



ADB Working Paper Series

**INNOVATIVE FINANCING FOR CITY
INFRASTRUCTURE INVESTMENT BY
INCREASING THE RATE OF RETURN
FROM SPILLOVER TAX REVENUES**

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Abstract

The growing trend of urban city development requires various infrastructure investments, including water supply, electricity, sanitation, transportation, and other supporting facilities. In facing this challenge, many Asian countries experience significant constraints, particularly on the issues of land acquisition and insufficient financial supply, which potentially create a time delay in infrastructure investment and huge budget deficits. If these infrastructure investments were financed by overseas investors, future exchange rate risks would have to be carried by infrastructure companies. This paper examines further ways to attract more investment in infrastructure by applying spillover tax revenues. Case studies of some innovative financing aspects of Japan and other countries are also presented.

Keywords: infrastructure financing, spill-over effects, tax revenue, land acquisition, smart city, connectivity

JEL Classification: C31, H21, O18, R51

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1. INTRODUCTION: URGENT INFRASTRUCTURE NEEDS IN GROWING ASIA

In proportion to the growing population, huge infrastructure needs are observed in many Asian countries. As can be seen in Table 1, the needs will represent about 6% of the total GDP annually from 2016 to 2030. To fulfill this demand, countries need to accelerate their infrastructure development. However, if public spending alone finances the development, countries will face a huge budget deficit that will consequently risk their fiscal sustainability. Therefore, governments are encouraged to find other sources of financing. Private sector financing is expected to be key to satisfying the huge demand of infrastructure investment.

On the other hand, if foreign private investors are expected to be the main supply of financing infrastructure investment, there are exchange rate risks that need to be managed by both investors and governments. Domestic infrastructure companies will carry a huge burden and eventually government might have to take over their losses for compensation. Therefore, domestic private financing will be the key to the success of infrastructure investment.

Table 1: Projected Infrastructure Investments 2016–2030
(\\$ billion in 2015 prices)

Region	Investment Needs	Annual Average	Investment Needs of Projected GDP (%)
Central Asia	492	33	6.8
East Asia	13,781	919	4.5
South Asia	5,477	365	7.6
Southeast Asia	2,759	184	5
Total Asia	22,509	1,501	6

Source: Authors' calculations using data from ADB (2017).

This paper addresses the ways to attract domestic private investments in infrastructure. The spillover tax revenue effect from the private investment in infrastructure will be discussed in depth in each chapter. Sharing spillover revenue with a private investor will raise the rate of return, which will benefit both government and investors (Yoshino, Abidhadjaev, and Pontines 2017). Another important solution to accelerate infrastructure investment is the use of a land trust for acquisition from landowners to minimize the acquire land through various negotiations followed by a construction period, thus the delay of infrastructure can be minimized (Yoshino et al. 2018).

The paper is organized as follows. Section 2 discusses the private saving aspect in Asian countries by using the spillover benefits from a successful case example. Section 3 discusses the method for measuring spillover revenue sharing. Section 4 provides more detail on some innovative examples of promoting private financing in infrastructure.

2. THE PRIVATE SAVING ASPECT AND WAYS TO PROMOTE PRIVATE SAVING IN ASIAN ECONOMIES

2.1 Ways to Promote Private Savings

The Republic of Korea; Thailand; Indonesia; Hong Kong, China; and several other Asian economies experienced a financial crisis in 1997. This situation affected the decreasing rate of domestic savings (Table 2). Foreign investors, who were looking for a higher rate of return and to create an economic bubble in Asia, were attracted to the Asia region. The bursting of the bubble led to a sudden outflow of capital from Asia, generating a big financial shock within the Asia region (Table 3). However, in recent years, Asian domestic savings have increased due to steady economic growth in the Asia region, as shown in Table 2.

It is imperative for various types of savings to be considered for the Asia region. Bank deposits dominate savings in many Asian economies (Figures 1 and 2). Insurance, pension funds, mutual funds, and other savings should be promoted to cope with the long-term security of the people. Long-term savings such as insurance and pension funds are the most suitable instruments for financing infrastructure investments.

Using the example of Japan, after World War II, there were many widows who lost their husbands during the war. The Japanese government empowered them to work selling life insurance. They visited companies and houses to ask people to prepare for their retirement and explained the importance of life insurance. At the time, Japan had one of the largest shares of insurance in household savings.

Table 2: Asia's Savings Rate, 1998–2000 and 2015–2017
(% of GDP)

Economy	Year						
	1998	1999	2000	...	2015	2016	2017
People's Republic of China	38.6	36.8	36.0	...	47.5	45.9	46
Hong Kong, China	30.0	30.67	32.0	...	24.9	25.5	26.7
Indonesia	17.0	12.5	24.9	...	32	32	32.1
Jordan	22.1	26.5	19.2	...	27.1	27.4	27.9
Rep. of Korea	38.5	35.4	34.8	...	36.5	36.2	36
Malaysia	41.1	38.6	36.5	...	28.2	28.3	28.5
Philippines	25.5	15.5	15.6	...	23.7	24	24.4
Singapore	53.1	49.7	45.7	...	43.5	44.6	44.5
Thailand	32.6	30.0	30.0	...	30.4	32.6	33.9

Note: Savings rate = gross national saving/GDP; investment rate = gross capital formation/GDP.

Source: Authors' calculations using data from IMF World Economic Outlook.

