

## Methodology: Labor Force Dynamics—What Influences the Size of the Labor Force?

Labor force data came from the U. S. Bureau of Labor Statistics (BLS), while gross domestic product (GDP) and personal income data by state came from the U.S. Bureau of Economic Analysis (BEA). Since a higher cost of living may induce further participation within the workforce to maintain a standard of living, a statewide measure of cost of living was calculated by Zimmer and Linville using Census data and ACCRA metropolitan cost of living estimates.<sup>1</sup>

Educational data were obtained from the U.S. Census Bureau’s American Community Survey, representing the percentage of individuals 25 and older who have achieved at least a bachelor’s degree. Homeownership statistics were provided by the STATS Indiana website, maintained by the Indiana Business Research Center (IBRC). The inclusion of homeownership follows a line of research introduced by Andrew Oswald, which examined the relationship between employee mobility, homeownership and unemployment.<sup>2</sup> Population data was also obtained from the U.S. Census Bureau.

The complete data set contained 5,508 observations. Summary statistics are provided in Table 1.

**Table 1 - Summary Statistics**

Observations	5,508			
	Mean	Std. Dev	Min.	Max.
Labor Force	2,944,161	3,216,213	269,654	18,300,000
GDP (mil. \$)	251,919	304,308	19,262	1,900,463
Population	5,855,804	6,528,044	497,069	37,300,000
Per Capita Income (\$)	36,003.53	6,974.85	23,131	70,710
Cost of Living Adjustment	106.58650	18.1465	88.89	167.22
Educational Attainment (%)	0.26856	0.0540	0.16078	0.50
Home Ownership (%)	0.69699	0.0588	0.43	0.813

A fixed effects model tested for influences on labor force size. The model used labor force size as the dependent variable. State binaries were created to account for state-specific biases altering the labor force. A fixed effects model was used to accommodate yearly variation. The model was run twice.

<sup>1</sup> T.E. Zimmer and K. Linville, “Does Cost of Living Affect Indiana Incomes?” *InContext*, November-December 2011, [www.incontext.indiana.edu/2011/nov-dec/article2.asp](http://www.incontext.indiana.edu/2011/nov-dec/article2.asp).

<sup>2</sup> A. Oswald, “A Conjecture on the Explanation for High Unemployment in the Industrialized Nations: Part I,” Warwick Economics Research Paper, University of Warwick (1996): 475.

The second time, the variables were transformed by application of the natural log both to show robust results and also to provide results as elasticities (as applicable).

$$\text{Labor Force Growth}_a = \beta_0 + \sum_i \beta_i (X_i) + \varepsilon$$

Labor Force Size<sub>a</sub> : U.S. States and the District of Columbia

$X_i$  :    GDP (mil \$)  
          Population  
          Per Capita Income (\$)  
          Cost of Living Adjustment  
          Educational Attainment  
          Home Ownership  
          State (Binary)

