

Regional and Local Economic Analysis Tools

Mustafa Dinc

Prepared for the Public Finance, Decentralization and Poverty Reduction Program
World Bank Institute

January 2002

The World Bank
Washington, DC

1. INTRODUCTION

In the last couple of decades, the world economy has been going through unprecedented changes in terms of its organization, composition, integration and interdependency. New developments in technology, improvements in telecommunications and transportation have been forcing countries to adjust themselves to a changing social and economic environment. The expansion of market boundaries and reduction or elimination of trade barriers have brought new opportunities to national and regional industries while simultaneously exposing them to increased competition from both domestic and foreign producers. Within the context of an increasingly integrated world economy, regional economies have become more and more crucial for national economies and in some cases dominate the national economy from a leading technology or entrepreneurial perspective.

Two new topics have emerged out of these developments: globalization and regionalization. It is argued that globalization and regionalization issues have been the dominant economic development characteristics of the last two decades. In this argument, globalization refers to trade liberalization and increasing factor mobility across the world. Globalization and liberalized international trade played a major role in the rise of living standards of people by improving the allocation of resources and by exerting discipline on economic policies through exposure to intense competition.

Regionalization, on the other hand, is recognized as the development of the spatially decentralized but economically functional regions across the world. The rise of regional economies as the building blocks for international competitiveness has been widely recognized by scholars. It was argued that competition and cooperation among these dynamic regions would dictate the future more than nation states themselves. New developments in production systems such as just-in-time production, flexible manufacturing, niche-specific production and closer customer focus encouraged regional specialization. In order to take advantage of these new developments rapid response is required in the production chain, all the way from suppliers to customers. This means that hard infrastructure, telecommunications and information infrastructure become crucial in

supporting an efficient production process and high-end services. The result is that regional interdependency in terms of interregional trade increased the interdependency of regions on each other's basic infrastructure support, as well. Congestion in Bombay means a delay in production in Tokyo, which, in turn, means that the access to a new market in the Netherlands may be lost to a competitor.

The ultimate goal of local and regional policy makers is to improve the well being of local population and promote opportunity and equity for them, which is possible only by increasing the competitive edge of their respective regions. To do so local and regional policy makers need to develop sound policies, and closely monitor the outcomes of these policies. Developing local and regional economic and social policies is a multi-faceted process, which involves analysis of economic, social and political issues. Particularly in forming economic development policies, assessing sectoral structure and performance of a region is very important, i.e. which sectors are growing or declining in terms of volume of activity, value-added or share of labor demanded. There are a number of descriptive economic impact analysis tools such as presented in this module, which are among the most reliable decision tools for the regional and local policymakers to prioritize support policies for sectors. Although, when the final decisions were made political factors often times dominate the data and the direction suggested by purely quantitative analytic studies, these methods provide substantial support for the public sector decision maker

The underlying purpose of this analytical module, therefore, is to provide local policymakers with simple and easy to use tools that will assist them in describing and documenting changes in their local economy in a way that enables them to make sound and informed decisions. In many developing countries where data availability and analytical capacity is limited, these simple methods and tools can become powerful decision-making aids for local planners and analysts due to their relatively simple logic, analytic clarity and easily accessible data requirements. In this module, three of these models will be discussed: the shift-share analysis, economic base model and location quotient.

These models, due to their simple and user-friendly structures, are widely used by local and regional development practitioners in industrial targeting, economic impact analysis and regional comparison across the world. In the U.S., for example, in urban and regional development and planning departments of universities, these three models are among the most widely taught analytic tools. In almost all states and in most counties, economic development agencies are utilizing these models to develop economic development policies. Further, because development and application of these models are quite inexpensive they are very popular among consulting firms that are advising local governments. Annex 1 provides real life examples on the utilization of these models.

2. THE SHIFT-SHARE MODEL

The shift-share model examines economic change (i.e., growth or decline) in a region by decomposing it into three components: national share, industrial mix, and regional share. The variable so decomposed may be employment, income, output, population or a variety of other economic factors that are imbedded in different hierarchical levels. Hence, the method serves as one of the most relevant techniques for regional analysis based on regional and sectoral decomposition. Shift-share analysis is very practical in assessing the impacts of industrial restructuring on regional and local economies and for providing guidance for industrial targeting, and hence can make a significant contribution to understanding and selection of key leading industries in the region, which can help forming local industry partnerships. Shift-share analysis can give a description of total regional economic change that is attributable to growth of the national economy, the industrial mix of the region, and the competitiveness of the local industries. By interpreting the results of shift-share analysis, it is possible to explore the advantages of the local area, as well as to identify growth, or potential growth industries that are worthy of further investigation.

2.1 Shift-share Components

As stated above, the shift-share analysis divides the change in local economy into three components. In the following discussion, the employment is used as the variable to examine the economic change in the region, and for consistency with other models the following notation is employed in the equations. E_{ir}^t is employment in sector i of region r at the beginning of a time interval extending from t to $(t+1)$ and E_{in}^t is employment in sector i of the reference area, n . The rate of growth over the same time interval in employment in industry i of region r is $g_{ir} = \frac{E_{ir}^{t+1} - E_{ir}^t}{E_{ir}^t}$. The rate of growth of employment in industry i in the reference area, n , is $g_{in} = \frac{E_{in}^{t+1} - E_{in}^t}{E_{in}^t}$. The rate of growth of all industries combined in the reference area is g_n .

National share component measures the regional economic change that could have occurred if the region had grown at the same rate as the reference area, and generally refers to the national economy (for smaller regions such as counties it may refer to the state or province). It is expected that if the nation as a whole is experiencing growth, it would have a positive influence on the local area (the rising tide would lift all boats) because the local area is a part of the changing national economy. It is formulated as:

$$NS \equiv \sum E_{ir}^t g_n \quad (1)$$

A simple example using a hypothetical region and fictitious data is provided in the table below. In this hypothetical world, there are two industries, A and B, and both had employment growth nationally and locally.

	Reference Area Employment		Local Employment		National Share
	1995	2000	1995	2000	1995-2000
Industry A	19,500	21,000	525	600	58
Industry B	21,000	24,000	675	825	75
Total	40,500	45,000	1200	1425	133

Interpretation of this component is quite straightforward. The national share component

of each industry tells us how many jobs in the industry can be attributed to the growth of the reference area economy. It calibrates the growth in local area employment that may be attributed to overall conditions and trends of the reference area. If the employment growth in industry A and B had been the same locally as nationally, then the local area employment growth over 1995 - 2000 would have matched the overall national rate of 11 percent or 58 and 75 new jobs would be created, respectively. In fact, actual employment change is 75 for industry A and 150 for industry B. To explain this difference we would also look at the industry mix and regional share components.

Industrial mix component measures the share of local economic change that can be attributed to the local area industry mix, and reflects the degree to which the local area specializes in industries that are fast or slow growing nationally. Thus, a region that contains a relatively large share of industries that are fast (slow) growing nationally will have a positive (negative) industry mix effect. Its formulation is:

$$IM \equiv \sum E_{ir}^t (g_{in} - g_n) \quad (2)$$

Using the same data let us examine the industry mix effect on the local area employment change. The industry mix results show positive values for those industries that experienced employment growth above the national average, while negative values are posted for those industries that grew at rates less than national average. As seen in the Table, industry A was not growing as fast as the reference area average, hence it lost 18 jobs that would have been created if the local economy matched the reference area economy. On the other hand, industry B gained 21 additional jobs because it had a faster growth rate than the reference area. The most important result from the industry mix calculation is the "TOTAL" derived from summing over all industries. In our example, when the industry mix components for each industry are added together the result is positive. The positive values indicate that the industry composition of the local area was tilted toward faster growing industries. Negative results would have indicated just the opposite.

	Reference Area Employment		Local Employment		Industry Mix
	1995	2000	1995	2000	1995-2000
Industry A	19,500	21,000	525	600	-18
Industry B	21,000	24,000	675	825	21
Total	40,500	45,000	1200	1425	3

Those industries that are growing faster than the national average may be more dynamic and have bright futures. However, these industries might also have increasing demands for labor, space, and inputs that may exceed the local supply if adjustments are not made to anticipate future demands of these industries. On the other hand, there may be a variety of reasons for industries that experienced negative employment changes. For example, the industry may be declining nationally, which might have been reflected in the local economy such as mining and textile industries. The industry may be going through a cyclical change that does not coincide with the rest of the economy's business cycle such as higher education. Another reason could be productivity improvements or new capital investments, in which case the industry may be producing the same level of output while employing less worker. It may have ineffective management and production processes that hurt its ability to expand.

Regional share component measures the change in a particular industry in the region due to the difference between the industry's local growth (decline) rate and the industry's reference area growth rate. This component indicates growth or decline in industries due to the local area's competitive position in a given industry. It is generally observed that some regions and some industries grow faster than others, even during periods of general prosperity. This is usually attributed to some local comparative advantage such as natural resources, linked industries, or favorable local labor situations. The regional share component can help identifying a local area's economic strengths and point to industries that enjoy local comparative advantage. It cannot, however, identify what the actual comparative advantage is. This wide range of factors is very diverse and often includes elements such as:

- The natural endowments, local raw materials or local inputs
- Well developed regional development policies
- Local entrepreneurial ability
- Transportation methods

- Local wage rates
- Influence of local industries
- University influences
- Local consumption and savings
- Other comparative advantages

The regional share component is formulated as:

$$RS \equiv \sum E_{ir}^t (g_{ir} - g_{in}) \quad (3)$$

The below table provides an example of how regional share component of an industry affects its total employment change. In our example, 35 additional jobs were created in industry A and 54 jobs were created in the industry B. The total number of new jobs for the regional share component is 89; showing local area enjoyed additional employment growth because a larger proportion of industries grew more quickly locally than nationally. If the total regional share component is positive, that means the region gained additional jobs over those that can be attributed to national growth and the region's industrial structure. If the total competitive component is negative then the region was less competitive than the national average. This component is seen the most important component of the model because it is unique to region and contains employment growth effects of regional policy, and hence it is the focus of interest for studies related to regional policies. The regional share component, however, did not tell us why various industries had employment growth or decline, rather, it offered a way to look at industries relative to their counterparts around the reference area.

	Reference Area Employment		Local Employment		Regional Share
	1995	2000	1995	2000	1995-2000
Industry A	19,500	21,000	525	600	35
Industry B	21,000	24,000	675	825	54
Total	40,500	45,000	1200	1425	89

Total shift is the sum of three components, which is the actual growth or decline in employment.

$$TS \equiv \sum E_{ir}^t g_n + \sum E_{ir}^t (g_{in} - g_n) + \sum E_{ir}^t (g_{ir} - g_{in}) \quad (4)$$

Results of the above examples can be summarized as:

Total Shift	=	National Share	+	Industry Mix	+	Regional Share
225		133		3		89

In terms of total employment change in the local area, the results have a relatively simple interpretation. From 1995 to 2000, our local area gained additional 225 new jobs, of which 133 are a result of economic growth in the reference area. Three new jobs are attributed to the industry mix component of the local area, which implies it had relatively favorable industrial structure. Finally, due to some regional advantages our local area gained 89 new jobs, which is an indicator of its competitiveness.

