# ADB-ADBI-CAREC Research Project

# Overview

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# Sustainable Development Goals (SDGs)

1, Promotion of Domestic Savings

Bank deposits, Insurance, Mutual Funds

2, Mobilization of domestic savings into domestic Investment

3, Infrastructure

4, Industrial development (SME)

5, Start up Finance

6, Human Capital Development (Education)

# Circulation of Savings into Domestic Investment

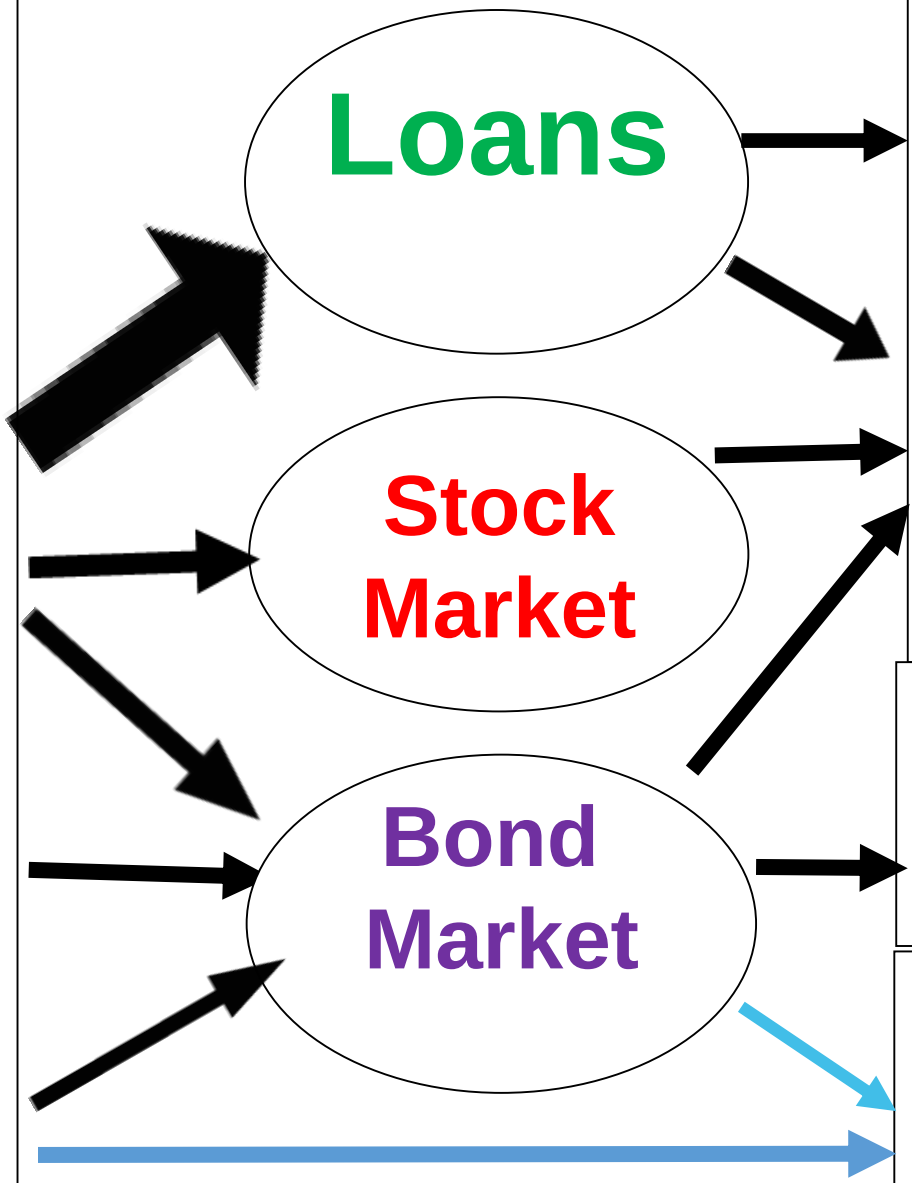
## Domestic Savings

Bank Deposits

Mutual funds

Insurance

Pension Funds




Large Corporates

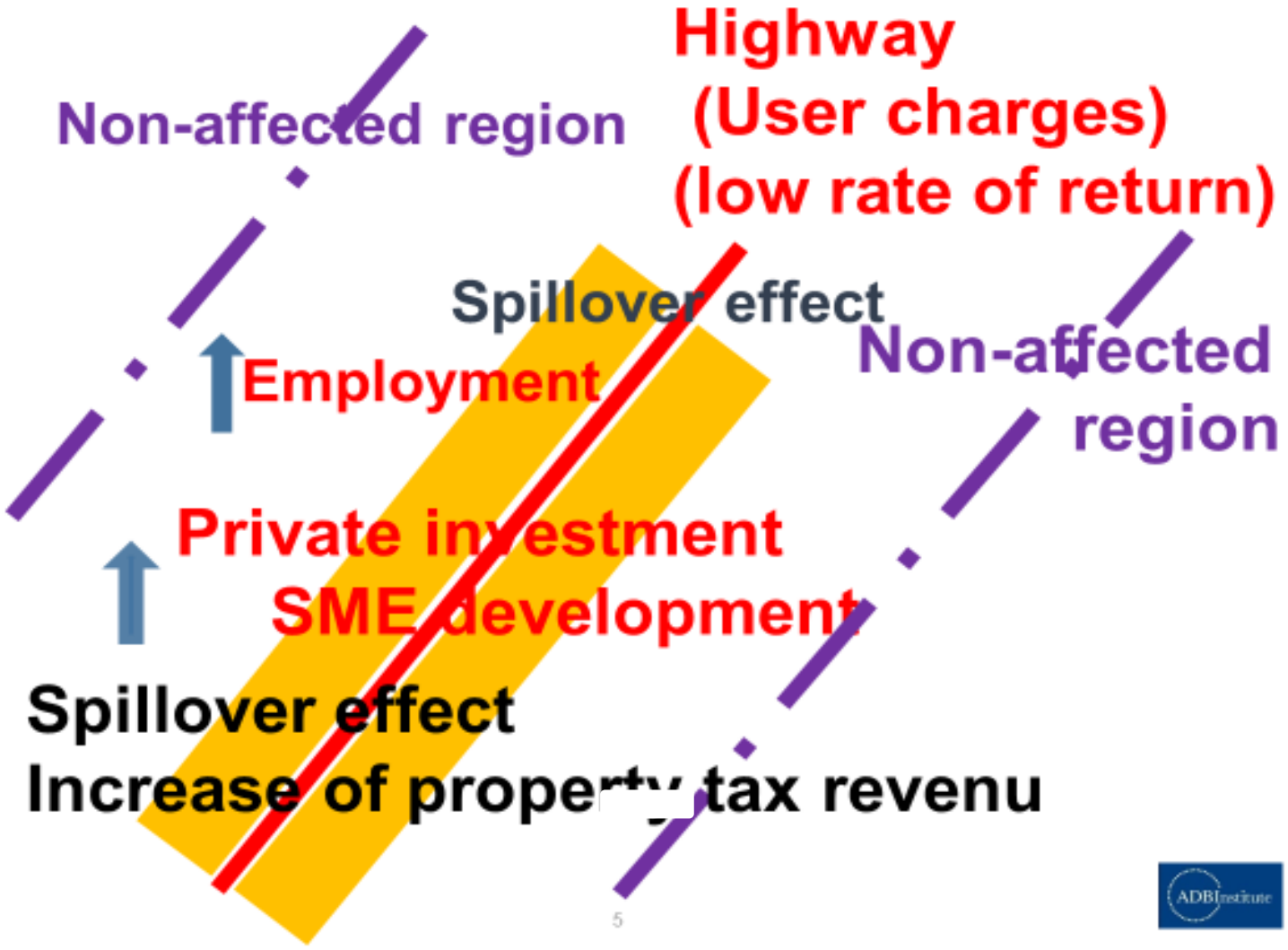
SMEs

Government Expenditures

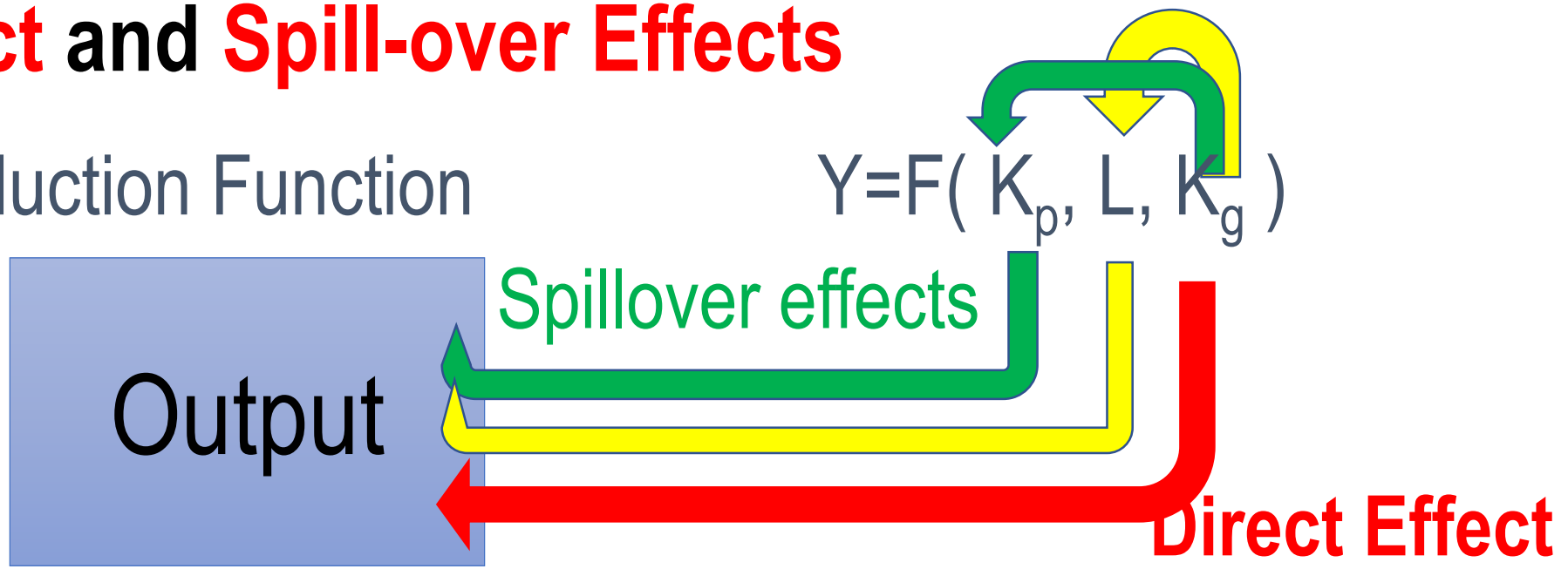
Infrastructure

# Quality of Infrastructure:

## Spillover Effects of Infrastructure Investment



# Direct Effect and Spill-over Effects




Y= Output,

$K_p$= private capital,

L = labor

$K_g$ = public capital (infrastructure)

**Quality of Infrastructure is measured by the spillover effects**

# High Quality of Infrastructure Investment

1, Big Spillover effects in the region
   Utilize spillover tax revenues
2, Reduce income inequality
3, Opportunities for small business
4, Gender equality
5, Education (together with infrastructure)
6, Incentive mechanism for operating company
7, Transparency

