



ShakeOut Scenario Appendix I: Characterizing a Regional Economy – Bureau of Labor Statistics Location Quotients for Industrial Sectors in Southern California

By Richard Champion¹ and Anne Wein¹

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**U.S. Department of the Interior
U.S. Geological Survey**

**California Department of Conservation
California Geological Survey**

¹ **U.S. Geological Survey**

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ShakeOut Scenario

Appendix I. Characterizing a regional economy: Bureau of Labor Statistics Location Quotients for industrial sectors in Southern California

by Richard Champion and Anne Wein, USGS

Introduction

Dolfman and others, (2007b) suggest that the presence of exporting industries in a local economy improves the resilience of the economy in the event of a shock, such as an earthquake. This is because the presence of exporting industries indicates strong ties between the local economy and a larger economy such as the national economy. An exporting industry meets local demand, and produces surpluses that can be sold outside of the region. An importing industry is one for which local production levels are insufficient to meet local demand. Location quotients characterize a local economy by comparing the local economy to a larger economy. Location quotients can suggest how to distinguish importing and exporting industries; and how to identify local economic strengths and competitive advantages, opportunities, and industry clusters (Shields 2003). This report uses U.S. Department of Labor, Bureau of Labor Statistics (BLS) location quotients to describe the eight county Southern Californian economy relative to the Californian and National economies. The analysis contributes a perspective on the region's economy for the U.S. Geological Survey's Multi Hazards Demonstration Project.

BLS location quotients (LQs) are ratios that compare employment concentration in a local area, such as an individual county or the eight county region, relative to a base region such as California or the Nation. A higher (lower) local concentration of jobs in the study region relative to the base region is indicated by a location quotient greater (less) than one. This assumes that the productivity (output per worker) of the local area is the same as in the base region. A high location quotient indicates that the industry is exporting. But this interpretation requires further scrutiny because, alternatively, the local industry may instead be less efficient, using more workers per output. If the latter is true, the industry may be relatively weak rather than relatively strong (Shields, 2003).

Methodology

Formulation of the Location Quotient

The LQ is the ratio of employment concentration of an industrial sector in selected regions relative to a base region (<http://www.bls.gov/cew/cewlq.htm>):

$$LQ = \frac{\% \text{ employment in local industry}}{\% \text{ employment in base industry}}$$

For this study, the local area is a county or the eight county study region; and the base region is the state or the nation. If $LQ > 1$, $LQ = 1$, or $LQ < 1$, then the proportion of industry concentration is greater than, equal to, or less than the industry concentration in the base region as a whole. We adopt the interpretation offered by Shields (2003): a location quotient greater than 1.0 indicates that the economy is self-sufficient, and may even be exporting the good or service of that particular industry, while a location quotient less than 1.0 suggests that the region tends to import the good or service. As a heuristic, an LQ greater than 1.25 strongly suggests an export industry, while an LQ less than 0.75 strongly suggests an import industry.

Data

The BLS location quotient is calculated for industrial sectors classified according to the North American Industrial Classification System (NAICS) codes. The BLS Location Quotient Calculator (LQC) uses a timely data source containing comprehensive industry and area detail—BLS's Quarterly Census of Employment and Wages (QCEW). The LQC supports analysis at several levels of detail: eleven BLS defined Super Sectors, twenty 2-digit NAICS code Sectors, and ninety three 3-digit NAICS code Sub Sectors. The LQC can also be run for selected specific industries as detailed as five digit NAICS codes. Each level of detail includes the class of “Unclassified”.

This LQ analysis was initiated when 2005 data were available and completed with more recent 2006 data. When the 2005 and 2006 county Super Sector LQs were compared, no significant differences were noted for the two years. In the interest of the aggressive time schedule of this project, earlier 2005 regional calculations were not updated.

Levels of Analysis

The LQC supports analysis for counties or states, so further processing was required to aggregate county results into regional results. The LQ can vary with the level of industry aggregation. Three- and four-digit NAICS codes potentially provide more precise industry descriptions than the more aggregated classifications. However, data confidentiality or limited geographic extent may impede analysis at a fine level of detail. This report begins with the most summary level of detail (the super sector), and then works down to finer levels of detail with appropriate disaggregation by county or groups of counties. Analyses of more disaggregated data illuminates the higher level results by identifying the specific industries contributing to the results.

