

## CHAPTER 3

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# REGIONAL MODELS OF INCOME DETERMINATION: SIMPLE ECONOMIC- BASE THEORY

## Economic-base concepts

Economic-base concepts originated with the need to predict the effects of new economic activity on cities and regions. Say a new plant is located in our city. It directly employs a certain number of people. In a market economy these employees depend on others to provide food, housing, clothing, education, protection and other requirements of the good life. The question which city planners and economists need to answer, then, is "what are the indirect effects of this new activity on employment and income in the community?" With these estimates in hand, we can work toward planning the social infrastructure needed to support all of these people.

Economic-base models focus on the demand side of the economy. They ignore the supply side, or the productive nature of investment, and are thus short-run in approach. In their modern form, they are in the tradition of Keynesian macroeconomics. In an introductory economics course, we might start with a simple model of a closed economy, usually with some unemployment. In regional economics we deal with an open economy with a highly elastic supply of labor.

It is appropriate to start this chapter first with a look at the place of economic-base theory in the history of economic thought and proceed to a review the simple Keynesian model and the elementary economic-base models. We

will then look at methods of estimating the values of multipliers.

## *Antecedents*

We commonly divide economies into two often opposing parts. In action, it's us against them; in primitive life, it is hunters and gatherers; in analysis, it will be primary and secondary, productive and nonproductive, basic and nonbasic, export and support, fillers and builders, productive and sterile workers, necessary and surplus labor, etc. The following notes trace obvious antecedents.<sup>1</sup>

Mercantilistic thought is a prime example. During the period in which the mercantilists were dominant, normally considered to be from 1500 to 1776, the nation-states of Europe were consolidating their power and gaining strength to resist or conquer others. The writers who documented the times emphasized a philosophy not unlike that of a modern merchant or chamber of commerce.

The mercantilists stressed accumulating a supply of gold with which to pursue the nation's political and military objectives. The economic base of a nation included the sectors which created a favorable balance of trade. Goods were produced for export despite the needs of a poor population, export of unprocessed materials was prohibited, shipping in local

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<sup>1</sup> This section is based on (Oser 1963) and (Kang and Palmer 1958). Oser's *The Evolution of Economic Thought* is one of the best short histories of economic thought in print.

bottoms was forced whenever possible, and colonies were exploited as a source of raw materials.

Thomas Mun, a merchant in the Italian and Near Eastern trade and a director of the East India Company, was probably the most famous of these writers. His exposition of mercantilist doctrine in *England's Treasure by Foreign Trade*, written in 1630, explained how "... to enrich the kingdom and to encrease our Treasure." He emphasized a surplus of exports as the key:

Although a Kingdom may be enriched by gifts received, or by purchase taken from some other Nations, yet these are things uncertain and of small consideration when they happen. The ordinary means therefore to encrease our wealth and treasure is by Forraign Trade, wherein wee must ever observe this rule; to sell more to strangers yearly than wee consume of theirs in value.(from Oser 1963 p.14)

The Physiocrats, led by François Quesnay and briefly prominent in France in the second half of the 18th century prior to the French Revolution, responded to the excesses of the mercantilists with several points important to later thought. They considered society subject to the laws of nature and opposed governmental interference beyond protection of life, property, and freedom of contract. They opposed all feudal, mercantilist, and government restrictions. "*Laissez faire, laissez passer*," the theme phrase for the free enterprise system, is from the Physiocrats. They opposed luxury goods as interfering with the accumulation of capital.

But, for our purposes, they were precursors of economic-base thought in two ways. First, they were important in their treatment of the sources of value. To the Physiocrats, only agriculture was productive. The soil yielded all value; manufacturing, trade, and the professions

were sterile, simply passing value on to consumers. This classification of productive and sterile activities is similar to the basic and service classification in economic-base discussions.

And second, the Physiocrats visualized money flowing through the economic system in much the same way as blood flows through the living body. Quesnay's *tableau economique* was a predecessor of the circular-flow diagrams popularized in Keynesian macroeconomics.

Adam Smith, writing in 1776, and heavily influenced by these French authors, took a less extreme but nevertheless strong position. He emphasized production of material or tangible goods and considered service and government as unproductive.

Karl Marx, in *das Kapital*, also divided the economy into two parts. To Marx, *necessary labor* was the source of wealth and was paid for with a wage barely sufficient to maintain its provider. *Surplus labor* was also provided by workers but its value was appropriated by the capitalists in the form of surplus value. Workers had to produce not only what they consumed but also a surplus for the capitalist. Menial servants, landlords, the Church, and commercial activities were unproductive – they added nothing to total value.

Others of the nineteenth century were more generous. Jean Baptiste Say in his *Treatise on Political Economy* (1803) popularized Adam Smith in France. Say's famous Law of Markets, paraphrased as "supply creates its own demand," required that all work be productive, that all compensated activity creates utility.

Nevertheless, we can see a strong line of thought dividing economic activities into two parts, and we can see economic-

base concepts as fitting into a centuries-old pattern.

### *Modern origins*

Modern literature on the economic base has been voluminous, but plagued occasionally by scholastic sloppiness in appropriate citations.

It seems that Werner Sombart, a German (historical) economist writing in the early part of this century, should receive major credit for modern concepts.<sup>2</sup>

Sombart was responsible for the distinction between "town fillers" and "town builders," ("Städtegründer" and "Städtefüller") which appeared in Frederick Nussbaum's *A History of the Economic Institutions of Modern Europe* (with full permission). But in a series of articles in the early 1950's, Richard B. Andrews quoted extensively from Nussbaum without mentioning the fact that Nussbaum had based his book on Sombart's work. Andrew's work was widely circulated and became the standard reference.

### **The structure of macroeconomic models**

It is convenient to begin with a review of the basic elements of model building. We can start with the simplest of all macroeconomic models, the Keynesian model of a closed economy. This model is presented algebraically in Illustration **Error! Reference source not found..1** and follows the standard format we will use in all of our models: we outline definitions, behavioral or technical

assumptions, equilibrium conditions, and finally the solution. Since this is a process we will follow with each new model considered, it may be worthwhile to review the nature of these model elements.

A *definition* is a statement of fact. By definition, it is always true. In mathematics, the proper term is *identity*. One of the more important identities in macroeconomics is the national income identity: realized national income (actual expenditures) is the sum of realized consumption and realized investment. In the simple national model, this has to be a true statement—it is a tautology. Actual expenditures have to equal their sum!

Another important identity in the simple model is that income (which is another term for 'output') is equal to the sum of consumption and savings. We, as recipients of incomes, either spend our incomes or we save (don't spend). This identity can also be taken as a definition of saving as the difference between income and consumption.

*Behavioral assumptions* are equations describing the behavior of certain groups, or actors, in the economy. In this case, the key behavioral relationship is the consumption function, which postulates consumption as dependent on, or caused by, income:

$$C = f(Y)$$

which in its linear form may be expressed as:

$$C = a + cY$$

where  $a$  represents autonomous consumption and  $c$  is the marginal propensity to consume ( $dC/dY$ ). The parameters of the equation are  $a$  and  $c$ . Recall that if  $a > 0$ ,  $dC/dY < C/Y$ .

<sup>2</sup> I rely on Günter Krumme for this statement (Krumme 1968). On his excellent web site Professor Krumme points out that, according to Marc de Smidt, Sombart himself traces the concept back to a 1659 manuscript by the Dutch mercantilist Pieter de la Court. See <http://faculty.washington.edu/~krumme/papers/sombart.html>

An incidental but important result of this assumption is that saving is also a function of income:

$$S \equiv Y - C = -a + (1 - c)Y$$

The other important behavioral assumption in this simple model is that

investment,  $I$ , is determined outside the system. It is *planned*. In terms common to model building, it is an *exogenous* variable in contrast to consumption, which is determined *endogenously* (that is, 'within the system').

### **Illustration Error! Reference source not found..1 The simple Keynesian model**

#### **Definitions or identities:**

- Planned Expenditures  $\equiv$  Consumption + Investment (planned sources of income)
- (1)  $E \equiv C + I$
- Actual Income  $\equiv$  Consumption + Savings (actual disposition of income)
- (2)  $Y \equiv C + S$

#### **Behavioral or technical assumptions:**

- Consumption = A linear function of income (both planned and actual)
- (3)  $C = a + cY$  ( $c < 1$  = the marginal propensity to consume)
- Investment = Planned investment (an exogenously determined value)
- (4)  $I = I'$

#### **Equilibrium condition:**

- Income = Expenditures, or actual income is equal planned expenditures
- (5)  $Y = E$
- or, with  $C + S = C + I$ , we can subtract  $C$  from both sides to form an equivalent equilibrium condition:
- Drains = Additions
- (6)  $S = I$

#### **Solution by substitution:**

$Y = C + I$	Substitute (1) into (5)
$Y = a + cY + I'$	Substitute (3) and (4)
$Y - cY = a + I'$	Gather the $Y$ , or income, terms
$(1 - c)Y = a + I'$	Factor out $Y$
$Y = \{1/[1 - c]\} * (a + I')$	Isolate $Y$ through division

#### **The simple Keynesian investment multiplier is:**

$$dY/dI = 1/[1 - c]$$

(An example of a *technical assumption* in economics is the production function. A production function describes the relations between

inputs and outputs. A familiar example is  $Q = F(K, L)$ , commonly used to describe how capital and labor are combined to produce output.)

*Equilibrium* is a condition in which the expectations (plans) of decision-makers (actors) in the system are met. In this simple model, the equilibrium condition is that income equals planned expenditures, or, what is the same thing, that saving (which sets the limits on actual investment) equals planned investment.

The point is that planned investment and saving do not have to be equal (even though, in the end, actual saving has to equal actual investment—this is a fundamental principle of accounting). When they are equal, then all parties are satisfied. When they are not, forces are at play which will take income to a lower or higher level, bringing saving into equality with planned investment.<sup>3</sup>

Good introductions to the art of model-building can be found in several readily available books (e.g. Bowers and Baird 1971; Kogiku 1968; Neal and Shone 1976). The simple Keynesian model is outlined in almost all texts on the principles of economics. A good reference is (Case and Fair 1994).

### **The "strawman" export-base model**

It is common in economics to construct a "strawman" against which to rail and argue. Nowhere is this practice more common than in the regional

literature. The "export-base" model, in which the sole determinant of economic growth is exports, is often built to represent the arguments of other practitioners. However, you can seldom find an "export-base" theorist who is not also an "economic-base" theorist readily acknowledging many other determinants of growth than exports alone.

Now let us construct this strawman and see how a pure export-base stance is untenable. We move into an open economy and make exports the sole exogenous factor. If any autonomous expenditure is included (the easiest is for consumption), then regional income can exist even when exports are zero (Ghali 1977).

Presented in Illustration 3.2, the model differs only slightly from the simple Keynesian model. With Keynes, the key leakage was savings. He explained the underemployment of a depressed economy as resulting when planned investment fell below full-employment equilibrium levels due to a lack of confidence in investment markets. His endogenous variable was consumption, through which most income flows occurred—the flows became disconnected in the saving-investment path.

In the export-base model, the endogenous flow remains consumption, redefined now as "domestic expenditures." We completely ignore saving and hide investment expenditures within domestic expenditures (we are concerned not about explaining depression in the whole economy but about explaining changes in regional income). The function of saving in creating a leakage from the economy is now assumed by *imports*, which is defined as a function of income. The

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<sup>3</sup> This paragraph brings "Say's Law" into play. Stated by Jean Baptiste Say in the early 1800s as the "Law of Markets," the idea that "supply creates its own demand" was named in 1909 by Frederic Taylor. Keynes succinctly restated it as above and argued that it did not apply. In Say's time, since saving and investment were often done by the same landed people, it might have been more valid. But in modern times with complex banking systems, saving is done by many people who do not buy capital goods and investment is done by people who borrow those savings. So the possibility of actual savings differing significantly from planned investment became real.

function of investment is now assumed by *exports*, the driver of the export-based economy.