# Growing Savings Ratio in Asian Countries

**(1) Savings → Bank Loans → SME → Economic Growth → Deposits**

**(2) Increase of domestic Savings is Important in Asian Growth**

**(3) 1997 Financial Crisis of Asia → Lack of Asian domestic Savings**

**→ relied on foreign capital inflows**

Nominal measure

| | 1966–70 | 1971–75 | 1976–80 | 1981–85 | 1986–90 | 1991–95 | 1996–2000 | 2001–07 | Average |
|---|---|---|---|---|---|---|---|---|---|
| PRC | 28.9 | 29.1 | 33.0 | 34.8 | 37.0 | 41.9 | 40.7 | 46.2 | 37.8 |
| Hong Kong, China | 28.2 | 29.4 | 33.5 | 31.6 | 36.0 | 32.6 | 30.4 | 31.5 | 31.6 |
| Indonesia | 14.3 | 23.9 | 30.8 | 30.1 | 31.9 | 32.4 | 28.1 | 29.9 | 27.8 |
| India | 15.5 | 16.7 | 18.7 | 19.4 | 21.9 | 23.0 | 22.4 | 29.0 | 22.2 |
| Korea, Rep. of | 15.2 | 19.0 | 27.0 | 27.8 | 36.5 | 36.4 | 35.6 | 31.8 | 28.8 |
| Malaysia | 24.3 | 24.2 | 31.1 | 28.1 | 33.3 | 37.8 | 45.8 | 42.6 | 33.4 |
| Pakistan | 8.9 | 8.0 | 7.9 | 7.2 | 10.3 | 16.4 | 14.9 | 16.1 | 11.2 |
| Philippines | 21.9 | 23.6 | 26.2 | 21.0 | 19.0 | 16.3 | 17.1 | 13.8 | 19.1 |
| Singapore | 18.4 | 26.3 | 34.9 | 43.8 | 41.0 | 47.3 | 49.9 | 46.3 | 39.8 |
| Thailand | 21.2 | 22.8 | 22.1 | 24.3 | 30.8 | 35.8 | 34.3 | 32.2 | 27.9 |
| Taipei,China | 25.3 | 30.4 | 33.0 | 31.6 | 33.4 | 27.2 | 26.0 | 26.0 | 28.7 |
| Viet Nam | | | | | 3.9 | 14.6 | 22.2 | 29.0 | 17.4 |
| Average a/ | 19.8 | 22.0 | 25.7 | 26.6 | 30.0 | 33.2 | 32.9 | 37.5 | |

