



# Measuring Economic Diversification

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## Background

Economic development efforts provide a variety of benefits to the state's economy and to the counties that comprise the state. Economic development efforts may enhance economic growth and job opportunities, attract high-wage firms and high-wage jobs to an area, and provide more economic stability over time through economic diversification efforts. While the Employment Department has a variety of statistics which measure job and wage growth across Oregon's industries and occupations, few data are available to measure the extent of economic diversification *within* the state.

Two previous issues of *Oregon Labor Trends* have considered the topic of economic diversification for the state of Oregon. In December 1995, Paul Warner (former State Economist) considered how Oregon's economic diversity had been affected by the contraction of Oregon's natural resource-based industries and simultaneous expansion of the state's high-tech industries. In February 1999, Jon LeBre (former Workforce Analyst with the Oregon Employment Department) applied an economic diversification index, developed by Carolyn Sherwood-Call of the Federal Reserve Bank of San Francisco, to Oregon's economy. Neither of these analyses considered differences in economic diversification within the State of Oregon.

In theory, a more diverse economy will have less variation in economic activity over time, *ceteris paribus* (i.e., all else constant). Of course, the extent of economic diversification varies not only from state to state, but also from one region to another within a state. If planners and policy makers believe that less variation in economic activity is a good thing, then having a measure of economic diversity within the state should be of value.

This article applies an economic diversification index, developed by Frank Hachman while with the Bureau of Economic Research at the University of Utah, to measure the extent of economic diversity of Oregon's 36 counties. In its most general form, the Hachman Index measures how closely the employment distribution of a subject region (e.g., state, county) resembles that of a reference region (e.g., nation, state) at a point in time. The more closely a subject region's economy reflects the reference region's employment mix, the higher the value of the Hachman Index. The Hachman Index has a maximum value of one (meaning a subject region's employment mix is exactly the same as the reference region's employment mix).

## Methods

This analysis uses 1999 covered employment and payrolls data for Oregon counties. The data are analyzed at the 2-digit SIC (Standard Industrial Classification) level of detail. While a finer level of industry detail would result in different index values, the relative diversification of the state's counties is not likely to be greatly affected. That is, more diverse counties are likely to have a higher index value than less diverse counties regardless of the level of industry detail used to calculate the index. The Hachman Index value will also be affected by the choice of reference region. Because the state and county employment estimates are readily available, this article generally focuses on each county relative

to the state. To determine the impact on index values of using the nation as the reference region, the article also provides 1999 Hachman Index values using national employment data.

The Hachman Index is measured, for a given year, as the inverse of the weighted sum of the location quotients, by industry, for a given county, across all industries (for the mathematicians in the audience – and I know you’re out there – the formula is given below). A location quotient (LQ) for a given year is the fraction of a county’s employment in a given industry divided by the fraction of the state’s (nation’s) employment in the same industry for the same time period. The LQs are weighted by the share of a county’s employment in a given industry, for the given time period.

Counties which have a large fraction of employment in a few key industries, which differ considerably from the fraction of employment for those industries statewide, will have a relatively large weighted LQ and, consequently, a relatively low Hachman Index value (since it is the *inverse* of the weighted LQs). Conversely, those counties which more closely reflect the statewide (national) employment distribution will have relatively small weighted LQs, and a relatively high Hachman Index value.

Hachman Index Defined:

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

where  $EMP_{CTYjt}$  is the share of the county’s employment in industry  $j$  in year  $t$ ,

and  $EMP_{STATEjt}$  is the share of the state’s employment in industry  $j$  in year  $t$ .

## Results

The 1999 Hachman Index values differ considerably across Oregon. Hachman Index values for 1999 are presented in *Figure 1*. Not surprisingly, the map suggests that counties on the west side of the Cascades tend to be more diverse than those to the east. In addition, with few exceptions, metro area counties are more likely to be diverse than are rural counties. All counties along the I-5 corridor have an index value of at least 0.4.

