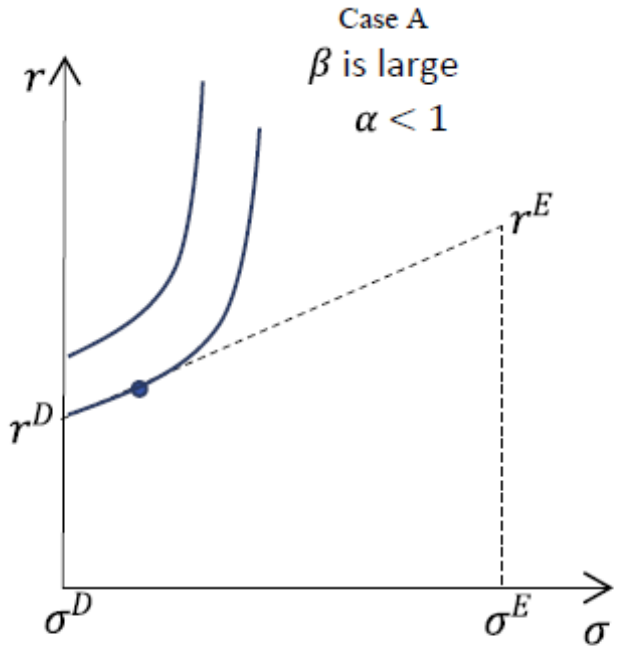
ADBInstitute

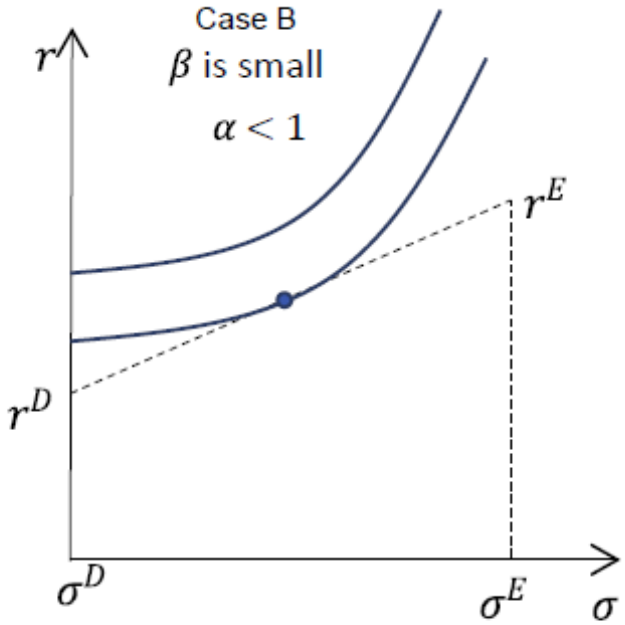

Asia Pacific
5,580 Mtoe
Africa
440 Mtoe
Middle East
895 Mtoe
Europe & Eurasia
2,867 Mtoe
South & Central America
705 Mtoe
North America
2,789 Mtoe
0
1,000
2,000
3,000
4,000
5,000
6,000
Million tonnes oil equivalent
Oil
Natural Gas
Coal
Nuclear Energy
Hydro-electricity
Renewable

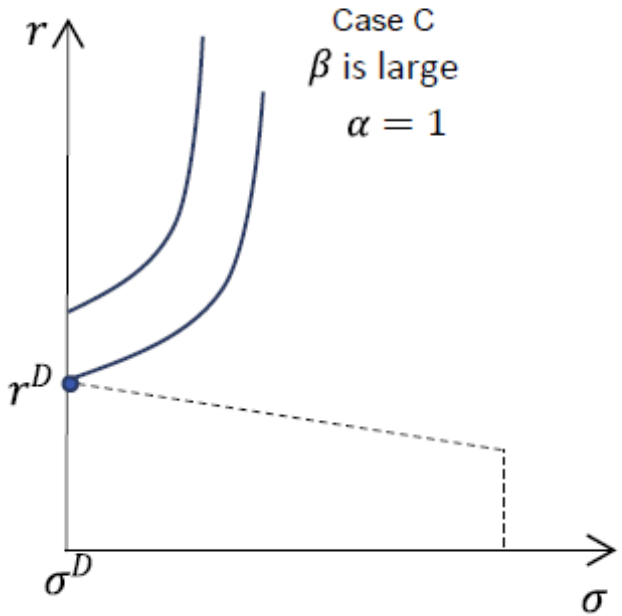

Annual average
Anomaly (°C) relative to 1961–1990
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
1850
1900
1950
2000
Year