# Stock Budget and Flow Budget

## (1) Flow Budget: Ordinary Budget

TAX Revenues → Government Expenditures

## (2) Stock Budget: long-term

Pension Funds → Infrastructure, SME

Post Office Savings → Housing Loans

# 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)

# Infrastructure Investment Needs by Sector, 2016-2030

($ billion in 2015 prices)

| Sector | Baseline estimates | | |
|---|---|---|---|
| | Investment Needs | Annual average | % share to total |
| **Power** | 11689 | 779 | **51.8** |
| **Transport** | 7796 | 520 | **34.6** |
| **Telecommunications** | 2279 | 152 | **10.1** |
| **Water and Sanitation** | 787 | 52 | **3.5** |
| **Total** | 22551 | 1503 | **100** |

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

# Various Risks associated with Infrastructure

1, Risks:

(i) political risk (International organization ADB, WB)

(ii) construction risk,

(iii) Natural Disaster

(iv) operation and maintenance risks,

(v) exchange rate risk (overseas' investors)

2, User charges cannot be set too high

User charges <<< Total costs

3, How to maintain stable income stream ?

Utilize Spillover Tax Revenues and Tax on CO2

# Different Classes of Infrastructure Assets

Bank Loans

Insurance

Pension Funds

Hometown Trust

Revenue Bond

Equity

Safer Assets

Different Infrastructure Classes

Riskier Assets

# Private Finance to Infrastructure Investment

1,Much more infrastructure can be constructed

2, Reduce construction period

3, Increase Efficiency of operation

4, Better price setting of user charges

5, Avoid distorted projects by politicians

6, Better governance of infrastructure

7, Connectivity creates large spillover effects

**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.

**Economic Modelling, 2019**

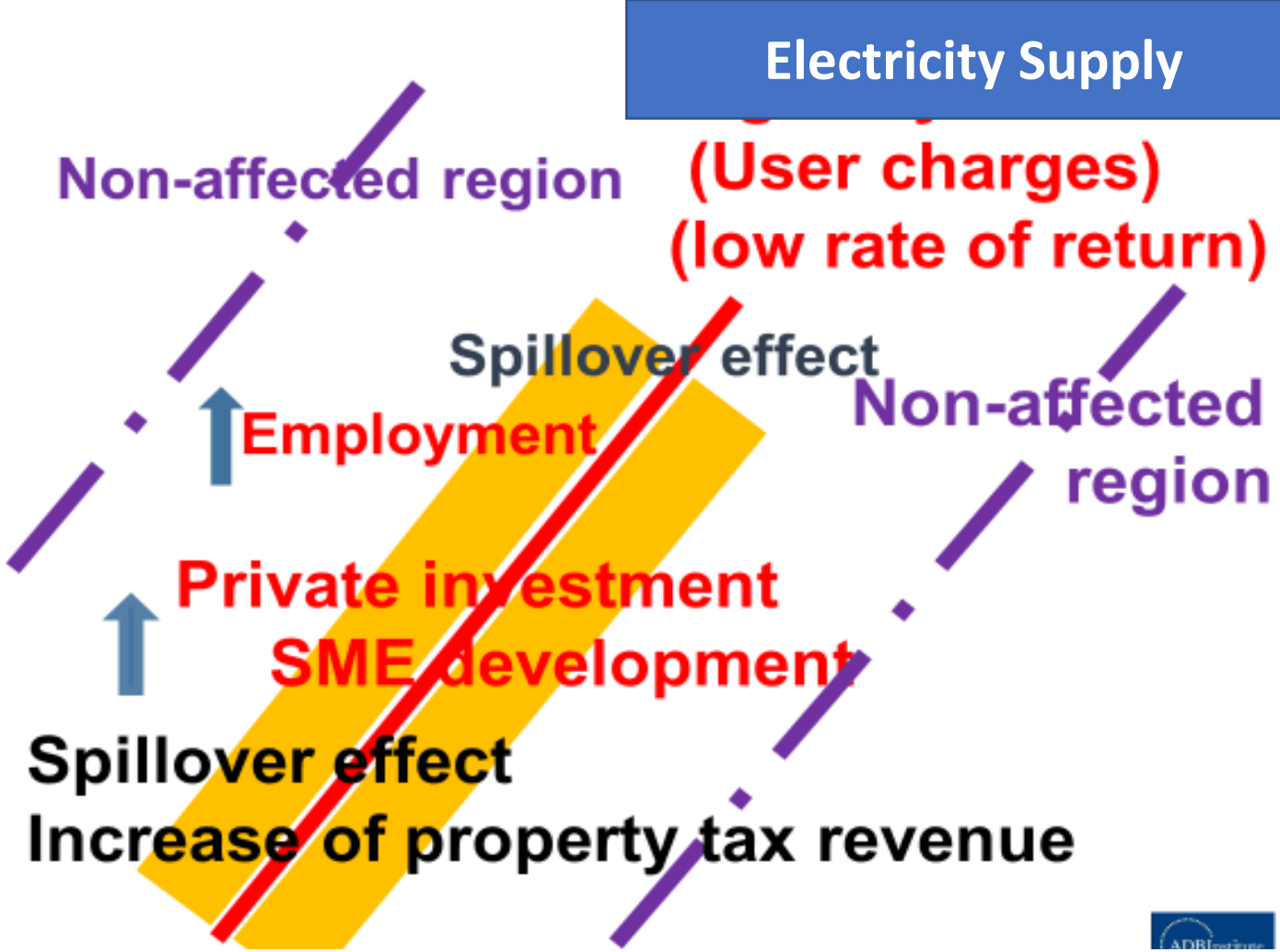
**Modelling the social funding and spill-over tax for Addressing the green energy financing gap**

**Naoyuki Yoshino,**

**Farhad Taghizadeh-Hesary,**

Hydropower plant

# Spillover Effects of Infrastructure Investment




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

# Trans-log Production Function

$$\ln Y_t - \ln \overline{Y} = \alpha_K \left(\ln K_{Pt} - \ln \overline{K_P}\right) + \alpha_L \left(\ln L_t - \ln \overline{L}\right) + \alpha_G \left(\ln K_{Gt} - \ln \overline{K_G}\right)$$

$$+ \beta_{KL} \left(\ln K_{Pt} - \ln \overline{K_P}\right) \left(\ln L_t - \ln \overline{L}\right)$$

$$+ \beta_{KG} \left(\ln K_{Pt} - \ln \overline{K_P}\right) \left(\ln K_{Gt} - \ln \overline{K_G}\right)$$

$$+ \beta_{LG} \left(\ln L_t - \ln \overline{L}\right) \left(\ln K_{Gt} - \ln \overline{K_G}\right) + \frac{1}{2}\beta_{KK}\left(\ln K_{Pt} - \ln \overline{K_P}\right)^2$$

$$+ \frac{1}{2}\beta_{LL}\left(\ln L_t - \ln \overline{L}\right)^2 + \frac{1}{2}\beta_{GG}\left(\ln K_{Gt} - \ln \overline{K_G}\right)^2$$

