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ECONOMIC EFFECTS OF INFRASTRUCTURE  
INVESTMENT AND ITS FINANCING

# Quality Infrastructure Investment: Ways to Increase the Rate of Return for Infrastructure investments

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## Abstract

Infrastructure is crucially important to foster a countries' economic development and prosperity. The demand for infrastructure development is quite high. However, the financing side still cannot fulfill this demand. To address this gap, this paper points out the importance of high-quality infrastructure investment where quality is measured by how much economic and social value can be created by infrastructure projects in a region. Simultaneously, the values created by the infrastructure could be utilized to address the financing gap of infrastructure investment. High-quality infrastructure will create high spill-over effects which will be reflected in the increase of the growth rate and tax revenue in the affected areas. Traditionally, the increase of tax revenue has been retained by governments. This study reveals that if part of the tax revenue can be directly distributed to infrastructure shareholders, including investors and landowners, the financing gap problem would diminish, and the construction time could be shortened. Building quality infrastructure does not refer to simply physical infrastructure, but also reforms, setting up the correct legal and institutional framework for infrastructure development. New models are being proposed for these reforms such as city infrastructure, hometown trust funds, and promotion of SMEs and start-up businesses, along with changing the face of educational and land trust for land acquisition.

Keywords: quality infrastructure, spill-over effects, tax revenue, infrastructure financing, land acquisition



## Challenge

**Infrastructure is crucially important to foster a countries' economic development and prosperity.** Investments in infrastructure contributes to higher productivity and growth, facilitates trade and connectivity, and promotes economic inclusion. Recognizing this critical role, Japan attempts to revive the infrastructure agenda under its G20 presidency.

**High infrastructure demand.** McKinsey (2013) has reported that from 2016 to 2030, there will be a need to invest 3.3 trillion USD annually on average to keep pace with the projected growth. Of which, 60% is accounted for by developing countries. Furthermore, ADB has estimated 1.7 trillion USD will be required every year to maintain rates of growth sufficient to alleviate poverty in the Asian region (ADB 2017).

**Financing gap for infrastructure development.** Although a lot has been accomplished, challenges remain regarding this agenda. To find the source of funds in closing these financing gaps, countries cannot simply rely on public financing and multilateral development banks. Both of them only account for approximately 45% of the global infrastructure financing needs (GIH 2016). Private investors are the potential source of funds for the remaining infrastructure financing needed. Public-Private Partnership (PPP) has been putting in effort to promote this narrow this gap as well.

**Infrastructure investment is less attractive for private investors.** In developing countries, the involvement of private sectors is quite low. There are several reasons why there is less appetite for private investors to invest in infrastructure:



- Long term investment and banks' asset liability mismatch. In developing countries, the capital market is shallow and more volatile, people tend put their money in bank deposits which is usually short to medium term in nature. This causes banks' assets to always have shorter tenor compared to the long-term financing needs of infrastructure. This mismatch is likely to constrain the lending in countries where risk hedging instruments are less developed. Furthermore, the banks extending many long-term loans leave themselves open to liquidity risks. On the other hand, from the point of view of the project development itself, if a long-term project can only be financed by short-term bank credit, it also means the company faces re-financing risks, which results in the increase of uncertainty regardless of at what price the project can continue to be refinanced.
- The expected rate of return in developing countries' infrastructure investment is relatively high due to the high risk exposure faced by investors and lack of viability of long-term contracts in emerging markets. The exposures include the role of government agencies and the perceived instability of public policies with regards to infrastructure. Some technical risks are also considered such as regime change, cost increases, unexpected revenue decreases, unexpected expenses and delay in land acquisition (Yoshino et al, 2018). Similar to most direct foreign investment concerns, foreign infrastructure investors also consider macro-economic risks such as taxation or the ability to work with local partners (as part of risk exposure) (GIH 2016).
- Failure of PPP and low yield problem. Despite this high risk exposure,



the infrastructure projects could not provide decent return to their investors. This is mainly because the return of the project is coming mostly from operating revenue or usage price such as toll fees or train fares. This return is relatively low compared to the risk that the investors face during project construction and at the development. For projects with low economic value, the government becomes involved to cover the risks through viability gap funding using Public-Private Partnership (PPP). However, this PPP concept burdens the government budget, which drives the money to major accumulated debt for local and central governments.