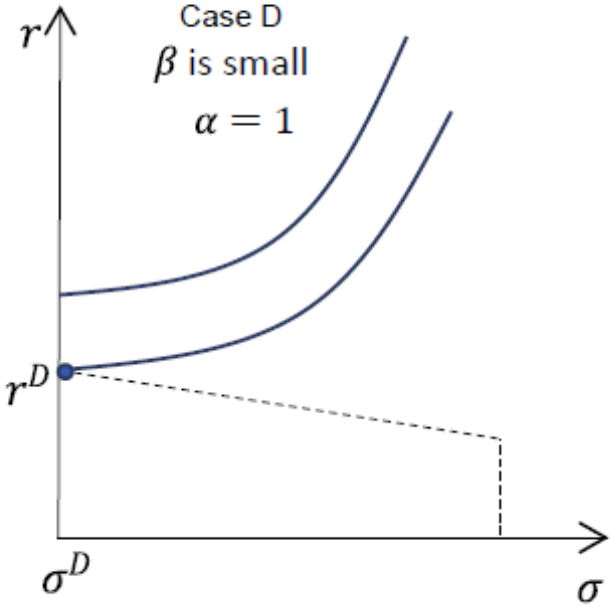
GLOBAL SEA LEVEL




Case A
β is large
$\alpha < 1$
r
r^E
r^D
σ^D
σ^E
σ


Case B
β is small
$\alpha < 1$
r
r^E
r^D
σ^D
σ^E
σ


Case C
β is large
$\alpha = 1$
r
r^D
σ^D
σ


Case D
β is small
$\alpha = 1$
r
r^D
σ^D
σ

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)

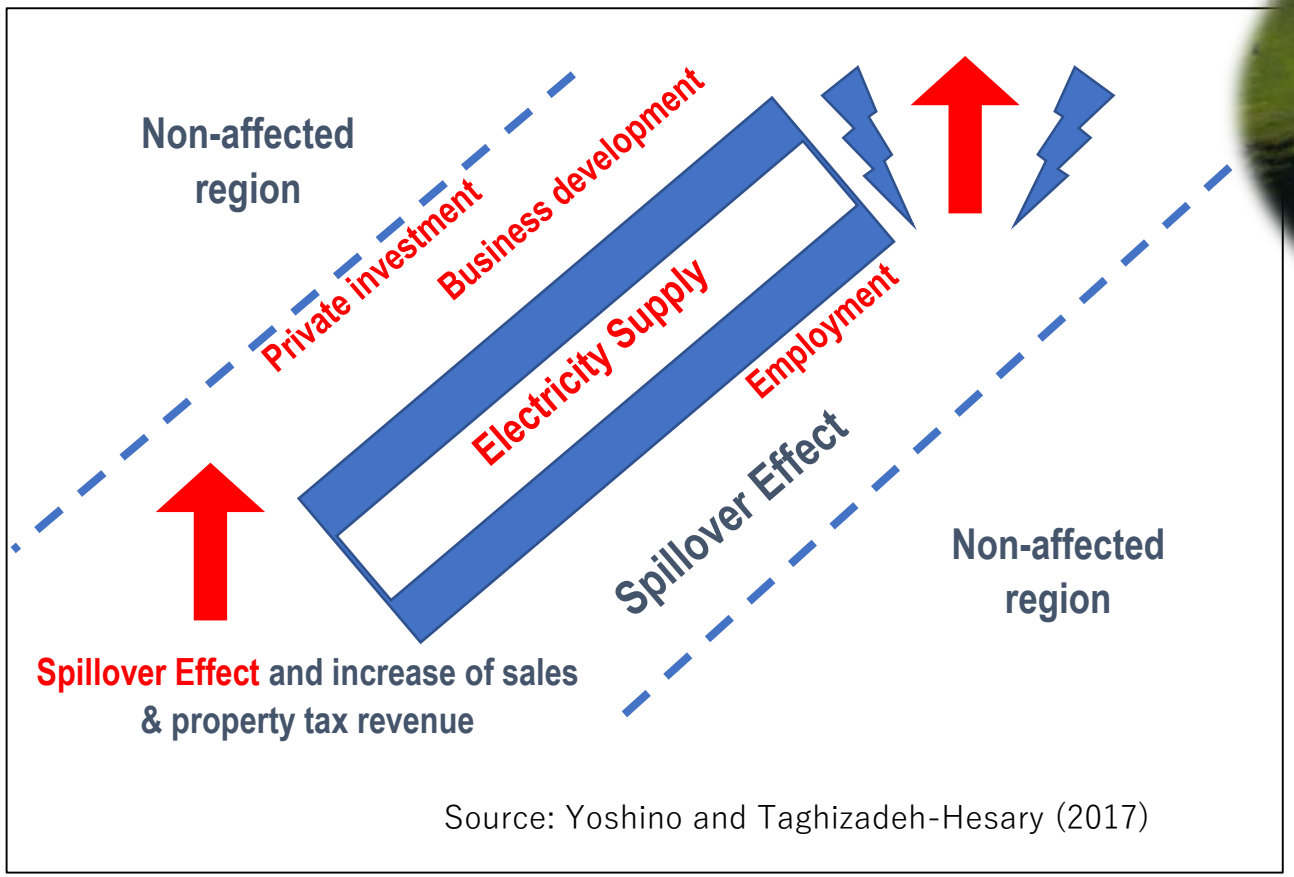
Large projects can be financed by **i) insurance and pension funds,** that have long-term Financing.

