SYNTHESIZED TRAVEL MODEL INPUT AND ACS DATA CONSISTENCY CHECK

Southeast Michigan Council of Governments

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Transportation Modeling Program

SEMCOG Area

- Eight large areas
  - 7 counties + city of Detroit
- Total population
  - 2010: 4.70 million
  - 2017: 4.74 million
  - 2045: 5.10 million

Forecasting at SEMCOG

- Land Use Model (LUM)
  - Using UrbanSIM at parcel level
  - Minor Civil Division (MCD) forecasting
- Travel Demand Model (TDM)
  - Social Economic (SE) input from LUM
  - 4-step modeling approach for traffic forecasting (2899 zones + 35k links)
  - Model base year: 2015

2015 SE Data Input to TDM

- 2015 SE data input from LUM
  - Disaggregated households & population by Population Synthesis
  - Zonal employment data by industry type
- This presentation focuses on
  - Consistency check on HH size
  - Comparison on HH number of workers
  - Connecting workers with employment
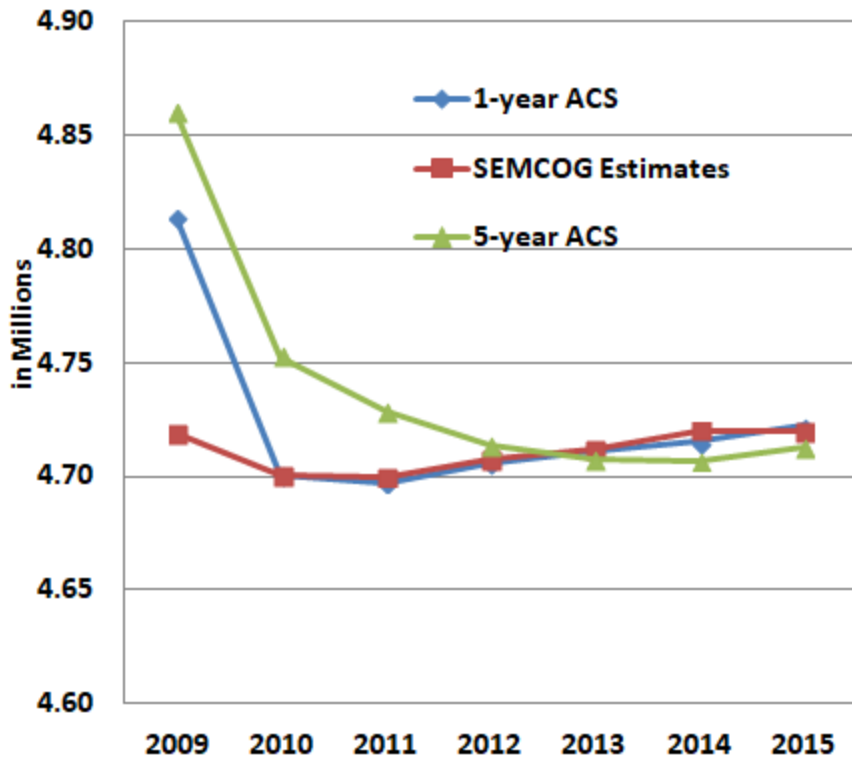
Consistency Check on HH Size

