TESTING THE EXPORT-BASE THEORY IN ALABAMA:
AN ONGOING CASE STUDY

David Brian Kimbugwe
Graduate Assistant, Agribusiness Department, Alabama A&M University
Room 316B, Dawson Building
PO Box 323, Normal, AL 35762
Phone: (256) 372-8669
Fax: (256) 372-5917
E-mail: brial202@yahoo.com

Swagata "Ban" Banerjee
Assistant Professor
Agribusiness Department, Alabama A&M University
Room 316I, Dawson Building
PO Box 323, Normal, AL 35762
Phone: (256) 372-4825
Fax: (256) 372-5917
E-mail: ban.banerjee@aamu.edu

Buddhi Raj Gyawali
Research Assistant Professor
Agribusiness Department, Alabama A&M University
Room 316H, Dawson Building
PO Box 323, Normal, AL 35762
Phone: (256) 372-5870
Fax: (256) 372-5917
E-mail: buddhi.gyawali@aamu.edu

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Introduction

The export-base model continues to be one of the most widely used in regional

Economic analysis. Although it has been widely criticized for its theoretical weaknesses

(Lewis, 2005), it remains one of the most widely accepted economic models utilized by

economic development practitioners and regional economic policy analysts for regional growth.

The main reasons for its acceptance and application are that it is easy to implement compared to

the relative costs associated with alternative methodologies such as I-O models or Computable

General Equilibrium models (CGEs) and best of all the Survey method which is the most

straight forward method, because you simply to ask businesses in the area to specify how much

of their revenues is basic and to use their responses to accurately divide local business activities

into basic and service components. In practice, this is seldom done. The neglect of the survey

approach is easy to explain. It is the most expensive, time-consuming, and subject to selection

bias and accuracy errors by respondents as stated by Isserman (1980): Since there is no

systematic correction factor, the analyst should not rely on one set of estimates, but rather should

compare results from several approaches coupled with a good working knowledge of the

community's economy in order to arrive at the 'best' estimate. Questionnaires on sensitive issues

such as revenues, employment, and markets are seldom answered freely; to obtain even a number

of responses the study team must resort to personal interviews. And even then, the interviewers

must be skilled and persuasive. In addition, if the area is of any size, the survey would require

careful planning. The sample must be carefully stratified and selected to represent the broad

spectrum of activities represented in modern communities. Such care and expense would meet the test of rationality only if data collection were in the context of a much larger study. The limit to the value of a simple export-base ratio is fairly low, in the hundreds of dollars.

The key concept of the export- base theory is that export activity is the engine for regional economic growth through export sales. The export-base theory of growth is grounded in the idea that a local economy must increase its monetary inflow if it is to grow and the only effective way to increase monetary inflow is to increase exports (John Blair, 1995). Export base theory argues that a county's or community's economy may be bifurcated into two sectors: an export or basic sector and a non-export or non-basic sector (Andrews, 1970; North, 1956; Tiebout, 1956). . In this case **basic sector** is a sector made up of local businesses (firms) that are entirely dependent upon external factors and **non-basic** in contrast is composed of those firms that depend largely upon local business conditions for example restaurants sell their goods to local households, businesses, and individuals. Its clients are locally based and therefore products are consumed locally.

The basic sector trades outside its boundaries and brings money into the local economy, which provides impetus for future economic development. The non-basic sector, on the other hand, supplies local consumption of goods and services whose activity depends upon basic sector export sales. External demand for a region's exportable goods and services injects income into the local economy, which in turn augments local demand for non-exportable goods and services (Krikelas 1992).

In the historical perspective, this theory has been used in comparative static analysis to examine impacts on income and employment of a change in the local economy by export sales.

These impacts are obtained as "multipliers". The multipliers derived from the model are used to 'forecast' changes in income or employment attributed to a change in regional exports.

According to Tiebout (1962, p.10), export markets are considered the prime movers of the local economy. If employment serving this market rises or falls, employment serving the local market is presumed to move in the same direction. When the factory closes, retail merchants (local) feel the impact as laid –off factory workers have less to spend. Because of prime mover prime role, export employment is considered as "basic". Employment which serves the local market is considered adaptive and is titled "non-basic".

