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ANALYZING A REGION'S ECONOMIC BASE

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Introduction

The economic base of a region is its export-producing activities. The economic base of Minnesota is its farming, mining, logging, manufacturing and services industries that ship their products to markets outside the State of Minnesota or to local businesses for purchase by out-of-state visitors. The economic base of North Trondelag County in Central Norway also is that part of its farming, mining, logging, manufacturing and services industries producing goods and services shipped to markets outside North Trondelag County or to local businesses for purchase by visitors. All of these activities bring new income into the region that defines and delineates the sources and determinants of its economic well-being.

Knowing the economic base of a region, understanding the sources and determinants of its past growth and change, and preparing guidelines for its future development are the tasks addressed in this paper. We start with the historical antecedents of our present day understanding of the role and importance of a region's base economy.

Antecedents of Modern Base Theory

In 1936, Homer Hoyt, an economist with the Federal Housing Administration (FHA) in President Roosevelt's administration, developed the "essential outlines of the economic base idea as we now know it. At that time, on the basis of admittedly limited experience and data, he conceived of the basic and service elements of cities as having an employment ratio of 1:1" (Andrews, 1953a, p. 163).

Eight years before Homer Hoyt's formulation of the economic base concept, Robert Haig, one of the authors of the **Regional Survey of New York and Its Environs**, noted that "productive occupations may roughly be divided into those which can be called *primary*...manufactured goods for general use (i.e., not confined to use within the community itself) and those occupations which may be called, *auxiliary*, such as are devoted directly or indirectly to the service and convenience of the people engaged in primary occupations." (Haig, 1928). However, the usefulness of the economic base concept was not recognized in the 1928 planning study for the City of New York.

Richard Andrews, in his article on the "Historical Development of the Base Concept" in the May 1953 volume of **Land Economics**--a source of much of the historical information in this paper--quotes a passage from **A History of the Economic Institutions of Modern Europe** by

the historian Frederick Nussbaum, as follows:

"The principal, constituent elements of the town were those who are able by power or wealth to command a means of subsistence from elsewhere, a king who can tax, a landlord to whom dues are paid, a merchant who makes profits outside the town, a student who is supported by his parents. These are 'town builders'. After them come what we call the 'town fillers', those who serve the needs of the 'town builders': the shoemaker who makes the king's shoes, the jeweler who depends on the purchases of the merchant's wife, the landlady from whom the student rents his room."

Glenn McLaughlin's **Growth of American Manufacturing Areas**, published in 1938, included much discussion of economic relationships within urban areas central to the economic base concept. For example, he examined the association between changes in industrial activity and population growth and decline. He also examined location factors affecting the industrial composition of urban areas.

Also in 1938, the editors of **Fortune Magazine** published a pioneering survey-based study on "Oskaloosa versus the United States." The study used a balance-of-trade approach in analyzing the economic activity of a small county seat and college town in Southcentral Iowa. The study distinguished between the community's "growth" and "service" factors in tracing the flow of exports and imports. It also dealt directly, although only implicitly, with the concept of an external product market for exports, an internal product market for imports and local services, and a local labor market.

The first published statement of the theory of the economic base appeared in 1939 in the text **Principles of Urban Real Estate** by Arthur Wiemer and Homer Hoyt. The idea of a mathematical relationship between basic employment and service employment and between basic employment and total population was introduced in this text.

Hoyt had in mind the use of the economic base model in forecasting the future of an entire city, including its total employment and population. According to Richard Andrews, Hoyt applied a four-stage forecasting technique as follows (Andrews, 1953a, p. 163):

- "(1) Calculation of total basic employment in the community, particularly, the amount of basic employment in *each* basic activity...
- "(2) Estimation of the proportion of basic employment to service employment...
- "(3) Estimation of the future trend in each segment of the base as indicated by analysis of demand for its product or service locational factors, productive efficiency, etc.
- "(4) Calculation of total employment and total future population on the basis of future trends in basic employment."

After a lapse of more than a decade local planning agencies began to use the Hoyt approach in their planning process. The Regional Plan Association in its study, **The Economic Status of the New York Metropolitan Region in 1944**, identified the basic portions of an industry by comparing the local industry distribution with the US industry distribution. They used the ratio of local to US percentages for each industry as an indicator of industry concentration and specialization in the region.

Also in 1944, the Detroit City Plan Commission published its study, **Economic Base of Detroit**. This study was followed in 1946 by the Cincinnati Planning Commission study, **Economy of the Area**, with Victor Roterus as its author. The Detroit and Cincinnati studies were further proof of the growing acceptance and use of Hoyt's economic base approach to the analysis of urban economies.

The scope and potential applications of the economic base concept were greatly expanded and broadened in two papers published in the annual proceedings issue of the **American Economic Review** in May 1949. One paper was by Rutledge Vining on "The Region as an Economic Entity and Certain Variations to be Observed in the Study of Systems of Regions," the other by Phillip Neff on "Interregional Cyclical Differentials: Causes, Measurements, and Significance". The two papers introduced the concept of the region as an appropriate territorial unit for delineating and defining the economic base.

Starting in the May 1953 issue of **Land Economics**, Richard Andrews published a series of nine articles on "The Mechanics of the Urban Economic Base." Each article focused on a particularly difficult issue in economic base analysis, as indicated by their titles, as follows:

"Historical Development of the Base Concept," May 1953, pages 161-167.

"The Problem of Terminology", August 1953, pages 263-268.

"A Classification of Base Types", November 1953, pages 343-349.