Deschutes County in Central Oregon has the most diverse economy outside the I-5 corridor, with an index value of 0.7836. The only other county in Central or Eastern Oregon with a 1999 index value over 0.6 is Klamath County at 0.6581. On the other hand, Benton County stands out among western Oregon counties. Benton County is the only metro area county with an index value below 0.4 (actually, it comes in below 0.3, with a 1999 index value of 0.2921). Clearly, Benton County’s reliance on two primary employers (Oregon State University and Hewlett-Packard) contributes to this relatively low diversity index value.

## The Impact of the U.S. as a Reference Region

As noted earlier, the diversification index value is a function of the reference region against which each county is compared. To this point, the analysis has considered how each county compared. How would the values change if the counties were compared with the nation’s industry employment distribution?

*Table 1* shows 1999 index values and relative rankings of Oregon’s counties, using the state and nation, respectively, as the reference region. The table suggests that when the U.S. is used as the reference region, not surprisingly, the Hachman Index value for each county is considerably lower. In addition, the

county rankings also differ when the U.S. is used as a reference. With the U.S. as a reference, Multnomah County has the highest diversity index value, while Lane County drops from first to fourth highest. Among the top five counties using Oregon as a reference, only Deschutes County (dropping to 12<sup>th</sup>) does not remain among the top five when using the U.S. as a reference. On the opposite extreme, of the five counties with the lowest Hachman Index value using Oregon as a reference (i.e., Morrow, Grant, Lake, Gilliam, and Sherman), only two remain in the bottom five (Lake and Grant), while three improve their ranking, with Gilliam County moving from 35<sup>th</sup> to 20<sup>th</sup> highest among Oregon's 36 counties.

Why does the reference region have such a large impact on the index values? Since Oregon's industry employment mix differs considerably from the U.S. mix, those counties which closely reflect the state's economy may not reflect the national industry mix. For example, Oregon has a large fraction of employment in lumber and wood products relative to the nation (3.1% compared with 0.7%, respectively, in 1999). For counties which have a relatively large fraction of lumber and wood products employment (e.g., Lane, with 4.9%), the fraction will more closely resemble the state's industry mix than the nation's. For counties with a relatively low fraction of employment in lumber and wood products (e.g., Multnomah, with 0.4%), the county's industry mix will more closely resemble the national industry mix.

### **Are More Diverse Economies More Stable?**

It was noted previously that one of the goals of economic diversification efforts is to provide greater economic stability. Do the data show that more diverse economies are more stable?

Although a more thorough statistical analysis would be required to answer this question, a simple regression test provides insights into the question. In theory, if more diverse economies are more stable, then the Hachman Index values (a proxy for economic diversification) should be negatively correlated with the variation in job growth rates (a proxy for economic stability). *Graph 1* plots 1999 Hachman Index values against the variation in job growth rates for each county from 1976 through 1999. The graph suggests that 1999 Hachman Index values (with Oregon as the reference region) are negatively correlated with job growth rates (the associated correlation coefficient was  $-0.51$  and the coefficient of determination was  $0.2613$ ). Although there is clearly much variation which has not been explained, the diversification index was significantly negatively related to the variation in job growth rates ( $t\text{-stat} = -3.5$ ;  $\text{prob-value} = 0.0012$ ). As such, this simple regression suggests that more diversified economies tend to be more stable (i.e., have less variation in job growth rates) than less diverse economies.

*Graph 1* also appears to suggest that there may be a level of diversification beyond which additional diversification has little impact on the variation in job growth rates. Four counties (Grant, Lake, Morrow, and Sherman) have a much wider variation in job growth rates than the other 32 counties in Oregon. Each of these counties has a Hachman Index value of under 0.2. For the remaining counties, the variation in job growth rates ranges from 0.00355 in Lake County to 0.00081 in Multnomah County. Of these counties, only two (Lake and Grant) have a 1999 Hachman Index value under 0.2.