- Land acquisition is one of the difficulties in infrastructure investment. When the construction of a road is planned, city officials have to negotiate with many landowners. Large amounts of time and money mobilization is required at the early stages of infrastructure construction.

## Proposal

### Introduction

In line with the requirement of quality infrastructure, the completion of physical infrastructure is not the only measurement for successful infrastructure projects. A high-quality infrastructure investment should have positive economic value that can stimulate job creation, enhance foreign direct investment, and improve productivity and tax revenue in the area in the end.



The connectivity among regions and rural community is important to boost economic value. Therefore, the development of railways, roads and highways is crucial. Such comprehensive infrastructure projects should have the ability to support communities and build business opportunities, including improving agriculture/farming. Farmers will be able to transport their harvest conveniently and access markets outside their regions easily supported by these infrastructure facilities. In other words, market accessibility and trade networks can be greatly expanded vastly if quality infrastructure thrives in a country. Furthermore, the connectivity will also lower the production cost and shorten the distance between buyer and producer, eradicating the “middle man” concept. This allows room for farmers and other villagers to start small and medium enterprises, building entrepreneurship capacity for farmers.

Based on the challenges above, this paper addresses the importance of creating high quality infrastructure investment measured by how much economic and social value can be created by infrastructure projects in a region, while the strategy is also relevant to addressing the financing gap in infrastructure investment.

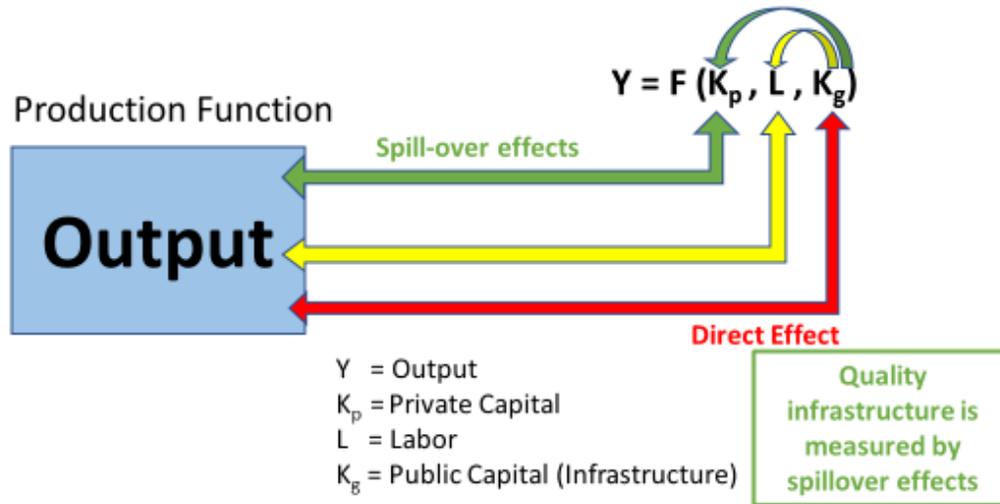
### **Spill-over Effects of Infrastructure Projects**

There are two effects in infrastructure development: direct and indirect. Direct effect means when private firms can increase outputs without changing inputs, while indirect effects occur when private firms want to further increase output by changing the amount of inputs in order to maximise profits. This indirect effect reflects the benefits of infrastructure investment for the economic activities of private firms which consequently increases capital inputs and employment resulting from infrastructure investment. The indirect



effect is assumed to be equal with the spillover effects, as explained by Figure A. below.

Figure A. Direct Effect and Spill-Over Effects



This spill-over effect could be described by the increase of regional GDP (Y), which is affected by the change of regional development created by infrastructure investment ( $K_g$ ). The increase in regional development ( $K_g$ ) will drive new business opportunities ( $K_p$ ) and create new employment (L).

This concept is explained in the equation below:

$$\frac{dY}{dK_G} = \eta_{K_G} \frac{Y}{K_G} + \eta_{K_P} \frac{\eta_{K_G} \eta_{K_P} + \beta K_G}{\eta_{K_P} (1 - \eta_{K_P}) + \beta K_L} \frac{Y}{K_G} + \eta_L \frac{\eta_{K_G} \eta_L - \beta K_G}{\eta_L (1 - \eta_L) + \beta K_L} \frac{Y}{K_G}$$

As new businesses start production, hotels and restaurants are expected to open near stations and roads. Those new businesses will create new employment. Furthermore, property prices will also rise which will increase property tax revenues. New business activities will also increase corporate tax



revenues. New employment will increase, and income tax revenues and sales tax revenues will also start to rise (near locations of the infrastructure investment).