Table 3: Asia's Investment Rate, 1998–2000 and 2015–2017
(% of GDP)

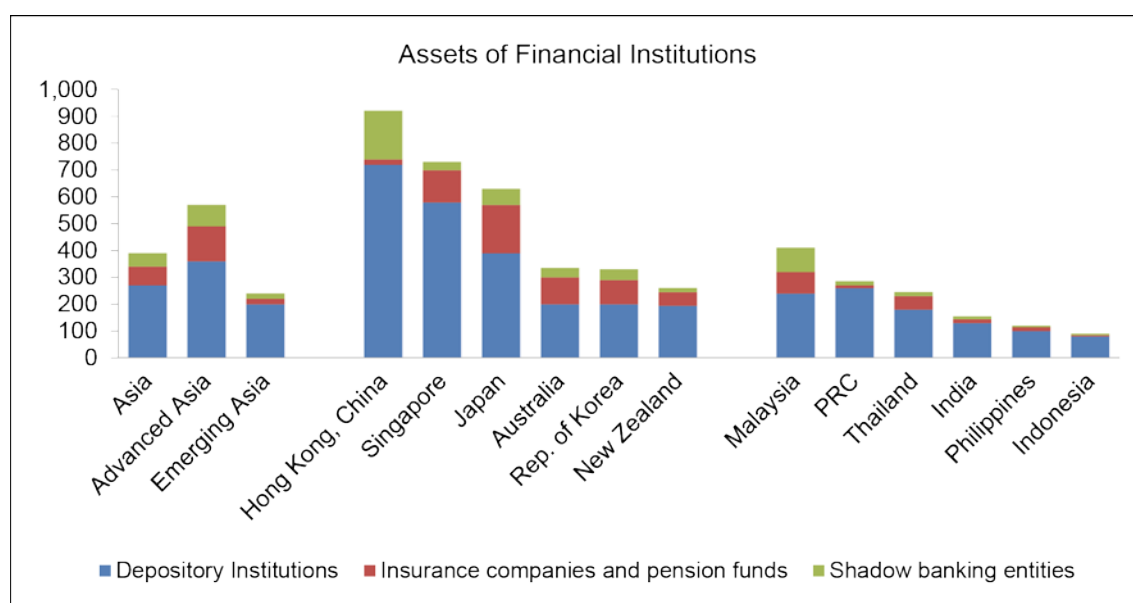
Economy	Year							
	1998	1999	2000	...	2015	2016	2017	
People's Republic of China	35.6	34.9	34.3	...	44.7	44.1	44.6	
Hong Kong, China	29.0	25.0	27.6	...	21.5	21.5	22	
Indonesia	19.2	13.6	25.1	...	34.1	33.9	33.7	
Jordan	21.8	21.6	22.4	...	24	23.4	23.9	
Rep. of Korea	27.8	30.9	32.9	...	28.9	29.3	31.1	
Malaysia	28.8	23.8	28.0	...	25.1	25.8	25.6	
Philippines	23.4	19.0	18.4	...	21.2	24.4	25.1	
Singapore	31.6	32.7	34.9	...	26.5	27	28.5	
Thailand	20.1	20.2	22.3	...	22.4	20.9	22.8	

Note: Investment rate = gross capital formation/GDP.

Source: Authors' calculations using data from IMF World Economic Outlook.

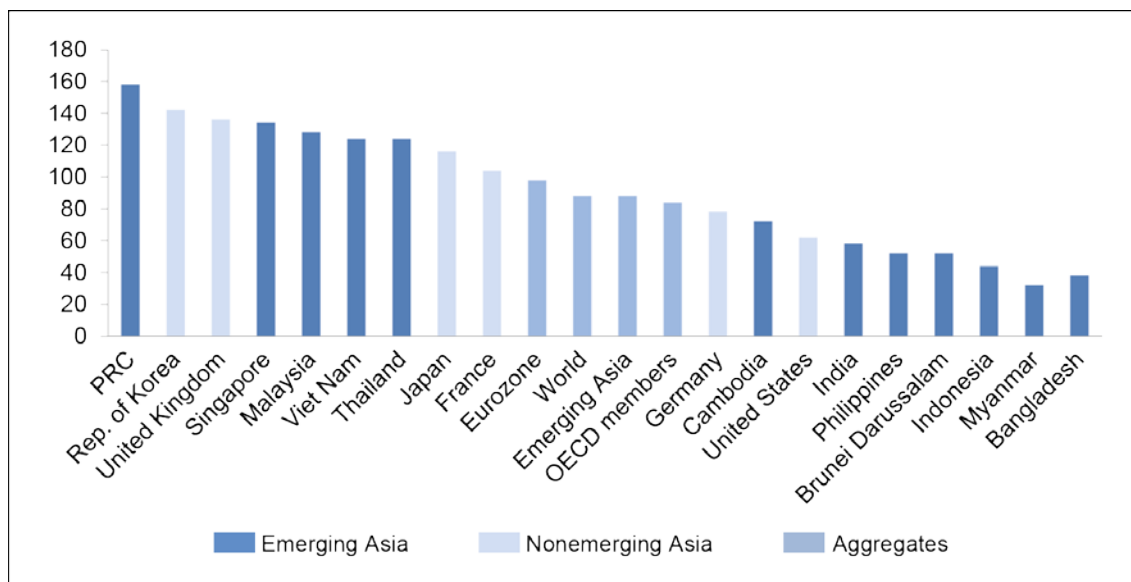
Following the success of saving accumulation from the insurance industries, post offices started collecting deposits and postal life insurance. That postal office insurance covered only the left-behind agricultural farmers and employees in small businesses because the private insurance companies focused more on large cities and big companies.

Figure 1: Dominance of Bank Deposits and the Share of Insurance in Asia
(\$ billion)



Source: Sahay et al. (2015).

Figure 2: Bank Provisions for Domestic Credit to the Private Sector, 2016
(% of GDP)



Source: World Bank, <https://data.worldbank.org/indicator/FS.AST.DOMS.GD.ZS>.

2.2 The Way to Increase the Rate of Return on Infrastructure Investment to Attract Long-Term Investors

As explained in the previous section, Asian countries’ domestic saving has increased since the Asian crisis of 1997. However, the saving is still dominated by bank deposits that tend to be short term. Instruments for long-term saving, such as insurance and pension and mutual funds, should be promoted to boost suitable financing sources for infrastructure investment.

On the other hand, the rate of return from infrastructure investments was not so high. There are also various risks associated with infrastructure investments that cause the expected rate of return to be high from the investor’s perspective. However, there is still a lack of discussion aimed at addressing the risk associated with infrastructure investment from the investor’s point of view. Recent discussions have been mainly focused on (i) how to share the risks between government and the private sector, and (ii) how to reduce various risks associated with infrastructure investment.

