What Lies Beneath?
A Sub-National Look at Okun's Law in the United States

Nathalie Gonzalez Prieto

IMF

Prakash Loungani

IMF, Vanderbilt University and OCP Policy Center

Saurabh Mishra

University of Maryland

September 2016
Preliminary draft

Abstract

We find that Okun's Law holds quite well for most U.S. states but the Okun coefficient—the responsiveness of unemployment to output—varies substantially across states. We are able to explain a significant part of this cross-state heterogeneity on the basis of the state's industrial structure. Our results have implications for the design of state and federal policies and may also be able to explain why Okun's Law at the national level has remained quite stable over time despite an enormous shift in the structure of the U.S. economy from manufacturing to services.

1. Introduction

Okun (1962) documented a short-run relationship between output and labor market fluctuations for the United States, which has since been dubbed "Okun's Law". Ball, Leigh and Loungani (2016), show that the Okun coefficient—the short-run responsiveness of the labor market to output fluctuations—has remained quite stable over the period 1948 to 2015 despite enormous changes in the structure of the economy over this period.

This paper estimates Okun's Law for U.S. states. The motivation is two-fold. First, evidence on how state labor markets respond to national output fluctuations can be useful to both state and national policymakers in the design of various policies to improve labor market outcomes. The more populous U.S. states are bigger than many countries, so understanding the determinants of their labor market fluctuations appears important for welfare. In the United States, states play a big role in deciding state-level government spending and in the provision of unemployment insurance, which affect how labor markets are able to cope during economic fluctuations.

A second motivation is to shed some light on why the Okun coefficient has remained stable over time, particularly given large changes in industrial structure. In popular discourse, manufacturing employment is considered much more responsive to output fluctuations than services employment. Hence, it is argued, the shift over time from manufacturing to services should make aggregate employment and unemployment less responsive to a given-sized output shock. We use industry-level data to show that several service industries are just as cyclically responsive as many manufacturing industries. Moreover, we are able to use these differences in these industry-level employment elasticities to explain a significant part of the heterogeneity in cross-state Okun coefficients. Hence, the sub-national look at U.S. industries and states provides some understanding for why the Okun coefficient has remained stable over time at the national level.

We use all 50 states and the District of Columbia in our analysis (henceforth, all are referred to as states, for convenience). Okun's Law is estimated for each state over the period 1976 to 2015. We find the average value of the state Okun coefficients is fairly close, though a bit lower, than that estimated from national data. There is considerable heterogeneity in the Okun coefficient across states. As noted, we are able to account for some of this using a state industrial structure variable, which is a weighted average of national-level employment elasticities (where the weights are the state share of industry employment in total state employment).

The rest of the paper is organized as follows. Section 2 reviews Okun's Law, Section 3 presents the main results and Section 4 delves into the determinants of cross-country differences in Okun coefficients. Section 5 provides our tentative conclusions.

2. Okun's Law

Okun's Law posits a relationship between cyclical fluctuations in output and the unemployment rate. Fluctuations of output around potential lead firms to hire and fire workers, changing the unemployment rate in the opposite direction. This relation can be expressed as:

$$u_t - u_t^* = \beta(y_t - y_t^*) + \varepsilon_t \tag{1}$$

where u_t^* and y_t^* are the trend components of the unemployment rate and log output, respectively. The error term reflects factors such as unusual changes in productivity or in labor force participation that shift the relationship.

The coefficient β in equation (1) depends on how much employment and the labor force adjust when output changes:

$$e_t - e_t^* = \beta^e(y_t - y_t^*) + \varepsilon_{et} \tag{2}$$

$$l_t - l_t^* = \beta^l(y_t - y_t^*) + \varepsilon_{lt} \tag{3}$$

where l_t^* and e_t^* are the trend values of the log of labor force and employment, respectively. The smaller is the cyclical response of the labor force, the stronger is the inverse correlation between β and β^e.

The source of the state-level data on the unemployment rate, employment, labor force and output are described in the Appendix. To measure the trend values of these variables, we use the Hodrick-Prescott (HP) filter, with the smoothness parameter set equal to 100.

Another version of Okun's Law posits a relationship between the changes in the unemployment rate and the growth rate of output:

$$\Delta u_t = \alpha + \gamma \Delta y_t + \omega_t \tag{4}$$

The corresponding equations for employment growth and labor force growth are given as:

$$\Delta e_t = \alpha^e + \gamma^e \Delta y_t + \omega_{et} \tag{5}$$

$$\Delta l_t = \alpha^l + \gamma^l \Delta y_t + \omega_{lt} \tag{6}$$

We refer to equations (1)-(3) as the gaps version of Okun's Law and equations (4)-(6) as the changes version. We present estimates for both versions but our results are not sensitive to which version is used.

3. Results

The top left panel of Figure 1 shows the histogram for the estimated β coefficients for the 51 states. The average value of the coefficient is -0.3, which is somewhat below the value at the national level over the same time period. There is considerable heterogeneity; the standard deviation is half as large as the average values. The top right panel provides evidence on the fit of Okun's Law as measured by the R-square statistic of the unemployment gap regressions. The average value is about 0.4, again with a standard deviation half as large.

The middle panel shows the histogram of the β^e estimates and the R-square values of the employment gap regressions. The mean value is 0.5 with a standard deviation of 0.2, while the mean R-square value is about 0.4 with a standard deviation of 0.2. The distribution of β^l estimates is shown in the bottom left panel. With the few exceptions, the coefficient is positive, viz. state labor force participation rises in good times and falls in bad times. The fit of the labor force equations, however, is quite poor: the average R-square value is less than 0.2.