- First delivery (09/2016) of 2015 SE
  - 2010-2014 ACS 5-year estimates for total HHs, population & marginal control totals
  - 2010-2014 ACS 5-year PUMS for household samples
- QAQC on HH size: regional and county level consistency
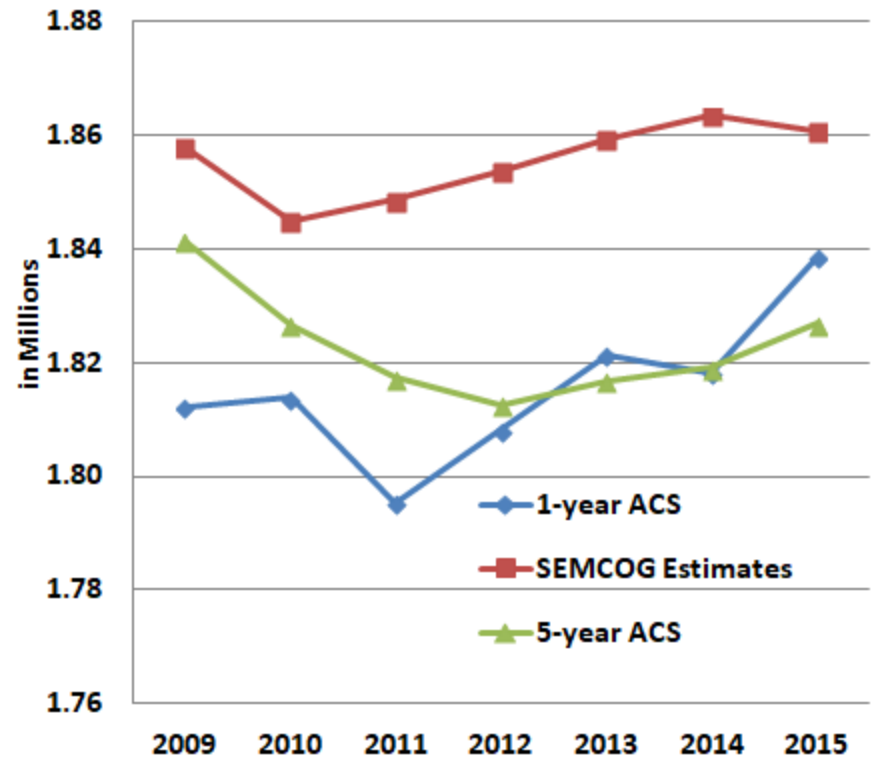
Unreasonable Household Size?

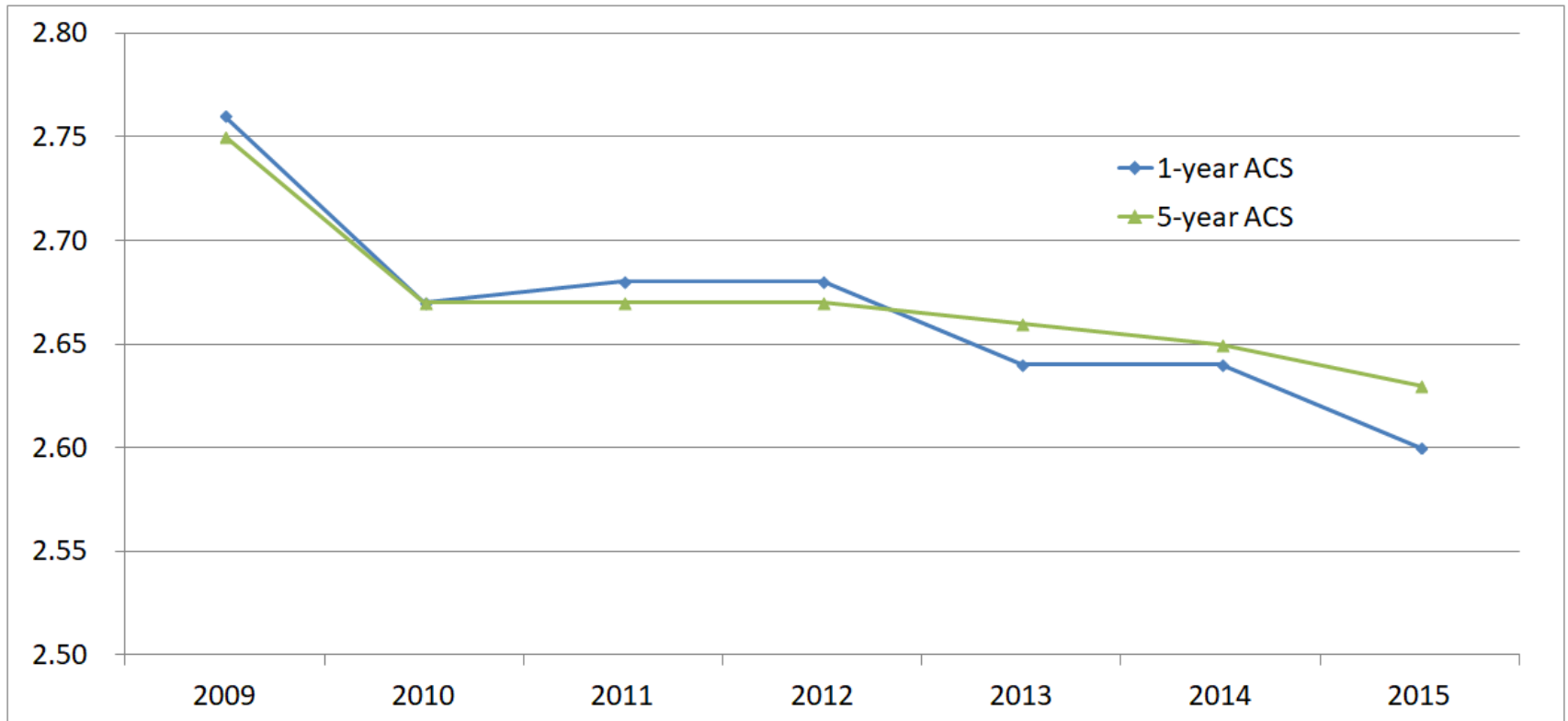| County	2010 Estimates	First Delivery of 2015 SE
Out Wayne County	2.53	2.63
City of Detroit	2.59	2.69
Livingston County	2.67	2.67
Macomb County	2.51	2.51
Monroe County	2.59	2.56
Oakland County	2.46	2.47
St. Clair County	2.52	2.48
Washtenaw County	2.38	2.44
Region Average	2.51	2.55