This model obviously stresses openness and dependence of the region on events beyond its reach.

### Illustration 3.2 The pure export-base model

Definitions or identities:

Total expenditures  $\equiv$  Domestic expenditures + Exports (inflows)  
 (1)  $E \equiv D + X$

Income  $\equiv$  Domestic production + Imports  
 (2)  $Y \equiv D + M$ , or  $D \equiv Y - M$

Behavioral or technical assumptions:

Imports = a linear function of income  
 (3)  $M = mY$  ( $m < 1$ , the marginal propensity to import)

Exports = an exogenously (outside-region) determined value  
 (4)  $X = X'$

Equilibrium condition:

Income = Total expenditures  
 (5a)  $Y = E$

or

Drains = Additions  
 (5b)  $M = X$

Solution by substitution:

$Y = Y - M + X$	Substitute (1) and (2) into (5a)
$Y = Y - mY + X'$	Substitute (3) and (4)
$Y - Y + mY = X'$	Gather the Y, or income, terms
$mY = X'$	Reduce
$Y = (1/m) * X'$	Isolate Y through division

The export-base multiplier is:

$$dY/dX = 1/m$$

### The typical economic-base model

To make the model slightly more realistic (or, rather, less simplistic!), saving and exogenously determined investment can be added back into the system.

Illustration 3.3 includes these to develop an almost typical economic-base model. Only minor interpretive comments are required.

The missing element is autonomous consumption (which appeared in the simple Keynesian model). Whether or not it is included seems to me to be a matter of personal preferences. On the one hand, it might be nice to be complete and consistent with the Keynesian model. In addition, it serves to warn us that the consumption function is probably curvilinear, originating at the origin and rising at a decreasing rate with respect to income. The marginal

propensity to consume at the range of incomes over which we might work is less than the average propensity to consume. A positive autonomous consumption permits us to simulate this case.

On the other hand, we already have one exogenously determined nonexport variable, investment. The investment

multiplier is identical to that which would be calculated for autonomous consumption—we have the results without the bother. While this is a logic which might reduce a model to pulp if pursued too rigorously, I have left autonomous consumption out of this illustration.

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### Illustration 3.3 The pure economic-base model

Definitions or identities:

Total expenditures  $\equiv$  Domestic production + Exports + Investment

$$(1) \quad E \equiv D + X + I$$

Income  $\equiv$  Consumption + Saving

$$(2) \quad Y \equiv C + S$$

Consumption  $\equiv$  Domestic expenditures + Imports

$$(3) \quad C \equiv D + M, \text{ or } D \equiv C - M$$

Behavioral or technical assumptions:

Consumption = a linear function of income

$$(4) \quad C = cY \quad (c = \text{the marginal propensity to consume})$$

Imports = a linear function of income

$$(5) \quad M = mY \quad (m = \text{the marginal propensity to import})$$

Exports = an exogenously (outside-region) determined value

$$(6) \quad X = X'$$

Investment = an exogenously (outside-system) determined value

$$(7) \quad I = I'$$

Equilibrium condition:

Income = Total expenditures

$$(8a) \quad Y = E$$

or

Drains = Additions

$$(8b) \quad M + S = X + I$$

Solution by substitution:

$$Y = C - M + X + I$$

$$Y = cY - mY + X' + I'$$

$$Y - cY + mY = X' + I'$$

$$(1 - c + m)Y = X' + I'$$

$$Y = \{1/[1 - (c - m)]\} * (X' + I')$$

Substitute (1) and (3) into (8a)

Substitute (4), (5), (6) and (7)

Gather the Y, or income, terms

Factor out Y

Isolate Y through division

The economic-base and investment multipliers are:

$$dY/dX = 1/[1 - (c - m)], \text{ and } dY/dI = 1/[1 - (c - m)]$$


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## Techniques for calculating multiplier values

### *Comparison of planner's relationship and the economist's model*

Concentrating purely on the practical need to develop an easy way to forecast community change, early planners developed economic-base ratios ( $T/B$  for the average ratio, and  $\Delta T/\Delta B$  for the marginal ratio, where the letters represent total (T) and basic (B) income (or employment) by pure observation as rules of thumb. By 1952, economists (Hildebrand and Mace 1950) had developed export-base models in the same analytic framework as the Keynesian macroeconomists, with multipliers expressed as  $(1/(1-PC_L))$ , where  $PC_L$  represents either the average propensity to consume locally produced goods ( $APC_L$ ) or the marginal propensity ( $MPC_L$ ). Could these approaches be equivalent? Yes. Charles M. Tiebout showed us how (Tiebout 1962). Tracing the metamorphosis for average propensities,

$$T/B = 1/(B/T) = 1/((T-NB)/T) = 1/(1-NB/T) = 1/(1-APC_L)$$

Here, the ratio of nonbasic activity to total activity ( $NB/T$ ) is the equivalent of the average propensity to consume locally produced goods.

So, if we can obtain values of total and basic variables over a period of years, we can estimate marginal export-base multipliers by regressing the total on the basic values. With the regression line formulated as  $T = a + bB$ , the slope  $b$  is the marginal multiplier ( $\Delta T/\Delta B$ ) for the region.

### *The survey method*

Of course, the most straight-forward method is 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 and time-consuming of approaches. Questionnaires on sensitive issues such as revenues, employment, and markets are seldom answered freely; to obtain even a smattering 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. A canvass would be prohibitive and 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.

A final argument against this simple approach is that the survey would probably yield data for only one year, leading to calculation of an average multiplier when a marginal multiplier is the most appropriate.

### *The ad hoc assumption approach*

The easiest and least expensive of methods is simply to rely on arbitrary assignment of activities to basic or nonbasic categories. This could be done

by assignment of, say, employment or payrolls for entire industries into categories, or it could be accomplished with a little more finesse by estimating proportions of employment involved in basic activities.

Needless to say, the chance of errors is large even for experienced analysts, and the multiplier will again be an average one with limited use in analyzing the effect of change.

### ***Location quotients***

The location quotient is probably responsible for the long life and continuing popularity and use of economic-base multipliers. These quotients provide a compelling and attractive method for estimating export employment (or income).

A location quotient is defined as the ratio

$$LQ_i = (e_i/e)/(E_i/E),$$

where  $e_i$  is area employment in industry  $i$ ,  $e$  is total employment in the area,  $E_i$  is employment in the benchmark economy in industry  $i$ , and  $E$  is total employment in the benchmark economy. Normally, the "benchmark" economy is taken to be the nation as the closest available approximation to a self-sufficient economy.

Assuming that the benchmark economy is self-sufficient, then a location quotient greater than one means that the area economy has more than enough employment in industry  $i$  to supply the region with its product. And a quotient less than one suggests that the area is deficient in industry  $i$  and must import its product if the area is to maintain normal consumption patterns.

Surplus or export employment in industry  $i$  can be computed by the formula

$$EX_i = (1 - 1/LQ_i)*e_i, LQ_i > 1,$$

which is easily shown to be the difference between actual industry employment in the area and the "necessary" employment in the area.

In fact, then, excess employment can be computed without reference to location quotients through this reduction of the formula:

$$EX_i = e_i - (E_i/E)*e$$

It is convenient to retain the initial formula as a reminder of the logic, and to compute location quotients as reminders of the strengths of exporting industries.

Now it is easy to estimate export employment for each industry in the area and to sum these estimates to yield a value for export employment for the area in some particular year. With this number and total employment, an average multiplier for the area can be computed. With a set of these values over 10-20 years, the more acceptable marginal multiplier can be estimated by simple regression.

While it is common to use employment as the primary basis for these calculations, other measures such as wages and salaries are just as appropriate. Indeed, wage data is more accessible electronically, especially on CD-ROM. *County Business Patterns*, a standard source of employment and payroll data, is available for years since 1986, two years per disk. In considerable detail, this is the best data for recent years, but skill with mainframe computers, tapes, and programming is required to gain access

for earlier years. The *Regional Economic Information System (REIS)*, updated on CD-ROM annually by the U.S. Department of Commerce with a two-year lag, includes a relatively aggregated 16-category employment series for the years 1969-2000 as well as a more detailed earnings series for every county in the nation (categories are based on the old Standard Industrial Classification (SIC) system). This data makes earnings-based location quotients a snap, especially if historic estimates are desired. The REIS files released June 2009, can be downloaded free of charge from <http://www.bea.gov/regional/docs/reis2007dvd.cfm>.

From 2001 on, the industry categories are based on the new North American Industry Classification System (NAICS), with 23 categories of employment and even more categories for earnings. This shift in industry definitions means that categorical data is not available in time series. Everything starts anew in 2001.

Location quotients have been in use by regional analysts for over 50 years now, and have been commented on at length. We should look at the assumptions involved in their use as well as the advantages and disadvantages.

The literature records at least three specific assumptions: (1) that local and benchmark consumption patterns are the same, (2) that labor productivity is a constant across regions, and (3) that all local demands are met by local production whenever possible.

The first assumption is not serious: not only can we not discern differences in consumption patterns without extraordinary expense but we can suspect that differences in production patterns are more important. Purchases

of intermediate goods by producers differ for regions depending on industry mix. (It turns out that we can account for industry mix with input-output models, so this difference has been accounted for by the march of time.).

The constant-labor-productivity assumption is difficult to avoid. Its impact can be ameliorated slightly through using earnings data, which can be assumed to reflect regional productivity variation through differences in wage rates. (This assumption could in turn be attacked if wages vary more by area cost of living than by productivity.)

The assumption that local demands are met first by local production is the more tenuous of the three. It is obviously not true, as any visit to a grocery or clothing store will attest. But it is common, and a better alternative is hard to come by.

In addition to the disadvantages accruing from these assumptions, another major fault is that the method is dependent on the degree of aggregation of the data, making comparisons among various studies of little value. To illustrate the problem, consider the food and kindred products industry in Atlanta. The location quotient computed for this broad industry should be less than one, and if excess employment were computed based on this classification, none would be credited to the food industry. But if the classification were more detailed, the soft-drink industry would show a large number of excess employees, since the headquarters of Coca-Cola is in the city.

The overpowering advantages of using location quotients are that the method is inexpensive and the exercise of computing excess employment may

give the analyst an opportunity to gain insights of interest in themselves.

### ***Minimum requirements***

In the 1960's, when available computing technology favored frequent use of economic-base models, one of the alternatives to the use of location quotients was the minimum-requirements approach (Ullman and Dacey 1960). This variation involved a slight revision of the location-quotient formula to

$$EX_i = e_i - (E_i/E)^{\min} * e,$$

where  $(E_i/E)^{\min}$  is the minimum employment proportion for industry  $i$  in cities of size similar to the subject city. You can readily see that we have substituted a varying benchmark employment proportion for a constant one:

$$LQ_i = (e_i/e)/(E_i/E)^{\min}.$$

While still appearing in various forms in the literature, the method suffers from two major criticisms. One is that, if enough cities are included in the selected set, all regions will be exporting and none may be importing. The other is similar in that, if we use data defined in a fine level of detail (which should be an improvement, as it was in location-quotient estimates), we may reduce local needs to near zero and make almost all production for export (Pratt 1968).

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.

