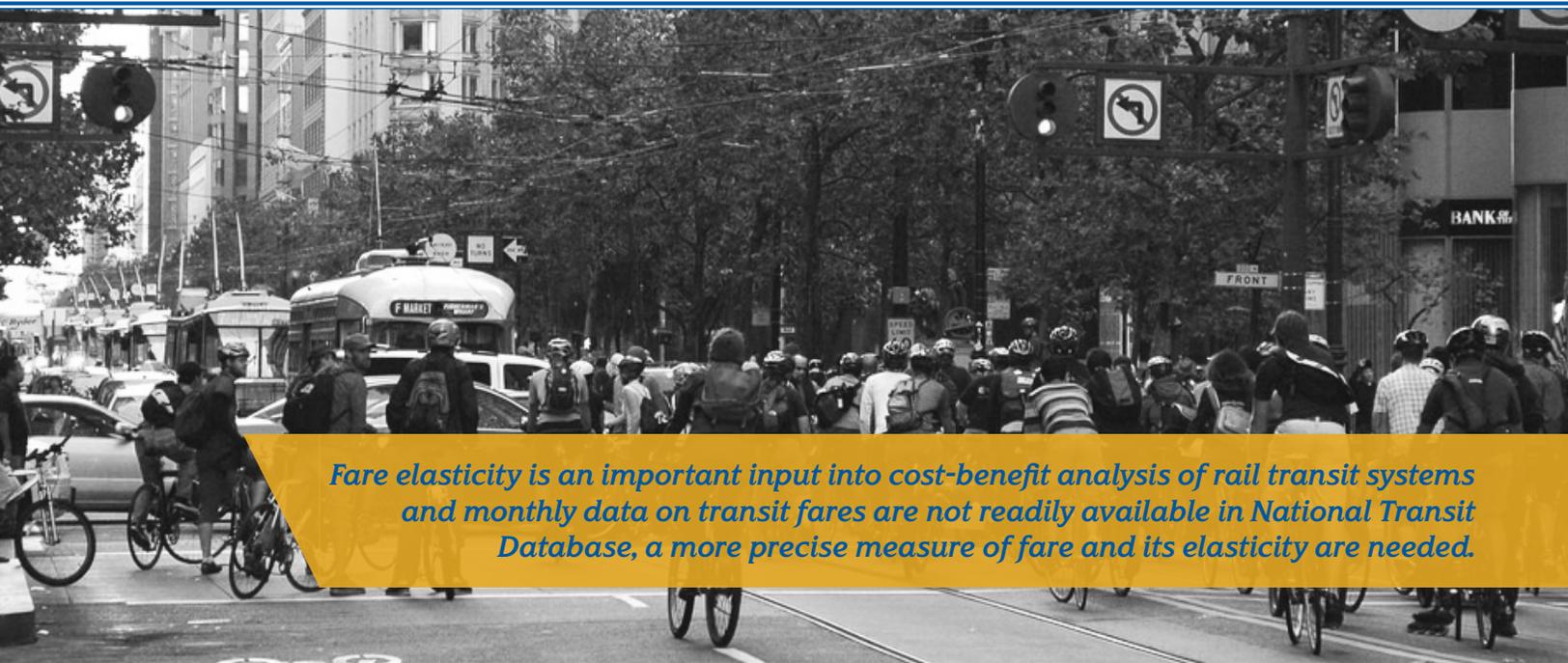


# Improving Demand Modeling in the California Rail Transit System

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*Fare elasticity is an important input into cost-benefit analysis of rail transit systems and monthly data on transit fares are not readily available in National Transit Database, a more precise measure of fare and its elasticity are needed.*

This paper analyzes urban rail fare elasticity and compares the results across four California transit systems. A method of Internet search is adopted to collect monthly transit fare records from 2002 to 2013. This paper contributes towards improving demand modeling for public transit using more precise and monthly data, and applies econometric techniques involving autoregressive integrated moving average (ARIMA) and panel data models. Results show that demand for public transit in California is very inelastic. Any ridership promotion policy may have a heterogeneous impact across transit systems.

## Study Methods

The researcher first employs a method of internet search to collect historical monthly fare structure for California rail transit systems. In this way, the researcher is able to determine the precise date at which new stations were opened and at which fares changed. The paper continues to analyze the data set with two times series techniques: autoregressive

integrated moving average (ARIMA) and panel data models. By using more precise, and monthly data, the analysis may result in more accurate fare elasticity estimates, which would thus be more suitable for drawing out policy recommendations.

## Findings

The seasonal ARIMA model results indicate that fare, service level, employment and number of stations all have a significant impact on transit ridership in San Jose and Los Angeles. In San Francisco, higher employment levels are associated with lower ridership. In Sacramento, service expansion is accompanied by higher ridership. The panel model results show that transit demand in California is in general very inelastic, more inelastic than those found in ARIMA analysis. The study also finds that there are significant differences in transit ridership across transit systems as indicated by system-specific fixed effects. Service level and number of stations are found to have a positive and statistically significant impact on California

transit ridership. This suggests that an increase in service development could potentially promote transit use.

### Policy Recommendations

This study shows that there are significant factors that determine transit demand in California and points out that any ridership promotion policy may have a variation of impact across transit systems. We shed some light as to the source of those variations, which might help policymakers draw out system-specific policies that will be more suitable in increasing transit ridership.

This study identifies several likely areas of improvement, falling into three categories: (1) using more precise, and monthly data may result in more accurate fare elasticity estimates; (2) adopting web scraping to collect more precise data from websites; (3) employing more advanced time series models to obtain fare elasticity.

### About the Author

Dr. Rui Liu is an Assistant Professor of Economics at San Jose State University. She is also a faculty member at the Center of Smart Technology, Computing, and Complex Systems at San Jose State University. She completed her Ph.D in Economics in 2013 at the University of California, Irvine (with a specialization in time series econometrics). She has several publications and research papers in the fields of applied econometrics, macroeconometrics, and education economics.

### To Learn More

For more details about the study, download the full report at: [transweb.sjsu.edu/research/1736](https://transweb.sjsu.edu/research/1736)



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