# Spatiotemporal Analysis of Commuting Patterns in Southern California Using ACS PUMS, CTPP and LODES

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Research & Analysis
Southern California Association of Governments

# Southern California Association of Governments (SCAG)


Nation's largest Metropolitan Planning Organization (MPO)

6 counties and 191 cities

19.0 million people within 38,000+ square miles

GRP in 2016: $1,126 Billion
(16th largest economy in the world)

# Overview

- Background
- Objectives
- Methodology & Findings
- Conclusions

# BACKGROUND

# Regional Transportation Plan and Environmental Justice

- Regional Transportation Plan (RTP)
  - A long-range transportation plan
  - Provides a vision for investing in our transportation system in the region.
- Environmental Justice (EJ) analysis to assess the impacts of RTP programs and projects on minority and low-income populations

# Jobs-Housing Imbalance/Mismatch and Social Equity

- A key contributor to long distance commuting to work and traffic congestion
- An impediment to Environmental Justice and social equity
  - EJ populations tend to be more sensitive to job accessibility due to the cost of housing and long distance commuting.

# OBJECTIVES

# Objectives

- To better understand the spatial and temporal dynamics of job-housing imbalance/mismatch
- To understand whether there are significant differences in commuting patterns between:
  - Different income levels
  - Coastal counties and inland counties
  - Temporal periods

# METHODOLOGY
# &
# FINDINGS

# ACS Public Use Microdata Samples (PUMS)

- ACS 5-year Public Use Microdata Samples (PUMS)
  - Most detailed geographic unit – Public Use Microdata Area (PUMA)
  - Weighting variable – PWGTP (Person's weight)
- Median wages for inter-county and intra-county commuters
  - Comparison of the median wages between workers residing in their destination-work-counties and outside their destination-work-counties

# 2005-2009 ACS 5-Year PUMS Median Wages for Inter-County and Intra-County Commuters

- Median Wage for Workers by Place of Residence and Place of Work, 2009

| Place of Residence | Place of Work | | | | | | |
|---|---|---|---|---|---|---|---|
| | Imperial | Los Angeles | Orange | Riverside | San Bernardino | Ventura | San Diego |
| Imperial | 25,170 | - | - | 32,616 | - | - | 38,052 |
| Los Angeles | - | 29,307 | 37,487 | 36,964 | 31,263 | 40,701 | 32,616 |
| Orange | - | 56,534 | 33,816 | 41,772 | 48,924 | 48,000 | 42,000 |
| Riverside | 69,619 | 54,359 | 48,924 | 26,632 | 41,772 | 45,087 | 50,126 |
| San Bernardino | - | 45,662 | 48,000 | 38,324 | 27,052 | 45,853 | 32,616 |
| Ventura | - | 63,684 | 50,385 | - | 83,714 | 30,000 | 28,947 |
| San Diego | 59,980 | 54,421 | 54,000 | 48,000 | 60,000 | 45,662 | 34,790 |

Sources: 2005-2009 ACS 5-year Public Use Microdata Samples (PUMS) (CPI adjusted to $ in 2013)
('-' indicates sample size is too small for the analysis.)

# 2009-2013 ACS 5-Year PUMS Median Wages for Inter-County and Intra-County Commuters

- Median Wage for Workers by Place of Residence and Place of Work, 2013

| Place of Residence | Place of Work | | | | | | |
|---|---|---|---|---|---|---|---|
| | Imperial | Los Angeles | Orange | Riverside | San Bernardino | Ventura | San Diego |
| Imperial | 26,154 | - | - | 18,983 | - | - | 43,455 |
| Los Angeles | 40,995 | 27,990 | 36,896 | 35,264 | 30,747 | 37,991 | 30,226 |
| Orange | - | 55,344 | 31,973 | 48,121 | 45,340 | 40,302 | 53,188 |
| Riverside | 40,909 | 48,444 | 46,120 | 24,597 | 38,946 | 25,189 | 47,458 |
| San Bernardino | - | 43,419 | 43,419 | 33,048 | 25,837 | 32,296 | 37,966 |
| Ventura | . | 60,453 | 58,438 | - | 52,731 | 27,420 | 65,669 |
| San Diego | 77,511 | 54,273 | 60,113 | 53,188 | 42,185 | 70,528 | 32,564 |

Sources: 2009-2013 ACS 5-year Public Use Microdata Samples (PUMS) (CPI adjusted to $ in 2013)
('-' indicates sample size is too small for the analysis.)