Regional Population and HHs

Wayne County: HH Size Trend

2015 ACS HH size Issues for 5+ HHs

- Estimated household population
- HH Type by HH Size - B11016

| 2015 1-year ACS	Livingston	Macomb	Monroe	Oakland	St. Clair	Washtenaw	Wayne	Region
Average HH Size	2.61	2.51	2.51	2.46	2.49	2.44	2.60	2.53
Avg. HH Size for 5+ HHs	5.80	5.91	6.28	6.43	6.08	6.40	7.58	6.74
Avg. HH Size for 7+ HHs	8.65	12.62	19.55	15.74	13.50	11.62	17.34	15.55

2011-2015 5-year ACS	Livingston	Macomb	Monroe	Oakland	St. Clair	Washtenaw	Wayne	Region
Average HH Size	2.69	2.54	2.52	2.48	2.47	2.44	2.60	2.54
Avg. HH Size for 5+ HHs	6.46	6.36	5.55	6.44	5.93	6.64	7.26	6.73
Avg. HH Size for 7+ HHs	14.99	16.87	8.50	17.17	9.90	16.09	16.66	16.24

SEMCOG's HH Adjustments

- SEMCOG's 2015 MCD estimates based on local knowledge
  - Michigan's birth/death rates
  - Detailed building permits data
  - Recent USPS HH occupancy rates
- Population synthesized with
  - Control totals of SEMCOG estimates
  - Samples of 2011-2015 5-year PUMS