The increase of tax revenue is described in the equation below:

$$\Delta T_{it} = \alpha_i + \phi_t + \beta X_{it} + \delta D_{gt} + \varepsilon_{it}$$

$\Delta T$  is the increase of tax revenue of the region impacted by infrastructure projects,  $\alpha_i$  is the sum of autonomous affect, and  $(\alpha)$  is the time-invariant unobserved region-specific affect,  $\phi_t$  is the year-specific growth effect;  $X$  denotes time-varying covariates (vector of observed variables),  $D$  is the binary variable indicating whether the observation related to the affected group after the provision of the project, and  $\varepsilon_{it}$  is the error term, assumed to be independent over time.

The increase in the tax revenue of infrastructure project using this method has been applied to Manila’s highway. It shows significant increase of tax revenues after 4 years of operation (t+4). Tax revenues in Batangas city went up to 1209.61 (million peso) compared to the period before construction of the highway, as seen in Table 1.

**Table 1. Calculated Increase in Business Tax Revenues for the Beneficiary Group Relative to Nonbeneficiary Group 4 (P million).**

Years	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: *The “Highway Effect” on Public Finance: The Case of the Southern Tagalog Arterial Road Tollway in the Philippines* (Yoshino & Pontines 2018)



Based on the explanation above, the economic value of infrastructure development is reflected in the rise of the growth rate or the increase of total tax revenue. The growth is reflected in the total GDP including value added from industries impacted by the projects in surrounding areas. The total tax revenue could be in the form of personal and corporate income taxes or property and sales taxes. Yoshino and Abidhadjaev (2017, 2016) use the difference in “difference approach” to quantify the additional economic value of infrastructure projects in Kyushu and Uzbekistan using tax revenue and growth rate respectively. Their studies found that the growth and tax revenue in the regions rise in line with the economic development of the areas.

### **Policies Proposed**

In the conventional system, the increase of economic value in the form of tax revenue (as a result of the spill-over effect of infrastructure) is retained by the government. The revenue could be used for the next infrastructure development or other public facilities. There is no direct incentives for infrastructure investors except the usage charge which is often lower than expected. With the challenges that the governments face to finance their infrastructure development, a new design of dividend policy for investors and the salary system of the infrastructure operating entity for both entities and investors is important.

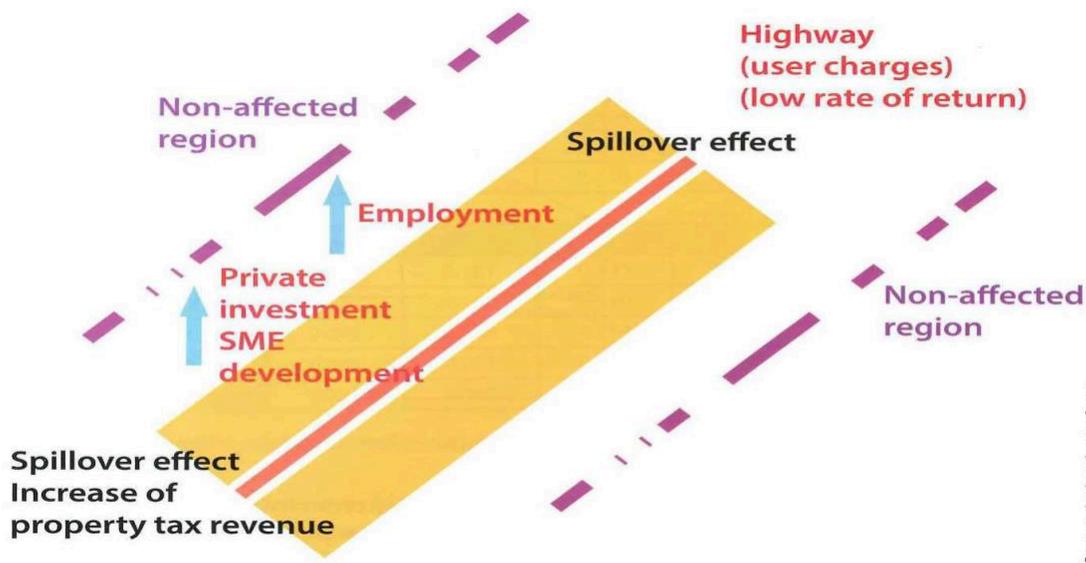
With our concept, we propose the sharing of spill-over in infrastructure development with infrastructure stakeholders, including investors and landowners. In line with the progress of economic development, regional development will lead to higher tax revenues. If part of these increased tax revenues were returned to the investors in infrastructure, their rate of return



