

## Introduction:

An extensive amount of research has occurred on industry attributes, competitiveness, and infrastructure factors of the transportation and logistics cluster. However, limited research has focused on the human capital or occupations, skills, and knowledge embedded within the U.S. logistics clusters. This study explores human capital aspects of the logistics cluster.

## Research Questions:

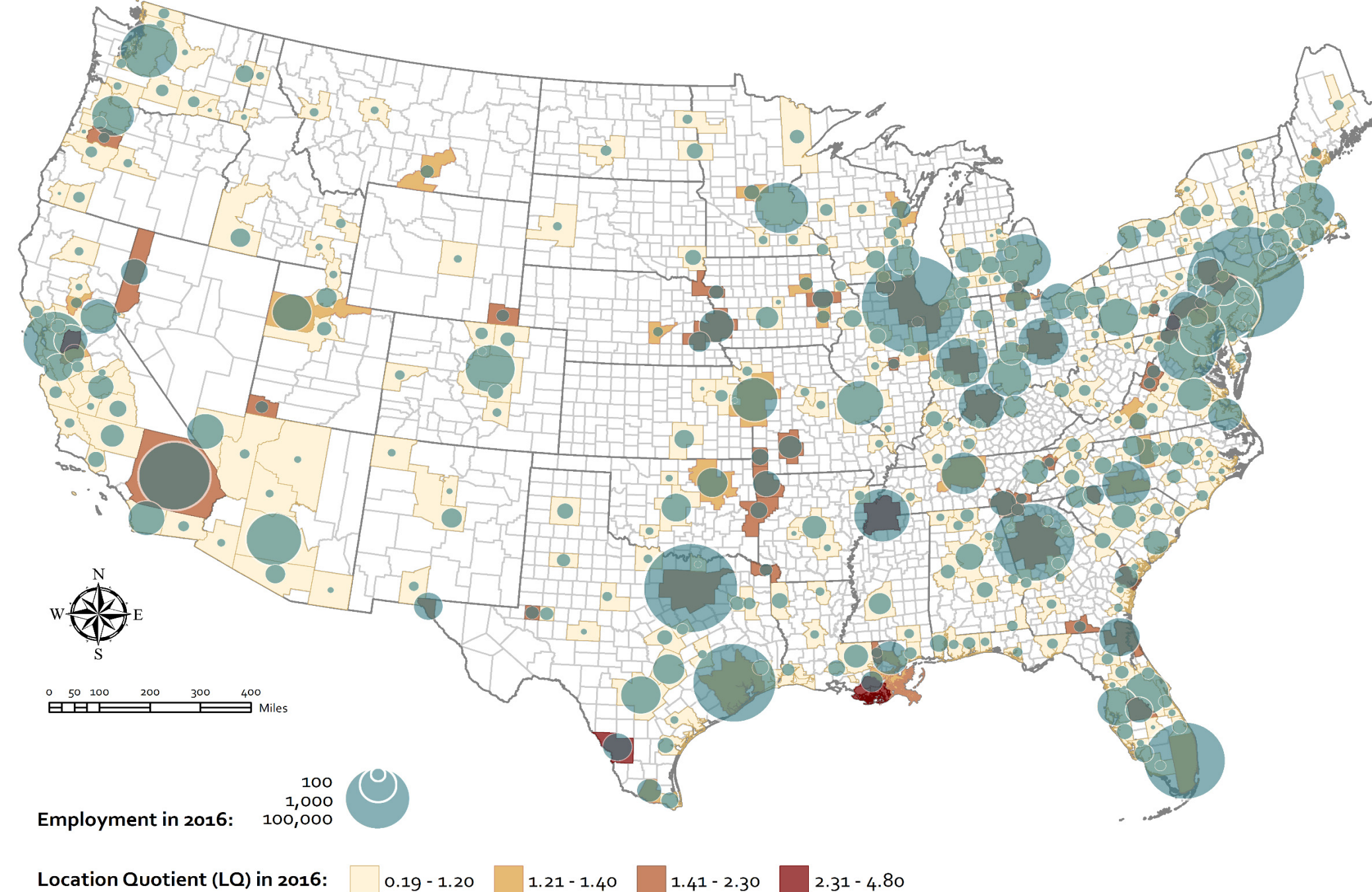
- How do occupation clusters differ in specialization within logistics cluster?
- How can occupation clusters inform the traditional cluster-based economic development policies in the U.S.?

## Literature Review:

- Local and regional economic development needs “crosshair strategy” of both industries and occupations.
- What they “do” versus what they “make”.
- Occupations within similar types of industries can differ significantly by geographic regions.
- Lack of robust crosswalks between industries and occupations, and worker characteristics at smaller geographic scale.
- Occupations are key to understand the impact of technology and automation.

