



# Spillover Effects of Digital Infrastructure and Financing

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## ABSTRACT

This article proposes a tax sharing scheme between governments and private sector investors of Information and Communications Technology (ICT) infrastructure. The current COVID-19 pandemic has not only emphasized the crucial need of ICT infrastructure development, but has also expanded government budget deficits in many countries. Therefore, participation from the private sectors is necessary to close the widening investment gap in ICT infrastructure. One of the measures to attract private sectors' involvement in ICT infrastructure is by creating a steady stream of income for the investors. To ensure the success of the proposed financing scheme, this article also recommends the development of supporting hard and soft infrastructure as well as the digitalization of tax reporting systems.

Keywords: tax sharing scheme, ICT infrastructure investment, private investors

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## SARI PATI

*Artikel ini membahas skema pembagian pajak antara pemerintah dan investor swasta dalam investasi infrastruktur teknologi informasi dan komunikasi (TIK). Pandemi Covid-19 membuktikan pentingnya pembangunan infrastruktur TIK sekaligus memperbesar defisit anggaran pemerintah di banyak negara sehingga partisipasi sektor swasta makin diperlukan untuk mengatasi kesenjangan investasi infrastruktur TIK. Salah satu langkah yang dapat mendorong keterlibatan sektor swasta adalah dengan menciptakan aliran pendapatan yang stabil untuk para investor. Untuk memastikan keberhasilan skema pembiayaan yang diusulkan, artikel ini juga merekomendasikan pengembangan infrastruktur pendukung keras dan lunak serta digitalisasi sistem pelaporan pajak.*

*Kata Kunci: : skema pembagian pajak, investasi infrastruktur TIK, investor swasta*

## CHALLENGE

Despite the increasing needs of ICT infrastructure development, the investment gap in that sector is widening. In the telecommunications sector alone, the gap is expected to reach more than USD30 billion in 2040 (Global Infrastructure Outlook, 2021). The reason for this gap of ICT infrastructure investment is the same as that of other types of infrastructures, such as the inability of many governments, especially which of developing countries, to fully finance their infrastructure needs. In addition, in many areas, investment in the ICT sector has been perceived as a private sector activity. This causes the ICT infrastructure development to focus on the needs of the growing urban middle class, leading to a deepening of the digital disassociation between urban and rural areas (Foundation & Association, 2018). However, the lack of digital infrastructure development in rural areas cannot be completely filled in by public finances which bring us back to the increasing needs of the private sectors' participation in ICT projects.

Consequently, governments have been turning to the private sectors for infrastructure investment. This has led to the use of partnerships between the public and the private sectors, or known as the public-private partnership (PPP).

While PPP has been adopted by many countries as a method to finance infrastructure investment, it also has its own set of challenges. First, the construction of physical infrastructure is risky. If a construction takes longer than previously anticipated or if its costs exceed estimates, the increased burden is usually borne by the private sectors. Second, even after the project is completed, failures can still occur if demands for the infrastructure turn out to be less than projected. PPP projects are usually public goods (such as roads, bridges, electricity, water, and ICT infrastructure) where users expect to pay low fees. In contrast, the private sector is profit-oriented and may be in

a position (by the PPP agreement) to raise fees in order to cover construction and operational costs. However, increasing user-charges may lower the consumers' demand. This mismatch in the needs of consumers and investors could lead to the failure of PPPs. This is also applied to the ICT infrastructure, as the most frequent explanations for the lack of internet use are related to digital literacy (69%), affordability (15%), and relevance (12%) (World Bank, 2021). Therefore, it is crucial to keep users fee relatively low.

To ensure the success of PPPs, it is essential to warrant the private sectors that their involvement in infrastructure investment will not lead to losses. It is important to realize that infrastructure development creates spillover impacts into the region, which means that the effects of infrastructure do not only benefit its direct users and investors, but also other parties that may be indirectly impacted by the infrastructures, such as the local governments through the increased tax revenues.