"The Problem of Base Measurement", February 1954, pages 52-60.

"General Problems of Base Identification", May 1954, pages 164-172.

"Special Problems of Base Identification", August 1954, pages 260-269.

"The Problem of Base Area Delimitation", November 1954, pages 309-319.

"The Concept of Base Ratios", February 1955, pages 47-53.

"The Base Process and the Planning Concept", February 1956, pages 69-84.

In the same issue of **Land Economics** (pages 69-84) as the last of Richard Andrews articles, John Alexander published his seminal paper on "The Basic-Nonbasic Concept of Economic Functions." Like the **Fortune Magazine** study, Professor Alexander used a survey-based approach to delimit the urban economic base, in this study, for two Wisconsin cities:

Oshkosh and Madison. Unique to the Alexander study, however, was the questionnaire for the individual business enterprise that asked for the proportion of business activity that was export.

Tiebout's Community Economic Base

Homer Hoyt's evolving concept of the urban economic base achieved its critical transformation in the writings of Charles Tiebout. His article on "The Urban Economic Base Reconsidered", also appeared in the February 1956 issue of **Land Economics** (pages 95-99). For the first time, economic base theory was joined with modern economic theory in the context of national income forecasting and the theory of the income multiplier.

Confluence of ideas on the community economic base and economic growth

Contemporaneously with the publication of "The Urban Economic Base Reconsidered" Tiebout embarked on a continuing controversy with Douglass North on problems connected with export base theory in his article on "Exports and Regional Economic Growth" appearing in the April 1956 issue of the **Journal of Political Economy** (pages 160-164). Douglass North had previously published in the same Journal, in June 1955, his article on "Location Theory and Regional Economic Growth." He argues in this article that the rate at which a region grows will depend on the rate at which the export base expands, consistent with the increase in demand for the region's exportable goods and services.

Much earlier, Harold Innis had stressed the role of exportable commodities in regional economic growth in his book on **Problems of Staple Production In Canada** published in 1933. Gerald Meier, writing on "Economic Development and the Transfer Mechanism: Canada, 1895-1913" in the February 1953 issue of **The Canadian Journal of Economics and Political Science**, noted that capital investment flows into a region as demand **grows for its exportable** products. The capital investment makes possible **improvement in production processes and expansion of specialized supporting industries** that further facilitate export sector growth.

Also contemporaneous with the advances in economic base theory were the observations of Colin Clark in his book published in 1940 on **The Conditions of Economic Progress**. Alan G. B. Fisher also contributed to the theory in his article on "Production, Primary, Secondary and Tertiary" in the June 1939 issue of **Economic Record**. The two authors showed that a rise in per capita income is generally accompanied by a decline in primary industries (like agriculture and mining). It is also accompanied by a rise, first, in secondary industries (mostly manufacturing) and, later, in tertiary, or service, industries. The Clark-Fisher approach to the understanding of regional growth, known as economic sector theory, focused on the specialization and division of labor within a region. Sector theory thus brought the **services industries to the forefront** of economic base analysis.

Sector theory is joined with location theory in forming a theory of development stages, starting with a stage of self-sufficiency in a subsistence economy and, then, shifting to several stages of production specialization. A theory of development stages provides for public intervention in the construction and financing of essential regional infrastructure that relaxes various physical and economic constraints in the expansion of private business enterprise. Analogous with macro-economic development stage's theory is micro-economic product cycle theory. This theory depicts the rise and fall of individual industries in a region with the maturation of individual product cycles. The product cycles start with early acceptance and high investment returns and continue to the later stages of increasing ease of entry of competitors. The competition gradually reduces profit margins and drives existing businesses to seek production locations with lower site costs.

Thus, the accumulation of ideas on the determinants of regional growth was accompanied by a corresponding transformation of economic base theory from simply a descriptive statement of urban economic structure to a predictive model of regional economic growth and change. When the Committee for Economic Development published Monograph No. 23 in 1962--**The Community Economic Base** by Charles Tiebout--economic base theory entered the mainstream of current economic thought. This monograph still serves as an authoritative source on the theory and application of the community economic base model.

Organization of the economic base study

Tiebout's community economic base models, with its income multiplier, introduced Keynesian economic concepts into the design and use of community economic surveys. In **The Community Economic Base Study**, Supplementary Paper No. 16, published in December 1962 by the Committee for Economic Development, Charles Tiebout provided a guide to economic base studies by showing how one is organized and implemented. Most of the paper, however, addresses the concerns of the economic base analyst. These included an understanding of the theoretical foundations of the economic base study, the structure of the local economy under study and the means of measuring its critical interrelationships, and the uses of the study in forecasting community economic activity.

Direct benefits of the economic base studied are listed (p. 15), as follows:

- *1. Base studies provide an understanding of the current sources of income and employment.
- *2. Base studies can pinpoint weaknesses in the community's economy.
- *3. As an aid in economic education, base studies are extremely worthwhile.
- *4. Information resulting from an economic base study assists in making governmental

decisions."

Tiebout goes on to state further (pages 15-16) that "Periodic base studies can enable a community to evaluate its progress towards certain broad public goals. These would include: (1) increasing total income and employment; (2) increasing per capita income; (3) attaining reasonable cyclical stability; (4) maintaining healthy prospects for future growth. Per capita income provides a measure of the average citizen's well-being. Base studies carried on over time will measure changes in per capita income and help to unearth the reasons for such change. Cyclical stability implies that employment and income in a community are not subject to extreme swings over a business cycle. A base study points out the industrial mix of the export industries. If this mix of industries is highly sensitive to cyclical fluctuations, then encouragement of more stable industries is suggested as an appropriate policy objective."

