

Tools for Understanding Economic Change in Communities:

Economic Base Analysis and Shift-Share Analysis

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INTRODUCTION

This circular discusses two important economic development analytical tools—base analysis and shift-share analysis—that can be used by county Extension agents, local officials, planners, and economic development specialists to understand economic changes taking place in their community.

There are numerous reasons for local economic changes. Entry of new businesses, expansion of existing businesses, new government policies, national economic trends, and global economic events can greatly affect the economic condition of a locality. These changes can affect all or most of the sectors in an economy even though the transactions of one sector are seemingly unrelated to other sectors. Even in the absence of major changes, local development officials and policy makers may want to know answers to questions such as:

- What are the growing and declining sectors of the economy?
- What is the current employment situation in the local economy?
- How is the local economy doing compared to its neighbors and other communities in the state?
- What are new opportunities for job growth?

Understanding the current state of the local economy, including its relative strengths and weaknesses, is necessary in order to formulate responses to existing and/or new economic challenges. This understanding can come

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from a detailed analysis of current and past performance of the local economy. There are numerous tools that have been developed by economic development scholars to analyze local economies and help economic and community development practitioners understand important economic trends in the local economy. This circular discusses two widely used tools: economic base analysis and shift-share analysis.

ECONOMIC BASE ANALYSIS

Economic base analysis is the preferred method among economic development specialists for understanding a local economy. It is a simple yet valuable tool that can be used to gain an understanding of the economic structure of communities. It can provide comparative information on the economic status of a locality across time periods and other localities with respect to employment conditions and trends.

Economic base analysis assumes that the local economy can be divided into two main sectors: basic and non-basic. The basic sector is made up of those local businesses that produce goods and services sold to consumers outside the community/region. Economic base analysis assumes that the sales of a basic firm are dependent almost entirely on export markets. For example, Intel’s facility in New Mexico sells to customers located all over the world. Their sales to consumers in New Mexico are negligible compared to their total sales outside of New Mexico. The non-basic sector, on the other hand, is composed of those firms that produce goods and services that are sold and consumed locally. Almost all local businesses, such as hairdressers, dentists, restaurants, and drug stores, can be categorized as non-basic because they depend almost entirely on local market sales.

Economic base analysis is grounded on the premise that basic industries form the economic base of a locality, and all other industries flourish by servicing this sector. Through its non-local market sales and resulting injection of new money into the local economy, the basic sector is an important contributor to and driver of local economic growth and progress. Changes in the composition or performance of the basic sector usually impact the non-basic sector and overall trends in the local economy. Economic base analysis has shown that the local economy is strongest when it develops those economic sectors that bring new dollars into the local economy. We next discuss how to determine the basic sectors in a local economy.

Ideally, economic base analysis should use industry output and trade flows to and from a locality. However, this is not possible for some localities due to data disclosure issues. The alternative is to use employment data. Although there are several ways to estimate the economic base of a locality, the location quotient (LQ) ap-

proach is the most popular method. Location quotients measure the relative concentration of a given industry in a given locality compared to a larger area, such as the whole nation, the state, or the region.

The LQ is the ratio of an industry’s share of the local employment (locality) divided by its share of the reference area (the nation, the state, or the region). The formula for computing location quotients can be written as:

$$LQ = (e_i / \sum_e) / (E_i / \sum E)$$

Where:

e_i = Local employment in industry i

\sum_e = Total employment in the locality

E_i = Reference area employment in industry i

$\sum E$ = Total reference area employment

For example, the locality can be a county and the reference area can be the state in which the county is located, the nation, or a region that consists of several counties or even several states. In Example 1, Doña Ana County is the locality, the state of New Mexico is the reference area, and the health care and social assistance sector is the industry.

Example 1. Employment, 2015		
	Doña Ana County	New Mexico
Health care and social assistance employment	13,655	129,672
Total full- and part-time employment	100,215	1,095,949
Location Quotient: 1.15		

To calculate the LQ for the health care and social assistance industry (using U.S. Bureau of Economic Analysis data for 2015) in Doña Ana County, divide the county’s share of employment in that industry (13,655 ÷ 100,125) by the state of New Mexico’s share of employment in the same industry (129,672 ÷ 1,095,949). The LQ for the health care and social assistance industry in Doña Ana County was 1.15 in 2015. An LQ of greater than 1 indicates that this is a “basic” industry—local production can satisfy local consumption and excess may be exported. An LQ of less than 1 indicates that the industry cannot satisfy local consumption and the difference must be imported. An LQ equal to 1 indicates production can just meet the local consumption demand. Similarly, the LQ for the health care and social assistance industry can be calculated for the state of New Mexico with reference to the nation.

