

Environmental and Economic Consequences of Population Relocation from the Tokyo Metropolitan Area

Topic: Input-Output Analysis: Regional policies (5)

Author: KAIRI INOUE

Co-Authors: Mami Matsuse, Shigemi KAGAWA, Sho Uehara

Japan's total population has been steadily declining since 2011. In contrast, the population of the Tokyo metropolitan area continues to grow, a phenomenon commonly referred to as "overconcentration in Tokyo." This excessive population concentration raises concerns about the accumulation of disaster-related risks, as well as urban challenges such as the heat-island effect and urban sprawl. To mitigate these problems, the Japanese government has promoted regional revitalization policies and has set a target of achieving a net outmigration of 10,000 people from the Tokyo metropolitan area. At the same time, policies that encourage relocation can alter interregional patterns of household consumption and may therefore affect both environmental burdens and economic outcomes. Although previous studies have shown that migration can substantially influence environmental and economic outcomes, empirical evidence for Japan remains limited.

Against this background, this study has two objectives. First, it quantifies how migration from the Tokyo metropolitan area to rural regions affects CO₂ emissions and value added at both the national and regional levels. Second, it examines how environmental and economic impacts vary depending on the destination of migration.

To achieve these objectives, this study constructs a counterfactual scenario in which 10,000 people migrate from the Tokyo metropolitan area to other prefectures, using out-migration data for 2015. It then estimates prefecture-level changes in household consumption based on household expenditure data, while accounting for migrants' age and gender composition as well as regional income inequality. Using these estimated demand changes, the study applies a multi-regional input-output analysis for Japan's 47 prefectures in 2015 to quantify changes in CO₂ emissions and induced value added.

The analysis distinguishes between two types of emissions. Direct emissions are defined as those associated with households' fuel consumption, such as gasoline and kerosene, whereas indirect emissions are defined as emissions induced through the production processes of goods and services.

The results indicate that even if 10,000 people migrate from the Tokyo metropolitan area to rural regions, Japan's total CO₂ emissions decrease by only 0.002%, remaining essentially unchanged at the aggregate level. However, the composition of emissions shifts: direct emissions increase, while indirect emissions decrease. The increase in direct emissions is attributable to higher gasoline consumption resulting from greater car use and to increased kerosene consumption for space heating following migration to rural areas. In contrast, the decrease in indirect emissions is driven by reduced consumption expenditures associated with lower income levels in destination regions.

The study further finds that Japan's total induced value added declines substantially by approximately 12% following migration, primarily due to an overall reduction in consumption expenditures. Although migration policies increase consumption in rural regions, they also induce an increase in value added in the Tokyo metropolitan area. This result suggests that such policies may be inefficient as a means of providing economic support to rural economies.

To explore migration strategies that are beneficial for both the environment and the economy, the study conducts a cluster analysis using Ward's method. Based on four environmental and economic indicators, Japan's 47 prefectures are classified into eight clusters. For each cluster, a scenario is simulated in which 10,000 people migrate from the Tokyo metropolitan area to prefectures within that cluster. The results show that, although induced value added at the national level declines for all clusters, the direction and magnitude of CO₂ emission changes vary across clusters. This finding indicates the existence of "negative decoupling" prefecture groups, where migration reduces Japan's total induced value added while increasing environmental burdens. Conversely, the study identifies a group of prefectures that can reduce CO₂ emissions while relatively limiting declines in induced value added. From the perspective of combined environmental and economic outcomes, these prefectures represent desirable relocation destinations. Specifically, when 10,000 people migrate to this favorable group, induced value added decreases by a factor of about 1.5, whereas CO₂ emissions decrease by a factor of about 40.

These findings suggest that implementing migration policies from the Tokyo metropolitan area without carefully specifying destination prefectures can result in substantial losses in Japan's total value added without achieving reductions in environmental burdens. Conversely, by selecting appropriate destination prefectures, it is possible to mitigate economic losses while simultaneously reducing environmental impacts.