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

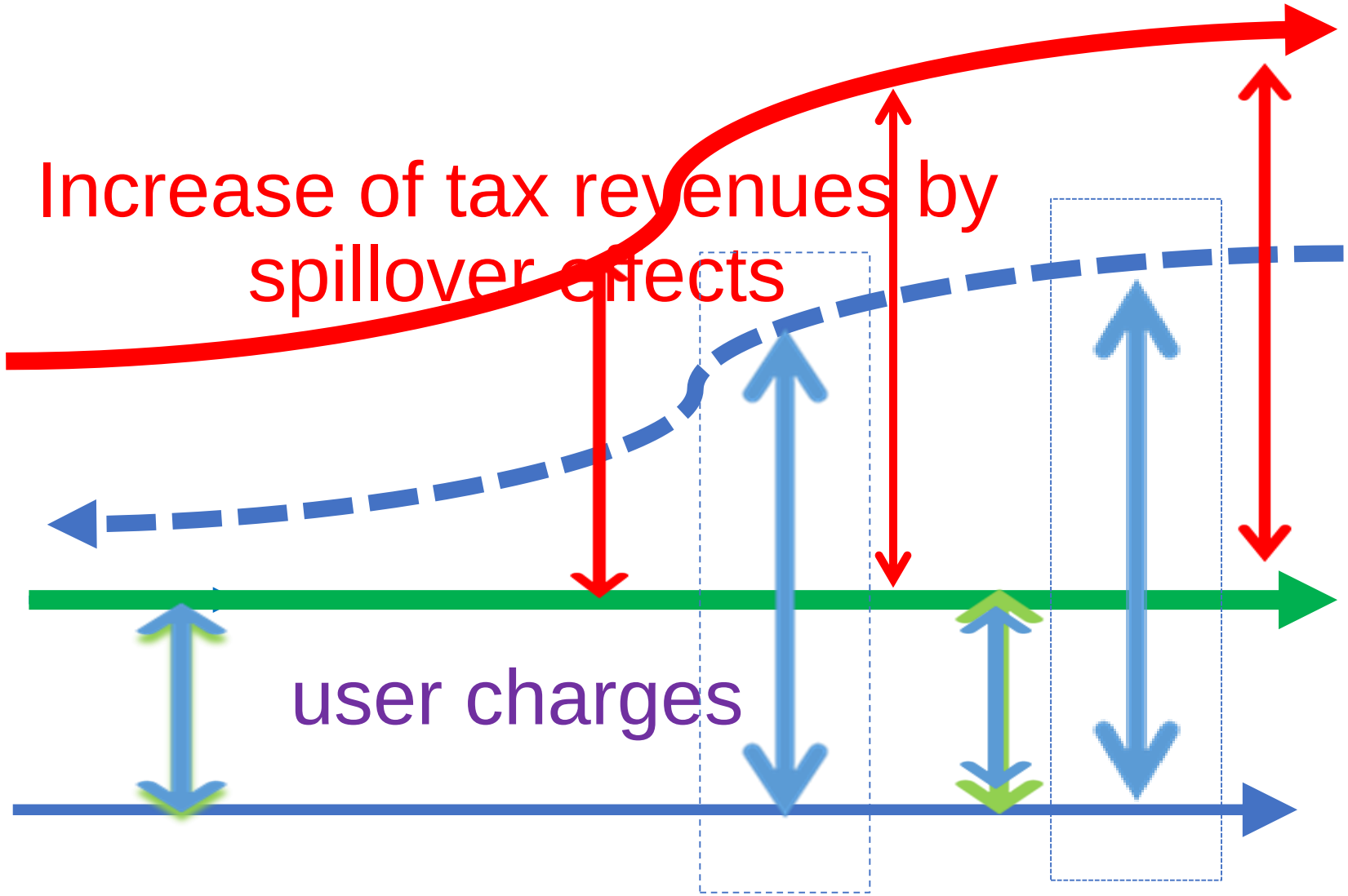
Injection of Increased tax revenues from the spillover effect into energy projects in order to increase the rate of return for private investors