# Census Transportation Planning Products (CTPP)

- CTPP 5-Year Data based on 2006-2010 American Community Survey (ACS) Data
  - Residence-based, workplace-based and home-to-work flow tables
  - Most detailed geographic unit – Census Tract
- Median commuting distance
  - Euclidean distance between origin and destination tracts (centroids)
- CTPP Tables
  - Total Workers (A302100), Household income in past 12 months (B303100), Poverty status (B304100), Vehicles available (B303202)

# CTPP 5-Year Data Set (2006–2010) Median Commute Distance, by Income

- Weighted Median Commute Distance (mi.), by Household Income,2010

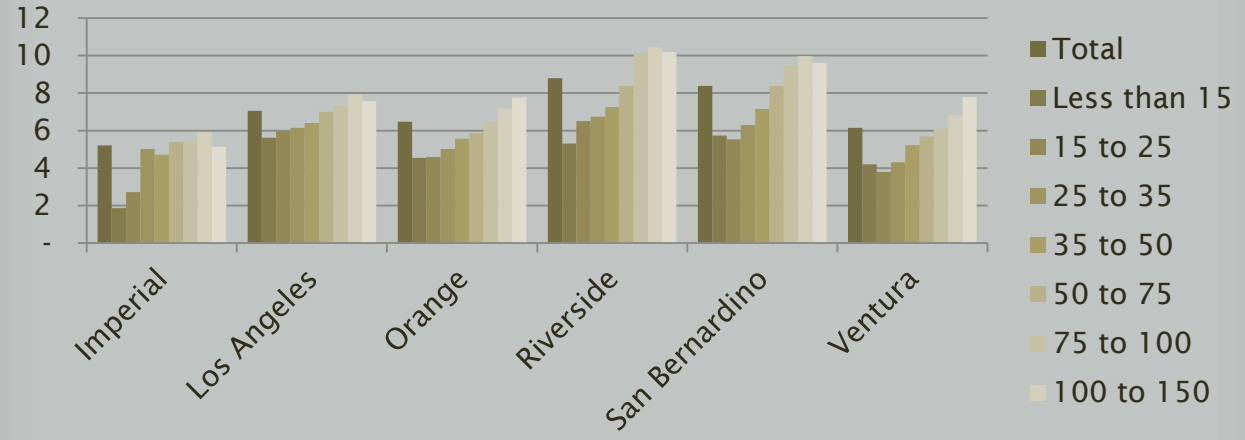
| Origin | Destination | Total Workers | Less than 15K | 15K to 25K | 25K to 35K | 35K to 50K | 50K to 75K | 75K to 100K | 100K to 150K | 150K or More |
|---|---|---|---|---|---|---|---|---|---|---|
| SCAG | SCAG | **7.1** | 5.3 | 5.7 | 6.0 | 6.3 | 7.0 | 7.5 | 8.0 | 7.9 |
| Imperial | SCAG | **5.2** | 1.9 | 2.7 | 5.0 | 4.7 | 5.4 | 5.4 | 5.9 | 5.1 |
| Los Angeles | SCAG | **7.1** | 5.6 | 6.0 | 6.1 | 6.4 | 7.0 | 7.3 | 7.9 | 7.6 |
| Orange | SCAG | **6.5** | 4.5 | 4.6 | 5.0 | 5.6 | 5.9 | 6.5 | 7.2 | 7.8 |
| Riverside | SCAG | **8.8** | 5.3 | 6.5 | 6.7 | 7.3 | 8.4 | 10.1 | 10.4 | 10.2 |
| San Bernardino | SCAG | **8.4** | 5.7 | 5.5 | 6.3 | 7.2 | 8.4 | 9.5 | 10.0 | 9.6 |
| Ventura | SCAG | **6.2** | 4.2 | 3.8 | 4.3 | 5.2 | 5.7 | 6.1 | 6.8 | 7.8 |