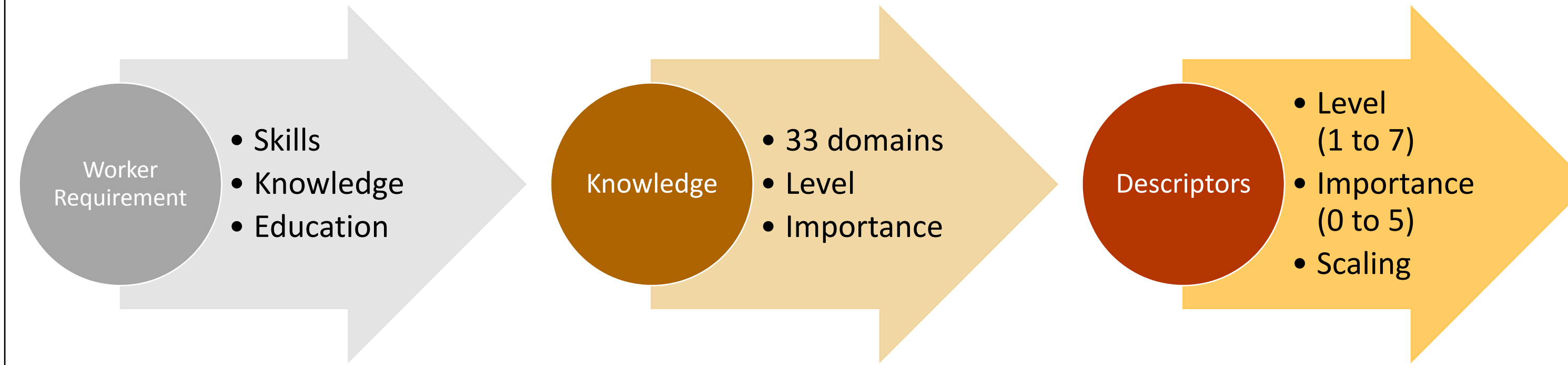
Based on Thompson and Thompson (1987), Markusen and Barbour (2003), Feser (2003), Koo (2005), Frey and Osborne (2017)

Transportation and Logistics Clusters in U.S. Metro Regions



## Methodology:

### O\*NET Content Model



### Agglomerative Hierarchical Clustering

Ward's algorithm = Level<sup>2</sup>, Importance; 66 variables, occupations from Job Zones 3, 4, and 5

### Occupation Cluster-Industry Cluster Construct

$$\frac{OC_{iR}IC_{jR}}{\sum_{i=1}^n OC_{iR}IC_{jR}} \bigg/ \frac{OC_{iN}IC_{jN}}{\sum_{i=1}^n OC_{iN}IC_{jN}}; j = 1, 2, \dots, 17$$

Where subscript *i* is occupation cluster, *j* shows industry cluster, *R* is a region, and *N* is the nation. In case occupation cluster definitions are not mutually exclusive, the denominator can include the sum of all occupations within the industry cluster.

### Decomposition of the location quotient (LQ)

$$LQ = \frac{E_{ir}}{E_r} \bigg/ \frac{E_{in}}{E_n} = \left( \frac{N_{ir}}{E_r} \bigg/ \frac{N_i}{E_n} \right) * \left( \frac{E_{ir}}{N_{ir}} \bigg/ \frac{E_{in}}{N_i} \right)$$

Plant Q      Size Q

Where subscript *i* is industry, *r* is a region, and *n* is the nation. *E* is employment and *N* is the Establishments.

