Patterns and Determinants of Stretch Commuting Across the Rural-Urban Continuum

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Introduction

- We first explored the concept of *stretch commuting*, or long distance commuters traveling 50 or more miles each way, in the context of rising gas prices in 2004 (using 2000 data).

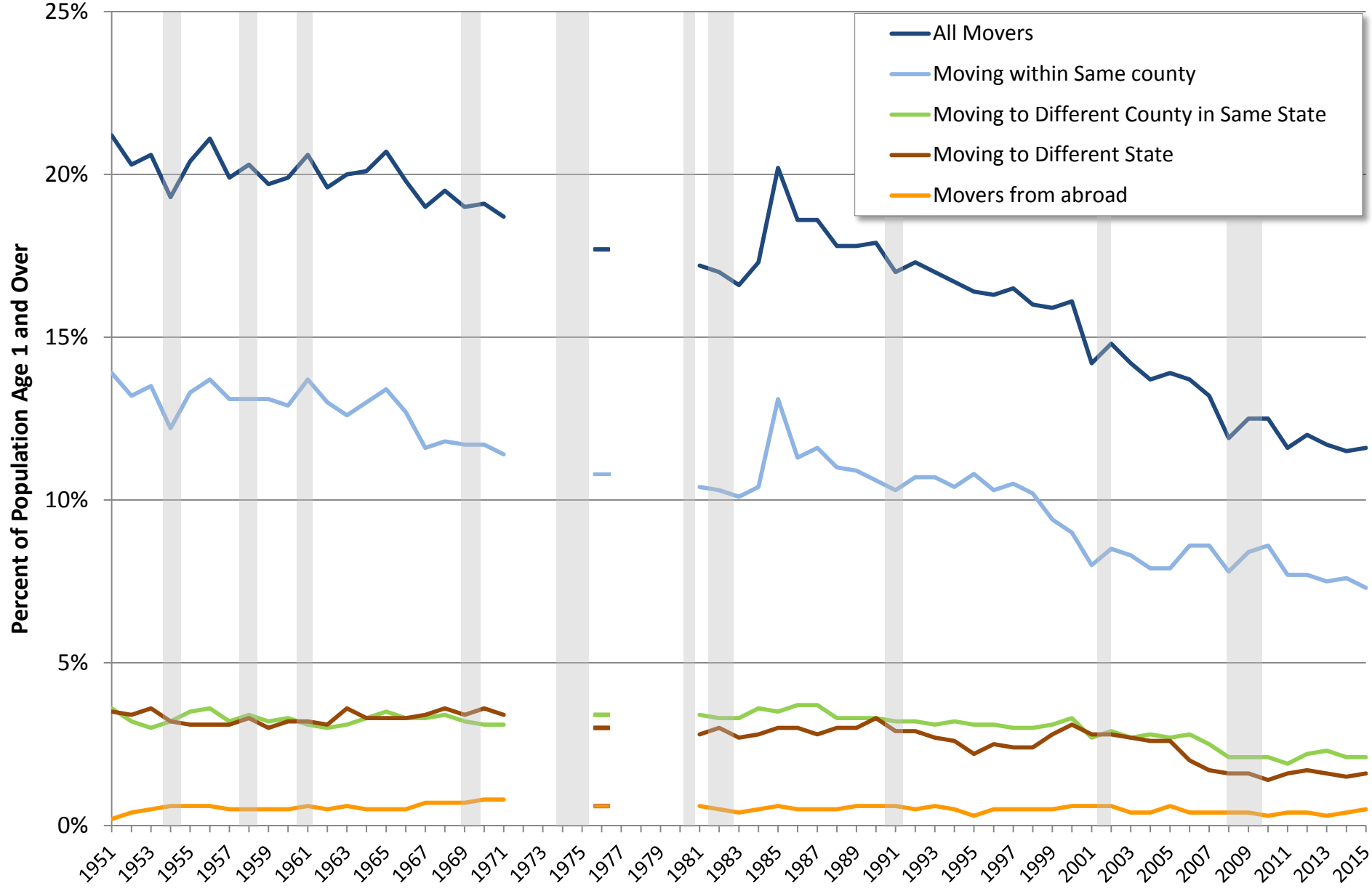
- More recently, regions in Wisconsin are interested in retaining out-commuters due to labor supply constraints (nearing full employment and declining labor force partly due to an aging population).

- Economic upheavals stemming from the Great Recession create opportunities for exploring how commuters may have responded to these shifts.

- Declining mobility rates raise the question of whether workers are substituting commuting for migration.