## PROPOSAL

Based on the above challenges, it is clear that in order to attract private sectors' involvement in digital infrastructure projects, the rate of return for the investors has to be increased. This policy brief proposes a way to create a steady stream of income for private sector investors, namely by sharing increased tax revenues brought by the development in digital infrastructure with the investors. In addition, this policy brief also suggests the development of supporting infrastructure, both hard and soft, as well as the digitalization of tax systems.

### **Proposal 1: Establish Tax-Sharing System between Governments and Private Investors of Digital Infrastructure**

Previous studies have shown that infrastructure development is linked to higher economic growth, business revenue, and also tax revenues

(Yoshino & Abidhadjaev, 2017a) (Yoshino & Abidhadjaev, 2017b) (Yoshino & Hoa, 2020). Focusing on ICT infrastructure, a forthcoming study by ADBI shows that a rise in the number of mobile-phone subscribers, which came as a result of a massive construction of mobile-phone towers in India, led to greater tax revenue (Yoshino, Siregar, Agarwal, Seetharam, & Azghaliyeva, Forthcoming).

In the past, these increased spillover tax revenues were absorbed only by the government. On the other hand, private investors of digital infrastructure continue to rely only on user fees as their source of income. As previously mentioned, the high reliance of private sector investors on user fees leads to the disproportionate development of digital infrastructure in areas where it is deemed unprofitable, such as in rural areas.

In order to bridge that digital division, private-sector financing is necessary. If increased spillover tax revenues were to be shared between the government and the digital infrastructure investors and operators, the rate of return can be expected to rise substantially. This will increase the profitability of such projects and incentivize the participation of private-sector investors.

Figure 1 illustrates how the sharing of the spillover tax revenues will push up investors' rate of return. Without the spillover tax revenues sharing from the government, investors rely on the user charges as their main source of income. However, if the government shares the spillover tax revenues, investors' rate of return will increase from only user charges to user charges and injection of spillover tax.

In practice, this means that a tax sharing system between the government and private sector investors must be established. In order to do so, a transparent and reliable tax collection system, is essential. To be able to benefit from this concept, a country needs to have a decentralized tax administration system. Since in many countries both central governments and regional/local governments impose taxes, both governments must commit themselves to share spillover tax revenues with private infrastructure operators and investors.

Identification of the sectors that will benefit from the infrastructure project should also be conducted in advance. Furthermore, the computing and tracking process of the tax collection should be transparent and

