

# **“What Lies Beneath: A Sub-National Look at Okun’s Law for the United States.”**

**Nathalie Gonzalez Prieto  
International Monetary Fund**

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# What the paper does and why

- Provides estimates of Okun's Law for '51' U.S. states (we confer temporary statehood on the District of Columbia)
- Explores industrial structure as an explanatory variable for the cross state variation in Okun coefficients
- Why?
- Useful for state and national level design of labor market policies
- There are states that are bigger than some countries but they share some common features.

# Okun's Law: What we estimate

Gaps version

$$u_t - u_t^* = \beta(y_t - y_t^*) + \epsilon_t$$

$$e_t - e_t^* = \beta^e(y_t - y_t^*) + \epsilon_{et}$$

$$l - l_t^* = \beta^l(y_t - y_t^*) + \epsilon_{lt}$$

Changes version

$$\Delta u_t = \alpha + \gamma \Delta y_t + \omega_t$$

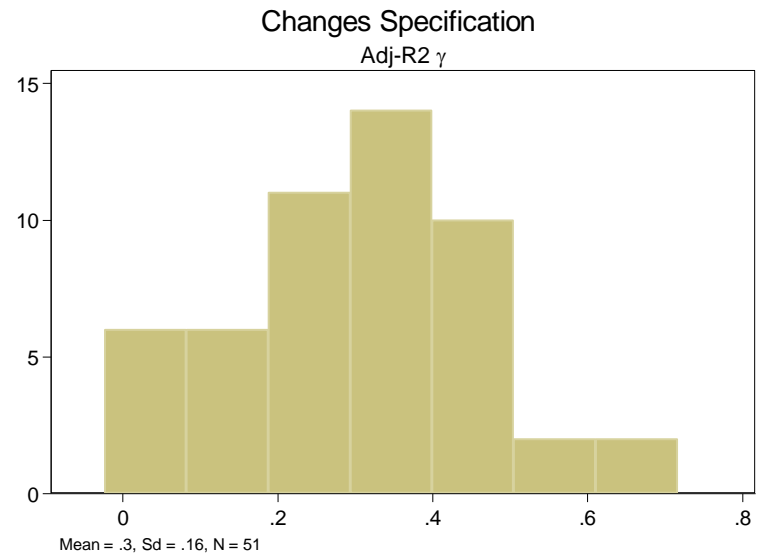
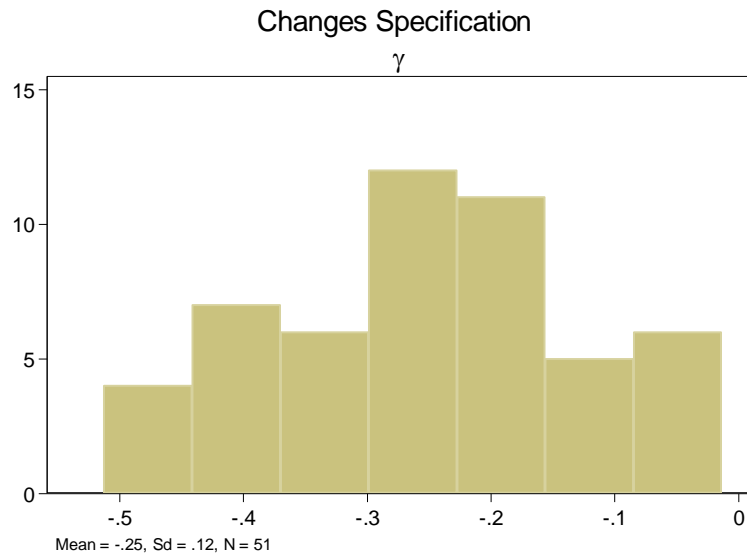
$$\Delta e_t = \alpha^e + \gamma^e \Delta y_t + \omega_{et}$$

$$\Delta l_t = \alpha^l + \gamma^l \Delta y_t + \omega_{lt}$$

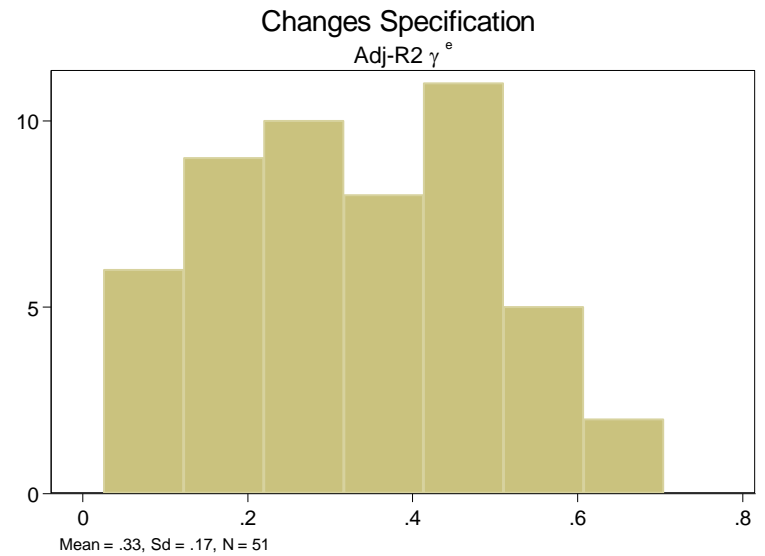
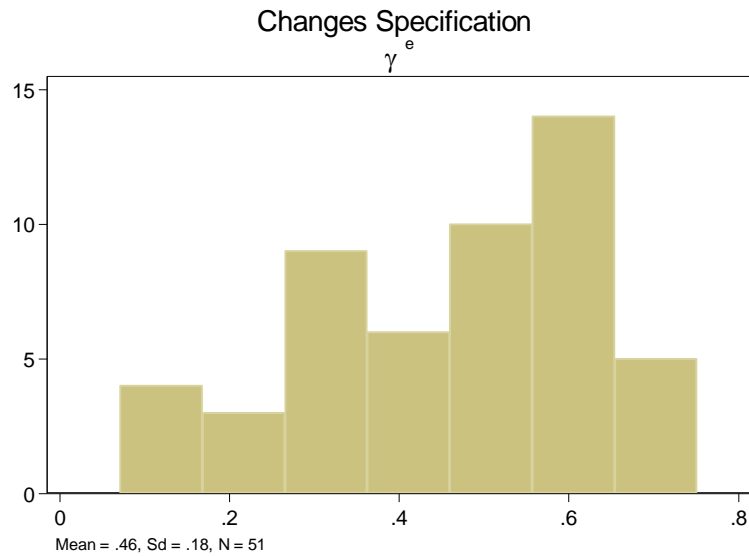
# Summary statistics