Industrial Super Sector Location Quotients

The LQ formula is a function of percentages of employees in each sector. Table I-1 presents the number of employees and percentages of employees in each super sector for each county, the region, and the U.S.. The number of employees record the size of the sector before this perspective is lost in the calculation of the Location Quotients. Trade, transportation, and utilities is the largest super sector for the U.S. and the region, and is significant for all counties. Natural resources and mining and Professional and business services employ larger numbers in some counties. Despite some local concentrations of Natural resources and mining, it is the smallest super sector for the U.S. and the region. In terms of payroll, the sector size is indicated in Figure 7-1 of Chapter 7. For example, although Information is one of the smallest super sectors in terms of employment, it represents relatively more of the payroll share.

Supersector	Imperial		Kern		Los Angeles		Riverside		Orange	
	# Emp	%	# Emp	%	# Emp	%	# Emp	%	# Emp	%
Total	41,031	100.0%	220,666	100.0%	3,590,993	100.0%	518,218	100.0%	1,367,703	100.0%
Natural Resources and Mining	11,506	28.0%	54,742	24.8%	11,674	0.3%	14,872	2.9%	6,031	0.4%
Construction	1,998	4.9%	20,001	9.1%	156,773	4.4%	80,760	15.6%	107,272	7.8%
Manufacturing	2,534	6.2%	12,793	5.8%	463,106	12.9%	56,426	10.9%	181,796	13.3%
Trade, Transportation, and Utilities	11,123	27.1%	45,492	20.6%	807,533	22.5%	123,750	23.9%	271,945	19.9%
Information	377	0.9%	2,660	1.2%	207,598	5.8%	7,676	1.5%	31,412	2.3%
Financial Activities	1,407	3.4%	8,985	4.1%	248,937	6.9%	23,804	4.6%	138,606	10.1%
Professional and Business Services	2,546	6.2%	25,306	11.5%	598,712	16.7%	62,625	12.1%	276,171	20.2%
Education and Health Services	2,844	6.9%	21,489	9.7%	467,978	13.0%	52,261	10.1%	136,617	10.0%
Leisure and Hospitality	3,250	7.9%	20,450	9.3%	387,881	10.8%	71,822	13.9%	169,638	12.4%
Other Services	3,442	8.4%	8,740	4.0%	240,569	6.7%	24,192	4.7%	48,120	3.5%

Supersector	San Bernardino		San Diego		Ventura		Region		U.S. Total	
	# Emp	%	# Emp	%	# Emp	%	# Emp	%	# Emp	%
Total	543,582	100%	1,096,565	100%	274,777	100%	7,653,535	100%	112,718,858	100%
Natural Resources and Mining	3,836	0.7%	11,216	1.0%	23,900	8.7%	137,777	1.8%	1,776,777	1.6%
Construction	46,234	8.5%	92,186	8.4%	20,460	7.5%	525,864	6.9%	7,602,148	6.7%
Manufacturing	66,171	12.2%	103,865	9.5%	37,910	13.8%	924,601	12.1%	14,110,663	12.5%
Trade, Transportation, and Utilities	162,532	29.9%	220,793	20.1%	56,133	20.4%	1,699,301	22.2%	26,006,269	23.0%
Information	7,620	1.4%	37,246	3.4%	5,952	2.2%	300,541	3.9%	3,040,577	2.7%
Financial Activities	28,192	5.2%	84,158	7.7%	22,172	8.1%	556,261	7.3%	8,162,063	7.24%
Professional and Business Services	78,575	14.5%	213,541	19.5%	40,026	14.6%	1,297,502	17.0%	17,469,679	15.5%
Education and Health Services	66,748	12.3%	123,498	11.3%	27,711	10.1%	899,146	11.7%	16,916,228	15.0%
Leisure and Hospitality	56,023	10.3%	154,844	14.1%	30,373	11.1%	984,281	11.7%	13,024,615	11.6%
Other Services	27,619	5.1%	55,176	5.0%	10,131	3.7%	417,989	5.5%	4,364,889	3.9%

Table I-1. Annual average employment calculated from 2006 Quarterly Census of Employment and Wages Data for each county, the region, and the U.S..

Super Sector Location Quotients relative to the nation

Eleven super sectors are listed in Table I-3. The LQC is currently limited to private sector data, so that the public administration sector is excluded. Summary statistics, tabular data, and histograms (Tables I-2 and I-3; Figure I-1) reveal that at the super sector level, industry concentrations within the 8-county region resemble the U.S. as a whole except for the information and other services sector, and the health and education sector.