An economic base study is valuable, also, to the private sector of a community. It can be used to show the size of the market for specific goods and services purchased by local households, businesses and government agencies. It is valuable, as well, to businesses located outside the community that may seek markets for their exports into the community.

Economic base studies are frequently joined with other studies of specific problems. Examples of other studies are: land use and transportation planning, estimating governmental revenues and expenditures, and forecasting future economic activity in the community and the job prospects for its population and labor force. Forecasts of future economic activity can be supplemented by forecasts of the occupational distribution of the employment in individual industries and the labor earnings by occupational category. A future "job's gap" can be calculated for each industry by comparing the projected demand for and the supply of individual occupational groups in the community. Similarly, future personal income levels and distributions can be calculated, given the occupational and labor earnings' forecasts. Industrial, commercial and residential space requirements of the forecast growth in industry activity and the related work force and population also can be derived from the job and earnings' forecasts.

Several sets of decisions are involved in a successful organization and implementation of a community economic base study. Appropriate sponsorship of the study is essential--sponsorship that can gain the support of the business sector of the community. Agreement among the study participants must be sought early on the objectives, scope and form of the study. Cost of the study must be estimated and its financing must be negotiated. A study director must be appointed and a study work scheduled must be approved by the study director, sponsors and financing sources.

Economic base analysis

Tiebout provides a framework of analysis that starts with a definition and delineation of sectors and industries. The individual sectors represent the sources of demand--local and export--for the outputs of community industries. The local sectors include households (personal consumption expenditures), business (gross private capital formation and change in business inventories) and government (federal, state and local). The level of income and its distribution in the community are important determinants of local demand for industry output. External conditions, like interest rates, also affect the levels of local demand, particularly local business investment in equipment, facilities and inventories. Finally, changes in government policies lead to subsequent changes in government purchases from local industries.

In addition to final purchases, local businesses also purchase intermediate inputs from other local businesses. With increasing externalization of certain staff specializations, the producer services sector has expanded rapidly to meet the increasing intermediate market demand for its services. Clusters of vertically linked businesses--backward to input suppliers and forward to product markets--have thus formed in proximity to one another. However, the Tiebout formulation of the economic base model omits the intermediate demand sector. It represents, therefore, a very special case of an input-output model application (Romanoff, 19745).

The export sector stands apart from the local sector. It is not affected by local demand determinants, except to the extent that local market conditions may indirectly affect the productivity of local resources. Individual business enterprise competes for market share, with the consequences of the market competition changing industry share. Individual exports may vary also because of changes in the total market for US industry output.

Tiebout puts forth the use of the *Standard Industrial Classification (SIC)* code in grouping industries into "one-digit" and "two-digit"--the digits referring to the level of industry aggregation--classifications. While the Tiebout illustrations were limited to the one-digit and two-digit classifications, with 10 to less than 100 industry groups identified, industry classifications used in current economic base studies may have several hundred individual industry groups identified.

Use of the intermediate demand and final demand sector concepts in building the new income-based economic base model is illustrated with an interindustry transaction's table compiled for the Los Angeles-Long Beach Standard Metropolitan Statistical Area (SMSA). The interindustry transaction table was built from survey-based data, supplemented by readily available data series prepared and published by the US Department of Commerce for individual counties and SMSAs in the United States.

A sample survey of individual businesses provided estimates of the industry, sector and

area origins of all business purchases, including primary inputs, such as labor, and income payments to other businesses and governments. Estimates were provided also of the industry, sector and area of destination disbursements of all business output. The two sets of estimates were then reconciled since reporting and estimating errors would yield somewhat different allocations to individual cells in the two-way table of input purchases and output sales.

The next step in analyzing the economic base is, therefore, measuring the local economy, using the new conceptual framework of interindustry and intersectoral purchases and disbursements. Two measurement approaches are available--indirect and direct. The indirect approach makes use of assumptions and empiricism based on non-survey data and one or more methods of estimating industry concentration and specialization. By definition, a community economic base consists of industries in which the community specializes. The direct approach makes use of several survey instruments, including questionnaires customized for individual business respondents, various assumptions and supporting empiricism based on non-survey methods. In short, the direct approach is the more comprehensive of the two and the one to which Tiebout defers.

The questionnaire is the preeminent instrument of the survey approach, illustrated by the California Markets Questionnaire (from Tiebout, 1962, pages 52-53). Each questionnaire is identified by area and SIC code number, but not by name of business. Confidentiality of responses is usually stipulated as an essential requisite of the survey approach. Each question is pre-tested with a business panel outside the sample of businesses selected for the survey to reduce survey error. The survey responses are tabulated after appropriate weighting of the individual responses to show the overall scope of the survey. The processed findings are then used to construct an input-output table for the area, from which the area income and product accounts are extracted for use in the calculation of area income multipliers.

Structural interrelationships in the local economy are analyzed by Tiebout (pages 57-75) for two activity response intervals that are appropriately labeled as "a short-run analysis" and "a long-run analysis." The short-run analysis identifies final sales to households as the only endogenous activity in the community. All other sales, except interindustry, are exogenous. The long-run analysis identifies final sales to local households, businesses and governments as endogenous. Only private exports and exports to the federal government are exogenous.