Distribution of Okun coefficients across states

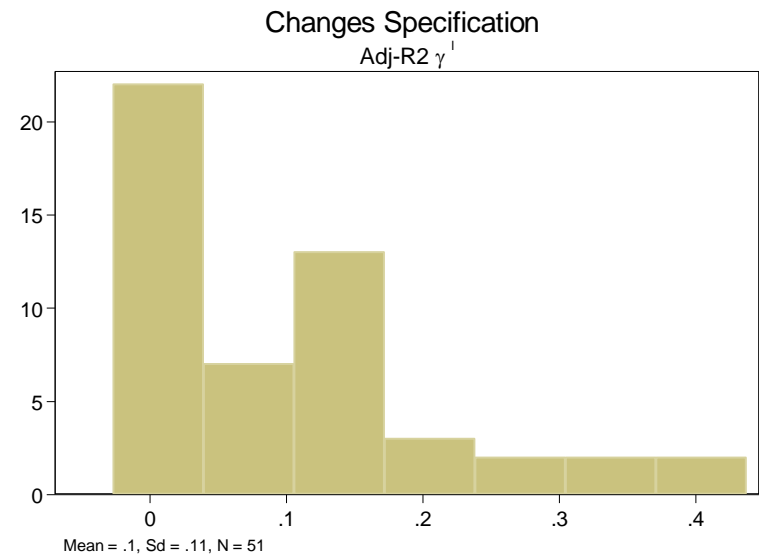
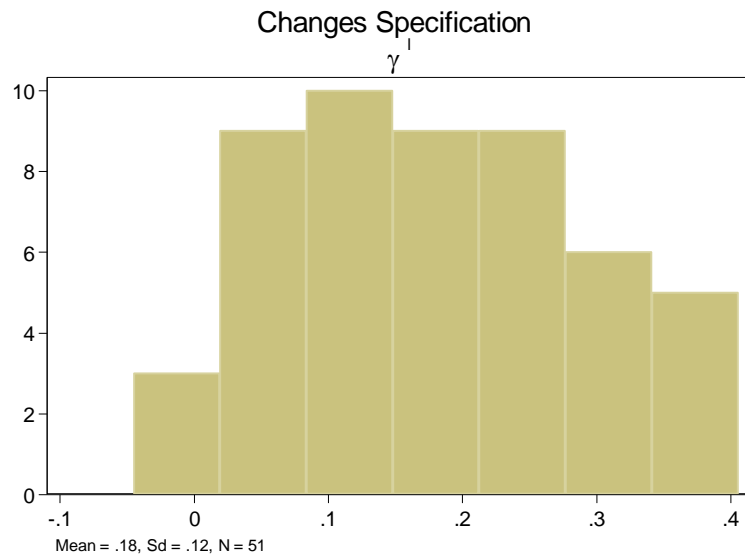
# Distribution of Okun Coefficient and $R^2$ : Unemployment, changes equation



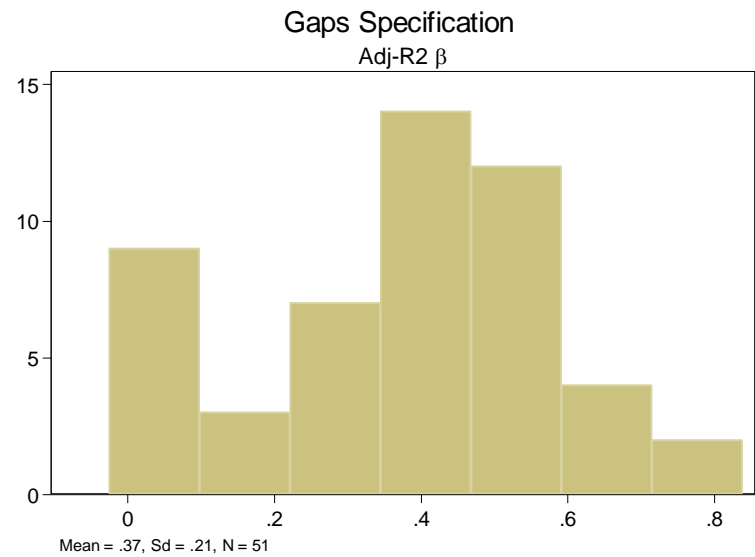
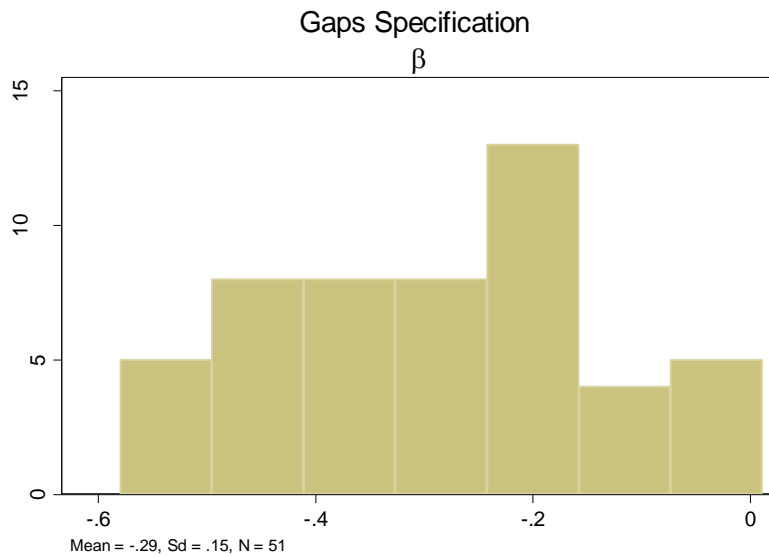
# Distribution of Okun coefficient and $R^2$ : Employment, changes equation



