Employment Decentralization and Commuting in U.S. Metropolitan Areas

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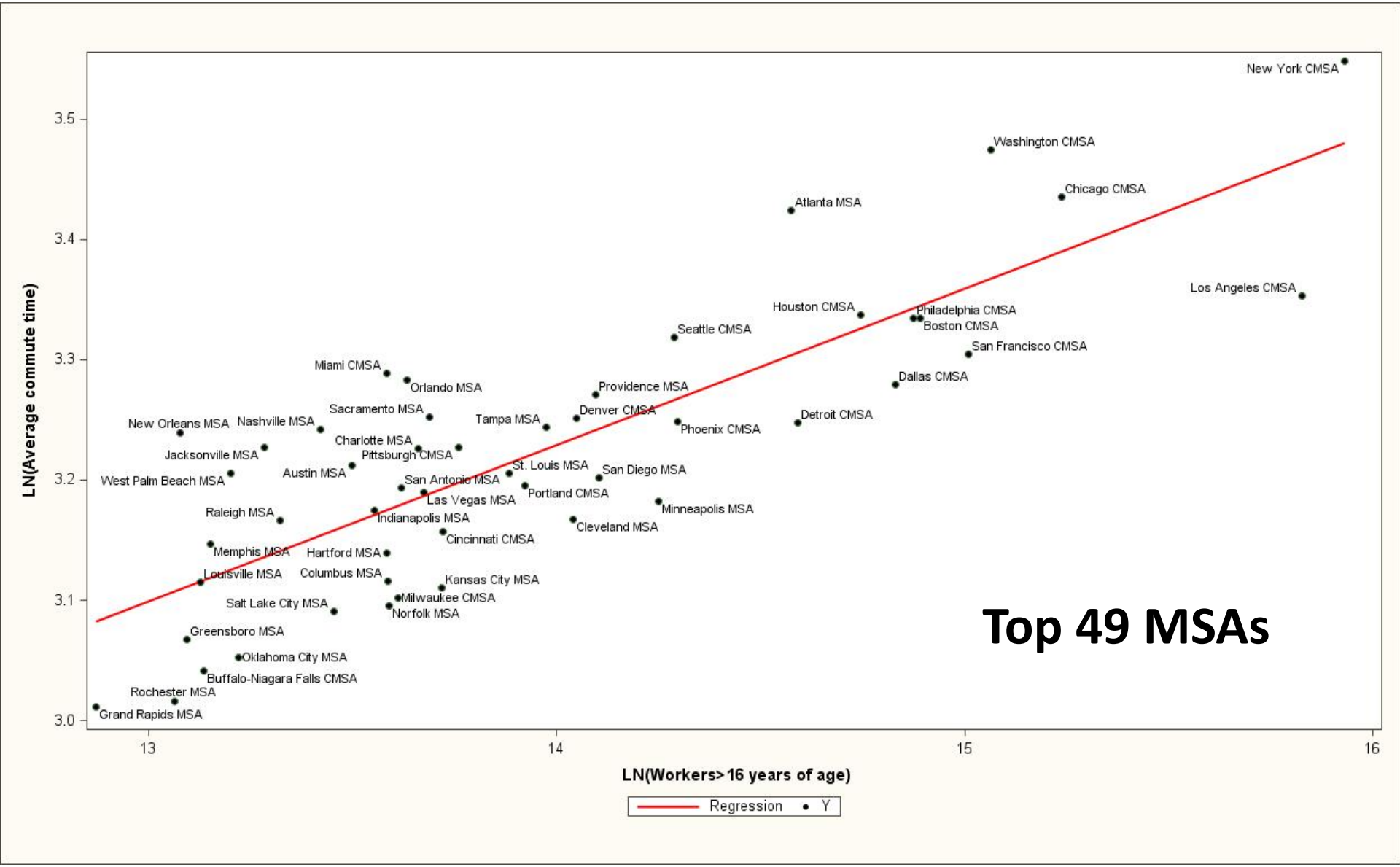
Symposium on the Work of Leon Moses

February 7, 2014
9:30-11:15am, and 2:30-4:30pm

Transportation Center
Northwestern University
Evanston, Illinois


New York CMSA
Washington CMSA
Chicago CMSA
Atlanta MSA
Los Angeles CMSA
Houston CMSA
Philadelphia CMSA
Boston CMSA
Seattle CMSA
San Francisco CMSA
Dallas CMSA
Miami CMSA
Orlando MSA
Providence MSA
Sacramento MSA
Denver CMSA
Detroit CMSA
New Orleans MSA
Nashville MSA
Tampa MSA
Phoenix CMSA
Charlotte MSA
Jacksonville MSA
Pittsburgh CMSA
St. Louis MSA
San Diego MSA
Austin MSA
West Palm Beach MSA
San Antonio MSA
Portland CMSA
Las Vegas MSA
Minneapolis MSA
Raleigh MSA
Indianapolis MSA
Cleveland MSA
Cincinnati CMSA
Memphis MSA
Hartford MSA
Louisville MSA
Columbus MSA
Kansas City MSA
Milwaukee CMSA
Salt Lake City MSA
Norfolk MSA
Greensboro MSA
Oklahoma City MSA
Buffalo-Niagara Falls CMSA
Rochester MSA
Grand Rapids MSA
3.5
3.4
3.3
3.2
3.1
3.0
13
14
15
16
LN(Average commute time)
LN(Workers>16 years of age)
Regression
Y
Top 49 MSAs

Doubling population increases commute time by 10%

URBAN AREA	WORKERS	AVERAGE COMMUTE
LOUISVILLE	0.5 million	22.7 minutes
PITTSBURG	1.0 million	25.5 minutes
HOUSTON	2.0 million	28.8 minutes
CHICAGO	4.0 million	31.0 minutes
NEW YORK	8.0 million	34.0 minutes

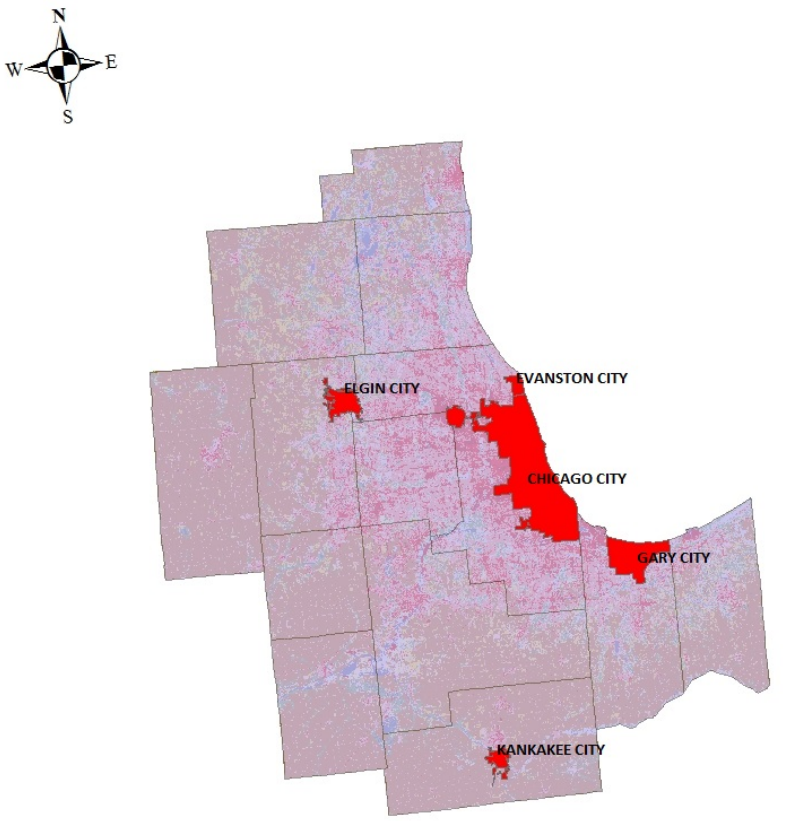
- *New York has 16 times more workers than Louisville but only 50% higher commute time*

Observed data

Commuting Patterns

Commuting patterns		United States	Canada
Residence	**Workplace**	**2000 Census** (%)	**2001 Census**(%)
Central city	*Central city*	**27.5**	**46.1**
Central city	*Suburb*	**8.9**	**7.5**
Suburb	*Central city*	**20.2**	**16.2**
Suburb	*Suburb*	**43.4**	**30.2**
Total		**100.0**	**100.0**