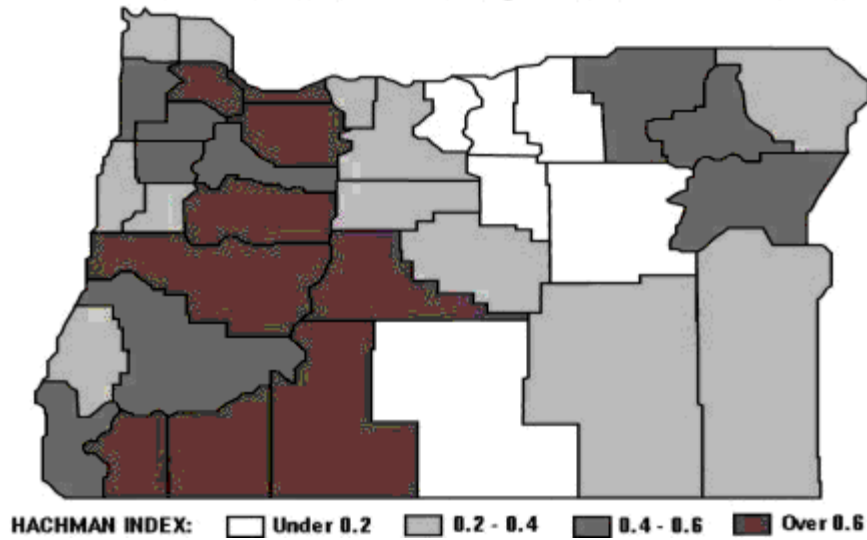
*Graph 1* also suggests that some counties which are not diverse may be relatively stable. Malheur County provides an example of a county which is not particularly diverse (Hachman Index value = 0.3433) but which is relatively stable (variation in job growth rate = 0.00084). On the other hand, Deschutes County, which has a 1999 Hachman Index value of 0.7836, has a relatively high degree of variation in its job growth rate at 0.02926. This suggests that a high degree of economic diversification is no guarantee of economic stability. Clearly, further analysis is necessary to determine the underlying causes for such differences in economic stability among Oregon's counties.

**Table 1**  
**Hachman Index: Oregon vs. U.S. Reference, 1999**  
**(lower values = less diverse / higher values = more diverse)**

County	Oregon Base:		U.S. Base:	
	Rank	Index Value	Rank	Index Value
Baker	15	0.4635	33	0.0222
Benton	26	0.2921	18	0.1617
Clackamas	4	0.8023	2	0.6466
Clatsop	20	0.3961	14	0.2353
Columbia	21	0.3773	8	0.2943
Coos	22	0.3773	13	0.2383
Crook	27	0.2818	32	0.0251
Curry	17	0.4100	24	0.0994
Deschutes	5	0.7836	12	0.2550
Douglas	11	0.4863	23	0.1016
Gilliam	35	0.1380	20	0.1175
Grant	33	0.1443	36	0.0036
Harney	28	0.2294	30	0.0438
Hood River	24	0.3042	25	0.0972
Jackson	3	0.8032	5	0.3897
Jefferson	29	0.2274	28	0.0926
Josephine	6	0.7531	9	0.2821
Klamath	8	0.6581	27	0.0951
Lake	34	0.1431	35	0.0065
Lane	1	0.8480	4	0.5453
Lincoln	25	0.3039	17	0.1718
Linn	9	0.6207	6	0.3432
Malheur	23	0.3433	10	0.2729
Marion	13	0.4812	15	0.2244
Morrow	32	0.1518	29	0.0750
Multnomah	2	0.8320	1	0.7741
Polk	16	0.4254	16	0.1732
Sherman	36	0.0758	31	0.0356
Tillamook	18	0.4023	22	0.1055
Umatilla	12	0.4834	11	0.2592
Union	14	0.4794	26	0.0965
Wallowa	30	0.2156	34	0.0170
Wasco	19	0.3975	19	0.1508
Washington	7	0.6612	3	0.5554
Wheeler	31	0.1569	21	0.1095
Yamhill	10	0.5104	7	0.3300

**Figure 1**

**Oregon: Hachman Index by County, 1999**  
 (Low Value = Less Diverse; High Value = More diverse)



**Graph 1**

**Oregon Counties: Degree of Diversification vs. Variation in Job Growth Rates (1976-1999)**