Mobility Rates 1950 to 2015

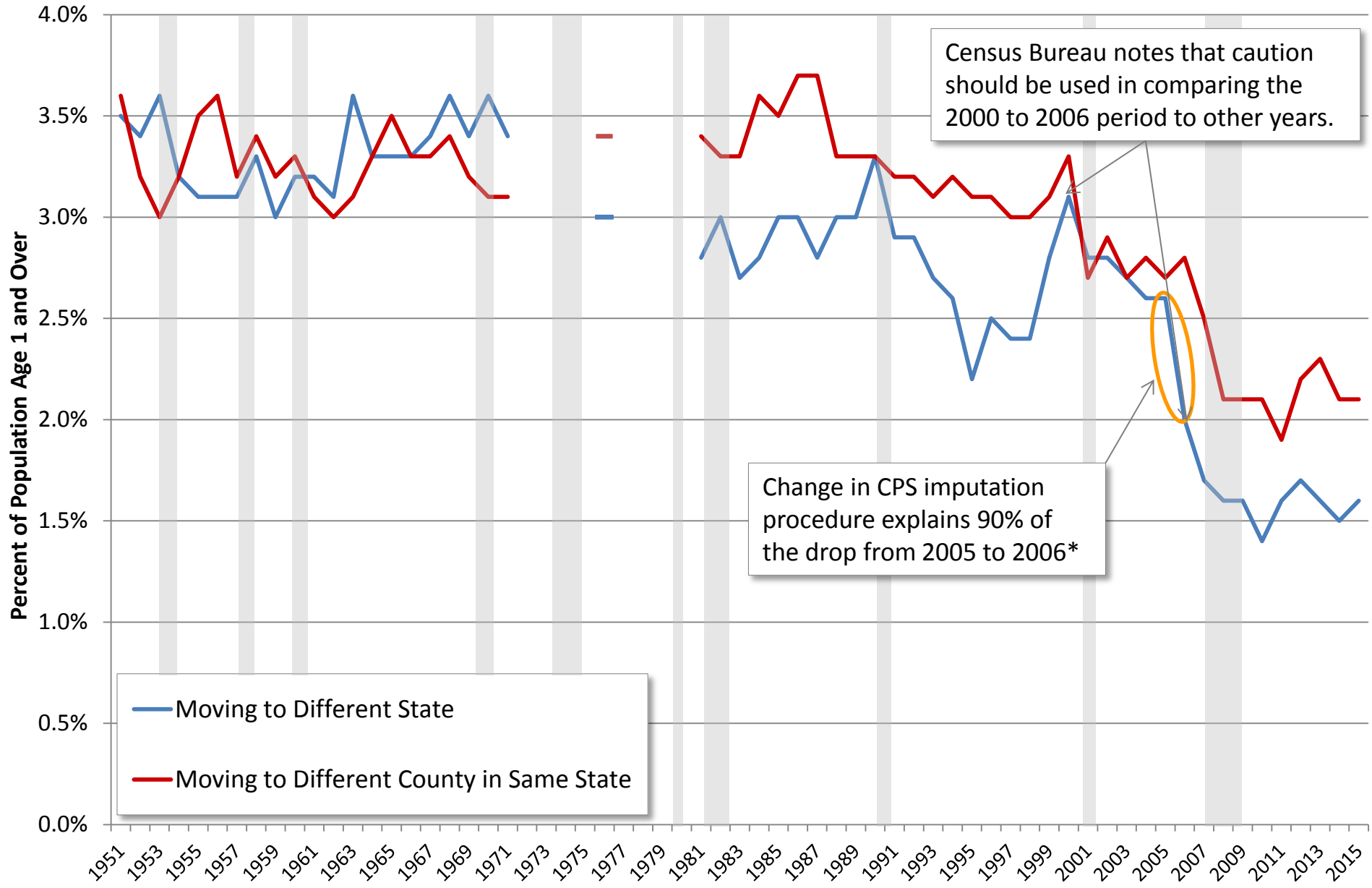
Percent of United States Population Moving (Age 1 and Over)



Source: US Census Bureau Current Population Survey

Inter-State and Inter-County Mobility 1950 to 2015

Percent of United States Population Moving Across State Lines (Age 1 and Over)



Source: US Census Bureau Current Population Survey

*Kaplan and Schulhofer-Wohl, 2012

Joint Residential-Employment Location Decisions

Commuters are assumed to jointly select their residential locations and workplaces in a manner that maximizes the positive benefits to his or her household (Renkow and Hoover, 2000; Cho, Rodriguez and Song, 2008; So, Orazem and Otto, 2001; Partridge, Ali and Olfert, 2010)

Utility function that can include:

- Housing/Costs Characteristics;
- Quality of Life (Natural or cultural amenities, school quality, social connections, etc.);
- Probability of finding employment;
- Wage differentials;
- Demographics;
- Travel costs (time and direct costs).

Commuting Patterns are Influenced by Many Factors

The exact influence of commuting length/time on locational decisions is neither definitive nor consistent (Cho, Rodriquez and Song, 2008):

- Workplace accessibility is either significant or a critical determinant for individuals who are deciding where to live (Abraham and Hunt, 1997; Levinson, 1998; Bhat and Guo, 2004).

- Demographic composition, housing characteristics and neighborhood attributes may play a greater role in residential selection (Molin and Timmermans, 2003; Zondag and Pieters, 2005).

- Commuting patterns are influenced by occupation, gender, income, and household structure (Kim, Sang, Chun and Lee, 2012; Wyly, 1998; Rapino and Fields, 2012).

- Spatial structure and distribution of labor markets influence commuting flows from both inter and intra-regional perspectives (Mitchelson and Fisher, 1987; Renkow and Hoover, 2000; Boschmann and Kwan, 2010; Partridge, Ali and Olfert, 2010; Chen, Zhan and Wu, 2012).

Is there a Reasonable Threshold for Commuting Distances?

- If shorter commuting times or distances are to be viewed as amenities to individuals, the values of these amenities must diminish as commuting times or distances increase. Several distance thresholds have been suggested where the returns associated with commuting become negligible:
  - 50 to 60 miles between a community of residence and the community of employment (Mitchelson and Fisher, 1987)
  - Distance of 118 kilometers (~73 miles) as a critical threshold where rural areas become less likely to benefit from rural-urban integration through commuting (Partridge, Ali and Olfert, 2010).
- However, the number of individuals willing to commute more than 50 miles each way is notable. These so-called “stretch commuters”, totaled more than 3.3 million individuals between 2001 and 2002 (Bureau of Transportation Statistics, 2004).
- Rapino and Fields (2012) find that five percent of all full-time workers traveled 50 miles or more from their place of residence to place of employment during the 2006-2010 period.