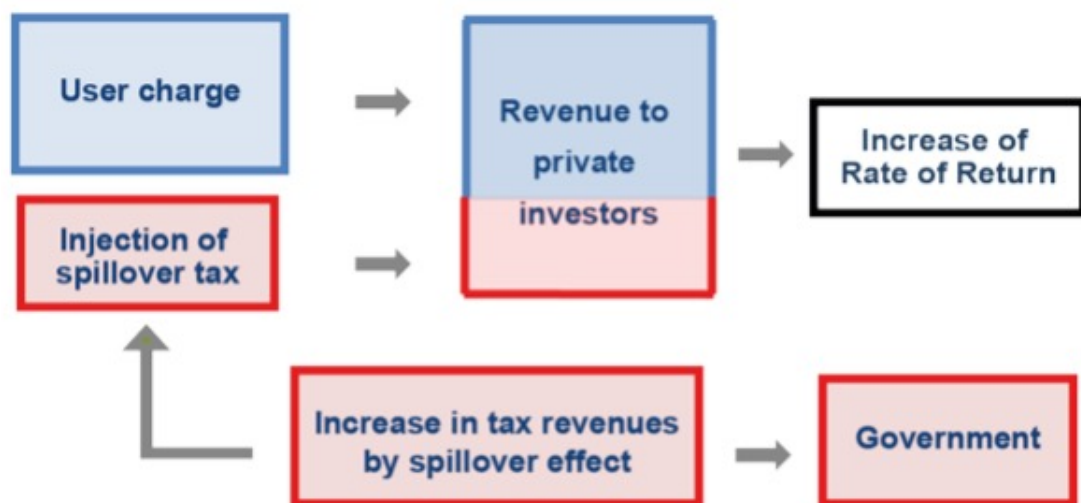


Figure 1. Spillover Tax Revenues increase the Rate of Return of Investors

accessible by the public. Most importantly, the mechanism should be supported by a helpful regulatory framework. Theoretically, a trans-log production function will give accurate estimates of the spillover effects created by ICT. Studies published in various sources have demonstrated this method on the case of the Philippines' STAR highway, Uzbekistan's railway, and Japanese high-speed railways (Yoshino & Abidhadjaev, 2017a, 2017b; Yoshino & Pontines, 2015). The same method can be applied to ICT infrastructure. Another plausible way to calculate the spillover tax revenues of infrastructure projects are by using econometric methods, such as difference-in-differences method. It can clarify incremental tax revenue caused by infrastructure investments. As for the amount of spillover tax revenues to be shared between the government and the private sector, a simple procedure could be to divide the increased tax revenues due to the infrastructure projects by half and half (50%-50%) between the government and the private entities.

It is important to ensure that the sharing of spillover tax revenues is publicly announced since the beginning of the project. Incremental tax revenues after operation compared to pre-construction period must be measured through robust empirical methods.

Going forward, the gap between actual tax revenues and the estimated ones can be used as an indicator of the possibility of tax evasion. This means that a transparent and accountable taxation system and enforcement will lead to an equalized society that can maintain stable revenues for the country. Computation of the spillover effects of digital infrastructure can lead to reducing tax evasions and loopholes.

Note that although in this brief we focus solely on ICT infrastructure, our proposed spillover tax sharing system can also be applied to any infrastructure projects, such as water supply, railways, electricity, and road.

## **Proposal 2: Bridge the Digital Divide by Developing Supporting Hard and Soft Infrastructure**

Other than spillover effects on tax revenues, there will also be "long-term" spillover effects of digital infrastructure. Figure 2 illustrates how the development of a nationwide network of digital infrastructure benefits the country, such as through:

- i. human capital development through online education and training programs,
- ii. efficient financial activities/sector through the development of online banking and other financial products and,
- iii. digital government which leads to the increased efficiency of government services.

The main proposal of this policy brief is to construct a scheme to finance digital infrastructure, namely by sharing the spillover tax revenues collected by the government with the investors of the infrastructure. However, as shown in Figure 2 which depicts the production function, the development of digital infrastructure will also affect other aspects, such as human capital development through an increased access to information and education. To put it simply, economic growth, which is shown by  $Y$  in Figure 2, is affected by human capital ( $L$ ), private sector capital ( $K_p$ ) and public/government capital ( $K_g$ ). The development of digital infrastructure can enhance those three factors which, in turn, is expected to support economic development. Another example: the development of online education which makes high-quality education accessible to many students at various regions in the country. Online education can be applicable to adults, for instance, through training programs which may push up quality of human capital. Similarly, the expansion of digital infrastructure in the financial sector and in the government sector may widen access to financial products, increase financial literacy and also enhance the efficiency of government activities. These will

contribute to further growth of the country and increase spillover tax revenues created by ICT infrastructure in the long run.

Nevertheless, in order for this to be realized, it is important to establish supporting infrastructure, such as electricity, which is critical for the utilization of mobile/internet connection. According to (Kumar, Ihita, Chaudhari, & Arumugam, 2022), the broadband penetration rate in urban areas in India reached 93% while rural areas only had a penetration rate of 29%. As reported by (Alexander & Padmanabhan, 2019), less than 50% of households in Indian villages enjoyed electricity more than 12 hours a day, while the remaining 33% received nine (9) to 12 hours, and about 16% received only one (1) to eight (8) hours of electricity a day. The lack of electricity in rural areas compared to urban ones may also be a contributing factor leading to the digital division.