Using the changes version of Okun's Law does not the broad pattern of results, as the histograms of the estimates of γ, γ^e and γ^l in Figure 2 show. The mean values of the γ and γ^e coefficients are -0.25 and 0.5, respectively, again with considerable heterogeneity. The estimates of γ^l again indicate a procyclical response of the labor force in most states.

Table 1 shows the correlations among the six elasticities that we estimate. The correlation between β and γ is almost 1 and between β^e and γ^e is 0.9. Hence, for all practical purposes, it does not make a difference whether the gaps or changes version is used. The correlation between β and β^e is -0.6 and between γ and γ^e is -0.7; hence it can make some difference to the conclusions which of the two Okun elasticities is used. Tables 2 and 3 give the elasticities for individual states. To provide a summary of where Okun's Law fits well and where it fits poorly, Table 4 classifies states into a 2x2 matrix based on the absolute values of β and the R-square statistic.

4. Determinants of Okun coefficients

In this section we look into some of the factors that are associated with the cross-state variation in γ and γ^e. The main determinant we consider is the measure of industrial structure described earlier. To construct this measure, we first estimate the national level responsiveness of employment growth in various 1-digit industries to growth in industry value added. Figure 3 shows the estimated elasticities. While construction and manufacturing have the highest elasticities, several service industries—particularly professional and business services—are not far behind. The industrial structure variable for each state is the weighted average of these elasticities, where the weights are each state's employment in the industry as a share of its total employment. We consider three other possible determinants of the Okun coefficients.

Size of the state: We conjecture that the Okun elasticities should be larger (in absolute values) for larger states. For smaller states we suspect that cross-state mobility in response to economic fluctuations (without a change in residence) could lower the estimated correlation between state employment and output. We measure the size of the state by its labor force.

Skill mismatch: Estevao and Tsounta (2011) suggest that skill mismatches can play a role in influencing how unemployment responds to shocks and present evidence supporting this from U.S. states. They measure skill mismatch as the difference between the skills embodied in the employment structure of a state ("demand") and the skills reflected in the educational attainment of the state's labor force ("supply").

Business regulations: Many observers suggest that the responsiveness of labor markets could depend on regulations governing labor and product markets. We try to proxy this by using an index of entrepreneurial activity in states. We conjecture that in states where barriers to entrepreneurship are lower, the Okun coefficient should be smaller (in absolute value).

Table 5 reports summary statistics on these four variables and Table 6 reports the correlations among them. The strongest correlation, 0.6, is between the industrial structure and the size of the labor force. Figure 4 shows scatter plots of these four possible determinants of the Okun elasticities. In all cases, the data suggests a significant bivariate relationship.

The top panel of Table 7 presents the results from regressions of γ on the possible determinants. Each variable is significant in a bivariate regression and with the expected sign, though the R-square values vary quite a bit. The strongest relationship is with the industrial structure variable, which has an R-square of about 0.5. When all four variables are included, only the industrial structure variable remains significant and the adjusted R-square actually falls a bit. As shown in the bottom panel of Table 5, industrial structure also helps explain the variation in γ^e but the R-square values are considerably lower.

5. Conclusions

The value of studying Okun's Law at the sub-national level has been made cogently by Binet and Facchini (2013) in their study of study of Okun's Law holds for regions in France:

> "For the regions in which the law holds, conventional nationwide policies to stimulate GDP might be sufficient. In contrast, region-specific policies should be implemented in those regions where the law does not hold (such as interregional labour mobility, public spending in terms of transport infrastructures to reduce the costs of spatial mobility, education and apprenticeship policies or a combination of these). In France, all these policies are provided by the decentralized regional authorities. But regional structures have dissimilar features. Therefore, the implementation of the appropriate policies to reduce unemployment must differ from one region to another."

In this paper, we show that there is considerable heterogeneity in the way labor markets in U.S. states respond to short-run economic fluctuations. We are able to explain a significant part of this heterogeneity in terms of differences in state industrial structure, a combination of national-level employment elasticities of various industries and the state shares of employment in those industries. Our findings have implications both for the design of both U.S. federal and state stabilization policies, which we intend to draw out in future work.

Figure 1: Distribution of Okun Coefficients and R-Square Statistics—Gaps Specification