# Distribution of Okun coefficient : Labor force, changes equation

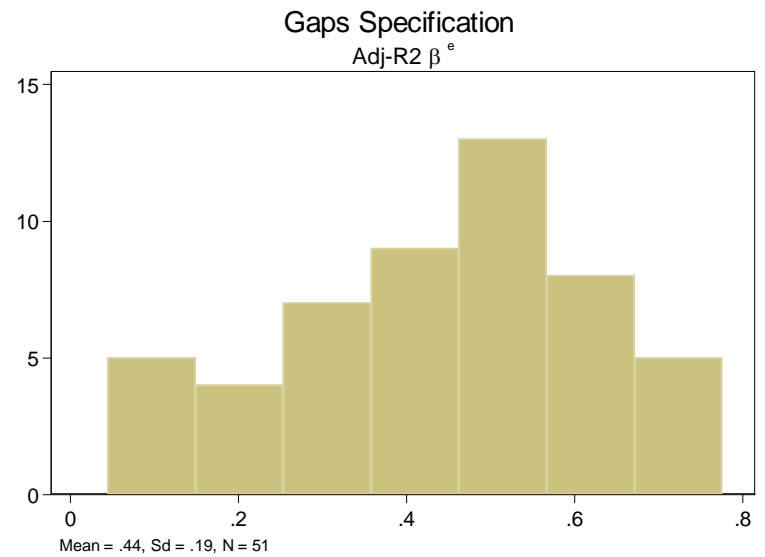
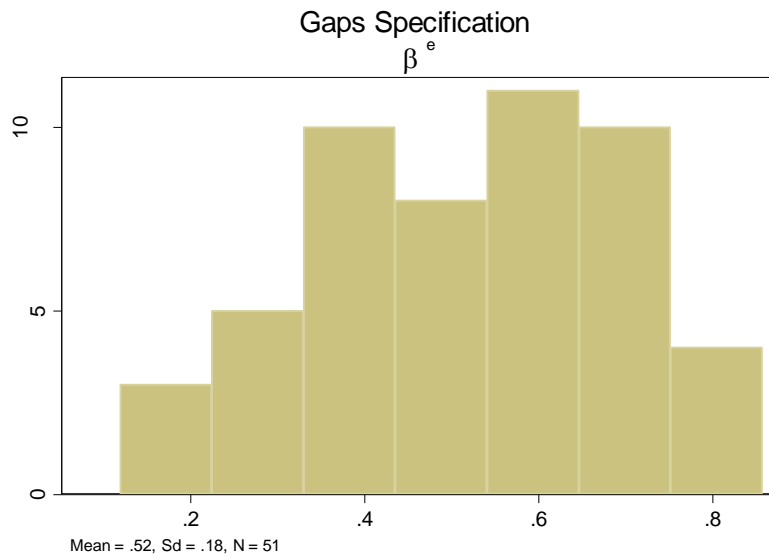


# Distribution of Okun Coefficient and $R^2$ : Unemployment, gaps equation

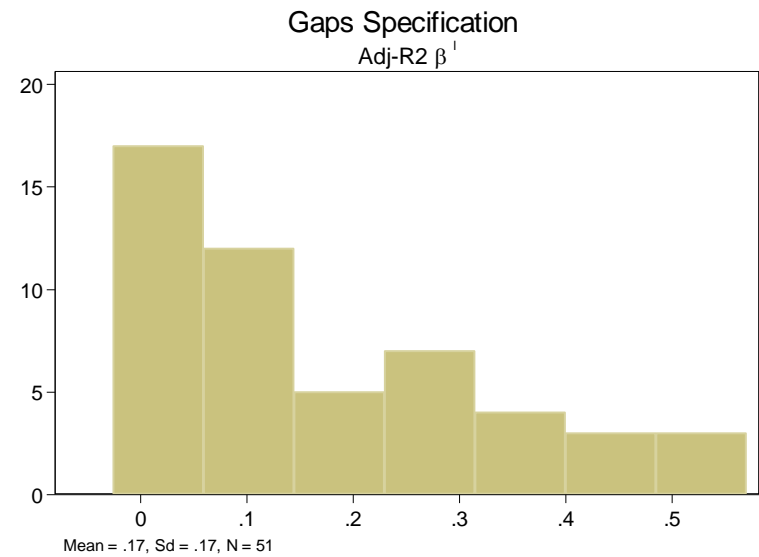
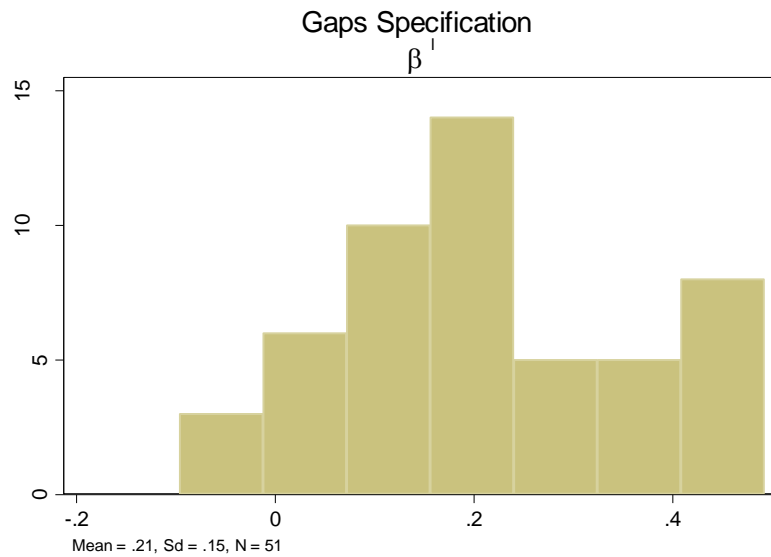




# Distribution of Okun coefficient and $R^2$ : Employment, gap equation



# Distribution of Okun coefficient and $R^2$ : Labor force, gap equation



# Correlation Matrix

	$\beta$	$\gamma$	$\beta^e$	$\gamma^e$	$\beta^l$
$\gamma$	0.9574*	1			
$\beta^e$	-0.6367*	-0.6060*	1		
$\gamma^e$	-0.7324*	-0.7446*	0.8852*	1	
$\beta^l$	0.3285*	0.3195*	0.5186*	0.2737	1
$\gamma^l$	0.0165	0.0458	0.6172*	0.6322*	0.7782*

# Distribution matrix: Gaps

	Low $R^2$	High $R^2$
High $\beta$ (in absolute value)	Mississippi	Alabama, California, Florida, Idaho, Illinois, Indiana, Kentucky, Michigan, Missouri, Nevada, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Utah, Washington, Wisconsin, New Jersey
Low $\beta$ (in absolute value)	West Virginia, Alaska, Colorado, Delaware, District of Columbia, Georgia, Hawaii, Iowa, Kansas, Louisiana, Montana, Nebraska, New Mexico, New York, North Dakota, Oklahoma, South Dakota, Texas, Wyoming	Arizona, Massachusetts, Arkansas, Maine, Maryland, Connecticut, Minnesota, New Hampshire, Vermont, Virginia