### ***"Differential" multipliers: a multiple-regression analysis***

Another approach which has been used in estimating economic-base multipliers is to fit a multiple-regression equation to regional data. The first of these studies arose in a study of the impact of military bases on Portsmouth, New Hampshire in 1968 by Weiss and Gooding (Weiss and Gooding 1968).

Simple economic-base models ignore the possibility that different industries may have different impacts on their communities. The regression technique eliminates this simplifying assumption. Weiss and Gooding set up an equation

$$S = Q + b_1 X_1 + b_2 X_2 + b_3 X_3,$$

where  $S$  represents service employment,  $Q$  is a constant, and the  $X$  terms are, in order, private export employment, civilian employment at the Portsmouth Naval Shipyard, and employment at Pease Air Force Base.

With data fitted from 1955-64, their results were

$$S = -12905 + .78 X_1 + .55 X_2 + .35 X_3$$

(.31)      (.23)      (.14)

The multipliers are  $1 + b_i$  for each sector.

Weiss and Gooding used a mixture of assumption and location quotient methods in allocating export employment and assumed that the export sectors were independent and that workers in the export sectors demanded similar services.

This variation on economic-base modeling has not fallen into widespread use for several reasons: its flexibility (in number of exogenous sectors) and the statistical significance of coefficients are limited by the number of observations available; determining the export

content of industry employment remains a demanding chore; and with the rise of desktop computing, input-output models are better sources of industry-specific multipliers and are similar in cost.

### **Critique: advantages, disadvantages, praise, criticism**

Economic-base models suffer from old age: they have been built by so many analysts with varying levels of quality and they have been criticized so often that little remains except the concept.

The indictment would include the following phrases:

Short run

Nonspatial

Simple adaptations of national models

Data is normally available for administrative units (counties) which may be poorly defined as economic regions.

Ignores capacity constraints

Assumes perfect elasticity of supply for inputs

Pits the area against the rest of the world, showing no interdependence between regions

Multiplier varies with size of region. (As a region grows it diversifies, importing less and so increasing local consumption and the multiplier (Sirkin 1959)). Also, larger regions tend to influence neighbors more and so to enjoy larger feedback effects (Richardson 1972)

An employment multiplier is often used to discuss income changes. (But this assumes that employment and per capita income are perfectly correlated -- in a simple economy with perfectly elastic supplies of labor this might be the case although, of course, the world is not simple.)

Assumes that exports are the sole determinant of economic growth. (It is not reasonable for us to take the rap for this.) Any rational person can see that the determinants of growth are many -- the simple model just emphasizes one determinant. Perhaps the fault lies in early attempts to formulate multipliers and the ease with which the simple multipliers could be constructed. (Ghali 1977; Sirkin 1959))

Direction of dependence may be questionable: which comes first, export growth or a strong service sector, or interdependence? Should we be concerned with preconditions for export growth (setting up an attractive service sector) in this simple model? Are we planning growth or explaining the true basis?

Although castigated for decades, the economic-base model has survived as a very succinct expression of the power of demand in regional income determination. The most current, and perhaps the clearest and most complete, statement of its status is found in a recent review by Andrew J. Krikelas (1992), reprinted below with permission from the Atlanta Federal Reserve Bank..

## APPENDIX A REVIEW OF ECONOMIC-BASE LITERATURE

The following article appeared in the *Economic Review*, Federal Reserve Bank of Atlanta, July/August 1992, pp. 16-29, and represents the latest in reviews and critiques of economic-base literature.

### **Why Regions Grow: A Review of Research On the Economic- Base Model**

**Andrew C. Krikelas**

*The author is an economist in the regional section of the Atlanta Fed's research department.*

Regional economic models are used in a variety of decision-making contexts. Government officials use them to prepare annual budgets. Businesses rely on them for producing short-run market demand forecasts and for analyzing longer-term growth strategies. Urban planners and transportation officials use them to develop long-range plans for urban and regional development. Finally, state and local policymakers turn to them to get new ideas for programs and policies to promote long-run regional growth.

Although it would be convenient if a single model had been developed to serve all these purposes simultaneously, no such model is ever likely to exist. Instead, regional models tend to be highly specialized in terms of the issues that they are able to address and the time horizons over which their analytical results are most reliable. For example, a short-run forecasting model might serve

the needs of state or local government officials engaged in the annual budgeting process, but it would contribute little information relevant to long-run local economic development issues confronting planners and policymakers. Only rarely is a regional model able to perform well in more than one of these distinct decision-making contexts.<sup>1</sup>

The rapid pace of urban growth during this century, along with the challenge it has presented for planners trying to anticipate and influence this growth, has ensured a healthy demand for regional economic models, particularly since 1945. Unfortunately, models supplied have been inadequate.

At the beginning of the postwar period, the economic base model was probably the only such instrument generally available for regional economic analysis. This model focuses on regional export activity as the primary determinant of local-area growth; it is one of the oldest and most durable theories of regional growth, with origins extending at least as far back as the early 1900s. However, economic base theory received the greatest amount of attention from scholars in regional science between 1950 and 1985. Despite the model's acceptance over such a long period, when the noted regional scientist Harry W. Richardson, writing for a special twenty-fifth anniversary issue of the *Journal of Regional Science*, reflected upon the more than forty years of research conducted within this paradigm,

he concluded that "the findings on economic base models are conclusive. The spate of recent research has done nothing to increase confidence in them.... The literature would need to be much more convincing than it has been hitherto for a disinterested observer to resist the conclusion that economic base models should be buried, and without prospects for resurrection" (1985, 646).

Like Richardson, others over the years have expressed concern with the narrow focus of economic base theory on exports—just one portion of the demand side of the regional growth equation—to the exclusion of important supply-side factors and constraints. Many have suggested that economic base theory, its analytical and methodological techniques, and the public policies that it promotes should be abandoned in favor of other, more comprehensive theories of regional growth and development.

Nevertheless, economic base research continues. Most notably, James P. Lesage and J. David Reed (1989) and Lesage (1990) have provided empirical evidence in support of the economic base hypothesis as both a short-run and long-run theory of regional growth. These authors suggest that their models could be used both for short-term forecasting of regional employment, income, and product and for longer-range regional economic planning and policy analysis. If these claims were valid, then the economic base model, rather than being of little value, would be one of the few regional models that might be useful in each of these very different but crucially important decision-making contexts.

Because regional economic models play such an important role in planning and policy discussions, it is important to have a clear understanding of their strengths and weaknesses. Limitations of the economic base model in particular, because it tends to be widely used, should be recognized. Recent research has provided evidence suggesting substantial improvement in traditionally static economic base model specifications through the adoption of techniques routinely employed in the macroeconomics time-series literature. However, this author's research suggests that these studies may have overstated the usefulness of these new economic base model specifications (Andrew C. Krikelas 1991).

The purpose of this article, therefore, is twofold. First, a concise analytical history of the old and extensive economic base literature generated by a variety of professional and academic disciplines is provided in order to place recent research in perspective. The discussion then turns to the central question addressed in Krikelas (1991): Can techniques borrowed from statistical time-series literature successfully breathe new life into the traditional economic base model?

### **Definition of the Economic Base Concept**

As originally formulated, the economic base model focused on regional export activity as the primary source of local-area growth. According to this theory total economic activity,  $E_T$  is assumed to be dichotomous, with a distinction being made between basic economic activity,  $E_B$  (activities devoted to the production of goods and services ultimately sold to

consumers outside the region), and nonbasic economic activity,  $E_{NB}$ , which includes activities involved in producing goods and services consumed locally:

$$E_T = E_B + E_{NB} \quad (1)$$

This division of regional economic activity into these two distinct sectors is the central concept of the model.<sup>2</sup> A serious empirical concern is immediately raised by this approach, however, because appropriate export data are available at any subnational level only at high cost and with long lags. Various alternative measures have been proposed and analyzed in the literature over the years, but none has been found entirely adequate. Data problems, therefore, have always complicated economic base research.

While the central concept of the economic base model is the duality of regional economic activity, its fundamental behavioral assumption is that nonbasic economic activity depends on basic economic activity. In this perspective, external demand for a region's exportable goods and services injects income into the regional economy, in turn augmenting local demand for nonexportable goods and services. The model assumes that the income injected into the regional economy and the accompanying potential for developing locally oriented, nonbasic industries are in proportion to the size of a region's export base. Static and demand-oriented, the model ignores factors that affect the supply of a region's output and other changes, such as the introduction of new products, that affect demands.

$$E_{NB} = f(E_B) = \alpha + \beta * E_B. \quad (2)$$

Equations (1) and (2) can then be combined into the reduced-form expression in equation (3), which

indicates that total economic activity is primarily a function of basic activity:

$$E_T = \alpha + (1 + \beta) * E_B \quad (3)$$

The expression  $(1 + \beta)$  is commonly referred to as the economic base multiplier, and the parameter,  $\beta$ , is called the economic base ratio.

When applied to analyzing regional growth, the economic base model suggests that the growth process will be led by industries that export goods and services beyond regional boundaries. It even offers a prediction, captured in the multiplier, of the total regional impact likely to result from a change in basic economic activity generated outside the region. Understanding the future path of a regional economy, the model implies, requires simply concentrating on the prospects for the base industries. These few important industries are often dubbed "engines of regional growth."

This simple model captures the essence of economic base theory. Although the model has been enhanced over the years to include additional variables as well as to capture more explicitly the dynamic nature of the regional growth process, most changes have been made within the scope of this simple demand-oriented specification. In general, economic base models have not evolved to acknowledge the potential impact of many important variables that may affect regional growth—interregional capital flows; labor migration patterns; changes in products, tastes, and production processes; demographic shifts; and changes in state and local tax laws, to name a few. Because these issues are generally too important to ignore, many regional scientists have concluded that economic base theory lacks the complexity to provide a useful



framework for analyzing many regional economic issues and policies. The following review of the development and testing of the model will summarize where the debate on this topic stands at this point.

### **History of the Economic Base Literature**

Five fairly distinct chronological periods characterize the history of the economic base literature: (1) the origin of the concept, 1916-21; (2) early development, 1921-50; (3) the first round of serious debate, 1950-60; (4) the second round of debate, 1960-85; and (5) a third and perhaps final round of debate begun in 1985 and continuing today. Decades of research within the economic base paradigm have created a body of conventional wisdom concerning the uses and limitations of the model, both in theory and in practice. Nonetheless, as yet another round of discussion has begun, it seems that few lessons of the past have been learned and that a brief summary of the history of this literature might be useful.

### **Origin of the Economic Base Concept.**

The essential duality of regional economic activity that is central to the simple model expressed in the equations above was first articulated in 1916 by the German sociologist Werner Sombart, who wrote of "actual city founders," identified as the "active, originative, or primary city formers"—those whose positions of authority, wealth, or occupation allowed them to draw income from outside the city—and the "passive or derived or secondary city founders," whose livelihood depended on the city formers (Gunter Krumme 1968, 114).<sup>3</sup>

In 1921 M. Arrousseau made a similar observation in commenting on the relationship between what he distinguished as a town's primary and secondary occupations: "The primary occupations are those directly concerned with the functions of the town. The secondary occupations are those concerned with the maintenance of the well-being of the people engaged in those of primary nature" (John W. Alexander 1954, 246).<sup>4</sup> Also in 1921, landscape architect Frederick Law Olmsted distinguished between what he called primary and ancillary economic activity in an urban area (Alexander 1954, 246).<sup>5</sup>

Thus, although Sombart was apparently the first to observe formally the seeming duality of urban and regional economic activity, the remarks of his contemporaries Arrousseau and Olmsted make it abundantly clear that the concept was ripe for expression. By the early 1920s, therefore, the economic base concept had generally surfaced as a potential theory for explaining the regional growth process.