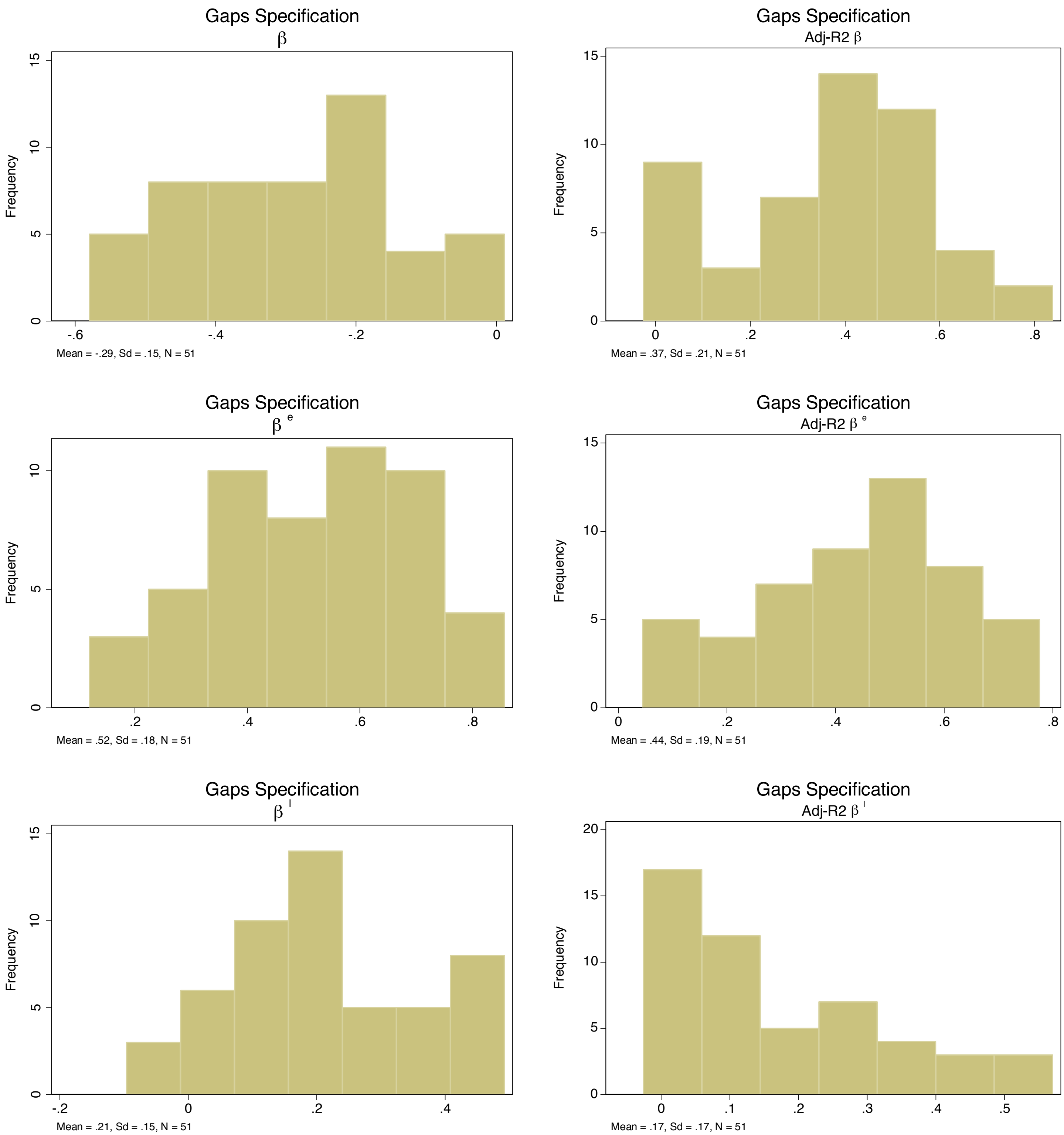


Figure 2: Distribution of Okun Coefficients & R-Square Statistics—Changes Specification