Motivation

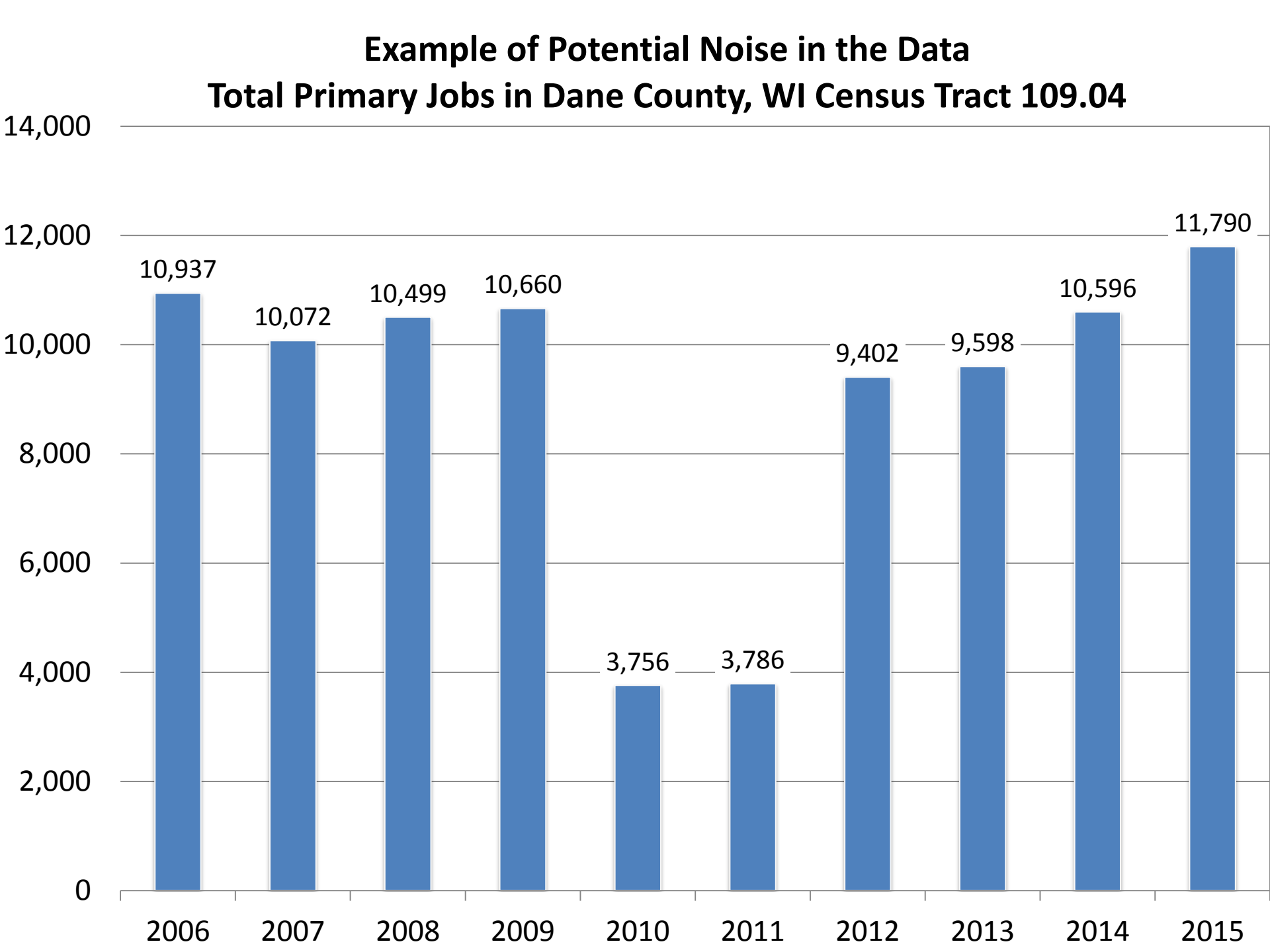
- Snapshots of long distance commuters confirm that some segment of the U.S. population is willing to travel distances either at or beyond the thresholds where many individuals or regions likely experience minimal returns.
- However, we do not necessarily know how place-based factors or individual motivations influence an individual's decision to commute beyond 50 miles (Rapino and Fields, 2012).
- Do patterns of stretch commuters vary across time and space similar to other socio-economic categories of commuters (past studies have been somewhat restricted by enumeration units and/or time periods).

Can we create and ultimately use a data set to answer these (and other) questions about long distance commuting?

Our analysis is largely exploratory

Data Source - Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LODES)

- *Synthetic* journey-to-work dataset produced annually (currently 2002 to 2015). Based on Q2 employment;
- State unemployment insurance reporting and account information and federal worker earnings records provide information on employment location for covered jobs and residential information for workers;
- Tabulated by residence area characteristics, workplace area characteristics and origin-destination characteristics. O-D subset includes more limited information on individuals by their earnings, age group and industry of employment;
- Enumeration units start with census blocks, which can be further aggregated to other geographic areas;
- For more information on LODES see Graham, Kutzbach, and McKenzie, 2014.


Example of Potential Noise in the Data
Total Primary Jobs in Dane County, WI Census Tract 109.04
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
10,937
10,072
10,499
10,660
3,756
3,786
9,402
9,598
10,596
11,790
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

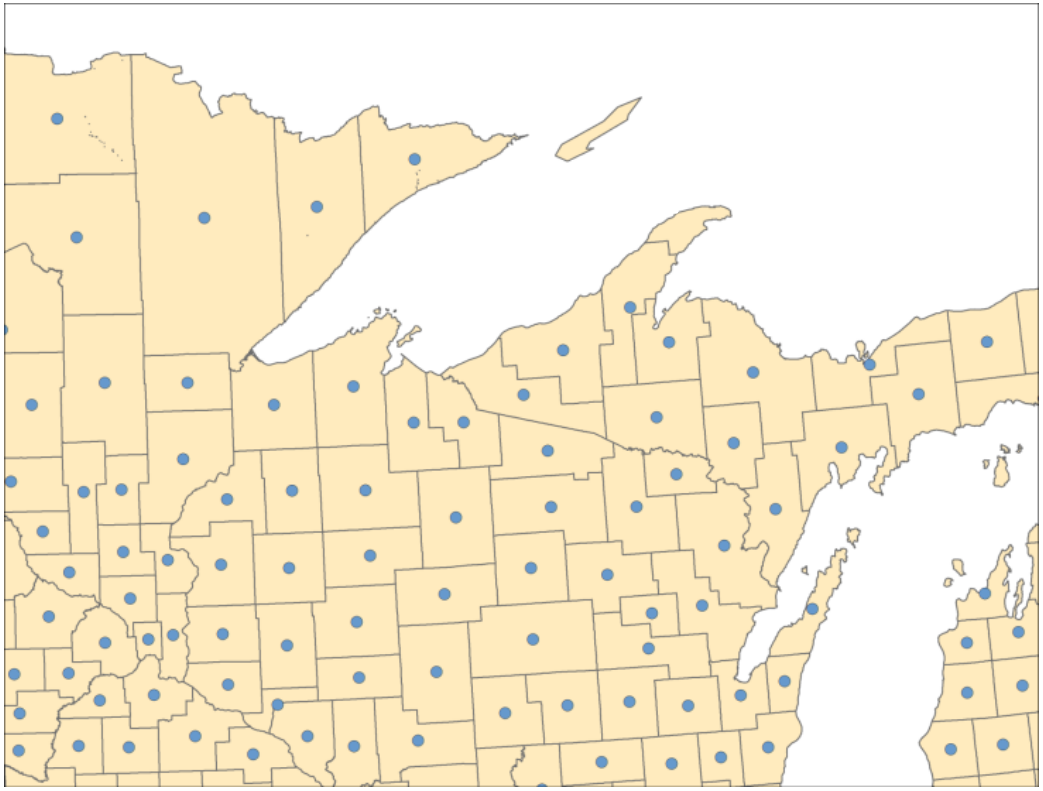
Methodology

- Census tract-to-census tract centroid measurements – An improvement over using large geographic areas to measure distances. However, does not necessarily "solve" issues related to the MAUP.

