

New Mexico's Industrial Diversity: A State- and County-Level Analysis

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Industrial diversity, defined as the employment mix among industries, is generally considered to be positively correlated with economic stability. In the same way a diversified investment portfolio reduces financial volatility, a more balanced economy is typically less sensitive to cyclical variation than one with greater employment concentration. This does not imply, however, that diversity should (or even can) be a primary goal for economic developers and planners; some areas have comparative advantages (from such factors as geographic location or natural resource endowments) that result in increased specialization. This article discusses statewide and county industry employment diversity, as measured by the Hachman Index, developed by Frank Hachman at the University of Utah's Bureau of Business and Economic Research, to provide data users with another tool for economic analysis.

Measuring Diversity

The Hachman Index measures the degree of similarity between a subject area and a reference area. In the analysis that follows, the nation is the subject area for states, and New Mexico is the subject area for its counties. Hachman Index values are bounded by 0 and 1, where 1 indicates identical industry employment distributions for the subject and reference areas and 0 signifies completely dissimilar structures. The calculations are based on private-sector employment at the two-digit (sector) North American Industry Classification System (NAICS) level. While Hachman Index computations are affected by the degree of industry detail, the impact is primarily on the values rather than the relative distribution, with more diverse areas likely posting higher index values regardless of the industry detail level. The Hachman Index formula for state-level calculations is as follows:

$$HI_t = 1/(\sum_j (EMP_{STATEjt}/EMP_{USjt}) \times (EMP_{STATEjt}))$$

$EMP_{STATEjt}$ is the share of state employment in industry j for year t.

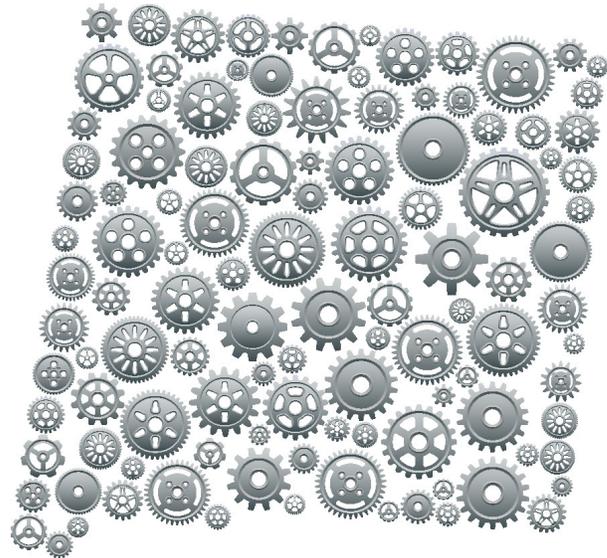
EMP_{USjt} is the share of national employment in industry j in year t.

To derive county-level values, employment totals for the county rather than state and state rather than nation are used.

Hachman Index calculations incorporate location quotients, which measure relative industry concentration in one area compared to that of another area. The $(EMP_{STATEjt}/EMP_{USjt})$ component of the Hachman Index formula represents the location quotient. Therefore, the Hachman Index is defined as the reciprocal of the sum of location quotients weighted by industry shares.

Evaluating State Diversity

Because comparative advantages can create industry concentration, oil- and gas-producing states, including New Mexico,



typically place low in Hachman Index rankings for similarity with the national industry employment mix. Exhibit 1 presents state Hachman Index values based on annual average employment data from the Quarterly Census of Employment and Wages (QCEW) program for 2008, 2011, and 2014 (encompassing New Mexico's recent peak and trough years and the most current available year), with New Mexico ranking, respectively, forty-fifth, at 0.83; forty-fourth, at 0.83; and forty-fifth, at 0.78. An examination of location quotients, which show considerable differences between the employment distributions for New Mexico and those for the nation as a whole, reveals the reasons for the state's low rankings. A location quotient of 1.00 represents perfect balance, with industry employment shares for the state equaling those for the nation. New Mexico's 2014 location quotients were especially high for mining, quarrying, and oil and gas extraction, at 6.18; agriculture, forestry, fishing, and hunting, at 1.70; and utilities, at 1.50, and low for manufacturing, at 0.43; management of companies and enterprises, at 0.44; and educational services, at 0.65. Exhibit 2 compares 2014 sector-level location quotients for New Mexico and Missouri (representing a more diverse economy), listed in descending order for New Mexico sectors. Missouri's location quotients were closer to 1.00 for 16 of the 19 sectors.