Chicago metro area with counties and central cities



Coordinate System: Albers Conical Equal Area
Projection: Albers
Datum: North American 1983
false easting: 0.0000
false northing: 0.0000
central meridian: -96.0000
standard parallel 1: 29.5000
standard parallel 2: 45.5000
latitude of origin: 23.0000
Units: Meter

40,000 20,000 0 40,000 Meters

Legend

CENTRAL CITIES

COUNTIES

Dependent variable: Log (Average commuting time)

YEAR	2000	2010	POOLED
Constant	+1.52*	+1.42*	+1.50*
MSA WORKERS	+0.11*	+0.10*	+0.11*
LN(% TRANSIT)	+0.02	+0.03**	+0.03*
LN(% EMP SUB)	-0.23**	-0.22*	-0.22*
LN(% RES OUT PC)	+0.24**	+0.26*	+0.25*
YEAR 2010			-0.03*
ADJ. R-sq. (%)	63.09	70.74	67.94

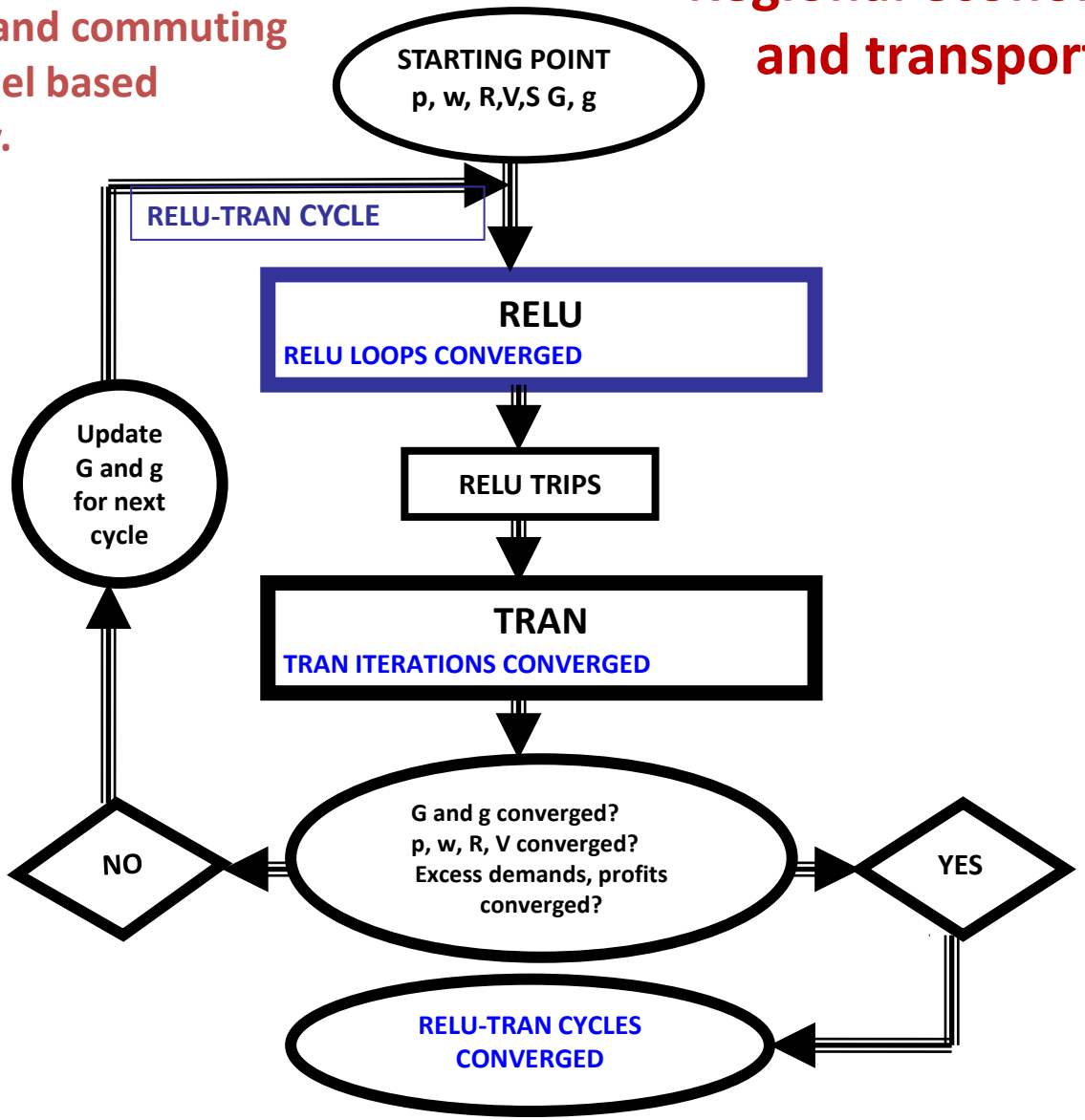
Top 49 MSAs

Significant at: * 1%; ** at 5%; *** at 10%

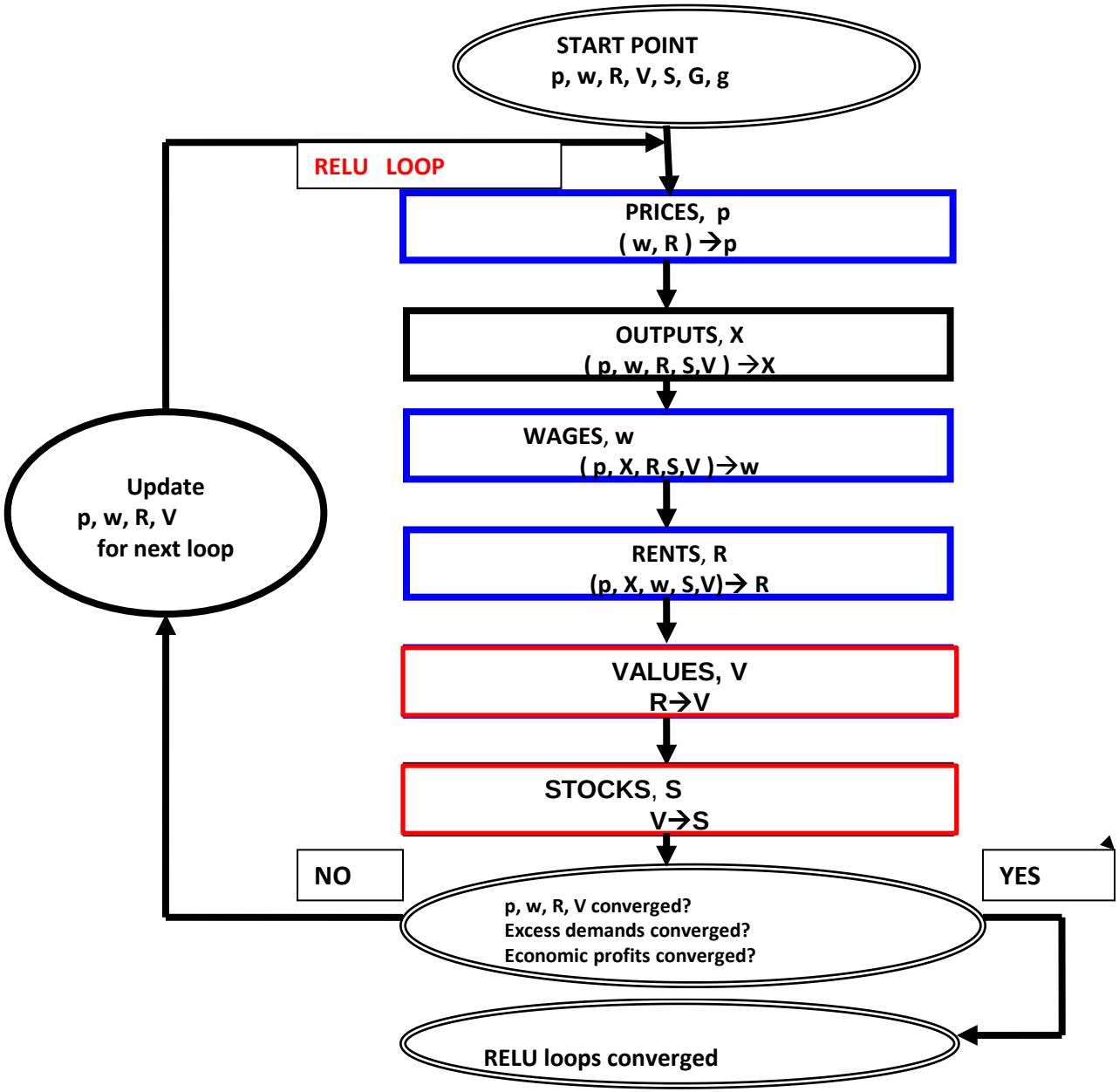
How do commuting times In the top 49 respond to?	
Change in:	**% Change in commuting times**
1% increase in MSA jobs	+ 0.11%
1% increase in suburban job share	-0.22%
1% increase in suburban population share	+0.25%
Year 2010 (relative to 2000)	-3%

To understand the process of decentralization and commuting we need a CGE model based on economic theory.

