**Relative Accessibility as the Potential for Car Independence**

Transportation accessibility metrics, operationalized as a travel-time-weighted sum of destinations that can be reached by a given mode, have become increasingly common tools to evaluate how well the combination of land-use patterns and transportation infrastructure facilitates activity and interaction within an urban area (Levin 2020; Siddiq and Taylor 2021). A debate has emerged on the topic of whether accessibility is itself a goal (Walker 2018) or if it is mostly useful as a proxy or determinant of travel behavior (Karner 2022), and this tension my reflect the difficulty of predicting travel choices based on accessibility metrics that describe the usefulness of a single mode. The current edition of the Transit Capacity and Quality of Service Manual (Transportation Research Board 2013) incorporates the concept of evaluating the ratio of transit travel times to travel times by car as a transit system performance metric. Similarly, evaluating the ratio of car-based accessibility to the accessibility available to those without a car may be a useful measure of the freedom travelers have to meet their daily needs without relying on a private vehicle.

I propose the ratio of average car-free accessibility to average accessibility by car as a measure of the potential for car independence (PCI). I have calculated this metric for each of 917 core-based statistical areas (CBSAs) (including both metropolitan and micropolitan areas) in the United States and for each of the 81,144 census tracts contained within those areas. I validate this as a measure of car independence by calculating its Pearson’s correlation with each of five travel-behavior variables from the 2019-2023 5-year sample of the American Community Survey: The share of workers that commute to work by each of four modes (car, transit, walking, and cycling) and the share of households that does not own a vehicle. Finally, I estimate a set of regression models to evaluate the degree to which several built environment characteristics predict the PCI indicator at both the regional (CBSA) level and the neighborhood (census tract) level.

I find that, at a 95-percent confidence level, the region-level PCI indicator has a significant correlation in the expected direction with the percentage of workers who walk to work, the percentage of workers who bike to work, and with the percentage of households without vehicle access. A higher PCI index is a associated with a greater share of workers who walk or bike to work and a greater share of households without vehicle access. The region-level PCI indicator has a correlation in the opposite to the expected direction for the percentage of households who drive to work (90 percent confidence) or commute to work by public transit (95 percent confidence). The tract-level PCI indicator has a significant (99-percent confidence) correlation with all five travel behavior outcomes in the expected direction.

A linear regression model predicting the tract-level PCI indicator based on the total area of the region, the population density of the region, and the population density of the tract predicts about nine percent of the variation in the tract-level PCI indicator. The results of that regression suggest that higher PCI indicators are associated with regions that have a smaller total land area, a lower population density at the regional level, and a higher population density at the tract level. In other words, a tract with the greatest potential for car-independence would be a relatively high-density neighborhood within a small, low-density micropolitan area. Interestingly, these are areas that generally do not have extensive public transit systems. The potential for greater car independence in those types of places is largely driven by shorter proximities than by greater mobility by non-car modes.

**References**

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