Spill over effects of electricity supply

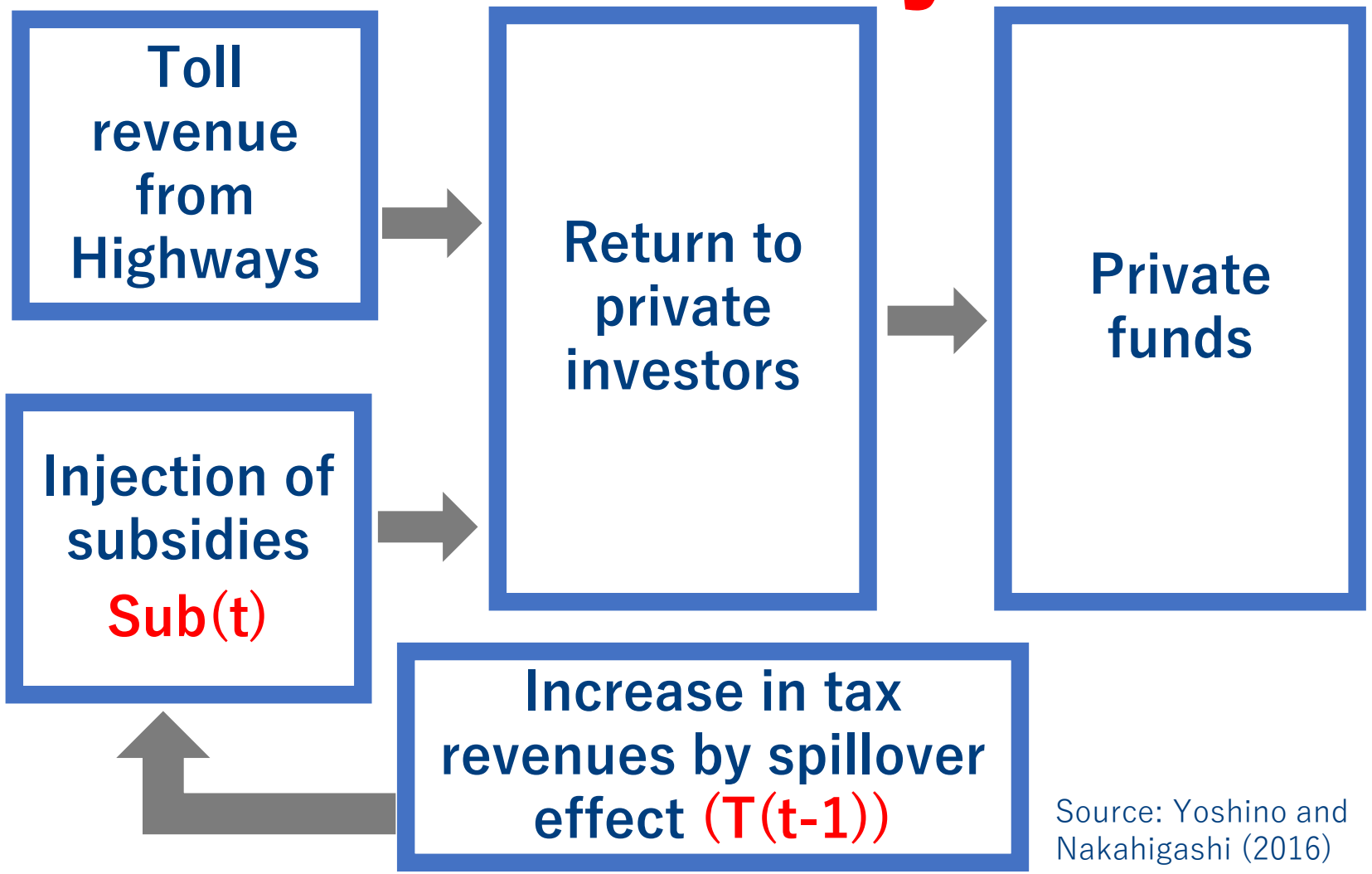


Source: Yoshino and Taghizadeh-Hesary (2017)

Injection of Increased Tax revenues



Injection of fraction of tax revenues as subsidy



Source: Yoshino and Nakahigashi (2016)

Various Private Financial Investors in Asia

1, **Banks - 1-5 years, capital requirements**

Brown field (infrastructure)