Tiebout introduces two important concepts to the analysis of the economic base--propensity to spend and income created per dollar of local sales. Propensity to spend measures the proportion of area income spent in a particular sector of the local economy for personal consumption, business investment, housing investment, local government investment, or local

government current operations. Income created per dollar of local sales measures the proportion of the purchases of each sector that is produced locally. One minus the income created per dollar of local sales is the propensity to import. This a measure of the "leakage" of local income due to the purchase of goods and services produced outside the community.

Tiebout's economic base model is now ready for testing as a mean of forecasting changes in local income. First, however, the two income parameters--propensity to spend and income created per dollar of local sales--must be estimated. Prospective changes in the two parameters, if any, must be taken into account in the forecasting process, specifically, in the derivation of the economic base multiplier. Finally, the future economic base must be specified before the change in local income can be forecast. Thus, the total local income is forecast as an aggregate measure of local economic activity.

Specific steps in forecasting local incomes are illustrated for the short-run and the long-run. In the short-run, the change in local income is represented by the form,

Total short-run income change = Change in economic base (i.e., all final sales, except personal consumption) x short-run income multiplier (i.e., $1/(1 - (\text{propensity to consume locally} \times \text{income created per dollar of local consumption sales}))$).

In the long-run, the formulation of the change in local income is a function of a more narrowly defined economic base and a larger income multiplier than in the short-run model.

Derivation of total long-run local income change is illustrated by Tiebout for a hypothetical local economy. Resident households, businesses and governments account for the local final sales of individual businesses and industries in the producing sector of the local economy.

By fitting the estimates of propensity to spend and income created per dollar of local sales to the long-run economic base model, a long-run income multiplier of is derived. Given the multiplier value, total long-run income change becomes a result simply of a change in the long-run economic base.

A long-run multiplier value can be derived by subtracting the cross products of the propensity to spend and the income created per dollar of local sales and then dividing the remainder into 1. For example, a multiplier value of 1.49 is obtained using the hypothetical values presented by Tiebout, as shown below:

Final Sales Sector	Propensity to Spend	Income Created per Dollar of Local Sales
Consumption	.5	.4
Business Investment	.08	.1
Housing Investment	.15	.3
Local Government Investment	.05	.2
Local Government Current Operations	.1	.7

Charles Tiebout evaluates the economic base model in his discussion of the local consumption sector and the export (rest of world) sector as he notes (pages 69-70) the following:

- *1. For a given commodity, the correlation between local consumption income and total income is high.
- *2. Empirical studies do not validate this notion, but suggest employment--as opposed to income--is not as sensitive unit of measurement.
- *3. For a given commodity, as income rises, the proportion earned in the local consumption sector may rise, fall or remain constant. Where the total income increase originates largely from increased population and employment, a rise in the proportion is the expected result.
- *4. Economic base studies do consider import substitution, i.e., local production of goods and services that were previously imported.
- *5. As between communities, the proportion varies systematically. The larger and the more geographically isolated the community, the larger the proportion of local consumption to total income.*

Romanoff (1974), writing in the *Journal of Regional Science*, notes that of the Tiebout model for income area determination is limited because of the omission of the exogenous sector of the local economy from the calculation of local propensities to spend. The input-output model, on the other hand, accounts for the local income effects of changes in all sectors of the local economy.

Westeren (1985), using the Keynesian analytical framework from Richardson's *Regional Analysis* (Chapter 4), introduces a series of tax and transfer payments parameters into the Tiebout formulation of the economic base model. He concludes that the proposed new extensions of the Tiebout model are well-founded and add to the understanding of the effects of the government sector on regional economic growth and change.

The final chapter in the Tiebout monograph is devoted to a critique of income forecasting,

primarily long-run, with the export industries playing a dominant role. Several approaches to forecasting the base economies are presented, starting with forecasts of the principal export-producing industries. Another approach is to weigh the advantages and disadvantages of specific industry location in the area and, then, identify those industries with largely favorable location factors for expansion and relocation in the area. A third approach is to forecast the area's share of specific US industry, which can be applied to other forecasts of future levels of corresponding US industry activity--employment, labor earnings, sales. A fourth approach makes use of a panel of business leaders representing the export-producing industries who would have well-conceived and soundly-formed professional judgments about their industry's future.

Third Generation Economic Base Theory and Application

Professor Richard Stone advanced the theory and application of national income and product accounting and, thus, economic base modeling, starting in the 1950s. In 1961, the Organization for European Economic Cooperation (OEEC) published the Richard Stone monograph on **Input-Output and National Accounts**. In the Forward to the 1961 monograph, Milton Gilbert, Director of Economics and Statistics, OEEC, describes the document as carrying the examination of conceptual problems in social accounting "one stage further. It deals with the sub-division of the national accounts on an industry basis so as to provide a detailed picture of industrial structure. This can be achieved by constructing input-output tables, first, for current flows and, second, for fixed assets and stocks within a national accounting framework."

A third generation of economic base models--the first two being the Hoyt and the Tiebout formulations, respectively--builds on the work of Sir Richard Stone in national social accounting. The third generation models adapt the principles of national social accounting to the region, specifically, the smallest geographical unit of comprehensive statistical reporting in the US--the county.

Access to detailed county-level statistical series marks a critical difference in the range of likely applications of the third generation modeling capability from earlier economic base studies (see: Appendix). A large body of economic literature is also available for extending the theoretical underpinnings of the new models based on the use of detailed social accounts. One entire volume of **Economic Systems Research** (see: References Cited, pages 18-20), for example, is devoted to articles presenting current research focusing national and regional social accounts.