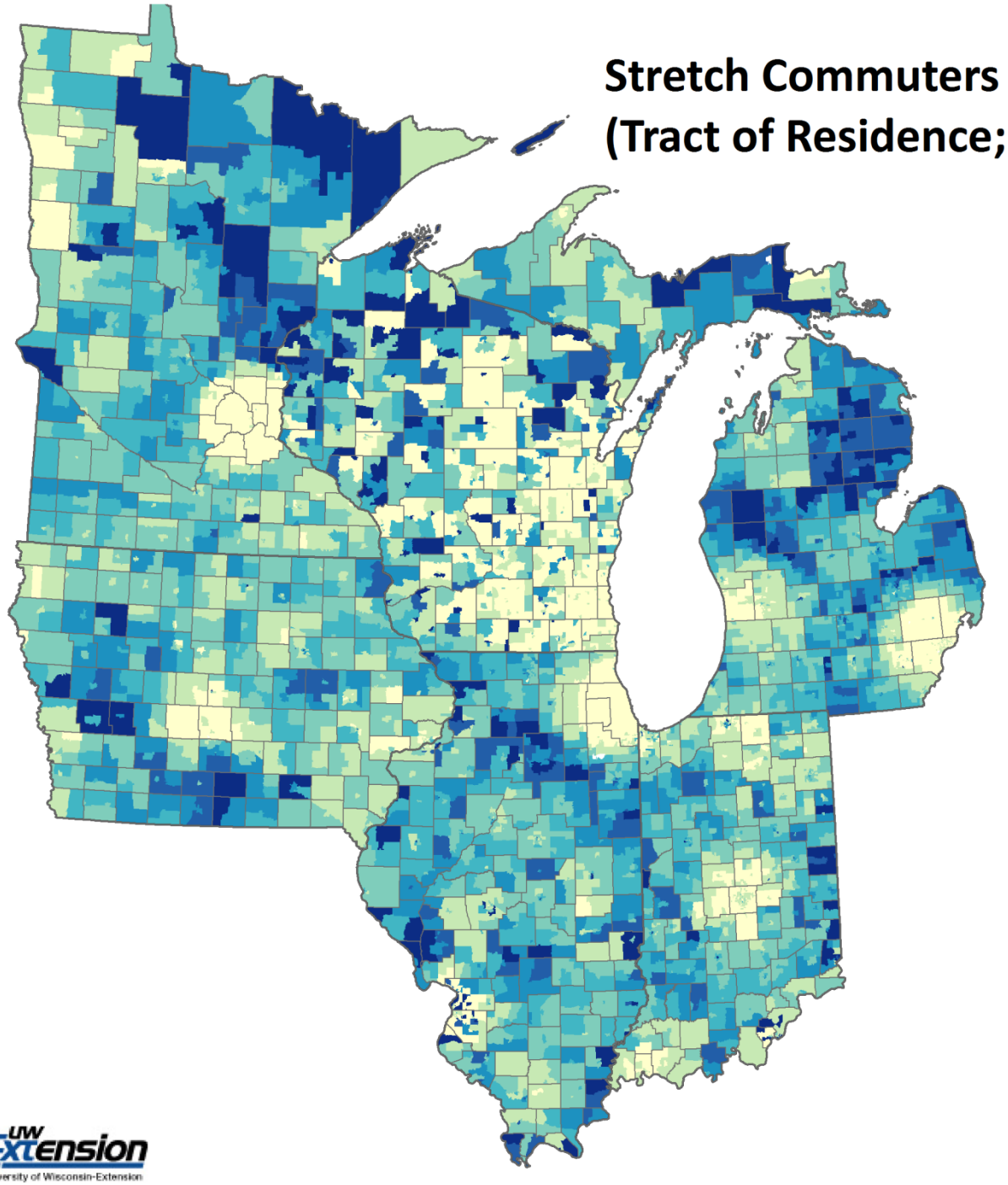
- Straight line calculations ignore travel barriers. Instead used shortest path analysis using road networks (Dijkstra algorithm). Faced with point-on-network problems in some rural areas.

- Six state study area (IL, IN, IA, MI, MN and WI). Also include surrounding state census tract centroids to consider out-of-state study area commuters. *Results in 300 million potential tract-to-tract origin-destination pairs.*

- Repeated the calculations for several time periods (2004, 2006, 2008, 2010, 2012, and 2014).



Stretch Commuters by Census Tract in 2004
(Tract of Residence; Percent of All Workers)



- 10.0% or Less
- 10.1% to 15.0%
- 15.1% to 20.0%
- 20.1% to 25.0%
- 25.1% to 30.0%
- 30.1% to 35.0%
- 35.0% or More