Invest into operation period

Securitization after certain period of time

Privatized projects by the government

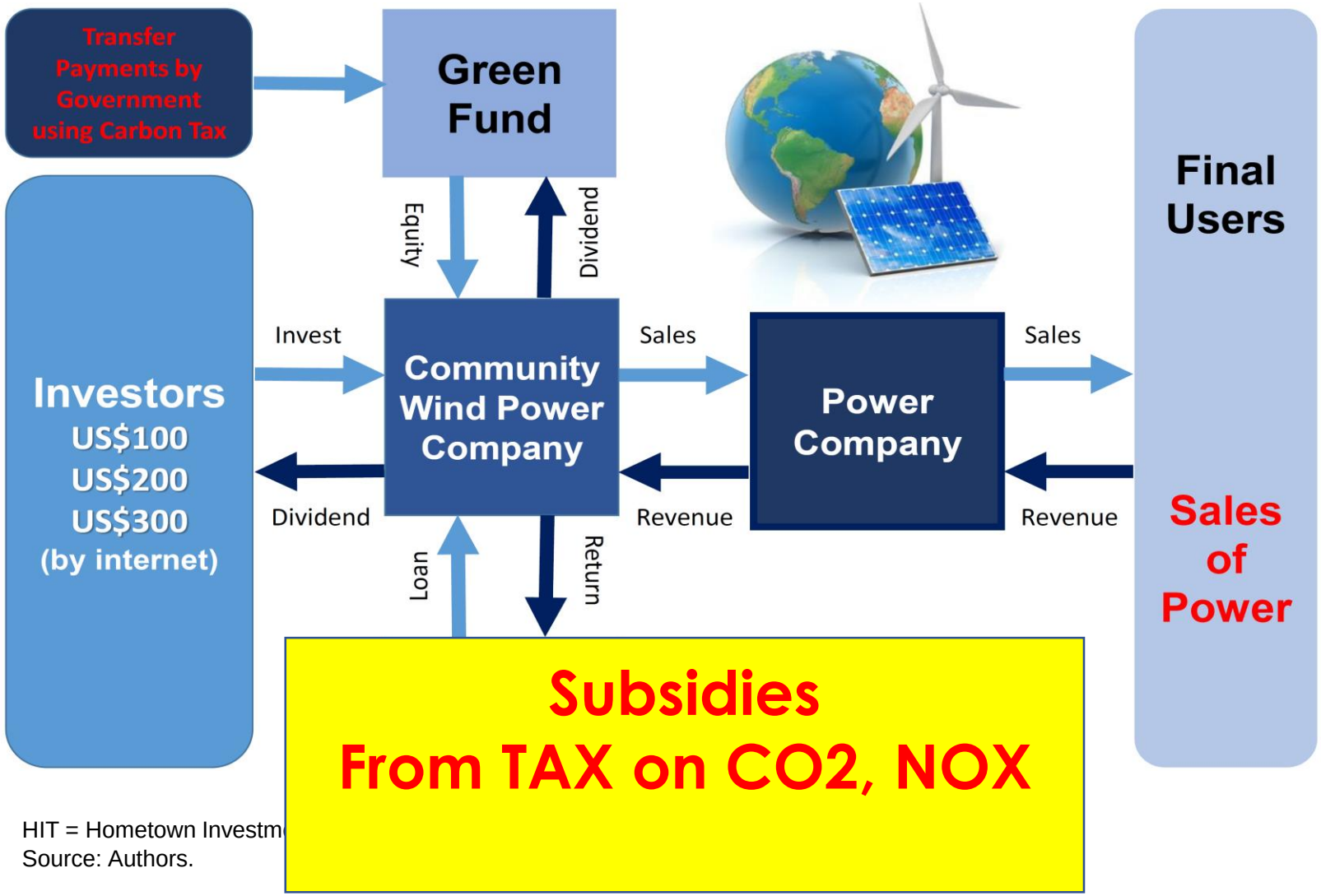
2, **Insurance and Pension funds**

Long term projects (10 years –20- 30 years)

3, **Green Bonds (floating interest rate)**

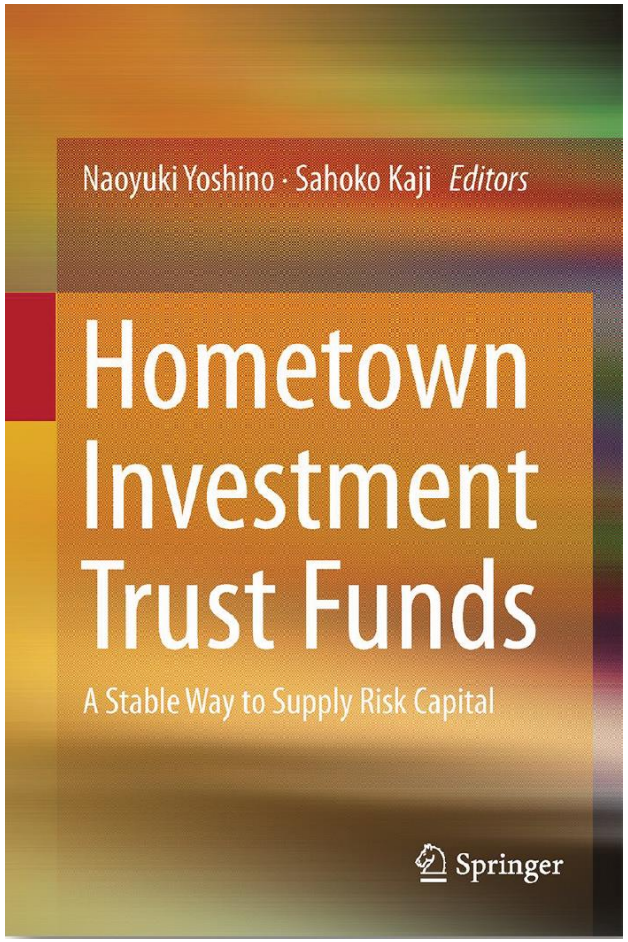
fluctuations of future income streams

Financing Scheme for Renewable Energy Projects Using HITs and Carbon Tax



HIT = Hometown Investm
Source: Authors.