SUPER SECTOR LOCATION QUOTIENT	
Mean	1.1
Median	1.0
Stand Dev	0.2
Range	0.7
Min	0.8
Max	1.5

Table I-2. Super sector summary statistics for the 8-county region (2005).

The information super sector consists of establishments engaged in producing and distributing information and cultural products; providing the means to transmit or distribute these products as well as data or communications; or processing data. The main components of this sector are the publishing industries, including software publishing, and both traditional publishing and publishing exclusively on the Internet; the motion picture and sound recording industries; the broadcasting industries, including traditional broadcasting and those broadcasting exclusively over the Internet; the telecommunications industries; Web search portals, data processing industries, and the information services industries (BLS 2008d). The other services super sector comprises establishments engaged in providing services not specifically provided for elsewhere in the classification system. These are primarily engaged in activities, such as equipment and machinery repairing, promoting or administering religious activities, grant making, advocacy, and providing dry cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services (BLS 2008e). Given the definitions of the information and other services sectors, it is appropriate to assume that the information industry exports to rest of the nation. Although the other services sector has a high LQ for the region, it does not seem reasonable to describe this as an exporting industry.

INDUSTRY: SUPER SECTOR	ABBREVIATION	LOCATION QUOTIENT	RANK
Information	SuSec_05	1.45	1
Other Services	SuSec_10	1.40	2
Natural Resources and Mining	SuSec_01	1.16	3
Professional and Business Services	SuSec_07	1.10	4
Construction	SuSec_02	1.02	5
Financial Activities	SuSec_06	1.01	6
Leisure and Hospitality	SuSec_09	1.01	7
Manufacturing	SuSec_03	0.97	8
Trade, Transportation, and Utilities	SuSec_04	0.96	9
Education and Health Services	SuSec_08	0.79	10

Table I-3. Super sector LQs and ranks (2005).

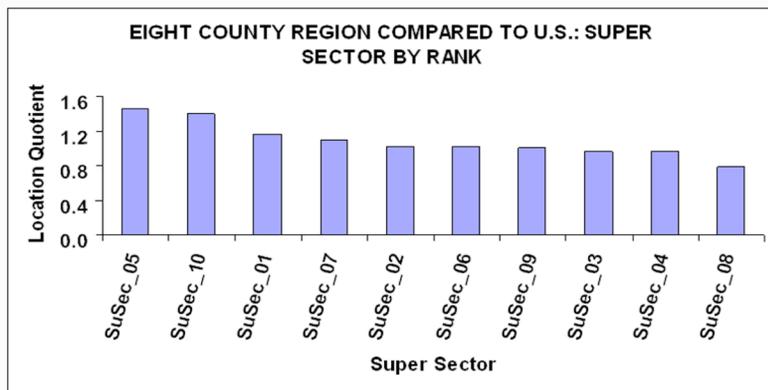


Figure 11. Super sector LQs relative to the U.S. aggregated for the eight county study areas: Ordered by rank (2005).

Comparison of Super Sector LQs: State and Nation

Table I-4 compares Super Sector LQs for the 8 county region relative to California and the Nation. With few notable exceptions, the LQ values at the super sector level are similar relative to both the U.S. and California (third and fourth column of Table I-4). The exceptions (in brown) occur where California differs from the rest of the nation, so that an industrial sector concentration in California is above or below the national average. For example, the regional natural resources and mining super sector LQ is average compared to the nation, but relatively low compared to the rest of California because the natural resources sector is more concentrated in California relative to the nation. The information and other service super sector LQs are high compared to the nation, but only average compared to the State because the State concentration in these industries are high compared to the rest of the nation for these sectors. These effects are reversed for the education and health services sector because California, as a whole, has lower levels of employment concentration in the education and health sector than the nation.

Industry	Calif LQ relative to US	Eight County LQ relative to US	8 County LQ relative to Calif
Natural Resources and Mining	1.95	1.14	0.59
Construction	1.05	1.02	0.97
Manufacturing	.91	0.97	1.06
Trade, Transportation, and Utilities	.94	0.96	1.02
Information	1.33	1.46	1.10
Financial Activities	.98	1.00	1.02
Professional and Business Services	1.09	1.09	1.00
Education and Health Services	.80	0.78	0.98
Leisure and Hospitality	1.00	1.01	1.01
Other Services	1.38	1.41	1.02

Unclassified	1.14	0.03	0.03
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Table I-4. Super sector LQs for California and the region relative to the US and California (2006).

