Exploring the Commuting and Land Use Patterns of Workers by Age:

Examples from Florida Cities

Mark W. Horner, Ph.D.
Dept. of Geography
Florida State University
Tallahassee, FL
mhorner@fsu.edu

Presentation Structure

1. Introduction to concepts in excess commuting and jobs-housing balance
2. Review of key concepts and studies from selected literature in commuting
3. Results of analysis of older workers in selected Florida metro regions

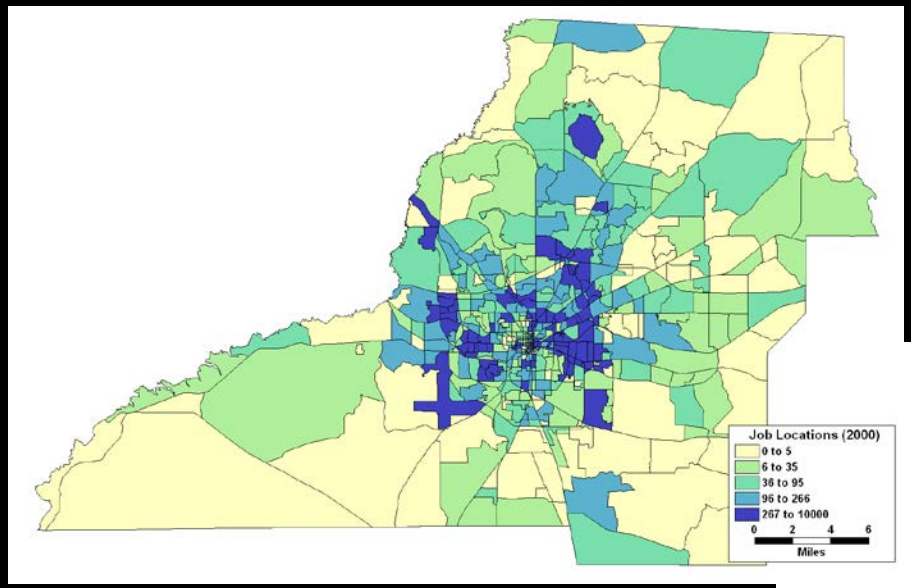
Interest in Commuting?

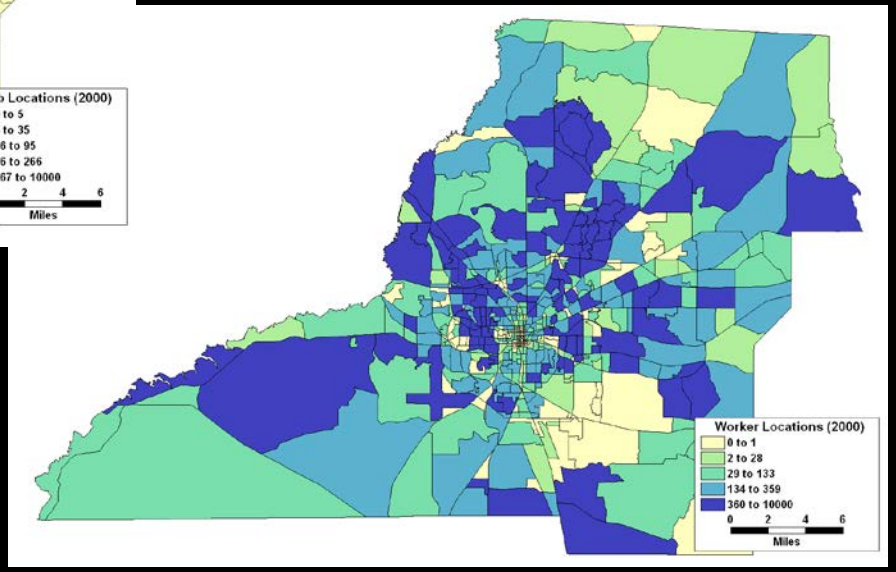
- Why urban commuting?
  - Commuting leads to a fundamental activity (i.e., employment)
  - Although only 20-25% of total travel
    - It is during peak periods that cities' roadways most congested
    - Reducing commuting could help alleviate congestion
  - Home-work relationship defines our activity spaces
- How does land use affect commuting?
  - A 'geographic' question (e.g. where the jobs are?)
  - Does the spatial arrangement of cities shape travel patterns?
  - Observed commute lengths are longer when places are more distant from one another