The theory and application of third generation economic base modeling is presented under four topical headings: local production system; product markets for locally produced and imported goods and services; local labor market; and local infrastructure. Limitations of economic base models are addressed, also, under each of the topical headings.

Local production system

The local production system in the third generation economic base model is represented by an input-output table of varying size, including a social accounting matrix of interinstitutional transactions. The input-output table for each county in the US in the University of Minnesota IMPLAN (IMpact Analysis for PLANning) system, for example, has 528 rows and 528 columns to represent individual commodities and industries. Many of the individual industries are represented at the four-digit level. The IMPLAN model also has 15 final demand sectors, four primary input sectors, and potentially 528 commodity import sectors for each of the two types of commodity import origins--domestic and foreign.

For illustrative purposes the 528 by 528 segments of the complete input-output table in the IMPLAN system are reduced to three by three segments of the complete input-output table in Exhibit 1. The one additional commodity sector represents used and secondhand goods acquired from past rather than current industry production. Similarly, the 15 final demand sectors and the four primary input sectors are reduced to single final demand and value added sectors. The total income payments received by the four primary input sectors are equivalent to total value added.

Comparison of the third generation model data illustrated in Exhibit 1 with the data from the Tiebout study show obvious differences in structure and interpretation that can be listed briefly as follows:

1. The third generation model makes use of both industry and commodity classifications while the Tiebout model refers only to an industry classification, which, moreover, is highly aggregated. The third generation model incorporates procedures for converting industry outputs into corresponding commodity classifications.
2. The third generation model provides for additions to commodity supply from inventory, state and local government and federal government that are ignored in the Tiebout model.
3. The third generation model provides for a breakdown of commodity imports, by market destination (i.e., intermediate and final), while imports are aggregated into a single entry for each sector in the Tiebout model.
4. The third generation model provides a consolidated set of regional income and product accounts in the form of a social accounting matrix that far exceed the functional economic groups introduced in the previously used economic base models.
5. The third generation model tracks income flows in the regional economy unlike the earlier models.
6. The third generation model is ideally suited to analyses of the regional economic

consequences of shifts in income flows and their distribution among the economic groups identified and delineated in the social accounting matrix.

Other comparisons can be made between the two models that deal with technical features of the economic base modeling systems.

The several segments of the illustrative model are re-arranged slightly and assigned a nomenclature for relating specific model elements to the current literature on regional input-output modeling systems, as illustrated in Exhibit 2. The left column and top row of model elements refer to the data entries of the conventional input-output table as defined in the writings of Richard Stone. The Stone methodology has been adopted by the US Department of Commerce in its current input-output modeling systems. The make matrix, which converts industry output into commodity output, is part of the conventional input-output table. However, the inventory and government sales are not usually a part of the conventional input-output table. They are incorporated into the corresponding inventory and government entries as net change in business inventories and net government purchases in the final demand sector of the regional economy.

The model elements in Exhibit 1 and Exhibit 2 are re-arranged slightly in Exhibit 3 to simplify the subsequent presentations on the social accounting matrix (SAM). For example, the industry row elements refer to the Make Matrix Account. The industry column entries refer to the Use Matrix Account, as well as the Value Added Account, the Sales and Taxes Account, the Institution Account and the Import Account. Similarly, the commodity row elements refer to the Use Matrix Account and the Consumption Account and the Export Account. The commodity column elements refer to the Make Matrix Account and, also, the Sales Account.

The regional economic accounts--represented by a summary three-by-three table--are addressed by six institutional sectors that were identified earlier in the corresponding row and column entries of the three exhibits. Other sectors that address specific elements of the regional economic accounts can be represented similarly, as shown in the Appendix.

Product markets

Domestic export markets for the economic base of the functional economic community or the local labor market in the US are represented by the BEA Economic Areas in Exhibit 4. The total population and purchasing power within each area varies greatly from the smallest to the largest. This variability is due to differences in the population density of the metropolitan core area as well as the geographic size of each area. The geographic size of each Economic Area is affected by the spacing between the individual metropolitan core areas.

Local product markets are represented by the labor market areas in Exhibit 5. Thus, for some export product markets, a BEA Economic Area may be shared by both the export-producing

the residential segments of a local industry.

Local labor market

The local labor market circumscribes the economic base of each functional economic community. Differences in the industry mix of the base economy of individual labor market areas account, in part, for differences in rates of growth in total employment and labor earnings. Industry mix differences, as represented by the excess earnings distribution of each labor market area. Excess earnings are defined as the difference in total labor earnings for a given industry in a labor market area and the total labor earnings for the same industry based on the US industry distribution. The sum of all excess earnings for a labor market area represents its economic base.

Regional differences in the industry mix of individual labor market areas contribute to the regionalization of the general business cycle in the US. Individual labor market areas differ in their year-to-year changes in gross area product because of differences in the timing of peaks and troughs in the regional business cycles. Regions dominated by the cyclically sensitive durable goods manufacturing industries show much income volatility. They also may show much income growth, depending upon the long-run trends in the cyclically sensitive industries. US regions with a concentration of technology-intensive industry have experienced sharp reductions in their growth. These are due to the industry restructuring in response to large cutbacks in US military spending and reduced rates of growth in market demand.