Recent articles, however, have applied structural econometric and time-series methodologies to the export-base model (Kraybill and Dorfman, 1992; Lesage and Reed, 1989; Lesage, 1990) combining it with the concept of cointegration introduced by Granger (1983, 1986). The model presented in this paper allows sectoral interactions. In addition, the time-series model attempts to fully estimate the long-run equilibrium relationships among a region's economic sectors, thereby increasing the efficiency of estimation with nonstationary time-series data. Most of the little empirical work that has been done in .this area is directed toward testing the economic base theory itself. The time-frame chosen in these studies has for the most part been dictated by the availability of data, or other factors. Thus, the short-run versions of economic base theory have not been treated as competing hypothesis in literature.

Overview of Export- Base Model

In export -base theory, it is argued that an economy is divided into two sectors; export or basic sector and the non export or non basic sector. The export or the basic sector is portion of the local economy that trades with firms outside the local region. The export trade brings in income

to the area which according to the export base theory generates future development in the local economy. The non export or non basic sector sell their products within the local economy and exist to support export or the basic sector. Therefore expansion in the basic economic sector will likewise increase economic in the non basic economic sector.

Given a time series of data, the export base multiplier can be expressed as follows

$$E_{NB} = \alpha + \beta E_B$$

Where E_{NB} the total non basic is sector income and is the total basic sector income. The intercept is symbolized by α. The estimated coefficient is β indicates the change in non basic sector income. By adding one to the estimated coefficient or (1+β) yields the export base multiplier; states the total change income from a change in basic sector income.

Problem Statement

The important issue of debate at the moment in regional economics is whether the export base theory applies best to the short run, long run, or both. However, currently data on small areas is still difficult to obtain particularly information on marginal propensities to consume and marginal propensities to import. Surveys of local spending habits can be made to determine propensity to spend locally, but such surveys are expensive and difficult to design as they would have to determine both consumer and business spending patterns to consider a complete measure of import and export tendencies (Blair 1995).

In order to avoid the need for surveys, this research in its attempt to find solutions for the ongoing debate and the above problem uses disaggregate multipliers by applying two-step cointergration procedure on readily available quarterly employment data for Autauga County in rural Alabama. The technique will also help us estimate and identify local multipliers in this rural

area. Employment is used as a proxy for income because of luck of regional income data. In this case employment which is our focus of study in this model will be used to operationalize the model.

In the next sections, the regional multiplier literature will be briefly reviewed and a multi-sector economic growth model, in addition to a discussion of the underlying properties of co-integration, is developed. This is followed by the construction of dynamic location quotients used in the separation of total employment into export and local employment, the empirical results and a discussion on the implications of the empirical results in the regional economic analysis in comparison to both the basic and non-basic components.

Objective and Purpose of Study

The overall objective of this research is, to determine if export-base theory is a short-run or long-run phenomenon, or both. Specifically this research will

(1) Explore four alternative procedures of determining basic and non-basic economic activities (i.e., variables)

(2) Determine long-run constancy for each basic and non basic activity via the two-step cointegration procedure; and

(3) Determine short-run multipliers and long-run constancy for each activity/variables via two tests on estimated coefficients of ordinary least squares (OLS) regression parameters in basic and non-basic models in levels and changes (first differences) for each of the four basic-non-basic bifurcation procedures

The research in this paper will explore some alternative procedures of determining the basic and non-basic economic activities; to taste for stationary data sector by sector for both

basic non basic components in each procedure; to apply cointegration to determine if long- run

equilibrium exists among the non-basic and basic variables; in .world were all variables first-

differenced, to observe the short-run behavior of non-basic sector as is driven by the basic

sectors; and also running ordinary least squares (OLS) regression on models without

differencing; to note the levels of parameter estimates of short-run multipliers, compare the latter

with differenced models. The research on economic base and location quotient will help us

make a comparative study of how the export-base theory applies to both the short and long- run

and results will be reviewed.

Literature Review

Export-base performance research has proliferated in the last decade. Significant progress has

been made in developing the model into a better theory and knowledge of the export performance of

firms. Counties or regions like countries do not exist in isolation; rather, they are subject to ongoing flows

of goods, ideas, people, products, and services. Therefore, any economic model that seeks to explain local

growth must take these flows into account in its explanation of the sources of growth. Emerging from

international trade theory, economic base models have sought to explain a region's growth through the

examination of its inflows and outflows (North, 1955).