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

Solar Power projects in Japan

SDG Investments: 17 Goals

Main Points

1, Current SDG allocation of asset will distort optimal portfolio allocation which will bring lower economic growth and higher unfriendly environment

2, SDG component is an additional factor which investors have to take into account

3, Different consulting companies provide different criteria for SDG which will make investors in different portfolio allocation

4, Best policy will be taxing wastes such as CO_2, NOx and plastics globally which will make investors focus of return and risks as they are

KPMG's Definition of SDG

In order to measure the consistency to each SDG, four points are mainly taken into consideration; demographics (the population prediction in specific country or region), income growth, technology (renewable energy sources, knowledge sharing cultures, and so on), and collaborations (among governments, companies, international organizations, academia and so on). The higher these four indicators' levels are, the more actively SDGs investment can be held,

NRI (Nomura Research Institute)

According to NRI, the consistency and contribution level to SDGs should be quantitatively defined. NRI sets 4 key performance indicators in investigating the business activities; innovation, business opportunity, impact and cost. Using the example of hydrogen energy, technological growth through innovation is essential in order to create the hydrogen energy market first of all. When a company succeeds activating the hydrogen energy business, business opportunity can be broadly expanded. Social impact of hydrogen energy is huge and can contribute to the achievement of SDGs. At the same time, however, risk factors should be taken into account such as the rise of energy prices or the high product costs.

PwC (Price Waterhouse Coper)

PwC has developed the indicators which consider the business level for achieving the Global Goals including SDGs. Confirming the right company to satisfy the SDGs strategy is crucial in the global market. The indicators include such as leadership (business and financial strategies), employee engagement (awareness and bottom up initiatives), reporting (risk assessment and management), and collaborations (among suppliers, consumers, government, NGO and so on).

3.1. Utilizing HIT funds for green energy projects

Two Parameter Approach

Investors (households) utility function depends on rate of return and risk. Eq (1). Shows utility function of investors which is function of rate of return and risk:

$$U = U(r_t, \sigma_t) = r_t - \beta\sigma_t^2 \tag{1}$$

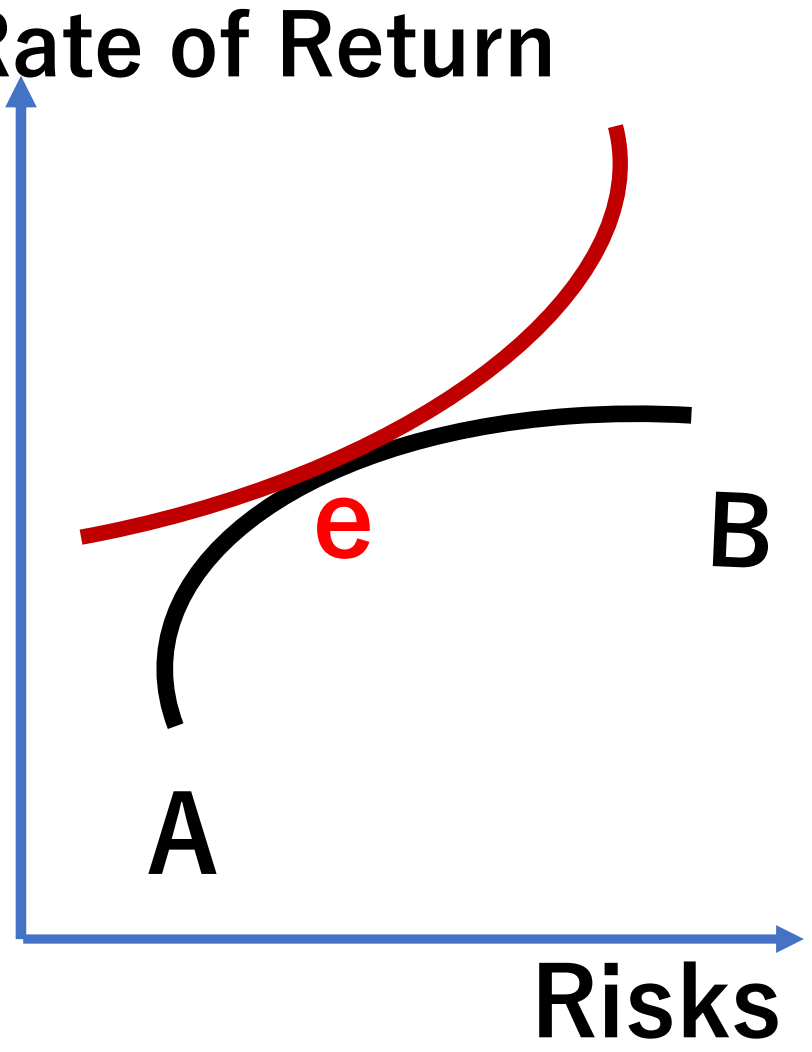
where r_t denotes the rate of return, σ_t denotes the risk and β is the weight for the risk. If investor gives more weight to the risk, then β will be larger. Smaller β means that the investor is not so much concerned about risk.