Good-quality infrastructure creates a huge positive spillover effect in a region, for instance, new roads will enable farmers to ship their products at cheaper costs and in less time. New railway lines will bring business into the region and commuting to large cities will be efficient and accessible. New apartments will be constructed around this infrastructure. New restaurants and shopping malls will further bring in new employment, which will be generated along the new railway lines. As a result, the amount of tax collected from property, corporate and individual income, and sales will inevitably rise.

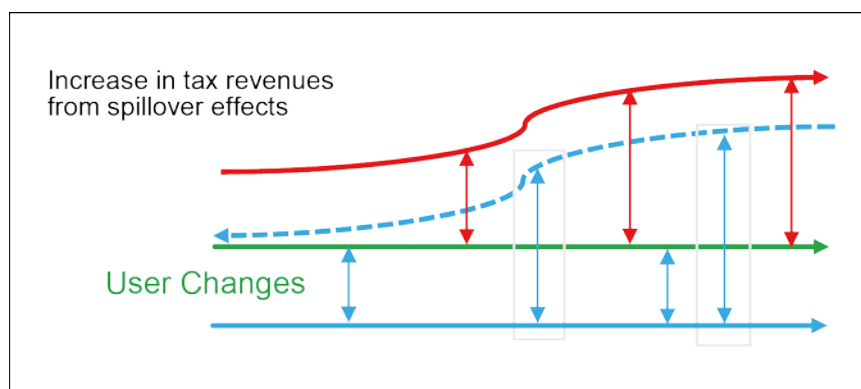
In the past, in Japan and selected countries, railway companies used land capture as a source of revenue for railways in addition to user charges. When a new railway was constructed, railway companies purchased the land from farmers. After that, they sold the land to individuals for housing and sold to commercial businesses at higher prices. So, the companies received revenue not only from the railway user charge but also from the capital gain generated by land transfers. Similar methods were used in the US when their railway had been expanded to the west in the 17th century.

However, land capture is only a one-time gain for railway companies. When a railway is to be constructed, the railway company purchases the land before the railway is constructed and sells it for housing, commercial buildings, etc. when the railway begins service. These gains are only received when the railway is constructed. This does not create continuous income flows for the railway companies.

It is important to have continuous inflows of revenue for infrastructure developers and investors in infrastructure. Spillover tax revenues created by infrastructure will be good sources of revenue in addition to user charges. Railways will benefit citizens with their easy accessibility. Better and sustainable housing and residential areas can be constructed. Stations will provide profitable business opportunities leading to more office space ownership. Property prices will rise, which will increase property tax revenues. The food and hospitality industries, along with commercial trading and textile centers, will get a much-needed boost. The overall corporate income tax will rise. These businesses will create new employment, which will increase income tax revenues. Sales of commercial businesses will rise, which will increase sales tax revenues.

In the past, all these tax revenues were collected by government (either by local government or by central government) and they were not returned to infrastructure investors. However, these spillover tax revenues were created by new infrastructure such as railways, roads, water supply, etc. If infrastructure companies only rely on user charges as shown in Figure 3, then these must be increased to secure a high rate of return for investors in infrastructure. Private participation in infrastructure has been advocated, starting with the PFI (private financial initiative) in the UK. However, most of the discussions were on how to mitigate risks and subsequently how to share the risks associated with infrastructure investment. There has not been much discussion on to increase the rate of return for a long period of time. Spillover tax revenues can be continuous sources for raising the rate of return from infrastructure investments.

Another important aspect of this is water supply, which will also create huge spillover effects in the region. The new residential and commercial buildings constructed will provide huge development in terms of water supply. If private investors finance water supply, they will seek a reasonable rate of return to secure their investment. If all the revenues from infrastructure investments, especially basic infrastructure, are received only from user charges, prices will be high, including water prices. Water supply is a necessity for everybody. In contrast, water services are often underpriced, typically capital-intensive, long-lived with high sunk costs, resulting in a poor record of return (OECD 2018). This calls for a high initial investment followed by a very long payback period.

Figure 3: Return in Infrastructure

Source: Yoshino and Abidhadjaev (2016b).

Another example is road infrastructure. Roads can easily create new residential areas due to their easy accessibility and farmers can sell their products much quicker and at lower costs to cities. However, there are no revenues from the usage of regular roads. In the past, government was the only body that could supply finance for road construction since there was no revenue. If government spends so much money on road construction, other government spending must be cut, or budget deficits will rise. The fiscal sustainability of the government will be at risk. Ordinary roads do not create any spillover income. However, regions will be developed alongside the road, and this will lead to huge spillover economic development, which will create large spillover tax revenues.

2.3 Three Cases of Positive Spillover Effects Created by Infrastructure Investments

Yoshino and Abidhadjaev (2016a) and Yoshino and Pontines (2015) developed a methodology to compute spillover effects created by infrastructure investments. This includes a railway in Uzbekistan, a high-speed railway on Kyushu island in Japan, and a highway in Manila city. The estimations were obtained by using the difference-in-difference method as follows.

In the case of Uzbekistan's railway, the economic growth in the nonaffected region changed from 8.3% to 8.5%, which is only 0.2% growth. On the other hand, the region along the railway (affected region) showed a 2.2% GDP growth from 7.2% to 9.4%. The two regions showed a 2.0% difference in their economic growth. In other words, the railway produced a 2.0% increase in GDP growth as a result of its spillover effects compared to other regions, which created huge tax revenues for the government. A detailed analysis can be seen in Yoshino and Abidhadjaev (2017).

In case of the highway in Manila city, tax revenues in three cities along the highway received three times as much tax revenue after the fourth year of operation (Yoshino and Pontines 2015). This shows a significant increase in tax revenues after four years of operation ($t+4$). Tax revenues in Batangas city went up to 1,209.61 (million pesos) compared to the period before the construction of the highway, as can be seen in Table 5.