Coastal Inland

Source: Census Transportation Planning Products (CTPP) 5-Year ACS 2006-2010

# CTPP 5-Year Data Set (2006–2010) Median Commute Distance, by Income

- Weighted Median Commute Distance (mi.), by Household Income,2010




Source: Census Transportation Planning Products (CTPP) 5-Year ACS 2006-2010

# CTPP 5-Year Data Set (2006–2010) Median Commute Distance, by Poverty Status and Vehicle Available

- Weighted Median Commute Distance (mi.), by Poverty Status and Vehicle Available, 2010

| Origin | Destination | Total Workers | Poverty Status | | | Vehicle Available | |
|---|---|---|---|---|---|---|---|
| | | | Below 100% | 100 to 149% | At-or-Above 150% | No Vehicles | 1+ Vehicles |
| SCAG | SCAG | 7.1 | 5.6 | 5.9 | 7.4 | 7.8 | 8.9 |
| Imperial | SCAG | 5.2 | 2.5 | 4.2 | 5.4 | 5.6 | 7.2 |
| Los Angeles | SCAG | 7.0 | 5.9 | 6.3 | 7.2 | 7.7 | 8.8 |
| Orange | SCAG | 6.5 | 4.8 | 5.0 | 6.7 | 7.3 | 7.0 |
| Riverside | SCAG | 8.8 | 6.2 | 6.7 | 9.2 | 9.5 | 13.4 |
| San Bernardino | SCAG | 8.4 | 5.6 | 5.8 | 9.0 | 8.9 | 12.1 |
| Ventura | SCAG | 6.2 | 3.9 | 4.3 | 6.5 | 7.1 | 6.5 |

Source: Census Transportation Planning Products (CTPP) 5-Year ACS 2006-2010

# Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES)

- LODES Version 7.2 Data
  - Origin-Destination (OD), Residence Area Characteristics (RAC), and Workplace Area Characteristics (WAC) datasets
  - Enumerated with 2010 census block
- Median commuting distance by wage group for the years 2002, 2008 and 2012
  - Weighted by block-level commuter number
  - Euclidean distance between origin and destination blocks (centroids)
  - Aggregated at tract level

# LODES Version 7.1 Data
# Median Commute Distance

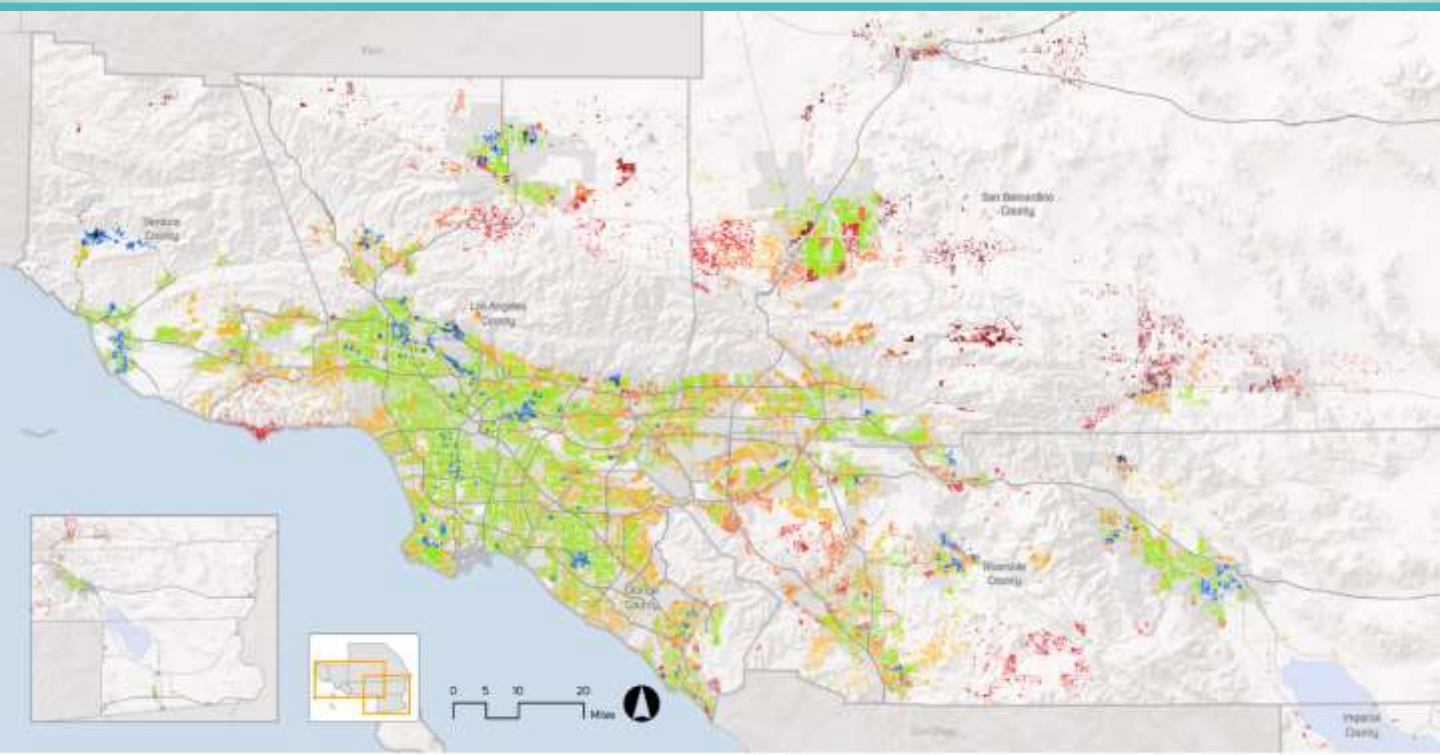
- Weighted Median Commute Distance (mi.), by Wage Group, 2002-2012