The results of shift share analysis shed some light on the local area economy but obviously, it is not enough to fully understand the real strength or weakness of the economy. Further, in these examples, shift-share analysis examined employment changes not changes in income, earnings, or value-added, which are alternative measures of an industry's size. For example, although healthy firms usually expand and hire more employees, in some cases, firms may actually reduce their number of employees due to improvements in productivity, and over time increase their competitiveness, earnings, and profits.

The findings of shift-share analysis could be supported by other methods. For example, it is very important to identify whether the large gainers or losers are export industries of the local area. These export industries are important to local economy for job creation. In addition, these industries by exporting goods and services bring in money from outside of the local area, and hence generate a multiplier effect. By this we mean that these "basic" industries will generate larger revenues in the long run because they are attracting money from outside of your workforce area as well as creating new jobs with in the region.

It should be kept in mind that like many other analytical tools, the shift-share analysis is only a descriptive tool that should be used in combination with other analysis to reach a better understanding of key industries in a region. It should also be noted that like many other analytical tools, shift-share analysis embodies some assumptions most of which may not hold in real world. Some of them are: (1) the regional technology is similar to the reference area (nation), (2) regional labor is as productive as its national counterparts, (3) regional demand patterns are similar to national averages, and (4) the model ignores international and interregional trade. Since the early 1970s these assumptions have been the sources of some criticisms and at the same time new extensions. See for a detailed review Dinc, Haynes Qiangsheng (1998) and Loveridge and Selting (1998).

Despite some inherited limitations, since its introduction in 1960, shift-share analysis has been adopted and applied to a variety of regional issues including: regional analysis of manufacturing labor productivity (Ledebur and Moomaw, 1981; Rigby and Anderson, 1993; Haynes and Dinc, 1997); the impact of transportation employment on regional growth (Toft and Stough, 1986); regional economic forecasting (Tervo and Okko, 1983); regional difference in employment growth (Qiangsheng, Haynes and Dinc, 1997; Haynes and Machunda, 1987); regional demographic change (Plane, 1989); the analysis of the impact of public decision making (Sui, 1995); migration turnaround (Ishikawa, 1992); the change in occupational sex composition (Smith, 1991); the ethnic/racial division of labor (Wright and Ellis, 1996; Daponte, 1996 and Waldinger, 1996); and the impact international trade on regional economy (Dinc and Haynes, 1998).

3. LOCATION QUOTIENTS

The location quotient is one of the most frequently used tools in economic geography and local regional economic analysis. The location quotient is a measure of an industry's concentration in an area relative to a reference area, which is generally the rest of the nation. It compares an industry's share of local employment with its share of national employment. It is a very quick and useful tool in determining a region's key industries. By using the same notation the location quotient is formulated as:

$$LQ = \frac{\frac{E_{ir}}{E_r}}{\frac{E_{in}}{E_n}} \quad (5)$$

As seen in the equation a location quotient is simply an industry's share of local employment over the industry's share of national employment. If the location quotient is 1 then the industry's share of local employees is the same as the industry's share nationally. A location quotient greater than 1 means the industry employs a greater share of the local workforce than it does nationally, which also implies that the industry is producing more goods and services than are consumed locally. Thus, the industry is exporting the goods or services and bringing money into the local area, which help the local economy grow. A location quotient less than 1 implies that the industry's share of local employment is smaller than its share of national employment. In consumer goods and services related sectors such as retail trade, a location quotient less than one may mean that local residents and businesses are purchasing services and goods from outside the local area. In such cases, it would be important to examine whether there is local demand for a good or service that is not being met. If this is the case, the next step would be to look into whether there is an opportunity for growth of that industry in the area.

We should note that a location quotient is greater than 1 does not necessarily mean that an industry is competitive or growing. It may simply mean the industry is not as efficient and employs more people than the national average to produce the same level of output. Other measures, such as earnings or value-added per employee, shift-share analysis, and changes in employment, can help determining whether the industry is actually high-growth and competitive.

The below example illustrates how location quotients can be used for both local and national policymaking purposes. In this example, there are four regions and two industries in the nation, and the data represent employment for each region and industry. From a national point of view, location quotients answer the following question: How is

employment in industry A and B concentrated across regions of the nation? Regional and local policymakers, on the other hand, want to learn which industries are concentrated in their respected region.

Region	Industry A	Industry B	Total	LQa	LQb
East	600	2250	2850	0.74	1.11
West	3300	7500	10800	1.07	0.97
South	900	3000	3900	0.81	1.08
North	1200	2250	3450	1.22	0.91
TOTAL	6000	15000	21000		

In our example, the location quotient of industry A reveals that it is concentrated in North and, to some degree, in West, and less than the national average in East and South. Industry B, on the other hand, is concentrated in East and South, and relatively evenly distributed. From this information, it is possible to map spatial patterns of industrial concentration.

Another way to use location quotients in regional and local economic policymaking is to look at how they have changed over a period of time. An investigation of annual changes in location quotients can provide valuable information on whether each industry is increasing or decreasing its concentration and importance in the local area relative to other areas.

$$\Delta LQ = \frac{LQ_{t+1} - LQ_t}{LQ_t} \quad (6)$$

Such an investigation can reveal that regional industries can be grouped into four categories. As seen in the below matrix, the location quotient value could be large and increasing, which is the most desirable situation. It could be large but declining overtime, in which case local planners should pay attention to the sector. The location quotient could also be small and growing or declining overtime.

	Location Quotient Value	
Change	Large	Small
	Increasing	Declining

This grouping, together with the location quotients themselves, provides a very useful analytical tool for understanding local and regional industries because each category might require a different economic development approach. For example, a region might focus its efforts on the industries that have large, but declining location quotients or on those that have small, but increasing location quotients. The industries with large location quotients are obviously quite important to the local economy, and losing them might create problems. On the other hand, those industries with small but growing location quotients may be a source of considerable future growth for the local economy and should warrant special attention. If some industries were experiencing a decline, it would be prudent to understand the causes of downfall and develop appropriate programs and policies to stop or slow their decline.

The industries with small and declining location quotients may not be as important to the local economy and apparently might not have much potential in the region. We should note that, although an industry may fit into the small or declining location quotient category, it may include one or more small, but dynamic industries. Therefore, it is important to look at these industries at a disaggregated level.

4. ECONOMIC-BASE MODEL

The economic base technique is the oldest, simplest and most widely used technique for regional economic analysis. Economic-base concepts originated with the need to predict the effects of new economic activity on cities and regions. Assume a new plant is located in the local area, which directly employs a certain number of people. This plant will also help generating new jobs due to its backward and forward linkages to the other local businesses. Further, these new employees depend on others to provide food, housing, clothing, education, protection and other requirements of the good life, which will induce

additional employment in the local area. The question, which planners and policymakers want to answer, then, is "what is the impact of this new activity on employment and income in the local community?" The economic base model is an analytical tool that can answer this question.

The economic base technique is based on the assumption that the local economy can be divided into two very general sectors: a) basic (or non-local) sector and b) non-basic (or local) sector.

Basic Sector is made up of local businesses (firms) that are entirely dependent upon external factors. For example, an airplane manufacturer builds and sells airplanes to companies and countries located throughout the world. Their business is dependent almost entirely upon non-local firms. It does not sell planes to families or households locally, so their business is very much dependent upon exporting their goods. Manufacturing and local resource-oriented firms (like logging or mining) are usually considered to be basic sector firms because their fortunes depend largely upon non-local factors; they usually export their goods. It should be noted that some service related sectors such as tourism, parks and entertainment are also considered as basic sector

The non-basic sector, in contrast, is composed of those firms that depend largely upon local business conditions. For example, a local grocery store sells its goods to local households, businesses, and individuals. Its customers are locally based and, therefore, its products are consumed locally. Almost all local services (like drycleaners, restaurants, and drug stores) are identified as non-basic because they depend almost entirely on local factors.

Economic Base Theory assumes that all local economic activities can be identified as basic or non-basic. Firms that sell to both local and an export market must, therefore, be assigned to one of these sectors or some means of apportioning their employment to each sector must be employed. Means of assigning firms to basic and non-basic sectors will be discussed in the various techniques outlined below.

Economic Base Theory asserts that the means of strengthening and growing the local economy is to develop and enhance the basic sector. The basic sector is therefore identified as the "engine" of the local economy. The economic base technique is based on a simple causal model that assumes that the basic sector is the prime cause of local economic growth, that it is the economic base of the local economy. Economic Base Theory also posits that the local economy is strongest when it develops those economic sectors that are not closely tied to the local economy. By developing firms that rely primarily on external markets, the local economy can better insulate itself from economic downturns because, it is hoped, these external markets will remain strong even if the local economy experiences problems. In contrast, a local economy wholly dependent upon local factors will have great trouble responding to economic slumps.

The method for estimating the impact of the basic sector upon the local economy is the **Base Multiplier**, which is the ratio of the total employment in year t to the basic sector employment in that year. It can also be defined as the employment multiplier that estimates local basic sector employment impacts and allows analysts to project non-basic sector job creation given an increase in basic sector employment. The base multiplier is calculated via the following ratio:

$$BM = \frac{E_r^t}{BE_r^t} \quad (7)$$

where BE_r^t is the basic employment in year t in region r . The Base Multiplier can provide insight as to how many non-basic jobs are created by one basic job. Assume that the local area has a total of 20,000 jobs of which 10,500 are basic employment. This indicates that the local area has a Base Multiplier of 1.9. This multiplier suggests that for every one Basic Sector job, 0.9 Non-basic Sector jobs are created (or for every 10 basic sector jobs we would expect additional 9 non-basic sector jobs). The non-basic jobs are usually in the form of personal/business services or related-goods employment.

Economic Base Analysis can be performed by way of several different techniques. However, each of these techniques is based upon general Economic Base concepts like the assignment of firms to basic or non-basic sectors and the calculation of a base multiplier (or multipliers).

4.1 Economic Base Analysis Techniques

There are several ways to analyze the strengths and weaknesses, specializations, and overall diversity of the local economy. The five techniques below offer planners a set of simple, but popular tools to perform such analyses.

4.1.1. The Survey Method

This is the most straightforward method, which is simply to ask businesses in the local area to specify how much of their revenues come from basic activities and to use their responses to accurately divide local business activities into basic and non-basic components. In practice, however, this is seldom done because it is the most expensive and time-consuming approach.

4.1.2. Assumption or Assignment Technique:

The Assumption Technique is the simplest and most easily performed economic base analysis technique. Since the goal is to allocate all local employment to basic or non-basic sectors, this technique literally "assumes" that certain industries are inherently basic sector jobs and others are non-basic sector jobs. When utilizing this technique, it is common practice to assume that all manufacturing, mining, agriculture, and federal and state governments are basic sector activities because (it is assumed) they rely largely upon non-local conditions. In contrast, all other industries are assumed to be non-basic, or entirely dependent upon local conditions. From these assumptions, the total Basic and Non-Basic employment for the local area can be estimated. Then, using the equation (7) the Base Multiplier can be calculated for the local area.