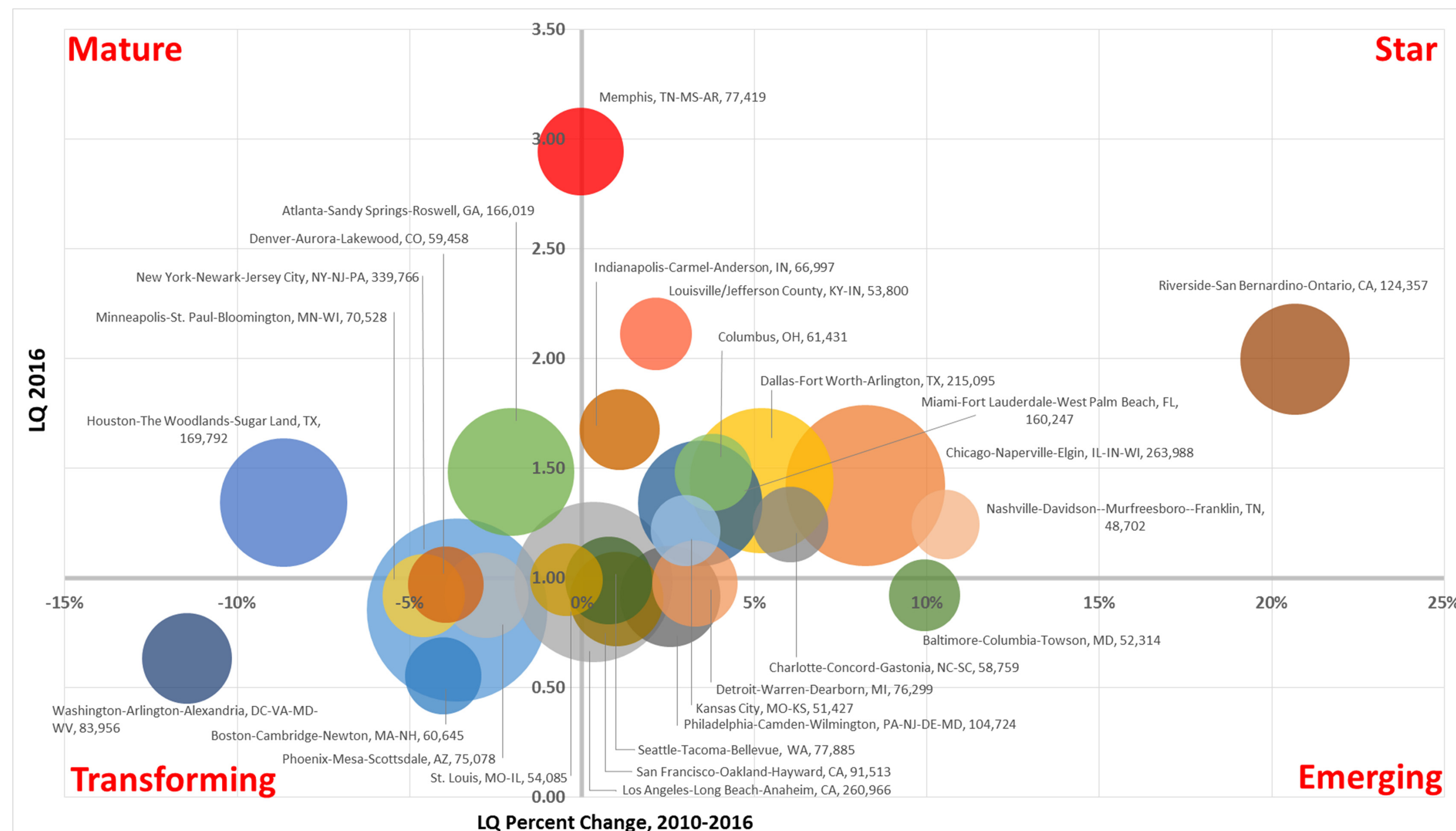
$$\ln(LQ) = \ln(Plant Q * Size Q) = (\ln Plant Q + \ln Size Q)$$

$$\beta^n = \frac{Cov(\ln Plant Q, \ln LQ)}{Var(\ln LQ)}$$

$$\beta^s = \frac{Cov(\ln Size Q, \ln LQ)}{Var(\ln LQ)}$$

Based on PCRD (2009), Nolan et al. (2011), PCRD (2007), Strotebeck (2010), Holmes and Stevens (2002), [www.onetcenter.org/content](http://www.onetcenter.org/content).

Transportation and Logistics Cluster Competitiveness in Select U.S. Metro Regions