Another concept, related to economic base analysis, used by economic development specialists is the base multiplier. The multiplier is a quantitative expression

that estimates the additional effects (e.g., added employment) that result from the initial effect (new employment) working its way through the internal linkages in the local economy. The base multiplier is calculated by determining the ratio between total employment in a particular year and the basic sector employment of that year. It measures how many non-basic-sector jobs are created for each basic-sector job. For example, if the basic sector of Doña Ana County is the health care and social assistance industry, it had 13,655 jobs in 2015. Then the base multiplier for 2015 would be equal to 7.3 ($100,215 \div 13,672$). This multiplier estimates that for every one basic-sector job created, six non-basic-sector jobs are created. For every health care and social assistance industry job created, six jobs may be created in other sectors of the economy. The health care and social assistance industry employment plays a major role in other sectors in the area. If the health care and social assistance industry cuts its workforce by several hundred, the local economy will likely lose a greater number of jobs, six for every one job of the health care and social assistance industry.

LIMITATIONS OF THE ECONOMIC BASE ANALYSIS

A location quotient using employment data implies that local productivity (output per worker) is the same as productivity in the reference area. An LQ greater than 1 suggests the industry is producing in excess of local consumption and is exporting the surplus. However, we can also get an LQ greater than 1 if the industry requires more workers than average to produce the same level of output. In this case, the greater-than-1 LQ is due to labor inefficiency, and the sector will not be as strong in the local economy as it appears. Problems can also arise depending on the level of data aggregation. The data available from the Bureau of Economic Analysis and the Census Bureau can be aggregated into different levels. The more the data are aggregated, the more details are hidden, and LQs can vary significantly depending on the level of industry aggregation. Analysts need to be aware of this possibility and adjust the level of aggregation to reflect local conditions and needs. Another issue that LQs do not take into consideration is the possibility that there may be firms importing the same type of goods into a locality as are being exported from it.

SHIFT-SHARE ANALYSIS

Shift-share analysis (SSA) is a technique widely used by regional economists and economic development specialists to examine the changes in employment in a locality. It provides useful information about the char-

acteristics of growth and competitiveness of local industries in a locality compared to a larger reference area. The comparison can also be done with similar industries in other localities. The SSA technique oftentimes is used for decomposing changes in employment in localities and identifying competitive industries in the local economy compared to those of a larger economy (the nation, a state, or a region). SSA helps determine whether a particular local economy has experienced a faster or slower growth rate in employment than the larger economy. Compared with the larger economy, jobs in a local economy may be concentrated in some industries more than in others based on the industrial structure of the local economy. For this reason, a locality with several fast-growing industries might display a high rate of employment gain. Similarly, a locality with several declining industries might experience a high rate of employment loss. More specifically, SSA allows us to analyze a change in the number of jobs in a locality in terms of structural changes, not just a general change in total employment in a locality.

SSA decomposes employment change in a region (over a given time period) into three contributing factors:

1. **National growth effect** represents the share of local employment growth that can be attributed to growth of the national economy. This component is based on the assumption that if the larger economy is experiencing employment growth, it is reasonable to expect that this growth will positively influence employment growth in a particular locality. Local businesses are usually aware of how the national economic climates affect them, and this effect is felt most intensely during boom and bust times of the business cycle. To calculate this component, base year (beginning year) employment in each industrial sector of the locality is multiplied by the national average rate of growth for all sectors. The resulting values are summed to obtain the total national growth component.

$$\text{National share} = (\text{base year [beginning year] employment in each industrial sector of the locality}) \times (\text{the national average rate of growth for all sectors})$$

2. **Industrial mix effect** represents the effects that specific industry trends at the national level have had on the change in employment in the locality. This component captures the fact that, at the national level, some industries grow faster or slower than others, and these differences are reflected in local industry structure. This component will highlight the industries in the locality that are increasing nationwide. To calculate the industrial mix component, base year employment in each local industrial sector is multiplied by

the difference between the national average rate for that sector and the national average rate for all sectors. A positive industry mix implies that the employment in the locality grew above the overall national average, and a negative industrial mix indicates the opposite.