North, (1955) argues that regions like countries exploit their natural resource distributions and

comparative advantages to produce goods with a lower opportunity cost. According to this model of

economic development, all other economic activities within the region that are not directly tied to this

export activity (basic industries) are depending on growth in these exporting industries. These industries

are labeled service or "non-basic" industries, producing locally-demanded consumer goods and services.

In this way, the total employment of a local community is driven by the employment growth of basic

industries. These local businesses are assumed to be a consequence of a region's growth not the source of

it.

From this original idea, economic base theory has undergone a series of revisions. These revisions include measuring export flows out of a region by identifying the long-run value of its imports (Hoyt, 1961). In addition, diversification of consumer goods produced by non-basic industries allows residents to consume largely within the community thereby keeping money flowing within the region rather than flowing out.

However, other sources of growth have also been identified beyond those originally included in economic base models. Such factors as cultural traits, population size, and institutions should also be considered because they change and influence a region's economic growth (Thomas, 1964). Furthermore, Thomas (1964) also points out that export base theory does not predict what will happen if an industry arises which is not dependent on the "basic" industries for growth. These could include the new economy firms who are largely dependent on consumer demand and innovation for industry growth.

It must also be noted that a regional economy need not be solely dependent on natural resources for growth (Stabler, 1968). Not only will the long-run characteristics of the natural resource help dictate a region's growth pattern, but also population growth, changes in taste, new discoveries, depletions of natural resources, changes in technology, linkage effects, will all have an influence on a region's economic growth potential.

Finally, economic base models have been created which try to explain how a region can base its exports on a trade of services, not goods (Polese and Verreault, 1989). The theory underlying the economic base multiplier gives us a useful way of analyzing the relationship between the so-called export sector and the local sectors of an economy. An early debate on the role and importance of the export sector in sub-national economies between North (1955, 1964)

and Tiebout (1956, 1964) raises a number of key points fundamental to the role of exports in regional economic growth.

The economic base model starts from the premise that economic activity can be separated into three sectors/stages, often referred to as the Fisher Clark thesis (Fisher, 1935; Fourastie, 1949). According to this theory of economic development there is a "natural" process of industrialization starting with the primary industries (e.g., agriculture, fishing, forestry and mining) which then evolves into manufacturing/secondary economic and then into the service/tertiary sector. The underlying assumption appears to be that services are in some sense "parasitic" and contribute little to the growth of local and regional economies. - (Kaldor, 1966). At the extreme, Fourastie (1949, as cited in Debbage & Daniels), for example, argues that if a regional economy develops the tertiary sector beyond the level at which it can be supported by the primary and secondary sectors this will cause economic decline rather than growth.

The debate concerning deindustrialization throughout the 1980s reflects this view of an export-base world (Drennan, 1992; Goe & Shanahan, 1991; Harrison & Bluestone, 1988). The fundamentals of an economic-base/export-base theory are the paradigm that an area needs to generate export sales in order to grow, and hence the rationale of dividing economic sectors into basic or non-basic within the economic base multiplier. The "basic" industries have to consist of the primary and secondary sectors, particularly the extractive industries and manufacturing industry, whereas the service sector is perceived as non-basic, (i.e., industries that serve only the local market). An extreme view is that the service is wholly dependent on the wealth generated by the high-wage manufacturing sector.

One of the uses of export-base theory is the identification of economic sectors that export and the amount of their export sales.' By identifying the export or basic sectors, regional

development practitioners can identify factors that influence export sales. If some factors are endogenous to the regional economy, regional development authorities may be able to formulate strategies to strengthen, protect, or expand sectoral export sales. Sectors that do not export and that may be importers of a given good and service also can be identified. By identifying importing sectors, regional economic development practitioners can formulate import substitution strategies that potentially could reverse flows of dollars from the regional economy (Shaffer, 1989)

Probably the most expansive use of export-base theory is the development of export-base multipliers for impact analysis. The estimation of sector's basic and non-basic employment or income is essential for the estimation of export-base multipliers. The bifurcation of economic sectors often has employed indirect or secondary procedures whose results may differ substantially from direct or primary surveys (Gibson and Worden 1981). Estimation of basic employment through direct or primary procedures, however, has been costly, time-consuming, and subject to selection bias and accuracy errors by respondents. As stated by Isserman (1980):

Methodology

The overall objective of this research is, to determine if export-base theory is a short-run or long-run phenomenon and hence to see if the export base theory can better explain the long-run dynamics or short- run fluctuations in this particular study with quarterly employment data. The following steps will lead us to accomplish this as follows:

1. To adopt alternative procedures to determine the export base- more specifically, the basic and non-basic activities

2. To apply the two-step cointergration procedure to determine if a long-run relationship exists between the basic and non-basic activities

3. To run Ordinary Least Squares (OLS) regressions on both the levels and the changes obtain the differential multipliers at levels and at margins, respectively.