Local Infrastructure

Measuring the effects of local infrastructure construction and the relaxation on business expansion is an increasingly important application of the third generation economic base modeling systems. Building local infrastructure has much **currency in legislative** committees because of the opportunity it offers local **representatives for "Bring home the bacon."** Moreover, numerous studies show a high correlation between public infrastructure expenditures and the profitability of business investment (Aschauer, 1991). Understandably, the findings are warmly received in legislative circles, even though the studies are highly aggregate in nature and the assumed causal relationship, if any, is questionable.

Nonetheless, an important attribute of an optimal location for a business enterprise is the local infrastructure--the physical facilities and economic resources shared, in varying degree, by all local businesses (Porter, 1990). For the most part, the local infrastructure is in the public sector. It includes, however, important quasi-private and private enterprise, namely, the regulated industries--transportation, communications and public utilities--and banking, finance and insurance companies, management consulting agencies, and research and development laboratories.

Each industry cluster in a local community shares the total local infrastructure, which represents the macro-economic entity that relates to the individual export-producing businesses in the local economy. By definition, the export-producing businesses are part of the local base economy and, typically, the largest employers in this category are branch plants or headquarters offices of multi-national companies trading in global markets. The branch plants, particularly, are affected by corporate decisions based on national and global rather than local considerations. However, the productivity of the local work force is strongly affected by the quality of local training and education in public schools and post-secondary educational institutions. Thus, measuring the effects of local infrastructure, as well as industry structure, is an important application in third generation economic base modeling.

Comparison of Economic Base Models

Substantive difference in the three approaches to understanding regional growth and change--the basic-service ratio, the income multiplier and the social accounting matrix (SAM). The substantive differences occur among model attributes as follows: (1) the economic base definition, (2) the economic area delineation, (3) the model variables and parameters, (4) the model output interpretations, and (5) the model output uses.

The economic base definition differs in each of the three approaches. In the Hoyt formulation the economic base is export-producing employment, largely manufacturing, while in the Tiebout formulation it is exogenously produced area income. This includes employee compensation, proprietary income, dividend and corporate tax liabilities payable in the next accounting period, depreciation allowances and retained earnings generated by non-local area income determinants. In the third generation models, the economic base is defined by the origin of area income flows, whether inside or outside the economic area. Income payment received from the tradable commodities purchased by a non-local resident is basic income, while the purchase of the same commodities by a local resident is not basic income. Thus, tourism would generate basic income according to this definition, while the local hospital would not, unless its patients came from outside the local community.

The economic area delineation differs in the three approaches because of the differences in the definition of the economic base. In the Hoyt and Tiebout approaches, the economic area is an arbitrarily defined territorial unit--a municipality or county, for example. In the third generation models, the local labor market--the commuting to work--delineates the functional economic community. The tracking of income payments by non-residents for goods and services originating in the functional economic community defines the economic base more precisely and objectively than in the two earlier approaches.

The model variables and parameters differ among the three approaches because of the already cited differences in the definition of the economic base and the delineation of the economic area. In addition, the continuous compilation and periodic reporting of economic statistics were still in their infancy in the Hoyt period and therefore not readily adapted to analytical uses, except for employment. Moreover, employment statistics were less subject to non-disclosures than income statistics, particularly for individual localities in the early years of economic base modeling. The third generation modeling approach now focuses on income flows, given the much improved access to income-related statistical series.

Model output interpretation differs among the three approaches because of the differences in model variables and parameters that relate to functional economic communities. The Hoyt economic base model yields an output of employment and population forecasts for urban planning purposes, particularly housing. The Tiebout economic base model produces area income forecasts that can help improve the understanding of area income growth and its determinants. The third generation models yield outputs of local production-related and consumption-related transactions and the commodity and income flows that also add to the understanding of area income growth and its determinants. In addition, the third generation models can show the likely local effects of the alternative futures identified for resident decision makers in a functional economic area.

Model output uses differ among the three approaches because of differences in model outputs and interpretation. Each of the three approaches focuses on prediction, but of different target variables and in different time frames. The time differences occur because of the shift from statics (in the Hoyt approach) to comparative statics (in the Tiebout approach) to dynamics (in the third generation approach). The sequence of time frames also represents a progression in the use of model output from (1) prediction of aggregate values like total employment and total population to (2) prediction of total area income in the next period and the contribution of each final demand sector to the income change from the current period to the next period and, finally, to (3) simulation of the local effects of using different decision criteria or combinations of criteria in the selection of projects for implementation.

Important questions still remain unanswered about the purposes of prediction, particularly when predictions fail to accurately represent the future. For these and other reasons the preferred nomenclature is not prediction but scenario construction: the difference is much more than semantic. Constructing alternative scenarios of the future is a basis for constructing alternative strategies that are not dependent on the accuracy of predictions. They provide, instead, well-conceived and well-articulated alternative courses of action for different futures

based on different assumptions about general economic conditions. They also make use of different combinations of decision criteria. A consensus prediction could be viewed as the baseline scenario--the most likely scenario, or the one based on widely accepted national projection series to which the local baseline series is linked.

The purposes of scenario construction can include preparation for dealing with the vulnerability of the local economic base to radical and painful change triggered by events totally outside the control of local residents. They also can help deal with economic restructuring that reduces the vulnerability of the local economic base and strengthens its competitive position in export markets. For the public agency with a mandate to assist in local economic development, the immediate issue is one of establishing decision criteria for development project selection. The decision criteria may include the re-training and re-employment of dislocated workers and of unemployed members of the local labor force. They may include also the enhancement of local income levels, the reduction in the incidence of poverty in the local area, and the reduction of local unemployment rates.