Eq. (2) shows the total rate of return of households' investment. We are assuming that households are putting their money either in bank deposit or in HIT funds that will be invested into green energy projects.

$$r_t = \alpha_t r_t^D + (1 - \alpha_t) r_t^E \tag{2}$$

In Eq. (2), we are assuming that α percent of the households assets is going to bank deposits and rate of return of bank's deposit or the deposit interest rate is r_t^D . On the other hand $(1 - \alpha)$ percent of their assets are investing in HIT funds and r_t^E denotes rate of return of HIT funds.

$$\sigma_t^2 = \alpha_t^2 \left(\sigma_t^D\right)^2 + (1 - \alpha_t)^2 \left(\sigma_t^E\right)^2 + 2\alpha_t(1 - \alpha_t)\sigma_t^D \sigma_t^E \tag{3}$$



Current SDG investment: distort asset allocation

1, Traditional asset allocation :

two parameter approach

(1) Rate of return, (2) Risks

2, SDG (or ESG) component is added for the asset allocation

multi-factor model

3, SDG criteria is different from one consulting company to another

4, Each Investor changes its' asset allocation based on specific criteria of SDG given by consultant

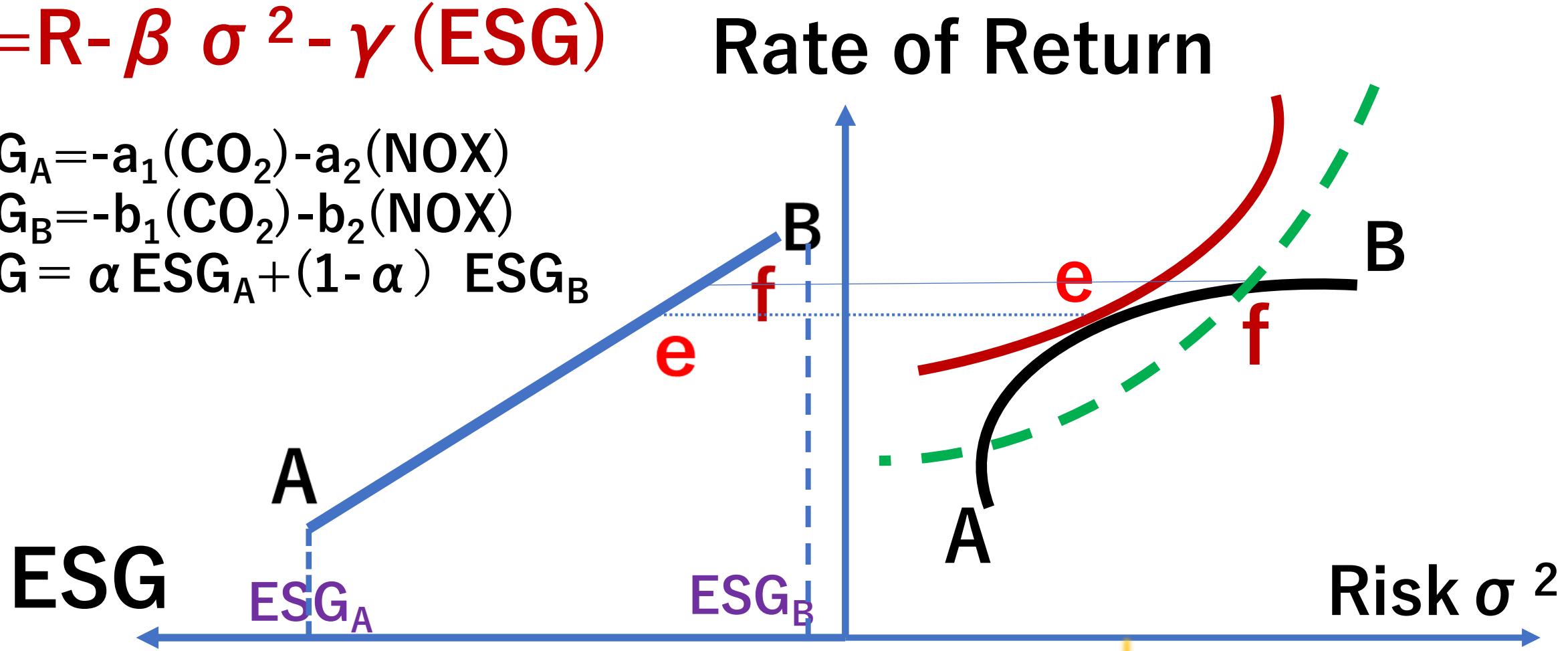
Multi-Factor Model (including ESG)

$U = R - \beta\,\sigma^2 - \gamma\,(ESG)$

$ESG_A = -a_1(CO_2) - a_2(NOX)$

$ESG_B = -b_1(CO_2) - b_2(NOX)$

$ESG = \alpha\,ESG_A + (1-\alpha)\;ESG_B$



$$\alpha_t = \frac{\frac{1}{2\beta}\left(R_t^A - R_t^B\right) + \left(\sigma_t^B\right)^2 + \frac{\gamma}{2\beta}\left(SDG_t^A - SDG_t^B\right)}{\left(\sigma_t^A\right)^2 - \left(\sigma_t^B\right)^2}$$

Optimal portfolio allocation can be achieved by taxing waste products

1, By taxing wastes such as CO2, NOX, Plastics etc. by identical international taxation, the investors can only look for rate of return and risks as they were conventionally focused on.