Yoshino and Abidhadjaev (2016a) found that in the case of the high-speed railway in Japan, corporate tax, income tax, and other tax revenues (including property tax revenues) were compared in three periods, namely: (i) the construction period,

(ii) operation period without good connectivity; and (iii) the operational period with good connectivity to Osaka and Tokyo. Total tax revenues, personal income tax revenues, corporate tax revenues, and other tax revenues (including property tax revenues) were compared for the three different periods (Figure 4). When the construction started, many speculators who anticipated high rising property values started to purchase the land along high-speed railways. Property tax revenues increased significantly. Construction of these properties increased, thereby leading to employment of many workers and construction companies in the region so that personal income tax revenues and corporate tax revenues increased.

However, during the operational period, there was no connectivity with the large cities of Osaka and Tokyo. That caused personal income tax revenues and corporate tax revenues to decrease compared to the revenues during the construction period. After establishing good connectivity with Osaka and Tokyo, the railway brought businesses and passengers into the region, which led to a huge increase in corporate income and individual income taxes in the region. An interesting phenomenon is that property tax revenues kept on rising due to the expected increase in property values that was speculated.

3. SPILLOVER EFFECTS MEASUREMENT METHODS

3.1 Difference-in-Difference Model to Estimate the Outcome of Infrastructure Investment

This section describes the estimated spillover effects of the three cases of infrastructure investment in Asian countries: the railway in Uzbekistan, the high-speed railway on Kyushu island in Japan, and the high-speed railway in Manila (Yoshino, Helble, and Abidhadjaev 2018). A dummy variable was introduced for before-after the construction periods by taking the difference in the tax revenues between two regions: a value of 1 for the region along the infrastructure and 0 for the other regions where there was no impact of infrastructure investment. As shown in Table 4, the railway provided a 2% difference in their economic growth due to the spillover effects compared to other regions, which created huge tax revenues for government (Yoshino and Abidhadjaev 2017).

In the case of the highway in Manilla city, tax revenues in three cities along the highway received three times as much tax revenue after the fourth year of operation (t+4) (Yoshino and Pontines 2015). There was a significant increase in the tax revenues of Batangas city up to 1209.61 (million pesos) compared to the period before the construction of the highway, as can be seen in Table 5.

The spillover effects can be simply defined as follows, as recommended by Minister Dominguez of the Philippines when he tried to apply this method to the Philippines.

- (1) Compute the national average growth rate of tax revenues in each tax item, such as corporate tax, personal income tax, property tax, sales tax, etc.
- (2) Compute the growth rate of all tax revenues along the newly constructed infrastructure, such as roads, highways, railways, water supply, etc.
- (3) Take the difference between (2) and (1) by defining the difference as spillover effects.

Table 4: Numerical Estimation of the Difference-in-Difference Coefficient Using Regional Data for Uzbekistan, 2005–2008 and 2009–2012

Region Group	Outcome	Pre-railway Period	Post-railway Period	Difference
Nonaffected Group	Average GDP growth rate (%)	8.3	8.5	0.2
Affected Group	Average GDP growth rate (%)	7.2	9.4	2.2
Difference				2.0

GDP = gross domestic product.

Note: The affected group includes the regions of Samarkand, Surkandharya, Tashkent, and the Republic of Karakalpakstan.

Source: Yoshino and Abidhadjaev (2017).

Table 5: Calculated Increase in Business Tax Revenues for the Beneficiary Group Relative to Nonbeneficiary Group 4 (million pesos)

Region	Year						
	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	637.83	599.49	742.28	1,209.61

Source: Yoshino and Pontines (2015).

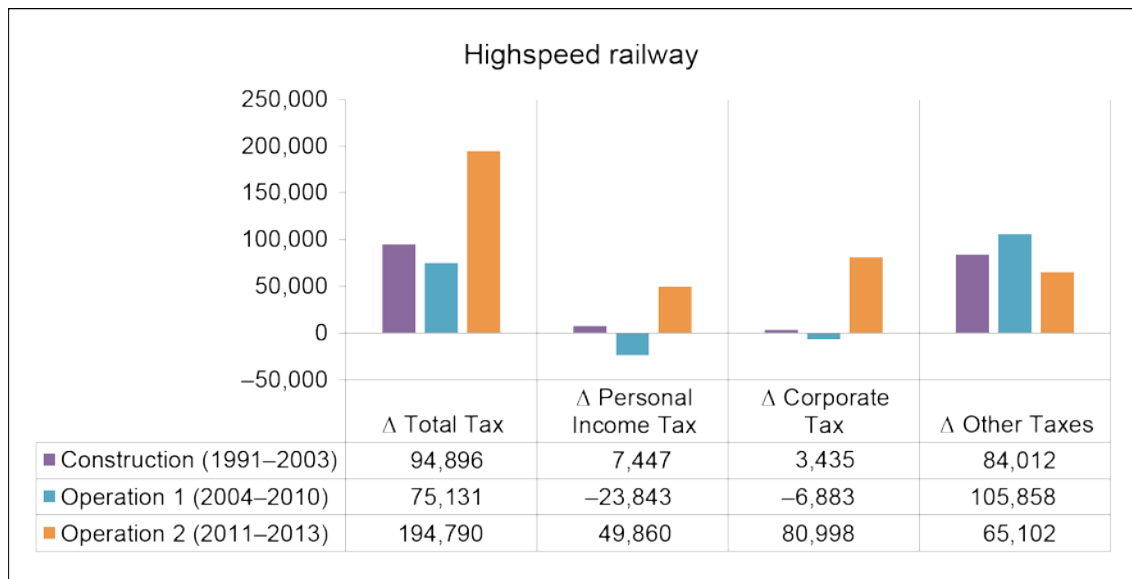
In the case of the high-speed railway in Japan, corporate tax, income tax, and other tax revenues, including property tax revenues, were compared in three periods, namely: (i) the construction period; (ii) the operational period without good connectivity; and (iii) the operational period with good connectivity to Osaka and Tokyo (Yoshino and Abidhadjaev 2017). Total tax revenues, personal income tax revenues, corporate tax revenues, and other tax revenues (including property tax revenues) were compared for the three different periods (Figure 4). When the construction started, many speculators who anticipated a significant rising of property values started to purchase the land along high-speed railways, which caused property tax revenues to go up significantly. The construction involved the hiring of many workers and construction companies in the region, so that personal income tax revenues and corporate tax revenues increased. Due to the operational period of no connectivity with the large cities of Osaka and Tokyo, the personal income tax revenues and corporate tax revenues went down compared to the construction period. Furthermore, good connectivity with Osaka and Tokyo brought businesses and passengers into the region, which created a huge increase in corporate income and individual income taxes. Interestingly, property tax revenues kept on rising because of the expected increase in property values that was speculated.