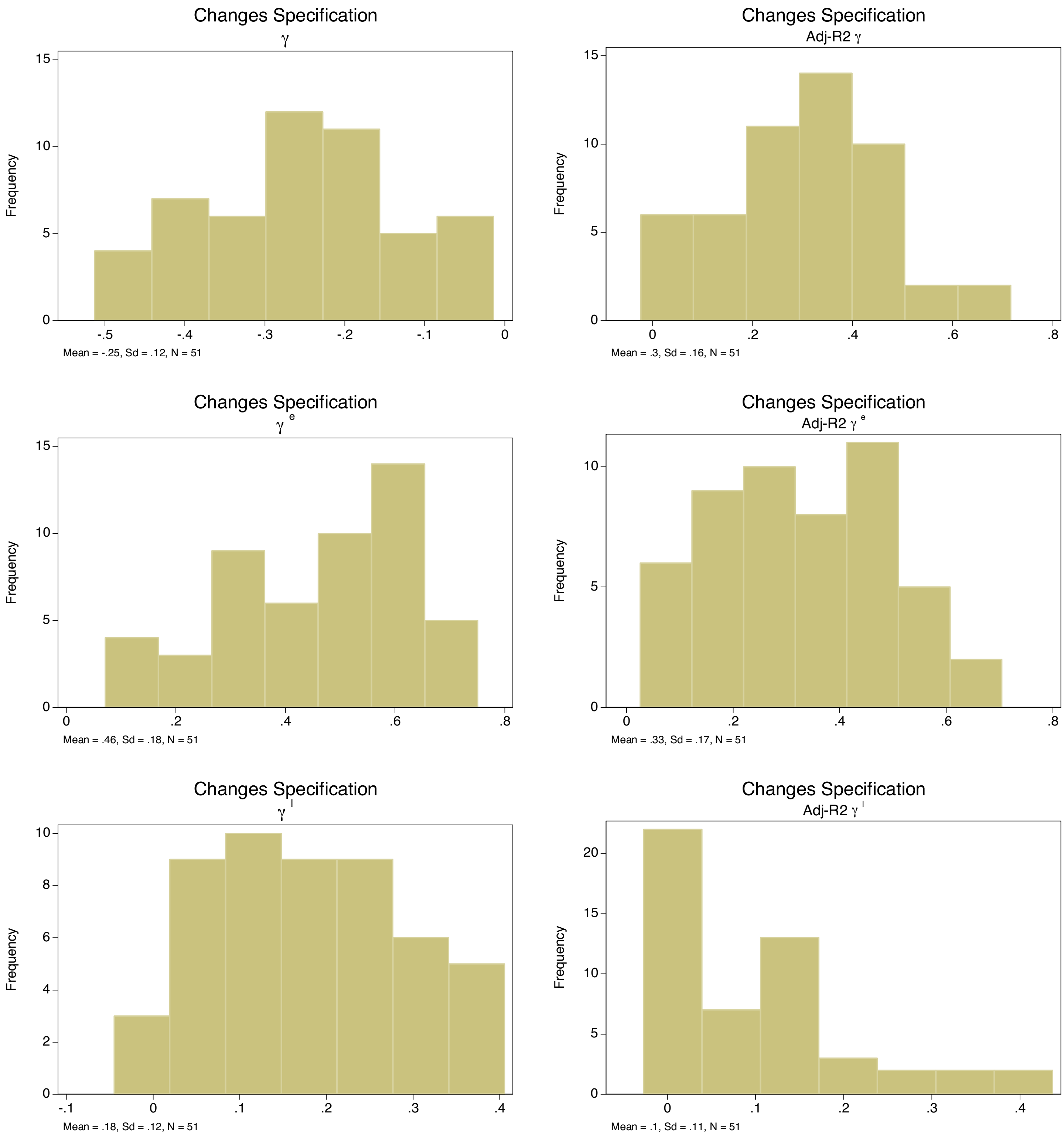


Figure 3: National-Level Employment Elasticities

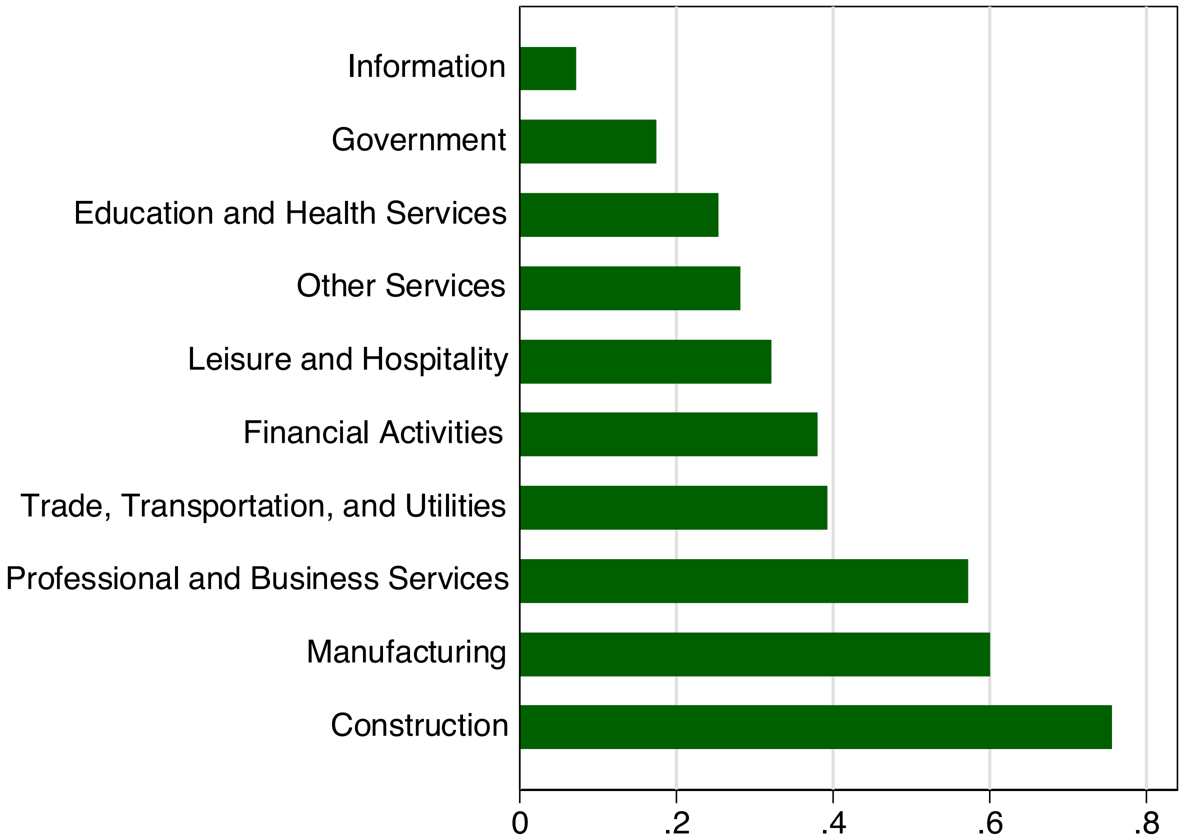
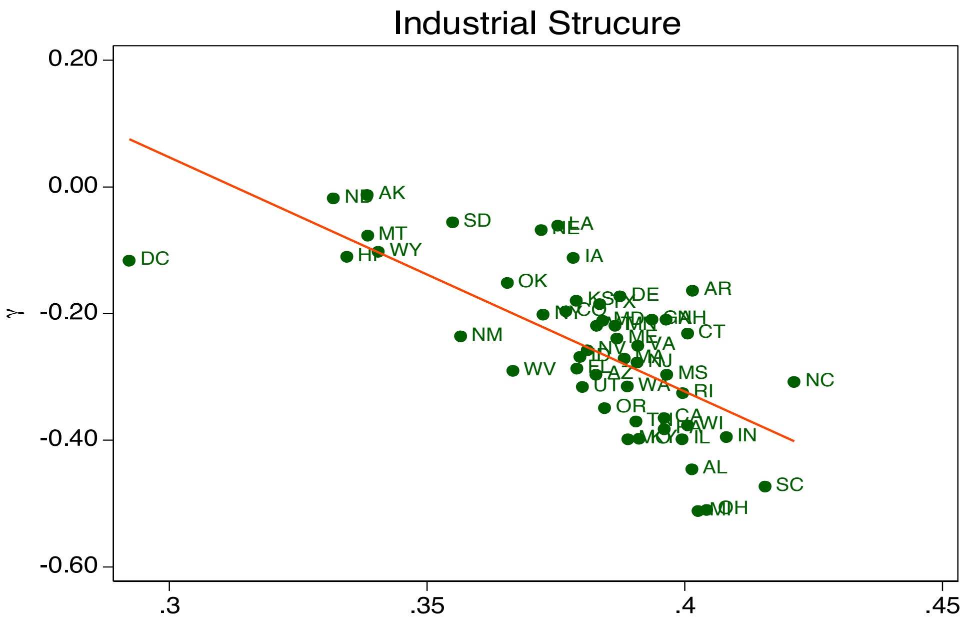
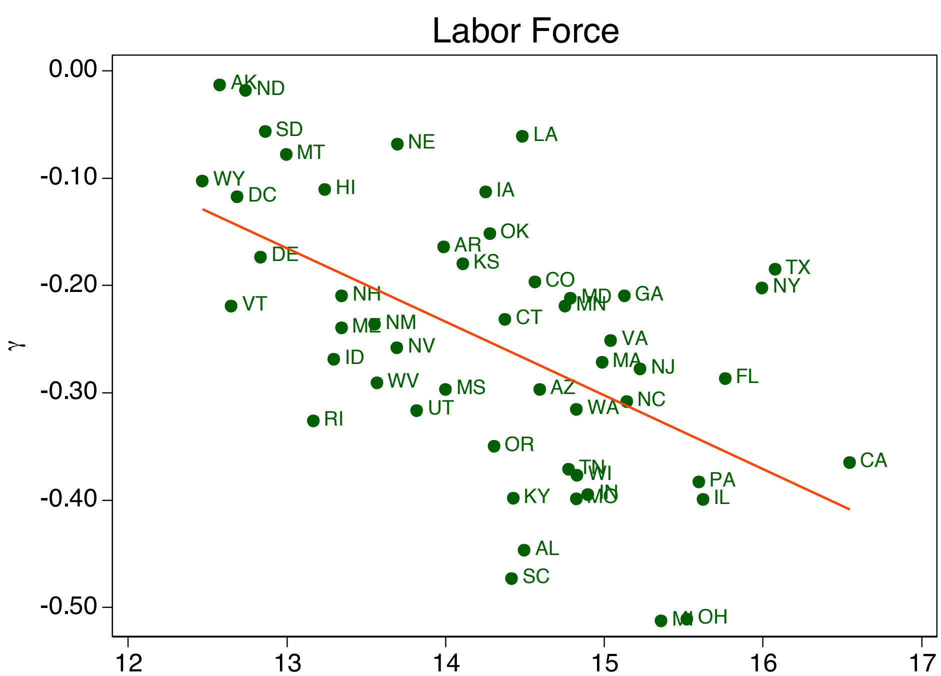
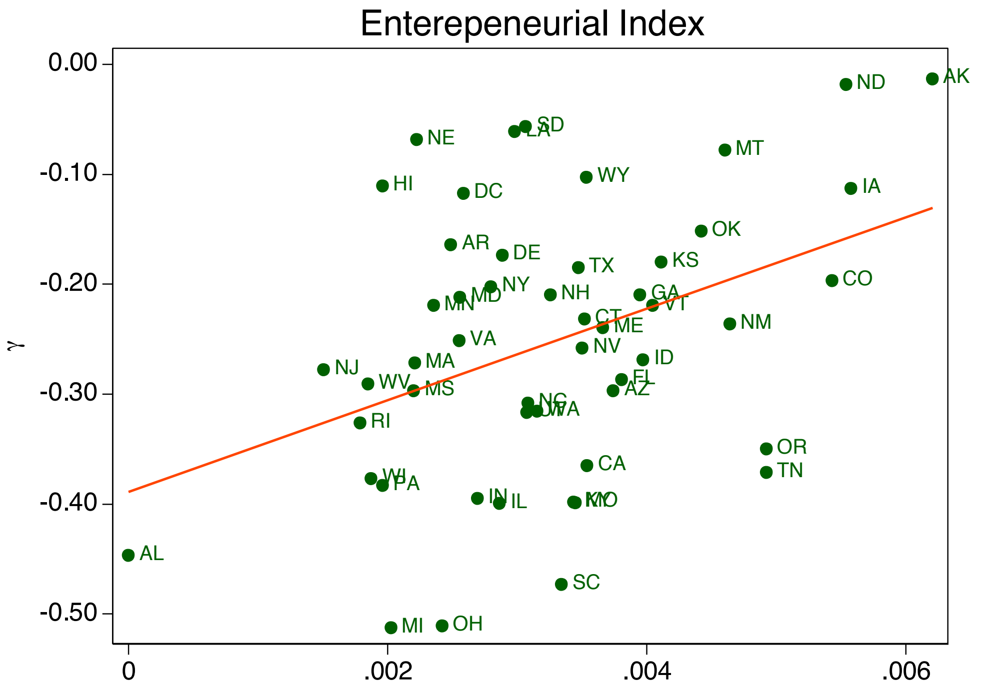


Figure 4: Determinants of Okun Coefficients






Enterepeneurial Index
γ
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0
.002
.004
.006
ND
AK
NE
SD
LA
MT
HI
DC
WY
IA
OK
AR
DE
TX
KS
CO
NY
NH
MD
MN
GA
VT
CT
ME
NM
VA
NV
ID
NJ
MA
WV
MS
FL
AZ
NC
WA
RI
OR
CA
TN
WI
PA
IN
IL
KY
MO
AL
SC
MI
OH