### **Early Development of the Theory.**

Following establishment of the theory, the next logical step should have been the empirical testing of the validity of the model's central hypothesis. However, this step was almost universally ignored and the model adopted as useful as the rapid growth of cities early in the century pressured state and local officials to improve the way in which they developed plans for urban expansion and the provision of public infrastructure and government services. The economic base model provided a much-desired framework for developing such plans, and studies designed to

identify and measure basic industries—economic base studies—quickly became primary tools employed in acquiring information for long-range planning.

After identifying a region's export base, economic base studies calculate a local-area economic base ratio,  $\beta$ . Once calculated, the economic base ratio can be used with forecasts of the future growth of the region's export base industries to predict the region's overall growth. The study's focus on the smaller number of industries identified as regional export industries helps streamline the process of forecasting total regional economic activity. In addition, by identifying those industries considered most important to the regional growth process, an economic base study provides information that adds insight to discussions of regional industrial policies and programs.

Sombart's analysis of the Berlin economy, published in 1927, was the first economic base study conducted during this period. Sombart, complaining that "nobody makes the effort to sit down with a pencil and figure out with the help of occupational statistics how much there actually is of a city-forming industry in a city such as Berlin," developed an empirical approach for dividing an urban economy into its dual parts (Krumme 1968, 116).<sup>6</sup>

Lacking detailed information on regional export activity, Sombart relied upon industry employment data collected in Berlin in 1907 to estimate the basic and nonbasic sectors of the city's economy. Relying mainly upon his personal judgment, Sombart estimated that approximately 262,000 of Berlin's total work force of 543,000 were employed in

export base industries (Krumme 1968, 113). These calculations placed Berlin's nonbasic/basic ratio,  $\beta$ , at 1.07, an approximately one-to-one relationship. Although Sombart did not use this information to forecast Berlin's growth, he could have done so. Making a more limited forecast of the prospects for those industries he had identified as being part of the city's export base and multiplying that total by the city's economic base multiplier ( $1 + \beta$ ) of 2.07 (assuming that the city's base ratio had remained relatively stable in the intervening twenty years since the census was conducted) would have provided a forecast of the change in total economic activity expected in Berlin as a result of some externally generated change in demand for its export product.

The reliance on secondary data sources for Sombart's study of Berlin's economic base is typical of most such research. As pointed out earlier, even today the appropriate regional export data required to conduct an adequate economic base study are available only at relatively high cost. The comprehensive economic analysis of the city of Oskaloosa, Iowa, published in *Fortune* magazine in 1938 illustrates this point ("Oskaloosa. . ." 1938).

Although published in a popular magazine, this study represents an important contribution to research on the economic base theory. The magazine staff conducted a complete census of the town's 3,000 families in order to determine the origin and destination of income flows within the city. They also conducted a census of the town's businesses, including an accounting of the destination of their output and the source and value of the most important

inputs into the local-area production process.

The results of the study indicated that in 1937 Oskaloosa was a net exporter of goods and services to the rest of the world and that manufactured goods and professional services were the town's leading export industries. The study's findings are interesting because they were based upon a census that provides a relatively accurate portrayal of Oskaloosa's export activity during the year studied. Even by present standards this study represents one of the most thorough economic analyses of a small community ever published.

The great effort required to collect these data, however, explains why a survey- or census-oriented approach to economic base identification generally has been abandoned for the nonsurvey identification techniques made popular by Homer Hoyt in the late 1930s. Working with the Federal Housing Administration during the mid-1930s, Hoyt developed and employed an economic base methodology for producing forecasts of local housing market demand. His techniques became known to a wide audience with the original publication of his textbook, *Principles of Urban Real Estate* (coauthored with Arthur M. Weimer in 1939), which Richard B. Andrews called the first "complete statement of the theory of the economic base." In commenting on the impact of this work, Andrews continued, "This statement included much material that was new outside of technical reports. For example, it introduced in formal fashion the idea of a mathematical relation between basic employment and service employment.... Hoyt considered the

economic base idea to be a tool that might be employed in analyzing the economic background of cities with the objective of forecasting the future of the entire city" (1953a, 163).

In this text Weimer and Hoyt distinguished between "urban growth" and "urban service" industries, suggesting that a region's potential for growth depended primarily upon the prospects for the region's urban growth industries. They provided a six-step procedure for identifying such industries. Using relatively accessible income and employment data, the authors developed a methodology that represented a combination of what has become known as the assignment technique and the location-quotient technique of economic base identification. The assignment technique is essentially identical to Sombart's methodology, in which personal judgment is used to assign industries within a particular regional economy to basic and nonbasic sectors. The location-quotient technique, on the other hand, relies upon regional economic data to make such distinctions.

Location-quotient methodology compares a region's concentration of economic activity in a particular industry with that of a benchmark economy, usually the entire country in which the region is located. If the regional concentration, measured in terms of the industry's share of total regional employment or income, exceeds the benchmark economy's concentration in that industry, the surplus level of employment or income is assumed to measure regional export activity. For example, if an industry accounts for 6 percent of regional employment but only

2 percent of national employment, two-thirds of that industry's employment would be called basic. (If the regional activity in an industry is less than that at the national level, the industry is categorized as nonbasic.) Making this identification requires only industry employment or income data for the region and a similar set of data for an appropriate benchmark economy.

Although Weimer and Hoyt were not the first to propose using the location quotient and assignment techniques as nonsurvey methodologies for dividing regional economic activity into its basic and nonbasic components, dissemination of the techniques through their textbook introduced these shortcuts to a wide audience. With these methodologies available it became feasible for local development officials to adopt the economic base paradigm for purposes of analyzing specific urban and regional economies. During the latter half of the 1940s, once these techniques had become more widely known, a much larger number of cities and states began to use the economic base model in urban and regional planning and economic analysis.<sup>7</sup>

**Theoretical Debate.** By 1950 economic base theory and its methodological techniques had become established as the primary tools of regional planning. The theory itself had been accepted, uncritically, as an explanation of local-area growth and economic development. Between 1950 and 1960, however, discussion at the theoretical and methodological level turned directly to the question of the validity of the economic base hypothesis itself. Unfortunately, only a handful of

empirical tests were reported during this entire decade.

The earliest and most cogent critique of economic base theory was presented by George Hildebrand and Arthur Mace (1950) in their analysis of the Los Angeles metropolitan area. This important contribution identified the theoretical model upon which the economic base paradigm was founded and performed an empirical test that provided evidence supporting the validity of the economic base hypothesis, at least for short-run forecasting.

Hildebrand and Mace's most significant contribution was their explicit formulation of economic base theory as a testable behavioral hypothesis. Their results, which demonstrated a statistically significant short-run relationship between basic and nonbasic employment in Los Angeles, represented the first empirical confirmation of the economic base hypothesis. Furthermore, the authors formulated their tests within the context of an explicitly Keynesian national income model and then outlined the inherent limitations of such a model.

Consider the familiar Keynesian relationship:

$$Y = C + I + G + (X - M), \quad (4)$$

where total regional income,  $Y$ , is divided into a number of distinct sectors, including consumption,  $C$ ; investment,  $I$ ; government expenditures,  $G$ ; and exports minus imports,  $X - M$ . The reduced-form expression of this model would include some smaller set of exogenous variables, only one of which would be regional exports. (Other exogenous variables would include the autonomous components of

consumption, investment, government expenditures, and imports; marginal propensities to consume locally, to invest locally, and to import; and local and federal tax policies.) It is this set of exogenous factors that would determine, theoretically, a region's total income level,  $Y$ .

The economic base model focuses on one particular aspect of this relationship, regional export activity,  $X$  ( $E_B$  in equation [1] above), and can be considered a special case of the more general Keynesian model in equation (4). Given this interpretation, it becomes clear that for exports to be considered the only exogenous determinant of regional growth, all other relevant factors, related to both demand and supply, must remain fairly constant or be functions of export activity. Although this might be a tenable assumption in the short run, it probably is an extremely poor one in the long run. Hildebrand and Mace made this observation explicit and suggested that the model was most appropriate for anticipating regional economic trends over a short time horizon. In addition, they listed some of the other variables that they thought should be taken into account in developing a more comprehensive model of regional economic activity: population levels and interregional migration patterns, regional capital investment levels and annual flows, state and local tax policies, and changes in the cost of transportation to reach external markets. Despite these reservations, Hildebrand and Mace offered a fairly encouraging assessment of the prospects for this type of research, based on the availability of additional census data and further empirical analysis across a ten-year span.<sup>8</sup>

Unfortunately, the lessons contained in Hildebrand and Mace's study were not widely disseminated. Hildebrand and Mace were among the first economists to contribute to the economic base literature. Their article was published in a journal not normally read by geographers and urban planners, who, before 1950, had played a dominant role in the research conducted within the economic base paradigm. Therefore, rather than playing the role of a seminal article to a further body of empirical research, the Hildebrand and Mace article remained relatively unknown. The debate of the 1950s brought many of their important insights to the attention of geographers and urban planners, but it took nearly a decade for all of these contributions to be uncovered.

Most of the 1950s' debate on economic base theory was conducted in the geography and planning literatures. The origin of this debate can be traced to a series of nine articles published by Andrews between 1953 and 1956 (see reference list). These articles provided a careful exposition of economic base theory and the methodologies that had been developed to analyze urban and regional economic activity. The author's stated purpose was to explore and evaluate the entire concept. "We have operated far too long on a set of ideas which appear valid but which, despite substantial conceptual omissions and difficulties of application, seem to be accepted all too blithely," he wrote, calling for "more fundamental thinking on and questioning of the reality and utility of base theory as presently conceived" (1953a, 167).

While Andrews was somewhat critical in his assessment of the economic base paradigm, he clearly was a proponent of its inherent validity and usefulness. Instead of suggesting the abandonment of the model as a tool for urban and regional economic analysis, he identified ways in which it could be improved to serve such purposes better. His recommendation included better efforts at basic industry identification and measurement, improvements in the collection of regional data, and modifications in the way in which economic base concepts were used. Given Andrews's criticism of the state of the economic base research prior to 1950, it is surprising to note he did not address one of the most fundamental shortcomings of this research: the lack of empirical verification of the underlying hypothesis. Krikelas (1991) identified only five empirical tests of the economic base hypothesis conducted during the 1950s. Three of those studies, including that of Hildebrand and Mace, supported the validity of the economic base hypothesis, at least in the short run, and two provided evidence against it. A decade of research, therefore, provided insufficient empirical evidence for determining the validity of the model's central hypothesis.

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*When applied to analyzing regional growth, the economic base model suggests that the growth process will be led by industries that export goods and services beyond regional boundaries.*

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Instead, most of the debate of the 1950s centered on questions related to theory

and practice rather than testing. Hans Blumenfeld (1955) was critical of the economic base model's narrow focus on export activity as the primary source of regional growth. While he agreed that this model might do well to explain economic growth in small or highly specialized economies, he argued that it was inadequate to explain the growth of complex urban economies. Blumenfeld was also critical of the policy implications of the model; these focused almost exclusively on supporting existing export industries at the expense of other reasonable alternatives, such as fostering the establishment and development of industries that would compete with imported goods and services.

