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

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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.[1]

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.

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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.[2] 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, β, 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 (Günter Krumme 1968, 114).[3]

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).[4] 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.)[5]

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, β. 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).[6]

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, β, 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.[7]

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:

$$Y = C + I + G + (X - M), \tag{4}$$

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.[8]

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.

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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.

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).

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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).

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.[9] 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).[10] 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.[11] 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, 178-79).

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 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.

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.[12]

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.[13] 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.[14] 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.

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.[15] 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 atheoretical 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, Dritter 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 (β) 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 over-all 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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