While Hachman Index values remain generally stable over time (employment concentrations typically shift gradually), the numbers can vary rapidly with a sudden change in the employment distribution, as was the case for North Dakota in recent years. The state's Hachman reading dipped from 0.90 in 2008 to 0.71 in 2011 and 0.55 in 2014 (Exhibit 1), reflecting the oil boom that began in 2008 with the emergence of horizontal drilling and hydraulic fracturing in the Bakken formation, lying mostly beneath western North Dakota. The share of the state's total employment concentrated in mining, quarrying, and oil and gas extraction swelled from 2.4 percent in 2008 to 7.9 percent in 2014 at the same time the national share for the sector edged up from 0.6 percent to 0.7 percent. The two other North Dakota industry sectors

benefitting the most from the oil boom were construction, where the employment share increased from 7.2 percent to 9.2 percent, and transportation and warehousing, where it expanded from 3.5 percent to 5.9 percent. Location quotients for these three sectors increased from 3.77 to 10.90 for mining, quarrying, and oil and gas extraction; 1.14 to 1.75 for construction; and 0.93 to 1.56 for transportation and warehousing.

Evaluating County Diversity

The Hachman Index values displayed in Exhibit 3, based on QCEW 2014 annual averages and using statewide New Mexico as the reference area, show that more populous counties generally ranked higher for industry diversity, with Bernalillo, at 0.92; Otero, at 0.88; Santa Fe, at 0.83; Doña Ana, at 0.82; and Chaves, at 0.80, leading the way. The higher index values for these counties imply greater similarity between their industry mixes and that of the state as a whole. For example, the same seven sectors, in nearly identical descending order, comprised over 70 percent of total employment for both New Mexico and Bernalillo County: health care and social assistance (New Mexico, 17.5 percent; Bernalillo County 18.1 percent), retail trade (15.0 percent, 14.3 percent), accommodation and food services (13.3 percent, 12.6 percent), professional and technical services (8.5 percent, 10.9 percent), construction (6.9 percent, 6.8 percent), administrative and waste services (6.7 percent, 8.2 percent), and manufacturing (4.5 percent, 4.9 percent). Bernalillo County's location quotients for these industries ranged from a high of 1.28 for professional and business services to a low of 0.95 for both retail trade and accommodation and food services.

Eddy and Lea Counties, both at 0.38, ranked among the least diverse on the Hachman scale, despite their relatively large populations (placing eighth and eleventh, respectively, statewide), because of the importance of extractive and related industries in their total employment numbers. For 2014, mining, quarrying, and oil and gas extraction accounted for 30.0 percent of total employment in Eddy County and 29.7 percent in Lea County, compared to just 4.5 percent statewide. Similarly, the employment share for transportation and warehousing registered 4.8 percent for Eddy County and 6.0 percent for Lea County but just 2.9 percent statewide. Construction employment accounted for 8.3 percent of the total in Eddy County, 10.9 percent in Lea County, and 6.9 percent statewide. The respective location quotients for these three sectors in Eddy and Lea Counties were as follows: mining,

