

Research

Steve Farber is quantitative transportation geographer and spatial analyst. His research program investigates how land use and transportation systems affect social and economic outcomes of urban areas. At the core of his research philosophy is the belief that travel behavior is a means through which land use and transportation systems are linked to social, economic and environmental conditions. Farber's work is aimed at better understanding this link in an effort to improve the sustainability of transportation and land use planning. This is achieved through the development of novel geo-computational and spatial econometric techniques and their judicious application to a number of research areas including: activity behavior, accessibility, and social sustainability. His interdisciplinary approach draws from and contributes to the theories of activity and travel behavior modelling, urban-, transportation-, and time-geography, spatial analysis, and geographic information science (GIS).

Social Interaction Potential

One of the major thrusts of his research program since obtaining his Ph.D. in 2010 has been about social interaction potential (SIP), a technique for quantifying the potential for face-to-face contact in metropolitan regions. The work, to date self-funded through start-ups, has recently been awarded a National Science Foundation research grant that will commence in fall 2013. As the intellectual spearhead of this body of work, the project simultaneously demonstrates his intellectual severance from previous mentors, namely his Ph.D. advisor, Antonio Páez, and his ability to create a new collaborative network of respected scholars. The project has been fruitful on many fronts. Farber is the author of SIP-related peer-reviewed publications appearing in *Annals of the Association of American Geographers*, *Journal of Transportation Geography*, *Environment and Planning B* and *Computers, Environment and Urban Systems*. In addition to nine conference presentations, SIP has been the topic of invited lectures given to audiences at UC Davis, University of Concepcion, and University of Murcia. Research results have been broadly disseminated to the public via international media outlets including: The Royal Geographical Society, The Atlantic Cities, WBEZ in Chicago, and the Salt Lake Tribune.

The next steps of the work surround the objectives of the NSF grant, to investigate the higher-order social and economic outcomes associated with social interaction potential. The work will primarily be conducted in collaboration with Morton O'Kelly and Harvey J. Miller from Ohio State University, experts in Spatial Interaction Modelling and Time Geography, respectively. Other researchers involved in the project include: Shaowen Wang (cyber infrastructure support) from University of Illinois; Tijds Neutens (European applications) from Gent University in Belgium; and Juan Antonio Carrasco (validation using spatial social network datasets) from University of Concepcion, Chile. Farber anticipates teaming up with regional scientists to better address the economic implications of social interaction potential.

Spatial Analysis

Since starting graduate studies, Farber has made consistent contributions in the fields of spatial analysis and spatial econometric modelling. In this work, he is inherently interested in quantifying the role of space and connectivity in multivariate models. His earlier contributions involved comparisons between different spatial econometric approaches for estimating hedonic house price models (with publications in the *Canadian Journal of Regional Science* and *Urban Studies*). That work has been evolving over time, with the focus shifting toward identifying the limitations of geographically weighted regression (with publications in *Journal of Geographical Systems* and *Environment and Planning A*) and spatial econometric models (with publications in *Geographical Analysis* and *Advances in Spatial Science*). Farber's efforts in this area remain strong, with an article outlining a new test for spatial autocorrelation (revise and resubmit at *Geographical Analysis*), and a working paper analyzing the issue of dense connectivity structures in spatial autoregressive models that has been presented at two conferences.

Accessibility

Farber's work in assessing accessibility investigates whether transportation systems provide equitable access to goods, services and employment opportunities. His specific contribution is through the incorporation of travel behavior theory in notions of activity space, the area in which individuals can potentially interact with their environment. Again, much of this work is intensively collaborative. He is working with Kevin Henry from Rutgers University on access to mammography clinics (published in *Health and Place*), with Michael Widener from University of Cincinnati on access to healthy foods (also published in *Health and Place*), and with a team of Canadian scientists (Antonio Páez from McMaster University and Catherine Morency from Montreal Polytechnic) on transport related social exclusion (published widely).

Funding

In terms of research funding, Farber is part of a team at the University of Utah (lead by Jessie Fan from Family and Consumer Studies) seeking funding from NIH for a national study of access to healthy food and its relationship to obesity. After their first application was declined, they are in the midst of revising their proposal for a future submission. Farber has also submitted a proposal with Michael Widener and Mark Horner (Florida State) for a food accessibility study under review by the Kresge Foundation.

Public Transit

Farber is currently leading two research projects involving social equity and public transportation. The first project, funded by the National Institute for Transportation and Communities and sponsored by the Utah Transit Authority (UTA), is investigating the equity implications of UTA shifting to a distance-based fare structure. Distance-based fare structures can disproportionately favor or penalize different subgroups of the population based on variations in settlement patterns, travel needs, and most importantly, transit use. According to federal law, such disparities must be evaluated by the transit agency, but the area-based techniques identified by the Federal Transit Authority for assessing discrimination fail to account for disparities in distances travelled by transit users. This means that transit agencies

currently lack guidelines for assessing the social equity impacts of replacing flat fare with distance-based fare structures. Their solution is to incorporate a behavioral model of trip generation and distance travelled into a Geographic Information System Decision Support System (GIS-DSS). The system enables a transit planner to visualize and compare distance travelled and transit-cost maps for different population profiles and fare structures. Other investigators on the project include Keith Bartholomew from City and Metropolitan Planning, Xiao Li, a graduate student whom Farber is advising toward a master's thesis, and Khandker Nurul Habib, University of Toronto. Their first manuscript is currently being prepared for submission to the Transportation Research Board for presentation at the 2014 meeting.

The second project involving social equity and public transit is investigating temporal variations in public transit accessibility and how this affects different subgroups of the population. Farber is advising a graduate student, Ben Ritter, toward a master's thesis on this topic. To investigate temporal variations, they are calculating origin-to-destination public transit travel time matrices with start times spanning the 24 hour period of a typical weekday and the two weekend days. They will then use the travel time matrices to visualize spatiotemporal fluctuations in accessibility, and investigate whether low-income neighborhoods are more or less subject to variations in level of service. The research seeks to explore whether the transit service provision adequately matches the unique temporal demand profile of low-income populations, who typically require transit during off-peak hours. To expedite the computation of the travel-time matrices, they are working with a developer at Environmental Systems Research Institute, Inc., Melinda Morang, to create a tool that can calculate shortest paths on a transit network using scheduling data provided in the General Transit Feed Service format, the standard made popular by Google Maps. This work will form the foundation for a new grant proposal being prepared for the National Center for Transportation and Communities in collaboration with the Utah Transit Authority, Salt Lake City, and Miriah Meyer from the Scientific Computing and Imaging Institute.