The spillover effects can be simply defined, as shown in Figure 5, as recommended by Minister Dominguez of the Philippines when he tried to apply this method to the Philippines (Yoshino and Pontines 2015).

- (1) Compute the national average growth rate of tax revenues in each tax item, such as corporate tax, personal income tax, property tax, sales tax, etc.
- (2) Compute the growth rate of all tax revenues along the newly constructed infrastructure, such as roads, highways, railways, water supply, etc.
- (3) Take the difference between (1) and (2) by defining the difference as spillover effects.

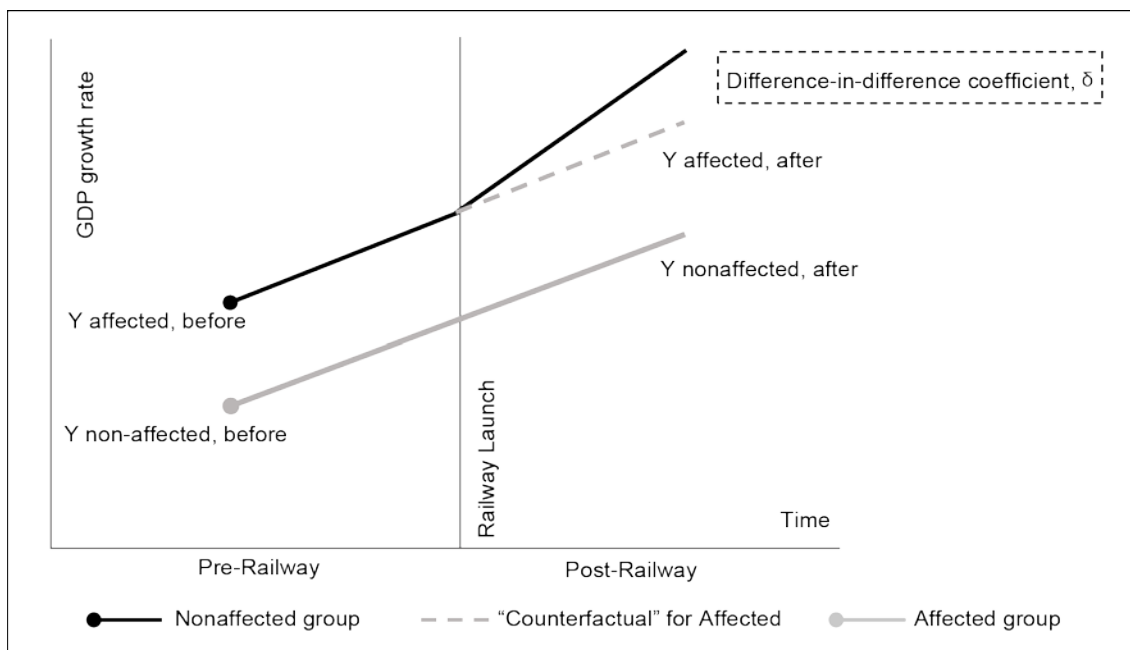
If there were no infrastructure investment, increased tax revenues would never be obtained by the government. Local and central governments do not deduct their existing tax revenues, but part of the tax revenues can be distributed to private investors who invested in the infrastructure. The proposed methods of returning the spillover tax revenues will encourage the development of rural regions. In the Philippines, many infrastructure investments are financed by the central government. However, the spillover tax revenues are mainly collected by the local government, which increases their tax revenues. If part of their increased spillover tax revenues is returned to the central government, they can invest the returned spillover tax revenues in rural roads, which will mitigate the poverty in rural regions in the Philippines. The proposal of returning the spillover tax revenues to private investors will also apply to central government in certain countries.

Figure 4: Estimates of Connectivity-Increased Tax Revenues
(¥ million)



Source: Yoshino and Abidhadjaev (2017).

Figure 5: Difference-in-Difference Method with the GDP Growth Rate Outcome Variable



GDP = gross domestic product.

Source: Yoshino and Abidhadjaev (2017).

3.2 The Share of Spillover Effects through Inducing Private Capital and Employment in Japan

In order to properly discuss the accuracy of the share between the government and the private sector, a theoretical approach is imperative. The translog production function will give us the distinction between direct effects and indirect effects (= spillover effects).

The following Table 6 is an estimate of the spillover effects of investment in infrastructure in the case of Japan (Nakahigashi and Yoshino 2016). The share of spillover effects through inducing private capital and employment in Japan was between 66.1% and 68.9%. Therefore, in the case of Japan, government should take 31.1–33.9 % of spillover tax revenues and private investors should be allocated 66.1%–68.9% of spillover tax revenues. To be accurate, the share between the public sector and the private sector has to be computed in each case. However, in practice, it is not easy to run the translog production function shown in the table. Therefore, the simple way is to split the spillover tax revenues 50% between government and private sectors. As a result, local government will work hard to increase the spillover effects from infrastructure investments, which will create higher tax revenues.

The current system in infrastructure does not provide any incentives to the government to increase the spillover effects of infrastructure investment. The share of spillover tax revenues will lead to both private investors and government working hard to develop the region with each infrastructure.

Table 6: Spillover Effects of Infrastructure Investment for the Case of Japan

Effect	Year					
	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

Effect	Year				
	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

Source: Yoshino and Abidhadjaev (2016b).