EXHIBIT 1: HACHMAN INDEX (HI) RANKINGS, 2008, 2011, AND 2014

2008			2011			2014		
State	Rank	HI	State	Rank	HI	State	Rank	HI
Illinois	1	0.98	Illinois	1	0.98	Missouri	1	0.98
Missouri	1	0.98	Missouri	1	0.98	North Carolina	1	0.98
Georgia	3	0.97	Arizona	3	0.97	Illinois	3	0.97
North Carolina	3	0.97	Georgia	3	0.97	Kansas	3	0.97
Utah	3	0.97	Kansas	3	0.97	Pennsylvania	3	0.97
Kansas	6	0.96	North Carolina	3	0.97	Utah	3	0.97
Minnesota	6	0.96	Utah	3	0.97	Arizona	7	0.96
Nebraska	6	0.96	Michigan	8	0.96	Georgia	7	0.96
New Jersey	6	0.96	Minnesota	8	0.96	Minnesota	7	0.96
Ohio	6	0.96	Nebraska	8	0.96	Maine	10	0.95
Pennsylvania	6	0.96	New Jersey	8	0.96	Michigan	10	0.95
Arizona	12	0.95	Ohio	8	0.96	Nebraska	10	0.95
Maine	12	0.95	Pennsylvania	8	0.96	New Hampshire	10	0.95
Michigan	12	0.95	Colorado	14	0.95	New Jersey	10	0.95
New Hampshire	12	0.95	Maine	14	0.95	Ohio	10	0.95
South Carolina	12	0.95	New Hampshire	14	0.95	Tennessee	10	0.95
Tennessee	12	0.95	Tennessee	14	0.95	California	17	0.94
Alabama	18	0.94	Alabama	18	0.94	Colorado	17	0.94
Colorado	18	0.94	Connecticut	18	0.94	Connecticut	17	0.94
Connecticut	18	0.94	Florida	18	0.94	Florida	17	0.94
Florida	18	0.94	Kentucky	18	0.94	Kentucky	17	0.94
Kentucky	18	0.94	Massachusetts	18	0.94	South Carolina	17	0.94
California	23	0.93	Oregon	18	0.94	Alabama	23	0.93
Iowa	23	0.93	South Carolina	18	0.94	Massachusetts	23	0.93
Massachusetts	23	0.93	California	25	0.93	Oregon	23	0.93
Oregon	23	0.93	Iowa	25	0.93	Rhode Island	23	0.93
South Dakota	23	0.93	New York	25	0.93	Vermont	23	0.93
Virginia	23	0.93	South Dakota	25	0.93	Virginia	23	0.93
Maryland	29	0.92	Vermont	25	0.93	Arkansas	29	0.92
Mississippi	29	0.92	Arkansas	30	0.92	Iowa	29	0.92
New York	29	0.92	Maryland	30	0.92	Maryland	29	0.92
Rhode Island	29	0.92	Mississippi	30	0.92	Mississippi	29	0.92
Texas	29	0.92	Rhode Island	30	0.92	New York	29	0.92
Vermont	29	0.92	Texas	30	0.92	South Dakota	29	0.92
Arkansas	35	0.91	Virginia	30	0.92	Texas	35	0.90
Washington	35	0.91	Indiana	36	0.91	Washington	35	0.90
Wisconsin	35	0.91	Wisconsin	36	0.91	Delaware	37	0.89
Delaware	38	0.90	Delaware	38	0.90	Indiana	37	0.89
Indiana	38	0.90	Washington	38	0.90	Louisiana	37	0.89
North Dakota	38	0.90	Idaho	40	0.89	Idaho	40	0.88
Idaho	41	0.89	Montana	40	0.89	Montana	40	0.88
Montana	42	0.88	Louisiana	42	0.87	Wisconsin	40	0.88
Louisiana	43	0.87	Hawaii	43	0.84	Hawaii	43	0.84
Hawaii	44	0.84	New Mexico	44	0.83	Oklahoma	44	0.79
New Mexico	45	0.83	Oklahoma	45	0.82	New Mexico	45	0.78
Oklahoma	46	0.82	North Dakota	46	0.71	West Virginia	46	0.74
West Virginia	47	0.71	Nevada	47	0.68	Nevada	47	0.70
Nevada	48	0.68	West Virginia	47	0.68	Alaska	48	0.60
Alaska	49	0.60	Alaska	49	0.62	North Dakota	49	0.55
District of Columbia	50	0.47	District of Columbia	50	0.49	District of Columbia	50	0.48
Wyoming	51	0.27	Wyoming	51	0.29	Wyoming	51	0.32

Sources: Bureau of Labor Statistics and author's calculations

quarrying, and oil and gas extraction, 6.67 and 6.60; construction, 1.21 and 1.57; and transportation and warehousing, 1.67 and 2.10.

Los Alamos County, with 73.2 percent of total employment in professional and technical services (mostly at Los Alamos National Laboratory), posted the lowest Hachman Index reading, at 0.16. The location quotient for professional and technical services was 8.60. All other available location quotients were well under 1.00, with finance and insurance registering the highest level, at 0.68. Seven Los Alamos County location quotients were either not calculable because employment totaled zero or not disclosable because of Bureau of Labor Statistics confidentiality requirements.