Other than hard infrastructure, such as ICT and electrical infrastructures, it is important to develop the digital literacy of individuals in order to maximize the spillover effects of the development of ICT infrastructure. As previously mentioned, (World Bank, 2021) found that in low- and middle-income countries, nearly 70% of non-internet users are held back by their lack of digital literacy.

Although there is no fixed definition of digital literacy, much of the literature agrees that

digital literacy is a multidimensional concept. (UNESCO Institute for Information Technologies in Education, 2011) describes digital literacy as a set of basic skills required for working with digital media, information processing and retrieval. However, it is important to note that processing content, evaluating, critiquing and synthesizing multiple sources of information is also a set of skills that are part of digital literacy. Therefore, the needs to enhance digital literacy skills is becoming increasingly important to ensure that not only people are able to access the information and contents available digitally, it is also to guarantee that they are able to process and evaluate such information.

This policy brief, thus, also proposes for the improvement of digital literacy. (The SMERU Research Institute, University of Oxford, United Nations ESCAP, 2022) identified three fundamental channels to improve Indonesia's digital skills, namely formal education, vocational training, and on-the-job training. The role of each channel is as follows: Formal education serves to broaden the access of students and educators to education, curriculum, and teaching quality. On the other hand, vocational training and on-the-job training serve as flexible and inclusive channels to upgrade digital skills outside of formal education and to upskill workers' digital competencies.

However, as previously discussed, in order to enable these channels to be fully utilized,, robust

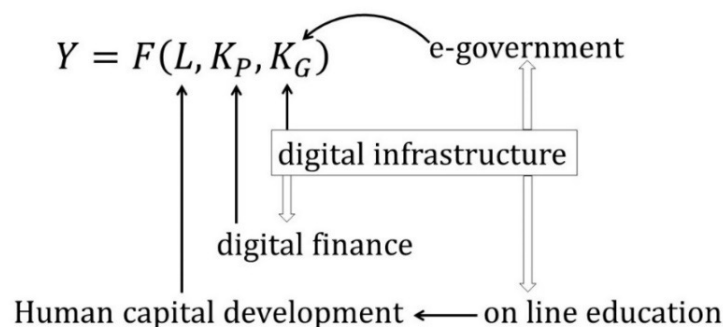


Figure 2. Benefits of digital infrastructure

digital infrastructure and sound policies which support the development of such infrastructures as well as supporting ones are necessary. Therefore, this brief proposes the development of infrastructure, both ICT and supporting infrastructures, along with the tax-sharing system to finance the development of such infrastructure hand-in-hand. The next proposal in this brief is also related directly to the first and second proposals, namely to digitalize the system to collect and report tax.

### **Proposal 3: Digitalization of Tax Collection and Reporting Systems**

Although this policy brief highlights the need of participation of the private sectors in the development of digital infrastructure, the role of the government, through public finance, remains vital. The success of the tax-sharing scheme proposed in this brief depends largely on the ability of the government to collect, process, and distribute taxes. They must know how much companies and individuals earn in order to collect their taxes and who the recipients of the government benefits are, including the private-sector infrastructure investors as discussed in Proposal 1. The digitalization of the taxation systems will not only benefit the government

by supporting them in the collection and distribution processes of taxes, but it will also be an advantage to the recipients of the government benefits.

OECD (2020) identified the opportunities of a digital transformation in the taxation systems, namely: real-time processes, transparency and trustworthiness, and digital identification. First, the digitalization of tax systems will enable tax administration processes to be done in real-time or close to real-time. Similarly, in several countries, tax authorities are already able to collect information on sales and wages in real time, giving them immediate insight into the state of the economy (Gupta, Keen, Shah, & Verdier, 2018). Second, the digitalization of tax systems will also increase its transparency and trustworthiness. Taxpayers will have the opportunity to check and question taxes assessed, paid and due. It will be clear which rules have been applied to which data, reflecting facts and circumstances. Finally, the development of digital identification systems, allows more accurate and cheaper authentication of an individual's identity, ensuring higher compliance to tax regulations and that benefits reach only the intended recipients.

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