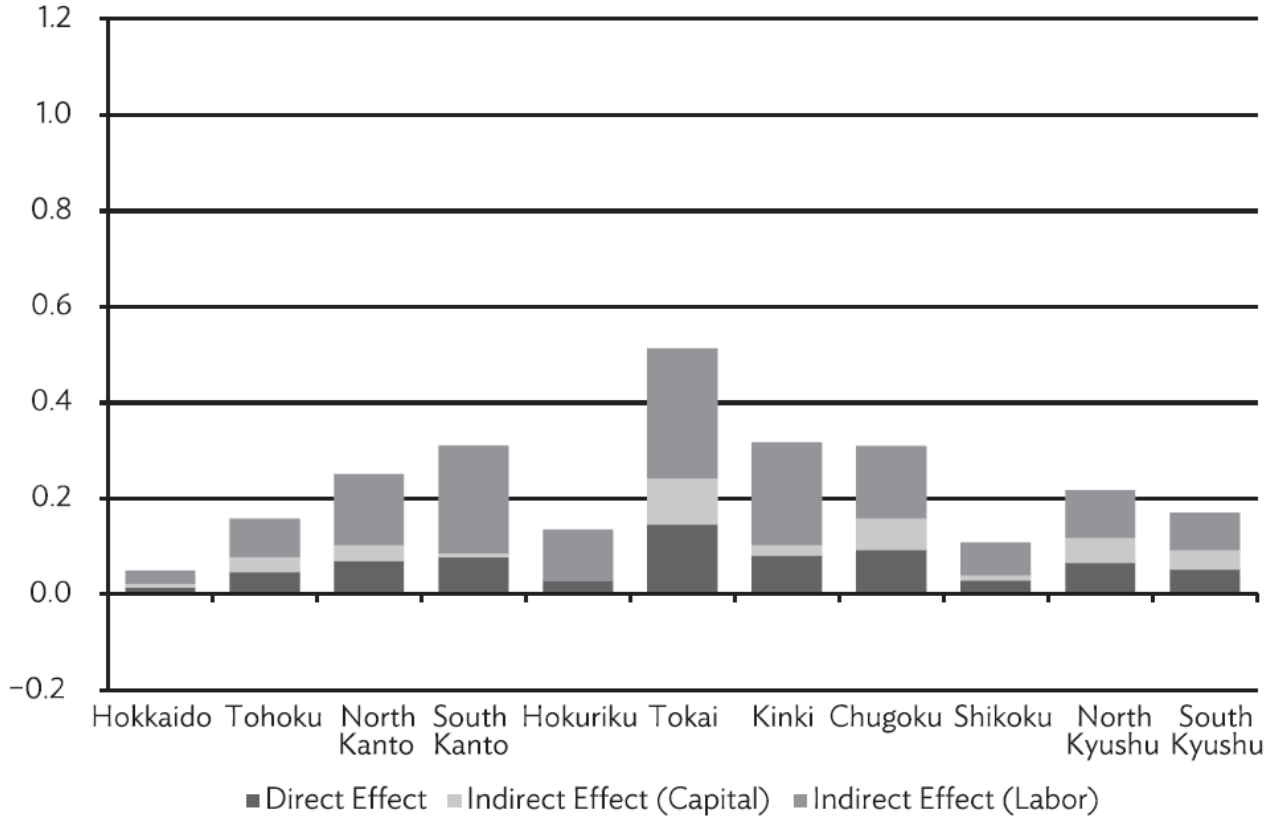
# Macroeconomic Effect of Infrastructure Investment

| Spillover Effects Estimated from a Macroeconomic Translog Production Function | | | | |
|---|---|---|---|---|
| | 1956-60 | 1961-65 | 2001-05 | 2006-10 |
| Direct effect (Kg) | 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 |
| | | | | |
| Increment | 43.8% | 41.5% | 39.0% | 39.1% |

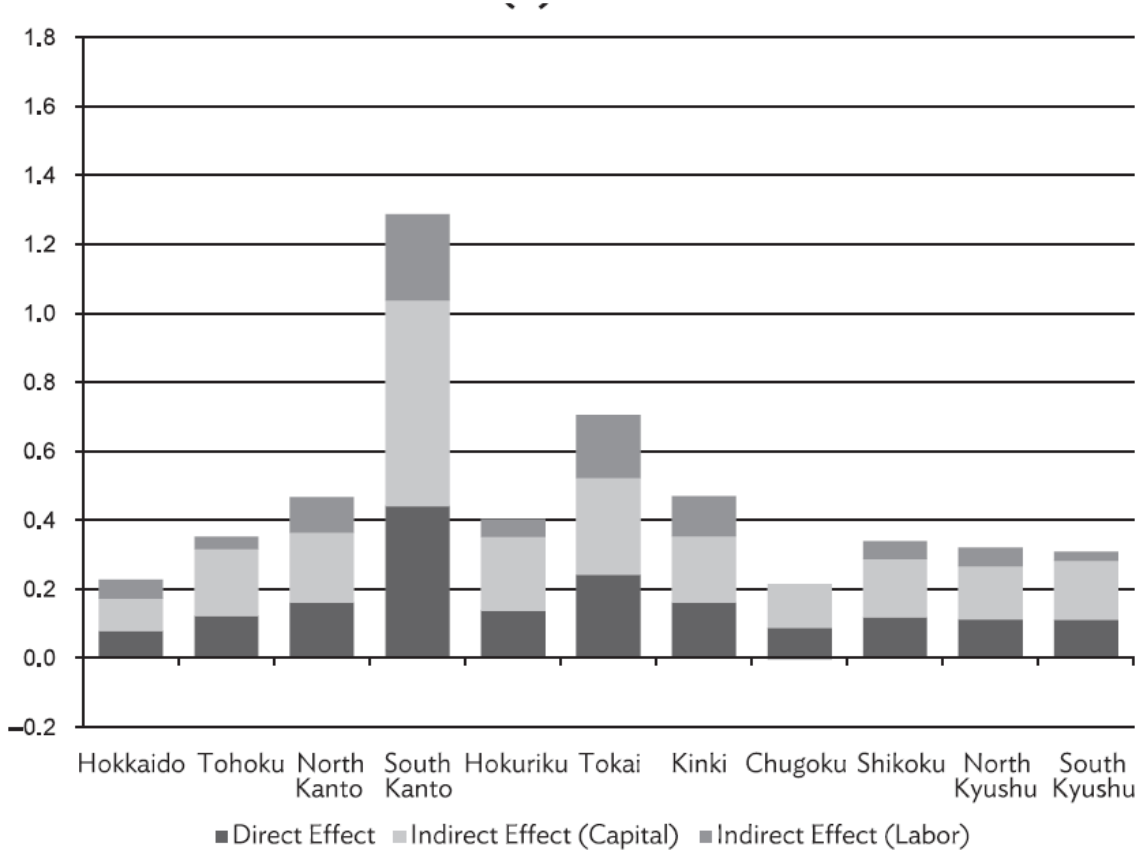
Source: Yoshino and Nakahigashi (2016)