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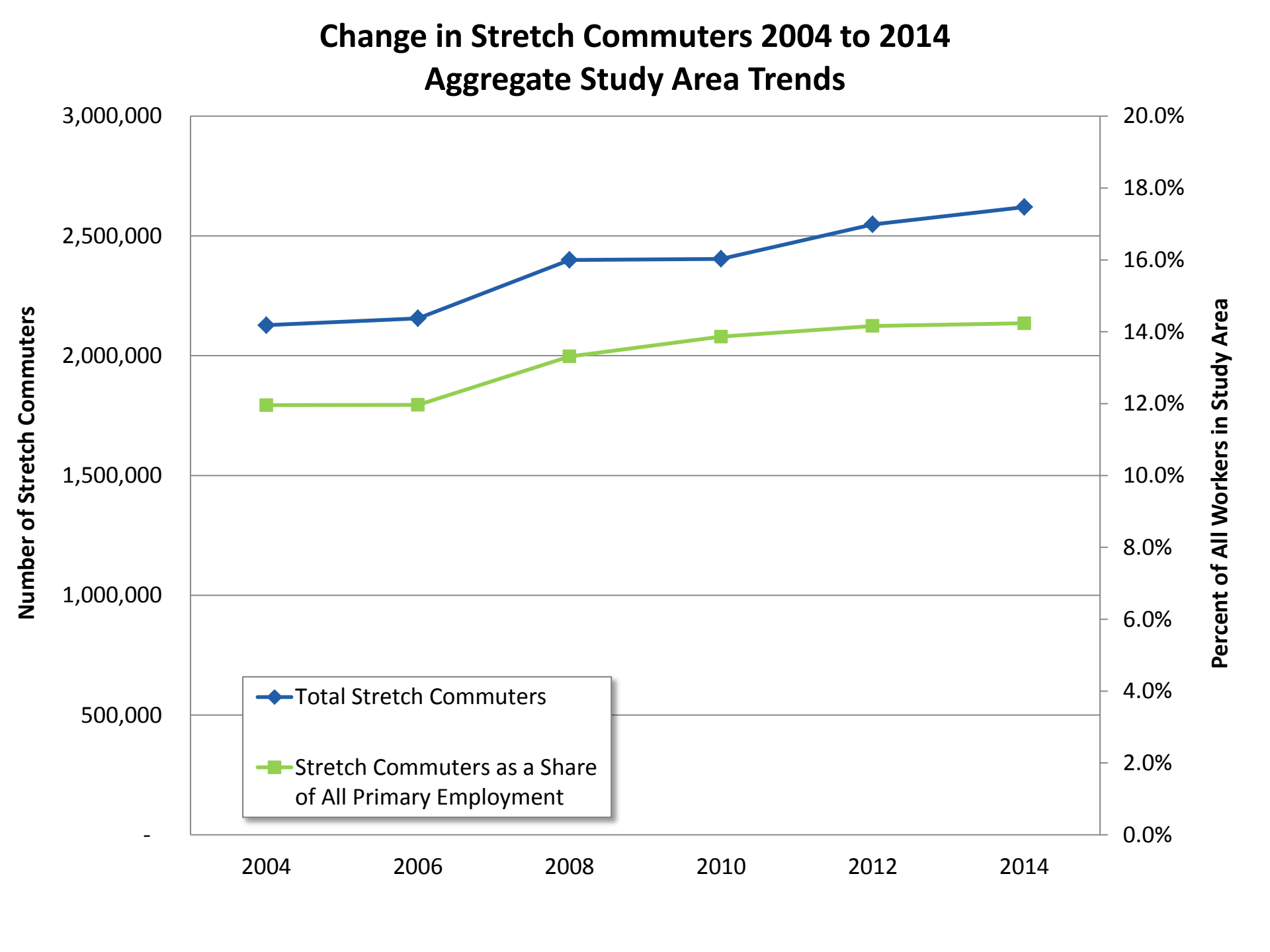

Change in Stretch Commuters 2004 to 2014
Aggregate Study Area Trends
Number of Stretch Commuters
Percent of All Workers in Study Area
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
2004
2006
2008
2010
2012
2014
Total Stretch Commuters
Stretch Commuters as a Share of All Primary Employment

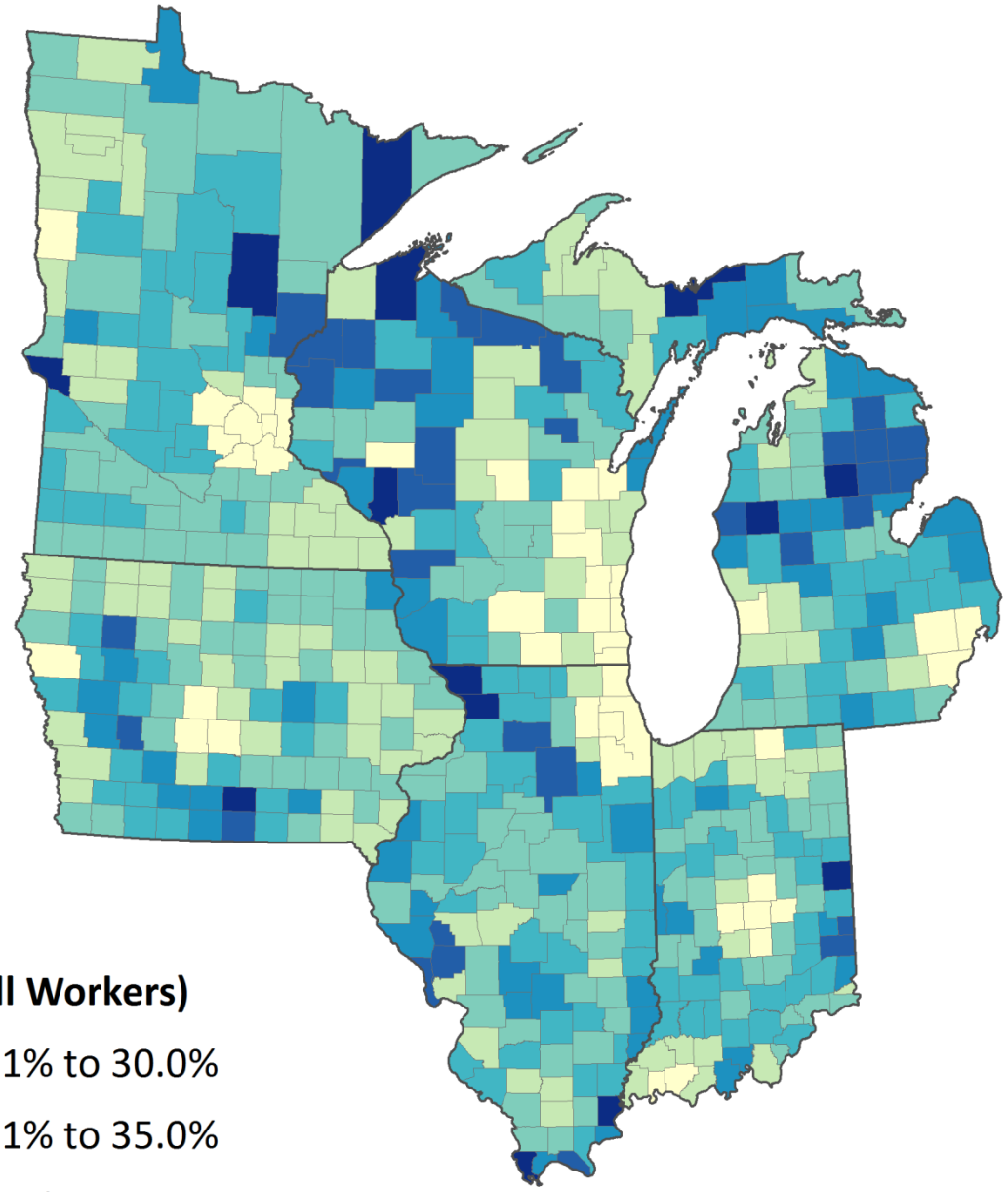
Distribution by Age Group
Stretch Commuters vs. All Workers