Excess Commuting and Jobs-housing Balance

- Excess commuting is
  - a benchmarking approach (Hamilton 1982)
  - the difference between *observed commuting* and a *theoretical minimum commute* (White 1988)
    - Theoretical minimum commute assumes people commute to job locations such that system travel costs are minimized (Buliung and Kanaroglou 2002)
      - useful for assessing the degree of regional *jobs-housing* balance (Giuliano and Small 1993, Layman and Horner 2010)
- Jobs-housing balance is
  - the *relative proximity* or accessibility of residences to workplace in a given area (Shen 2000)

Residential and Job Locations (2000 CTPP)





What are the implications of various metrics for understanding land use / transport relationships?

The Transportation Problem for finding the 'Minimum' Commute

$$T_r = \sum_{i=1}^{n} \sum_{j=1}^{m} c_{ij} x_{ij}$$ *(minimize total commuting costs)*

Subject to

$$\sum_{i=1}^{n} x_{ij} = D_j$$ *(jobs in each zone must be filled)*

$$\sum_{j=1}^{m} x_{ij} = O_i$$ *(workers living in each zone depart)*

$$x_{ij} \geq 0$$ *(no negative zonal worktrip flows)*

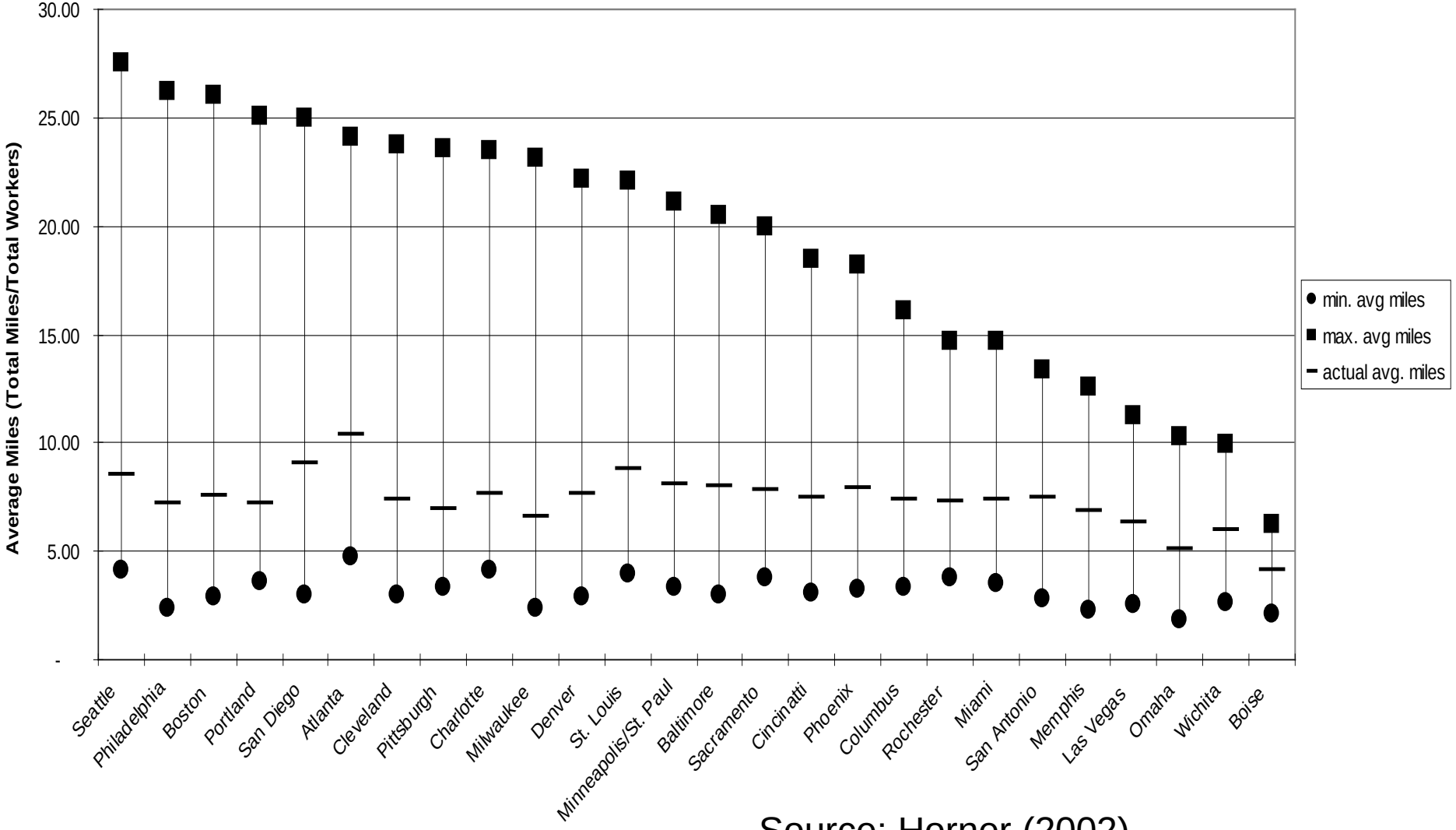
Where

T_r = Theoretical minimum journey to work commute
n = Number of origin TAZ locations
m = Number of destination TAZ locations
O_i = Number of workers living in zone i
D_j = Total employment in zone j
c_{ij} = Travel costs between zone i and zone j
x_{ij} = Journey to work trips from zone i to zone j