2nd Delivery of 2015 SE (02/2017)
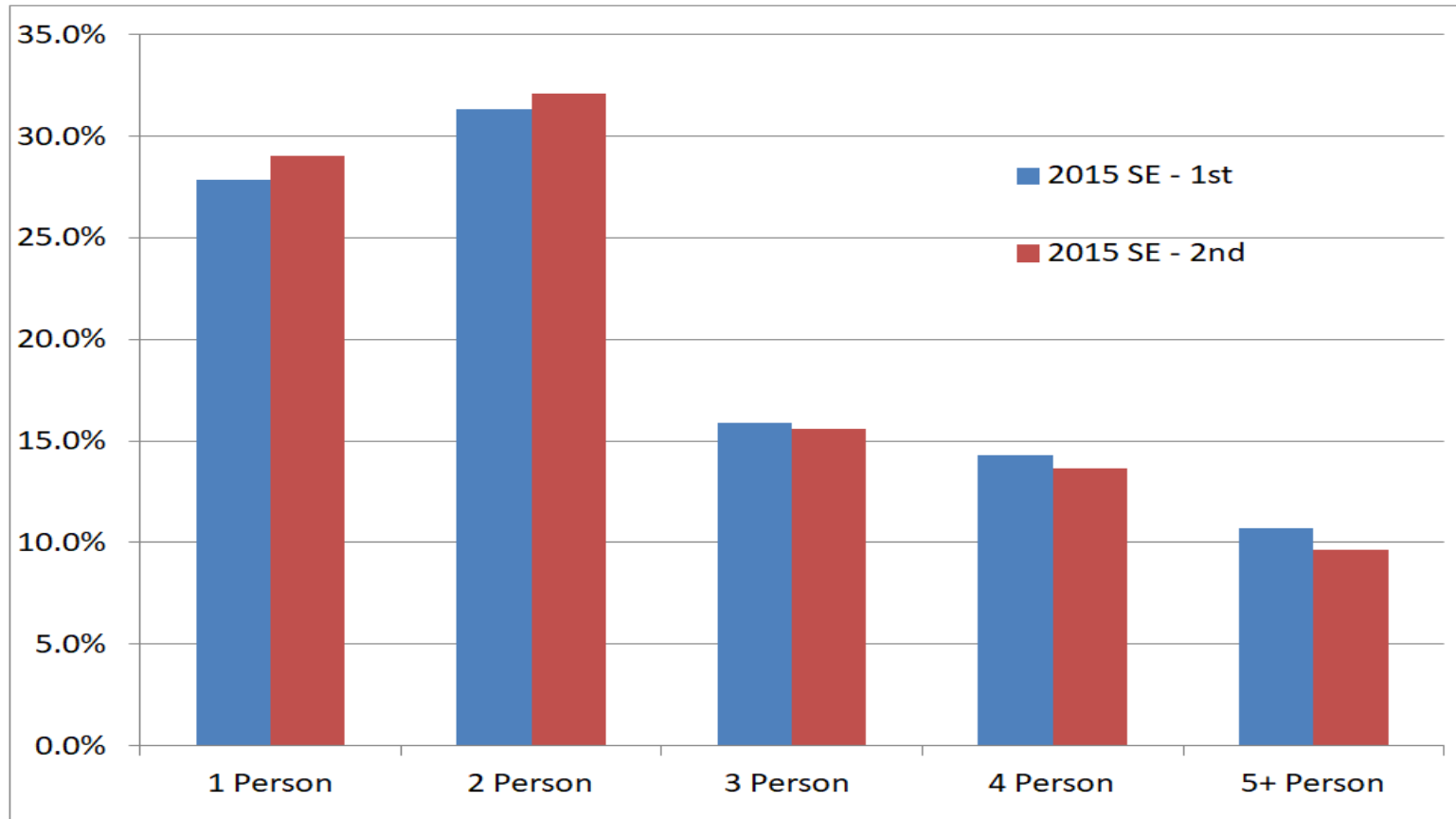
Household Size After Adjustments

County	2010 Estimates	First Delivery (2011-2014 ACS)	Second Delivery (SEMCOG Estimates)
Out Wayne County	2.53	2.63	2.53
City of Detroit	2.59	2.69	2.53
Livingston County	2.67	2.67	2.61
Macomb County	2.51	2.51	2.50
Monroe County	2.59	2.56	2.54
Oakland County	2.46	2.47	2.43
St. Clair County	2.52	2.48	2.47
Washtenaw County	2.38	2.44	2.37
Region Average	2.51	2.55	2.49

Worker and Employment Status

- Worker comparison between 2015 SE data and 2011-2015 ACS data
  - HH distribution by number of workers
  - Average number of workers per HH
- Employment status in ACS data