Percent of Total	2004	2006	2008	2010	2012	2014
Age 29 or Younger						
Stretch Commuters	31.3%	31.3%	30.6%	27.9%	27.0%	27.6%
All Employees	25.9%	25.9%	25.5%	23.3%	22.6%	22.8%
Age 30 to 54						
Stretch Commuters	54.1%	53.1%	52.5%	53.6%	52.5%	51.1%
All Employees	58.8%	57.5%	56.5%	57.3%	56.0%	54.8%
Age 55 or Older						
Stretch Commuters	14.7%	15.6%	17.0%	18.4%	20.5%	21.4%
All Employees	15.3%	16.7%	18.0%	19.4%	21.3%	22.4%

Distribution by Earnings
Stretch Commuters vs. All Workers

Percent of Total	2004	2006	2008	2010	2012	2014
Earnings of $1250/month or less						
Stretch Commuters	32.3%	30.7%	28.8%	28.4%	27.5%	27.1%
All Employees	25.6%	24.4%	23.0%	22.1%	21.6%	21.2%
Earnings of $1251 to $3,333/month						
Stretch Commuters	37.7%	36.8%	36.9%	36.5%	35.8%	34.5%
All Employees	40.8%	39.2%	37.9%	37.0%	35.9%	34.8%
Earnings greater than $3,333/month						
Stretch Commuters	30.0%	32.5%	34.3%	35.1%	36.8%	38.3%
All Employees	33.6%	36.4%	39.1%	40.9%	42.4%	44.1%

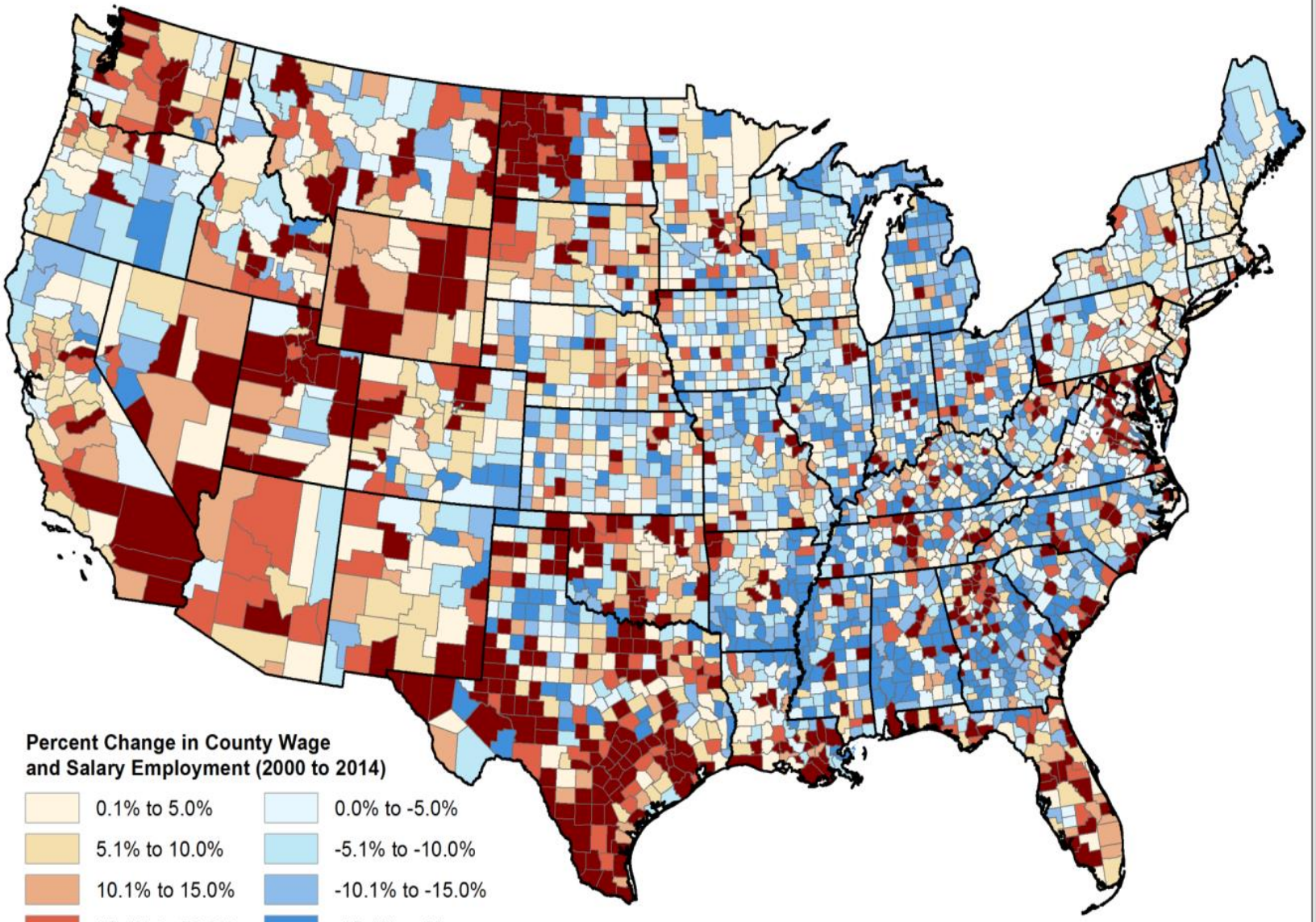
2004



Stretch Commuters by County
(Place of Residence - Percent of All Workers)

- 10.0% or Less
- 10.1% to 15.0%
- 15.1% to 20.0%
- 20.1% to 25.0%
- 25.1% to 30.0%
- 30.1% to 35.0%
- 35.0% or More