By using the data in the below table, let us illustrate the Assumption Technique. The employment figures for the Major Industrial Sectors are presented in this table. It is

assumed that that the local area’s Agriculture, Mining, and Manufacturing sectors are basic and all other sectors are non-basic. This is the most basic application of this Technique.

Industrial Sector	Employment	Assumption	Basic Employment	Non-Basic Employment
Agriculture	2,600	Basic	2,600	
Mining	230	Basic	230	
Construction	18,300	Non-Basic		18,300
Manufacturing	59,000	Basic	59,000	
TPU	20,100	Non-Basic		20,100
Wholesale Trade	22,600	Non-Basic		22,600
Retail Trade	51,200	Non-Basic		51,200
FIRE	24,200	Non-Basic		24,200
Services	79,800	Non-Basic		79,800
Unclassified	910	Non-Basic		910
Total	278,940		61,830	217,110

In our local area we have 61,830 basic jobs and 217,110 non-basic jobs. By using equation (7) Base Multiplier can be calculated as:

$$BM = \frac{E_r^t}{BE_r^t} = 278,940 / 61,830 = 4.5$$

In this example, the local area has a Base Multiplier of 4.5, which means for every one basic sector job created, 3.5 non-basic sector jobs are created.

4.1.3. Location Quotient Technique:

The Location Quotient Technique determines the level of Basic sector employment by comparing the local economy to the economy of a larger geographic unit like state or the entire nation, in the process attempting to identify specializations in the local economy. The location quotient is the most commonly utilized economic base analysis method. It was developed in part to offer a slightly more complex model to the variety of analytical tools available to economic base analysts. The location quotient technique is based upon a calculated ratio between the local economy and the economy of some reference unit. This ratio, called an industry location quotient, gives this technique its name.

Unlike the assumption technique, the Location Quotient Technique does not assume that all employment in each industry is Basic or Non-Basic. Instead, location quotients are calculated for all industries to determine whether or not the local economy has a greater share of each industry than expected when compared to a reference economy. If an industry has a greater share than expected of a given industry, then that "extra" industry employment is assumed to be Basic because those jobs are above what a local economy should have to serve local needs. Recall that in the above example North had a location quotient of 1.22 for industry A, which means in this region the extra employment in industry A is assumed to be Basic.

As discussed earlier interpreting the Location Quotient is quite simple. Only three general outcomes are possible when calculating location quotients. In the economic base concept, a LQ less than one suggests that this industry is not even meeting local demand for a given good or service, and hence all of its employment is considered non-basic. A LQ equal to one indicates that the local employment is exactly sufficient to meet the local demand for a given good or service. Therefore, all of this employment is also considered non-basic because none of these goods or services are exported to non-local areas. Finally, a LQ greater than one provides evidence of basic employment for a given industry. It shows that there are some extra jobs that export their goods and services to non-local areas, which, by definition, make them Basic sector employment.

Because of the assumptions of the Location Quotient approach, a second formula must be applied to determine the number of Basic sector jobs when the LQ is greater than 1.0. By using the same notation the equation for Basic sector can be derived as:

$$E_{ir} = BE_{ir} + NBE_{ir} \quad (8)$$

$$BE_{ir} = E_{ir} - NBE_{ir} \quad (9)$$

$$NBE_{ir} = \left(\frac{E_{in}}{E_n} \right) * E_r \quad (10)$$

$$BE_{ir} = E_{ir} - \left[\left(\frac{E_{in}}{E_n} \right) * E_r \right] \quad (11)$$

Dividing by E_{in} and rearranging terms

$$BE_{ir} = \left[\frac{E_{ir}}{E_{in}} - \frac{E_r}{E_n} \right] * E_{in} \quad (12)$$

Another way to estimate basic employment in industry i in region r is:

$$BE_{ir} = \left[1 - \frac{1}{LQ_i} \right] * E_{ir} \quad (13)$$

By using the same data in Location Quotient example above, let us calculate the Basic employment and Basic multiplier for our hypothetical region North, which had the largest LQ value among the regions. Since the Location Quotient for Industry A is greater than 1, there is evidence that some of this employment is Basic sector because this industry appears to be exporting some of its goods to non-local markets.

Area	Industry A	Total	LQa	Basic Employment	Basic Multiplier
North	1200	3450	1.22	214	5.6
Reference Area	6000	21000			

By using equations (12) and (13) we can calculate the number of Basic sector jobs from this specific industry:

$$BE_{ir} = \left[\frac{E_{ir}}{E_{in}} - \frac{E_r}{E_n} \right] * E_{in} = \left[\frac{1,200}{6,000} - \frac{3,450}{21,000} \right] * 6,000 = 214$$

$$BE_{ir} = \left[1 - \frac{1}{LQ_i} \right] * E_{ir} = \left[1 - \frac{1}{1.22} \right] * 1,200 = 214$$

The Basic Multiplier for the Industry A is

$$BM = \frac{E'_r}{BE'_r} = \frac{1,200}{214} = 5.6$$

In this industry, 214 jobs are considered as basic sector jobs. The Basic Multiplier for this industry is 5.6, which means every on basic job created there will be additional 4.6 non-basic jobs.

We should note that as with any of the Economic Base Methods, the level of aggregation of the data and, perhaps more importantly, choice of comparison area can greatly affect the results. Therefore, analysts should pay special attention to this aspect of the model.

It is also important to note that the Location Quotient Technique is often paired with the Assumption Technique to provide a more complete set of results. Some industries can clearly and correctly be identified as Basic and others can be identified as Non-Basic. For example, Hotels and Lodging is generally assumed to be Basic sector employment, regardless of its calculated LQ, because this industry, by definition, largely serves a non-local demand. Similarly, Local Government employment is always assumed to be Non-basic because these jobs, again by definition, serve local demand. By pairing the assumptions of these different techniques a more reasonable and accurate assessment of the local economy is possible.

4.1.4. Minimum Requirements Technique:

In contrast to the LQ Technique, the Minimum Requirements Approach (MR) compares local conditions with those of a sample of similarly sized regions, for example, a local county of approximately one million people is compared to four other counties of the same approximate size. For each industry, then, the MR technique assumes that the minimum shares region has just enough employment to satisfy local demand for that industry's goods and services. It follows that all other regions will have some Basic sector employment because their share in that industry is greater than that in the "minimum shares region". The key concepts or the steps in calculating Basic employment by using MR are:

- Identify several similarly sized region for comparison;

- Identify a "minimum shares region" for each industry to determine the necessary level of Non-Basic employment for each industry for these regions;
- Calculate Basic Sector employment from this minimum share.

The following example illustrates step by step how to use the MR in determining the Basic sector employment and multipliers. In this example, the local area to be investigated is EAST and three similar sized areas with similar characteristics to be used for comparison are West, South and North. After identifying the sample comparison areas, total industry and individual industry figures are collected for each of these geographic units. Within each area and for each industry a simple share is calculated using the following formula:

$$Share = \frac{E_{ir}^t}{E_r^t} \quad (14)$$

<i>MAJOR INDUSTRIAL SECTORS</i>	Employment				Share			
	<i>EAST</i>	<i>West</i>	<i>South</i>	<i>North</i>	<i>EAST</i>	<i>West</i>	<i>South</i>	<i>North</i>
Agriculture, forest & fishing	7,847	4,074	8,180	2,526	0.0093	0.0043	0.0100	0.0032
Mining	697	1,259	449	139	0.0008	0.0013	0.0006	0.0002
Construction	55,146	28,994	42,000	34,885	0.0656	0.0308	0.0515	0.0443
Manufacturing	179,691	179,362	117,830	113,441	0.2138	0.1904	0.1444	0.1441
Transportation and utilities	61,430	57,856	34,675	71,652	0.0731	0.0614	0.0425	0.0910
Wholesale trade	67,643	78,606	46,391	72,719	0.0805	0.0834	0.0568	0.0924
Retail trade	153,268	157,176	187,673	138,622	0.1824	0.1668	0.2300	0.1761
Finance, insurance, and real estate	72,523	68,927	66,320	85,452	0.0863	0.0732	0.0813	0.1086
Services	239,308	365,064	311,783	266,781	0.2848	0.3875	0.3821	0.3390
Non-classifiable establishments	2,744	759	748	805	0.0033	0.0008	0.0009	0.0010
Total area employment	840297	942078	816049	787021	1.0000	1.0000	1.0000	1.0000

The region with the lowest share for a given industry is identified as the minimum shares region, which is seen as a benchmark that is necessary to satisfy the local demand for that industry's goods and services. Any employment above that share is then identified as Basic employment because the corresponding portion of goods and services of this industry are exported. Using equation (14) we can calculate the employment shares by

Major Industrial Sector for our four areas. We can then identify the "minimum shares region" for each industry, which then allows us to identify those sectors that EAST is assumed to have some Basic sector employment. As seen in the table below, the region under investigation, EAST, is the minimum share region in only the Services, and for other industries West, South and North are the minimum share regions. Therefore, EAST is assumed to have some Basic Sector employment in all other sectors.

Using the following formula, we can now calculate the Basic sector employment and multiplier for each industrial sector except the Service sector because if a region has the minimum share for a given industry then it would be exporting no goods and services for that industry. In this formula to allocate employment to the Basic Sector we simply subtract the calculated "minimum share" from the local economy share and multiply that number by the total employment in that local economy.

$$BE_{ir} = \left[\left(\frac{E_{ir}}{E_r} \right) - \left(\frac{E_{is}}{E_s} \right)_{\min} \right] * E_r \quad (15)$$

Below table presents the Basic sector employment and multiplier for each major sector in EAST with the exception of the Services. By using the equation (7) we can calculate industrial and aggregated the regional Base Multiplier.

<i>MAJOR INDUSTRIAL SECTORS</i>	<i>East's share</i>	<i>Min Req.</i>	<i>East</i>	<i>East Total</i>	<i>Basic Employment</i>	<i>Basic Multiplier</i>
Agriculture, forest & fishing	0.0093	0.0032	7,847	840,297	5150	1.52
Mining	0.0008	0.0002	697	840,297	549	1.27
Construction	0.0656	0.0308	55,146	840,297	29284	1.88
Manufacturing	0.2138	0.1441	179,691	840,297	58571	3.07
Transportation and utilities	0.0731	0.0425	61,430	840,297	25725	2.39
Wholesale trade	0.0805	0.0568	67,643	840,297	19874	3.40
Retail trade	0.1824	0.1668	153,268	840,297	13073	11.72
Finance, insurance, and real estate	0.0863	0.0732	72,523	840,297	11043	6.57
Services	0.2848	0.2848	239,308	840,297	0	0.00
Non-classifiable establishments	0.0033	0.0008	2,744	840,297	2067	1.33
Total area employment	1.0000	1.0000	840297	840,297	165336	5.1

We used a very aggregated data (Major Industrial Sectors) and three comparison areas to keep our example simple. Therefore these results should be seen as representing a starting point for such an analysis to understand the mechanics of the technique. It is important to note that to perform this analysis more correctly two adjustments would be necessary due to two major criticisms:

- Very specific selection criteria for comparison areas should be identified and a large enough sample of comparison areas should be used. If over a certain number of cities or regions are included in the selected set, all regions will be exporting and none may be importing.
- The level of aggregation of the data is important. If the data used are defined in a fine level of detail, which seems an improvement, this may reduce local needs to near zero and make almost all production for export

At any rate, the method is not commonly used now. The location-quotient method remains the virtually sole survivor as a simple means of identifying export industries.