# Regional Disparities (2010)

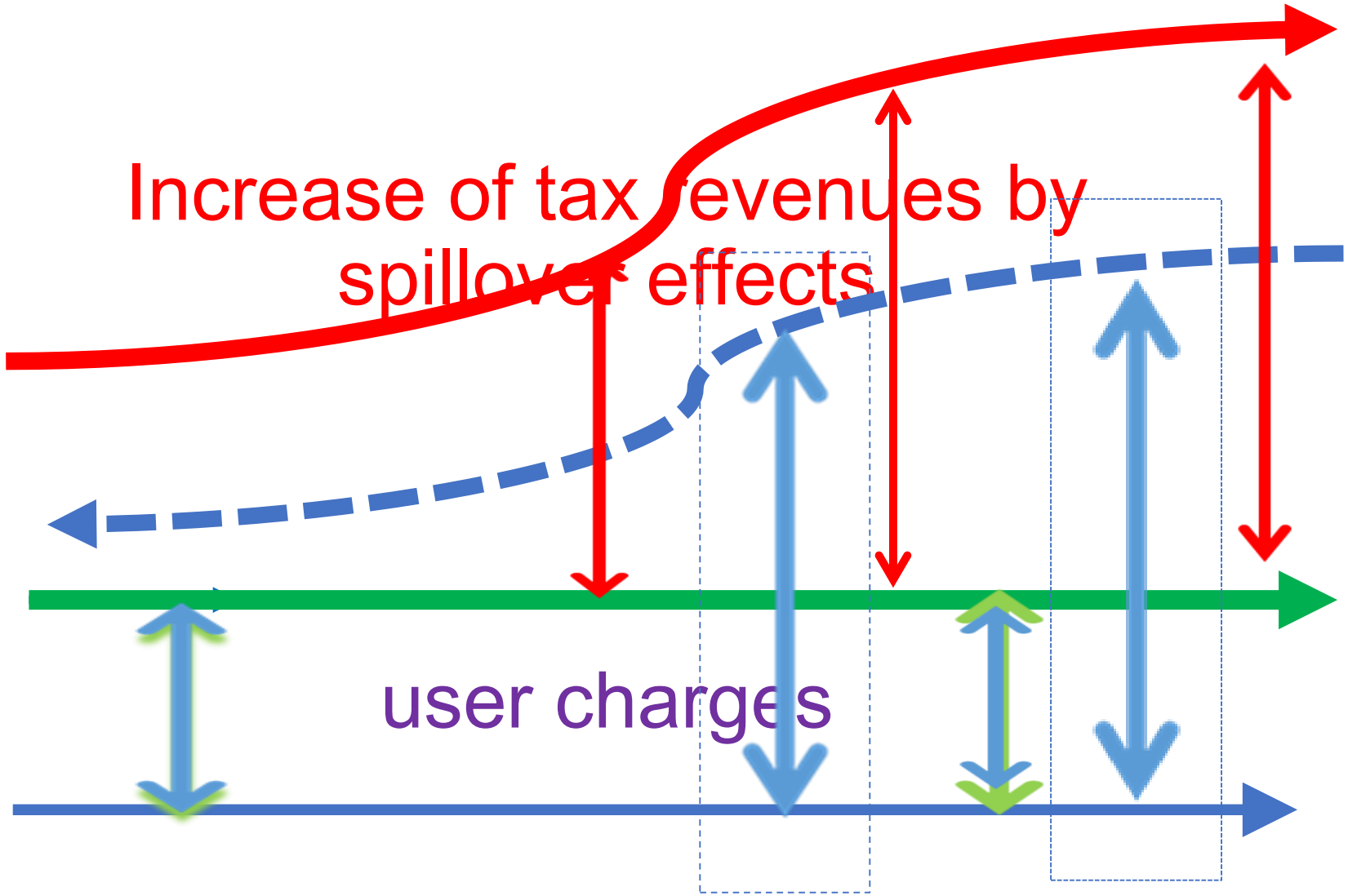
## Manufacturing




## Services Sector



# Injection of Increased Tax revenues



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

## Tax Revenues in three cities

Yoshino and Pontines (2015)