Table 7: Positive Spillover Effects Determined by Infrastructure Investment and Education (secondary school and university)

Regression Number	REG.1	REG.2	REG.3
Variables	Coef. (t-stats)	Coef. (t-stats)	Coef. (t-stats)
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)*ln(Sec)	0.20 (1.59)		
ln(UNI)			0.21 (2.07)
ln(Kg)*ln(Uni)		0.24 (2.76)	
Constant	-0.28 (-0.33)	0.56 (0.69)	0.48 (0.57)
Number of observations	44	44	44
R-squared	0.21	0.3	0.3
F-statistic	2.62	4.14	3.29

Source: Yoshino and Abidhadjaev (2016b).

3.3 Mitigation of Environmental Protection Associated with Infrastructure

Yoshino and Hesary (2018) and Sachs et al. (2019) propose charging tax on CO₂ and other gas emissions to promote green finance. Fossil fuels, especially coal, are the main sources of fuel for the emerging Asian economies. Excessive reliance on fossil fuels, especially coal, is a major cause of GHG emissions in this region. Low-carbon energy projects are sustainable solutions for mitigating the climate warming issues from the current critical level. Carbon or environmental taxation is one of the solutions to protect the environment and force the hand of polluting industries.

Taxes can directly address the failure of markets to take environmental impacts into account by incorporating these impacts into prices. Environmental pricing through taxation gives consumers and businesses the flexibility to determine how best to reduce their environmental footprint. This enables the lowest-cost solutions, provides an incentive for innovation, and minimizes the attempt of government to pick winners (OECD 2011).

Another necessity for the development of low-carbon energy projects is raising energy self-sufficiency and energy security through diversification of energy resources. Too much reliance on limited energy resources (coal, oil, or gas) will reduce the resilience of the economy and make it more prone to energy price fluctuations. Savings at insurance companies are predominantly long-term (10, 20, or 40 years), which means insurance companies and pension funds can allocate their resources to long-term projects such as infrastructural projects or mega energy projects (large hydropower projects, gas-based power generation projects, etc.). On the other hand, electricity tariffs are regulated by government and kept at low rates. Hence, to increase the investment incentives, the spillover effects originally created by energy supplies need to be utilized and tax revenues refunded to investors in energy projects. This is a form of fiscal policy reform.

Therefore, this paper may contribute by encouraging government to consider the spillover effect of energy supply by the private sector, especially in nonelectrified regions. Then, the entire increase in the tax revenue, or a portion of it due to more output in the region because of electrification, needs to be injected into private energy projects, especially into low-carbon energy projects, to increase the rate of return of these projects.

3.4 Determinant Factors Increasing the Economic Value of Spillover Effects

The relation of education and technology to the region's economic growth could be expressed in the production function as $Y = A F(K_p, L, K_g)$, where Y = regional GDP (log difference of GDP per capita in 1991–2010), A = technological progress, K_p = private capital, L = labor, and K_g = infrastructure. If the technological progress (A) goes on, the regional output that is created by infrastructure investment will further increase. Human capital development (L) will enhance the regional output created by spillover effects.

The results (Table 7) show that the level of education of infrastructure stakeholders determines significantly the economic value of the spillover effects of the project. Stakeholders included investors, government, landowners, farmers, and businessmen both from SMEs and start-ups. Yoshino and Abidhadjaev (2016b) pointed out that secondary school and university education together with infrastructure investments

create higher GDP in the region, as estimated through the use of data from 40 countries.

Nowadays, a modern education system can be introduced by utilizing information technology supporting innovations that are very important in the education system, especially in engineering education. Traditionally, many students from rural areas could not enter good schools or educational institutions due to the disparity of education quality and limited access to information. The expansion and advancement of technology make it convenient for academics to deliver and receive lectures remotely.

This paper further recommends including Internet-based education for all levels from secondary to university and engineering education. It is important for governments to facilitate education using technology equipment and to encourage students and teachers to better use these facilities for personal growth.

4. INNOVATIVE APPROACHES TO FINANCING INFRASTRUCTURE INVESTMENT

4.1 Hometown Trust Funds to Promote SMEs and Start-up Businesses

At this point, the authorities should think beyond building infrastructure. Even if the infrastructure is available, most SMEs find it difficult to receive financial support for their start-ups. Banks and financial institutions are often reluctant to lend money to start-ups, due to the high risks involved. This is where “hometown investment trust funds” can encourage SMEs and other businesses. Twenty years ago, Japan was able to create such funds and that is how it developed a generation of new entrepreneurs.

These funds had two primary objectives. The first was to provide money for start-ups – especially for women who wanted to start their own businesses, such as restaurants and shops. The second was to start Internet-based selling portals where the villagers could sell their products to markets outside their villages. Through Internet marketing they could capture a large clientele around the country, and due to the well-built infrastructure, goods and produce could be dispatched without much delay.

An important aspect for hometown trust funds to succeed is digital literacy. The paper proposes better Internet-based education for secondary to university students on subjects including engineering education. This will also further benefit women’s access to business development. This effective and accessible model of lectures can be transmitted all over the country. Hence, various groups of people can learn basic technical skills and languages, and gain knowledge about many aspects of industries and vocations.