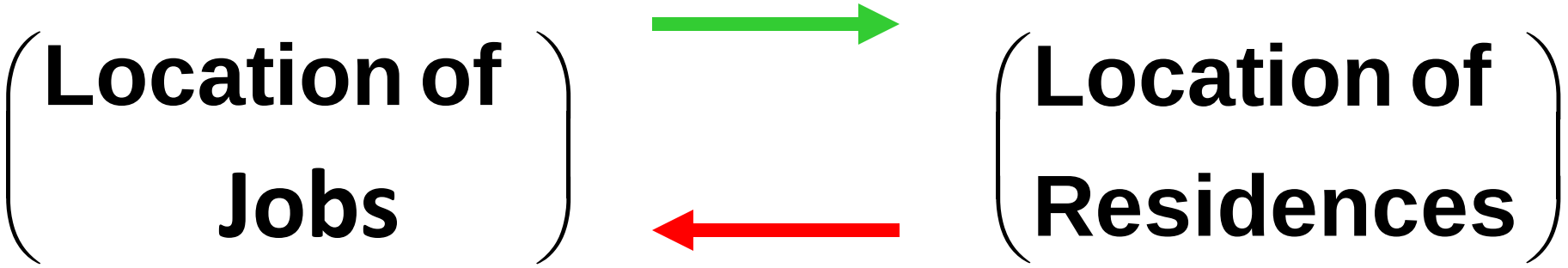
Regional economy, land use and transportation model



Cyclical linking of the RELU and TRAN algorithms in RELU-TRAN



The RELU algorithm



Consumers/Workers care about access to jobs:

- Access to jobs for commuting or shopping → residence location
  - Access to jobs → labor supply of workers

Producers care about access to residences:

- Access to residences → wages offered by employers
- Access to residences → pricing of product for sale

Congestion

- **Congestion rises when population increases but road capacity remains constant.**

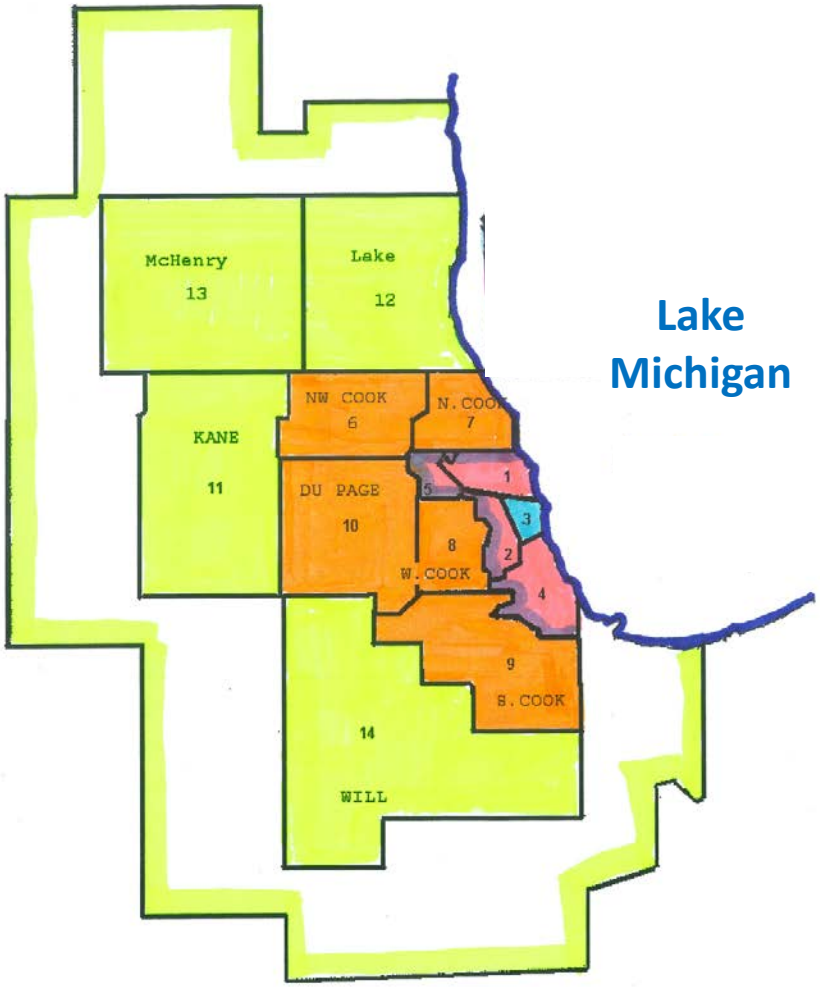
- **Travel time per mile of road increases on average**

- **People try to economize on car miles traveled by:**

1. Switching to public transit
2. Locating closer to jobs
3. Making fewer discretionary trips
4. Making shorter discretionary trips
5. Trip chaining more