Developing the model

The following four stage theoretical approach will be used in developing the export base

1. Identify the appropriate regional unit

2. Measure the export base- i.e. statistically measure the level of employment generated by the export activity

3. Specify the equation system

4. Estimate the parameters of the model-specifically, non-basic and basic employment multiplier and hence the total multiplier (which is obtained by adding the unity to the non-basic multiplier.

.   One of the most contentious issues facing development of an export-base model or export-base analysis is the identification of a region's basic or export activity. The economic base model is predicated upon the bifurcation of regional economic activity into at least two distinct sectors, export or basic sector and non-export or non-basic sector. State and county data for development of export base activity usually cannot be obtained, except at a high cost. Because of the high cost, potential selection bias, and accuracy errors of respondents, many regional scientists and economic development practitioners have adopted non-survey techniques for identifying basic or export activity.

Empirically, the study will be conducted in three parts. **First** we will start by bifurcating data in all sectors into basic and non-basic sector components, which will be done using the following four   non-survey procedures.

The assignment procedure. For this approach, two procedures, BASE 1 and BASE 2 will be employed. Employment within a broad employment category is assigned to either the basic or the non-basic sector.

(i) Assignment 1(BASE1): only manufacturing sector employment is designated as basic sector and all other sector employment for the BASE1 procedure is aggregated as non-basic employment.

(ii) Assignment 2 (BASE 2): Quarterly employment data in the manufacturing sector, the mining sector, and the construction sector are aggregated as basic sector employment from January 1980 to December 2008. Employment in all other sectors is aggregated into non-basic sectors.

(iii) General location quotient (BASE3): The location quotient (LQ) is the ratio of the proportion of employment (or income) in an industry in the region in question to that of the benchmark region. It measures the relative concentration on economic activity in a, given industry in the region understudy, as compared with another region chosen as a benchmark. The rule of thumb we will follow is industry, region and time period and the benchmark being the national. In this case the basic industries of the region will be identified by comparing employment in the region to national norms. The location quotient procedure follows the time-series version developed by Lesage and Reed (1989) and can be stated as:

$$LQ_{irt} = \frac{\dfrac{E_{irt}}{E_{rt}}}{\dfrac{E_{int}}{E_{nt}}}$$

where:

E_{irt}, = Employment in sector i in region r in time period t;

E_{rt} = Total employment in region r in time period t;

E_{nit} = National (n) employment in sector i in time period t;

E_{nt} = Total national (n) employment in time period t; and

LQ_{irt} = Location quotient for sector i in region r in time period t.

Examining this formula more closely, we see that to allocate employment to the basic and non-basic sectors, location quotients are calculated for each industry. Simply stated, the location quotient method compares Local Employment to National Employment. The LQ_{irt} provides evidence for the existence of basic employment in a given industry.

After calculating location quotient values only three general outcomes are possible,

$LQ_{irt} < 1.0$

$LQ_{irt} = 1.0$

$LQ_{irt} > 1.0$,

$LQ_{irt} < 1.0$ = All Employment is Non-Basic

A LQ that is less than zero suggests that local employment is less than was expected for a given industry. Therefore, that industry is not even meeting local demand for a given good or service. Therefore all of this employment is considered non-basic by definition.

$LQ_{irt} = 1.0 =$ All Employment is Non-Basic

A LQ that is equal to zero suggests 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.

$LQ_{irt} > 1.0, = \underline{Some}$ Employment is Basic

A LQ that is greater than zero provides evidence of basic employment for a given industry.

When a $LQ_{irt} > 1.0,$ the analyst concludes that local employment is greater than expected and it

is therefore assumed that this "extra" employment is basic. These extra jobs then must export

their goods and services to non-local areas which, by definition, make them Basic sector

employment.