Percent Change in Wage and Salary Employment by County - 2000 to 2014



Sources: U.S. Census Bureau, Bureau of Economic Analysis and UW-Extension

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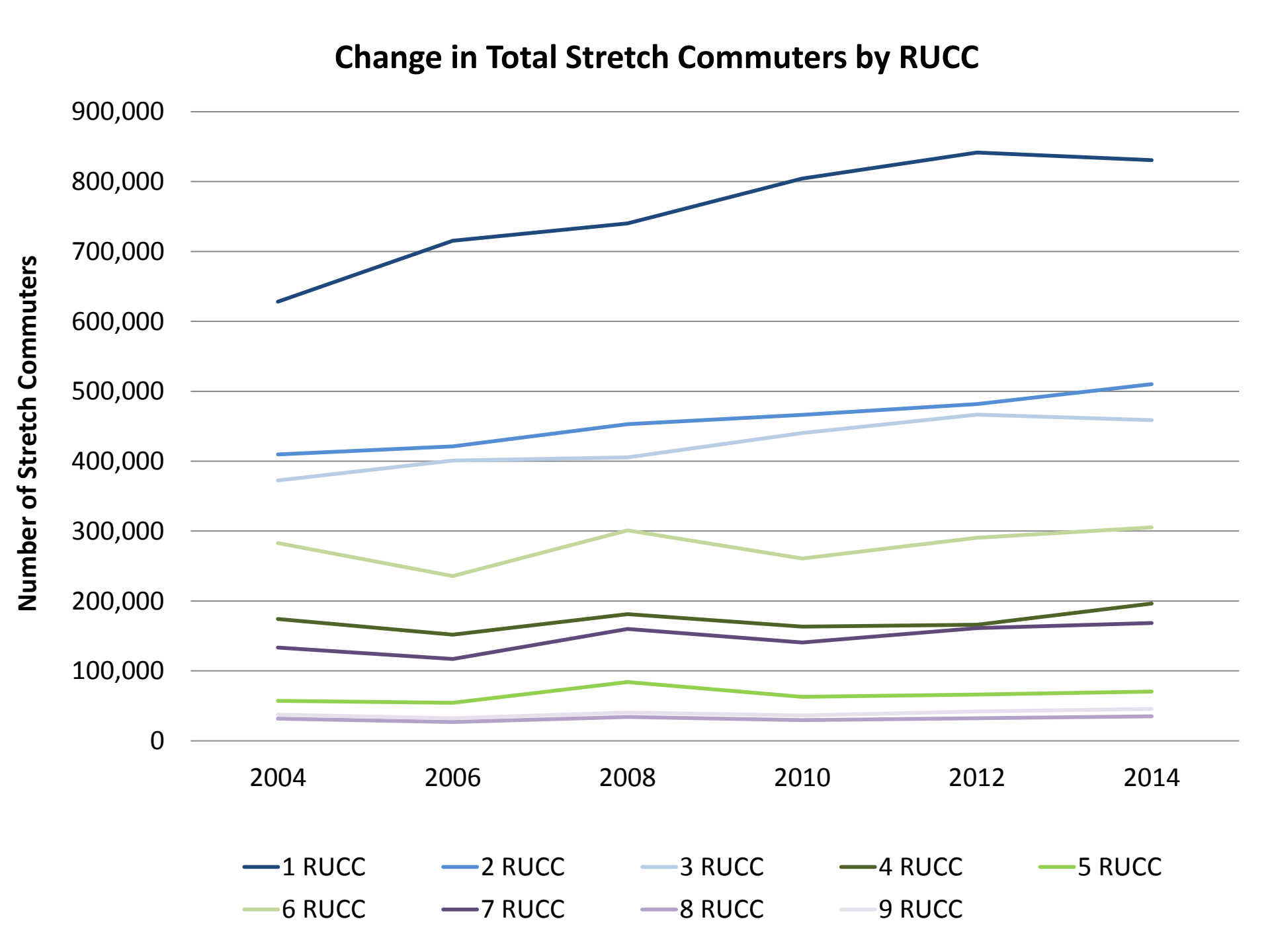
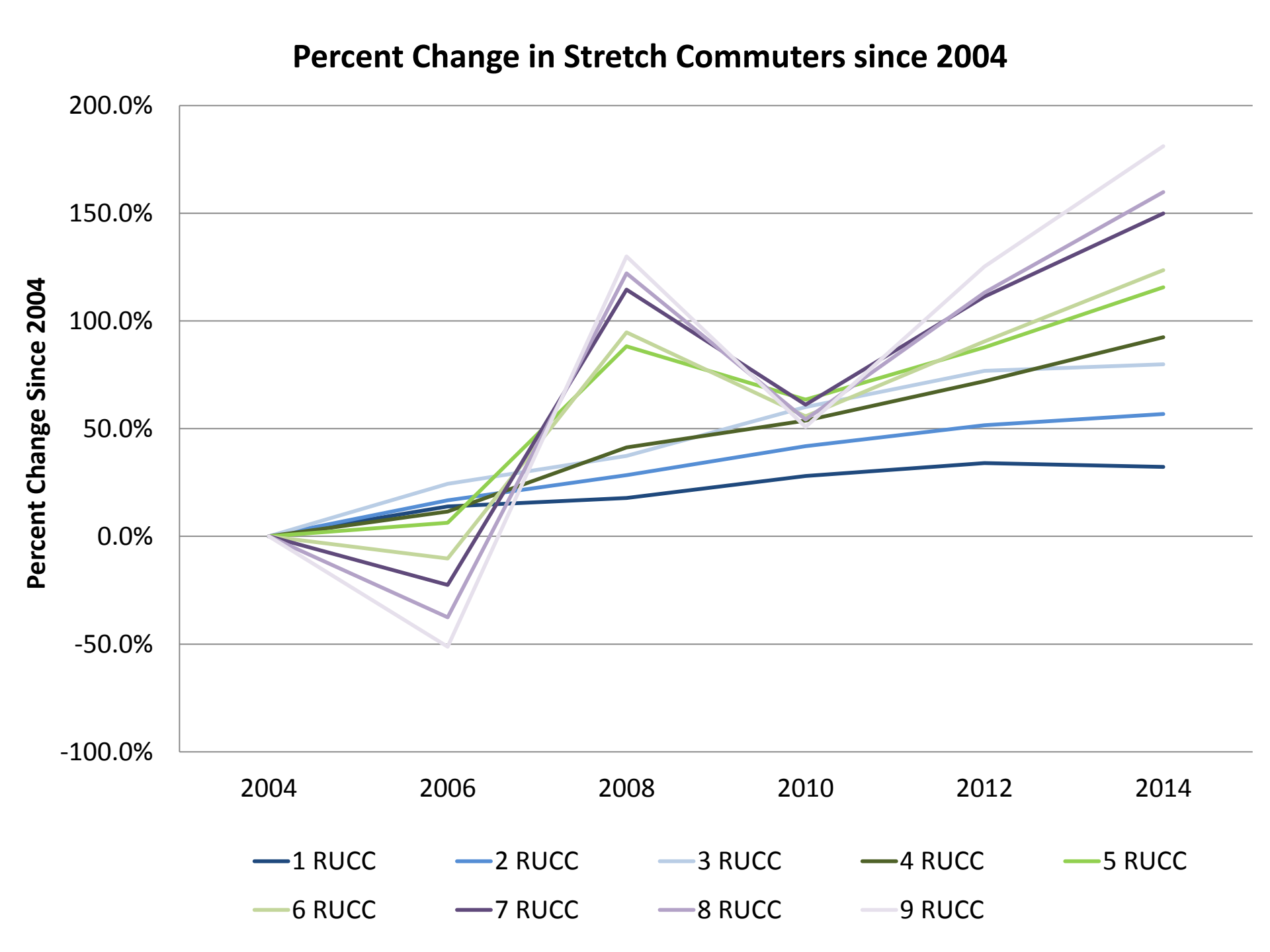
Rural-Urban Continuum Codes
Another Method for Making Comparisons