# Industrial Structure

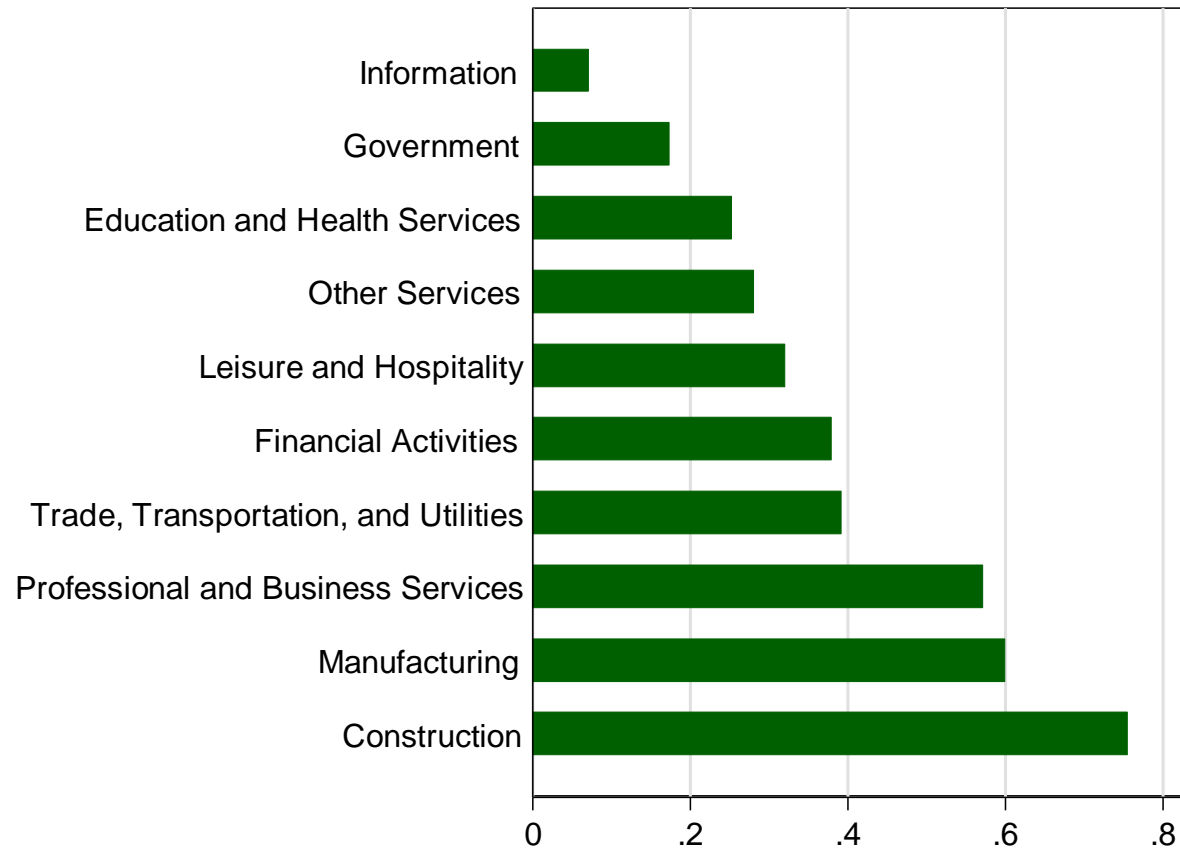
- Methodology
- Explaining the heterogeneity

# Employment elasticity at the industry level

- How responsive is employment to changes in value added at the industry level?
- National data on value added at the industry level -  $V A_I$
- National data on employment at the industry level -  $Empl_I$

$$\Delta Empl_{I,t} = \omega_{0,I} + \omega_I \Delta V A_{I,t}$$

# Elasticities by sector - $\omega_I$



# Industrial structure: State level

$$IndStruc_S = \sum_I \frac{Empl_{S,I}}{Total\ Empl_S} * \omega_I$$

- Once we have the elasticities ( $\omega_I$ ), we build a weighted average at the state level, using the share of employment of that industry in the states as the weighting factor.
- Given that the estimated elasticities are between zero and one, the industrial structure is also bound between zero and one.



# Determinants

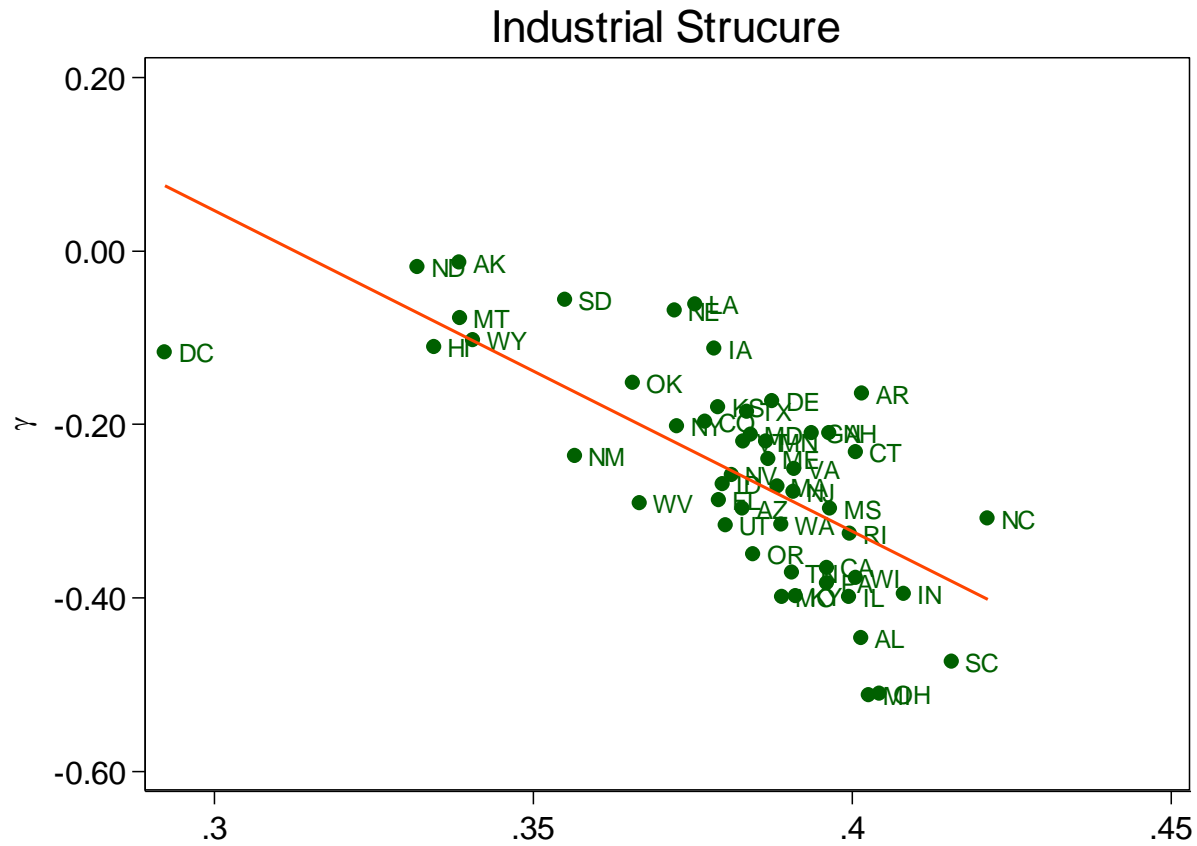
Testing whether the industrial structure explains the heterogeneity of the Okun coefficient

# Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
Industrial Structure	51	0.38	0.02	0.29	0.42
Average Unemployment	51	6.10	1.14	3.56	8.30
Log-Labor Force	51	14.29	1.02	12.47	16.55
Entrepreneurial Index	51	0.00	0.00	0.00	0.01
Skill Mismatch Index	51	9.84	3.04	4.32	20.34
Oil	51	0.08	0.27	0	1

