# Impact of Transport Infrastructure Investment on Interregional Economic Activity and Regional Welfare : A SAM-Based General Equilibrium Approach

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A substantial amount of scarce resources is invested in transport infrastructure projects in a developing country like the Philippines. Due to this, the choice of location of the transport infrastructure investment becomes a critical variable in macro level decision-making. The benefits relative to the costs of such choice must be pinpointed so that optimal decisions can be made.

This dissertation addresses such concern by undertaking several pioneering endeavors: (1) the construction of a five-region social accounting matrix (SAM) as database for simulated policy shocks. Prior to this, a single region SAM and bi-region SAM were also built; (2) the development of the first transport-oriented spatial computable general equilibrium (SCGE) model for the Philippines. This will be used to generate quantitative estimates of benefits of transport infrastructure investment across regions and households; and (3) the introduction of the impedance function, which integrates concepts in transport engineering and economics in the model.

The study then describes the methodology used in arriving at a single-region, two-region and finally five-region SAM. A SAM represents transactions in a complete economic system during an accounting period. It integrates within a macroeconomic framework several detailed accounts of factors of production and institutions - especially households. In this study, SAM construction entailed the usage of non-survey techniques. The database that resulted from such was verified against the result of a nation-wide survey of interregional flows of freight and passengers.

The empirical results at the one-region and two-region levels complement each other. They both indicate that welfare gains are nearly double the welfare losses if the transport margin decreases due to efficient infrastructure planning. The two-region model endogenizes the transport margin as part of market price through the introduction of an impedance function. This relates the impedance ratio (traffic volume to capacity ratio) to changes in either interindustry flows or transport capacity. Simulation results at the two-region level (National Capital Region, NCR, vs. Rest-of-the-Philippines) indicate that an improvement of transport capacity through infrastructure investment in Rest-of-the-Philippines,

(ROP), results in higher welfare gain for households in ROP than for those in NCR. This narrows the economic gap between a high-income region, which is NCR, and the lower income regions which comprise ROP.

The highlight of the study is a spatial computable general equilibrium model with a 5-region SAM as database. A three level production function combining Cobb-Douglas and Leontief form is estimated for each regional production sector. The five-region model is used to identify the beneficiaries of two types of policy shocks - (1) the infusion of more capital into the land transport services sector in NCR (high-income region) and then in Mindanao (low-income region). This leads to enhancement of the transport capacity of the land transport services sector. An additional scenario is simulated wherein higher transport capacity in the NCR land transport sector is financed by foreign transfers; and (2) the introduction of technological improvement in land transport services in NCR. This leads to higher output elasticity with respect to transport input. An intermodal comparison across transport modes is undertaken in terms of impact on output, relative welfare, and consumption and pollution levels.

The results indicate that when transport capacity enhancement and technological improvement take place within the land transport services sector in NCR, the absolute gains in output go to NCR production sectors such as industry, land transport services and other services. However, in relative terms, the biggest increment in output occurs in the agricultural sector in adjacent regions such as Southern Luzon (SOL), Northern Luzon (NOL) due to spillover effects, and to Visayas (VIS) and Mindanao (MIN) due to linkage effects. A further result is a rise in the impedance ratio of interindustry flows with the NCR land transport sector as destination. While this maintains the income ranking among regions, the effect is mitigated by the fact that significant output increases took place in non-NCR regions Southern Luzon (SOL), Visayas (VIS) and Mindanao (MIN). Also, a substitution effect in favor of the NCR land transport mode and away from air and water transport services in non-NCR regions and even NCR itself is manifested by the decline in traffic flows and impedance ratio to such destination sectors in all of the five regions. Another result that has positive effect on intra-regional equity is that the middle income groups across all regions experience the biggest absolute welfare gain. However, in terms of relative welfare gains, the low income groups of the VIS and SOL experience the highest increase in utility due to

the exogenous shock in NCR.

In terms of intermodal comparison, the study found that the land transport mode has the biggest impact on output, welfare and consumption levels across all five regions. Complementary to the land mode is the water transport mode due to the archipelagic geography of the Philippines. Port infrastructure development leads to water pollution. An important finding is that port development in the Visayas region would yield to the highest level of pollution, emitted by the region's agricultural sector. The water pollutant-suspended solids-has the highest emission level due to Visayas port development. Consequently, environment protection measures have to be instituted if Visayas is prioritized as prime region for port development.

The aforementioned results show that the benefits of transport infrastructure investment are spread out to other regions and are not confined to the region in which the investment is made. There are significant spillover and equity effects of policy interventions such as enhancement of transport capacity and technological improvement in the transport sector. Such interventions affect the spatial pattern of economic benefits, the value of economic benefits across production sectors, and the distribution of benefits among household income groups.

In conclusion, the study shows that proper spatial planning entails the choice of location and the type of transport infrastructure investment that has the widest impact on inter-industry and interhousehold relationship among regions. Consequently, improvements in interregional efficiency and equity can be attained.