As a total package, decision criteria for project assistance are often contradictory. They serve notice, however, that all goals are not fully, but only partially, attainable. To what extent each goal is attainable depends upon the weights attached by the decision makers to the related decision criteria.

An increasingly critical role of economic base analysis is in the targeting of business or government ventures for project assistance. The targeting process starts with the identification of basic industry clusters in the local economic area--the local labor market--and in analogous areas. The results of the targeting process in a community economic development agency, for example, will inevitably focus on the critical determinants of regional economic well-being. For many communities this finding will limit project assistance to the local cluster of export-producing business enterprise.

Recasting Economic Base Theory and Application

A recasting of economic base theory and application is presented in the context of regional economic analysis and planning. The three-part framework presented earlier is now recast under the new topical headings of prediction, prescription and performance.

Prediction is one end-in-view of each of the three approaches to economic base analysis. With only minor recasting, the Hoyt's base multiplier is now extended to the use of location quotients and their derivatives in estimating the economic base of an area. Excess employment coefficients are derived for each industry, with the positive values represent export-producing employment and the negative values representing import-losing employment (see:

Maki, 1991b). The relative importance of each industry in the economic base of the area is approximated by the percentage distribution of industry excess employment. Similarly, the import dependency is approximated by the percentage distribution of import-losing employment. The two new employment series thus provide an initial data set for exploring two frequently mentioned area development options--export expansion and import substitution.

A dynamic dimension in economic base modeling is introduced with the derivation of complementary shift-share values (see: Maki, 1991a). The shift-share model is simply a widely accepted scheme for partitioning total employment change in a regional industry into three change sources--national growth, industry mix and regional share. Thus, industry employment change in the region can be quickly compared with the corresponding industry employment change in the US. Moreover, the use of US industry coefficients for two of the three change sources ready the model for immediate use, provided the still-missing regional share coefficient can be readily derived.

Several approaches are available for entering an appropriate value for the regional share coefficient, starting simply with one or more of several assumptions. A predicted regional share can be derived, also, using historical data series for Minnesota. Different assumptions in constructing the regional share coefficient would apply for each alternative future's scenario, if more than a single baseline prediction series were derived for the State.

The excess employment and the shift-share approaches can be combined in predicting future excess and deficit industry employment. The same reference series (US or Norway industry employment) would serve in the derivation of the new set of shift-share coefficients.

Thus the Tiebout community economic base model is extended by using existing input-output and income and product accounts. These are now available for individual counties or groups of counties. They can be combined with economic models that drive the demand sectors from one year to the next. The excess employment and shift-share economic models are readily replaced by recursive economic modeling systems (see: Olson et al, 1985). The advanced modeling procedures introduce the model outputs of the current period as model inputs of the next period. These procedures are used in the simulation of alternative futures for a variety of planning purposes (see: Maki, 1991b).

Summary and Conclusions

The essential outline of the economic base idea was formulated 55 years ago by Homer Hoyt, an economist with the US Federal Housing Administration. His initial formulation of the economic base ratio was very simple; basic-to- service employment in a city is in the ratio of 1 to 1.

Hoyt's intent was to use the basic-service ratio to predict employment and population

growth in a city. Given well-founded forecasts of export-producing employment and reliable estimates of the basic service multiplier and the employment-producing employment and reliable estimates of the basic service multiplier and the employment-population multiplier, it is possible to construct employment and population forecasts for the housing and other urban planners in the large cities and metropolitan areas of the US.

Twenty-five years ago, Charles Tiebout--fresh out of a doctoral program in Economics at the University of Michigan--published a series of articles critical of the existing economic base concept. He proposed, instead, the use of income rather than employment as a measure of the economic base. He proposed, further, to identify the income affected by exogenous determinants of change as basic and the endogenously affected income as service or residuary.

In 1962, the Committee for Economic Development published Supplementary Paper No.16--**The Community Base Study** by Charles Tiebout. It joined the economic base idea with the mainstream of current economic thought with the use of Keynesian multiplier as a model for the construction of the community base multiplier. It also provided a rationale for the implementation of a community base study. To this day Tiebout's model of the community economic base serves as an inspiration and a guide to graduate students writing masters' theses and doctoral dissertations in the regional sciences. It also has been used widely by urban and regional planners in forecasting future economic activity.

Over the next quarter century, much work transpired in extending the uses of Wassily Leontief's work in input-output modeling. Leontief's path breaking work started its historic course in the 1930s and reached sufficient recognition by the 1960s and early 1970s to lead its author to the Nobel award in Economics. Charles Tiebout used the Leontief concepts in the construction of several regional input-output models that were part of the development of the community base model.

During the early years of economic base and input-output modeling Richard Stone was formulating the idea of the social accounting matrix as an extension of national income and product accounting. By 1985, he had won sufficient international recognition for his work in national social accounts. to also win the Nobel award in Economics.

By now, a growing number of countries, including those in the Organization for European Economic Development that sponsored Sir Richard Stone's early studies, had adopted national income and product accounts and input-output modeling systems he proposed. The accounting systems followed the principles and procedures he had established over the previous quarter century of research and reporting. The social accounting matrix is at the heart of the third generation of economic base modeling.

The most recent uses of economic base modeling rest upon the theoretical and empirical advances of a half century or more of economic research and, particularly, the improvements in data collection, processing and analysis of the last two decades. They rest, finally, on access to data and constructs for estimating income flows in a local or regional economy. Income flows that bring into the local community the new dollars for buying locally-produced goods and services, as well as imports, now define the dimensions and determinants of the community economic base.