will keep on increasing for many years keeping pace with the development of the region.

### Spill-overs to Infrastructure Investors

The economic spill-over effects derived from infrastructure projects could be utilized to incentivize investors to have a better return and at the same time stimulate creativity to make the infrastructure projects more economically functional and productive. For example, Kyushu’s rapid railway train company increased the tax revenue in the area during the construction, but then revenue reduces when operation commences. However, when the railway connected to large cities, the tax revenue increased significantly. This shows stimulations expecting high returns is not always successful. With motivation for a better return, investors and governments will find ways to come up with projects that yield higher returns.



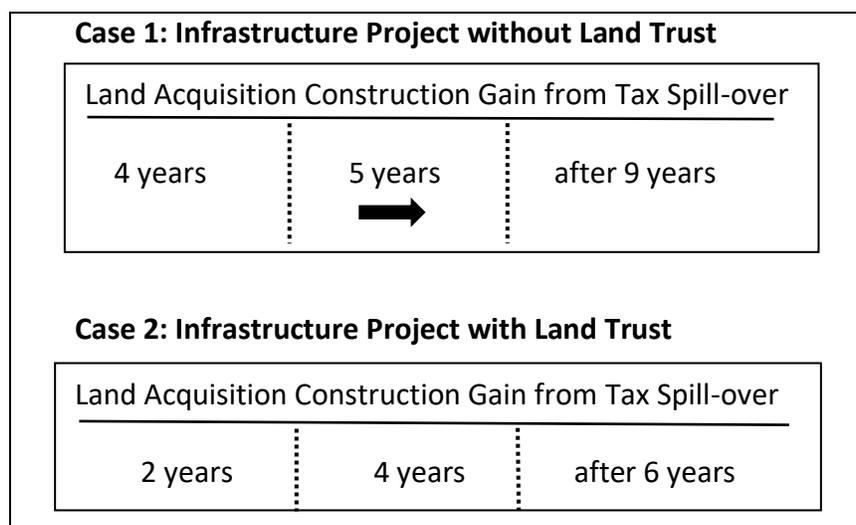
Source: Closing the Asia Infrastructure Gap - BRI, Public Investment, Private Financing, and Spillover Effects. (Yoshino et al, 2018)



### Spill-overs to Landowners

A similar concept could be applicable to landowners whose lands are used for infrastructure projects. Landowners play an integral role in deciding allocation and development of infrastructure projects (Iriwn 2017). In many developing countries, land acquisition is one of the major obstacles in infrastructure development. Using the spill-over from the infrastructure concept, the economic value distributed to landowners could be in the form of rent with a long term leasing contract. The sources of rent payment could be from the spill-over of tax revenue or additional economic value from projects.

**Figure D. Land Trusts Shorten the Completion Time of Infrastructure Projects**



Source: *Land acquisition and infrastructure development through land trust laws: A policy framework for Asia.* (Yoshino et al, 2018)

Sharing spill-over from the infrastructure investment with landowners in the form of rent payment proves that the shortening the construction time of



infrastructure projects (Figure D.) will be beneficial. Acquisition of land is often very difficult in infrastructure development since the land owners feel they will lose the opportunity to gain greater economic value in the future. By applying this concept and providing them with recurring economic compensation in the form of rent, the land owners will have sustainable income over the years.

## **Recommendations**

In developing infrastructure, we cannot investigate infrastructure projects in isolation. There are many areas that require careful design in order to build quality infrastructure projects. Most regions in Asia struggle with digital connectivity, hampering the process of information dissemination to large population in short period of time. Encouraging quality infrastructure investments to address this problem will lead to greater access of skill-based education through digital mediums, thus positively impacting people welfare.