- **Producers respond by:**

1. Moving closer to labor and customers
2. Offering higher wages



Central Business District

Rest of City of Chicago

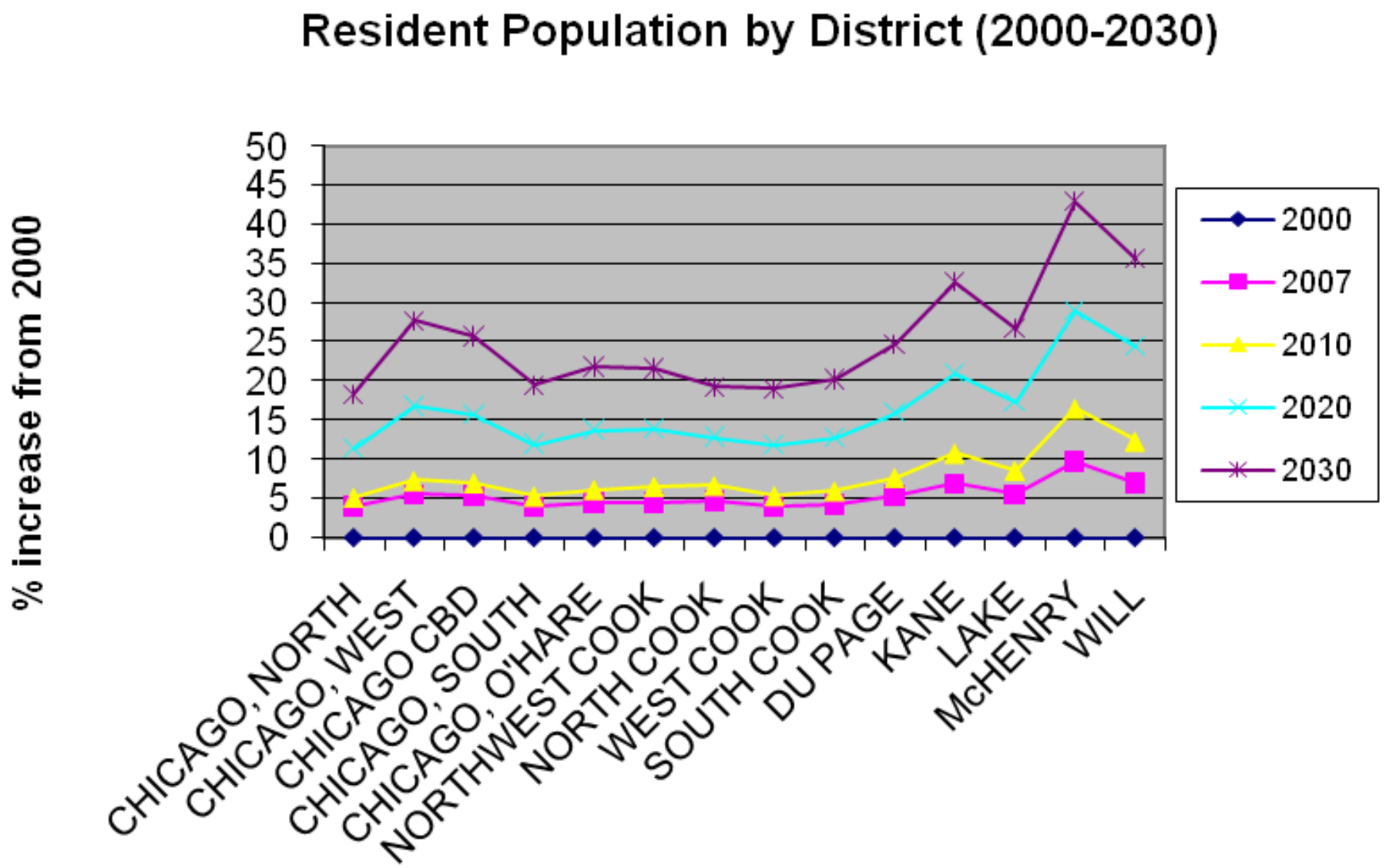
Inner ring suburbs

Outer ring suburbs