Charles M. Tiebout (1956a, 1956b) and Douglass C. North (1955, 1956) engaged in a short but lively debate over the short-run versus long-run applicability of the economic base model. Tiebout, explicitly recognizing the Keynesian roots of the economic base model, supported Hildebrand and Mace's (1950) contention that the economic base model was most appropriate for short-run economic analysis. He also argued that the economic base model minimized the important contribution that nonbasic economic activity made to local area growth and development. He wrote that, although export activity was important, "in terms of causation, the nature of the residentiary industries will be a key factor in any possible development. Without the ability to develop residentiary activities, the cost of development of export activities will be prohibitive" (1956a, 164).

North, however, objected to the characterization of the economic base

model as an adaptation of the demand-oriented Keynesian model. Instead, he argued that the most important determinant of a region's long-run growth potential was its ability to attract capital and labor into the region from outside. Such supply-enhancing flows in turn would respond quite favorably to profit opportunities offered by regions engaged in high levels of export activity. North observed that historically "it was frequently the opportunities in manufacturing for the United States market which led to immigration of labor and capital into a region. The important point is that the pull of economic opportunity as a result of a comparative advantage in producing goods and services in demand in existing markets was the principal factor in the differential rates of growth of regions" (1956, 166).

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*Many regional scientists have concluded that economic base theory lacks the complexity to provide a useful framework for analyzing many regional economic issues and policies.*

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The economic base model proposed by North explicitly recognized the important role of supply factors in determining the nature and growth potential of a region's export base. In practice, however, most economic base models of this and subsequent periods have maintained a fairly strict demand orientation. This demand-oriented model is also the one to which Tiebout raised so many objections. As a result, although Tiebout and North found themselves on different sides concerning the validity of the model as a long-run theory of

regional growth, both ultimately agreed that supply factors needed to be added to the model in order to make it relevant for long-run regional economic analysis.

One additional advance in the theoretical literature of this period that called into question the adequacy of economic base modeling techniques was the development of regional input-output models. Before 1950 the economic base model represented the primary tool available to regional planners for analyzing the impacts of anticipated changes in regional economic activity. During the first half of the 1950s, however, input-output modeling techniques first developed by Wassily W. Leontief (1951) were adapted for purposes of regional economic analysis.<sup>9</sup> While a regional input-output model could distinguish between the differential regional impacts that might be associated with, for example, the construction of a specialty steel manufacturer versus a mail-order catalog facility—two very different kinds of basic economic activity—the simple two-sector economic base model could not make such a distinction. Given this limitation, many urban planners began to advocate input-output techniques as more appropriate for forecasting anticipated changes in regional economic activity.

The debate of the 1950s also focused on several important methodological issues. Papers by John M. Mattila and Wilbur R. Thompson (1955) and Charles L. Leven (1956) considered the adequacy of the location-quotient technique's ability to identify a region's economic base industries. While suggesting certain improvements to the traditional formulation of the location quotient,

Mattila and Thompson concluded that "if used with care, the index of surplus workers in both its absolute and relative form should prove to be a highly useful tool in regional economic base studies" (1955, 227).<sup>10</sup> Leven, on the other hand, arrived at the opposite conclusion, stating that "the shortcomings of this technique render it useless as a quantitative measure of basic activity in an area" (1956, 256).

The issue of the appropriate measure to be used for calculating location quotients was also discussed. Because employment data were more readily available than wage or income data, most economic base studies of this period used employment in identifying regional export activity. This measure, however, has some serious drawbacks. In addition to placing equal weight upon part-time and full-time employment and failing to adjust adequately for productivity and wage differences between workers employed in different industries, employment data do not provide any measure of the impact that transfer payments and other sources of unearned income, such as interest payments, rents, and profits, have upon a regional economy.

Recognizing the serious weaknesses associated with the use of employment data for purposes of identifying a region's economic base, Andrews (1954a), Leven (1956) and Tiebout (1956c) all suggested the adoption of alternative measures of regional economic activity. Andrews and Tiebout advocated the use of income received by residents of the region, and Leven argued for a value-added measure. Income and value-added data, however, generally are not available for regional

economies, especially at the substate level, except with long lags.

By the beginning of the 1960s professionals engaged in urban and regional economic analysis had divided into three distinct camps concerning the conduct of research within the economic base paradigm: those who still considered the economic base model to be a reasonable framework for urban and regional economic analysis; those who questioned its validity but sought more empirical evidence before abandoning the paradigm; and those who rejected the validity of the hypothesis, instead turning to the investigation of other methods of regional economic analysis, including regional input-output models. Whereas the debate of the 1950s was conducted primarily at the theoretical level, the quarter-century between 1960 and 1985 was filled with empirical examinations of a wide range of theoretical and methodological questions related to the economic base model.

**Empirical Debate.** Between 1960 and 1985 a large number of articles and several books were published on the economic base model.<sup>11</sup> Yet while the question of the empirical relevance of the economic base hypothesis was arguably the most important issue facing the profession on the heels of the debate of the 1950s, only a quarter of these contributions actually addressed it. To provide some perspective on the extensive literature of this period, Krikelas (1991) developed a taxonomy. The six categories listed represent distinct facets of the economic base literature of this period: (1) identification of export base activity, (2) calibration studies, (3) extensions of the base model, (4) case studies, (5) theoretical works,



and (6) tests of the economic base hypothesis.

A thorough discussion of the contributions that fall into each of these categories is beyond the scope of this article. However, a summary of the major developments in each category should yield insights. It should be noted that the majority of the research published during this period—that is, categories (1)-(4)—assumed, at least implicitly, the validity of the economic base hypothesis.

*Identification of Export Base Activity.*

The most contentious issue facing researchers using the economic base model is the identification of regional export activity. Much attention has been paid to the development of nonsurvey techniques, and during this period seventeen studies were devoted to creating new or improving old methodologies. Edward L. Ullman and Michael F. Dacey (1960) and Vijay K. Mathur and Harvey S. Rosen (1974) introduced two completely new nonsurvey methods for identifying regional export activity, and several other researchers suggested refinements for improving both the location-quotient and assignment methods of economic base identification. Andrew M. Isserman (1980) offers an excellent survey of the developments of this period, including a critique of each methodology.

*Calibration Studies.* Calibration studies are research designed to test the adequacy of competing nonsurvey identification techniques. Researchers either compare nonsurvey estimates of regional exports with benchmark survey or census data on regional exports or simply compare results of several

nonsurvey techniques. Another seventeen studies conducted between 1960 and 1985 can be classified as calibration studies, and Isserman provides an excellent summary of such research, concluding that although efforts to develop and refine the nonsurvey methods had been substantial, "the situation is lamentable" (1980, 179-79).

*Extensions of the Base Model.* During this period at least two important extensions were made to the simple economic base model. In the first, additional variables other than basic economic activity were added to the original specification in order to investigate their effects on the regional growth process. Stanislaw Czamanski's (1965) study represents the first of several in which a demographic variable—population—was explicitly included in the model specification. Paul E. Polzin (1977), on the other hand, developed a model designed to capture the effects of local-area labor supply conditions on regional economic activity, and Ron E. Shaffer (1983) and Shahin Shahidsaless, William Gillis, and Shaffer (1983) included variables designed to measure the contribution of both demographic and geographic factors. Given the fact that these authors generally found the additional variables to be very important determinants of regional growth, it is somewhat surprising that relatively few studies focused on this issue.

A second innovation, which gained a much broader acceptance in the literature, was the disaggregation of basic activity into more than one sector—manufacturing, construction, services, and government, for example.

This work was stimulated by the challenge posed by regional input-output models and their clear demonstration that changes in regional activity in different export industries were likely to have very different effects upon a regional economy. Steven J. Weiss and Edwin C. Gooding (1968) provide the first example of a multisectoral economic base model, and their work was repeated and extended in many subsequent studies. However, while the literature of this period reported the results of numerous multisectoral economic base models, the maximum number of sectors for which multipliers can be estimated has always been limited by the length of available data series, usually to ten sectors or fewer. As a result, no economic base model has ever been able to reproduce the level of industry disaggregation available in most regional input-output models.

*Case Studies.* In most instances the main purpose of these base studies was the calculation of multisectoral economic base multipliers intended to demonstrate the significant impact of the sectors under consideration. Early studies had focused mainly on the role of manufacturing in the regional growth process. Many of these later works were instead devoted to showing the important contribution that the trade and service sectors could also play in regional growth.<sup>12</sup>

*Theoretical Works.* Several contributions during this period were devoted exclusively to advancing the theoretical foundations of the economic base paradigm. Edwin F. Terry (1965) explicitly derived the linkage between the economic base model and the Keynesian model. John Mutti (1981), on

the other hand, demonstrated the close relationship between economic base and international trade models. And finally, Wolfgang Mayer and Saul Pleeter (1975) and F.J.B. Stillwell and B.D. Boatwright (1971) developed economic base theoretic models that demonstrated that the location-quotient and minimum-requirements methods of export industry identification could be derived from, and were consistent with, economic base theory. While these and other contributions provided a formal statement of the theoretical underpinnings of the economic base model and its methodological techniques, they did not provide empirical evidence in support of the theory's central hypothesis.

*Tests of the Economic Base Hypothesis.* In considering the empirical results of studies published during this period, it is important to distinguish between dynamic and static tests of the economic base hypothesis. Although the economic base paradigm generally has been used, implicitly, to analyze dynamic regional economic events, most specifications of the model, like that in equations (1)-(4), have been explicitly static in nature. This point was made clear first by Charles E. Ferguson (1960). Subsequently, one of the major contributions of this period was the more explicit consideration of the dynamic properties of the economic base model. Researchers began using time-series modeling and other econometric techniques to analyze the short-run versus long-run applicability of the economic base model as well as to develop practical regional forecasting models.

The majority of these studies, however, were still predicated upon explicitly

static model specifications. Even some of the studies that ostensibly attempted to capture the dynamic properties of the economic base model failed to do so adequately.<sup>13</sup> Given that the utility of an economic base study depends upon its use for analyzing dynamic economic events, it is unfortunate—and surprising—that relatively few of these empirical studies were specified in such a way as to explore this issue.

In reviewing the literature of this period, Krikelas (1991) examined twenty-three studies that reported the results of tests of the economic base hypothesis. Eleven were static tests; twelve, dynamic. Of these, six static tests and seven dynamic tests provided results consistent with the economic base hypothesis. Many of the dynamic tests of the hypothesis were further designed to explore the issue of the short-run versus long-run validity of the economic base hypothesis. Only four studies—Harold T. Moody and Frank W. Puffer (1970), Curtis Braschler (1972), Braschler and John A. Kuehn (1975), and James E. McNulty (1977)—provided any ostensible evidence in support of economic base theory as a long-run theory of regional growth.

As Shelby D. Gerking and Isserman (1981) have pointed out, however, the model specifications adopted in three of these four studies actually tested only the contemporaneous relationship between basic and nonbasic economic activity rather than the long-run relationship purportedly tested by the authors. They further concluded that Moody and Puffer's (1970) results, which were based upon an appropriately specified dynamic model, were more likely to be attributable to the authors' choice of bifurcation methodology than to the

existence of a long-run economic relationship between basic and nonbasic employment. Thus, while a narrow majority of the test results reported during this twenty-five-year period provided evidence in support of the validity of the economic base hypothesis, at least in the short run, very little empirical evidence suggested that the model could also perform well in the long run.

By 1985 the most definite and positive comment the literature could support about an economic base model was that it would perform best in providing relatively short-term forecasts of total regional economic activity. More than fifty years of research had failed to provide any substantial evidence in support of the model as a long-run theory of regional growth—a serious limitation in light of the fact that policymakers are generally more interested in long-run growth issues. It should be clear that the economic base model, because it fails to account for some of the fundamental determinants of the regional growth process, should not be adopted for long-range planning and policy analysis. These are the results that led to Richardson's call (cited earlier) for burying economic base models "without prospects for resurrection" (1985, 646).