Super Sector LQs by county

At another level of detail, the economies of the individual counties can be compared by industry to the economy of the U.S. (Table I-5; and Figures I-2 and I-3) and California (Table I-6). Comparisons among counties (Table I-5) show that natural resources and mining is extraordinarily high in Imperial, Kern, and Ventura Counties (17.79, 15.74, and 5.52) relative to the US. But corresponding values for these counties (Table 3-6) relative to California (9.14, 8.08, and 2.83) are lower as explained above, but still extreme. The dominance of Los Angeles County in the information sector is apparent, but, San Diego County is also a contributor. Dolfman, and others, (2007a) confirm the “vast concentrations of creative resources” in Los Angeles county, including the motion picture and sound recording industry within the information sector. Relative to the nation, Imperial, Los Angeles, San Bernardino, and San Diego Counties all rank high for the small sector of other services (SuSec_10), but, only Los Angeles and Imperial Counties are strong in these industries relative to the California. The trade, transportation and utilities sector in San Bernardino County appears to be of national significance. Riverside, San Bernardino and Kern Counties have a concentration of the construction industry, reflecting the highest population growth rates in 2004-2006 in the eight county region, although the higher growth rates in Imperial County are not reflected. Education and health LQs are low across the board by national standards, except for Los Angeles and San Bernardino Counties.

Industry	Imperial	Kern	LA	Orange	River	San Bern	San Diego	Ventura
Base Industry: Total, all industries	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Natural Resources and Mining	17.79	15.74	0.21	0.28	1.82	0.45	0.65	5.52
Construction	0.72	1.34	0.65	1.16	2.31	1.26	1.25	1.10
Manufacturing	0.49	0.46	1.03	1.06	0.87	0.97	0.76	1.10
Trade, Transportation, and Utilities	1.17	0.89	0.97	0.86	1.04	1.30	0.87	0.89
Information	0.34	0.45	2.14	0.85	0.55	0.52	1.26	0.80
Financial Activities	0.47	0.56	0.96	1.40	0.63	0.72	1.06	1.11
Professional and Business Services	0.40	0.74	1.08	1.30	0.78	0.93	1.26	0.94
Education and Health Services	0.46	0.65	0.87	0.67	0.67	0.82	0.75	0.67
Leisure and Hospitality	0.69	0.80	0.93	1.07	1.20	0.89	1.22	0.96
Other Services	2.17	1.02	1.73	0.91	1.21	1.31	1.30	0.95
Unclassified	0.06	0.02	0.03	0.03	0.03	0.03	0.02	0.02

Table I-5. LQs for individual counties relative to the US (2006).

Industry	Imperial	Kern	LA	Orange	River	San Bern	San Diego	Ventura
Base Industry: Total, all industries	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Natural Resources and Mining	9.14	8.08	0.11	0.14	0.94	0.23	0.33	2.83
Construction	0.69	1.28	0.62	1.11	2.20	1.20	1.19	1.05

Manufacturing	0.54	0.51	1.13	1.17	0.96	1.07	0.83	1.21
Trade, Transportation, and Utilities	1.25	0.95	1.03	0.91	1.10	1.37	0.93	0.94
Information	0.26	0.34	1.61	0.64	0.41	0.39	0.95	0.60
Financial Activities	0.48	0.57	0.97	1.42	0.65	0.73	1.08	1.13
Professional and Business Services	0.37	0.68	0.98	1.19	0.71	0.85	1.15	0.86
Education and Health Services	0.58	0.81	1.09	0.83	0.84	1.02	0.94	0.84
Leisure and Hospitality	0.69	0.80	0.94	1.08	1.20	0.89	1.22	0.96
Other Services	1.57	0.74	1.26	0.66	0.87	0.95	0.94	0.69
Unclassified	0.06	0.02	0.03	0.04	0.03	0.03	0.02	0.02

Table I-6. LQs for individual counties relative to California (2006).