The entrepreneurship index is the percent of individuals (ages 20-64) who do not own a business in the first survey month that start a business in the following month with 15 or more hours worked. Kauffman foundation. The data corresponds to 1996, the first year with available data

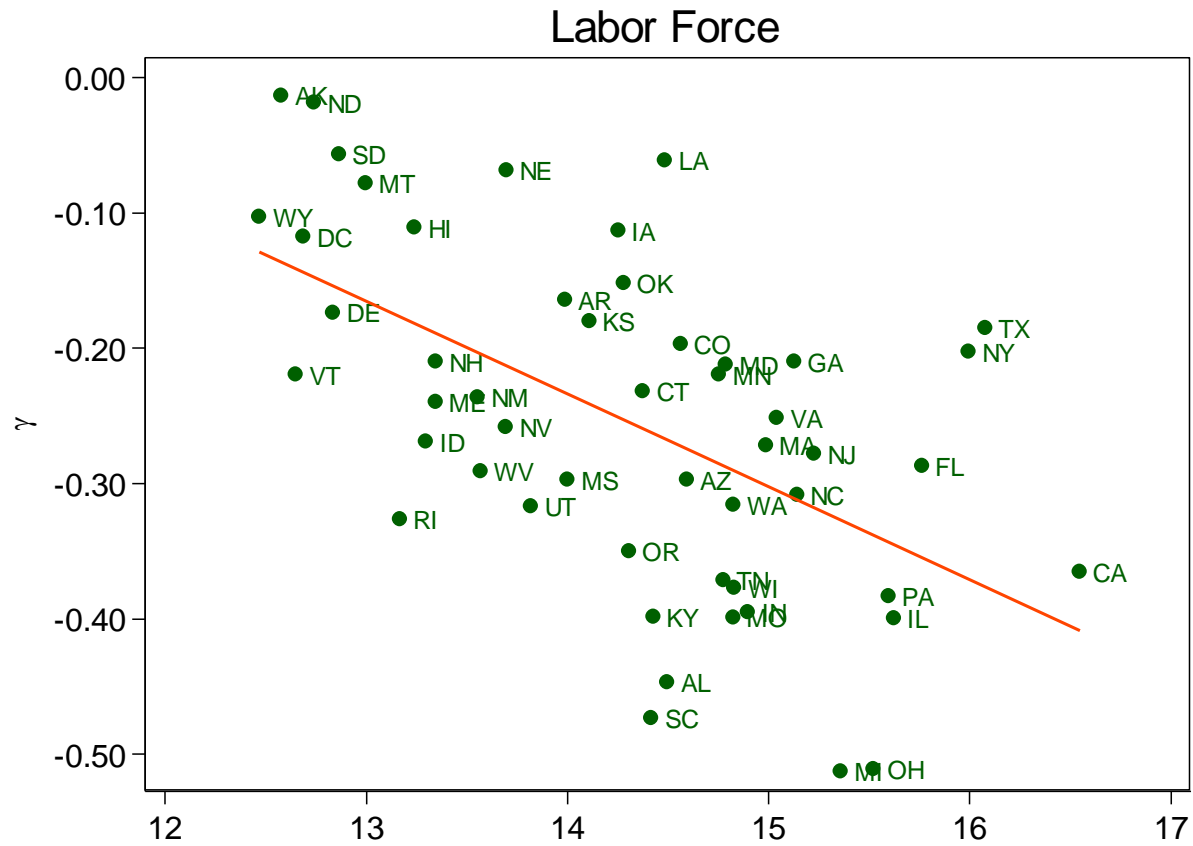
# Okun coefficient and industrial structure



