

Investigation Transportation Infrastructure in Developing Countries

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Abstract— This paper presents transportation infrastructure problems. One of the most significant problems that clearly have been seen in developing countries is economical problem. In any country, a good economic situation can be efficient in transportation and also the maintenance of transportation systems. Hence, to reach the ideal situation in infrastructure it's needed to come up with the lack of budget. World Bank (2005) lists several key business environment issues for infrastructure, i.e., “four Cs”: inadequate cost recovery, corruption, insufficient competition, and low credibility of institutions. The aim of this paper is to clarify the significance of economic role in transportation infrastructure and also try to find the appropriate ways to improve developing countries economic.

Keywords— transportation, infrastructure, developing and economic

I. INTRODUCTION

All public transport runs on infrastructure, either on roads, rail, airways or seaways; all consists of interchanges and way. The infrastructure can be shared with other modes of transport, freight and private transport, or it can be dedicated to public transport. The latter is especially true in cases where there are capacity problems for private transport. Investments in infrastructure are high, and make up a substantial part of the total costs in systems that are expanding. Once built, the infrastructure will further require operating and maintenance costs, adding to the total costs of public transport. Sometimes governments subsidize infrastructure by providing it free of charge, just like is common with roads for automobiles. Traffic congestion is one of the chronic problems in most developing countries and this problem is getting worse year by year.

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The growth of road developments in developing countries is much slower than the growth rate of vehicle ownership. In Indonesia, for example, the growth rate of vehicle ownership is 9 to 11 percent per year but the growth of road developments is only less than 1 percent per year.

When a new highway was built or a road was widened, it will only solve the traffic congestion for a short period of time. After a few years, the new highway will fill with traffic that would not have existed if the highway had not been built. Similarly, the widened road fills with more traffic in a few months. Such phenomenon is called induced demand. Because of the induced demand, neither building new roads nor widening roads are the long-lasting solution to traffic congestion.[6]

In developing countries, unreliable and inadequate infrastructure is regarded as a major impediment for economic growth. The World Bank (2005) lists several key business environment issues for infrastructure, i.e., “four Cs”: inadequate cost recovery, corruption, insufficient competition, and low credibility of institutions. It claims that unsatisfactory public sector performance is due to the lack of long-term planning and coordination for infrastructure and the lack of a healthy framework for suitable financing opportunities for infrastructure.

II. EFFECT OF OMITTING A SPATIALLY LAGGED DEPENDENT VARIABLE IN TO SPECIFICATION BIAS ON THE INFRASTRUCTURE PARAMETER

A. Spatial autocorrelation

Spatial econometrics (Cliff and Ord, 1981) has grown in popularity over the past 30 years, and only recently has been widely applied in the area of infrastructure studies. Spatial autocorrelation occurs when one locality's error term in a regression depends on “neighboring” localities' shocks or innovations, instead of merely being normally distributed with zero mean, constant variance, and zero covariances between observations over time and space. Spatial autocorrelation implies interdependencies among different localities, and in general researchers can accommodate for spatial autocorrelation after conducting a procedure that generates an estimate of the magnitude of the autocorrelation (such as the generalized moments procedure developed by Kelejian and Prucha, 1999). The word “neighboring” is in quotations because the word does not necessarily imply that the neighbor is at a contiguous location. That is, it could imply that

locations are similar (or dissimilar) in other ways, such as average incomes of residents, volume of trade between individual locations, distance from each other, or other demographic characteristics. There are a number of reasons why a model might potentially exhibit spatial autocorrelation. These include possible omitted variables that vary spatially; decisions in one location that are made for entities in other locations; using data that are averaged over different sized areas for different geographic units (Bell and Bockstael, 2000), such as rural versus urban regions; and/or common shocks that spill over across geographic boundaries. An example of the latter could be the weather and its impact on firms' costs or production process. A weather "shock" (for instance, either a storm or a heat wave) hitting some states and impacting production or costs can spill over to an adjacent state, and thus there can be some degree of persistence over geographic space that may lead to spatial autocorrelation. Ignoring spatial autocorrelation can lead to parameter estimates with higher standard errors than if spatial autocorrelation had not been present. These higher standard errors can translate into t-statistics that are smaller than they should be. In other words, ignoring significant spatial autocorrelation can impact hypothesis testing, as researchers might fail to reject a null hypothesis that is actually a false hypothesis. In the context of infrastructure, ignoring spatial autocorrelation can lead a researcher to erroneously accept a null hypothesis that the infrastructure elasticity is equal to zero. Further difficulties arise when ignoring a spatially lagged dependent variable, which can lead to biased parameter estimates, implying inaccurate estimates of infrastructure impacts. [2]