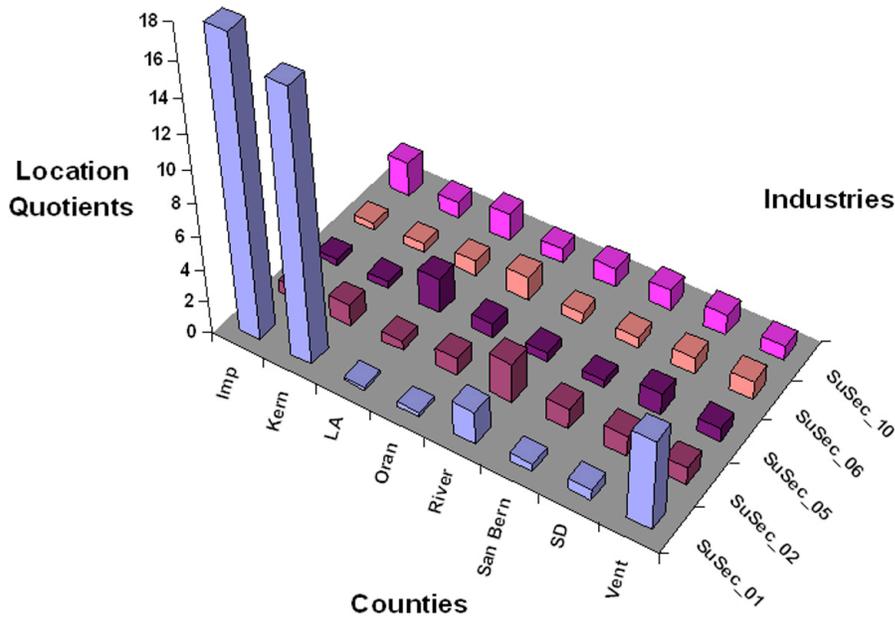


Figure I-2. Super Sector LQs by individual counties. Aggregation: LQs exceed US (2005).

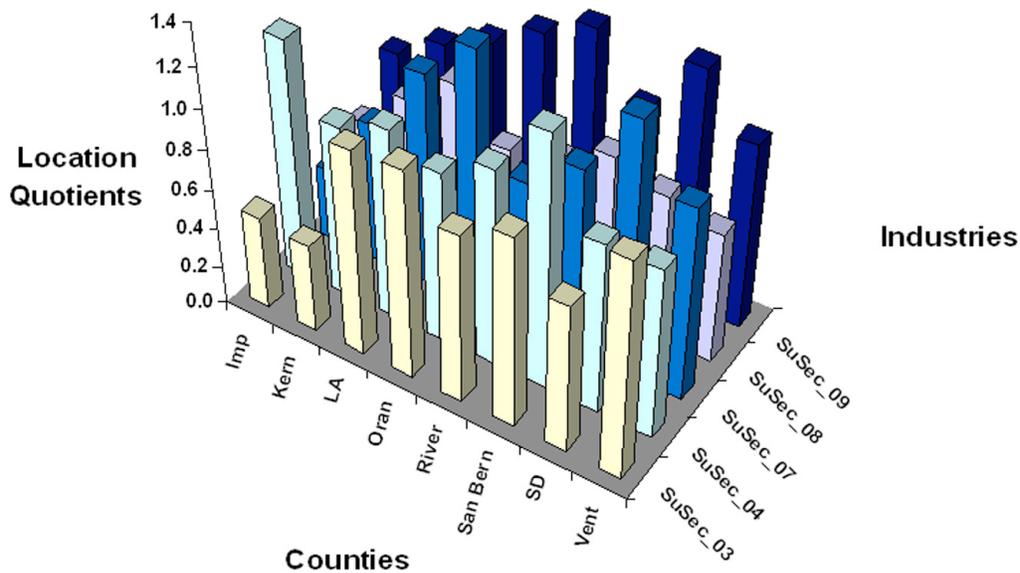


Figure I-3. Super Sector LQs by individual counties. Aggregation: LQs near US (2005).

Breakdown by geography

Geography provides a way of comparing the composition of the economy across regions (Table I-7, and Figures I-4 and I-5). In this breakdown the natural resources and mining sector (SuSec_01) is excluded to avoid anomalously high values in a limited number of counties. The inland counties tend to be higher in some industry groupings than the coastal counties. These include construction (SuSec_02); trade, transportation and utilities (SuSec_04), and other services (SuSec_10). The industry groupings for which the coastal counties tend to be higher include information (SuSec_05), financial activities (SuSec_06), and professional and business services (SuSec_07). The industry groupings for which the coastal counties and the inland counties are approximately equal and similar to the US as a whole include manufacturing (SuSec_03), education and health services (SuSec_08), and leisure and hospitality (SuSec_09).