# Okun coefficient and average unemployment rate

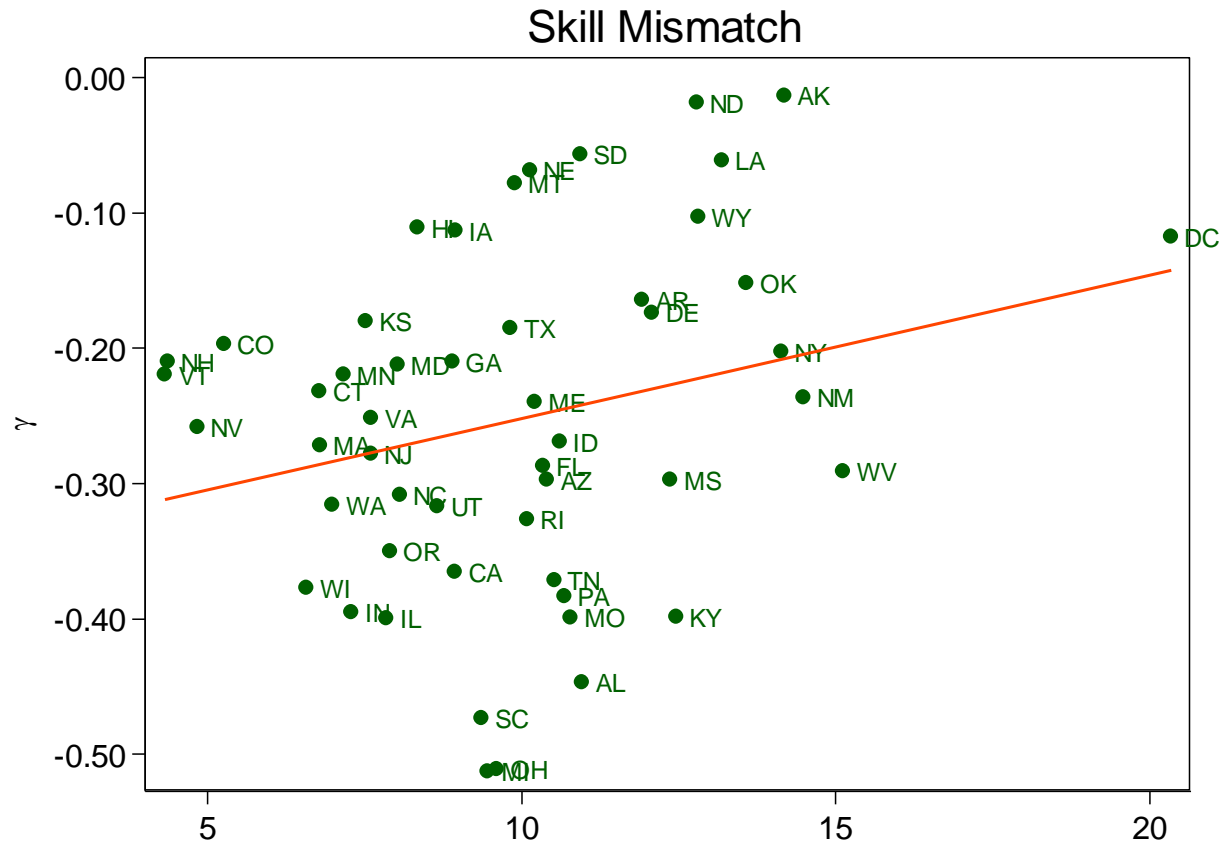


# Okun coefficient and labor force



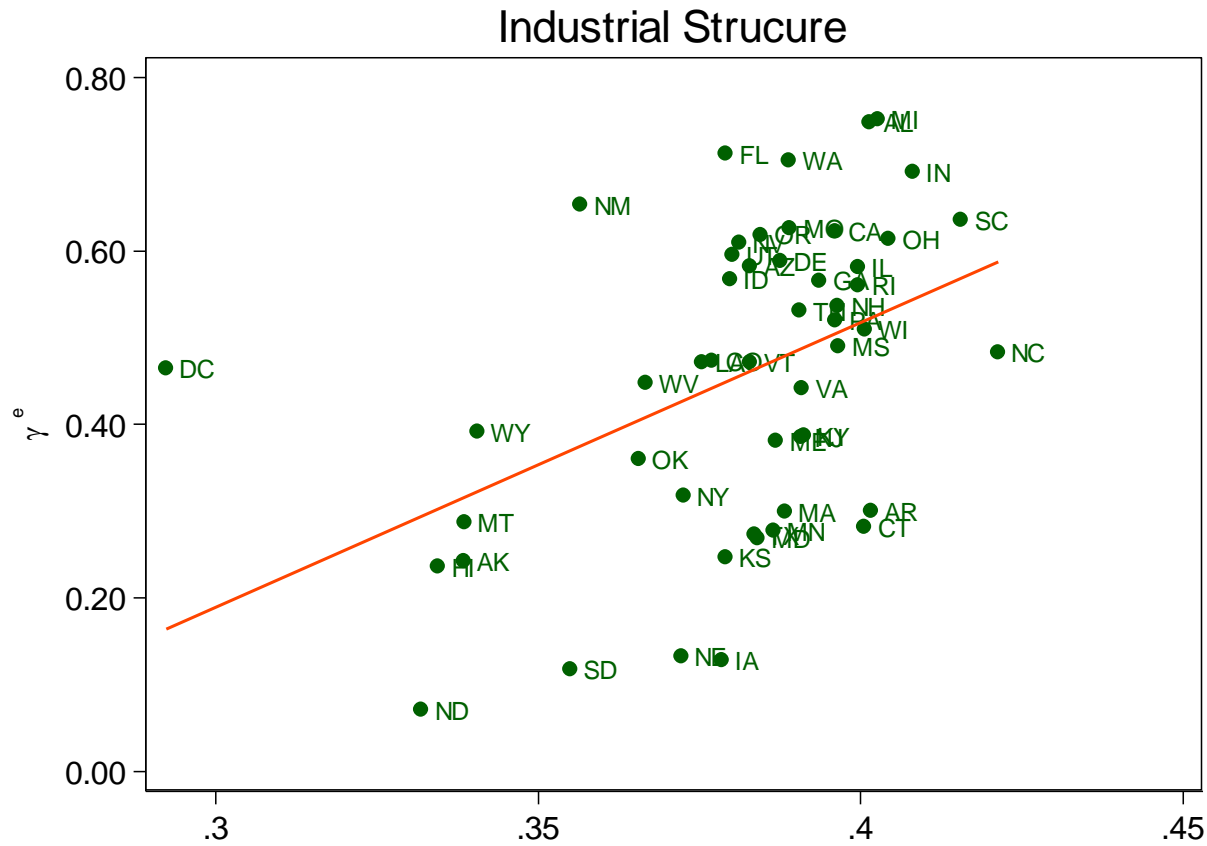


# Okun coefficient and skill mismatch index



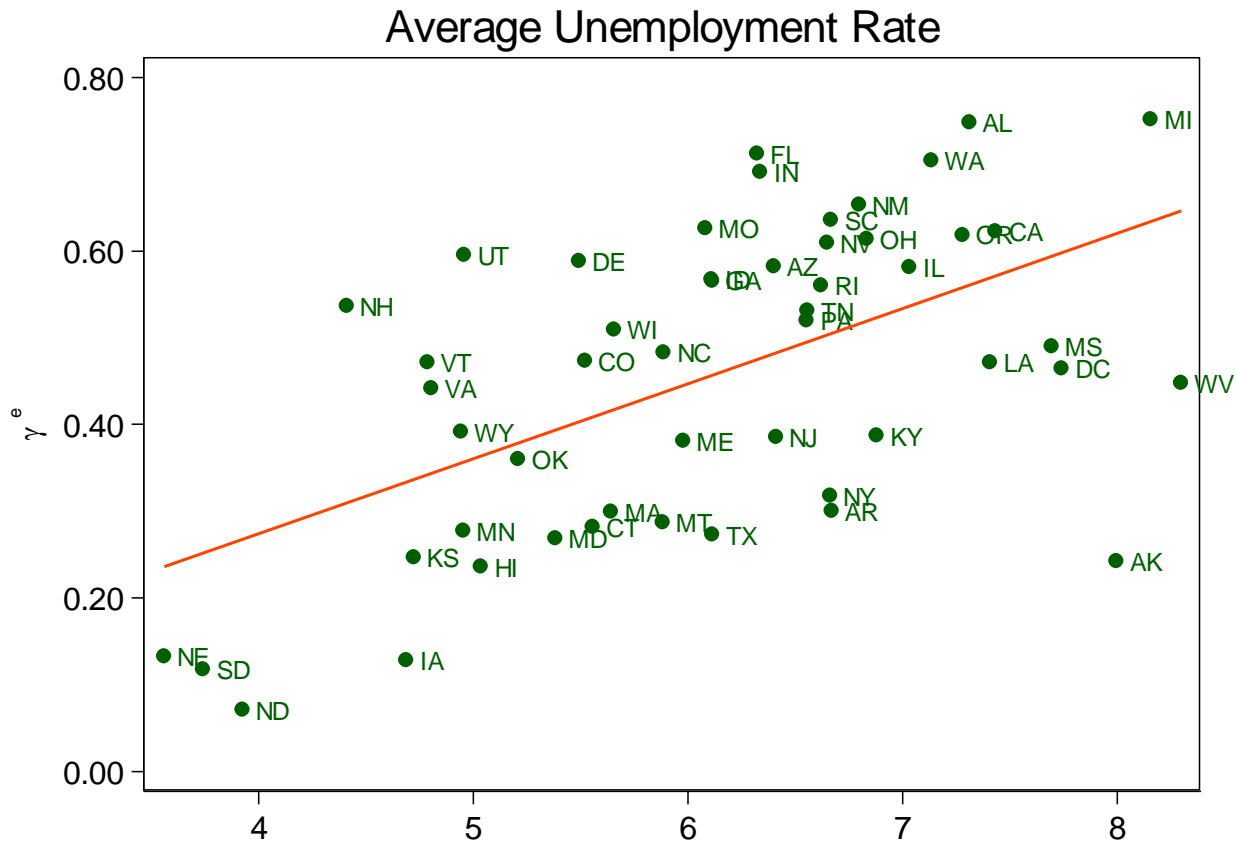
SMI data comes from Estevão and Tsounta (2011). A Higher number indicates a higher mismatch