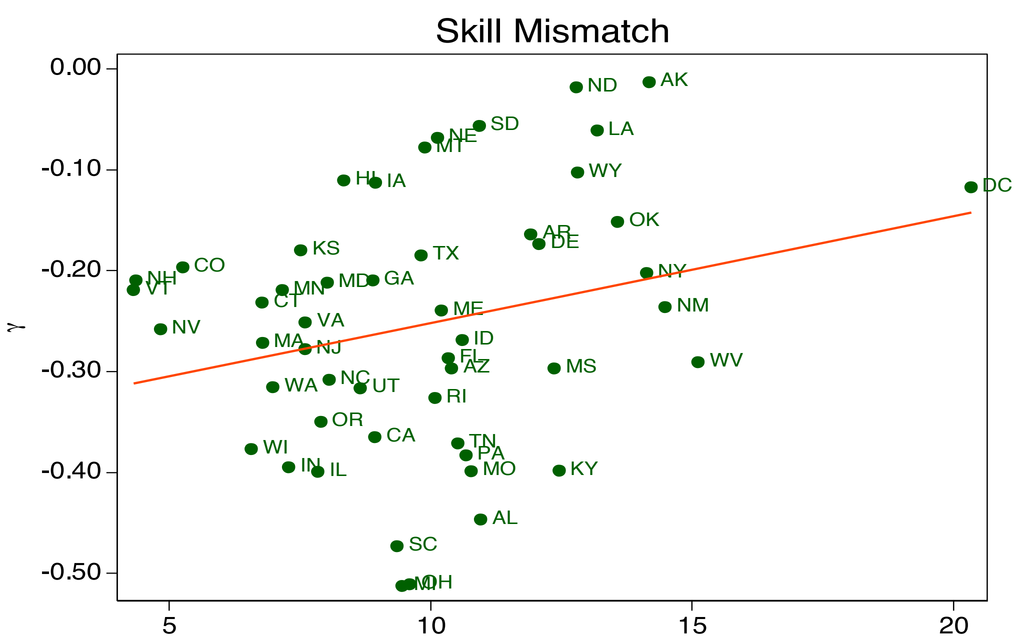

Skill Mismatch
γ
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
5
10
15
20
ND
AK
SD
LA
NE
MT
WY
HI
IA
DC
OK
AR
DE
KS
TX
CO
NH
VT
MN
MD
GA
NY
CT
ME
NM
VA
NV
MA
NJ
ID
FL
AZ
MS
WV
WA
NC
UT
RI
OR
CA
TN
PA
WI
IN
IL
MO
KY
AL
SC
MI
OH

Table 1: Correlations among Okun coefficients

	β	γ	β^e	γ^e	β^l
γ	0.96*	1			
β^e	-0.64*	-0.61*	1		
γ^e	-0.73*	-0.74*	0.89*	1	
β^l	0.33*	0.32*	0.52*	0.28	1
γ^l	0.02	0.05	0.62*	0.63*	0.78*

Table 2: Classification of States by Fit of Okun's Law

	R^2 below average	R^2 above average
β above average (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
β below average (in absolute value)	Alaska, Colorado, Delaware, District of Columbia, Georgia, Hawaii, Iowa, Kansas, Louisiana, Montana, Nebraska, New Mexico, New York, North Dakota, Oklahoma, South Dakota, Texas, West Virginia, Wyoming	Arizona, Massachusetts, Arkansas, Maine, Maryland, Connecticut, Minnesota, New Hampshire, Vermont, Virginia

Table 3: Estimates of Okun Elasticities by State—Gaps Specification

State	β	$Adj\ R^2$	β^e	$Adj\ R^2$	β^l	$Adj\ R^2$
Alabama	-0.58***	0.49	0.81***	0.56	0.17*	0.07
Alaska	0.01	-0.02	0.43***	0.59	0.44***	0.54
Arizona	-0.28***	0.46	0.47***	0.50	0.17**	0.10
Arkansas	-0.24***	0.40	0.39***	0.17	0.13	0.01
California	-0.41***	0.63	0.65***	0.71	0.21***	0.23
Colorado	-0.18***	0.22	0.53***	0.33	0.34***	0.18
Connecticut	-0.27***	0.42	0.37***	0.45	0.08	0.01
Delaware	-0.24***	0.35	0.62***	0.54	0.37***	0.47
District of Columbia	-0.21***	0.24	0.72***	0.51	0.49***	0.43
Florida	-0.39***	0.54	0.71***	0.78	0.29***	0.56
Georgia	-0.23***	0.34	0.48***	0.46	0.23***	0.27
Hawaii	-0.13**	0.10	0.33***	0.27	0.20***	0.17
Idaho	-0.37***	0.49	0.85***	0.68	0.45***	0.31
Illinois	-0.47***	0.60	0.66***	0.55	0.16**	0.08
Indiana	-0.48***	0.70	0.78***	0.58	0.26***	0.17
Iowa	-0.17***	0.25	0.26**	0.09	0.07	-0.01
Kansas	-0.20***	0.24	0.32***	0.15	0.12	0.01
Kentucky	-0.46***	0.49	0.40***	0.24	-0.10	-0.01
Louisiana	-0.06	-0.01	0.53***	0.40	0.47***	0.30
Maine	-0.25***	0.40	0.43***	0.45	0.17**	0.10
Maryland	-0.22***	0.38	0.26***	0.30	0.03	-0.02
Massachusetts	-0.24***	0.37	0.30***	0.38	0.04	0.01
Michigan	-0.50***	0.84	0.74***	0.77	0.18***	0.23
Minnesota	-0.27***	0.50	0.26***	0.23	-0.03	-0.02
Mississippi	-0.36***	0.28	0.57***	0.26	0.19	0.03
Missouri	-0.41***	0.58	0.69***	0.55	0.25***	0.18
Montana	-0.11*	0.05	0.55***	0.35	0.43***	0.32
Nebraska	-0.06	0.03	0.14**	0.11	0.08	0.02
Nevada	-0.38***	0.63	0.60***	0.65	0.19**	0.09
New Hampshire	-0.23***	0.49	0.51***	0.75	0.27***	0.57
New Jersey	-0.34***	0.46	0.45***	0.43	0.09*	0.05
New Mexico	-0.17**	0.09	0.58***	0.38	0.40***	0.40
New York	-0.22***	0.28	0.41***	0.39	0.17***	0.25
North Carolina	-0.39***	0.42	0.54***	0.46	0.13**	0.12
North Dakota	-0.00	-0.02	0.12*	0.06	0.11*	0.07
Ohio	-0.56***	0.75	0.62***	0.53	0.01	-0.03
Oklahoma	-0.09	0.04	0.55***	0.64	0.45***	0.43
Oregon	-0.43***	0.56	0.71***	0.61	0.24**	0.09
Pennsylvania	-0.49***	0.51	0.64***	0.52	0.11*	0.06
Rhode Island	-0.35***	0.40	0.61***	0.58	0.24***	0.38
South Carolina	-0.53***	0.56	0.69***	0.57	0.11*	0.05
South Dakota	-0.06**	0.10	0.13	0.04	0.07	0.00
Tennessee	-0.45***	0.58	0.55***	0.38	0.06	-0.02
Texas	-0.17***	0.18	0.34***	0.53	0.16**	0.13
Utah	-0.30***	0.42	0.66***	0.49	0.35***	0.23
Vermont	-0.23***	0.40	0.40***	0.31	0.16**	0.09