Industrial mix effect = (base year employment in local industrial sector X) × (the national average growth rate for sector X – the national average growth rate for all sectors)

3. **Competitive effect** shows how industrial groups in the locality performed relative to those groups at national averages. It is based on the assumption that for the same industry groups, sometimes the locality may not follow the national trends with the same magnitude. This is due to the locality having a comparative advantage in terms of natural resource base, labor resources, and so forth. To calculate this component, base year employment in each local industrial sector is multiplied by the difference between the local sector growth rate and the national average growth rate for that sector. A positive competitive

share component suggests that the locality increased its share employment in that industry, and a negative competitive share component means the opposite.

Competitive effect = (base year employment in local industrial sector X) × (the local growth rate for sector X – the national average growth rate for sector X)

An example of how to calculate the shift-share components for changes in New Mexico employment is provided in Tables 1 through 6. In summary, during the period from 2010 through 2015, New Mexico increased its number of jobs by 3.32% (Table 2) vs. 9.02% for the U.S. (Table 1). Shift-share analysis components of New Mexico’s employment gain include 272% due to the national effect, -30% due to the industry mix effect, and -142% due to New Mexico’s competitive effect (Table 6). During the 2010–2015 period, New Mexico had a competitive advantage over the U.S. in several sectors, including farming; forestry, fishing, and related activities; and mining, quarrying, and oil and gas extraction (Table 6).

Employment category	2010 jobs	2015 jobs	Percent change
Farm employment	2,636,000	2,642,000	0.23%
Forestry, fishing, and related activities	855,400	962,000	11.08%
Mining, quarrying, and oil and gas extraction	1,268,000	1,504,600	15.73%
Utilities	582,200	588,500	1.07%
Construction	8,793,700	9,948,900	11.61%
Manufacturing	12,102,900	13,091,200	7.55%
Wholesale trade	6,024,000	6,785,600	11.22%
Retail trade	17,591,600	19,149,000	8.13%
Transportation and warehousing	5,474,200	6,605,300	17.12%
Information	3,222,600	3,376,600	4.56%
Finance and insurance	9,202,400	9,645,700	4.60%
Real estate and rental and leasing	7,697,000	8,727,200	11.80%
Professional, scientific, and technical services	11,755,800	13,242,900	11.23%
Management of companies and enterprises	2,019,400	2,431,800	16.96%
Administrative, support, waste management, and remediation services	10,402,200	12,022,900	13.48%
Educational services	4,089,900	4,662,000	12.27%
Health care and social assistance	19,089,900	21,309,800	10.42%
Arts, entertainment, and recreation	3,788,400	4,289,000	11.67%
Accommodation and food services	11,986,300	14,032,200	14.58%
Other services (except public administration)	9,780,800	11,036,200	11.38%
Government and government enterprises	24,672,000	24,142,000	-2.20%
Total employment	173,034,700	190,195,400	9.02%

Employment category	2010 jobs	2015 jobs	Percent change
Farm employment	25,630	28,772	12.26%
Forestry, fishing, and related activities	5,200	5,884	13.15%
Mining, quarrying, and oil and gas extraction	27,049	35,898	32.71%
Utilities	4,637	4,573	-1.38%
Construction	61,314	60,555	-1.24%
Manufacturing	34,587	34,076	-1.48%
Wholesale trade	26,921	28,567	6.11%
Retail trade	110,475	115,724	4.75%
Transportation and warehousing	23,430	26,447	12.88%
Information	17,130	16,006	-6.56%
Finance and insurance	34,660	34,612	-0.14%
Real estate and rental and leasing	39,500	40,479	2.48%
Professional, scientific, and technical services	78,439	77,546	-1.14%
Management of companies and enterprises	5,380	5,814	8.07%
Administrative, support, waste management, and remediation services	54,315	54,184	-0.24%
Educational services	16,814	17,553	4.40%
Health care and social assistance	119,533	129,672	8.48%
Arts, entertainment, and recreation	23,110	24,885	7.68%
Accommodation and food services	81,222	90,601	11.55%
Other services (except public administration)	53,935	55,544	2.98%
Government and government enterprises	217,435	208,557	-4.08%
Total employment (number of jobs)	1,060,716	1,095,949	3.32%

