

## **Abstract**

"How well does the gravity equation describe commuting flows?"

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Economists increasingly use quantitative spatial models to evaluate potential transportation investments and land-use planning decisions. The growing availability of economic data observed at increasingly finer spatial scales offers tremendous potential for new insights, but the granular nature of these data raises new challenges for quantitative spatial models. We document that commuting matrices feature pervasive zeros. How should researchers apply the gravity equation to sparse commuting matrices? The extant literature typically ignores zeros when estimating elasticities and rationalizes zeros with infinite commuting costs. We show that the former introduces a selection bias into estimated elasticities. The latter eliminates potential margins of adjustment when computing counterfactual outcomes. We propose treating observed commuting matrices as finite-sample realizations from a discrete probability distribution. Unlike standard methods, our approach allows residence-workplace pairs that currently have zero commuters to become active commuting routes in counterfactual scenarios.