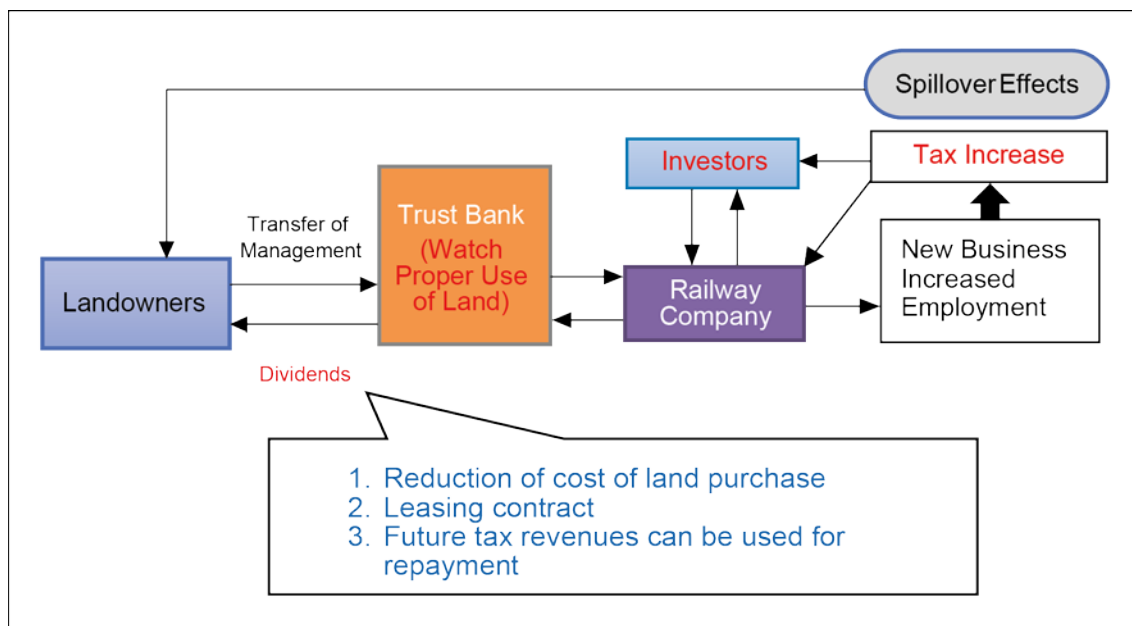
4.2 Land Trusts to Smoothen Land Acquisition

Acquisition of land for development projects has been a major barrier in many Asian countries. Landowners are reluctant to give up their land for development projects. This paper suggests setting up a land trust, which can be a solution to the barriers mentioned. According to the land trust practiced in Japan, the owners retain their ownership of the land while they lease it for a stipulated period, say, 99 years for infrastructure projects.

Under the land trust method, landowners entrust their land to trust banks and the trust banks manage the land (Yoshino et al. 2018). For instance, Figure 6 shows that

landowners, whilst retaining ownership, transfer the usage right to manage the land to the land trust, which further leases it to a railway company. The landowners will receive part of the profit as dividends. The proposed framework increases their profit by leasing land for infrastructure and development projects.

Figure 6: Land Trust for Infrastructure Investment



GDP = gross domestic product.

The method is to consolidate assets owned by individuals, entrust them to the trust bank, and make a better use of the assets. It has a similar function to a trust of money. Consolidating money to operate more effectively is the same as consolidating assets owned by individuals who are not able to maximize the utility of their assets by themselves or do not have the knowhow; entrusting them to the trust bank can increase the utility of the assets.

This is one of the most efficient ways to allow people to give usage rights to infrastructure companies and city planning. Further, the acquisition costs of land will significantly reduce, which thereby reduces the one-time costs of infrastructure developers. They can only pay for the rehabilitation costs of landowners and return an annual rent for 99 years to landowners. The continuing spillover tax revenues from the infrastructure project will be able to aid in financing these rental payments to landowners.

4.3 City Infrastructure

The city planning aspect has become a guidance for stakeholders when developing an infrastructure project to measure the gain from a positive spillover effect of an infrastructure investment. When considering only a construction perspective, the capability and capacity of the proposed infrastructure in developing a region will benefit various communities. Further, by allocating designated areas or zones to commercial and residential areas, a more productive and efficient city can be created. Both government and private sectors attempt to enhance the spillover effects of infrastructure investments for urban development if the proposed methods are implemented (Yoshino, Abidhadjaev, and Hendriyetty 2019).

The Mass Transit Railway (MTR) in Hong Kong, China is an interesting example of land capture (Suzuki et al. 2015). Established in 1975, the Mass Transit Railway (MTR) corporation is a government-owned enterprise that builds, operates, and maintains a mass transit railway system for Hong Kong, China. This public transport needs to conduct its business according to prudent commercial principles (Dimitriou and Cook 2018). Through the 1980s and 1990s, the government fully acquired the ownership of MTR as a public company and offered about 20% of the ownership to private sectors (Cervero and Murakami 2009).

The basic rule applied in Hong Kong, China is that the government grants the MTR corporation a “running line lease” at a nominal charge for the use of land to develop railway infrastructure, such as stations and track. Railway depot sites are granted to the company as a normal land grant, and land premium is charged on the basis of industrial use, as railway maintenance is regarded as an industrial activity. When the railway depot site is also used for property development, an extra land premium is paid for property development rights. Indeed, the government granted the assembled rights of way for lines, stations, and depots and sold the development rights of sites above the new stations and depots to the MTR corporation to build the Kwun Tong line (Dimitriou and Cook 2018).

This is not full return from the spillover effects from our proposal. On the other hand, MTR can receive not only user charges but also the development return from regional development. However, the Hong Kong, China MTR case may not be implemented in a country where the land is owned by individuals and privately.

4.4 Long-Term Infrastructure Floating Bond

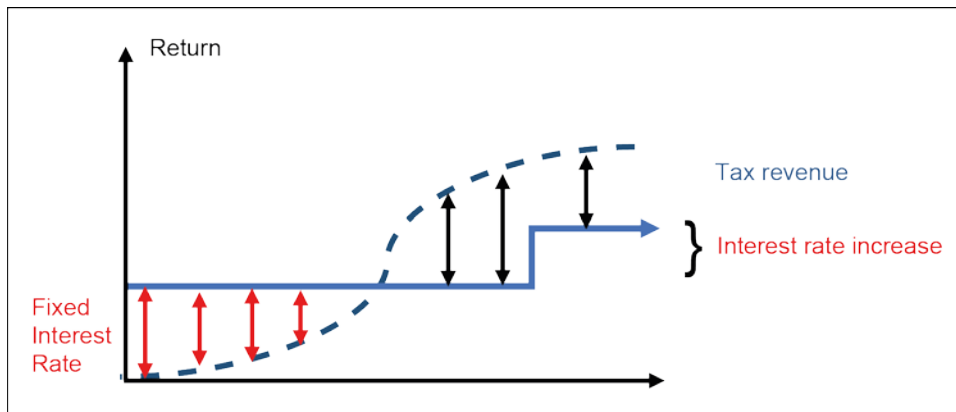
As explained previously, infrastructure projects take a long time to finish or be ready to operate. Therefore, it takes a while for a project to generate a return and the economic multiplier effects work to increase tax revenue. For example, a highway project in Manila took about four years after the operation before the net rate of return rose. In the high-speed railway in Japan, the rate of return rose after connectivity with large cities had been completed. In this situation, the use of a floating bond, instead of a conventional fixed-term bond, could be a solution to this problem.