| Origin | Destination | 2002 | | | 2008 | | | 2012 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | All | Low Wage | High Wage | All | Low Wage | High Wage | All | Low Wage | High Wage |
| SCAG | SCAG | **9.4** | **8.6** | **11.0** | **9.8** | 8.9 | 11.0 | **10.1** | **9.0** | **11.3** |
| Imperial | SCAG | **7.5** | 8.1 | 5.6 | **7.6** | 5.5 | 8.2 | **8.5** | 6.3 | 9.6 |
| Los Angeles | SCAG | **8.8** | 8.2 | 10.2 | **9.0** | 8.1 | 10.0 | **9.1** | 8.1 | 10.1 |
| Orange | SCAG | **9.0** | 8.0 | 10.6 | **9.3** | 8.6 | 10.3 | **9.8** | 8.9 | 10.8 |
| Riverside | SCAG | **13.4** | 11.8 | 17.6 | **15.8** | 14.2 | 18.5 | **16.6** | 14.8 | 19.3 |
| San Bernardino | SCAG | **13.3** | 12.1 | 16.0 | **15.7** | 14.8 | 17.4 | **16.2** | 14.7 | 18.2 |
| Ventura | SCAG | **9.4** | 8.6 | 11.5 | **10.5** | 11.2 | 11.4 | **11.2** | 11.7 | 12.0 |

Coastal Inland

(Note: 'Low Wage' = Jobs with earnings $1250/month or less; 'High Wage' = Jobs with earnings greater than $3333/month)
Source: U.S. Census Bureau. 2015. LODES Data. Longitudinal-Employer Household Dynamics Program.

# Median Commute Distance, 2012 (All Jobs, Residential Parcels)




Median Commute Distance (Residential Land Use Parcels)

3 Miles and Under | 3 to 5 | 5 to 10 | 10 to 15 | 15 to 20 | 20 to 30 | Longer than 30 Miles

# LODES Version 7.1 Data
# Job-to-Worker Ratio

- Estimated total jobs and workers for each tract within median commute distance

# LODES Version 7.1 Data
# Job-to-Worker Ratio

- Job-to-Worker Ratio by Wage Group, 2012
  - Higher ratio means more jobs.
  - Lower ratio means more workers.

| | County | All Jobs | Low Wage | High Wage |
|---|---|---|---|---|
| | Imperial | 0.94 | 0.93 | 1.01 |
| Coastal | Los Angeles | 1.17 | 1.09 | 1.23 |
| Coastal | Orange | 1.13 | 1.16 | 1.11 |
| Inland | Riverside | 0.86 | 0.88 | 0.88 |
| Inland | San Bernardino | 0.91 | 0.93 | 0.92 |
| | Ventura | 0.91 | 0.97 | 0.86 |

(Note: 'Low Wage' = Jobs with earnings $1250/month or less; 'High Wage' = Jobs with earnings greater than $3333/month)
Source: U.S. Census Bureau. 2015. LODES Data. Longitudinal-Employer Household Dynamics Program.

# CONCLUSIONS

# Conclusions

- Higher wage workers tend to commute longer distance than lower wage workers.
- The commute distance is growing in the region, especially more rapidly in inland counties.
- Inland counties show a lower job-to-worker ratio than coastal counties.
- Need for more job growth in inland counties, while coastal counties need more housing growth

# Thank you!

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