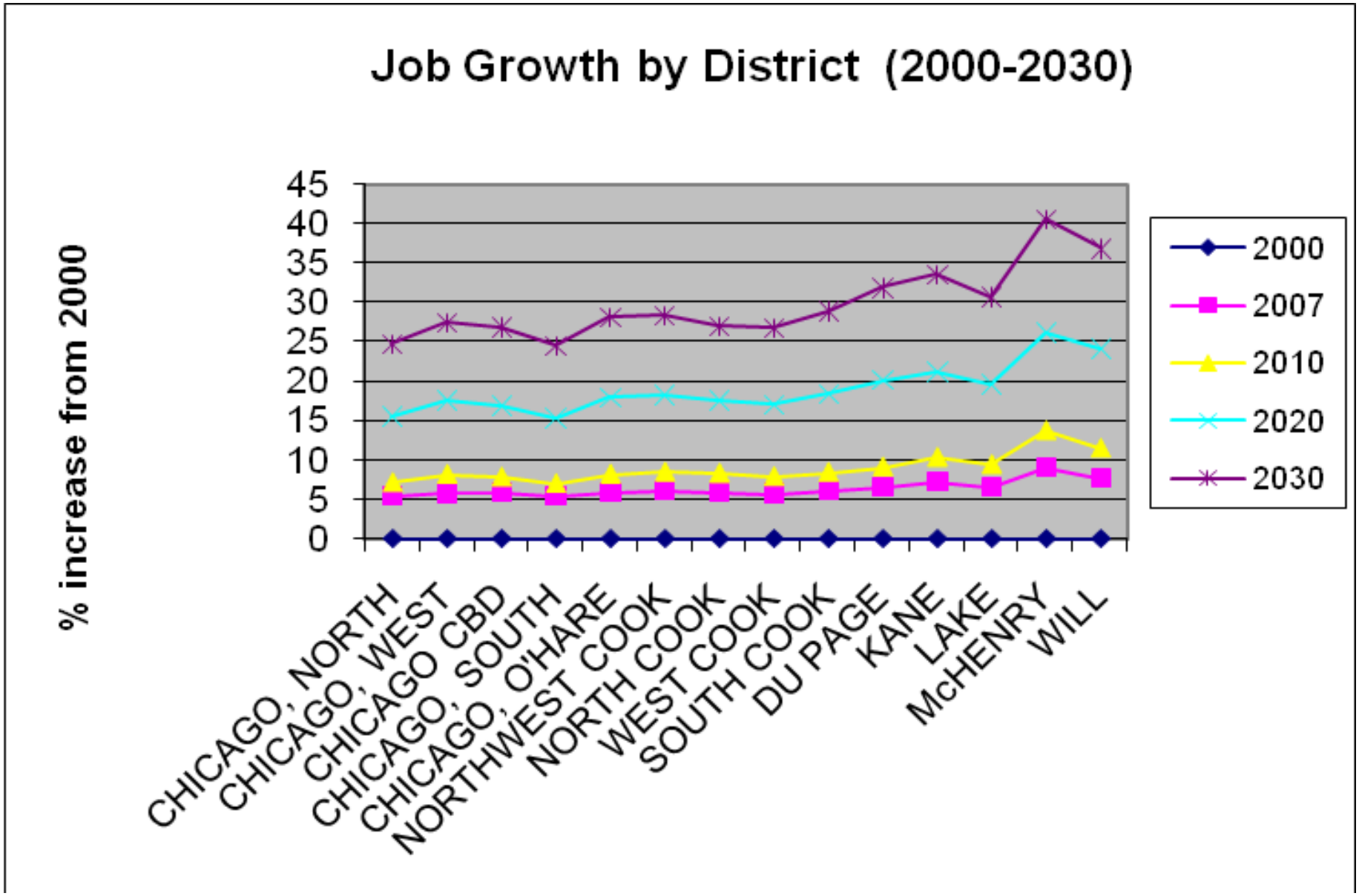
Exurban area

The Chicago MSA

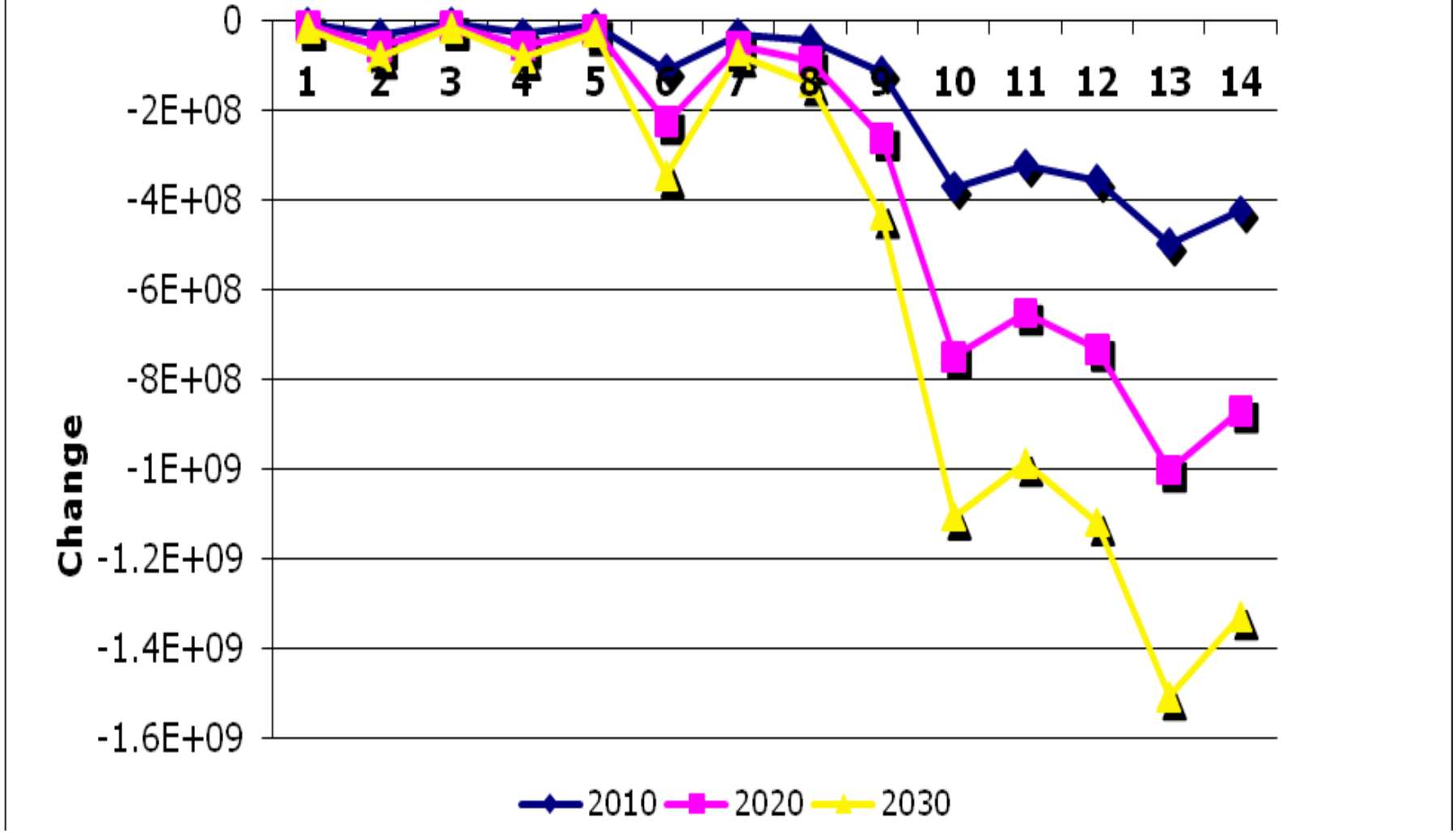
Effect of Growth on Residence Location



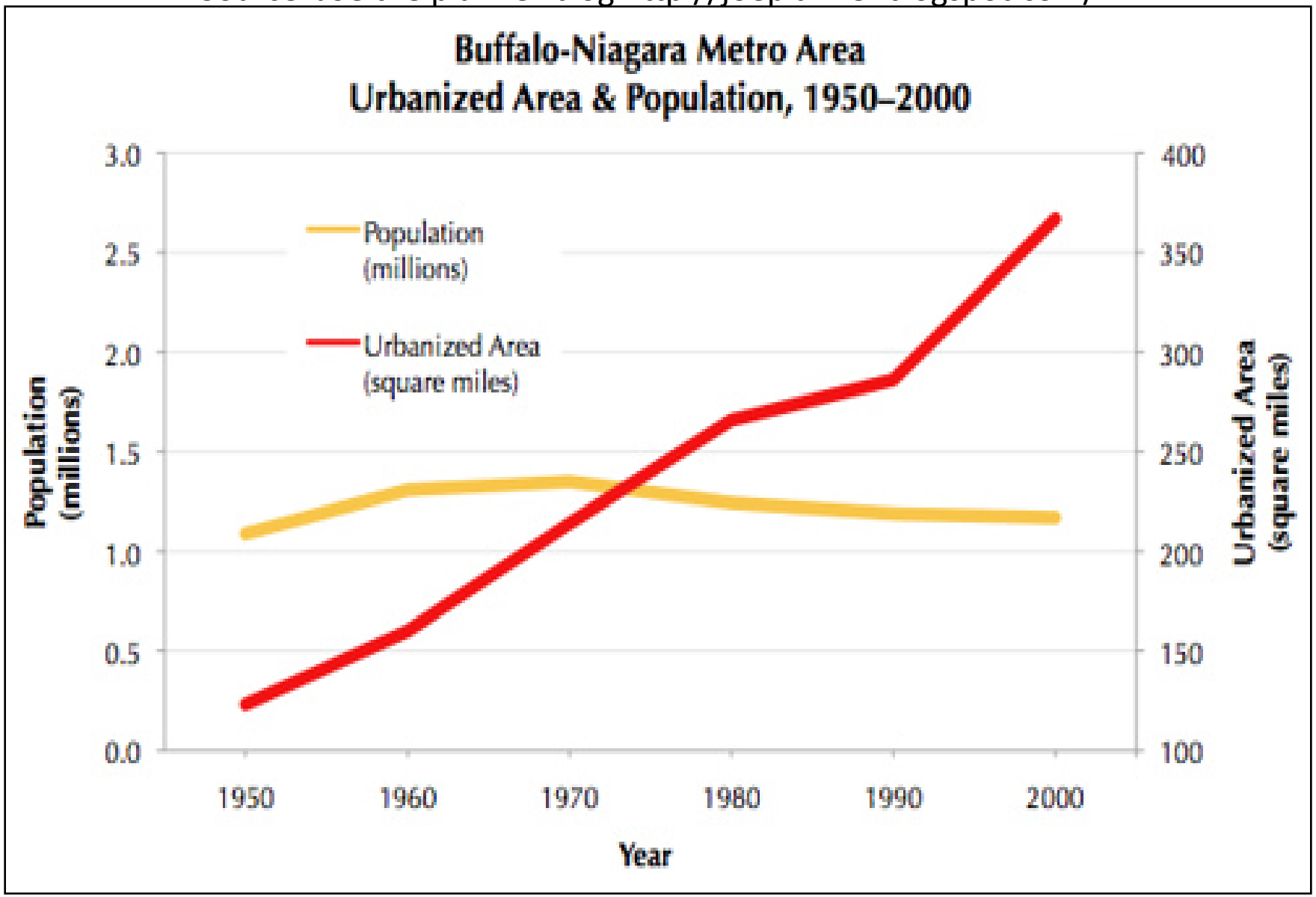
Effect of Growth on Job Locations



Undeveloped land area (Urban sprawl)