# Employment coefficient and industrial structure

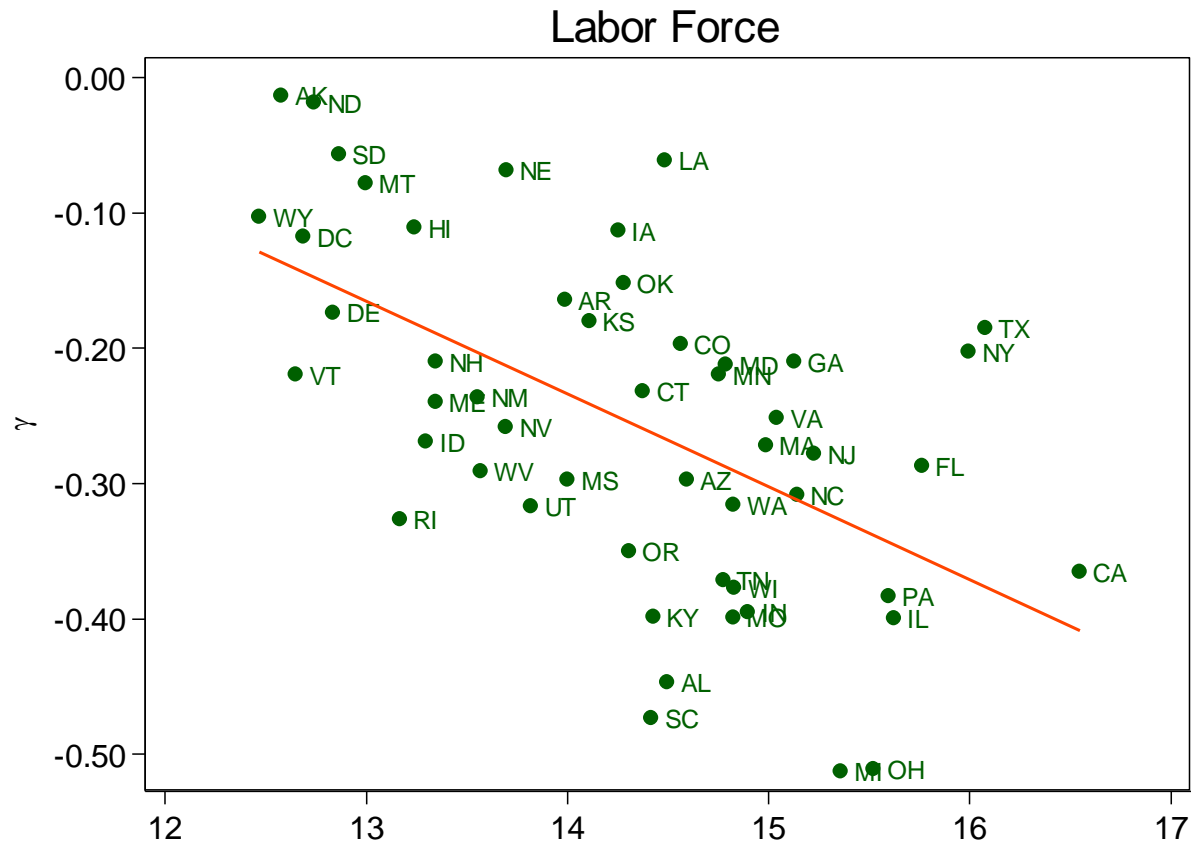




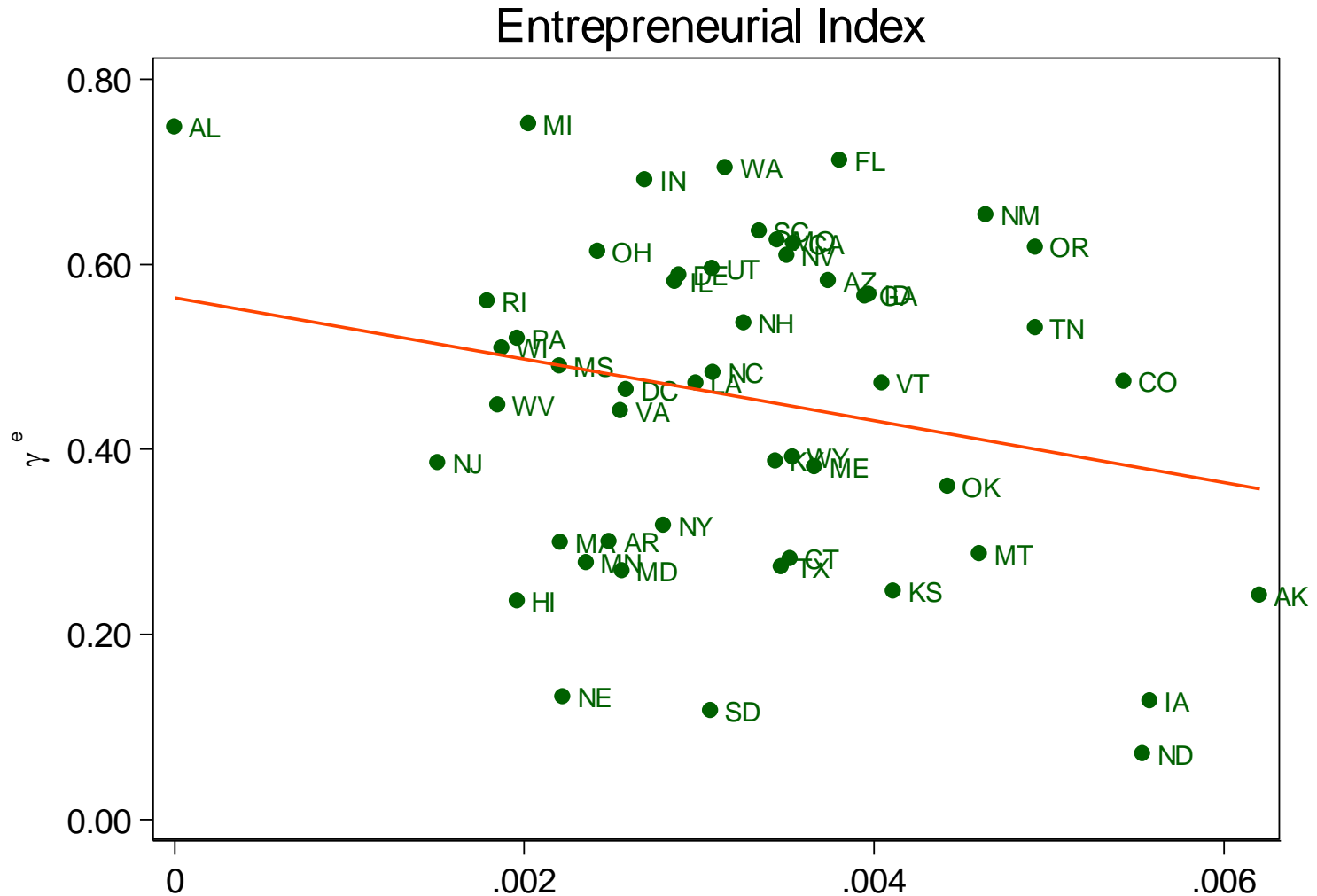
# Employment coefficient and average unemployment rate