Household Distribution by Workers
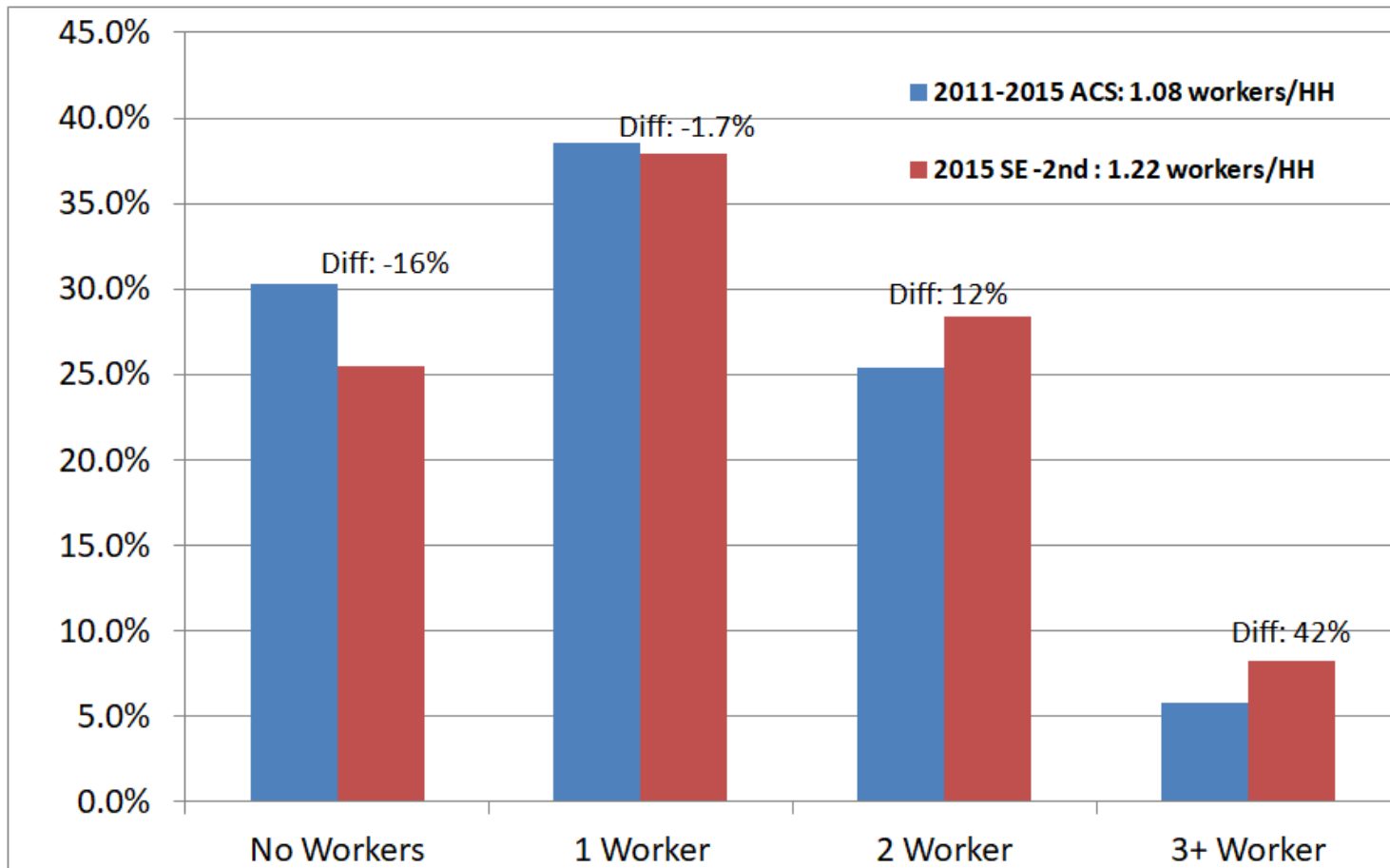
Employment Status for 16+ in ACS