A ‘family’ of EC/JHB Metrics

- Theoretical minimum commute
  - Lower value, greater jobs-housing balance
- Theoretical maximum commute
  - Higher value, greater worker-job dispersion
- Commute range
  - Higher value, more commuter flexibility
- Commuting capacity used
  - Higher value, less efficient commute pattern
- Excess Commuting
  - Higher value, lower transportation land/use link

Commuting Analysis for 26 Cities



Source: Horner (2002)

Trends towards policy-related analyses

- Literature reviews in Ma and Banister (2006), Charron (2007), Layman and Horner (2010), Kanaroglou et al. (2015)
- Increasing body of research discussing how metrics can be used in more policy-oriented situations
  - Merriman et al. (1995)
  - Scott et al (1997)
  - Frost et al. (1998)
  - Horner and Murray (2003)
  - Yang (2008)
  - Horner (2007, 2009)
  - Murphy (2009)
  - Loo and Chow (2011)
  - Horner and Schleith (2012)
  - Schleith and Horner (2014)

Idea of Commuter Disaggregation

- Use data characteristics to stratify commuters – control for worker type
- Can control for multiple dimensions using LEHD Flows data
- Previous work has looked at incomes (Horner and Schleith 2012)
- This work looks at age of commuters

LEHD Data

- LODES
  - Commute flows of workers - census block scale
- Available for multiple years
- Counts of workers/jobs by blocks
- Flows can be disaggregated by selected attributes (income, age, industry)