ADBI Discussion paper 549

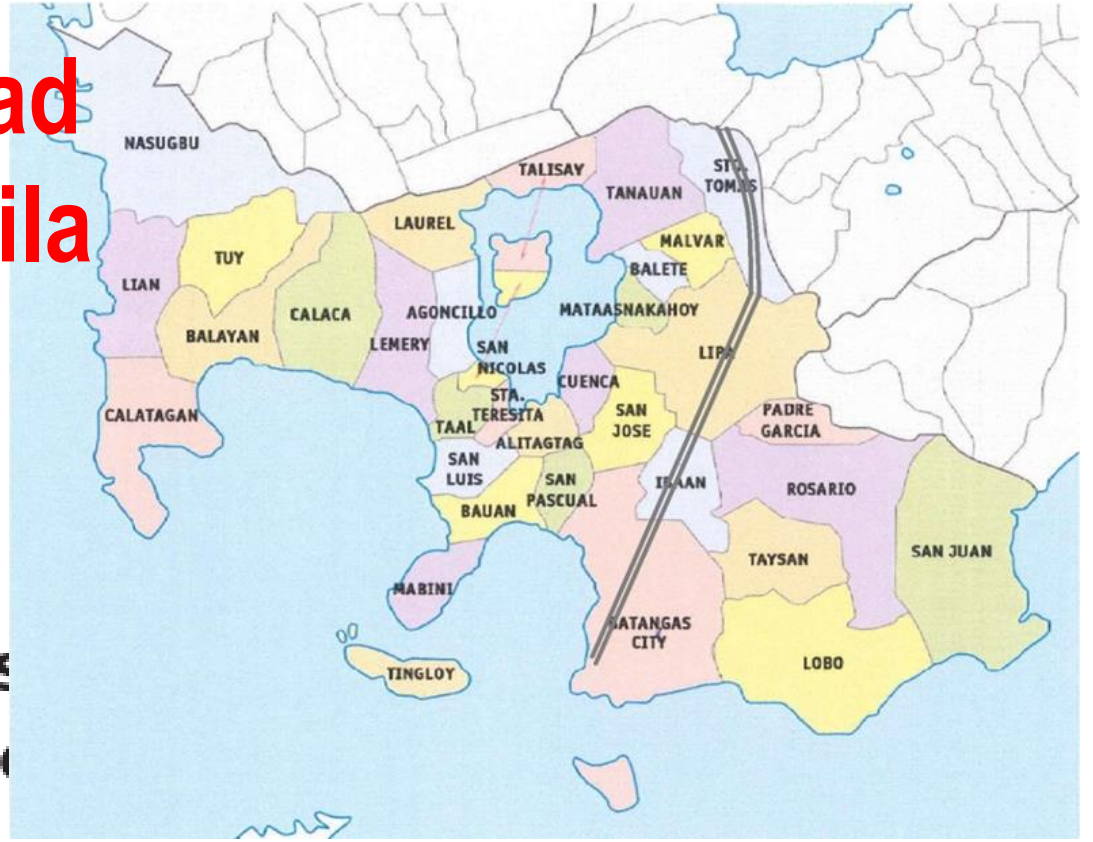


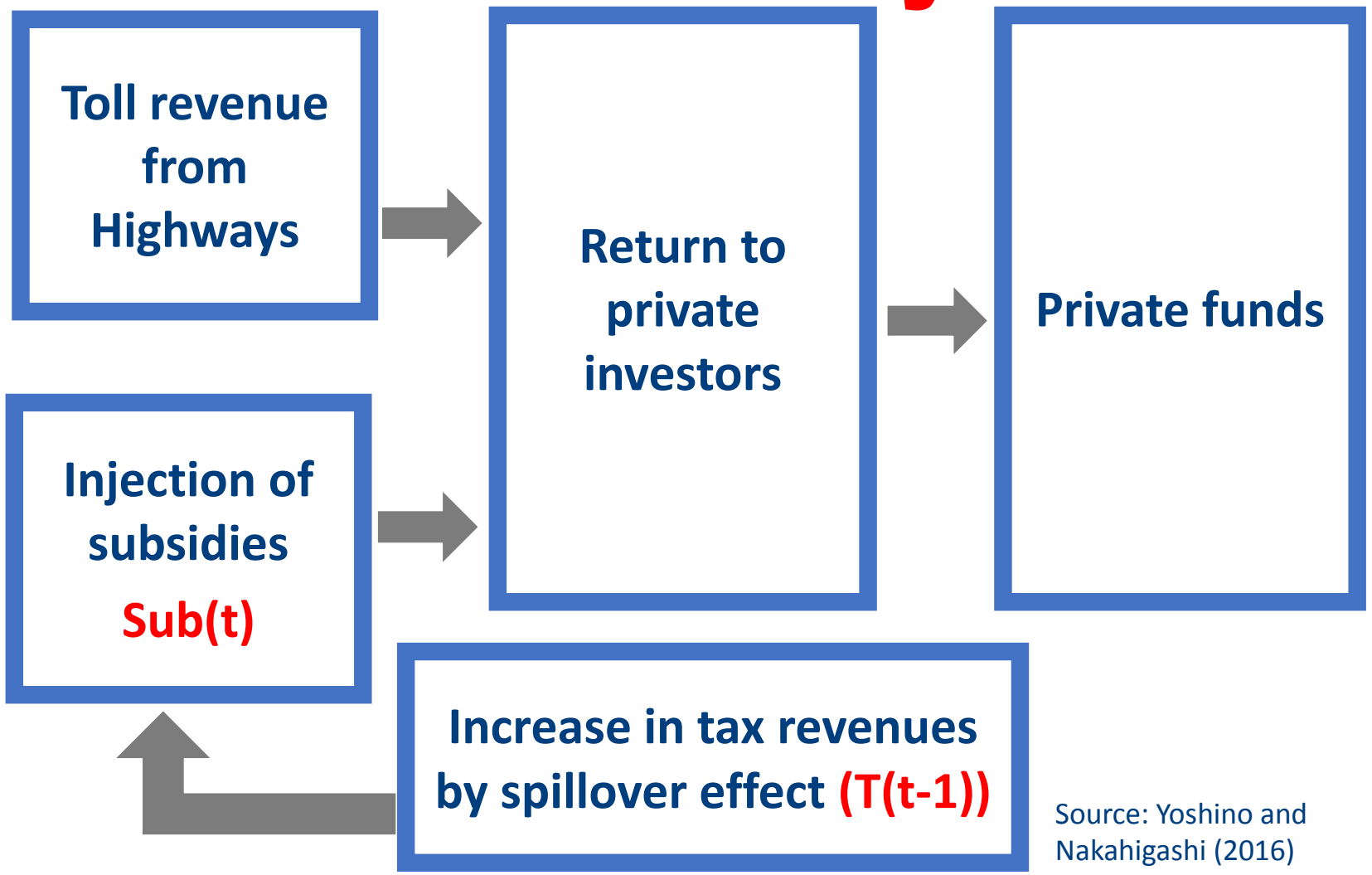

**Table 3.3 Calculated Increase in Busines**
**Beneficiary Group Relative to Nonbenefi**

| | 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

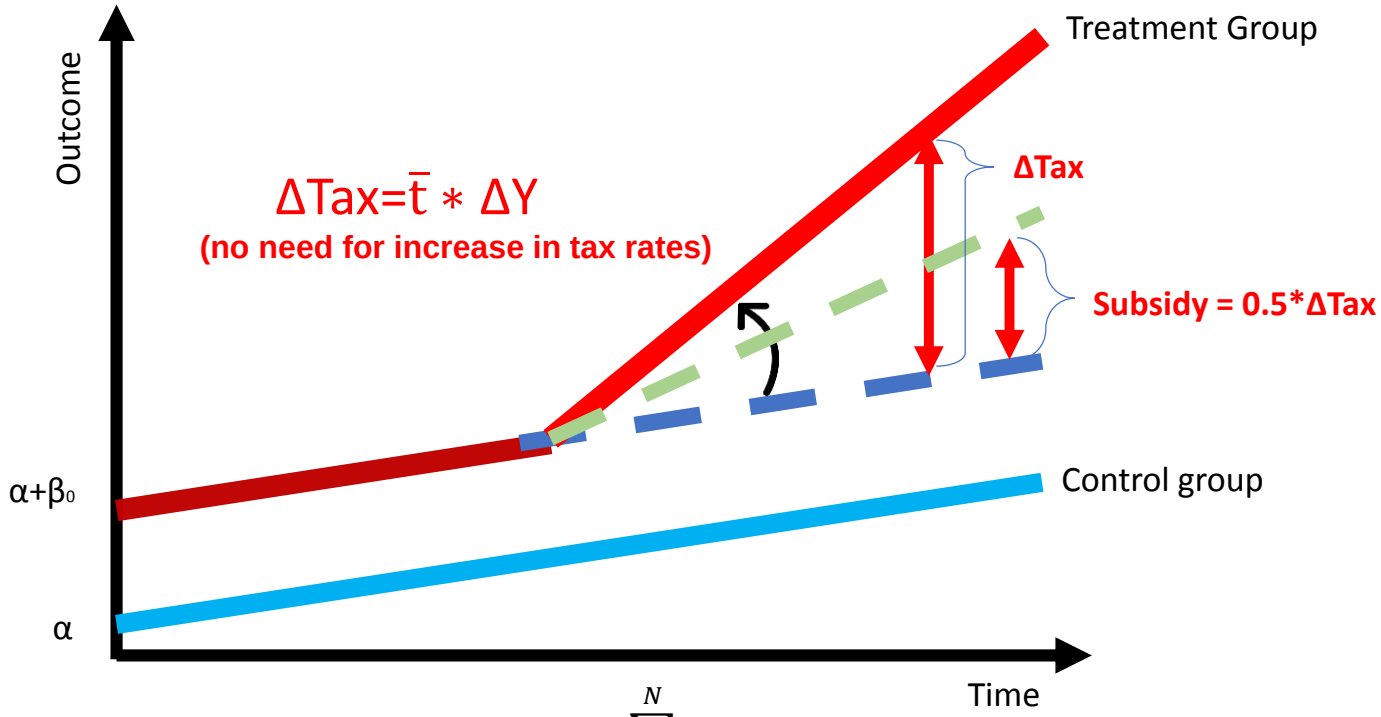
Operation period

# Injection of fraction of tax revenues as subsidy




Source: Yoshino and Nakahigashi (2016)