4.1.5. Differential multipliers: a multiple regression analysis

Another approach, which is much less known and used in estimating Basic sector employment and multipliers, is to fit a multiple regression equation to regional data. Simple economic-base techniques ignore the possibility that different industries may have different impacts on their community. The regression technique eliminates this simplifying assumption.

$$E = c + b_1 X_1 + b_2 X_2 + b_3 X_3, \dots + b_n X_n$$

where E represents employment, c is a constant, and the X terms are export employment, The multipliers are $1 + b_i$ for each sector.

This technique has not fallen into widespread use for several reasons:

- Its flexibility (in number of exogenous sectors) is limited by the number of observations available, otherwise the coefficients may not be significant;
- Determining the export content of industry employment remains a demanding chore;

- With the rise of desktop computing, input-output models are better sources of industry-specific multipliers and are similar in cost.

CONCLUDING REMARKS

A shift-share analysis is a "snap-shot" of 2 particular periods and may not give an entirely clear picture of the local, and national economies because the results are sensitive to the period chosen. Shift-share analysis, however, offers a simple, straightforward approach to separating out the national and industrial contributions from local or regional employment growth. As discussed earlier, the shift-share analysis is based on some assumptions, which were the sources of main criticisms of the model. To address these criticisms and to improve this simple approach there have been several extensions, and today the model is much more widely used. The location quotient and economic base models are also based on similar assumptions and have been addressed in extended versions of these models. Using these models in support of each other could provide a better picture of the local economy under investigation.

Analysts should pay attention to few key issues in order to get reliable results. First, the identification of the study area and reference area is very important because the definition of local area will determine the definition of the reference area. Second, a suitable measurement unit is needed i.e. employment, earning, sales, value added and number of establishment. The third important issue is the level of aggregation of the measurement unit used in the analysis because properly disaggregated data would increase the reliability of the results.

Finally, the investigation period should be selected carefully. To calculate change over time, data are needed for an earlier year and recent year. The base year may be two, five, ten, or any number of years earlier than the most recent year used in the analysis. If the economy went through a short period of decline at some point in the recent past it is probably best to select a year before that downturn. This should provide a more accurate picture of how industries in the region are doing. The best way to deal with this issue is to

run the analysis for consecutive years for a period, in which the base year and the current year are at the same point in a business cycle.

READING LIST

Shift-Share Analysis

- Arcelus, F.J. 1984. "An extension of shift-share analysis," *Growth and Change*, 151: 3-8
- Ashby, L.D. 1967. The shift-share analysis of regional growth: a reply, *The Southern Economic Journal*, 33: 577-81
- Ashby, L.D. 1970. "Changes in regional industrial structure: a comment," *Urban Studies*, v.7: 423-425
- Barff, R. A. and P. L. Knight 1988. "Dynamic shift-share analysis," *Growth and Change*, 19: 1-10
- Berzeg, K. 1984. "A note on statistical approaches to shift-share analysis", *Journal of Regional Science*, 242: 277-285
- Bishop, K.C. and C.E. Simpson, 1972. "Components of change analysis: problems of alternative approaches to industrial structure". *Regional Studies*, 61: pp59-68
- Brown, H.J. 1969. "Shift-share projections of regional growth: empirical test", *Journal of Regional Science*, 9: 1-18
- Buck, T.W. and M.H. Atkins 1976. "The impact of British regional policies on employment growth," *Oxford Economic Papers*, 28: 118-32
- Chalmers, J.A., 1971 "Measuring changes in regional industrial structure: A comment on Stilwell and Ashby," *Urban Studies*, 8: 289-292
- Daponte, B.O., 1996, "Race and Ethnicity During an Economic Transition: The Withdrawal of Puerto Rican Women from New York City's Labor Force, 1960-1980," *Regional Studies*, v.30 n.2:151-166
- Dawson, J. 1982. "Shift-share analysis: A bibliographic review of technique and applications," Monticello, IL: Vance Bibliographies
- Dinc, M. and Haynes, K. E., 1999 Source of Regional Inefficiency: An Integrated Shift-Share, Data Envelopment Analysis and Input-Output Approach, *The Annals of Regional Science* vol. 33:1-20,
- Dinc, M. and Haynes, K. E., 1998, International Trade and the Shift-share Analysis: A Specification Note, *Economic Development Quarterly*, v. 12 n.4,
- Dinc, M. and Haynes, K. E., 1998, International Trade and the Shift-share Analysis: A Specification Note, Rejoinder, *Economic Development Quarterly*, v. 12 n.4,
- Dinc, M., Haynes, K. E., Stough, R. R. and Yilmaz, S. 1998, Regional Universal Telecommunication Service Provision in the U.S.: Efficiency versus Penetration, *Telecommunication Policy*, v.22, n.6,
- Dinc, M., Haynes, K. E and Anderson W. P. 1998, Sources of Employment Change in Canadian Manufacturing Regions: A Multifactor / Shift-Share Approach, *Canadian Journal of Regional Science*, v.21 n.3
- Dinc, M. and Haynes, K. E., 1998, Regional Efficiency in Manufacturing Sector: A Shift-Share / Data Envelopment Analysis (DEA) Approach, *Economic Development Quarterly*, v.13 n.2:183-199,
- Dinc, M., Haynes, K. E. and Qiangsheng, L., 1998, Evaluation and Comparison of Shift-Share Extensions: A Survey Article, *Australasian Journal of Regional Studies*, v.4 n.2:275-302,

- Dinc, M., Haynes, K. E., and Yilmaz, S., (in press) Changes in U.S. Manufacturing Productivity: Infrastructure Implications, in Charlie Carlson (ed.) *New Approaches to Infrastructure and Economic Development*,
- Dinc, M., Haynes, K.E. and Paelinck, J.H.P. (forthcoming), Estimating Sources of Regional Manufacturing Productivity Using Shift-Share Extensions, in Gunvor Albihn (ed.) *Disappearing Distance - Towards a Networking Future*,
- Dinc, M. and Haynes, K. E., (forthcoming), European Integration and International Trade in Manufacturing: Productivity Considerations and Employment Consequences, in Green C. (ed.), *New Developments in the European Union*,
- Dinc, M. and Haynes, K. E., 2001, Change in Productivity in the Southern U.S.: Implications for Regional Growth Theory, in Stough, R. R. et al (eds.) *Theories of Endogenous Regional Growth*,
- Dunn, E.S., 1960. "A statistical analytical technique for regional analysis", *Papers, Regional Science Association*, 6: 97-112
- Emmerson, Richard, R. Ramanathan, and Wolfhaard Ramm, 1975. "On the analysis of regional growth patterns", *Journal of Regional Science*, 15: 17-28
- Esteban-Marquillas, J.M., 1972. "A reinterpretation of shift-share analysis", *Regional and Urban Economics*, 23: 249-55
- Haynes, K. E. and Z.B. Machunda 1987 "Considerations in extending shift-share analysis: a note", *Growth and Change*, Spring: 69-79
- Haynes, K.E. and Z.B. Machunda 1988. "Decomposition of change in spatial employment concentration: an information-theoretic extension of shift-share analysis", *Papers of the Regional Science Association*, 65: 101-113
- Haynes, K.E. and Dinc, M., 1997 "Productivity Change in Manufacturing Regions: A Multifactor / Shift-Share Approach," *Growth and Change* v.28 Spring:150-70
- Herzog, H.W.Jr. and R.J. Olsen, 1979 "Shift-share analysis revisited: the allocation effect and the stability of regional structure, a reply", *Journal of Regional Science*, 193: 393-95
- Houston, D.B. 1967. "The shift-share analysis of regional growth: a critique", *The Southern Economic Journal*, 33: 577-81
- Ishikawa, Y., 1992. "The 1970s migration turnaround in Japan revisited: a shift-share approach", *Papers in Regional Science*, 712, April: 152-174
- Keil, S.R., 1992, "On the Value of Homotheticity in the Shift-Share Framework," *Growth and Change*, v.23 n.4:469-93.
- Klaassen, L.H. and J.H.P. Paelinck, 1972. "Asymmetry in shift-share analysis", *Regional Science and Urban Economics*, 23: 577-81
- Knudsen, D.C. and R. Barff, 1991. "Shift-share analysis as a linear model", *Environment and Planning A*, Vol 23: 421-431
- Kurre, J.K. and B.R. Weller 1989. " Forecasting the local economy, using time-series and shift-share techniques", *Environment and Planning A*, 21June: 753-70
- Ledebur, L.C. and Moomaw, R.L., 1983, "A Shift-Share Analysis of Regional Labor Productivity in Manufacturing," *Growth and Change*, v.14 n.1:2-9.
- Markusen, A.R., Noponen, H. and Driessen, K., 1991, "International Trade, Productivity, and U.S. Job Growth: A shift-Share Interpretation," *International Regional Science Review*, v.14 n.1:15-39.