Industry	Imp	Kern	LA	Oran	River	San Bern	SD	Vent
Construction	0.78	1.3	0.64	1.14	2.42	1.29	1.28	1.06
Manufacturing	0.48	0.45	1.04	1.06	0.86	0.97	0.76	1.1
Trade, Transportation, and Utilities	1.2	0.88	0.97	0.87	1	1.28	0.87	0.87
Information	0.37	0.43	2.13	0.88	0.55	0.48	1.26	0.8
Financial Activities	0.47	0.56	0.95	1.44	0.64	0.71	1.06	1.17
Professional and Business Services	0.37	0.72	1.08	1.3	0.76	0.94	1.28	0.98
Education and Health Services	0.47	0.69	0.87	0.65	0.71	0.83	0.75	0.67
Leisure and Hospitality	0.68	0.82	0.93	1.07	1.19	0.9	1.2	0.94
Other Services	2.11	1.06	1.7	0.91	1.15	1.31	1.3	0.94

Table I-7. Super sector LQs by individual inland (brown) and coastal (blue) counties. Natural resources and mining excluded.

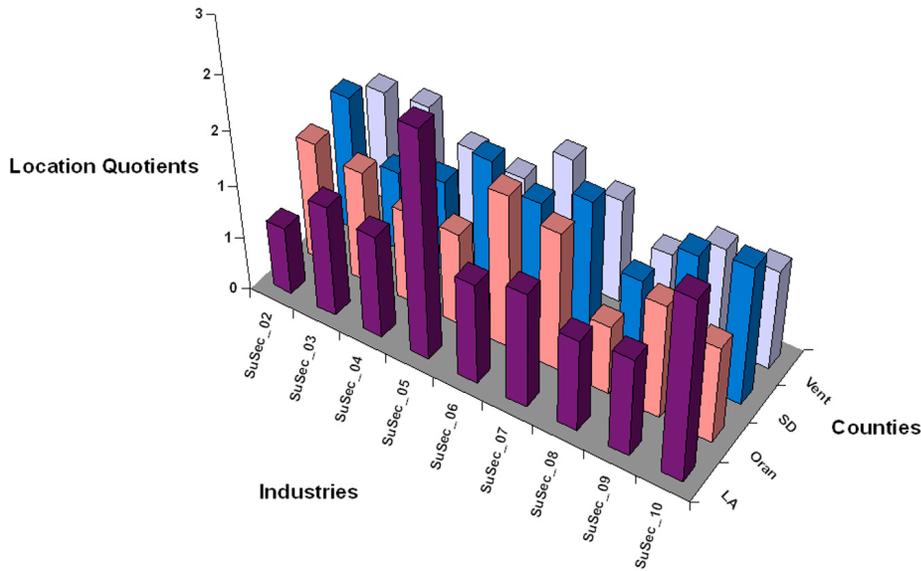


Figure I-4. Super sector LQs for individual coastal counties. Mining and natural resources (SuSec_01) excluded.

