

# **Unequal Distribution of Economic and Environmental Benefits from Transportation Infrastructure**

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## **1. Introduction**

This study aims to address three critical research questions: Does the expansion of transportation infrastructure (1) boost economic benefits (2) and lead to improvements in air quality? (3) Are these benefits evenly distributed across regions? We focus on quantifying the benefits associated with the first two questions and analyze their regional distribution to tackle the third.

## **2. Background**

Our research tackles the endogeneity problem in evaluating transportation infrastructure expansion impacts, by adopting the 'market access' concept (Donaldson and Hornbeck, 2016), which considers both direct and indirect effects. We assembled a database of Japan's HSR and highway infrastructure (1983-2020), and created a travel time and cost matrix for all cities. Additionally, we use a hypothetical least-cost path between HSR stations and highway intersections as an instrumental variable (IV), following Faber (2014), for assessing the influence of increased market access on economic outcomes. In regression analysis, we analyze market access against city-level outcomes like air pollution and income. For air pollution data, we utilize historical suspended particulate matter (SPM) records from over 1600 stations. We categorize Japan into five subgroups to enable detailed regional analysis. Finally, we monetize the economic and environmental benefits, incorporating health aspects, drawing from methods in prior studies such as Davis (2008) and Li et al. (2019).

## **3. Result**

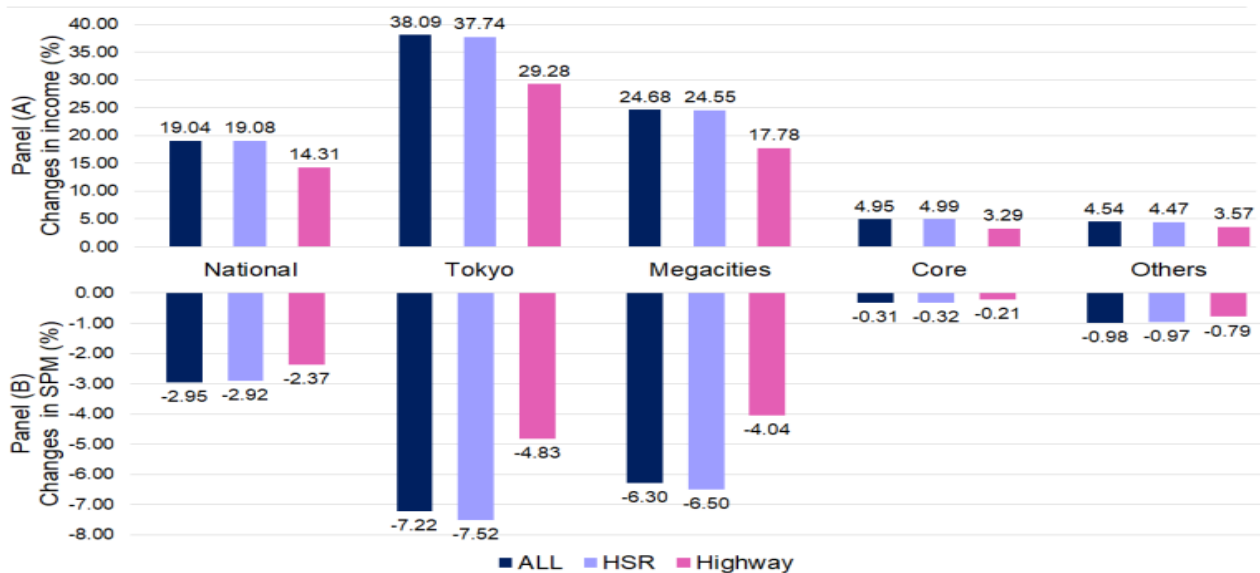
Figure 1 summarizes the results under three cases: MA change due to both HSR and highway expansion, MA change due to HSR expansion only, and MA change due to highway expansion only. In any measure, we observe a clear pattern of regional disparity again; Tokyo and Megacities experience larger increase in income per capita due to change in MA compare to Core and Others. In particular, Others experiences negative per capita income change in any measures. Similarly, Tokyo and Megacities see large reduction in SPM, while the impact is much smaller in Core and Others. Note that the changes are relatively small for National, and this is mainly due to the fact that regions that belong to Core and Others account more than 75 percent of the sample.

## **4. Conclusion**

In this study, we reconsider the impact of transportation expansions, with an emphasis on economic development and air pollution. By focusing on high-speed rail systems (HSRs) and

highways over a 35-year period in Japan, we found that the calculated environmental and economic benefits of both HSRs and highways account for approximately 3.87% and 27.54% of total costs, respectively. Although this coverage is notable, it is insufficient to surpass the total costs.

**Figure 2 Market Access induced change in total income / SPM by region**



Crucially, our study highlights regional disparities in the impacts of transportation infrastructure expansion in terms of economic development and environmental pollution. While previous research has focused on economic outcomes, less attention has been paid to the environmental aspects. Thus, our work makes a significant contribution by emphasizing the need to consider environmental outcomes and the necessity to address unequal distributions of economic and environmental benefits.

#### 参考文献

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