- McDonough, C.C. and Sihag, B.S., 1991 "The Incorporation of Multiple Bases into Shift-Share Analysis," *Growth and Change*, v.22 n1:1-9.
- Nojonen, H., Markusen A. and Driessen, K., 1997, "Trade and American Cities: Who Has the Comparative Advantage?" *Economic Development Quarterly*, v.11 n.1:67-87.
- Perloff, H.S. and E.S. Dunn, Jr., E.E. Lampard and R.F. Muth 1960. *Regions, Resources and Economic Growth*, Lincoln, Nebraska: University of Nebraska Press
- Plane, D.A. 1989. "Population migration and economic restructuring in the United States." *International Regional Science Review*, v.1 n.23:263-280
- Qiangsheng, L. Haynes, K.E. and Dinc, M., 1997, "An Extended and Integrated Approach to Shift-Share: Decomposition Analyses of the Washington Metropolitan Economy," *Applied Geographic Studies*, v.1 n.4:233-252.
- Richardson, H.W., 1978. "The state of regional economics: a survey article", *International Regional Science Review*, 31: 1-48
- Rigby, D. L. and W. P. Anderson, 1993. "Employment change, growth and productivity in Canadian manufacturing: an extension and application of shift-share analysis". *Canadian Journal of Regional Science/Revue canadienne des sciences regionales*, XVI: Spring/ printemps, 69-88
- Sakashita, N. 1973. "An axiomatic approach to shift-share analysis", *Regional and Urban Economics*, 33: 263-72
- Smith, S.A. 1991. "Shift-share analysis of change in occupational sex composition", *Social Science Research*, 20: 437-453
- Sihag, Balbir S. and C.C. McDonough 1989. "Shift-share analysis: the international dimension", *Growth and Change*, Summer: pp88-88
- Stevens, B.H. and C.L. Moore 1980. "A critical review of the literature on shift-share as a forecasting technique", *Journal of Regional science*, 204: 419-37
- Stilwell, F.G.B., 1969. "Regional growth and structural adaptation", *Urban Studies*, 6: 162-178
- Stokes, H.K., 1974 "Shift-share once again", *Regional and Urban Economics*, 4: 57-60
- Sui, D.Z., 1995 "Spatial Economic Impacts of New Town Development in Hong Kong: A GIS-based Shift-share Analysis," *Socio-Economic Planning Science*, v.29 n.3:227-243.
- Tervo, H. and P. Okko 1983. "A note on shift-share analysis as a method of estimating the employment effects of regional economic policy", *Journal of Regional Science*, v. 23, n.1: 115-121
- Theil, H., and R. Gosh. 1980. "A comparison of shift-share and the RAS adjustment", *Regional Science and Urban Economics*, 10: 175-80
- Toft, G.S. and Stough, R.R., 1986, *Transportation Employment as a Source of Regional Economic Growth: A Shift-Share Approach*, Transportation Research Board, National Research Council, Washington, D.C.
- Waldinger, R., 1996, "Still the Promised City?" Harvard University Press, Cambridge, MA
- Weeden, R. 1974. "Regional rates of growth of employment: an analysis of variance treatment", *National Institute of Economic and Social Research Regional Papers*, No. 3. Cambridge UK

Wright, R. and Ellis, Mark, 1996, "Immigrants and the Changing Racial/Ethnic Division of Labor in New York City, 1970-1990," *Urban Geography*, v.17 n.4:317-353

Economic Base and Location quotient

- Andrews, Richard B. 1953. "Mechanics of the Urban Economic Base: Historical Development of the Base Concept." *Land Economics* 29: 161-167.
- Archer, B.H. 1976. "The Anatomy of a Multiplier." *Regional Studies* 10: 71-77.
- Blumenfeld, Hans. 1955. "The Economic Base of a Community." *Journal of the American Institute of Planners* 21: 114:132.
- Gibson, Lay James, and Marshall A. Worden. 1981. "Estimating the Economic Base Multiplier: A Test of Alternative Procedures." *Economic Geography* 57: 146-159.
- Klosterman, Richard E. 1990. *Community and Analysis Planning Techniques*. Rowman and Littlefield Publishers, Inc. Savage, Maryland. See Chapters 9-13.
- Klosterman, Richard E., Richard K. Brail, and Earl G. Bossard. 1993. *Spreadsheet Models for Urban and Regional Analysis*.
- Lane, Theodore. 1966. "The Urban Base Multiplier: An Evaluation of the State of the Art." *Land Economics* 42: 339-347.
- Martin, Randolph C. and Harry W. Miley, Jr. 1983. "The Stability of Economic Base Multipliers: Some Empirical Evidence." *Review of Regional Studies* 13: 18-27.
- Tiebout, Charles M. 1956a. "Exports and Regional Growth." *Journal of Political Economy* 64: 160-164.
- Tiebout, Charles M. 1956a. "The Urban Economic Base Reconsidered." *Land Economics* 31: 95-99.
- Ullman, Edward L., Michael H. Dacey, and Harold Brodsky. 1971. *The Economic Base of American Cities*, rev. ed. Seattle: University of Washington Press.
- Williamson, Robert B. 1975. "Regional Growth: Predictive Power of the Export Base Theory." *Growth and Change* 6: 3-10.

DALLAS, TEXAS SHIFT-SHARE ANALYSIS

<http://socrates.cdr.state.tx.us/iSocrates/ShShare/shshare.asp>

Region and Time Period

For this particular analysis, the State of Texas is divided into 28 sub-regions called Local Workforce Development Areas. The shift-share analysis examines a specific workforce region over a historical period of time. This analysis examines the Dallas region of Texas. Our base time frame is the 1st quarter of 1993 and the terminal time frame is the 4th quarter of 1996.

SIC	Industry Title	Employment				% Chg Loc Emp	Nat'l Share	Indust Mix	Local Share	Abs Chg
		Local 1st Qtr 1993	Local 4th Qtr 1996	National 1st Qtr 1993	National 4th Qtr 1996					
Greatest Likelihood for Potential Job Opportunities										
73	Business Services	103471	149880	5506000	7625000	45	12117	27704	6588	46409
17	Special Trade Contractors	26160	42151	2539000	3438000	61	3064	6199	6728	15991
58	Eating & Drinking Places	68499	82634	6560000	7543000	21	8022	2243	3871	14135
87	Engineering/Management Services	32502	46055	2525000	2888000	42	3806	866	8880	13553
45	Transportation by Air	11039	19444	967000	1148000	76	1293	773	6339	8405
61	Nondepository Institutions	13182	18128	435000	548000	38	1544	1881	1522	4946
15	General Bldg Contractors	8141	12971	1025000	1280000	59	953	1072	2805	4830
55	Auto Dealers & Service Stations	17560	21483	1968000	2285000	22	2056	772	1094	3923
57	Furniture/Homefurnishings Stores	9186	12709	808000	1040000	38	1076	1562	885	3523
78	Motion Pictures	7215	10695	404000	536000	48	845	1512	1123	3480
75	Auto Repair Services & Parking	12141	14598	914000	1098000	20	1422	1022	13	2457
79	Amusement & Recreation Services	9268	11533	1139000	1349000	24	1085	623	556	2265
62	Security & Commodity Brokers	6547	8485	455000	571000	30	767	902	269	1938
07	Agricultural Services	5216	6968	955000	1191000	34	611	678	463	1752
47	Transportation Services	5129	6437	346000	427000	26	601	600	107	1308
16	General Contractors, Ex Bldg	4566	5823	613000	744000	28	535	441	281	1257
52	Bldg Materials/Garden Supplies	5117	6353	739000	909000	24	599	578	59	1236
24	Lumber & Wood Products	4229	5316	689000	784000	26	495	88	504	1087
41	Local & Interurban Transit	1985	2528	385000	460000	27	232	154	156	543
84	Museums/Botanical/Zoological Garden	497	644	69000	86000	30	58	64	25	147
Potential Comparative Advantage										
48	Communications	24946	39856	1259000	1378000	60	2921	-564	12552	14910
80	Health Services	79824	92827	8660000	9599000	16	9348	-693	4348	13003
36	Electronic & Other Electrical Equip	41119	48166	1523000	1676000	17	4815	-685	2916	7047
93	Local Government, Ex Education/Hosp	30982	33408	11638000	12388000	8	3628	-1632	429	2426
35	Industrial Machinery & Equip	12673	14598	1928000	2127000	15	1484	-176	617	1925
34	Fabricated Metal Products	12706	14578	1330000	1466000	15	1488	-189	573	1872
27	Printing & Publishing	17382	19125	1511000	1551000	10	2036	-1575	1283	1743
76	Misc Repair Services	3300	5027	354000	373000	52	386	-209	1550	1727
81	Legal Services	14329	15694	917000	933000	10	1678	-1428	1115	1365
64	Insurance Agts, Brokers, & Services	11711	12877	662000	716000	10	1371	-416	211	1166
39	Misc Mfg Industries	2384	3385	374000	389000	42	279	-184	905	1001
30	Rubber & Misc Plastics Products	5335	6166	899000	991000	16	625	-79	285	831
23	Apparel & Textile Products	8003	8784	996000	846000	10	937	-2142	1986	781
28	Chemicals & Allied Products	7170	7855	1080000	1031000	10	840	-1165	1010	685
25	Furniture & Fixtures	1948	2594	483000	510000	33	228	-119	537	646
67	Holding & Other Investment Offices	3862	4125	220000	212000	7	452	-593	403	263
92	State Government, Ex Education/Hosp	4575	4783	4581000	4660000	5	536	-457	129	208
44	Water Transportation	94	146	162000	172000	55	11	-5	46	52
22	Textile Mill Products	326	355	673000	621000	9	38	-63	54	29
31	Leather & Leather Products	83	94	118000	94000	13	10	-27	28	11

Less Likely to Offer Employment Opportunity

51	Wholesale Trade, Nondurable Goods	35948	37561	2513000	2700000	4	4210	-1535	-1062	1613
70	Hotels & Other Lodging Places	19185	20354	1518000	1661000	6	2247	-439	-638	1169
65	Real Estate	27844	28604	1271000	1383000	3	3261	-807	-1694	760
86	Membership Organizations	6250	6498	2012000	2219000	4	732	-89	-395	248
33	Primary Metal Industries	1869	1939	682000	711000	4	219	-139	-9	70
32	Stone, Clay, & Glass	4755	4757	502000	545000	0	557	-150	-405	2
01	Agriculture Production, Crops/Lives	296	276	2126000	2235000	-7	35	-19	-35	-20
56	Apparel & Accessories Stores	12571	12483	1108000	1202000	-1	1472	-406	-1154	-88
14	Nonmetallic Minerals, Ex Fuels	323	203	96000	105000	-37	38	-8	-150	-120
46	Pipe Lines, Ex Natural Gas	278	53	19000	14000	-81	33	-106	-152	-225
72	Personal Services	12841	12570	1192000	1167000	-2	1504	-1773	-2	-271
63	Insurance Carriers	24917	24575	1511000	1522000	-1	2918	-2737	-523	-342
26	Paper & Allied Products	6275	5776	689000	686000	-8	735	-762	-472	-499
20	Food & Kindred Products	13530	12196	1626000	1673000	-10	1584	-1193	-1725	-1334
60	Depository Institutions	24188	22252	2079000	2018000	-8	2833	-3542	-1226	-1936
38	Instruments & Related Products	14021	11425	907000	860000	-19	1642	-2369	-1869	-2596
37	Transportation Equip	17241	13623	1775000	1815000	-21	2019	-1631	-4007	-3618
91	Federal Government, Ex Postal Servi	20133	15907	2926000	2757000	-21	2358	-3521	-3063	-4226
13	Oil & Gas Extract ion	15688	10253	338000	329000	-35	1837	-2255	-5017	-5435

Indeterminate / No Defined Pattern

50	Wholesale Trade, Durable Goods	72006	81324	3390000	3858000	13	8433	1508	-623	9318
82	Educational Services	66144	73491	1771000	2173000	11	7746	7268	-7667	7347
59	Misc Retail Stores, Total	26121	31245	2402000	2955000	20	3059	2955	-890	5124
53	General Merchandise Stores	26036	28924	2391000	3011000	11	3049	3702	-3863	2888
42	Trucking & Warehousing	25993	28261	1395000	1649000	9	3044	1689	-2465	2268
83	Social Services	11277	13243	2046000	2457000	17	1321	945	-299	1966
54	Food Stores	27451	28121	3157000	3532000	2	3215	46	-2591	670
49	Utilities & Sanitary Services	7716	7705	941000	873000	0	904	-1461	547	-11
29	Petroleum & Coal Products	1091	1067	149000	139000	-2	128	-201	49	-24
89	Services, NEC	609	581	41000	47000	-5	71	18	-117	-28

Summary:	1156999	1354545	110982000	123979000	Total National % Change: 11.71
-----------------	----------------	----------------	------------------	------------------	---------------------------------------

Analysis

From the analysis of the Dallas region, one can observe that certain industries display the greatest employment potential. Other industries display positive growth and may exhibit some local potential comparative advantage, but not quite as high as industries in the first group. Still other industries are less promising in terms of employment growth, they display negative employment growth, or they display no definite growth pattern at all.