B. Spatial lag

The other form of spatial spillovers that can be assessed with spatial econometrics is known as a spatial lag. A spatial lag (or spatial dependence) occurs when the "neighbors" of a particular geographic unit's variable(s) are included as explanatory variables in a regression. These spatially lagged variables can be of the dependent variable, as in Kelejian and Robinson (1997) who include in their infrastructure study a spatial lag of output (they call it neighbors' average productivity, or output per worker). Such a spatial lag is often interpreted as the weighted average of other jurisdictions' dependent variable. It is also common for researchers to include a spatial lag of some variable(s) other than the dependent variable, such as neighbors' infrastructure (Boarnet, 1998). Ignoring a spatial lag when it should be in a model would lead to biased parameter estimates. In other words, the sign and magnitude of the infrastructure impacts can be affected if spatial lags are ignored. Thus, addressing potential spatial autocorrelation and spatial lags can have important implications for the estimates of infrastructure impacts. A spatial multiplier incorporates indirect effects on neighboring locations when a particular location changes its infrastructure level. A contribution of this paper is the synthesis of several major studies in the infrastructure productivity literature that incorporate spatial econometrics in the context of transportation. It is postulated that incorporating

spatial econometrics leads to more reliable estimates that are significantly different from zero. It is also shown that adjusting one's results for a spatial multiplier can substantially affect the estimates for productivity of infrastructure, through an empirical example of public infrastructure productivity in the US manufacturing sector. This is opposed to the findings of some infrastructure productivity studies, such as Tatom (1993), Hulten and Schwab (1991), and Kopp (2005), which do not incorporate spatial econometrics and postulate that public infrastructure has essentially zero or minimal productive impact. Thus, incorporating wider benefits through spatial econometrics techniques can be important in accurately assessing the impacts of infrastructure. [2]

III. EXAMPLES OF SUCCESSFUL TRANSPORT INFRASTRUCTURE DEVELOPMENT

Some Asian countries, particularly in East and South-East Asia, have been very successful in instrumentalizing transport for their overall national economic development. In fact, many East and South-East Asian countries have substantially expanded their transport infrastructure. Some countries have doubled road network length over the past two decades (Fig. 1); some invested in road widening schemes which significantly increased capacity through increased total lane length. Yet, in most Asian countries, transport densities and effective network access levels are still much lower than in Europe or North America, implying a potential for further large transport infrastructure development. [1]

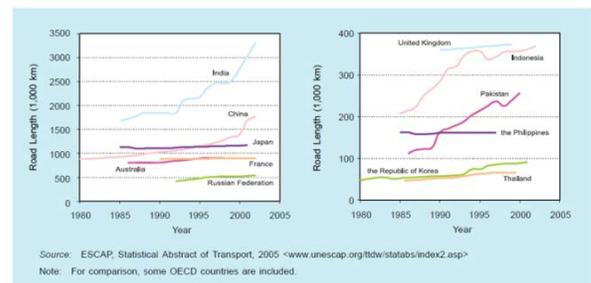


Fig. 1 Road length in selected ESCAP member countries (1980-2003)

Seaport and airport infrastructures have grown even faster. Port container traffic in the ESCAP region tripled in the 1990s. Today, Asian countries account for 26 per cent of world gross product but 62 per cent of world container throughput. In the 1990s, port container traffic increased 23-fold in China, 5-fold in Malaysia and 4-fold in the Republic of Korea, Indonesia, Bangladesh and India (Fig. 2), much faster than in most of the rest of the world. [1]

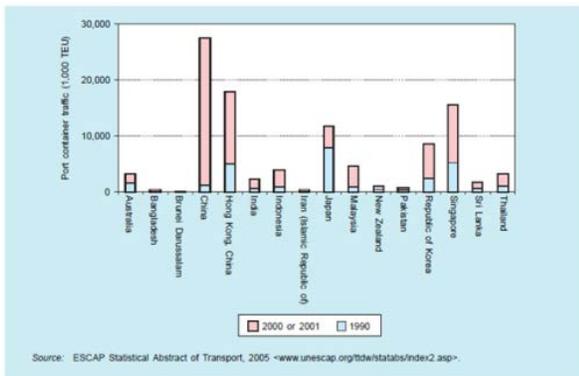


Fig. 2 Port container traffic in select ESCAP members and associate members (1990 and 2000/2001)

Aircraft departures in the region doubled between 1990 and 2000 and have tripled since 1980. In some emerging Asian economies, departures grew even faster, albeit from a low base. Between 1980 and 2000, departures increased 11-fold in China, 6-fold in the Republic of Korea and 4-fold in the Islamic Republic of Iran.

Intercity railway infrastructure has attracted comparatively less investment in Asian countries in recent years. Almost all the increase in Asian railway length occurred in China, with some expansion in Indonesia. India has undertaken a major gauge conversion programme, while the Republic of Korea, Turkey, Malaysia and Japan made significant investments in electrification.