Table 2 - Labor Force

Observations	5,508			
Variable	9			
F-Value	6.40E+05			
Prob>F	0.0000			
	Coeff.	Std. Error	t	p
<b>Labor Force Growth (%)</b>				
GDP (mil. \$)	0.40734	0.02476	16.45	0.000 **
Population	0.38458	0.00401	95.99	0.000 **
Per Capita Income (\$)	4.40461	0.46050	9.56	0.000 **
Cost of Living Adjustment	4,409.46	3,195.11	1.38	0.168
Educational Attainment (%)	442,929.60	100,582.90	4.4	0.000 **
Home Ownership (%)	-342,764.30	48,227.21	7.11	0.000 **
States				
Alabama	189,201.1	12,557.3	15.07	0.000 **
Alaska	-310,310.0	121,826.4	2.55	0.011 *
Arizona	290,599.3	28,506.8	10.19	0.000 **
Arkansas	99,547.9	12,693.7	7.84	0.000 **
California	2,781,269.0	174,478.9	15.97	0.000 **
Colorado	422,678.5	31,673.1	13.35	0.000 **
Connecticut	-35,832.8	120,164.0	0.30	0.766
Delaware	-144,161.6	38,649.3	3.73	0.000 **
Washington D.C.	-615,159.7	155,964.3	3.94	0.000 **
Florida	1,396,449.0	60,683.4	23.01	0.000 **
Georgia	723,417.9	28,517.1	25.37	0.000 **
Hawaii	-450,411.3	236,958.7	1.90	0.057
Idaho	1,565.2	11,450.1	0.14	0.891
Indiana	551,440.3	18,965.5	29.08	0.000 **
Illinois	1,096,899.0	59,386.1	18.47	0.000 **
Iowa	294,074.5	10,587.3	27.78	0.000 **
Kansas	167,003.6	14,690.8	11.37	0.000 **
Kentucky	228,580.1	17,765.9	12.87	0.000 **
Louisiana	89,052.0	15,320.6	5.81	0.325
Maine	-89,335.5	72,924.8	1.23	0.221
Maryland	307,857.2	104,382.7	2.95	0.003 **
Massachusetts	339,643.6	114,814.1	2.96	0.003 **
Michigan	817,851.4	30,956.6	26.42	0.000 **
Minnesota	551,837.1	54,584.2	10.11	0.000 **
Mississippi	54,549.5	7,549.7	7.23	0.000 **
Missouri	523,070.6	17,274.4	30.28	0.000 **
Montana	-88,333.9	25,137.8	3.51	0.000 **
Nebraska	91,722.7	16,432.5	5.58	0.000 **
Nevada	48,171.4	28,361.4	1.70	0.089
New Hampshire	-120,337.0	79,888.6	1.51	0.132
New Jersey	510,427.8	120,684.9	4.23	0.000 **
New Mexico	-23,195.8	13,838.2	1.68	0.094
New York	1,019,064.0	238,697.4	4.27	0.000 **
North Carolina	671,383.3	27,737.1	24.21	0.000 **
North Dakota	-88,344.6	12,802.7	6.90	0.000 **
Ohio	1,126,399.0	34,956.6	32.22	0.000 **
Oklahoma	151,001.7	13,383.2	11.28	0.000 **
Oregon	155,235.5	57,993.4	2.68	0.007 **
Pennsylvania	1,038,865.0	71,191.5	14.59	0.000 **
Rhode Island	-231,866.8	100,704.3	2.30	0.021 *
South Carolina	197,541.6	16,453.3	12.01	0.000 **
South Dakota	-69,734.3	13,825.7	5.04	0.000 **
Tennessee	419,709.4	20,922.6	20.06	0.000 **
Texas	1,800,430.0	71,489.3	25.18	0.000 **
Utah	94,932.0	20,392.2	4.66	0.000 **
Vermont	-218,735.6	89,788.8	2.44	0.015 *
Virginia	624,889.9	44,069.9	14.18	0.000 **
Washington	445,782.9	58,011.0	7.68	0.000 **
West Virginia	omitted			
Wisconsin	625,831.8	29,606.9	21.14	0.000 **
Wyoming	-139,093.4	21,892.2	6.35	0.000 **
Constant	-258,779.6			