The first step is to identify those industries with very large positive or negative absolute changes. It is important to remember that if an industry is declining nationally, the local industry could still show a positive local share effect if it were declining at a slower rate than the industry nationally. Ideally, you should identify those industries with both a positive industry mix effect and a positive local share. These will be your industries with the greatest likelihood for potential job opportunities.

Secondly, the analyst should look at the local share column. This column will give the first indication as to whether the local area is performing well or poorly and will help identify industry sectors in which the local area may have comparative advantage. Where the local share is larger than the industrial mix, and both figures are positive, this is an indication that the local area may have some comparative advantage.

As mentioned previously, it is necessary to research the actual cause of the local comparative advantage. You will also want to identify what factors the local area may not be taking advantage of that allow an

industry nationwide to outperform the local area. Similarly, where the local area shows a positive local share and a negative industry mix, you would want to identify why the local area industry was able to prosper despite poor national industry performance.

Greatest Likelihood for Potential Job Opportunities

From an industrial perspective, certain industries within the Dallas region exhibited high employment potential between the 1st quarter 1993 and the 4th quarter 1996. That is, from our analysis, these industries displayed a positive industry mix and a positive local share during this time period. Business Services (SIC 73) displayed the largest change in absolute employment with a gain of 46,409. Special Trade Contractors (SIC 17) followed with a gain of 15,991 jobs. Eating & Drinking Places (SIC 58) followed closely in absolute employment change with a gain of 14,135, followed by Engineering/Management Services (SIC 87) with 13,553 and Transportation by Air (SIC 45) with 8,405. Also significant for the Dallas region during this time period were Non-depository Institutions (SIC 61), General Bldg Contractors (SIC 15), Auto Dealers & Service Stations (SIC 55), Furniture/Home furnishings Stores (SIC 57), Motion Pictures (SIC 78), Auto Repair Services & Parking (SIC 75), Amusement & Recreation Services (SIC 79), Security & Commodity Brokers (SIC 62), Agricultural Services (SIC 07), Transportation Services (SIC 47), General Contractors, Ex Bldg (SIC 16), Bldg Materials/Garden Supplies (SIC 52), Lumber & Wood Products (SIC 24), Local & Interurban Transit (SIC 41), and Museums/Botanical/Zoological Garden(SIC 84).

Total employment for the Dallas Workforce Development Region grew by 197,546 jobs during the examined time period, a change of 17.07%.

Nationally, total industrial employment for the United States grew by 12,997,000 jobs during the examined time period, a change of 11.71%.

Potential Comparative Advantage

This second group of industries displayed a positive local share with a negative industrial mix during the examined time period. This is an indication that the local area may have some comparative advantage in these industries, despite sub par national performance.

THE ECONOMIC IMPACT OF TECHNOLOGY-BASED INDUSTRIES IN WASHINGTON STATE IN 1997

<http://www.technology-alliance.com/publications/tech97.html>

Defining Technology-Based Industry

A measure of R&D employment was selected as the criterion for selecting industries to be included in the 1997 Technology Alliance economic impact study. The Washington State Department of Employment Security (ESD) developed a list of industries showing the proportion of employment in research and development occupations. Industries with 10% or greater employment in these occupations were included in that study.

Current Employment

In 1997, employment in technology-based industries totaled 266,451 in Washington State, or 10.4% of the State's 2,550,000 total covered employment base. Manufacturing industries comprised 60.7% of these technology-based jobs, with aerospace being by far the largest single category, representing nearly 40% of total jobs. The 56,000 non-aerospace manufacturing jobs are spread among a wide variety of chemicals, petroleum, machinery, electrical equipment, instruments, and motor vehicles manufacturing sectors, with no single one of these other sectors rivaling aerospace in importance. The technology sector features two large service industries, software and other computer services, and engineering, commercial research, and consulting services. Biotechnology industries in Washington state can be split into service and manufacturing components with drug and medical equipment manufacturing combined with research-related employment to constitute the entire biotechnology sector.

Concentration of Technology-Based Industries in Washington State

Washington State's share of technology-based employment has increased significantly over the past decade. In 1985, its relative share of private sector technology industries was 10% above the national average; by 1995, this share had increased to 46% above the national average. Location quotients can be used to measure statewide technology sector activity. The location quotient is a simple measure of the relative concentration of a particular industry in a certain region compared to the concentration of that industry for the nation as a whole. A value less than 1.0 indicates that an industry is underrepresented in a state or region, a value over 1.0 indicates a higher level of concentration than the nation, and a value around 1.0 indicates that an industry within the state or region is similar to the concentration of that industry within the national economy.

The Results

Technology-based industries have grown rapidly over the past twenty years, increasing from 93,000 private sector jobs in 1974 to 220,000 private sector jobs in 1995, an increase of 137%, which brings **total technology-based employment to 266,451 positions**. These 266,451 positions create indirectly 628,917 additional jobs for a total jobs impact of 895,368 or 35% of state employment.

The industries included in this study have higher than average impacts on the state economy, creating **3.36 jobs for each technology-based job**. This high impact stems from the higher than average wage payments in these industries; their average labor income per job was \$52,167, which compares to a statewide average of \$29,447.

Technology-based industries are now responsible for **one third of total employment** in Washington state, making them the largest industry in the State's economy. Natural resource-based industries, such as agriculture and food products, and forest products, continue to be very important, particularly in more rural parts of Washington State.

Technology-based industries were defined in this study as those Standard Industrial Classification Codes with at least 10% of their employment in occupations defined by the National Science Foundation as

research and development related. (Using this definition, this study finds that 895,000 jobs, some **35% percent of Washington's aggregate employment**, are supported by technology-based business activity.) Technology-based industries also are strong contributors to the economic base of the state, as over **76% of their sales are made out-of-state**. This compares with an economy-wide average of 40% out-of-state sales.

Washington state has a **larger share of employment in technology-based industries** than the nation as a whole. In 1997, this state had 35% more employment in these industries than the national average.

STRATEGIC ECONOMIC PLAN: TUCSON ECONOMIC DEVELOPMENT

<http://www.futurewest.com/greatertucson/section3.htm>

Tucson Economic Trends Targeted economic growth equates to better standards of living for the citizens, with good job opportunities and higher wages, a superlative infrastructure, better government services, and excellent recreation opportunities. The focus of targeted economic development should be to maintain and attract those firms offering relatively high-paying jobs. However, while this does not necessarily mean attracting a certain industry sub-sector--manufacturing for instance--a relatively high level of disposable income translates into a higher level of savings and consumption in Tucson, and ultimately a higher income multiplier effect.

Since 1980, Greater Tucson has seen a dramatic shift in the proportion of services jobs to manufacturing jobs. *In 1980 there were nearly 2 manufacturing jobs to every 3 service jobs. Today, the two sectors have diverged to approximately 1 manufacturing job for every 3 service jobs.* This trend mirrors the trend in the national economy, and is expected to continue.

However, the disparity in average earnings between manufacturing and services translates into a lower standard of living in Tucson. In 1993, an average Tucson manufacturing employee earned approximately \$17 per hour; whereas, an average services employee earned nearly \$7 less per hour. However, to truly target economic development, one must take a closer look at the composition of industry sectors. Nearly one-third of the Pima County workforce is occupied within the services segment. Tucson's service industry employees represent a broad number of disciplines including business, legal services, recreation, health care, and computer and data processing, among many others. Many of the occupations in this industry are relatively high-paid and require highly-educated or certified people; however, the average level of compensation in the services industry is relatively low because of an offsetting number of relatively low-paid employees.

Jobs in the service industry have long been decried as economically inferior to jobs in the manufacturing sector. In the past, a growing manufacturing job level has been considered an indicator of economic vitality; however, because of the exportation of many manufacturing jobs overseas or to developing countries, the composition of manufacturing employment has been changing from assembly and production operation to more technical and professional operations.

The computer industry is a good example of this --it employs a high percentage of technical personnel relative to production personnel. Manufacturing, as was once known, is almost a thing of the past. Therefore, another important goal is to attract those firms whose industry and income profile match the long term goals of the city. Tucson, for instance, is evolving into a community with a base of scientific and research industries. The efforts to attract new industry to Tucson should leverage this strength.

Tucson Industrial Profile

Employment in the Greater Tucson Metropolitan Area is broken into seven groupings, which include the following (see Figure 6):

- Services
- Trade (Wholesale and Retail)
- Government (Military, Federal Civilian, State and Local)
- Manufacturing
- Construction
- FIRE (Finance, Insurance, and Real Estate)
- TCPU (Transportation, Communications, Public Utilities).

Mining is not shown because of its small share of total employment.

The employment distribution in Tucson is concentrated in the services and trade sectors. In 1993, the Greater Tucson Metropolitan Area employed approximately 275,000 people. Total services jobs comprise nearly one-third of the 1993 total wage and salary employment in Tucson; trade jobs account for approximately one-fourth of the total employment. Together the two sectors account for approximately

54.0 percent of Tucson's total labor force. The number of government jobs is nearly equal to the number of trade jobs in 1993. Manufacturing jobs represent less than ten percent of the total employment in 1993.

The Pima County average earnings per employee are slightly more than \$22,500 per year. Industry groupings below the average wage level include Retail Trade (\$13,850), FIRE (\$15,077), Services (\$20,101), and Military (\$21,609). Groupings above the average compensation level include Construction (\$23,144), Wholesale Trade (\$25,868), State and Local Government (\$26,917), TCPU (\$31,410), Manufacturing (\$34,035), Federal Civilian Government (\$37,027), and Mining (\$44,328).

Pima County Total Services employment in 1993 was approximately 87,000. Health and business services accounted for nearly half of the total 1993 employment in Services. Three of the profiled Services industries compensated employees above the average compensation level in Pima County. The remaining eight industries were substantially lower than the average Pima County level of pay.

In contrast to the Services sector, compensation in the majority of the Pima County Manufacturing industries was above the average level of compensation in Pima County (see Figure 10). The employment distribution for the Manufacturing sector is shown in Figure 11.