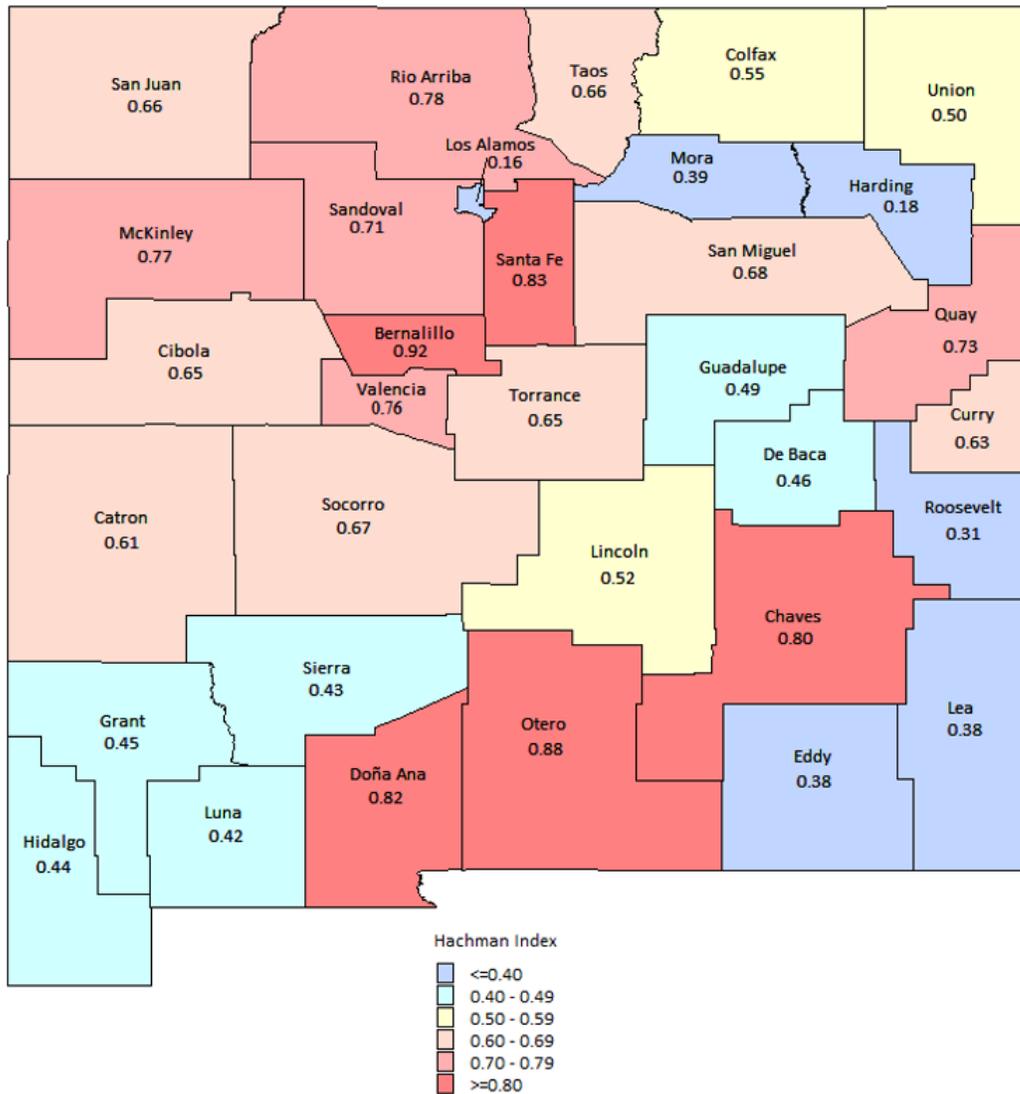
As previously noted, the county-level Hachman Index values for this article were computed using New Mexico as the reference area. In most cases, because of the extent of industrial diversification at the national level, using the United States as the reference area for 2014 employment produced considerably lower Hachman values, particularly for New Mexico counties with significant employment in the extractive industries. Interestingly, however, Sandoval was the only county to register a higher Hachman reading, 0.83 to 0.71, with the United States rather than New Mexico as the reference area. Sandoval County location quotients were much closer to 1.00 for two sectors in particular when using this alternative computation method: mining, quarrying, and oil and gas extraction, 0.58 to 0.09, and manufacturing, 1.53 to 3.57.

EXHIBIT 2: LOCATION QUOTIENTS, 2014

Sector	New Mexico	Missouri
Mining, quarrying, and oil and gas extraction	6.18	0.24
Agriculture, forestry, fishing and hunting	1.70	0.51
Utilities	1.50	1.12
Construction	1.31	0.93
Accommodation and food services	1.22	0.99
Professional and technical services	1.18	0.84
Retail trade	1.13	1.02
Health care and social assistance	1.13	1.08
Real estate and rental and leasing	0.92	0.88
Administrative and waste services	0.90	0.92
Other services, except public administration	0.90	0.89
Information	0.86	0.98
Arts, entertainment, and recreation	0.79	1.06
Transportation and warehousing	0.76	1.00
Finance and insurance	0.72	1.10
Wholesale trade	0.70	1.07
Educational services	0.65	0.84
Management of companies and enterprises	0.44	1.57
Manufacturing	0.43	1.08

Source: Bureau of Labor Statistics

EXHIBIT 3: HACHMAN INDEX (HI) VALUES, 2014



Sources: Bureau of Labor Statistics and author's calculations