The rule of thumb here is:

    (i) If LQ>1, export employment exists

    Then, {1-1/LQ}, is basic employment and rest is non basic:

    (ii) If LQ≤1, export employment does not exist so it's non basic.

    (iv)   Tiebout Location Quotient (BASE 4): Using the same formula as in method 3,
    bifurcation will follow a different rule of thumb:

    (i) If LQ>1, export employment exist, all of it is basic

    (ii) If LQ≤1, export employment does not exist, so all employment is non basic

Second, we will conduct the two step cointergration procedure. The <u>first-step</u> involves the

determination of stationary or otherwise in all the variables. Each of the variables in each sector;

both basic and non basic will be tested for stationary using the Dickey Fuller test for Unit roots.

The <u>second step</u> determines if there is stationary among the residuals in model specifications

chosen with those variables. Out of the non stationary variables determined in the first step, we will use the ones that are candidates for cointergration test in a long-run cointergrating relationship with the associated basic variables, given by the non-stationary disturbance terms

Third, OLS regressions will be run for levels and first differences using the usual non-basic specifications. Two relevant tests will be used determine if there exist some long-run and/or short-run relationship between basic and the non-basic sectors. Test 1 is a test on the estimated value of the intercept term, and Test 2 is a test of stability of multipliers as given by their sign (positive or negative) as well as statistical significance (t value). For long-run stability, these multipliers should be positive in sign and be significantly differently from zero.

Regional economics are usually interested in observing long-run behavioral dynamics. Granger (1986) and Engle (1987) documented that cointergration implies that deviations from equilibrium are stationary. However if time series data are not stationary, the data will exhibit trends. Nelson and Plosser (1982) indicate that most of the national aggregate time series data are non-stationary and that regional data may reflect the same non-stationarity. Nelson and Plosser (1982) stress the importance of identifying stationarity of time series data because of its importance from a statistical standpoint, but also from a policy perspective. In relation to the popular two-step procedure, the statistical test employed to investigate stationarity of a time series is the augmented Dickey-Fuller (ADF) test (Dickey and Fuller 1979) as discussed earlier.

Data Description and Area of Study

Because of the lack of economic interlinkages and the importance of export sales by small rural economies, small economies may be more appropriate for export-base theory than large metropolitan counties. Blumfield (1955) states that the basic/non-basic ratio is meaningful

only in small and simply structured communities; the larger and more complex (that is, the more 'metropolitan') the community, the less applicable is the ratio and the entire method.

Therefore, Autauga county of semi-rural Alabama has been chosen for this paper and the following sectors have been considered for the illustrative case study: Mining (MIN) ; Construction(CON) ; Manufacturing(MFG) ; Transportation and Public Utilities(TPU) ; Trade(TRD) ; Finance, Insurance, and Real Estate(FIRE) ; Services (SER) ; and Government (GOV).

The primary data currently used in this analysis was obtained from the Alabama Department of Industrial Relations with help from the Labor Market Division. A 4-digit SIC (Standard Industrial Code) from 1980-2001 and after then converted from SIC to 6-digit NAICS (North American Industry Classification System) from 2002 forward. The quarterly employment data for Autauga County was collected from January 1980 to December 2008. These data are used to derive sectoral and county basic and non-basic employment.

Located in central Alabama, northwest of the state capital of Montgomery Autauga County has been one of the fastest growing counties in Alabama. The town of Prattville which is the main town in Autauga began as a pioneering company town and was founded by industrialist Daniel Pratt. Autauga County's proximity to the cotton-growing Black Belt made it a manufacturing giant during the nineteenth century. Population in Autauga County according to the U.S Census Bureau rose from 32,259 in 1980 to 34,222 in 1990 and, at the time of the 2000 Census Autauga County recorded a population of 43,671, a 27 percent increase from the 1990 Census. According to U.S. Census Bureau estimates, the 2008 population was 50,364, with 80.7 percent Caucasian, 17.3 percent African American, and 1.7 percent Hispanic.

Conclusion

The economic base model is predicated upon the bifurcation of regional economic activity into at least two distinct sectors, export or basic sector and non-export or non-basic sector. However in Autauga, various methods have been employed especially for this paper to determine export base activity in the county. At the moment, procedures have been successfully employed to bifurcate sectoral employment into basic and non basic employment with the rest set to follow.

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