The trade sector, when broken into wholesale and retail components, reveals that retail trade jobs accounted for approximately 86.0 percent of the total trade jobs. The average compensation for retail trade is under \$15,000 per year; whereas, wholesale trade workers make over \$25,000 per year.

Employment in Tucson tends to be most concentrated in relatively low-paying jobs, and least concentrated in high-paying jobs. The average compensation for industries that have location quotients above 1.0 (relatively intensive regional employment) is lower than the Pima County average wage. Similarly, the average compensation for industries that have location quotients below 1.0 (relatively non-intensive regional employment) is higher than the Pima County average compensation.

The average compensation in Tucson is roughly 80.0 percent of United States wages. There are several factors that contribute to the lower wage structure in Tucson including:

- Proximity to Mexico
- Large part-time student and retiree workforce
- Status as an open-shop region (low unionization)
- Sunshine discount.

Business Expansion/Retention Target Industries

In order for compensation to rise appreciably in the Tucson area, a higher concentration of employment in high-wage industries is required. Referring to Table C in Appendix A, wages in Tucson tend to be the highest in industries such as mining, manufacturing, wholesale trade and durable goods, health care, and professional services.

Based on their importance to the local economy and their relatively high wages, this study recommends that the following industries be targeted for expansion and retention:

- Defense
- Aerospace
- General Manufacturing
- GTSPED High-Tech Industry Clusters

The **defense** industry in Tucson consists of Davis Monthan Air Force Base and several defense-related contractors. While the defense industry in general has been contracting due to federal government funding cuts, it is still a very important sector locally.

Davis Monthan Air Force Base, for example, employs about 7,500 people and brings in hundreds of millions of dollars per year into the local economy. It is estimated that the closure of Davis Monthan would result in the loss of around 11,300 local jobs and the reduction of local sales by almost half a billion dollars

per year, according to studies done by the University of Arizona. Tucson should continue its efforts to protect the base from closure through its plans to extend the runway and keep the base open.

Similarly, local defense contractors contribute high-wage jobs to the local economy and generate a significant amount of export revenue for the region; however, the market for defense-related production is shrinking due to the collapse of the former Soviet Union and pressure on the U.S. Congress to control the federal budget deficit. Tucson should continue to assist these firms by offering programs to convert from defense to non-defense production and to assist them in developing international markets for their products.

The local **aerospace** industry features high-wage, high-skilled jobs. However, the aerospace industry throughout the United States (with the exception of commercial space industries) has been experiencing declining employment over the last decade due to defense cut-backs. The local aerospace industry could benefit from economic development programs which are designed to assist in conversion from defense to non-defense production. Local aerospace firms would also benefit from programs offering employee training and workforce development. These programs are intended to increase labor productivity and manage production costs, making local firms more competitive in global markets.

General manufacturing is targeted for regional business expansion and retention efforts because of its high wages and exportable products. Wages in the manufacturing sector in Tucson tend to be higher than the average wage and considerably higher than wages for services and retail trade. With a Pima County location quotient of approximately 57.0 percent, manufacturing employment in Tucson is roughly half as intensive as it is in the U.S. as a whole. To successfully raise average wages in the area, it is critical for Tucson to retain and increase its existing manufacturing base, as well as recruit additional firms in target industries.

GTSPED high-tech clusters have been identified as industries that are relatively “clean”, offer high wages, are export-driven, and have growing global markets. The community should target these industries in its business expansion and retention programs because of the relative ease of growing local firms versus recruiting firms from outside.

Two major Tucson industries that were not included as targets for business expansion and retention are mining and tourism.

Mining is a high wage industry that has a substantial economic impact on the region. The rationale for not targeting mining is that it is essentially a captive industry. Mines are located within the region because of the existence of copper ore. There is little that the community can do to assist the industry’s expansion or contraction plans. The industry is driven primarily by conditions in world copper markets. GTEC, however, will continue to target higher paying mining support industries.

Tourism has a major economic impact on Tucson. Tourism and retirement industries inject millions of dollars annually into the Tucson economy. They also promote a favorable image of the community to other parts of the country. However, tourism-related businesses tend to be service-oriented and have wages lower than the Pima County average. For these reasons, tourism and retirement industries are not targeted for business expansion and retention efforts.

The community has supported and should continue to support activities such as the Copper Bowl, the baseball stadium and the attraction of business and other conventions. Moreover, the community should continue to provide adequate funding for important activities of organizations such as the Metropolitan Tucson Convention and Visitors Bureau. These activities should be funded from tourism-related areas of local budgets, including the Bed Tax, and not be considered economic development targets if the community truly intends to raise the overall compensation levels of its citizens.

THE ECONOMIC BASE OF EUREKA COUNTY

http://www.ag.unr.edu/uced/reports/technicalreports/9798reports/9798_05rpt.pdf

The economic base of a county refers to the relative size of its industries. A county is said to have a diversified economic base if several industries are relatively large. Conversely, if one or a few industries dominate a local economy, the economy is said to have a concentrated economic base. There are two techniques used to measure economic base and changes in economic base. These are location quotient analysis and shift-share analysis.

Location Quotient Analysis

The degree of concentration of Eureka County industries is determined by calculating location quotients for individual economic sectors. Location quotients indicate the economic importance of each regional industry relative to the same industry at the national level. Location quotients usually use employment as an indicator of an industry's size and importance. The primary focus of location quotients is to identify the industries, which are either more important or less important locally than nationally. The broader the economic base, that is, the higher the location quotients, the more stable the economy of a community. On the other hand, very low location quotients represent industries that are largely underdeveloped and may offer an opportunity for future development. An industry's location quotient is the ratio of the industry's share of employment in the county to the industry's share of employment in the nation.

Results of Location Quotient Analysis

Location quotients shown in Table 1 were derived from employment levels in each economic sector at county and national levels from the U.S. Department of Commerce, Regional Economic Information System, for 1990 and 1995. Given the interpretation of location quotients, economic sectors in Eureka County can be classified as export sectors (that is, they market much of their output outside the county in which they are located) or import industries (that is, a large portion of the demand for goods and services is satisfied by producers outside the county).

The location quotient analysis for Eureka County's economic base for 1990 and 1995 indicates that the county is highly dependent on Mining, and Agricultural Sectors. The Mining Sector had the highest location quotient value of 143.92 in 1995 showing the importance of the Mining Sector to the local economy. Also, because of disclosure problems the Agriculture Services; Manufacturing; Transportation Communication and Public Utilities; Wholesale Trade; and Finance, Insurance and Real Estate Sectors were aggregated into a single sector.

Table 1. Location Quotient Analysis Results for Eureka County, 1990 and 1995

Economic Sector	Location Quotient 1990	Location Quotient 1995
Agriculture	1.48	1.18
Mining	114.69	143.92
Construction	0.35	1.20
Retail Trade	0.11	0.12
Services	0.08	0.05
Federal, Civilian and Military	0.06	0.04
State Government	0.19	0.20
Local Government	0.42	0.55
Aggregate	0.04	0.04

Because of disclosure problems the Agricultural Services; Manufacturing; Transportation Communication and Public Utilities; Wholesale Trade; and Finance, Insurance and Real Estate Sectors were aggregated into one sector denoted as the Aggregate Sector.

From Table 1, Eureka County imports much of its goods and services. The location quotient analysis can be used to target new industries or businesses for the county and to develop economic strategies for the future. One strategy, for example, might be to encourage the location of input suppliers for the mining and/or

agricultural sectors. Also strategies to strengthen the local retail sector to reduce retail sales leakages may be another appropriate economic development strategy.

The Changing Economic Base of Eureka County

The location quotient results indicate the nature of the area's economy for a specific time period. Of additional interest is the change occurring in the county's economic base. Shift-share analysis is performed to measure these changes. Shift-share analysis, like location quotients, is a measure of a county's economic condition relative to other communities and to the nation as a whole. The data used in this analysis are the same as that used for the location quotient analysis. For this study, the shift in economic base was studied from 1980 to 1990 and 1990 to 1995.

The purpose of shift-share analysis is to determine the county's competitiveness and changing employment patterns in the industrial market place. Shift-share analysis assumes that there are three components to changes in employment: national growth, industrial mix and competitive share.

National Growth Component

The sum of employment in all industries in all communities makes up national employment. One would expect that if a community's economy was maintaining its relative competitiveness, changes in the level of national employment would be reflected in proportionately equal changes in the local employment. The calculation of the national growth component, therefore, measures how much of the local employment change is due to the national growth trend.

Industrial Mix Component

On a national level, each industry grows or declines at some rate, at least partially independent of the rate of growth in the national economy. A local economy's performance will depend, on its mix of industries, that is, on whether its economic base is concentrated in faster or slower growing industries. The industrial mix calculation indicates the expected growth in local industries if they grow at the same rate as their national counterparts. The expected local share of the particular industry is determined using the following equation:

Competitive Share Component

A local industry's employment grows or declines for a number of reasons, including changes in the national employment level, changes in employment by the same industry at the national level, and changes in local conditions. After the first two components have been calculated, the residual change, if any, is attributed to changes in the competitiveness of the local industry. The competitive share component measures this latter factor in employment change.

Results of Shift-Share Analysis

A local industry's employment grows or declines for a number of reasons, including changes in the national employment level, changes in employment by the same industry at the national level, and changes in local conditions. After the national component and industrial mix component have been calculated, the residual change, if any, is attributed to changes in the competitiveness of the local industry. Tables 12 and 13 show the results of the shift-share analysis for Eureka County for the periods 1980 to 1990 and 1990 to 1995.

From Table 2, Eureka County overall employment increased by 3,242 from 1980 to 1990. The Mining Sector was by far the leading economic sector in growth with the Mining Sector accounting for approximately ninety-nine percent of total county growth from 1980 to 1990. Nationally, mining lost employment from 1980 to 1990. However, the competitive advantage of the Mining Sector in Eureka County provided for most of the overall employment growth in Eureka County.

For the Retail Sector, national and industrial mix growth rates contributed to positive growth in this local sector. However, the negative competitive share contributed to overall decline in retail trade. An economic development strategy would be to investigate the causes for this negative competitive share and if possible correct the non-competitiveness of this sector.

From Table 3, overall employment in Eureka County increased by 624 jobs from 1990 to 1994. The Mining and Construction Sectors contributed most to growth in Eureka County. This is due to expanded mining operations and construction related to mining operations and housing. As opposed to Table 2, the Retail Trade Sector realized employment growth during 1990 to 1995 and had a positive competitive share during this five-year period. However, the Service Sector realized employment loss from 1990 to 1995 and had the largest negative Competitive Share of all economic sectors in Eureka County.

Overall, Eureka County realized employment growth between 1980 and 1990 and from 1990 to 1995. National growth component impacted Eureka County employment positively for these two study periods. For both time periods, the Mining Sector was a major contributor to county employment growth. Analyzing results of both the location quotients and shift-share analysis, Eureka County is highly dependent on the Mining Sector. By diversifying the economic base of Eureka County, it may be possible to lower cyclical swings in the local economy. However, in pursuing the goal of economic diversification, the goal of economic growth must also be addressed.