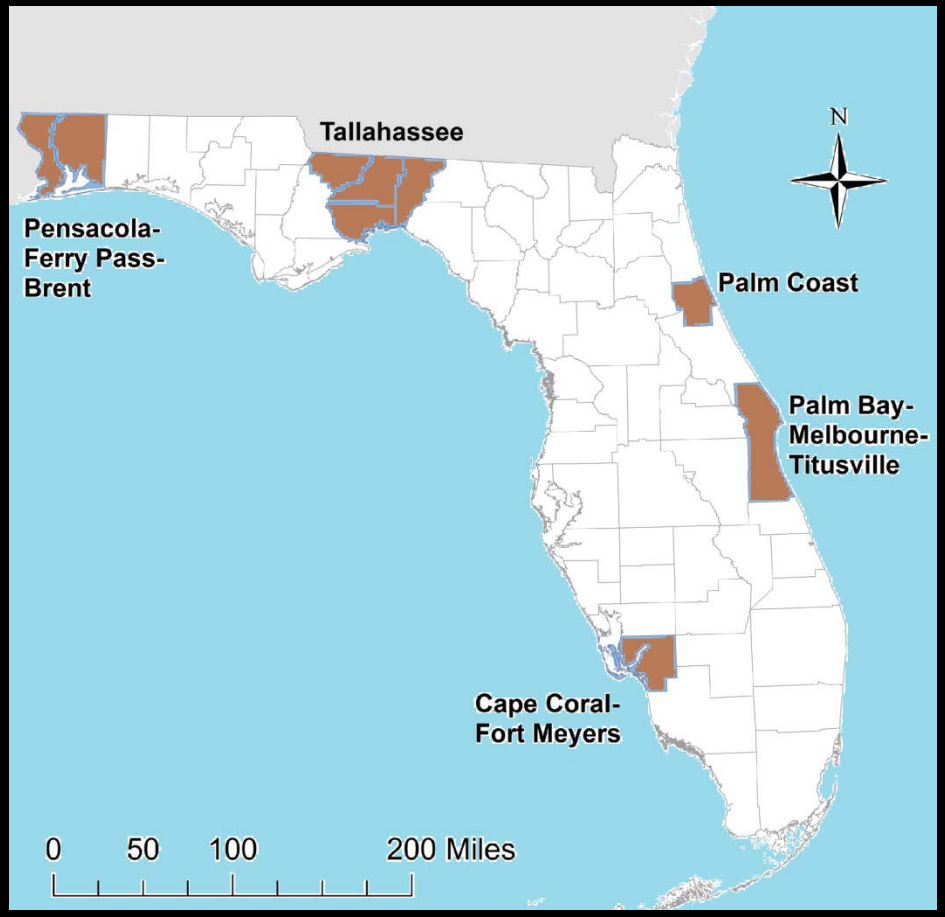
Study Design

- Selected 5 CBSAs in Florida
- Use years 2002, 2007, 2011
- Separate commuters by three age categories:
  - Less than or equal to 29
  - 30-54
  - 55 and over

Study Design

- Road network distances as travel costs
- Primary jobs considered
- Comparison of years 2002, ‘07, ‘11
- All values/data resolved to 2010 Census Blocks
- TransCAD GIS used to compute matrices, solve transportation problems, manage data

Study Areas


Tallahassee
N
Pensacola-
Ferry Pass-
Brent
Palm Coast
Palm Bay-
Melbourne-
Titusville
Cape Coral-
Fort Meyers
0
50
100
200 Miles

Study Area Statistics

2010 Census Population Data	Total Population	Population of Adults 65 and Older	Percent of Adults 65 and Older
Cape Coral-Fort Meyers	618,754	145,106	23.5
Palm Bay-Melbourne-Titusville	543,376	110,712	20.4
Palm Coast	95,696	23,405	24.5
Pensacola-Ferry Pass-Brent	448,991	62,389	13.9
Tallahassee	367,413	38,074	10.4
Florida (entire state)	18,801,310	3,259,602	17.3
USA	308,745,538	40,267,984	13.0

