The Decline in Inter- and Intra-Urban Mobility and its Impact on Passenger Travel

PI: Gary Painter **Co-PI:** Sandip Chakrabarti

Verna & Peter Dauterive Hall (VPD) 207c

Los Angeles, CA 90089-3331

Email: gpainter@usc.edu; schakra4@uno.edu

Project Objective

Geographic mobility contributes to changes in the demographic, economic, and social makeups of cities. Monitoring and analysis of migration trends help planners and policy makers forecast demand across urban sectors better, and devise strategies to adjust supply or manage demand. The impact of migration on various urban outcomes, e.g. homeownership, has been investigated. Although conceptually straightforward, the population mobility–transportation connection remains unexplored. We hypothesize that declining inter-city mobility among immigrants can affect urban passenger transportation demand as travel surveys show that immigrants' (specifically recent immigrants') travel behaviors and patterns are different from non-immigrants on average.

Problem Statement

This paper presents research exploring how inter-urban migration of recent immigrants has affected aggregate public transit ridership change across U.S. urban areas over a five-year (2008-2013) period. By explicitly estimating the magnitude of change in ridership demand in an urban area in response to inflow of recent immigrants from other urban areas, all else remaining equal, the study helps determine the effect of declining geographic mobility of recent immigrants on urban transit. The research confirms findings from other literature that among other factors, population density, transit supply, and the size of the recent immigrant population predict increased transit usage. The results also demonstrate that recent immigrant migrants to an urban area are less likely to use transit if they arrived from another metropolitan area than those that have arrived directly from a foreign country. The effect of inflow of recent immigrants to a city on the change in transit demand in that city depends on the level of transit investments (or supply-side changes) – in cities that expanded transit service relative to population over the study period, the migrants seem to positively contribute to transit ridership. For inter-urban moves, built environment of the origin city influences in part travel behavior in the destination city for some immigrants.

Research Methodology

Linear ordinary least squares regression models are used to analyze changes in aggregate transit ridership across U.S. urban areas (UAs) over a 5-year period (2008-2013) as a function of the net in-migration rate of recent (10 years or less in the U.S.) immigrants over the period across the urban areas. Other variables that could also contribute to observed changes in ridership are included. In addition, factors that must be held constant in order to evaluate the effects of the various explanatory variables on the dependent variable are used as controls. Variables and data sources are summarized in Table 1. Additionally, the effects of past and present built environment characteristics on present commute mode choice of recent immigrants are tested. This part of the analysis uses disaggregate (individual persons as units of analysis) data from the ACS to analyze 2012-13 moves.

TABLE 1 Dependent and Explanatory Variables at the Urban Area (UA) Level

Variable name	Variable description	Data source
Dependent variable		
ΔRIDER	Estimated change in the number of annual unlinked transit passenger trips. ΔRIDER=RIDER$_{2013}$-RIDER$_{2008}$	US National Transit Database (NTD)

Variable name	Variable description	Data source
Mobility variable		
MIG	Average annual in-migration of recent (<10 years in the US) immigrants from other UAs.	ACS one-year microdata
Other sociodemographic variables		
ΔIMM10	Estimated change in the number of recent (<10 years in the US) immigrants (or foreign-born persons). ΔIMM10=IMM10$_{2013}$-IMM10$_{2008}$	ACS one-year microdata
ΔPOVERTY	Estimated change in the number of people with family income under the federal poverty line. ΔPOVERTY=POVERTY$_{2013}$-POVERTY$_{2008}$	ACS one-year microdata
ΔCOLLEGE	Estimated change in the number of college (or more) educated persons. ΔCOLLEGE=COLLEGE$_{2013}$-COLLEGE$_{2008}$	ACS one-year microdata
ΔUNEMP	Estimated change in the number of unemployed persons. ΔUNEMP=UNEMP$_{2013}$-UNEMP$_{2008}$	ACS one-year microdata
ΔWHITE	Estimated change in the number of persons with race White only. ΔIMM10=IMM10$_{2013}$-IMM10$_{2008}$	ACS one-year microdata
Transportation supply variables		
ΔROADPERCAP	Change in road miles per capita. ΔROADPERCAP=ROADPERCAP$_{2013}$-ROADPERCAP$_{2008}$	FHWA highway statistics
ΔTRANSITMI	Change in annual transit revenue miles. ΔTRANSITMI=TRANSITMI$_{2013}$-TRANSITMI$_{2008}$	US NTD
Control variables		
ΔPOP	Estimated change in population. ΔPOP=POP$_{2013}$-POP$_{2008}$	ACS one-year microdata
POP2008	Baseline population, capturing the effect of city size.	ACS one-year microdata
TRANSITMI2008	Baseline annual transit revenue miles, capturing the effect of the level of transit supply.	US NTD

Results

The regression result presented in **Table 2** suggests that after controlling for the size of the total and immigrant population, the in-migration rate of recent immigrants is negatively associated with aggregate urban area transit ridership. Therefore, the average recent immigrant who migrated from one city to another within the U.S. over the study period was not a transit patron in the destination city. This might be plausible because those who chose to move could have been relatively more educated and/or higher-income than others to begin with, and therefore were unlikely to be transit patrons on average in the origin city. Upward economic and social mobility in the destination city could further reduce their propensity of transit use. The model also suggests that the outflow of recent immigrants negatively affects transit ridership in an urban area, all else equal.

TABLE 2 OLS Regression Model of Change in Transit Ridership (2008-2013)

Independent variable	Coef.	P>|t|
MIG	*-156.89*	*0.05*
ΔIMM10	*68.99*	*0.00*
ΔPOVERTY	-3.66	0.79
ΔCOLLEGE	-0.14	0.99
ΔUNEMP	36.17	0.32
ΔWHITE	*-23.74*	*0.01*
ΔROADMI	1.66E+08	0.24
ΔTRANSITMI	*0.28*	*0.03*
ΔPOP	12.22	0.29
POP2008	-2.63	0.11
TRANSITMI2008	*0.17*	*0.00*
Constant	4.72E+05	0.15

Adj. R-square=0.74; N=294; Coefficients with p<0.05 are highlighted (bold, italics)

Closer investigation reveals that in-migration of recent immigrants (from other urban areas within the U.S.) and in-migration of new immigrants (from other countries) have opposite effects on transit ridership. All else equal, increases (or change in the positive direction) in the number of new immigrants into an urban area is found to be associated with bigger positive change in transit ridership, suggesting that new immigrants drive, in part, urban transit use. Analysis also reveals that the effect of in-migration rate on change in transit ridership is moderated by the magnitude of change in transit supply. In urban areas where per capita miles of transit service increased, the association between in-migration rate of recent immigrants and change in transit ridership is positive. Conversely, places where per capita miles of transit service decreased significantly (bottom 10th percentile), the association is negative. Results suggest that recent immigrants positively contributed to transit ridership, on average, in urban areas that underwent significant transit investments leading to service increases that were more than proportional to population increases. It seems that those cities were on average able to attract incoming recent immigrants into transit efficiently.