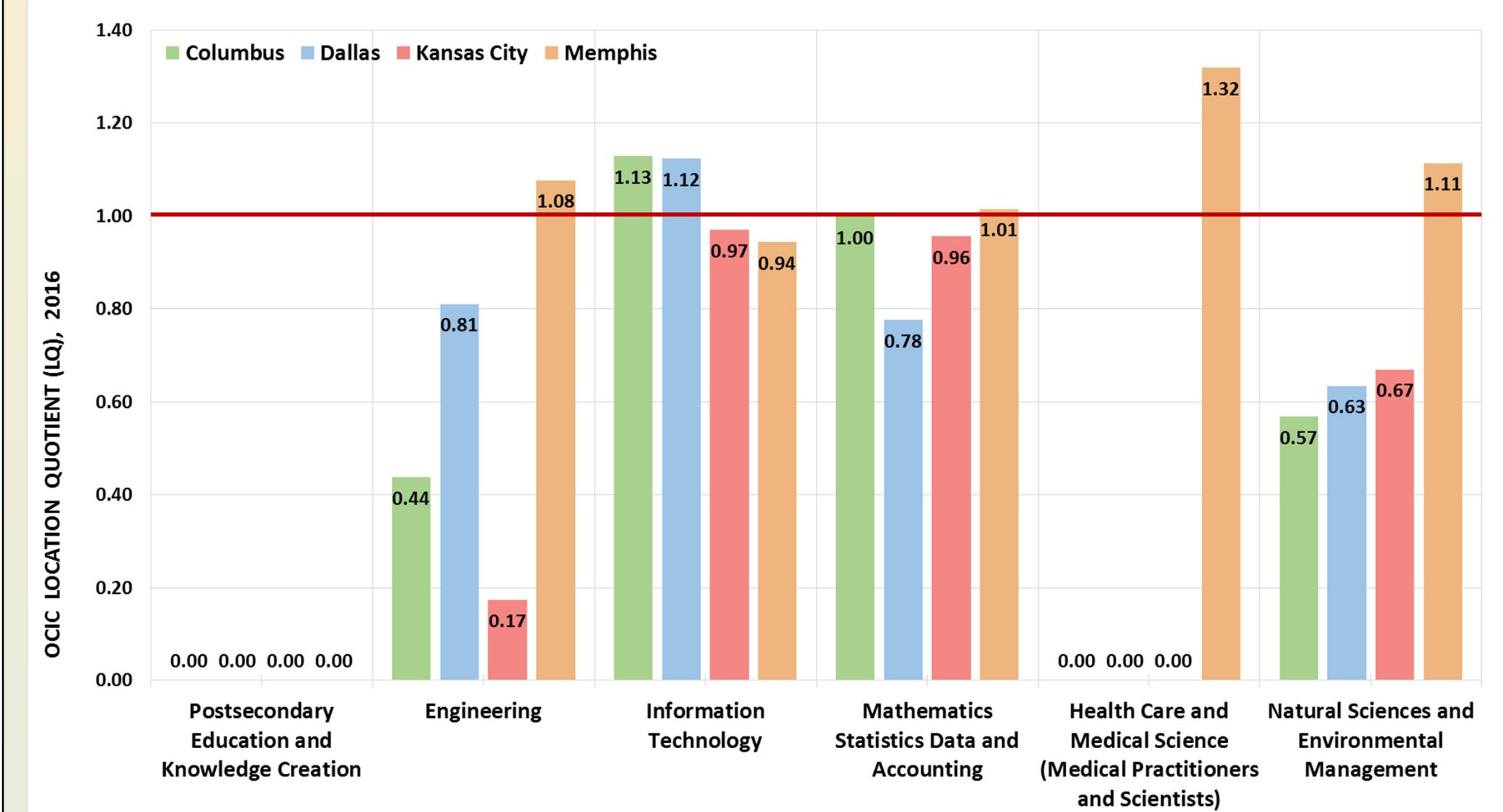
## Results:

### 380 + metropolitan areas

Covariance (Log LQ 2016, Log Plant Q)	0.115
Covariance (Log LQ 2016, Log Size Q)	0.113
Variance (Log Plant Q)	0.128
Variance (Log Size Q)	0.126
Variance (Log LQ 2016)	0.229
$\beta^n$ (Covariance/variance, Plant LQ)	<b>0.502</b>
$\beta^s$ (Covariance/variance, Size LQ)	<b>0.495</b>

The number and size of establishments have an almost equal contribution towards specialization or LQ.

### OCIC-LQ for select metropolitan areas



- The transportation and logistics cluster in Memphis exhibits specialization in knowledge-based occupation clusters, such as Engineering, Mathematics-Statistics-Data and Accounting, Natural Sciences and Environmental Management, and Healthcare and Medical Science.
- Memphis has 50,000 plus jobs in Job Zone 2, which is comprised of occupations requiring some preparation.
- Memphis' LQs for Job Zones 1 and 2 are 0.81 and 0.97, respectively.
- Memphis has 4,000 plus jobs and an LQ of 0.76 in Skilled Production Workers, an occupation cluster comprised of middle-skill occupations.

## Automation impact

- A weighted index for automation is developed based on occupational distribution within the transportation and logistics cluster and probabilities of computerization.
- Memphis shows a joint probability of around 0.6.
- A replicable method to compare various transportation and logistics clusters in the U.S.

## Acknowledgement

The study is supported, in part, by the U.S. Economic Development Administration (EDA) University Center Grant ED 16CH13030033.