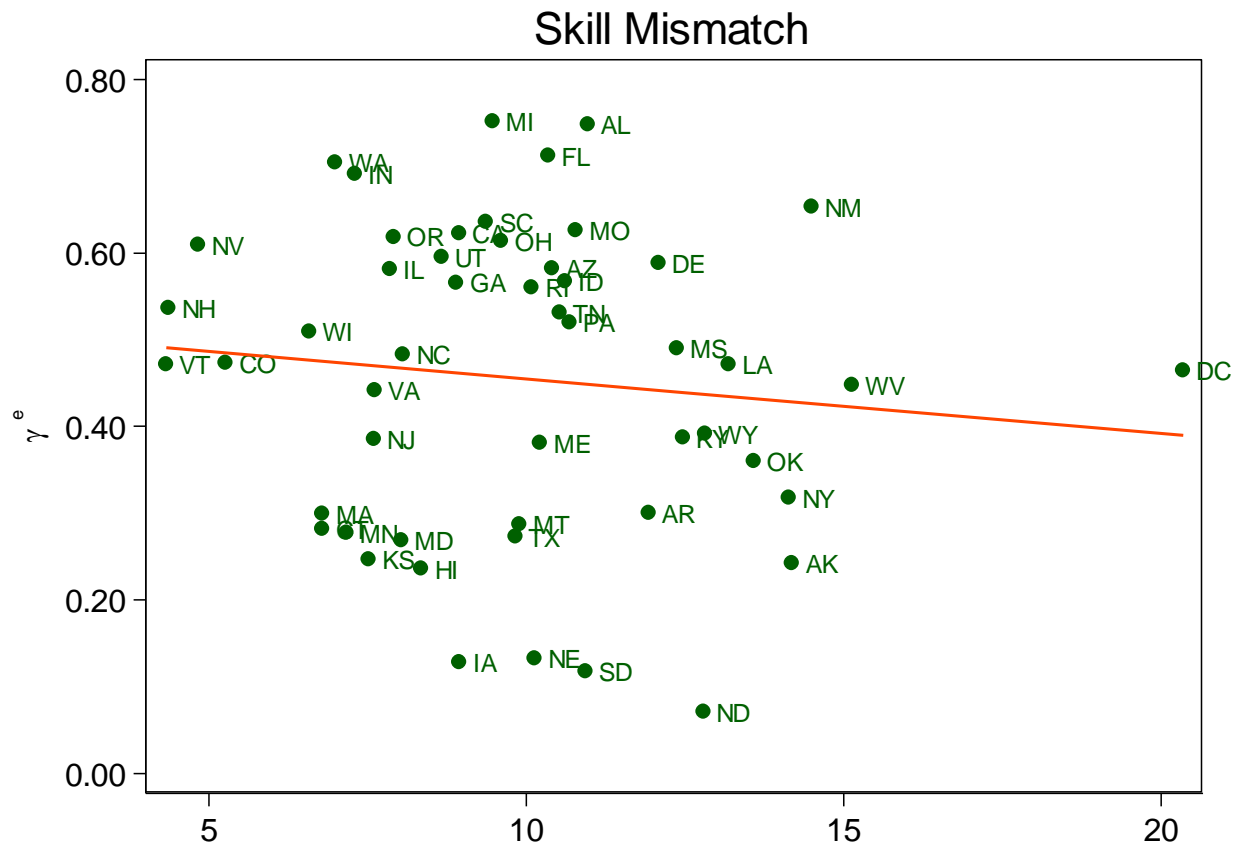
# Employment coefficient and labor force



# Employment coefficient and entrepreneurial index



# Employment coefficient and skill mismatch index



SMI data comes from Estevão and Tsounta (2011). A Higher number indicates a higher mismatch

# Correlation Matrix

	Industrial Structure	Average Unemployment	Log-Labor Force	Entrepreneurial Index	Skill Mismatch Index	Oil
Average Unemployment	0.13	1.00				
Log-Labor Force	0.59*	0.28	1.00			
Entrepreneurial Index	-0.32	-0.17	-0.24	1.00		
Skill Mismatch Index	-0.56*	0.37*	-0.26	0.02	1.00	
Oil	-0.18	-0.05	0.01	0.09	0.24	1.00

# Multivariate regressions

	$\gamma$							$\gamma^e$							
Industrial Structure	-3.70*** (0.53)							-2.51*** 3.28*** (0.68) (0.95)							
Average Unemployment	-0.05*** (0.01)							-0.04*** (0.01)		0.09*** (0.02)					
Log Average Labor Force			-0.07*** (0.01)					-0.02 (0.01)		0.05** (0.02)					
Entrepreneurial Index			41.70*** (13.78)					14.00 (9.40)		-33.27 (20.67)					
Skill Mismatch			0.01* (0.01)					0.00 (0.01)		-0.01 (0.01)					
Oil						0.14** (0.06)		0.08** (0.04)				-0.09 (0.09)			
Constant	1.16*** (0.20)	0.06 (0.09)	0.73*** (0.21)	-0.39*** (0.05)	-0.36*** (0.06)	-0.26*** (0.02)	1.12*** (0.27)	-0.79** (0.36)	-0.07 (0.11)	-0.30 (0.34)	0.56*** (0.07)	0.52*** (0.08)	0.46*** (0.03)	-0.59 (0.50)	
Observations	51	51	51	51	51	51	51	51	51	51	51	51	51	51	
R-squared	0.50	0.22	0.32	0.16	0.07	0.09	0.70	0.20	0.31	0.09	0.05	0.01	0.02	0.48	
Adjusted R-squared	0.49	0.20	0.30	0.14	0.05	0.07	0.66	0.18	0.30	0.08	0.03	-0.01	0.00	0.40	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Conclusions

- The Okun coefficient is heterogeneous within the country
- Industrial structure explains a big part of this heterogeneity
  - The degree of employment responsiveness to changes in value added accounts for 50% of the heterogeneity across states
  - This relationship holds even when we include other explanatory variables