In order to positively impact productivity, growth, and tax revenue, it is imperative that reforms be well implemented in infrastructure development. Creating an institutional framework with poor implementation may lead to more problems than solutions. Therefore, we propose suggestions to facilitate better implementation of the sharing of spill-over infrastructure projects.

### **City infrastructure**

When developing infrastructure, many countries, policymakers, builders and contractors overlook the city planning aspects. City planning is imperative for construction of sustainable infrastructure. This can ensure a positive spill-over



effect from infrastructure investments. Traditionally, infrastructure has been considered only from the *construction* perspective. However, it goes much further beyond simple construction. It is pertinent to address the capability of the proposed infrastructure to *develop* the region, cascading the benefits to multiple communities. Such projects should allocate areas or zones for markets, shops, residencies and manufacturing industries. This kind of zoning will help create a good city.

### **Hometown trust funds to promote SMEs and start-up businesses**

The authorities should think beyond “building infrastructure.” Encouraging businesses to grow in the region impacted by the infrastructure is also important. 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 inherent high risks. This is where the “hometown investment trust funds” (HIT) can play an integral role. The basic objective of HIT funds is to connect local investors with projects in their own locality in which they have personal knowledge and interest (Yoshino and Taghizadeh-Hesary 2017). Furthermore, the “hometown trust fund” can also improve the inclusiveness in the region. Due to the nature of SMEs and start-ups, female participation into labour markets can be encouraged by providing hometown funds.

### **Enabling Digital Literacy for Better Education**

The level of education among infrastructure stakeholders also determine how big the economic value of the spill-over effects (of the project) can get. Said stakeholders include investors, government, land-owners, farmers, and



businessman (both from SMEs and start-ups). Yoshino and Abidhadjaev (2016) show that the secondary school education and university education together will lead to a higher GDP in the region infrastructure investment estimated using data of 40 different countries.

The modern education system can be introduced using of mobile phones and internet. Technological progress and innovations are very important in the education system, especially in STEM education. Traditionally, in order to receive quality education, students had to attend exclusive private schools which have a very competitive admission process in Asia. With the expansion and advancement of the technology, it is rather convenient for young students and even for those keen to study further, to listen to compelling lectures and learn from the foremost professors and academicians through internet and smart phones, irrespective of their geographical location. It is important for the governments to provide facilities with quality technology and encourage students and school leavers to make use of these facilities for personal growth.

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,  $A$ = technological progress,  $K_p$ = private capital,  $L$ = Labor, and  $K_g$ = infrastructure. If the technological progress ( $A$ ) advances, the regional output created by the infrastructure investment will also rise up. Human capital development ( $L$ ) will enhance regional output induced by spill-over effects.

Therefore, this paper suggests Asian countries to start including digital education services for all levels from secondary to university. Professors and lecturers can deliver lectures online that can be broadcasted all over the country afterwards. This technique will be beneficial for students and people in



various regions and villages. People can learn basic technical skills, languages and gain knowledge to further pursue industrial and vocational training courses.

### **Land Acquisition by creating Land Trust**

Land trust could be an intermediary between the landowners and government for managing the spill-over effects of the infrastructure. Land trust was created in Japan many years ago and accordingly, owners are able to keep ownership of their land. Furthermore, they can lease the land for a long-term contract, for instance for a period of 99 years. By doing so, the owner can earn a reasonable income over many years.

Under the land trust concept, landowners entrust their land to trust banks, and the trust banks manage the land. For instance, in the case of agricultural land, the trust bank aids a young farmer who wishes to farm on a large consolidated land in order to enhance his or her scale of economics. The landowners will receive the part of the profit as dividends. The consolidation of land leads to higher profits for landowners. The proposed framework allows for the usage rights allowing owners to maintain their ownership right whilst increasing their profit by leasing land for infrastructure and development projects.

The stages of this method are: 1) To consolidate assets owned by individuals 2) Entrust them to the trust banks 3) Make a better use of the assets. This concept has a similar function to a trust fund. Pooling the fund and then investing that on more effective operations is similar to consolidating assets owned by individuals who are not able to maximize the utility of their assets



themselves, or do not have the know-how. Entrusting them to the trust bank can increase the utility of the assets.

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