1. Civilian employed, at work
2. Civilian employed, with a job but not at work
3. Unemployed
4. Armed forces, at work
5. Armed forces, with a job but not at work
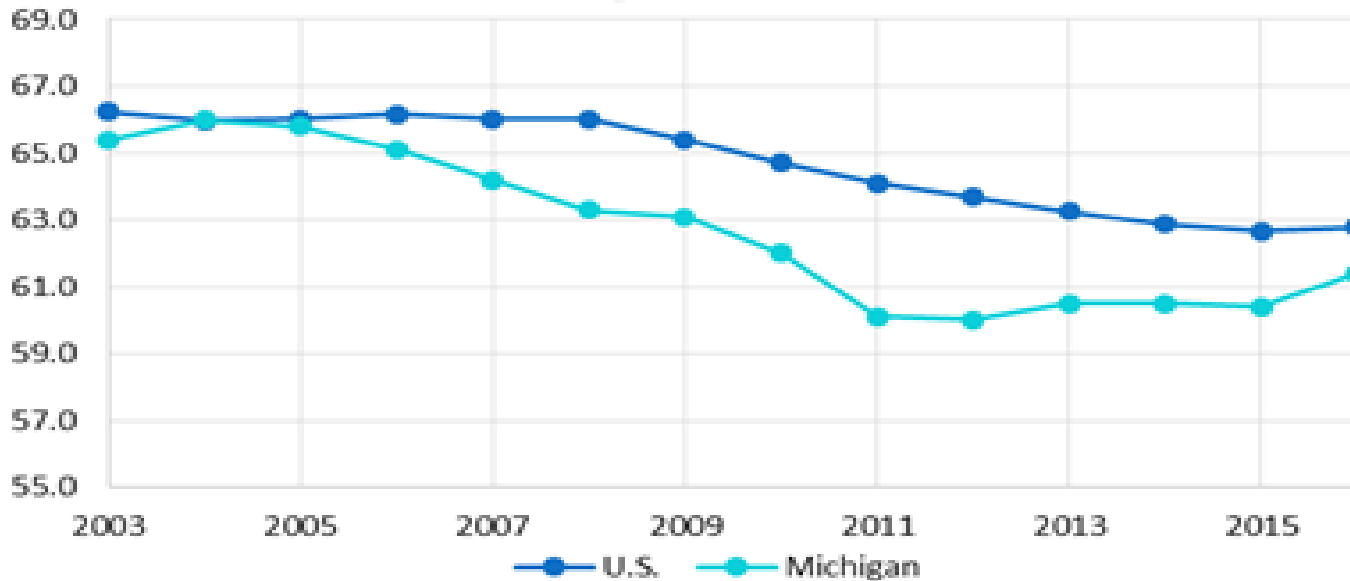6. Not in labor force