**Third Period of Debate.** Despite Richardson's impassioned warning, research continues to be performed within the framework of the economic base paradigm. Recently, a resurgence in such research has been fueled by a recognition that some sophisticated econometric techniques used in analysis of macroeconomics time series may be applied to the economic base model. In particular, it has been demonstrated that

the essential features of the economic base model can be captured within the context of a bivariate vector autoregression (VAR) linking basic and nonbasic economic activity.<sup>14</sup> Once specified, such a VAR can be subjected to the time-series econometric tests and analytical procedures that have been developed over the years. Granger causality tests can be formulated in order to test the validity of the economic base hypothesis. Impulse-response functions (the response of a variable to an unanticipated increase in other variables) can be derived and given a natural interpretation as dynamic base multipliers. Forecasting competitions can be held in order to assess how well competing models improve the accuracy of a given forecast. Finally, co-integration tests can be performed in order to assess whether there might be a long-run relationship between basic and nonbasic economic activity.

Using such techniques, Lesage and Reed (1989) and Lesage (1990) found empirical evidence in support of the economic base hypothesis. Lesage and Reed reported Granger causality test results that were generally consistent with the economic base hypothesis, at least in the short run. Proceeding further, the authors used their VAR model specifications to derive impulse-response functions describing the dynamic relationships between basic and nonbasic employment in eight metropolitan statistical areas (MSAs) in Ohio. The reasonable nature of the multipliers calculated from this experiment led the authors to conclude that this methodology offered promise for regional economic forecasting and policy analysis purposes. When Lesage (1990) reported the results of co-

integration tests that demonstrated a long-run economic relationship between basic and nonbasic employment in several of these MSAs, the combined results of this research effort seemed to provide evidence that such empirical work was both justified and could prove fruitful.

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*A third period of debate on the economic base model centers on the question of whether new techniques borrowed from macroeconomics time-series literature can revive the traditional economic base model.*

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The results of Lesage and Reed's (1989) and Lesage's (1990) studies are already being cited in the literature. David S. Kraybill and Jeffrey Dorfman (1992), for example, used these authors' methodology to estimate a three-sector model for the state of Georgia. These and other recent contributions represent examples of what has become a third period of debate on the economic base model, centered on the question of whether new techniques borrowed from macroeconomics time-series literature can revive the traditional economic base model.

Replicating and expanding this research, this author conducted extensive time-series econometric tests of the economic base hypothesis on models specified for the state of Wisconsin (Krikelas 1991). The results of this research, based upon a large number of two-sector and multisector model specifications, suggest that these new techniques do not provide the convincing evidence to support revival of the economic base model for

purposes of long-term forecasting or planning context.

First and foremost, the fundamental problems associated with deriving adequate estimates of regional export activity remain unresolved. Although Lesage and Reed (1989) claimed that their dynamic location-quotient technique "provides a more accurate decomposition of local area employment" (1989, 616), this claim seems to be overstated. Krikelas (1991) confirms the results reported by Isserman (1980) and several others who have found that the location-quotient technique tends to underestimate the level of regional export activity and, consequently, lend an upward bias to export base multiplier estimates.

Second, in order to assess the stability of multiplier estimates derived from a bivariate VAR, Krikelas (1991) calculated impulse response functions for models that were based upon data generated from a variety of alternative sample separation techniques. The results of this experiment show that small changes in the way in which a given data set is divided into its basic and nonbasic components can lead to large changes in multiplier estimates. These results call into question the usefulness of the dynamic multipliers derived from a bivariate economic base VAR for even short-run regional impact analysis.

Finally, Krikelas (1991) explored the possibility of deriving multipliers from multisectoral VAR specifications and found similar difficulties. As the number of sectors included in a VAR is expanded, establishing identifying restrictions required in order to derive

multiplier estimates becomes so arbitrary as to call into question the credibility of the multipliers derived from such specifications. As a result, any policy implications that might be implicit in a finding of significant differences between sectoral multiplier estimates would also be questionable.

More fundamentally, however, Krikelas concludes that the new techniques employed in Lesage and Reed and similar research do nothing to broaden the economic base paradigm's focus on the demand side of the regional growth equation. Past research has clearly indicated that economic base models that fail to account for important supply-side factors and constraints do not perform as well as models that try to incorporate such relationships. Labor migration patterns, interregional capital flows, and state and local tax policies all have important effects upon regional economic growth and development and need to be incorporated into regional economic model specifications for the model to have value for anything other than short-term forecasting. Although it is possible to expand the bivariate economic base VAR to include some of these important supply-side variables, this author has concluded that such research would be largely in vain because other problems would remain (see Krikelas 1991). The recent attempt to breathe new life into the economic base model seems to have failed to resuscitate the patient.

### **Conclusion**

Given the fact that several authors have begun to report empirical results in support of the validity of the economic base hypothesis, a third round of debate on the model seems already under way

in the literature. An examination of some of the claims made by the proponents of these new dynamic economic base models, however, indicates that they are apparently unaware of the scope of the literature preceding their efforts.<sup>15</sup> This brief analytical history should be

sufficient to convince users that the economic base model has severe limitations, especially for economic planning and policy analysis, and to help make this next and perhaps final round of debate a relatively short-lived one.

## Notes

1. Structural econometric models are often used for purposes of both forecasting and policy analysis. However, the great expense required to specify and maintain such models has generally led economists either to develop less complex models that focus narrowly on a small set of policy issues or to develop theoretical time-series models that perform well for purposes of short-run economic forecasting.
2. Besides the terms basic and nonbasic, a number of others have been proposed to distinguish between the two types of economic activity: town builders/town fillers, exchange production/own production, primary/ancillary, export/local, as well as others. Andrews (1953b) directly addresses the issue of the profligate and confusing terminology of the economic base paradigm.
3. Krumme was translating Werner Sombart's *Der Moderne Kapitalismus, Erster Band: Die Vorkapitalistische Wirtschaft*, 2nd rev. ed. (Munich: Duncker and Humblot, 1916). Sombart identified the city formers as "a king who collects taxes; a landlord who receives rent payments; a merchant who profits from trade with outsiders; a craftsman, a manufacturer, who sells industrial products to the outside; an author, whose writings are being bought outside the gates; a physician, who has clients in the countryside; a student, who is supported by his parents in another place, etc. These are the people who live and let live."
4. Alexander was citing M. Arrousseau, "The Distribution of Population: A Constructive Problem," *Geographical Review* 11 (1921).
5. Alexander cites a letter dated February 21, 1921, to John M. Glenn, a member of the New York Regional Planning Committee in which Olmsted wrote, "The multiplicity of their productive occupations may be roughly divided into those which can be considered primary, such as carrying on the marine shipping business of the port and manufacturing goods for general use (i.e., not confined to use within the community itself), and those occupations which may be called ancillary, such as are devoted directly or indirectly to the service and convenience of the people engaged in the primary occupations."
6. According to Krumme's translation, Sombart wrote, "It is necessary to find out for each trade how much of it is engaged in work for local consumption and how much in work for exports out of the city. This figure then is the city-forming ratio for the individual trade. Naturally, the ratio can be found accurately only with the assistance of an extensive enquete (survey). However, one could gain at least an approximate impression of the shares of the export industries in the total gainful employment by a careful investigation of the results of the occupational census" (1968, 116). The empirical study cited by Krumme was published for the first time in the second revised edition of Sombart's *Der Moderne Kapitalismus, Drifter Band: Das Wirtschaftsleben im Zeitalter des Hochkapitalismus*, in 1927. Krumme, however, was quoting from the third printing of this edition, published in Berlin in 1955.
7. The following list identifies a few of the communities that performed economic base studies during the 1940s, the individuals or institutions that performed these analyses, and the base ratios (B) calculated, respectively: New York, The Regional Plan Association Inc., 2.1; Detroit, Detroit City Plan Commission, 1.1; Cincinnati, Victor Roterus and the staff of Cincinnati City Planning Commission, 1.7; Washington,

- D.C., National Capitol Park and Planning, 1.1; Brockton, Massachusetts, Homer Hoyt, 0.8; the state of New Jersey, Homer Hoyt, 1.1; and Albuquerque, New Mexico, Federal Reserve Bank of Kansas City, 0.9. This information was originally compiled by Edward Ullman and published in the third edition of Weimer and Hoyt's text in 1954 and was reprinted in Pfouts (1960, 30).
8. Hildebrand and Mace wrote, "The forthcoming Census of 1950 will permit further advances in this research. Recalculation of location quotients and comparisons with 1940 will indicate changes in external markets and locational concentrations during the war decade, particularly in communities undergoing large gains or losses in population. With monthly statistics of insured employment, a current record of employment in non-localized industries can be maintained. Improved multiplier analysis, with current local labor force statistics, should then permit more precise depiction of local unemployment problems, and attainment of more adequate policies at the overall and community levels" (1950, 249).
  9. Perhaps the most often-cited contribution to the early regional input-output literature was an article coauthored by Isard and Kuenne (1953).
  10. The index of surplus workers is simply a measure of the number of workers in excess of that which would be required if the region's employment profile matched the national average.
  11. Krikelas (1991) identified eighty-four contributions to the literature during this period.
  12. Some of the sectoral multiplier studies conducted and the region or project for which they were calculated, include the following, respectively: retail trade multipliers calculated by Friedly (1965) for Redondo Beach, California; trade and service sector multipliers calculated by Terry (1965) for St. Louis, Missouri; defense industry multipliers calculated by Billings (1970) for the state of Arizona and by Erickson (1977) for the Badger Ammunition Plant, near Baraboo, Wisconsin; rural area multipliers calculated by Garrison (1972) for five nonmetropolitan counties in Kansas; and university sector multipliers calculated by Wilson (1977) for Tulsa, Oklahoma.
  13. See Gerking and Isserman's (1981) discussion of the results of Braschler (1972), Braschler and Kuehn (1975), and McNulty (1977).
  14. A VAR model consists of an equation for each variable in which the equations are estimated by regressing each of the variables against lagged values of all the variables. By not imposing any particular theoretical connection among the variables, the VAR will capture any correlations that exist in the data. In this sense, VARs are distinct from traditional structural models, which typically include a large number of variables that are theoretically linked.
  15. Lesage, for example, reported on one of the few empirical tests recorded in the history of the literature that supports the economic base hypothesis as a long-run theory of regional growth and wrote that "this finding would not be particularly surprising to most regional economists" (1990, 309). His is one of several comments published recently that have pointed toward the need for presentation of a comprehensive history of the extensive body of literature that exists.

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## **APPENDIX B AN ECONOMIC-BASE MODEL OF ATLANTA**

The following article is an example of a simple economic-base multiplier, probably the last computed for Atlanta. With modern data sources and computing equipment, such models are seldom seen; but just a few decades ago they were quite common. Their virtue is the ease with which they are understood.

# **AN ECONOMIC-BASE MULTIPLIER FOR ATLANTA, 1961-1970**

THIS ARTICLE OUTLINES the concept of an economic-base multiplier and develops a rough estimate of such a multiplier for Atlanta. In the interest of simplicity, we choose to ignore many points concerning economic-base models, which are already well documented in economic literature.<sup>1</sup> Instead, we discuss the principles involved and show how our estimates were derived from a general computing model applicable in other metropolitan areas.

The multiplier is useful in discussing the general importance of new economic activity in the region. For instance, a multiplier of the type developed here has been used in pointing out the economic impact of the Braves and the Falcons on Atlanta.<sup>2</sup> It is important to note several cautions before proceeding. First, the economic model is highly aggregated and should be used only in forming general conclusions; it is not "industry specific" and cannot be used for policy decisions which require choices between alternative actions.