Results: 2011 Data Analysis

CBSA 2011	Commutes	*T-min*	*T-obs*	*T-max*	*EC*	R	*CU*
Fort Meyers	124,341						
≤ 29	24,501	3.42	9.33	16.52	63.34%	13.10	45.12%
30 - 54	69,252	3.82	9.35	15.80	59.08%	11.97	46.13%
≥ 55	30,588	3.24	8.66	15.77	62.61%	12.53	43.26%
average	41,447	3.49	9.11	16.03	61.68%	12.53	44.84%
Palm Coast	10,638						
≤ 29	1,953	2.18	5.76	8.94	62.15%	6.76	53.01%
30 - 54	5,790	2.59	5.86	8.87	55.73%	6.28	51.98%
≥ 55	2,896	2.71	5.79	8.93	53.17%	6.22	49.50%
average	3,546.3	2.50	5.80	8.92	57.02%	6.42	51.50%
Pensacola	127,263						
≤ 29	29,486	3.43	9.79	20.96	65.02%	17.53	36.33%
30 - 54	71,303	4.09	10.02	16.85	59.22%	12.76	46.50%
≥ 55	26,474	3.85	9.44	16.25	59.26%	12.40	45.08%
average	42,421	3.79	9.75	18.02	61.17%	14.23	42.64%
Tallahassee	114,855						
≤ 29	26,562	3.50	8.45	13.33	58.55%	9.83	50.33%
30 - 54	63,226	5.24	9.72	15.17	46.06%	9.92	45.11%
≥ 55	25,067	5.33	9.56	15.34	44.22%	10.01	42.24%
average	38,285	4.69	9.24	14.61	49.61%	9.92	45.89%
Titusville	133,420						
≤ 29	23,211	3.13	10.35	25.73	69.79%	22.60	31.96%
30 - 54	77,871	3.83	11.39	25.70	66.37%	21.87	34.56%
≥ 55	32,338	3.98	11.26	25.51	64.66%	21.53	33.81%
average	44,473.3	3.64	11.00	25.65	66.94%	22.00	33.44%

Results: 2011 Data Analysis Findings

- T-min ranges from 2.18 miles for younger workers in Palm Coast to 5.33 miles for oldest worker group in Tallahassee
- Titusville had some of the largest dispersion levels (all age groups' T-max 25+)
- With the exception of Fort Meyers, oldest group has higher T-min than youngest
  - Middle age group sometimes has the highest