Virginia	-0.25***	0.42	0.40***	0.47	0.13*	0.05
Washington	-0.39***	0.46	0.86***	0.54	0.43***	0.24
West Virginia	-0.28*	0.05	0.67***	0.18	0.35**	0.08
Wisconsin	-0.50***	0.59	0.50***	0.28	-0.03	-0.02
Wyoming	-0.10***	0.19	0.55***	0.60	0.45***	0.39

Table 4: Estimates of Okun Elasticities by State—Changes Specification

State	γ	$Adj\ R^2$	γ^e	$Adj\ R^2$	γ^l	$Adj\ R^2$
Alabama	-0.45***	0.33	0.75***	0.47	0.25**	0.12
Alaska	-0.01	-0.02	0.24**	0.13	0.23**	0.10
Arizona	-0.30***	0.39	0.58***	0.49	0.26**	0.13
Arkansas	-0.16***	0.27	0.30**	0.13	0.12	0.01
California	-0.37***	0.50	0.62***	0.52	0.23***	0.15
Colorado	-0.20***	0.22	0.47***	0.27	0.27**	0.12
Connecticut	-0.23***	0.34	0.28***	0.20	0.03	-0.02
Delaware	-0.17**	0.14	0.59***	0.33	0.40***	0.32
District of Columbia	-0.12*	0.07	0.46***	0.19	0.34**	0.13
Florida	-0.29***	0.41	0.71***	0.65	0.40***	0.44
Georgia	-0.21***	0.26	0.57***	0.50	0.34***	0.34
Hawaii	-0.11*	0.06	0.24*	0.06	0.12	0.01
Idaho	-0.27***	0.40	0.57***	0.44	0.28***	0.17
Illinois	-0.40***	0.49	0.58***	0.50	0.15**	0.09
Indiana	-0.40***	0.58	0.69***	0.54	0.26***	0.19
Iowa	-0.11***	0.19	0.13	0.03	0.01	-0.03
Kansas	-0.18***	0.25	0.25**	0.11	0.06	-0.02
Kentucky	-0.40***	0.47	0.39***	0.27	-0.04	-0.02
Louisiana	-0.06	-0.01	0.47***	0.28	0.40***	0.17
Maine	-0.24***	0.29	0.38***	0.18	0.13	0.01
Maryland	-0.21***	0.26	0.27***	0.16	0.04	-0.02
Massachusetts	-0.27***	0.38	0.30***	0.28	0.01	-0.03
Michigan	-0.51***	0.72	0.75***	0.70	0.18**	0.14
Minnesota	-0.22***	0.38	0.28***	0.28	0.04	-0.01
Mississippi	-0.30***	0.24	0.49***	0.15	0.17	0.01
Missouri	-0.40***	0.51	0.63***	0.46	0.20*	0.07
Montana	-0.08*	0.06	0.29***	0.19	0.20**	0.13
Nebraska	-0.07**	0.09	0.13***	0.16	0.06	0.02
Nevada	-0.26***	0.44	0.61***	0.58	0.33***	0.24
New Hampshire	-0.21***	0.40	0.54***	0.60	0.31***	0.37
New Jersey	-0.28***	0.29	0.39***	0.25	0.09	0.01
New Mexico	-0.24***	0.21	0.65***	0.39	0.41***	0.24
New York	-0.20***	0.21	0.32***	0.23	0.10	0.04
North Carolina	-0.31***	0.31	0.48***	0.37	0.15**	0.11
North Dakota	-0.02*	0.06	0.07*	0.06	0.05	0.02
Ohio	-0.51***	0.62	0.61***	0.53	0.06	-0.01
Oklahoma	-0.15***	0.18	0.36***	0.37	0.20**	0.11
Oregon	-0.35***	0.42	0.62***	0.45	0.24**	0.10
Pennsylvania	-0.38***	0.35	0.52***	0.35	0.11	0.03
Rhode Island	-0.33***	0.34	0.56***	0.43	0.21***	0.16
South Carolina	-0.47***	0.43	0.64***	0.46	0.12	0.02
South Dakota	-0.06***	0.17	0.12**	0.08	0.05	0.00
Tennessee	-0.37***	0.44	0.53***	0.30	0.13	0.02
Texas	-0.19***	0.24	0.27***	0.30	0.07	0.00