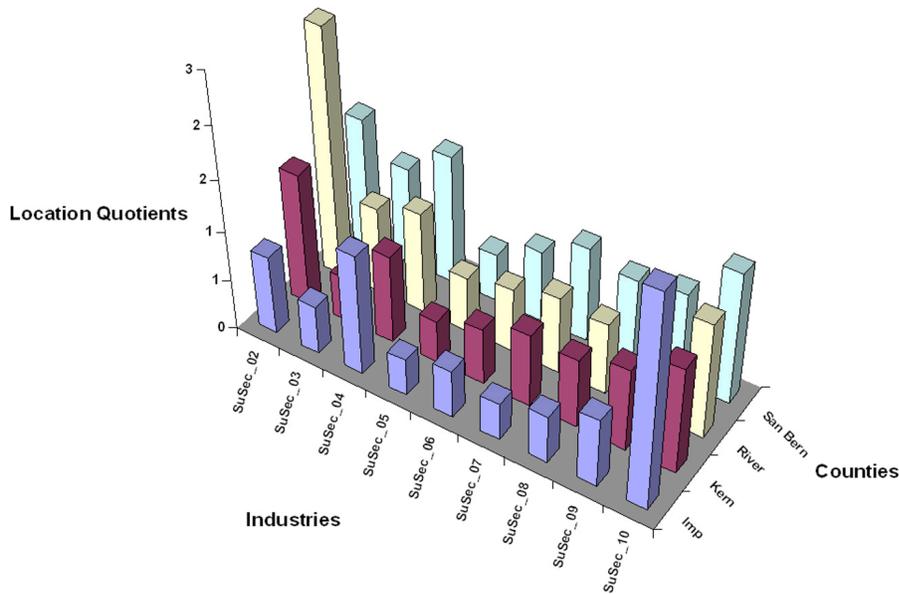


Figure I-5. Super Sector LQs for individual inland counties. Mining and natural resources (SuSec_01) excluded.

Industrial Sector Location Quotients

Analysis at the sector level gives more specific information on industry concentrations, but at the cost of increasing the number of LQs to 8*19=152 (Table I-8 and Figure I-6). At this level and below, the economic questions must be focused to extract the useful information in the volumes of data.

Analysis at the sector level shows that the high super sector LQs for natural resources and Mining, reflect high agricultural, forestry, fishing, and hunting activities rather than mineral extraction. A similar analysis shows that the low LQs for education and health are due to low levels of health care and social assistance activities rather than low levels of education activities.

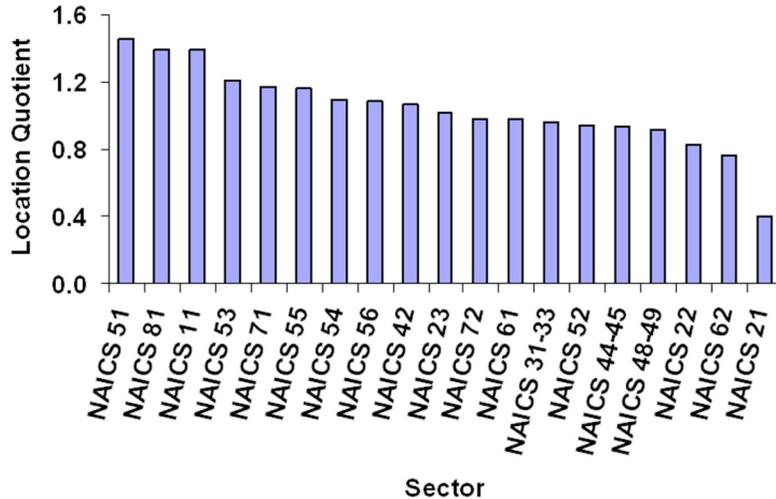


Figure I-6. Location quotients by sector aggregated for the eight county study area: Ordered by rank (2005).

NAICS CODE	Industry	Location Quotient	Rank
NAICS 51	Information	1.45	1
NAICS 81	Other services, except public administration	1.40	2
NAICS 11	Agriculture, forestry, fishing and hunting	1.39	3
NAICS 53	Real estate and rental and leasing	1.21	4
NAICS 71	Arts, entertainment, and recreation	1.17	5
NAICS 55	Management of companies and enterprises	1.16	6
NAICS 54	Professional and technical services	1.09	7
NAICS 56	Administrative and waste services	1.08	8
NAICS 42	Wholesale trade	1.07	9
NAICS 23	Construction	1.02	10
NAICS 72	Accommodation and food services	0.98	11
NAICS 61	Educational services	0.98	12
NAICS 31-33	Manufacturing	0.97	13
NAICS 52	Finance and insurance	0.94	14

NAICS 44-45	Retail trade	0.93	15
NAICS 48-49	Transportation and warehousing	0.92	16
NAICS 22	Utilities	0.83	17
NAICS 62	Health care and social assistance	0.76	18
NAICS 21	Mining	0.40	19

Table I-8. Location quotients by sector aggregated for the eight county study area: Ordered by rank (2005).

Transportation and warehousing

To supplement the goods movement and transportation special studies for the ShakeOut earthquake, the transportation and warehousing sector is explored further. The LQ can provide an increasingly detailed view of the transportation activities of the eight counties by more finely examining the transportation activities by NAICS codes with 48 and 49 as the first two digits. The LQs for the transportation and utilities super sector, and for the transportation and warehousing sector for the region are comparable to those for the Nation and the State. This is a surprising result given the significance of the San Pedro ports and related transportation activities. Further analysis shows that port related transportation activity is revealed at a finer level of detail. The strength of the transportation and utilities Super sector in San Bernardino County (Table I-9) is explained by a concentration in transportation and warehousing at the sector level (Table I-10).