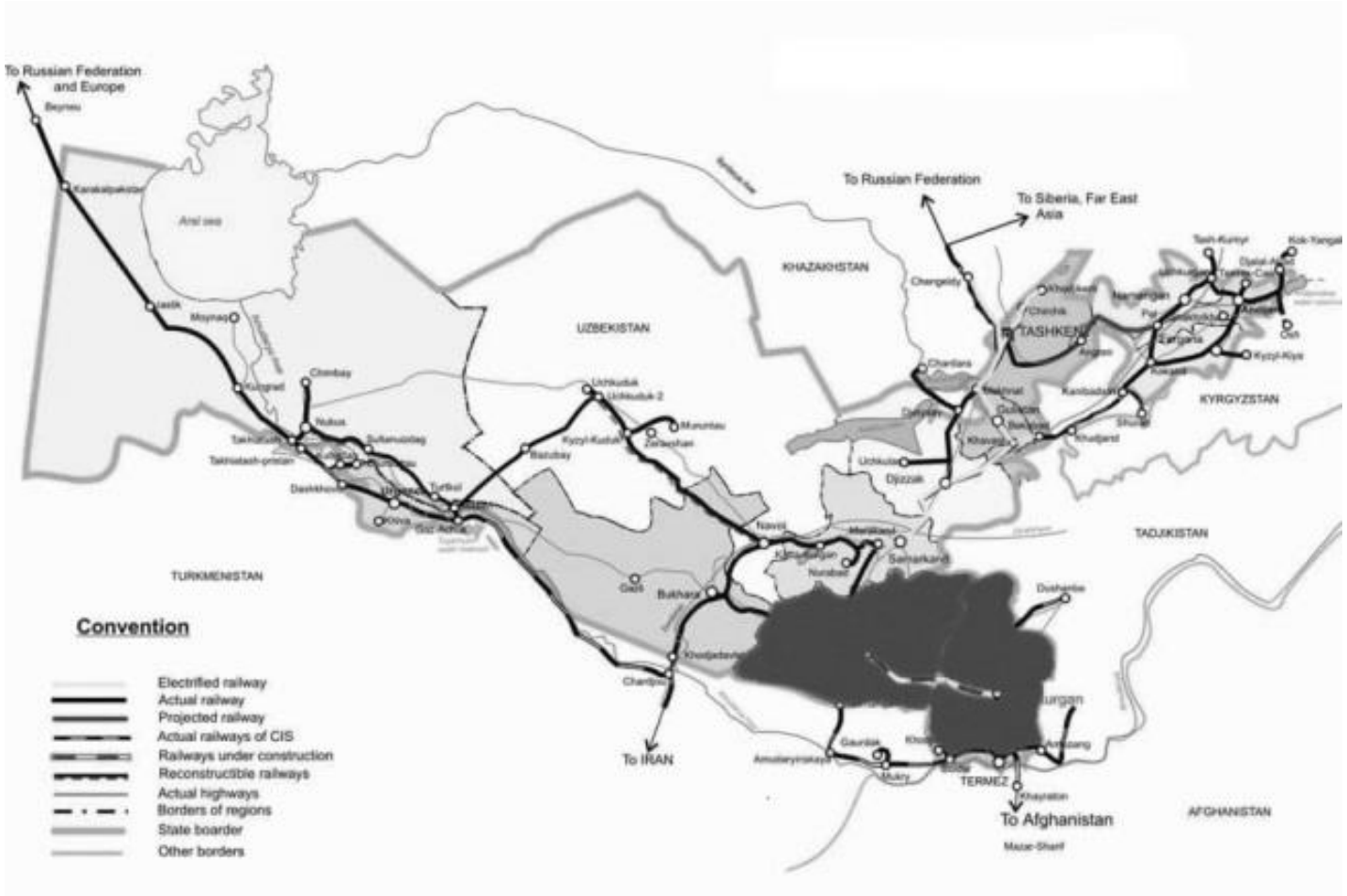
# Concept of subsidy based on additional flow of tax revenue due to infrastructure




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

# Uzbekistan Railway

(Yoshino and Abidhadjaev, 2017)



Contents lists available at ScienceDirect

Journal of Asian Economics 49 (2017) 1–11

Full length article

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

Naoyuki Yoshino[a], Umid Abidhadjaev[b,*]

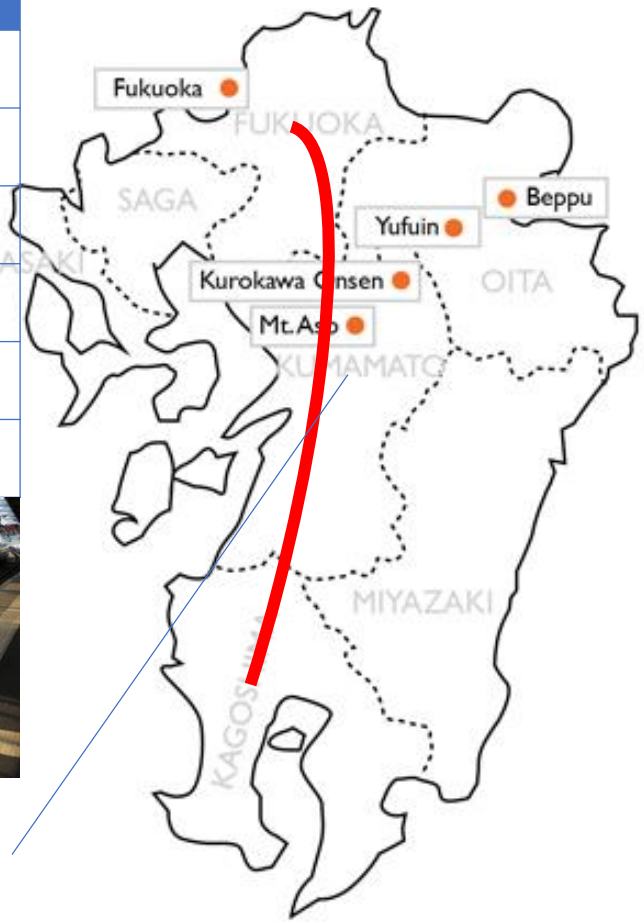
In the spectrum of economic sectors, the positive effect reflected in regional GDP seems to be driven by approximate increases of 5% in industrial output and of 7% in aggregate services. The effect on agricultural output is moderate relative to other sectors, constituting around 1% for connectivity effects, which is consistent with previous literature on the impacts of public capital.