LAWRENCE S. DAVIDSON and  
WILLIAM A. SCHAFER

Mr. Davidson is a graduate student and Dr. Schaffer is Associate Professor of Economics, College of Industrial Management, Georgia Institute of Technology

Economic-base multipliers have been replaced in recent years by more sophisticated and useful input-output studies so that their use can be justified "only when crude, hurried research is required."<sup>3</sup> While the Georgia Economic Model, a large input-output model of the state, is in use by state planners,<sup>4</sup> the simple model outlined here is all that is available for Atlanta.

Second, the estimating technique is one of a number of equally rough alternatives. Other techniques may yield different values for Atlanta's multiplier.

But the technique which we use is as good as any requiring so little data, and its results are adequate to bridge the gap until a more detailed and realistic model of Atlanta can be developed.

Economic-base theory, a commonly held explanation of urban growth, states that export activity is crucial to the economic growth of a region. Sometimes called export-base theory, it divides a region's economy into two sectors, the export (or basic) sector and the local (or support) sector. The former holds the promise of economic growth, while the latter, often called the service sector, primarily serves the needs of the basic sector. Change in employment in the service sector is a function of change in employment in the export sector. Hence, growth of employment in a region can be expressed as a simple function of growth of employment in export-base industries.

Exporters such as automobile and aircraft manufacturers, hotels, restaurants, service stations, department

stores, and recreation centers obtain income from customers outside the region. This export income then enters the local economy in the form of wages and salaries, purchases of materials, dividends, and so on, and becomes income to other local citizens. Since a local economy is usually dependent on its neighbors for at least some of its goods and services, a portion of this new circulating income leaks out of the local economy when goods, supplies, and services are purchased from outsiders. With each subsequent round of expenditures, local incomes increase in a continuing but diminishing chain. The impact of the original export sale persists over time and tends to decrease with each successive round of expenditures as leakages continue. This series of income and employment changes which follows the initial injection of money is known as the "multiplier effect." This term covers both direct and indirect effects of new economic activity.

The multiplier may also be expressed in terms of employment, as we will do. Each basic employee, who brings money into the region, requires a certain number of workers who provide the services needed to support his efforts. As new economic activity requires new basic employment, employment in the service sector is also stimulated, leading to an increase in total employment which is greater than the initial change. The ratio of change in total employment to change in basic employment is the economic-base multiplier.

Let us examine the main features of Atlanta's economic base, using "location quotients" to identify the industries which are strong exporters in Atlanta. A location quotient is a ratio comparing employment by an industry in a region as a percentage of total regional employment to employment by this industry in a benchmark economy as a percentage of total employment. The benchmark is normally taken to be the rest of the nation or state, with a degree of self-sufficiency normally imputed to this economy. Let us take the retail trade industry as an example. In Atlanta, 16.6% of employment is in retail trade, but in Georgia, only 14.1% is employed in retail trade. The location quotient, obtained by division, is 1.18, which means that Atlanta has 18% more retail trade employees than would be expected according to national standards. Since Atlanta is a well-known

regional shopping center, we can reasonably assume that these extra employees are selling to persons who live outside the metropolitan area; that is, they are exporting their services to other areas. With 101,100 retail trade employees in Atlanta, 85,760 are required to serve local needs, while 15,340, or 18% of local required employment, are involved in export sales.

Exhibit 1 shows employment and location quotients for industries in Atlanta in 1970. Atlanta's strengths are evident, and here its economic "base" lies primarily in the so-called "non-basic" industries. Atlanta's rapid growth requires a larger than normal con-

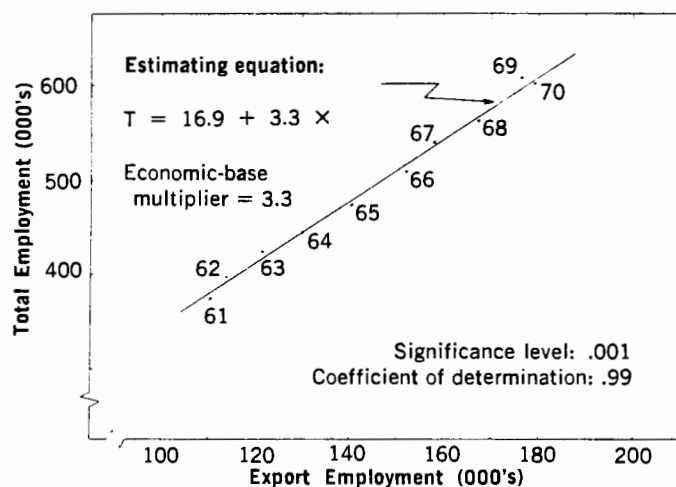
struction industry, and the size of her employment pool has permitted automobile and aircraft manufacturers to flourish. Transportation and communications, as seen in both public utilities and printing, are important functions of the city, as are finance, insurance, real estate, and the other service industries. But her greatest strength is in trade, especially wholesale trade, where 45,000 workers in excess of normal requirements for a region of Atlanta's size are employed. And while Atlanta has more than her share of federal government employees, Georgia's capital city, strangely, has less than her quota of state and local government

Exhibit 1: Employment and Location Quotients of Industries in Metropolitan Atlanta, 1970  
[Employment in thousands]

Industry	Total employment	Location quotient	"Excess" employment
Contract construction	31.4	1.09 <sup>N</sup>	2.6
Lumber	2.7	.54 <sup>N</sup>	—
Furniture and fixtures	3.6	.91 <sup>N</sup>	—
Stone, clay, and glass products	4.5	.82 <sup>N</sup>	—
Primary metal industries	2.8	.80	—
Fabricated metal products	5.7	.80	—
Machinery, except electrical	5.1	.89	—
Electrical machinery	3.9	.79	—
Transportation equipment	34.3	4.25	26.2
Other durables	3.0	.72	—
Food and kindred products	15.1	.98 <sup>N</sup>	—
Textile mill products	5.9	.71 <sup>N</sup>	—
Apparel and other textile products	8.1	.68 <sup>N</sup>	—
Paper and allied products	7.3	1.19 <sup>N</sup>	1.2
Printing and publishing	9.3	2.38	5.4
Chemicals and allied products	5.5	1.07	.4
Leather and leather products	1.7	.84	—
Other nondurables	1.9	.30	—
Transportation and public utilities	59.2	1.92	28.3
Wholesale trade	65.8	3.15	44.9
Retail trade	101.1	1.18	15.3
Finance, insurance, and real estate	44.2	2.04	22.5
Service, miscellaneous, and mining	92.4	1.40	26.2
Federal government	26.8	1.15 <sup>N</sup>	3.5
State and local government	68.0	.78 <sup>N</sup>	—
Total	609.3		176.5

N = Based on national benchmark. The location quotient used is the greater of quotients based on national or state data.

Exhibit 2: The Economic-Base Multiplier for Atlanta, 1961-1970



employees, due primarily to the spread of highway-related employees across the rest of the state.

Using location quotients, we can estimate "excess" employment in Atlanta, as seen in Exhibit 1. This employment can be used as a first estimate of Atlanta's export employment. We have made these calculations for each year from 1961 to 1970 and have plotted the relationships between total employment and export employment in Exhibit 2. The fit is remarkably good, almost a textbook illustration of simple linear regression. Since the slope of this line is the ratio of change in total employment to change in export employment, its

value is the economic-base multiplier. A rough estimate of Atlanta's economic-base multiplier, therefore, is 3.3.

We can illustrate the use of the economic-base multiplier with the results of a recent study of the economic impact of the Atlanta Falcons. In 1972, local and visiting football fans spent \$7.5 million in association with professional football games in Atlanta. The 29% of those fans living outside metropolitan Atlanta spent \$4,040,000 in the area; only 30% of this total was spent at the stadium itself, while \$2,825,000 became direct expenditures with Atlanta businesses. The Falcons, then, brought at least \$4 million into the

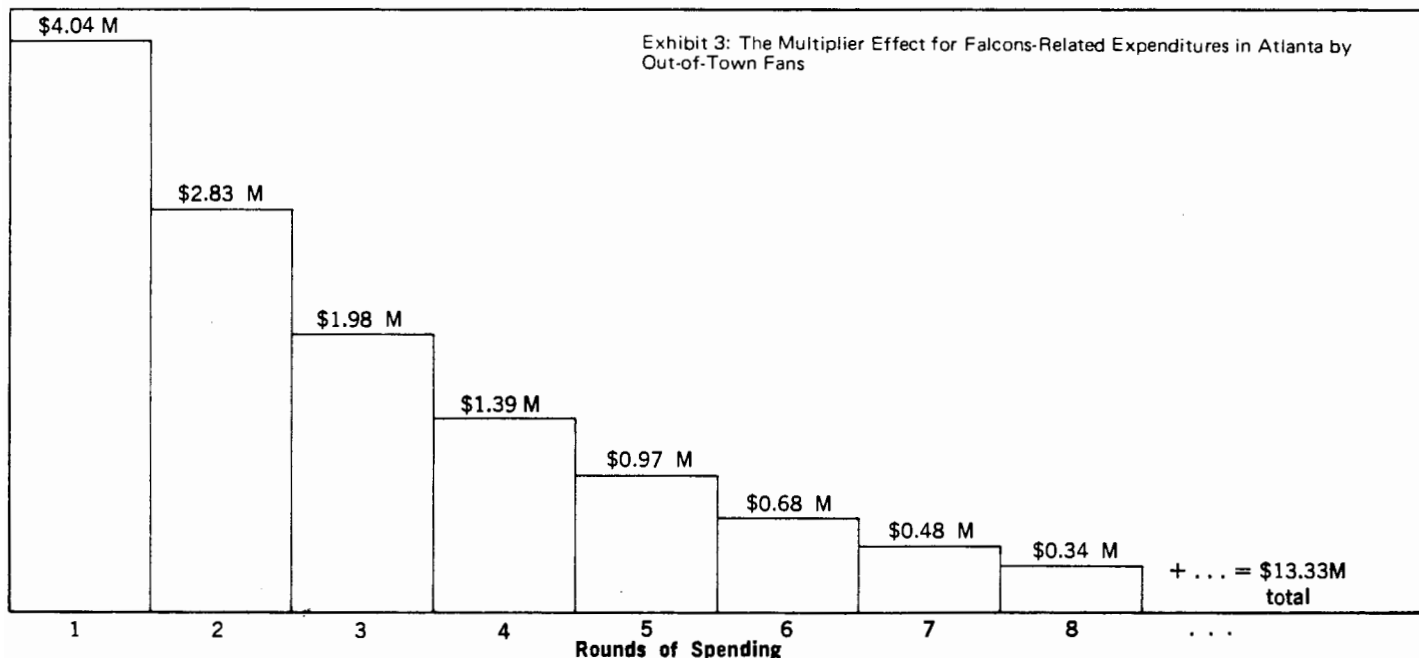
Atlanta economy in 1972. As this money circulates, it means up to 3.3 times this amount, or +13.33 million, in income for Atlanta businesses. Exhibit 3 illustrates the multiplier process, showing that an average of 70% of each dollar spent in Atlanta is recirculated locally.

1. For a discussion of the conceptual basis, application, limitations, and criticisms of the economic-base multipliers, see Charles M. Tiebout, *The Community Economic Base Study* (Washington, Committee for Economic Development, 1962); Walter Isard, *Methods of Regional Analysis: An Introduction to Regional Science* (New York, John Wiley and Sons, Inc., 1960), chap. 6; and Harry W. Richardson, *Elements of Regional Economics* (New York, Praeger Publishers, 1969), chap. 10.