Employment category	2010 jobs				
Farm employment	25,630	×	9.02%	=	2,313
Forestry, fishing, and related activities	5,200	×	9.02%	=	469
Mining, quarrying, and oil and gas extraction	27,049	×	9.02%	=	2,441
Utilities	4,637	×	9.02%	=	418
Construction	61,314	×	9.02%	=	5,532
Manufacturing	34,587	×	9.02%	=	3,121
Wholesale trade	26,921	×	9.02%	=	2,429
Retail trade	110,475	×	9.02%	=	9,968
Transportation and warehousing	23,430	×	9.02%	=	2,114
Information	17,130	×	9.02%	=	1,546
Finance and insurance	34,660	×	9.02%	=	3,127
Real estate and rental and leasing	39,500	×	9.02%	=	3,564
Professional, scientific, and technical services	78,439	×	9.02%	=	7,077
Management of companies and enterprises	5,380	×	9.02%	=	485
Administrative, support, waste management, and remediation services	54,315	×	9.02%	=	4,901
Educational services	16,814	×	9.02%	=	1,517
Health care and social assistance	119,533	×	9.02%	=	10,785
Arts, entertainment, and recreation	23,110	×	9.02%	=	2,085
Accommodation and food services	81,222	×	9.02%	=	7,328
Other services (except public administration)	53,935	×	9.02%	=	4,866
Government and government enterprises	217,435	×	9.02%	=	19,618
New Mexico national growth effect					95,705

Employment category	2010 jobs		U.S. industry growth rate		U.S. job growth rate		Industry mix share
Farm employment	25,630	×	0.23%	-	9.02%	=	-2,254
Forestry, fishing, and related activities	5,200	×	11.08%	-	9.02%	=	107
Mining, quarrying, and oil and gas extraction	27,049	×	15.73%	-	9.02%	=	1,813
Utilities	4,637	×	1.07%	-	9.02%	=	-369
Construction	61,314	×	11.61%	-	9.02%	=	1,587
Manufacturing	34,587	×	7.55%	-	9.02%	=	-510
Wholesale trade	26,921	×	11.22%	-	9.02%	=	593
Retail trade	110,475	×	8.13%	-	9.02%	=	-983
Transportation and warehousing	23,430	×	17.12%	-	9.02%	=	1,898
Information	17,130	×	4.56%	-	9.02%	=	-764
Finance and insurance	34,660	×	4.60%	-	9.02%	=	-1,534
Real estate and rental and leasing	39,500	×	11.80%	-	9.02%	=	1,099
Professional, scientific, and technical services	78,439	×	11.23%	-	9.02%	=	1,731
Management of companies and enterprises	5,380	×	16.96%	-	9.02%	=	427
Administrative, support, waste management, and remediation services	54,315	×	13.48%	-	9.02%	=	2,421
Educational services	16,814	×	12.27%	-	9.02%	=	546
Health care and social assistance	119,533	×	10.42%	-	9.02%	=	1,667
Arts, entertainment, and recreation	23,110	×	11.67%	-	9.02%	=	612
Accommodation and food services	81,222	×	14.58%	-	9.02%	=	4,514
Other services (except public administration)	53,935	×	11.38%	-	9.02%	=	1,269
Government and government enterprises	217,435	×	-2.20%	-	9.02%	=	-24,392
New Mexico industrial mix effect							-10,522

Employment category	2010 jobs		NM industry growth rate		U.S. industry growth rate		Competitive effect
Farm employment	25,630	×	12.26%	-	0.23%	=	3,084
Forestry, fishing, and related activities	5,200	×	13.15%	-	11.08%	=	108
Mining, quarrying, and oil and gas extraction	27,049	×	32.71%	-	15.73%	=	4,596
Utilities	4,637	×	-1.38%	-	1.07%	=	-114
Construction	61,314	×	-1.24%	-	11.61%	=	-7,878
Manufacturing	34,587	×	-1.48%	-	7.55%	=	-3,122
Wholesale trade	26,921	×	6.11%	-	11.22%	=	-1,376
Retail trade	110,475	×	4.75%	-	8.13%	=	-3,736
Transportation and warehousing	23,430	×	12.88%	-	17.12%	=	-995
Information	17,130	×	-6.56%	-	4.56%	=	-1,905
Finance and insurance	34,660	×	-0.14%	-	4.60%	=	-1,641
Real estate and rental and leasing	39,500	×	2.48%	-	11.80%	=	-3,684
Professional, scientific, and technical services	78,439	×	-1.14%	-	11.23%	=	-9,701
Management of companies and enterprises	5,380	×	8.07%	-	16.96%	=	-478
Administrative, support, waste management, and remediation services	54,315	×	-0.24%	-	13.48%	=	-7,453
Educational services	16,814	×	4.40%	-	12.27%	=	-1,324
Health care and social assistance	119,533	×	8.48%	-	10.42%	=	-2,313
Arts, entertainment, and recreation	23,110	×	7.68%	-	11.67%	=	-922
Accommodation and food services	81,222	×	11.55%	-	14.58%	=	-2,463
Other services (except public administration)	53,935	×	2.98%	-	11.38%	=	-4,526
Government and government enterprises	217,435	×	-4.08%	-	-2.20%	=	-4,105
New Mexico competitive effect							-49,950