Industry	Kern	LA	Imp	Orange	River	San Bern	San Diego	Vent
Transportation and warehousing	0.90	0.88	1.07	0.47	0.78	1.92	0.52	0.49

Table I-9. LQs for Transportation and warehousing sectors (NAICS48 to 49), by county, relative to the US (2006).

Industry	Kern	LA	Imp	Orange	River	San Bern	San Diego	Vent
NAICS 481 Air transportation	0.19	1.26	ND	0.14	0.19	0.59	0.31	0.05
NAICS 482 Rail transportation	NC	0.82	NC	ND	NC	ND	NC	NC
NAICS 483 Water transportation	ND	0.73	NC	0.38	ND	NC	ND	ND
NAICS 484 Truck transportation	1.26	0.62	1.30	0.30	0.77	2.62	0.36	0.43
NAICS 485 Transit and ground passenger transportation	0.29	1.02	0.57	0.40	0.75	0.98	0.60	0.63
NAICS 486 Pipeline transportation	2.30	0.50	ND	0.47	ND	0.67	ND	ND

NAICS 487 Scenic and sightseeing transportation	NC	0.51	NC	0.96	0.10	ND	3.30	0.95
NAICS 488 Support activities for transportation	0.62	2.25	1.30	0.50	0.50	1.33	0.77	0.69
NAICS 491 Postal service	ND	2.18	ND	ND	0.93	1.38	1.67	ND
NAICS 492 Couriers and messengers	0.48	1.22	ND	0.94	0.59	2.43	0.74	0.51
NAICS 493 Warehousing and storage	1.49	0.82	0.99	0.70	1.84	2.37	0.48	0.71

Table I-10. LQs for Transportation sectors, by selected three digit NAICS codes, by county, relative to the US. NAICS codes: 481- 488; and 491- 493. (2006). NC and ND: Unavailable.

Examination of the transportation and warehousing sector at the three digit NAICS code level (Table 9) suggests significant warehousing and storage activity in Kern (1.49, Riverside (1.84) and San Bernardino (2.37) Counties and truck transportation in Kern (1.26), Imperial (1.30), and San Bernardino (2.62) Counties. The prominence of these four counties can be attributed to local freight trucking and other special local trucking. Only San Bernardino County is strong in long distance freight trucking (2.62) and courier services (2.49). Freight transportation arrangement (a five digit code) is concentrated in Los Angeles and Imperial Counties. For Los Angeles County (3 digit) air transportation is significant (1.26). Port activity appears at the four digit level as support activities for water transportation with a LQ of 3.99 for Los Angeles County. Within Transportation Maintenance and Operations, the largest industry is support activities for water transportation which includes port and harbor operations and marine cargo handling (Henton et al. 2006). There is also a concentration of scenic and sightseeing transportation in San Diego County.

Summary and Discussion

Analysis of LQs for the eight county Southern California region identifies information as a major exporting industry, owing to the presence of the creative arts industry (see Dolfman, Holden and Wasser, (2007a)). Although the concentration of transportation at the Super Sector and Sector levels is comparable to California and the Nation, at finer levels of detail the importance of the port, and trucking and warehousing industries become apparent. Selecting finer levels of detail gives more precise information, but requires more careful analysis. Close analysis at finer levels of detail may also be hampered by confidentiality. The LQ also provides a means to explore the distinctive character of county economies. For example, Los Angeles County is the source of the regional information concentration, and San Bernardino County plays a significant role in long distance trucking. The Construction LQ reflects population growth in the inland counties. The LQ also identifies counties for which agriculture is an important economic activity. The LQ shows that construction and trade, and transportation and utilities tend to be concentrated in the inland counties. The industry groupings for which the coastal counties tend to be higher include information, financial activities, and professional and business services. The LQ also suggests a possible insufficiency in the health care sector relative to the nation, but not compared to the state of California. The LQ is a useful tool to identify the relative strengths and weakness of a regional economy, and where appropriate to identify exporting

industries and, thus, connections to the rest of the nation. The tool has the potential to be used to identify trends. For example, when we looked at the difference between 2005 and 2006 location quotients some notable trends appeared to be decreases in agriculture & mining, and education & health, and increases in other services and construction.

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