Code	Description
Metro Counties	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Non-Metro Counties	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban pop., adjacent to a metro area
9	Completely rural or less than 2,500 urban pop., not adjacent to a metro area

Source: USDA Economic Research Service


Change in Total Stretch Commuters by RUCC
Number of Stretch Commuters
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
2004
2006
2008
2010
2012
2014
1 RUCC
2 RUCC
3 RUCC
4 RUCC
5 RUCC
6 RUCC
7 RUCC
8 RUCC
9 RUCC


Percent Change in Stretch Commuters since 2004
Percent Change Since 2004
200.0%
150.0%
100.0%
50.0%
0.0%
-50.0%
-100.0%
2004
2006
2008
2010
2012
2014
1 RUCC
2 RUCC
3 RUCC
4 RUCC
5 RUCC
6 RUCC
7 RUCC
8 RUCC
9 RUCC

Exploratory Modeling

Working hypothesis: Stretch commuting has been expanding over time; people are willing to commute greater distances in order to live in one place and work in another.

Simple panel model: $\Delta SC_{t \rightarrow t+1} = f(SE_t, D_t)$

Where:

- $SC_{t \rightarrow t+1}$ - Change in the number of workers that are stretch commuters from time t to time *t+1*
- SE_t - Set of simple socioeconomic variables
- D_t - Set of time dummies. Assuming a simple linear function, we would expect the coefficients on the time dummies to be increasing over time: $\beta_{Dt} > \beta_{Dt-1} > \beta_{Dt-2} > \cdots$.

Exploratory Modeling

- Two measures of stretch commuting: (1) the change in total number of stretch commuters, and (2) the change in the percent of workers that are stretch commuters.

- We use both measures as more of a simple robustness check. We also use an aspatial fixed effects estimator along with a crude spatial error model with fixed effects.

- We explored two way fixed effects along with time fixed effects. F tests for fixed effects rejected the two way fixed effects in favor of the time fixed effects model. This latter result lends some credence to the basic hypothesis that stretch commuting is shifting over time, or at least the study period explored here.

Exploratory Modeling

Table 1: Exploratory Analysis of Stretch Commuting

	Number of Commuters		Share Commuters	
	Aspatial	SEM	Aspatial	SEM
% Pop Over Age 65	-0.2367	-0.1124	-0.2323	-0.1072
	(0.5555)	(0.7327)	(0.5507)	(0.7353)
Population/Employment Ratio	0.0631 *	0.0791 **	0.0512	0.0686 **
	(0.0529)	(0.0020)	(0.1052)	(0.0056)
Share of Employment in Manufacturing	-0.2982 *	-0.2046	-0.2483	-0.1491
	(0.0795)	(0.1512)	(0.1320)	(0.2783)
Share of Employment in Farming	0.9876 **	1.0715 ***	0.8699 **	0.9410 **
	(0.0012)	(0.0001)	(0.0033)	(0.0003)
Unemployment Rate	-0.7118	-0.4627	-0.4851	-0.2634
	(0.3934)	(0.5047)	(0.5486)	(0.6936)
Per Capita Income	-0.0199	0.0033	-0.0204	0.0021
	(0.4590)	(0.7787)	(0.4331)	(0.8494)
Time Fixed Effect 2004	-0.3176 ***	-0.2897 ***	-0.3280 ***	-0.3011 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Time Fixed Effect 2006	0.3928 ***	0.4191 ***	0.3844 ***	0.4097 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Time Fixed Effect 2008	-0.1656 ***	-0.1505 ***	-0.1377 **	-0.1229 ***
	(0.0001)	(0.0001)	(0.0006)	(0.0001)
Time Fixed Effect 2010	-0.0322	-0.0260	-0.0762 *	-0.0694 *
	(0.4262)	(0.4972)	(0.0520)	(0.0615)
Spatial Parameter ρ	——	-0.2700 ***	——	-0.2820 ***
		(0.0001)		(0.0001)
R^2	0.1453	0.1777	0.1476	0.1824

Marginal significance (p-value) in parentheses.

***: Significant at 99.9% level.

**: Significant at 95.0% level.

*: Significant at 90.0% level.

Next Steps

- Improve the data set – Further examine for noise, expand the time periods and geographic scope to allow for further exploration of robustness.

- Explore different distance thresholds - As we have the individual travel distances between all census tracts in our study area, we could also change our distance threshold from 50 miles to some other value or range of values.

- Expand the analysis of determinants of stretch commuting to explore our initial questions:

    1. How might place-based factors or individual motivations influence an individual's decision to commute long distances.

    2. Do patterns of stretch commuters vary across time and space similar to other socio-economic categories of commuters.

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