Table 2. Shift-Share Analysis Results for Eureka County, 1980-1995

Economic Sector	National Component	Industrial Mix	Competitive Share	Total
Agriculture	44	78	25	59
Mining	80	146	3,278	3,212
Retail	23	6	-62	-33
Services	16	23	-21	18
Federal Government, Military and Civilian	-2	-1	-1	0
State Government	0	0	23	23
Local Government	22	-8	21	35
Aggregate	20	-10	36	46
TOTAL	207	-214	3,249	3,242

Public Utilities; Wholesale Trade; and Finance, Insurance and Real Estate Sectors were aggregated into one sector denoted as the Aggregate Sector.

Table 3. Shift-Share Analysis Results for Eureka County, 1990 – 1995

Economic Sector	National Component	Industrial Mix	Competitive Share	Total
Agriculture	34	-40	40	-34
Mining	874	-1,246	763	391
Construction	19	-19	197	197
Retail Trade	18	-16	17	19
Services	22	64	-102	-16
Federal Government, Civilian and Military	2	-3	-2	-3
State Government	6	-5	2	3
Local Government	33	-27	52	58
Aggregate	15	-32	26	9
TOTAL	1023	-1,324	925	624

Because of disclosure problems the Agricultural Services; Manufacturing; Transportation Communication and Public Utilities; Wholesale Trade; and Finance, Insurance and Real Estate Sectors were aggregated into one sector denoted as the Aggregate Sector..

Interindustry Analysis

Within a regional economy, there are numerous economic sectors performing different tasks. All sectors are dependent on each other to some degree. A change in activities will directly or indirectly affect the response or level of production of the other regional sectors. The amount of economic activity among economic sectors shows the degree of interrelationships or linkages between sectors. That is, an increase in

production by the regional Livestock Sector would directly increase purchases of alfalfa hay. With increased alfalfa hay purchases, farm workers will have greater incomes, which would increase their purchases from the Trade Sector.

The Trade Sector would experience increased economic activity because of its indirect relationship with the Livestock and Alfalfa Hay Sectors. These interdependencies among regional economic sectors can be estimated through interindustry analysis.

ECONOMIC IMPACTS OF AGRICULTURE ON THE HURON COUNTY ECONOMY

<http://www.ofa.on.ca/aglibrary/Research/Huron%20County/1.htm>

Economic Base Analysis Results

The economic base analysis of the 18 sector 1991 Census data for Huron County identified the base multiplier and the base ratio for Huron County. This analysis used the LQ as well as assumptions about local industry to determine the basic and non-basic components. Thus, the location quotient is discussed before the economic base analysis.

Recall that a LQ value greater than one indicates a greater level of specialization in the region than the reference region in the sector. A LQ equal to one indicates an equal level of employment in the study region to the reference region, and a LQ less than one indicates a lower rate of employment in the study region compared to the reference region in the study sector. In this analysis, the reference region was the Province of Ontario and the study region was Huron County.

The sectors where the LQ indicated a greater ratio of employment than the province of Ontario ($LQ > 1$) were agriculture (6.42), fishing and trapping (2.3), mining (2.23), construction (1.16), health and social services (1.14), and wholesale trade (1.03). The other sectors all have LQs less than one employment below the provincial average. These sectors include accommodation (0.98), logging and forestry (.97), manufacturing (.91), retail trade (0.90), transportation (0.87), other service (0.77), education (0.73), government (0.71), communication (0.68), real estate (0.56), finance (0.5) and business services (0.38). In analyzing the location quotient it is important to the magnitude of the number relative to one.

Huron County is one of the better agriculture producing counties in the province (Huron County, 1991, p.7). Therefore, it is no surprise that the LQ was greater than one. The fishing and trapping industry also had a LQ greater than one. This industry is also mainly for export, as is the mining industry which exports both salt and aggregates out of the county. The construction sector is on the rise in the county with the increase of tourism-related construction such as cottages along the lake (Dahms, 1982, p. 22). The health and social services sector also had an LQ greater than one, indicating a higher degree of employment in that sector for Huron County than in the Province of Ontario as a whole. The wholesale sector was the final sector with a higher employment rate than the wholesale sector in the province as a whole. This is most likely accounted for by the agriculture-related industry. This data can be viewed in Tables 14 through 17.

The economic base calculations were predicated on a combination of the LQ and assumptions made from local knowledge of the economy. In this method, the sectors of agriculture, fishing and trapping, logging and forestry, mining and manufacturing were classified as basic. This assumption has been made based on the exporting nature of the sectors as a whole. Local knowledge indicates that manufacturing, mining and agriculture all export their products outside of the county. The products of forestry and fishing are also exported from Huron County.

The results of the location quotient on the 18 sectors demonstrated that 12 of 18 sectors had a LQ less than one. However, there are certain points which indicated to the researcher that not all of these sectors should fall in the non-basic component of the economy. For instance, the manufacturing industry ($LQ = .91$) in Huron County produces road graders and salt for export. The logging and forestry sector ($LQ = .97$) is also a net exporter. As well, it is unrealistic to think that the 59,065 people of Huron county could consume all of the manufactured production from the county. For this reason, the manufacturing and forestry sector were included in the basic component.

The LQ was used to determine the remaining components of the basic. This was found by calculating the LQ for the remaining sector of the economy and using the basic calculations for each sector with an LQ greater than one. This yielded three additional sectors to be included in the basic component. Only the basic employment for these sectors was used to provide the overall basic component for Huron County. In Huron County, only three sectors had LQs greater than one, indicating they were more specialized than the

province in the sector and potential exporters were assumed to produce solely for local consumption because they had LQs less than 1.

The economic base analysis, which provided estimates of employment for the 18 sectors 1991 census employment data have been classified into basic and non-basic employment. Basic sector employment includes the entire sectors of agriculture and related services (4,845), fishing and trapping (25), logging and forestry (75), mining (425), and manufacturing (4,790). As well, parts of the construction (318), wholesale (39), and health and social services (356) sectors have been included because their LQ were greater than one. Only the portion of the employment calculated as basic has been included in the basic component. The non-basic sectors are transportation and storage (905), communication and utilities (710), retail trade (3,505), finance and insurance (705), government (1,620), real estate and insurance (310), business service (765), educational service (1,475), accommodation, food and beverage (1,750) and other services (1,515). Figure 6.1 contains the basic and non-basic values for the 18 sector 1991 census data. The non-basic employment were retail (3,115), health (2,359), and accommodation (1,714). The highest basic employment was in business services (765), education (546), and other services (453). These data can be seen in Tables 1 through 4.

Table 1: Economic Base Analysis Results: Basic Calculated for Sectors With Location Quotients > 1

	All Industries	Construction			
Ontario	5,435,850	358,890	LQ	Basic	Nonbasic
Huron County	30,095	2,305	1.16	318	1,987
	All Industries	Wholesale Trade			
Ontario	5,435,850	233,915	LQ	Basic	Nonbasic
Huron County	30,095	1,335	1.03	39	1,296
	All Industries	Health and social service			
Ontario	5,435,850	475,115	LQ	Basic	Nonbasic
Huron County	30,095	2,895	1.14	356	2,539

Table 2: Economic Base Analysis Results: Sectors Assumed As Basic

	All Industries	Agriculture and related services			
Ontario	5,435,850	139,880	LQ	Basic	Nonbasic
Huron County	30,095	4,845	6.42	4,845	0
	All Industries	Fishing and trapping			
Ontario	5,435,850	1,965	LQ	Basic	Nonbasic
Huron County	30,095	25	2.3	25	0
	All Industries	Logging and forestry industries			
Ontario	5,435,850	13,965	LQ	Basic	Nonbasic
Huron County	30,095	75	0.97	75	0
	All Industries	Mining (milling), quarrying and oil wells			
Ontario	5,435,850	34,355	LQ	Basic	Nonbasic
Huron County	30,095	425	2.23	425	0
	All Industries	Manufacturing			
Ontario	5,435,850	942,995	LQ	Basic	Nonbasic
Huron County	30,095	4,790	0.91	4,790	0

Table 3: Economic Base Analysis Results: Non-basic Calculated For Sectors With Location Quotients<1

	All Industries	Transportation / storage industries			
Ontario	5,435,850	187,830	LQ	Basic	Nonbasic
Huron County	30,095	905	0.87	0	905
	All Industries	Communication / utility industries			
Ontario	5,435,850	188,630	LQ	Basic	Nonbasic
Huron County	30,095	710	0.68	0	710
	All Industries	Retail Trade			
Ontario	5,435,850	700,925	LQ	Basic	Nonbasic
Huron County	30,095	3,505	0.9	0	3,505
	All Industries	Finance and insurance			
Ontario	5,435,850	253,135	LQ	Basic	Nonbasic
Huron County	30,095	705	0.503	0	705
	All Industries	Government service			
Ontario	5,435,850	411,450	LQ	Basic	Nonbasic
Huron County	30,095	1,620	0.71	0	1,620
	All Industries	Real estate / insurance agent			
Ontario	5,435,850	100,090	LQ	Basic	Nonbasic
Huron County	30,095	310	0.56	0	310
	All Industries	Business service			
Ontario	5,435,850	367,200	LQ	Basic	Nonbasic
Huron County	30,095	765	0.38	0	765
	All Industries	Educational service			
Ontario	5,435,850	365,235	LQ	Basic	Nonbasic
Huron County	30,095	1,475	0.73	0	1,475
	All Industries	Accommodation, food and beverage service			
Ontario	5,435,850	322,955	LQ	Basic	Nonbasic
Huron County	30,095	1,750	0.98	0	1,750
	All Industries	Other service			
Ontario	5,435,850	355,310	LQ	Basic	Nonbasic
Huron County	30,095	1,515	0.77	0	1,515

Table 4: Total Basic and Non-basic Employment

	Basic	Nonbasic
Totals	10,873	19,222

The calculations for the base ratio and the base multiplier require the determination of the basic and non-basic components. The economic base multiplier (EBM) is calculated by simply dividing the total employment by the basic employment. The formula is contained in equation 6.1. The economic base ratio (ERB) is calculated by dividing the basic by the non-basic. These two calculations were made using the basic value of 10,873 and the non-basic value of 19,222. Thus the economic base multiplier is 2.77 (30,095 / 10,873 = 2.77) while the economic base ratio is 1.76 (19,222/10,873 = 1.76).

The economic base analysis demonstrated that overall impact of the combined exporting industries on the county. Combined, industries in agriculture, fishing and trapping, forestry, mining, manufacturing as well as construction, wholesale and health and social services support 19,222 jobs in the non-basic sector. Overall then, the base multiplier is 2.77 and the base ratio is .57. This means that for every one job in the basic sector, 1.76 jobs are generated in the non-basic.