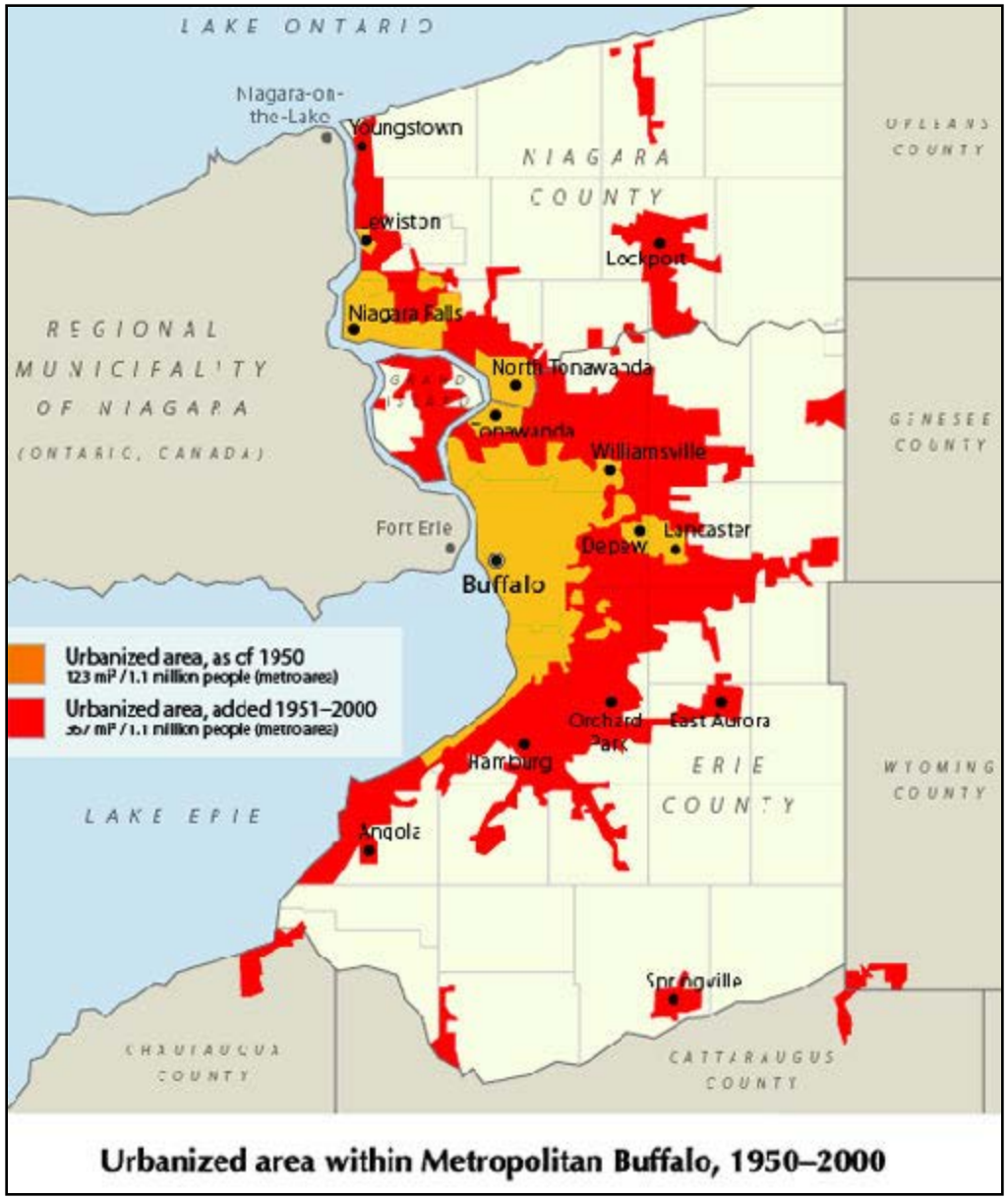


Source: Joe the planner blog http://joeplanner.blogspot.com/



Historical urban sprawl pattern in the Buffalo-Niagara Falls MSA

Source: Joe the planner blog, http://joeplanner.blogspot.com/

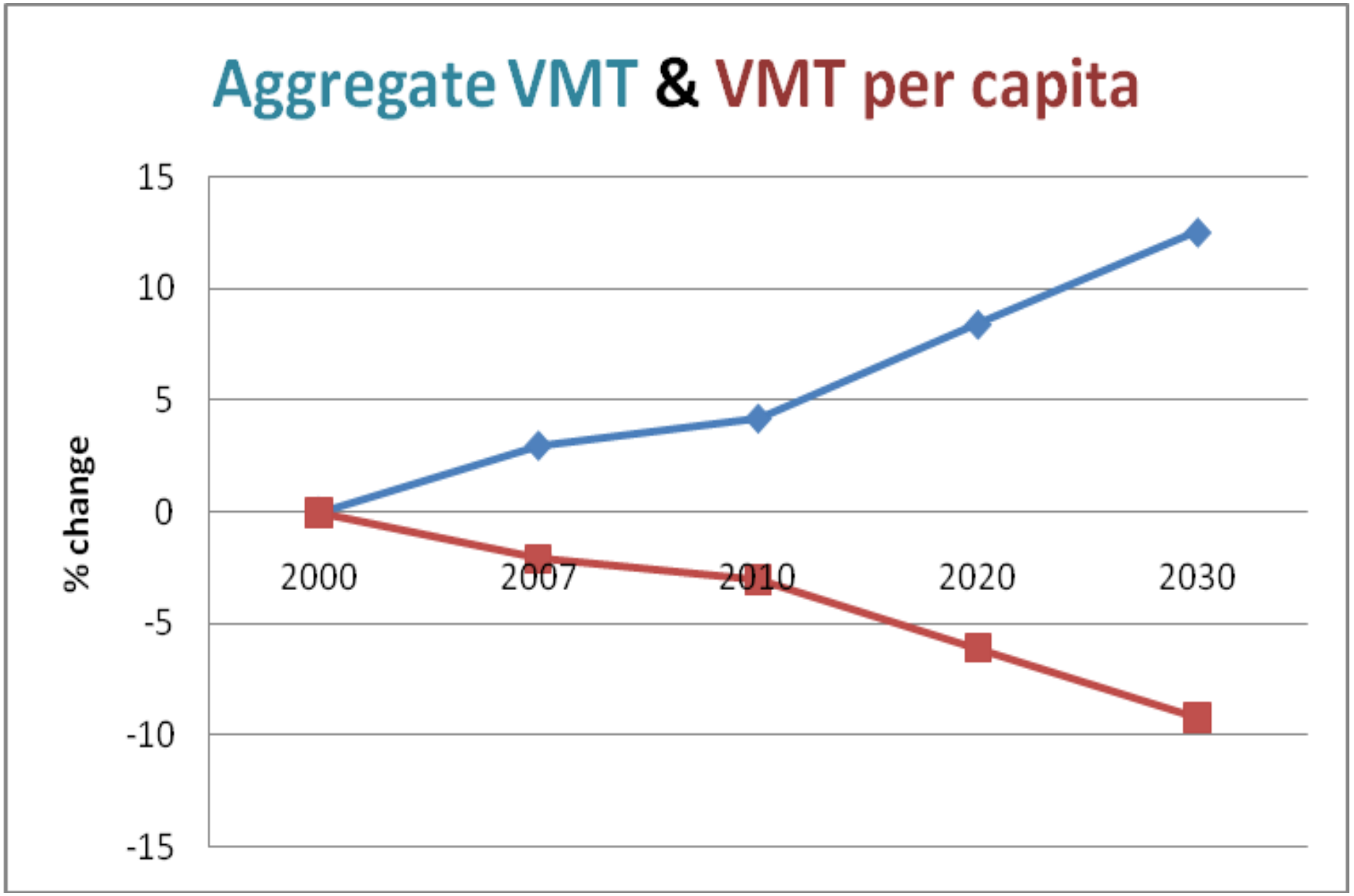


Urbanized area within Metropolitan Buffalo, 1950–2000

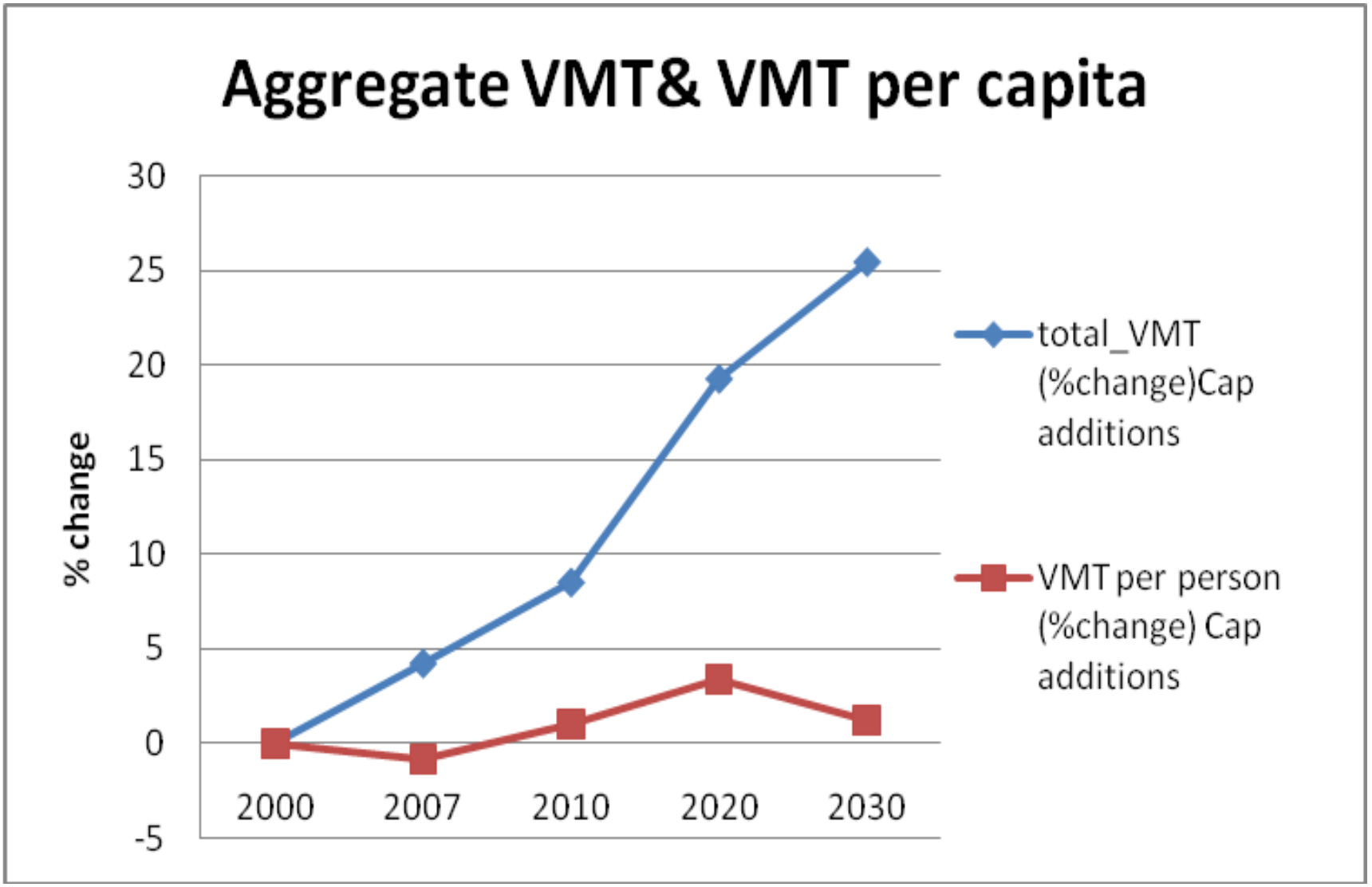
“Sprawl spreads development out over large amounts of land; puts long distances between homes, stores, and job centers; and makes people more and more dependent on driving in their daily lives.