Definition of Workers

- LUM:
  - 16+ adults who are in labor force
  - Employment status in ACS: 1, 2, 3, 4, 5
  - Labor force participation rates as controls
- TDM:
  - 16+ adults who have jobs
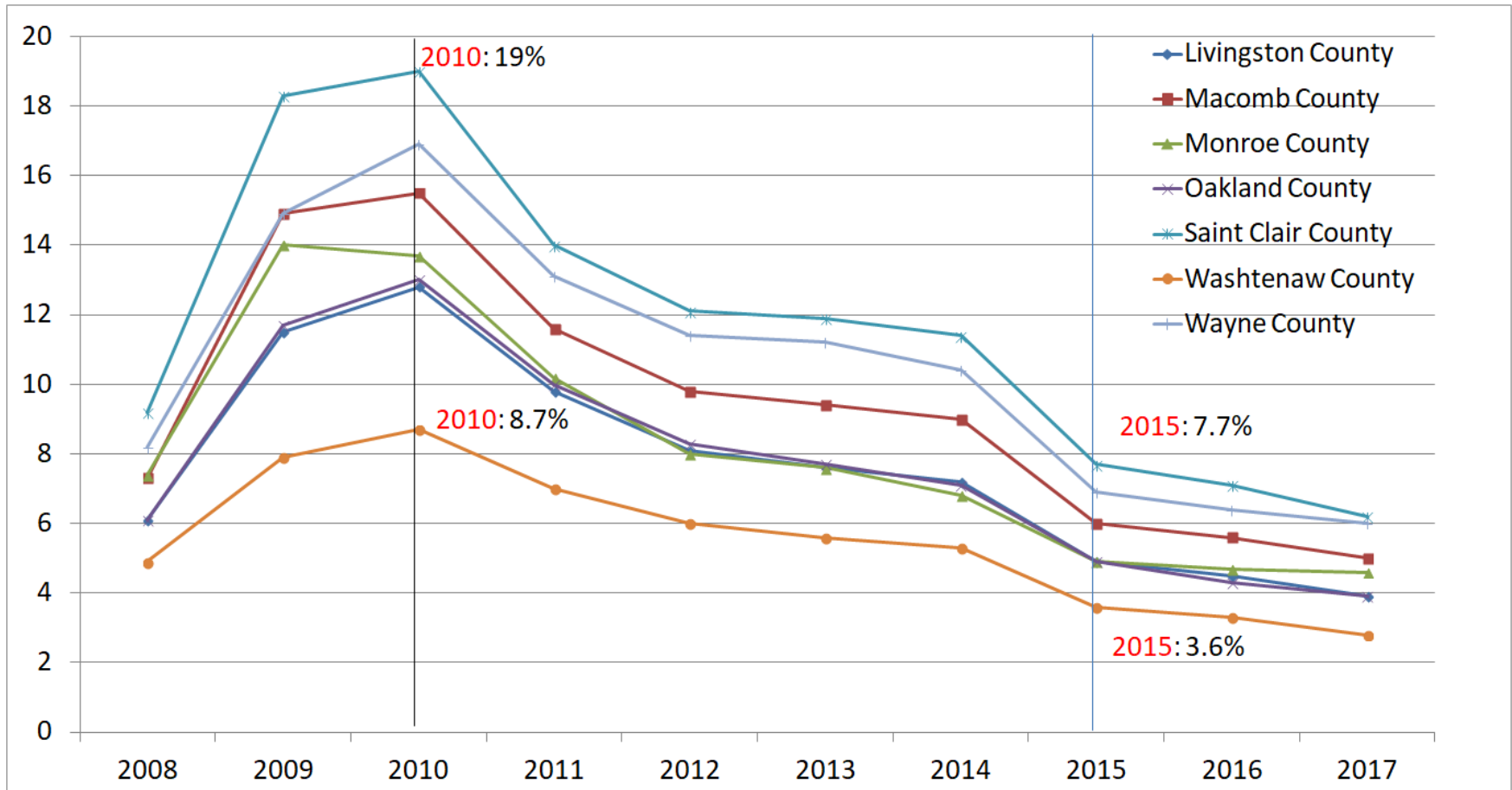 - Employment status in ACS: 1, 2, 4, 5

Historical Labor Participation Rates

Labor Force Participation Rate in the United States and Michigan, 2003-2016

Unemployment Rates 2008-2017

Modified Worker Estimation

- 2015 Base year
  - Worker counts excluding the unemployed
  - Labor participation rates & unemployment rates applied at county level
  - HH income & Autos adjusted accordingly
  - 3rd delivery (05/2017): 1.09 workers per HH
- Forecast years: still under discussion

Connecting Workers to Job Locations

- LUM provides
  - Household: individual home location, HH income and number of workers
  - Employment: aggregated number of jobs at zonal level by industry sectors
- We want to connect
  - High income workers to high income jobs
  - Low income workers to low income jobs

HH Side: Worker's Income Level

- Being assigned using "detailing worker earnings by HH income" from census data

Household Income	Worker Income			
	< $30K	$30K-60K	$60K-100K	>$100K
< $30K	100%	-	-	-
$30K-60K	56%	44%	-	-
$60K-100K	35%	36%	29%	-
>$100K	23%	23%	29%	25%

Source: Census Transportation Planning Products Table A103204.