Utah	-0.32***	0.46	0.60***	0.43	0.26**	0.12
Vermont	-0.22***	0.36	0.47***	0.26	0.24**	0.09
Virginia	-0.25***	0.36	0.44***	0.36	0.18**	0.08
Washington	-0.32***	0.39	0.70***	0.44	0.36***	0.19
West Virginia	-0.29**	0.10	0.45**	0.11	0.12	0.00
Wisconsin	-0.38***	0.38	0.51***	0.32	0.10	0.00
Wyoming	-0.10***	0.17	0.39***	0.41	0.28***	0.20

Table 5: Descriptive statistics—Determinants of Okun Coefficients

	Obs.	Mean	Std. Dev.	Min	Max
Industrial Structure	51	0.38	0.02	0.29	0.42
Log-Labor Force	51	14.29	1.02	12.47	16.55
Entrepreneurial Index	51	0.001	0.002	0.00	0.01
Skill Mismatch Index	51	9.84	3.04	4.32	20.34

Table 6: Correlations among Determinants of Okun Coefficients

	Industrial Structure	Log Labor Force	Entrepreneurial Index
Log Labor Force	0.59*		
Entrepreneurial Index	-0.32	-0.24	
Skill Mismatch	-0.56	-0.26	0.02

Table 7: Determinants of Okun Coefficients

	γ				
Industrial Structure	-3.70***				-3.24***
	(0.53)				(0.77)
Log-Labor Force		-0.07***			-0.02
		(0.01)			(0.01)
Entrepreneurial Index			41.70***		16.18
			(13.78)		(10.94)
Skill Mismatch Index				0.01*	-0.01
				(0.01)	(0.00)
Constant	1.16***	0.73***	-0.39***	-0.36***	1.33***
	(0.20)	(0.21)	(0.05)	(0.06)	(0.30)
Observations	51	51	51	51	51
R-squared	0.50	0.32	0.16	0.07	0.57
Adjusted R-squared	0.488	0.302	0.140	0.0477	0.535

	γ^e				
Industrial Structure	3.28***				3.68**
	(0.95)				(1.45)
Log-Labor Force		0.05**			0.01
		(0.02)			(0.03)
Entrepreneurial Index			-33.27		-8.36
			(20.67)		(20.74)
Skill Mismatch Index				-0.01	0.01
				(0.01)	(0.01)
Constant	-0.79**	-0.30	0.56***	0.52***	-1.15*
	(0.36)	(0.34)	(0.07)	(0.08)	(0.57)
Observations	51	51	51	51	51
R-squared	0.20	0.09	0.05	0.01	0.23
Adjusted R-squared	0.180	0.0765	0.0308	-0.00840	0.161

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I. DATA APPENDIX

The goal of this appendix is to clarify the exact variables and modifications that we used in the paper. It is going to be organized by type of variable: output, labor market, and determinants. It will also include the source, period of availability, a link the raw data, and finally descriptions of any modification performed to produce the variables used to generate the results.

Output measures

Bureau of Economic Analysis

- Personal income at the state level (1929-2015): http://www.bea.gov/newsreleases/regional/spi/sqpi_newsrelease.htm This variable is in nominal terms so as a first step we used CPI at the national level from the IFS[1] to deflate it. After that, for the gaps specification we estimated the potential output using the Hodrick Prescott filter on the logarithm of the real series with a smoothing parameter of 100 and used that as y_t^* . For the changes specification Δy_t is equal to the growth rate of the real variable.

- Value added at the industry level (1947-2015): http://www.bea.gov/industry/gdpbyind_data.htm The ω_i where calculated using the changes specification. So in that case, after deflating the variable using the national CPI we simply calculated the growth rate $\Delta VA_{I,t}$

Labor market variables

Bureau of Labor Statistics[2]

- Labor market variables-State level (1976-2015): http://www.bls.gov/lau/ this is the source for all the labor market related data used in the estimation of the Okun coefficients as the state level. For the gaps specification we used the HP filter with a smoothing parameter of 100 to obtain the potential value for all variables: u_t^*, l_t^*, e_t^*. In the case of employment and labor force we filtered the logarithm of the series and for unemployment rate we filtered the series directly. For the changes specification, in the case of labor force and employment we calculated the growth rate to obtain $\Delta e_t, \Delta l_t$ and for the unemployment rate we used the difference between the current and the previous value to get Δu_t.
- Employment by industry (1939-2015): http://www.bls.gov/ces/ this variable is used in the estimation of the employment elasticity at the industry level before including it in the regression we calculate it's growth rate to get $\Delta Empl_{I,t}$

[1] In a previous version we used deflator with different aggregation levels (metropolitan area) but the results don't change significantly.

[2] This variables are easily downloadable using the multiscreen function in the BLS website and using the codes in http://www.bls.gov/help/hlpforma.htm#OE

- Employment by industry at the State level (1995-2015): http://www.bls.gov/sae/ In this case we used the value for 1995 to define the weights of each industry in the construction of the industrial structure variable. $\frac{Empl_{S,I}}{Total\ Empl_S}$

Determinants

- Lag Labor Force: logarithm of the average labor force for the period 1976-2015.

- Entrepreneurial Index: 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.

- Skill Mismatch Index: comes from appendix B in Estevão and Tsounta (2011). A Higher number indicates a higher mismatch.