(Yoshino and Abidhadjaev, Chapter 2)

# Context: Japan

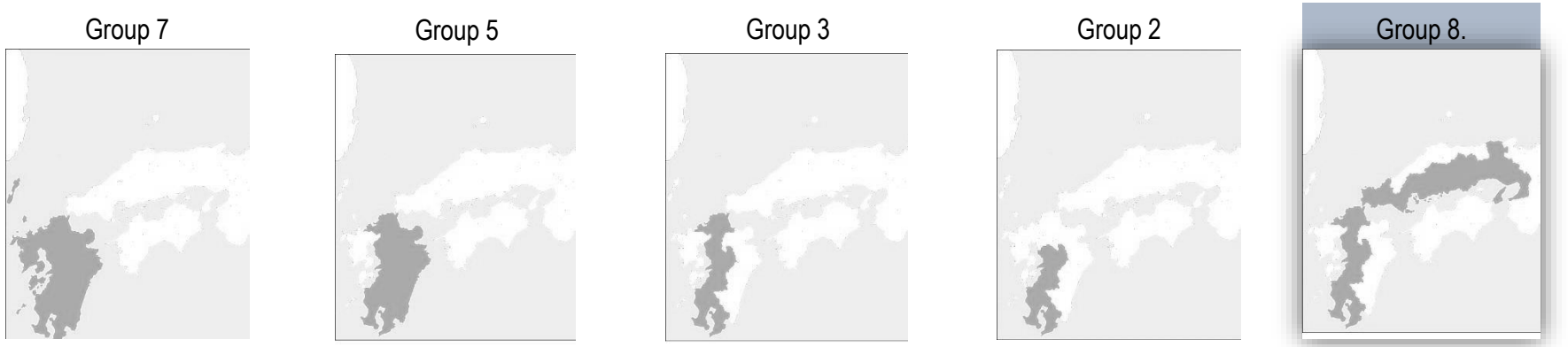
| Travel time to Kagoshima | | |
|---|---|---|
| | **Before** | **After** |
| Tokyo | 9h 00m | 7h 20m |
| Shin-Osaka | 6h 20m | 4h 40m |
| Hakata | 3h 50m | 2h 10m |
| Kumamoto | 2h 30m | 1h 00m |
| Shin-Yatsushiro | 2h 10m | 35m |

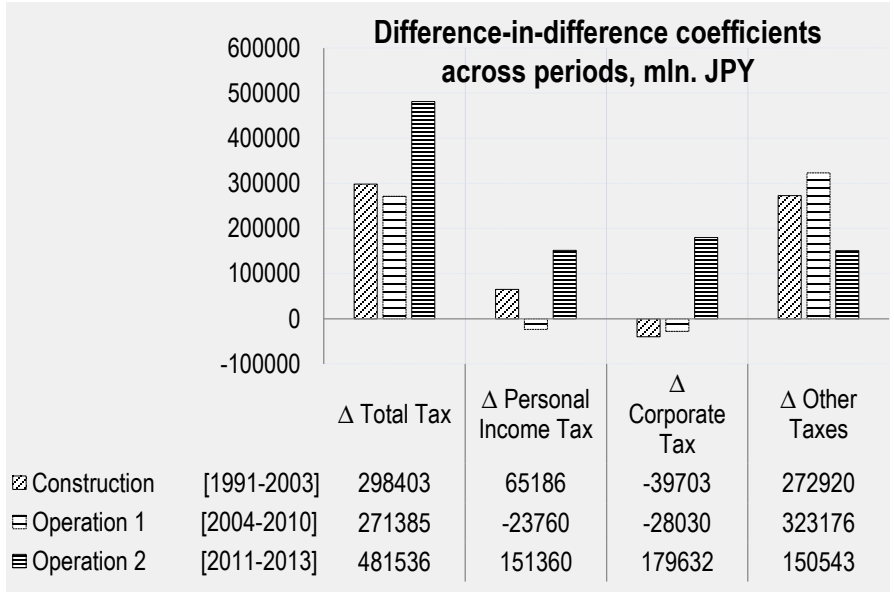
**Kyushu Shinkansen**
Japan



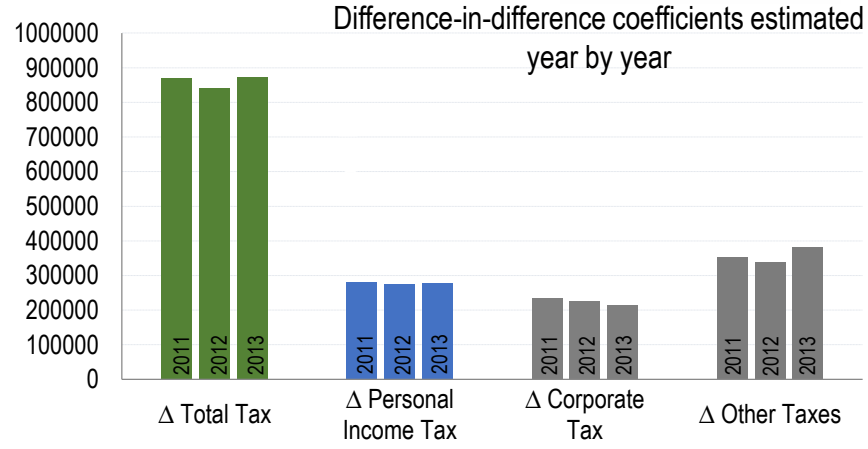

Source: https://www.acprail.com/rail-passes/japan-rail/bullet-train/kyushu-shinkansen

# Estimation results




| | | Δ Total Tax | Δ Personal Income Tax | Δ Corporate Tax | Δ Other Taxes |
|---|---|---|---|---|---|
| Construction | [1991-2003] | 298403 | 65186 | -39703 | 272920 |
| Operation 1 | [2004-2010] | 271385 | -23760 | -28030 | 323176 |
| Operation 2 | [2011-2013] | 481536 | 151360 | 179632 | 150543 |




| | Δ Total Tax | Δ Personal Income Tax | Δ Corporate Tax | Δ Other Taxes |
|---|---|---|---|---|
| Y2011 | 869153 | 280000 | 234839 | 354313 |
| Y2012 | 840176 | 274941 | 226902 | 338332 |
| Y2013 | 873184 | 277902 | 214219 | 381062 |

**Note**: Numbers for tax revenue amount adjusted for CPI with base year 1982. Pre-shinkansen construction period covers years from 1982 to 1990. Non-affected groups include rest of the prefectures
Affected groups: Group 2: Kagoshima, Kumamoto ; Group 3: Kagoshima, Kumamoto, Fukuoka; Group 5: Kagoshima, Kumamoto, Fukuoka, Oita, Miyazaki
Group 7: Kagoshima, Kumamoto, Fukuoka, Oita, Miyazaki, Saga, Nagasaki ; Group 8: Kagoshima, Kumamoto, Fukuoka, Yamaguchi, Hiroshima, Okayama, Hyogo, Osaka

# References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