Employment Side: Job's Pay Level

Employment Sector	Worker Income			
	< $30K	$30K-60K	$60K-100K	>$100K
Agriculture, forestry, fishing and hunting, and mining	59%	27%	12%	2%
Construction	37%	37%	20%	6%
Manufacturing	22%	30%	32%	16%
Wholesale trade	30%	36%	21%	13%
Retail trade	65%	23%	8%	4%
Transportation and warehousing, and utilities	30%	41%	23%	6%
Information	33%	33%	25%	9%
Finance, insurance, real estate and rental and leasing	33%	36%	19%	12%
Professional, scientific, management, administrative, and waste management services	36%	29%	21%	14%
Educational, health and social services	44%	32%	18%	6%
Arts, entertainment, recreation, accommodation and food services	80%	15%	4%	1%
Other services (except public administration)	62%	26%	9%	3%
Public administration	18%	38%	34%	9%
Armed forces	25%	45%	25%	6%

Source: Census Transportation Planning Products Table A202205.

Worker and Employment Income Process

- The process improves the linkage between work trip origins and destinations

HBW Prod by HH income → Census: Wrkr earnings by HH income → HBW Prod by wrkr earnings → Destination Choice ← HBW Attr by empl earnings ← Census: Empl by earnings ← Empl by sector (SED)

Total HBW Attr
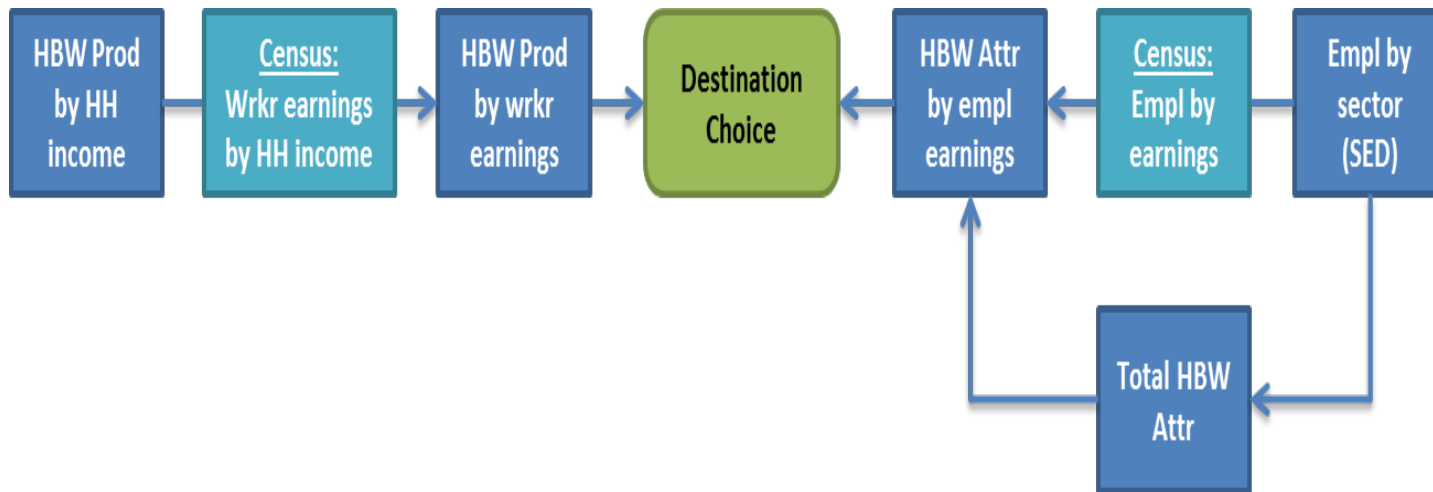
Summary of Findings

- ACS data:
  - Provides a good base to SE data, but its consistency could be a concern
  - Can be enhanced by local knowledge
- Input data QAQCs lead to
  - Methodology refinement and a better SE dataset for model inputs
- Communication is the key

Any Questions?

Thank You!

Acknowledgements to SEMCOG's Land Use Team:

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