Infrastructure projects have low or no return in the beginning stage of development. In contrast, banks, insurance companies, pension funds, and other financial institutions that are expected to finance infrastructure projects demand a positive rate of return in all stage of the projects. So, if the project is financed by a conventional bond, the issuer, which in this situation is the government, will bear the cost of interest in the earlier stages of the projects.

This paper proposes the application of a floating bond to finance infrastructure projects. A floating bond could be issued by infrastructure companies. The yield of the bond could be adjusted in line with the return from the projects. With this mechanism, government and infrastructure companies will work together to boost economic development in the region by enhancing the positive spillover effects of the infrastructure projects and introducing a land trust mechanism. The more the economy in the region develops, the more the positive spillover increases; then there will be more tax revenue that can push the yield of the bond to rise. The government and infrastructure companies will also be motivated to provide SME finance to start-up and small business in the expectation that the spillover tax revenue will increase even faster.

As shown in Figure 7, if a floating bond is issued to finance an infrastructure project, in the first few years, the actual rate of return from the infrastructure investments may be low. However, several years later, the rate of return will keep increasing as the city develops payback to infrastructure. When the rate of return becomes high, the initial losses of the infrastructure bond will be compensated. If the spillover effects increase, the interest rate or yield of the bond will rise.

Figure 7: Long-Term Infrastructure Bond (Floating Rate)



Source: Authors.

REFERENCES

- Asian Development Bank (ADB). 2017. *Meeting Asia's Infrastructure Needs*. Manila.
- R. Cervero, and J. Murakami. 2009. Rail and Property Development in Hong Kong: Experiences and Extensions. *Urban Studies* 46 (10): 2019–2043.
- H. Suzuki et al. 2015. *Financing Transit-Oriented Development with Land Values: Adapting Land Value Capture in Developing Countries*. NY: World Bank Group. <http://documents.worldbank.org/curated/en/468551468165570019/pdf/936860PUB001SB0TransportDevLV0final.pdf> (accessed 21 May 2019).
- H. T. Dimitriou and A. H. S. Cook. 2018. *Land-Use/Transport Planning in Hong Kong: The End of an Era: A Review of Principles and Practices*. Vanderbilt Avenue, NY: Routledge.
- IMF. World Economic Outlook. <https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/download.aspx> (accessed 5 May 2019).
- J. D. Sachs, W. Thye, N. Yoshino, and F. Taghizadeh-Hesary. 2019. Why Is Green Finance Important? *ADBI Working Paper Series*. No. 917. Tokyo: Asian Development Bank Institute.
- M. Nakahigashi, and N. Yoshino. 2016. Changes in Economic Effect of Infrastructure and Financing Methods. *Public Policy Review*. 12 (1). pp. 47–68.
- N. Yoshino, S. Paul, V. Sarma, and S. Lakhia. 2018. Land Acquisition and Infrastructure Development Through Land Trust Laws: A Policy Framework for Asia. *ADBI Working Paper Series* No. 854. Tokyo: Asian Development Bank Institute.
- N. Yoshino, M. Helble, and U. Abidhadjaev. 2018. *Financing Infrastructure in Asia and the Pacific: Capturing Impact and New Sources*. Tokyo: Asian Development Bank Institute.
- N. Yoshino and U. Abidhadjaev. 2016a. Explicit and Implicit Analysis of Infrastructure Investment: Theoretical Framework and Empirical Evidence. *American Journal of Economics*. 6 (4). pp. 189–199.
- N. Yoshino and U. Abidhadjaev. 2016b. Impact of Infrastructure Investment on Tax: Estimating Spillover Effects of the Kyushu High-Speed Rail Line in Japan on Regional Tax Revenue. *Journal of Infrastructure, Policy and Development*. 1 (2): 129–148.
- N. Yoshino and U. Abidhadjaev. 2017. An Impact Evaluation of Investment in Infrastructure: The Case of a Railway Connection in Uzbekistan. *Journal of Asian Economics*. 49 (1). pp.1–11.
- N. Yoshino, U. Abidhadjaev and N. Hendriyetty. 2019. Quality Infrastructure Investment and Land Trust. *Global Solutions Journal*. (1) [forthcoming].
- N. Yoshino and V. Pontines. 2015. The Highway Effect on Public Finance: Case of the STAR Highway in the Philippines. *ADBI Working Paper Series*. No. 549. Tokyo: Asian Development Bank Institute.
- OECD. 2010. *A Guide to Environmentally Related Taxation for Policy Makers, in Taxation, Innovation and the Environment*. Paris.
- OECD. 2018. Financing Water, Investing in Sustainable Growth. *OECD Environment Policy Paper No. 11*. Paris: OECD Publishing.

- R. Sahay et al. 2015. A Bird's-Eye View of Finance in Asia: *The Future of Asian Finance*, by H. Kang, P. Jeasakul, and C. H. Lim. Washington, DC: International Monetary Fund. https://asean.elibrary.imf.org/doc/IMF071/22239-9781498317191/22239-9781498317191/Other_formats/Source_PDF/22239-9781513555591.pdf (accessed 1 May 2019).
- World Bank. Domestic Credit Provided by Financial Sector. <https://data.worldbank.org/indicator/FS.AST.DOMS.GD.ZS> (accessed 5 May 2019).