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

Global Taxation on Wastes

Tax levied on Asset A

$$T_A = t_1 x a_1 x(CO_2) + t_2 x a_2 x(NOX)$$

Tax levied on Asset B

$$T_B = t_1 x b_1 x(CO2) + t_2 x b_2 x(NOX)$$

Revised rate of return on asset A

$$RA = R_A - t_1 x a_1 x(CO_2) - t_2 x a_2 x(NOX)$$

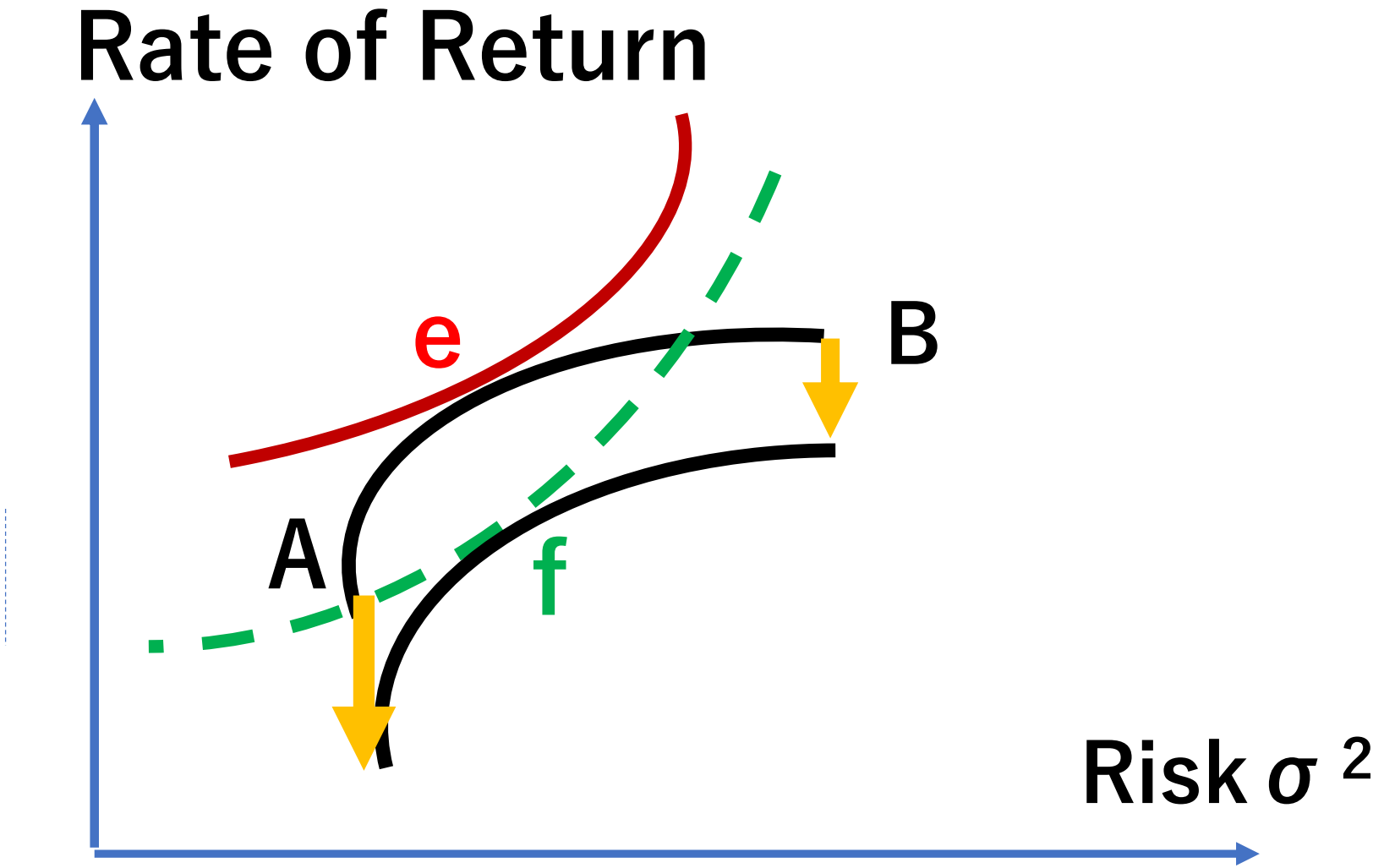
Revised rate of return on asset B

$$RB = R_B - t_1 x b_1 x(CO2) - t_2 x b_2 x(NOX)$$

Investors look RA and RB instead of R_A and R_B

Global tax on CO_2 and NOX

$U = R - \beta \sigma^2 - \gamma$ (SDG)



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The way to induce private participation in green finance and investment

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Thank you for your Attention

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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]