…. Sprawl lengthens trips and forces us to drive everywhere. The average American driver currently spends the equivalent of 55 eight-hour workdays behind the wheel every year.” **(Sierra Club).**

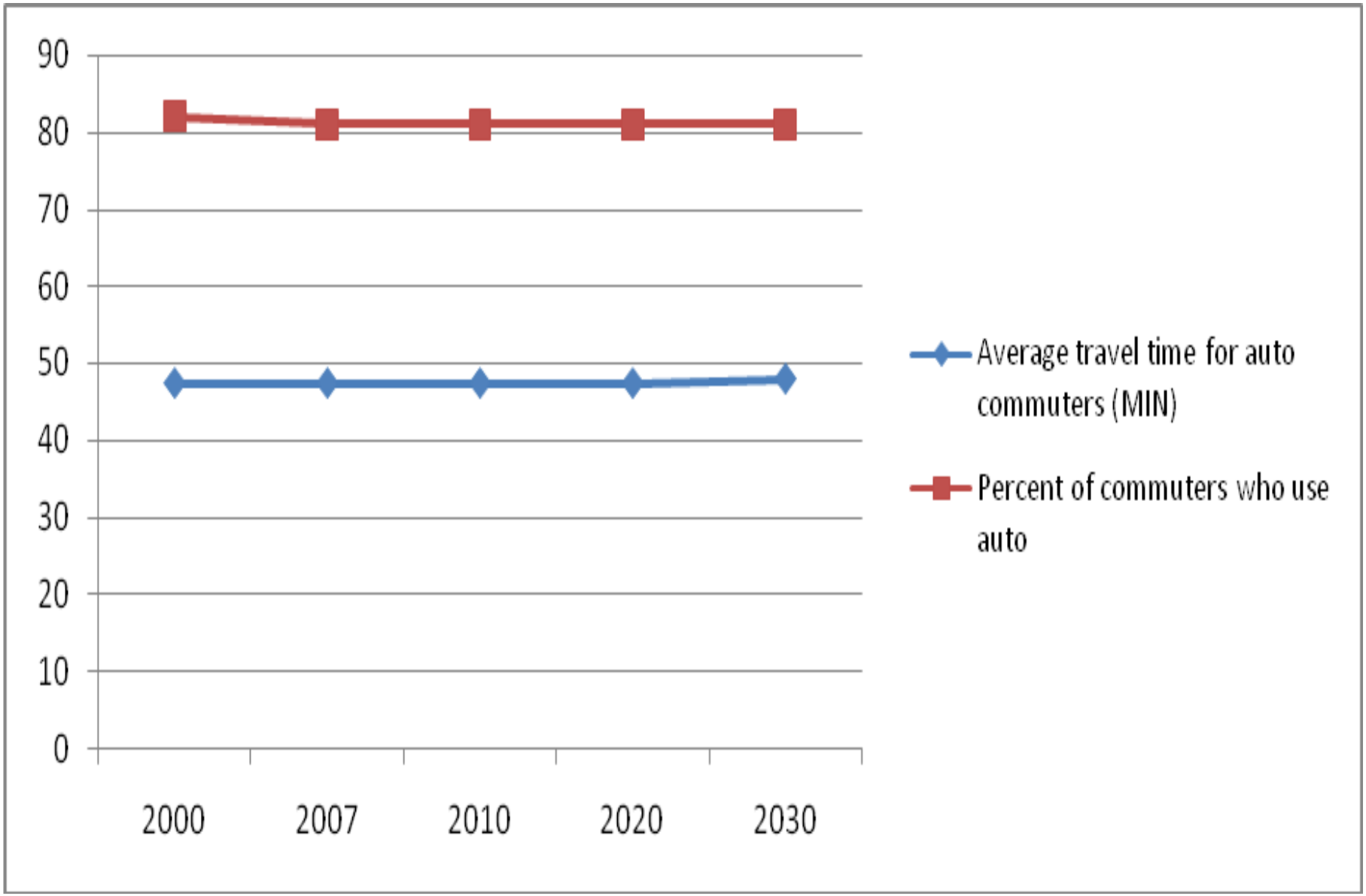
VMT Traveled without Road Capacity Addition