Results: Time Series Analysis

	Primary Jobs		T-min		T-obs		T-max		EC		R		CU	
	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.	07-11 cng.	02-11 cng.
Fort Meyers Metro	-8.92%	-0.33%	-	-	-	-	-	-	-	-	-	-	-	-
≤ 29	-22.76%	-10.41%	6.73%	17.61%	4.53%	16.33%	6.38%	14.15%	-1.18%	-0.63%	6.30%	13.28%	-2.82%	2.04%
30 - 54	-7.64%	-5.10%	10.88%	20.21%	5.72%	13.76%	4.80%	9.08%	-3.12%	-3.58%	3.00%	5.95%	-0.56%	3.53%
≥ 55	2.60%	25.15%	7.85%	14.65%	4.29%	11.41%	2.83%	5.63%	-1.93%	-1.66%	1.61%	3.53%	0.65%	5.83%
Average	-	-	8.56%	17.60%	4.86%	13.86%	4.68%	9.58%	-2.06%	-1.94%	3.65%	7.53%	-0.95%	3.75%
Palm Coast Metro	9.55%	38.03%	-	-	-	-	-	-	-	-	-	-	-	-
≤ 29	-3.84%	26.74%	16.40%	-2.71%	-5.43%	-20.09%	-0.48%	-12.91%	-10.25%	-9.81%	-4.93%	-15.76%	-10.71%	-14.46%
30 - 54	9.83%	33.13%	21.83%	-26.56%	-5.00%	-24.88%	-0.07%	-19.32%	-14.89%	1.85%	-6.97%	-15.89%	-13.09%	-9.04%
≥ 55	20.27%	59.38%	3.83%	-40.20%	-6.10%	-30.14%	1.81%	-23.48%	-7.77%	17.39%	0.95%	-12.85%	-14.21%	-5.90%
Average	-	-	13.18%	-27.38%	-5.51%	-25.27%	0.41%	-18.80%	-11.09%	1.26%	-3.81%	-14.89%	-12.66%	-10.03%
Pensacola Metro	-14.99%	-8.53%	-	-	-	-	-	-	-	-	-	-	-	-
≤ 29	-27.44%	-17.17%	-6.19%	-5.44%	5.86%	12.85%	37.81%	43.94%	7.42%	11.62%	51.72%	60.30%	-25.05%	-21.42%
30 - 54	-14.00%	-14.90%	-2.73%	-1.12%	1.82%	10.10%	2.51%	8.68%	3.33%	8.48%	4.31%	12.24%	0.86%	6.40%
≥ 55	1.17%	34.07%	0.50%	4.06%	3.19%	11.03%	4.83%	10.82%	1.88%	4.83%	6.25%	13.10%	-1.05%	2.91%
Average	-	-	-2.76%	-0.82%	3.59%	11.31%	14.66%	20.86%	4.26%	8.34%	20.40%	28.32%	-8.72%	-4.36%
Tallahassee Metro	-10.20%	-18.76%	-	-	-	-	-	-	-	-	-	-	-	-
≤ 29	-22.72%	-25.36%	20.06%	-35.77%	4.63%	5.79%	1.29%	-1.69%	-8.34%	84.56%	-4.06%	21.23%	-0.04%	61.04%
30 - 54	-9.43%	-25.52%	11.20%	1.50%	3.95%	6.15%	0.27%	0.57%	-7.10%	5.67%	-4.68%	0.08%	1.32%	12.08%
≥ 55	5.70%	19.92%	16.45%	12.30%	6.20%	9.99%	0.00%	-0.91%	-9.99%	-2.52%	-7.00%	-6.76%	2.79%	14.99%
Average	-	-	15.29%	-8.39%	4.93%	7.33%	0.48%	-0.65%	-8.46%	23.33%	-5.27%	3.49%	1.26%	27.20%
Titusville Metro	-7.45%	-6.40%	-	-	-	-	-	-	-	-	-	-	-	-
≤ 29	-19.87%	-14.29%	-13.05%	-6.09%	6.92%	11.02%	3.48%	1.97%	11.04%	8.56%	6.27%	3.20%	11.72%	16.79%
30 - 54	-9.28%	-14.11%	-8.04%	-3.20%	5.54%	8.33%	5.35%	-0.01%	8.09%	6.43%	8.11%	0.57%	5.52%	14.65%
≥ 55	10.17%	30.42%	-2.51%	1.65%	4.26%	8.90%	0.21%	1.23%	3.95%	4.06%	0.73%	1.15%	7.59%	12.04%
Average	-	-	-7.65%	-2.37%	5.53%	9.36%	2.98%	1.05%	7.70%	6.37%	4.98%	1.64%	8.13%	14.42%

Results: Time Series Findings

- Observed commutes increased across all regions except Palm Coast
  - Nearly all its metrics have decreased
- Titusville and Pensacola's older commuters are commuting less efficiently (as measured by EC)
- Primary jobs in older group age class is increasing

Summary

- Utilized LEHD/LODES to analyze commuting trends in several Florida cities
- General finding is that statistics vary more across regions than when comparing age groups in a given region
- Next steps could be to expand the range of cities considered, incorporate other data years, etc.

Acknowledgments

- Past Papers using LODES:
  - Daniel K. Schleith and Mark W. Horner. 2014. Commuting, Job Clusters, and Travel Burdens: An Analysis of Spatially and Socioeconomically Disaggregate LEHD Data. *Transportation Research Record*, 2452, 19-27.
  - Mark W. Horner and Daniel Schleith. 2012. Analyzing Temporal Changes in Land Use-Transportation Relationships: A LEHD-Based Approach. *Applied Geography* 35(1-2), 491-498.
- Portions of this presentation based on work in:
  - Mark W. Horner, Daniel K. Schleith, and Michael J. Widener. 2015. An Analysis of the Commuting and Jobs-Housing Patterns of Older Adult Workers. Forthcoming in The Professional Geographer. http://dx.doi.org/10.1080/00330124.2015.1054018

Thank You

Mark W. Horner
Department of Geography
Florida State University
mhorner@fsu.edu