2. See William A. Schaffer, George D. Houser, and Robert A. Weinberg, *The Economic Impact of the Braves on Atlanta: 1966* (Atlanta, The Industrial Management Center, Georgia Institute of Technology, 1967); and William A. Schaffer and Lawrence S. Davidson, *The Economic Impact of the Falcons on Atlanta: 1972* (Atlanta, The Atlanta Falcons, 1973).

3. Isard, op. cit., p. 221.

4. This study is reviewed in William A. Schaffer, Eugene A. Laurent, and Ernest M. Sutter, Jr., "The Georgia Economic Model—A Nontechnical Lesson in Input-Output Analysis," *Atlanta Economic Review*, March-April 1973, p. 34; it is reported in full in William A. Schaffer, Eugene A. Laurent, and Ernest M. Sutter, Jr., *Using the Georgia Economic Model* (Atlanta, College of Industrial Management, Georgia Institute of Technology, 1972).



## NOTE A. TECHNIQUES FOR DATA ANALYSIS

### Introduction

Now, with a few explanatory models under our belts, let us take a look at a couple of techniques for examining data. The term “analysis” comes from the Greek term for “a breaking up.” I like to think of it as a “laying out” of essential features for the better understanding of some phenomenon or thing. The process of analysis can involve a simple re-ordering of elements or it can involve a complex statistical tool or maybe even a model.

Sometimes, the simple approach is the best and can yield insights with great benefits at small costs. Here, I would like to re-visit our old friend the location quotient and consider a new technique, shift-share analysis. Both of these tools have their critics in academic circles, but both can be used to suggest strengths and weaknesses in an economy and both can point toward actions for developing a community.

### Location quotients

A location quotient is commonly defined as the ratio

$$LQ_i = (e_i/e)/(E_i/E), \quad \text{a-1}$$

where  $e_i$  is area employment in industry  $i$ ,  $e$  is total employment in the area,  $E_i$  is employment in the benchmark economy in industry  $i$ , and  $E$  is total employment in the benchmark economy. Normally, the “benchmark” economy is taken to be the nation as the closest available

approximation to a self-sufficient economy.

As pointed out in our discussion of economic-base models, it is easily converted for use in estimating export employment. We simply assume that a location quotient greater than one means that an industry produces more than expected in a self-sufficient economy and thus would be an export industry. On this assumption and location quotients for a local economy, we built an estimate of the economic base multiplier for an economy.

But all of these computations for detailed industries can lead to questions as well as answers. The analyst could proceed to ask why the local economy varies from the benchmark economy. What resources are present or absent? What opportunities for import substitution are unexploited? What is the apparent comparative advantage signaled by a large location quotient? Could it be an impediment or an enhancement for future growth?

Obviously, this means that location quotients are suggestive in nature -- they point toward further analysis, and they force us to proceed next to understand production processes and to explore comparative advantage and ways to change the local economy and promote growth.

The popularity of location quotients has lead to a large number of variations. As Avrom Bendavid-Val points out in his excellent practitioner’s book, the list of derived measures includes “...

coefficient of localization, coefficient of specialization, index of diversification, coefficient of redistribution, coefficient of geographic association, coefficient of participation, index of occupational discrimination, coefficient of deviation, friction ratio, and more. All of these amount to little more than imaginative applications of the basic location quotient technique, computing a ratio of ratios, in response to particular analytic needs.” (Bendavid-Val 1983)

Advantages and disadvantages of using location quotients are discussed in Chapter 3 along with sources of data.

### Shift-share analysis

Sometimes, it may be helpful to increase your general knowledge of change in the area in which you are conducting a regional impact analysis. For this task, “shift-share analysis” may be appropriate. It is the most common technique for breaking economic change in areas into components is called “shift-share analysis.”<sup>1</sup>

Although originating in the 1940’s, the technique was introduced to frequent use in 1960 by a team of economists undertaking a massive study of regions and economic growth (Perloff et al. 1960). Since then, it has been extended, used, criticized and revived numerous times. As a projection technique, it has been abandoned by all (including the U.S. Department of Commerce, a staunch supporter in the 1960’s) but the most faithful. As an expository technique, it has enjoyed continued life. Economists have criticized it as merely a

definitional manipulation of data containing no explanation of phenomena (that is, it is simply a way to organize data) -- the explanation of change has to come from further investigation.

But its major fault is that its interpretation relies heavily on the level of aggregation of the data used. Nevertheless, it is a great and inexpensive way to start a review of the industrial structure of an area.

Now, to see how this tool works, let us try various ways to estimate regional employment in year 2 for industry  $i$  ( $R_{2i}$ ), given knowledge of growth in national employment in industry  $i$  ( $N_{2i}/N_{1i}$ ), growth in total national employment ( $N_2/N_1$ ), and even knowledge of actual employment in industry  $i$  in the region ( $R_{1i}$ ). How could we proceed?

There are four alternative estimating techniques consistent with shift-share analysis. First, we could assume that employment in industry  $i$  is the same in period 2 as it is in period 1:

$$R_{2i} = R_{1i} \quad \text{a-2}$$

Here, we simply have neither knowledge nor hope for growth.

Second, we could assume that the local employment in industry  $i$  grows at the same rate as does the national economy:

$$R_{2i} = R_{1i} * N_2/N_1 \quad \text{a-3}$$

This, of course, is also a naïve assumption. In effect, we have assumed that both the industry and the economy have grown at the same rate, that local elements have each retained a constant *share* of national growth (hence the term).

Third, we could assume that the local employment in industry  $i$  grows at the

<sup>1</sup> A clear statement of this technique is contained in an essay by Charles F. Floyd included as an appendix to (Schaffer 1976). My comments rely on Professor Floyd’s work as well as appendix B in (Jackson et al. 1981)

same rate as does the employment in industry  $i$  in the national economy:

$$R_{2i} = R_{1i} * N_{2i} / N_{1i} \quad \text{a-4}$$

This is a little better. We can reasonably assume that local industries are subject to the same demand pressures felt by their competitors at the national level.

Fourth, we could assume that the local employment in industry  $i$  grows at the same rate as actually occurs (if we somehow could know this!):

$$R_{2i} = R_{1i} * R_{2i} / R_{1i} \quad \text{a-5}$$

Now, what if we try subtraction to make equations a-3 through a-5 into expressions of net change so that they can be added? We can do this by subtracting the right side of the preceding equation from each and naming the results.

The change in employment due to national growth alone, assuming the region gets its share, we call the *national growth effect* ( $NG_i$ ):

$$\begin{aligned} NG_i &= R_{1i} * N_{2i} / N_{1i} - R_{1i} \\ NG_i &= R_{1i} (N_{2i} / N_{1i} - 1) \end{aligned} \quad \text{a-6}$$

The other two changes represent *shifts* away from the national trend. The first is called the *industry-mix effect* ( $IM_i$ ) and shows the additional change due to the growth characteristics of industry  $i$ :

$$\begin{aligned} IM_i &= R_{1i} * N_{2i} / N_{1i} - R_{1i} * N_{2i} / N_{1i} \\ IM_i &= R_{1i} (N_{2i} / N_{1i} - N_{2i} / N_{1i}) \end{aligned} \quad \text{a-7}$$

The last change is called the *regional-shift effect* ( $RS_i$ ) and shows the additional change due to the specific characteristics of the region itself:

$$\begin{aligned} RS_i &= R_{1i} * R_{2i} / R_{1i} - R_{1i} * N_{2i} / N_{1i} \\ RS_i &= R_{1i} (R_{2i} / R_{1i} - N_{2i} / N_{1i}) \end{aligned} \quad \text{a-8}$$

Total change for each industry can be summarized as:

$$TC_i = NG_i + IM_i + RS_i \quad \text{a-9}$$

These elements can then be summed to yield:

$$TC = \sum_i TC_i = \sum_i (R_{2i} - R_{1i}) \quad \text{a-10}$$

Demonstration that all of these equations fit together to form this identity is left as an exercise.

We should note that the terminology used here, while it seems the most common, is not unique. The technique has been used and reinterpreted frequently, leading to renaming of effects. “Effects” are sometimes “components.” The “industry-mix effect” has been the “structural component,” the “proportional shift,” and the “industry-composition effect;” and the “regional-share effect” has been called the “differential shift” and the “competitive effect.” (Floyd 1976)

### Thoughts on writing an area profile

An area profile might be defined as an economic description which may lead to action or insight. Profiles may have many purposes. They may be intended to inform potential investors, to attract visitors, to inform citizens about the structure of their community, etc. The challenge for an analyst is to break free of the exclamatory hype associated with promotional literature. You should organize data to proclaim advantages and accomplishments, to identify problems and opportunities, or to suggest future policy, as appropriate. The following words and phrases are random points derived from a general reading of published and unpublished profiles; I suggest a scanning of collections of brochures, of Federal



Reserve Economic Reviews, of the World Wide Web, etc. for further guidance:

What is the region? Describe it absolutely and relative to other places.

How is the region defined? If it is a political region, what is its economic component. If it is a statistical region, are there any unusual features?

Geography and significant landscape features, advantages, and limitations.

Demography: population, age and ethnic composition if significant, education, etc.

Employment -- Have recent changes been due to dramatic changes for particular industries, or have they occurred across the board?

Governments -- fragmented, consolidated, etc.

Subregions -- definitions and boundaries, uneven growth or population distribution?

Economic base, before, now, expected. Location quotient analysis. How similar to the nation or state? Should it change? Where is the market for its exports? Where should major imports originate? Are these other markets stable or volatile (that is, is the region subject to an interregional business cycle)?

Will the economic base help or hinder in the future?

What are the prospects for improving the industry mix to get higher personal incomes, less pollution, whatever?

Which industries lead the region's performance? Do they contribute to cycles or to stability?

What is the reason for the region's existence? Why do people live there?

What will happen in the next two, three years -- expected new industries or activities, departures, significant events?

Development policies stated by authorities and in practice.

Problems

Trends in various indicators and performance relative to nation or other regions.

Why should the region be optimistic or pessimistic about its future? (Remember that you are an objective analyst, not a promoter.)

### **Elements to include in a location quotient analysis**

A location-quotient analysis should be carefully planned to take advantage of modern spreadsheets such as Microsoft's Excel. The challenge is to lay out the system so that you can sort and resort on the basis of the values of location quotients and on calculated surplus employment and back into industry order as needed.

You should pay careful attention to presentation of data in tabular format:

Does the table title clearly identify the region under study, the year, and the data?

Are the columns clearly identified in the caption?

Does the stub identify all rows and are sections specified and set apart?

Are columns wide enough for data?

Are decimals set consistently and at the appropriate level for discussion?

In other words, does the presentation meet the standards of good scholarship and sound workmanship?

Have you presented only data that is relevant, excluding items that are inconsequential?

The written part of the analysis is also important. Here are some points to consider:

At a very basic level, do you define “location quotients” and how they are used?

Do you show awareness of your data source, the level at which you work, and problems which may be associated with your data?

Did you experiment with several sources (e.g. both the Regional Economic Information System and

County Business Patterns) to see if they yield similar results?

Did you use both quotients and estimated excess employment?

Did you set up the tables and your statements such that the reader could easily check your results and even make their own conclusions?

Did you speculate on apparently questionable results?

Did you explore changes over time? (Since REIS data is since 1969 and the CBP data is available in yearly chunks on CD-ROM since 1986, we might expect an alert and energetic analyst to look at variation over time either to show trends or to identify data problems.)