IV. CAUSES AND FORMS OF PUBLIC DIVESTURE

Facing the growing inability of governments to manage and fund transport infrastructure, the last decades has seen deregulation and more active private participation. Many factors have placed pressures on public officials to consider the privatization of transport infrastructure, including terminals:

A. Fiscal problems

The level of government expenses in a variety of social welfare practices is a growing burden on public finances, leaving limited options but divesture. Current fiscal trends clearly underline that all levels of governments have limited if any margin and that accumulated deficits have led to unsustainable debt levels. The matter becomes how public entities default on their commitments. Since transport infrastructures are assets of substantial value, they are commonly a target for privatization. This is also known as “monetization” where a government seeks a large lump sum by selling or leasing an infrastructure for budgetary relief.

B. High operating costs

Mainly due to managerial and labor costs issues, the operating costs of public transport infrastructure, including maintenance, tend to be higher than their private counterparts. Private interests tend to have a better control of technical and financial risks are able to meet construction and operational guidelines as well as providing a higher quality of services to

users. If publicly owned, any operating deficits must be covered by public funds, namely through cross-subsidies. Otherwise, users would be paying a higher cost than a privately managed system. This does not provide much incentives for publicly operated transport systems to improve their operating costs as inefficiencies are essentially subsidized by public funds. High operating costs are thus a significant incentive to privatize

C. Cross-subsidies

Several transport infrastructures are subsidized by revenues from other streams since their operating costs cannot be compensated by existing revenue. For instance, public in part by revenues coming from fuel taxes or tolls. Privatization can thus be a strategy to end cross-subsidizing by taping private capital markets instead of relying on public debt. The subsidies can either be reallocated to fund other projects (or pay existing debt) or removed altogether, thus reducing taxation levels.

D. Equalization

Since public investments are often a political process facing pressures from different constituents to receive their “fair share”, many investments come with “strings attached” in terms of budget allocation. An infrastructure investment in one region must often be compensated with a comparable investment in another region or project, even if this investment may not be necessary. This tends to significantly increase the general cost of public infrastructure investments, particularly if equalization creates non-revenue generating projects. Thus, privatization removes the equalization process for capital allocation as private enterprises are less bound to such a forced and often wasteful redistribution.

Of necessity such analysis would be complex and must recognize the multidimensional nature of the links between transport, location, development and many other new factors relevant to our understanding of these processes as these too affect economic growth (Fig. 3).

V. PROBLEMS IN TRANSPORT INFRASTRUCTURE DEVELOPMENT IN DEVELOPING COUNTRIES

The private sector participation in infrastructure development is strongly hoped for. For instance, Philippine is actually one of the most active countries in the introduction of private forces between developing countries. However, we have recently observed a disappointing reduction in private sector involvement because of several factors such as: (i) high and increasing general country risk, (ii) deteriorating business environment for infrastructure, (iii) weakness in planning, preparing, and executing private infrastructure projects, (iv) unclear rationale and ineffective guidelines for providing fiscal support to private infrastructure projects, and (v) ambiguous BOT policy and sector-specific gaps in the enabling framework (World Bank (2005), p. 66). [5]The road sector is one of the crucial sectors for economic development.