VMT Traveled With Highway Capacity Additions



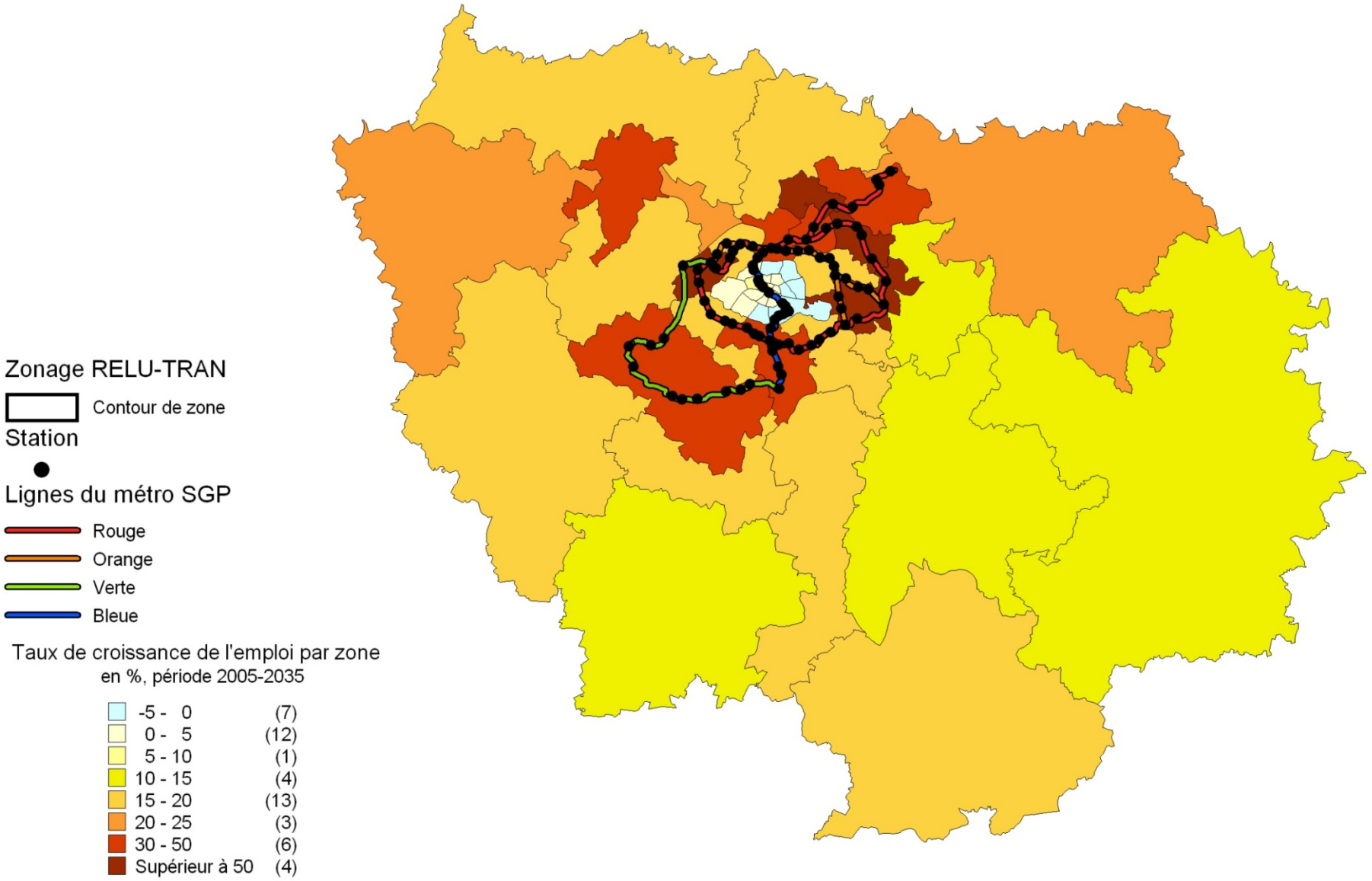
Stability of Commuting Time by Car

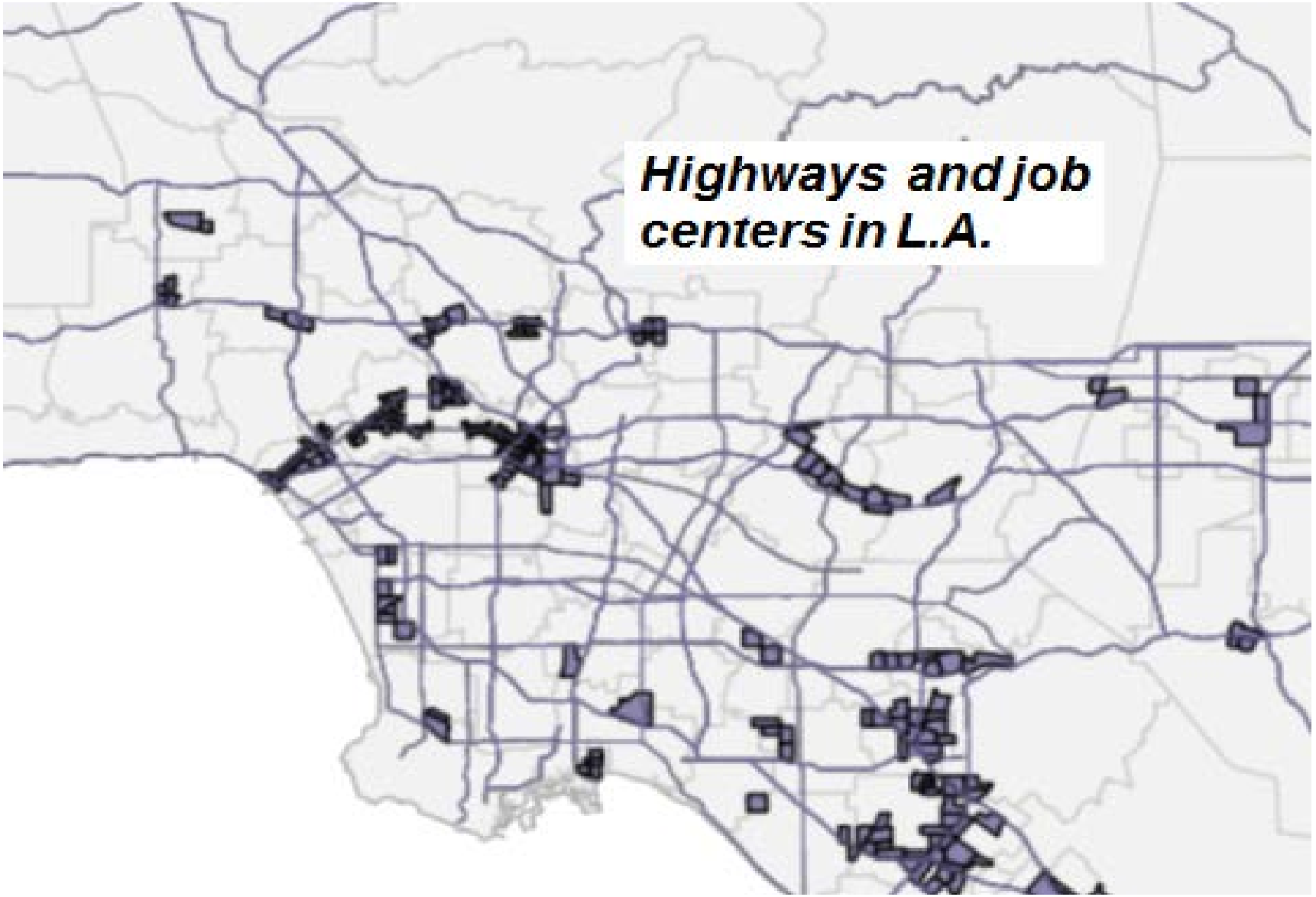


Other applications of the model

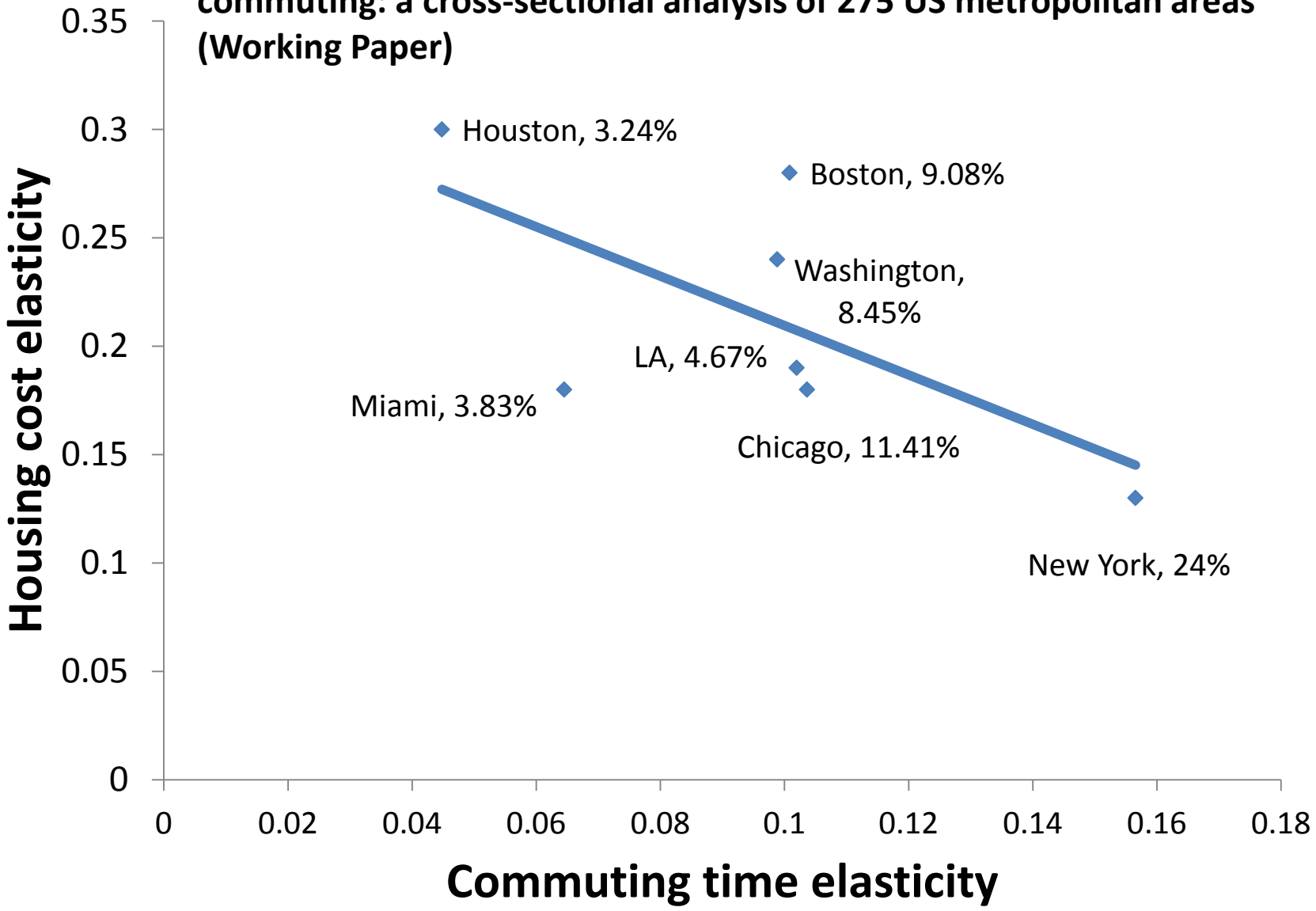
	Public transit share in commuting	Employment dispersion
Chicago, MSA	13%	About 30% of jobs in the 4 largest job centers
Ile-de-France (Greater Paris)	50%	About 50% of jobs in the City of Paris and 10 surrounding centers
Los Angeles, MSA	4.5%	About 30% of jobs in the 30 largest job centers

How would new circumferential public transit links affect suburban job concentrations ?




Highways and job centers in L.A.

Debarshi Indra, "Choice of residence location and mode of commuting: a cross-sectional analysis of 275 US metropolitan areas" (Working Paper)



MSAs are shown with public transit shares