\*\* Significant at the 1% level  
\* Significant at the 5% level

Observations	5,508			
Variable	9			
F-Value	1.01E+06			
Prob>F	0.0000			
	Coeff.	Std. Error	t	p
<b>Ln (Labor Force Growth)</b>				
Ln (GDP)	0.03926	0.00596	6.59	0.000 **
Ln (Population)	0.73629	0.01027	71.69	0.000 **
Ln (Per Capita Income)	0.07850	0.00839	9.36	0.000 **
Ln (Cost of Living Adjustment)	0.02030	0.07665	0.26	0.791
Ln (Educational Attainment)	0.03438	0.00694	4.95	0.000 **
Ln (Home Ownership)	-0.02707	0.00841	-3.22	0.001 **
States				
Alabama	0.45768	0.03650	12.54	0.000 **
Alaska	0.06647	0.00872	7.63	0.000 **
Arizona	0.53278	0.03214	16.58	0.000 **
Arkansas	0.37110	0.03687	10.01	0.000 **
California	0.91693	0.03211	28.56	0.000 **
Colorado	0.57624	0.03069	18.78	0.000 **
Connecticut	0.43070	0.01651	26.09	0.000 **
Delaware	0.11572	0.02370	4.88	0.000 **
Washington D.C.	omitted			
Florida	0.78542	0.03691	21.28	0.000 **
Georgia	0.65989	0.03684	17.91	0.000 **
Hawaii	0.17294	0.01665	10.39	0.000 **
Idaho	0.26576	0.03146	8.45	0.000 **
Indiana	0.60384	0.03863	15.63	0.000 **
Illinois	0.73090	0.03173	23.04	0.000 **
Iowa	0.51154	0.03389	15.09	0.000 **
Kansas	0.44410	0.03465	12.82	0.000 **
Kentucky	0.46589	0.03893	11.97	0.000 **
Louisiana	0.41709	0.03351	12.45	0.000 **
Maine	0.28155	0.01817	15.50	0.000 **
Maryland	0.56328	0.02081	27.07	0.000 **
Massachusetts	0.57992	0.02072	27.99	0.000 **
Michigan	0.68118	0.03686	18.48	0.000 **
Minnesota	0.62530	0.02622	23.85	0.000 **
Mississippi	0.33454	0.03543	9.44	0.000 **
Missouri	0.59702	0.03650	16.36	0.000 **
Montana	0.19140	0.02734	7.00	0.000 **
Nebraska	0.38330	0.03574	10.72	0.000 **
Nevada	0.38197	0.02818	13.56	0.000 **
New Hampshire	0.30693	0.01670	18.37	0.000 **
New Jersey	0.62382	0.02559	27.61	0.000 **
New Mexico	0.26906	0.03132	8.59	0.000 **
New York	0.75267	0.03061	24.59	0.000 **
North Carolina	0.64911	0.03592	18.07	0.000 **
North Dakota	0.17585	0.03112	5.65	0.000 **
Ohio	0.74100	0.03758	19.72	0.000 **
Oklahoma	0.42346	0.03683	11.50	0.000 **
Oregon	0.47990	0.02385	20.12	0.000 **
Pennsylvania	0.72993	0.02995	24.37	0.000 **
Rhode Island	0.21494	0.01261	17.04	0.000 **
South Carolina	0.46643	0.03332	14.00	0.000 **
South Dakota	0.20011	0.03022	6.62	0.000 **
Tennessee	0.56084	0.03941	14.23	0.000 **
Texas	0.83887	0.04296	19.53	0.000 **
Utah	0.39511	0.03039	13.00	0.000 **
Vermont	0.17242	0.01391	12.39	0.000 **
Virginia	0.63094	0.03049	20.69	0.000 **
Washington	0.59173	0.02671	22.16	0.000 **
West Virginia	0.21621	0.03409	6.34	0.000 **
Wisconsin	0.64056	0.03134	20.44	0.000 **
Wyoming	0.08417	0.02769	3.04	0.002 **
Constant	1.49886			

\*\* Significant at the 1% level  
\* Significant at the 5% level

## Data Sources

- ACCRA Cost of Living Index (COLI). [www.coli.org](http://www.coli.org). Data Extracted August 1, 2011.
- Indiana Business Research Center (IBRC). [www.stats.indiana.edu](http://www.stats.indiana.edu). Data extracted 10-25-2011.
- The Tax Foundation. [www.taxfoundation.org](http://www.taxfoundation.org). Data extracted 10-25-2011.
- The U.S. Bureau of Economic Analysis website. [www.bea.gov](http://www.bea.gov). Data extracted 10-25-2011.
- The U.S. Bureau of Labor Statistics website. [www.bls.gov](http://www.bls.gov). Data extracted 10-25-2011.
- The U.S. Census Bureau. [www.census.gov](http://www.census.gov). Data extracted 10-25-2011.