Table 6. Shift-Share Analysis, 2010–2015, New Mexico Versus U.S.

Employment category	National effect		Industry mix effect		Competitive effect		Total
Farm employment	2,313	+	-2,254	+	3,084	=	3,142
Forestry, fishing, and related activities	469	+	107	+	108	=	684
Mining, quarrying, and oil and gas extraction	2,441	+	1,813	+	4,596	=	8,849
Utilities	418	+	-369	+	-114	=	-64
Construction	5,532	+	1,587	+	-7,878	=	-759
Manufacturing	3,121	+	-510	+	-3,122	=	-511
Wholesale trade	2,429	+	593	+	-1,376	=	1,646
Retail trade	9,968	+	-983	+	-3,736	=	5,249
Transportation and warehousing	2,114	+	1,898	+	-995	=	3,017
Information	1,546	+	-764	+	-1,905	=	-1,124
Finance and insurance	3,127	+	-1,534	+	-1,641	=	-48
Real estate and rental and leasing	3,564	+	1,099	+	-3,684	=	979
Professional, scientific, and technical services	7,077	+	1,731	+	-9,701	=	-893
Management of companies and enterprises	485	+	427	+	-478	=	434
Administrative, support, waste management, and remediation services	4,901	+	2,421	+	-7,453	=	-131
Educational services	1,517	+	546	+	-1,324	=	739
Health care and social assistance	10,785	+	1,667	+	-2,313	=	10,139
Arts, entertainment, and recreation	2,085	+	612	+	-922	=	1,775
Accommodation and food services	7,328	+	4,514	+	-2,463	=	9,379
Other services (except public administration)	4,866	+	1,269	+	-4,526	=	1,609
Government and government enterprises	19,618	+	-24,392	+	-4,105	=	-8,878
Total	95,705		-10,522		-49,950		35,233
	272%		-30%		-142%		100%

LIMITATIONS OF SHIFT-SHARE ANALYSIS

The shift-share analysis technique is a simple analytical tool, but it has some methodological limitations that require its results to be interpreted with caution and used in combination with other regional/local analysis techniques to determine a locality's economic potential. The SSA technique does not fully account for all things that may contribute to or explain changes in local employment, including, for example, the impact of national and regional business cycles, identification of actual comparative advantages in a locality, and differences due to levels of industrial disaggregation. Nor can SSA identify the determinants of the SSA components. In addition, the results of SSA reflect only the total employment changes over the time period under consideration and do not shed light on the magnitude or cause of employment changes in individual years during the same period. On the other hand, the SSA technique provides a simple, straightforward approach to identifying a locality's employment changes based on local competitive advantage as contrasted to the national growth effect and industrial mix effect. This can be use-

ful information for targeting industries that might offer significant future growth opportunities in a locality.

CONCLUSION

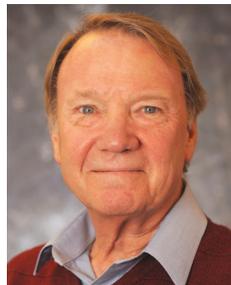
This circular discusses two important analytical tools—economic base analysis and shift-share analysis—that can be used by county Extension agents, local officials, planners, and economic development specialists to understand economic changes taking place in their community. The tools are relatively easy to use. An Excel spreadsheet and data on employment for various categories of industries will do the job. By following the calculations described in this circular, one can determine the economic base of a locality and the competitive industries in a local economy. Employment data by industry can be obtained from the U.S. Census Bureau's annual County Business Patterns publication and can be accessed through its website at <https://www.census.gov/programs-surveys/cbp.html>. The U.S. Bureau of Economic Analysis (through Regional Economic Accounts) also provides employment data by industry for every

state and county; data can be accessed at <http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1>. One shortcoming of both these data sets is that the data are suppressed for some counties due to disclosure rules.

FURTHER READING

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