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Robo-Taxis Are Likely to Increase Job Accessibility, Especially Among Low-Income Households

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Issue

After years of research and development, companies are now operating fully driverless shared-use automated vehicle-enabled mobility services (SAMS) or "robo-taxis" in Arizona and California. SAMS offer several potential benefits to travelers and society including reducing vehicle ownership, parking demand, congestion, crashes, energy consumption, and emissions, as well as increasing roadway capacity, mobility, and accessibility.[1] Moreover, previous research by our team found that SAMS can provide significant job accessibility benefits to workers in California.[2] To better understand the equity implications of the job accessibility benefits from SAMS, we analyzed the distribution of SAMS benefits across different segments of the population (e.g., low- vs. high-income, young vs. old).

To measure the accessibility benefits of SAMS, we use the logsum of a hierarchical work destination and commute mode choice model—a monetary measure of consumer surplus consistent with microeconomic and utility maximization theories. If a new commute mode (e.g., SAMS) is made available to travelers, and that new mode is competitive with existing modes in terms of travel time and travel cost, then the new mode will improve a traveler's job accessibility. For more information, please see our previous study on measuring the job access benefits of SAMS[2].

Key Research Findings

Carless households could be major beneficiaries of SAMS in terms of increased access to jobs. As expected, Figure 1 shows that workers in zero-car households would receive larger job accessibility benefits from SAMS than one- and multi-car households. The mean (denoted with a vertical white line) and median (denoted with black "x") benefit for workers in zero-car households are substantially higher than the mean and median of the other car ownership segments.

The wide interquartile range for the zero-car segment likely stems from the difference between voluntary and involuntary car-less workers. While voluntary car-less workers likely have access to high-quality transit and can walk to numerous job locations, involuntarily car-less workers likely live in areas with poor-quality transit service and cannot walk or bike to nearby job locations.

SAMS job access benefits are highest for low-income households. Figure 2 shows that on average low-income workers would benefit the most from SAMS in terms of job accessibility, followed by middle-income and then high-income workers. This result stems from our statistical model finding that low-income workers are most sensitive to changes in the quality of their commute mode options, measured in terms of travel time and travel cost. Although not displayed in this policy brief, we also find that on average Hispanic and Black workers would receive larger benefits, on average, than White and Asian workers.

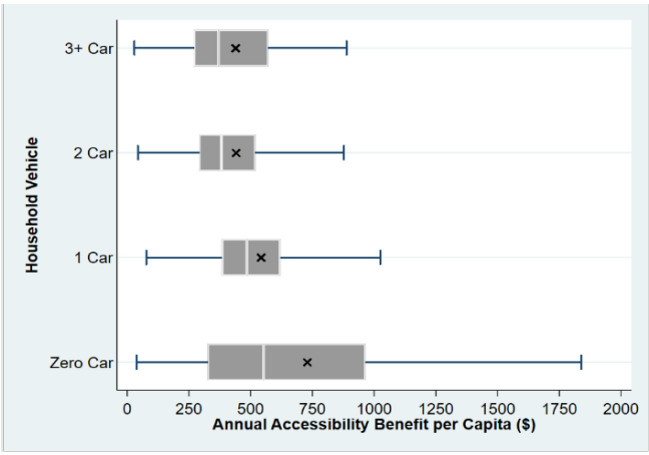

Figure 1. SAMS job accessibility benefits for a synthetic population of workers in Southern California, categorized by household vehicle ownership

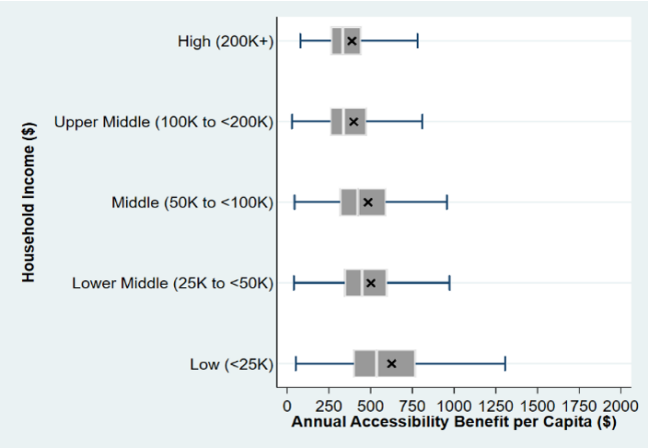

Figure 2. SAMS job accessibility benefits for a synthetic population of workers in Southern California, categorized by household income

Conclusion

Our model-based results indicate that not only will SAMS have a substantial positive impact on job accessibility (around $500 in value on an annual basis for the average worker), but the largest beneficiaries of SAMS are likely to be involuntarily car-less workers, workers from the lowest income households, and Black and Hispanic workers.

More Information

This policy brief is drawn from the journal article "Equity Implications of Robo-Taxis on Job Accessibility: Avoiding the Ecological Fallacy with Agent-Based Models" at www.ucits.org/research-project/2022-37/. For more information about findings presented in this brief, please contact Professor Hyland at hylandm@uci.edu.

[1]Narayanan, S., Chaniotakis, E., Antoniou, C., 2020. Shared autonomous vehicle services: A comprehensive review. Transp Res Part C Emerg Technol 111, 255–293. https://doi.org/10.1016/j.trc.2019.12.008

[2]Ahmed, T., Hyland, M., Sarma, N.J.S., Mitra, S., Ghaffar, A.. Quantifying the employment accessibility benefits of shared automated vehicle mobility services: Consumer welfare approach using logsums. Transp Res Part A Policy Pract 141, 221–247, 2020. https://doi.org/10.1016/J.TRA.2020.09.002

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