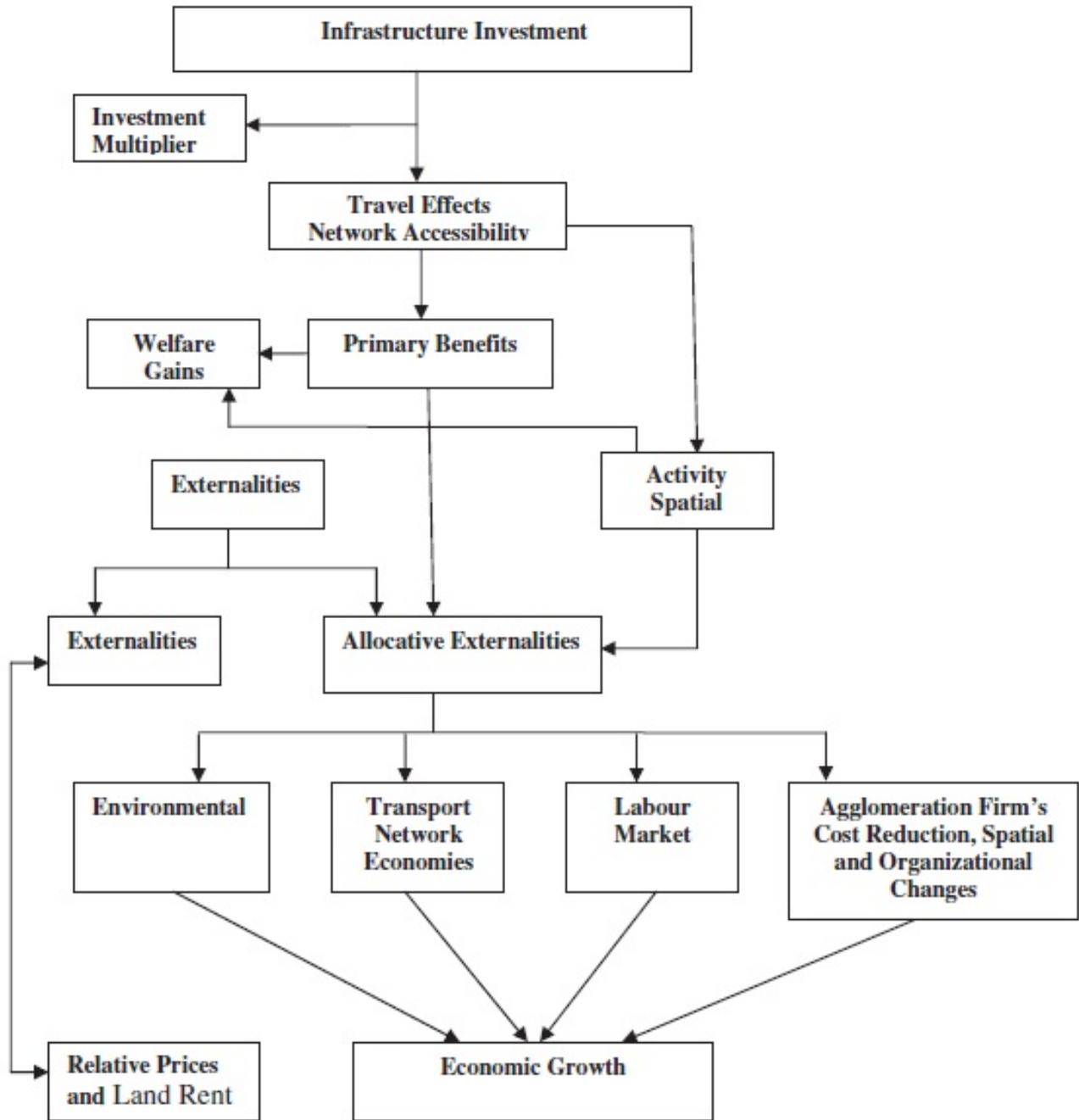


Fig. 4 Evaluation of economic growth benefits from the transport infrastructure. Source: Banister & Berechman, 2001

The developed countries have aggressively committed themselves to participating in international production/distribution networks, and substantial improvement in transport infrastructure and logistic services has recently been observed. Poor road condition in developing countries is one of the major concerns in order to effectively utilizing globalization forces for economic development. [3]

In 1952, the former legislation Law Concerning Special Measures for Highway Construction (SMHC Law) was enacted, which provided loan funds from the Trust Fund Bureau of the Ministry of Finance to construct roads and encouraged the collection of tolls from users to repay the loan.

The toll revenues worked as a powerful financial source in order to avoid heavy financial burden on the government. Road construction, however, is slow. As for toll roads, while a few transactions were successfully concluded, there have been serious delays in actual implementation. Most of the toll road construction projects have been stalled in more developing countries. The cost recovery after the commencement of operations has also become a problem. Despite the establishment of the Toll Road Board and a Road Support Fund under the Motor Vehicular User Charges Law, cost recovery is low to the extent that even regular road maintenance is being compromised.

The World Bank (2005b, p.12 of the Executive Summary) provides several recommendations in regards to improving road infrastructure: [5]

(i) Governance and accountability of spending at the Department of Public Works and Highways and the Special Road Fund should be improved by establishing accountability for results of road spending at the district and regional levels. Staffing levels should be reduced and performance-based outsourcing increased to improve efficiency.

(ii) Greater reliance on user charges is needed for the upkeep and development of the road network. Key measures include expanding toll road coverage, charging appropriate toll fees, and increasing user charges through the fuel levy.

(iii) Private sector interest in road improvement can be more effectively utilized if the government can proactively resolve issues of stalled toll road concessions, address right-of-way delays, and use open competition for project selection.

We observe that the overall improvement of government budgetary situation is ultimately crucial in infrastructure development in the Philippines.

Due to the public nature of its operation, some developing countries enjoyed some exemptions made by the national government. The privileges included the following:

- Exemption from various taxes, including corporation tax,
- Compulsory collection of tolls and other charges related to expressway operation,
- Power of compulsory purchase of land and of administrative enforcement,
- Loans from the government, bond placement to the government funds, and government guarantee to bonds.

VI. CONCLUSION

The investigations in this paper consider economical parameters that lead to make better situations in developing countries transportation industry. The suggested ways by World Bank (2005) are inadequate cost recovery, corruption, insufficient competition, and low credibility of institutions.

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