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Appendix: IMPLAN Economic Base Modeling System

One vehicle for building the third generation economic base models is the University of Minnesota IMPLAN, which is the acronym for the full name of this new economic base modeling system: IMPact Analysis for PLANning. The IMPLAN Development and Applications Group in the University of Minnesota's Department of Agricultural and Applied Economics, with the help of colleagues in the Land Use Planning Unit, US Forest Service, Fort Collins, Colorado, are now preparing the 1988 and 1990 IMPLAN data bases, including the capability of producing a social accounting matrix (SAM), for each one of the more than 3200 counties in the US.

IMPLAN was developed and refined over the last 15 years by the USDA Forest Service to provide a complete, integrated analysis tool for planning efforts. In cooperation with the Forest Service, the IMPLAN Development and Applications Group has been distributing the system to public and private organizations since 1988.

IMPLAN is now a PC-based system for constructing regional economic accounts, including social accounting matrices and input-output tables, and regional predictive models.

With the IMPLAN system software and data base, users can construct non-survey input-output models for any county or combination of counties in the US, suitable for conducting economic impact assessments.

Because no individual county is accurately represented by the US industry structure, it is imperative for each county to have as detailed a representation of its own unique industrial structure and activity levels as is technically feasible. The new 1988 and 1990 IMPLAN systems fulfill this objective within an operating budget under which the IMPLAN Development and Applications Group can undertake its periodic updates and continuing technical improvements. The fee structure for the purchase of individual county data bases and accompanying software and resident workshops, with participation of over 400 active IMPLAN users, provide virtually all of the current funding for system maintenance and development.

IMPLAN produces over 40 tables, including investment, trade flows, commodity production and consumption, and capital account information. The data base provides regional economic statistics for all US counties and states. Each county data file contains estimates of total commodity consumption for 15 final demand groups and estimates of industry factor payments and industrial output and employment for 528 industries.

County and state data files can be combined and recombined into any region desired by the user. Superior hybrid accounts can be produced by incorporating user-supplied data at any stage of the model building and application process. Users can modify both data base statistics and key assumptions underlying the economic accounts and model building methodology.

The local production system is represented by a very large input-output table, including a social accounting matrix of interinstitutional transactions. The new input-output table for the US and for each county in the US has 528 rows and 528 columns to represent individual commodities and industries, 15 final demand sectors, four primary input sectors, and potentially 528 commodity import sectors for each of the two types of commodity import origins--domestic and foreign.

The IMPLAN model elements in Exhibit 1 and Exhibit 2 are re-arranged slightly in Exhibit 3 to simplify the subsequent presentations on the IMPLAN social accounting matrix (SAM). The Exhibit 3 array of regional economic accounts is followed in the individual reports and files available from the IMPLAN system.

The first set of columns from Exhibit 3 is identified as the industry outlay sector. The industry outlay sector in IMPLAN contains reports and files listed as follows:

1. Regional use (value of individual interindustry purchases and disbursements in the region);
2. Place of work factor income (value added); employee compensation; proprietors

income; other value added;

3. Indirect business taxes (business taxes based on total output);
4. Non-industrial sales (included in sales and taxes account); commodities not produced by industries in the area;
5. Non-competitive imports:L commodity not produced in the area;
6. Competitive imports:L commodity imports that would compete with commodities produced by industries in the area.
7. Total industry outlay: sum of all income payments by industry.

The individual reports and files are generated by each IMPLAN model, whether a single county or state or a combination of counties or states.

Reports and files of the commodity outlay accounts are also available from the IMPLAN models. The regional make table shows the total byproducts of each industry. The nonindustrial sales table sales of final demand sectors--enterprises, households, and governments.

Reports and files of the factor outlay accounts include employee compensation, proprietary income and other property income. The distribution transactions provide for the distribution of factor outlays among the three current account institutions--enterprises, households and governments, and the capital account. The import transactions are the factor outlays to non-resident resource owners.

Reports and files of the institutional outlay accounts include the three current account institutions--enterprises, households, and governments, with federal shown separately from state and local--and the capital accounts. The institutional outlays to the commodity accounts are included in the four final demand sectors--personal consumption expenditures, federal government purchases, state and local government purchases and business investment in the form of gross private capital formation and change in business inventories. The transfer of institutional outlays to enterprises, households, federal government, state and local governments and investment re listed individually under the following transaction accounts:

Enterprises: dividends, interest and rent payments to household; corporate tax payments to federal, state and local governments, and retained corporate earnings;

Households: personal taxes to federal, state and local governments, and personal savings;

Federal government: net interest paid to enterprises; transfer payments to households; transfers within and between governments; and surplus and deficit account transactions;

State and local governments: net interest paid to enterprises; transfer payments to households; transfers within and between governments; and surplus and deficit account

transactions;

Imports of goods and services purchased by each of the institutional sectors are listed by commodity.

Reports and files of the export accounts include four export categories. They are identified as commodities, factors, institutional transfers, and transshipments to balance the export and import transactions accounts.

The series of exhibits and related discussions show the wide range of regional economic activity monitored in the IMPLAN system. The IMPLAN SAM was constructed to provide for internal consistency with the aggregate of the individual transactions accounts as well as access to any transaction element among the individual accounts. The IMPLAN SAM also serves as an interface to the national income and product accounts (NIPA).

Empirical investigations of the community economic base made a great leap forward with the construction of detailed input-output models of regional economies, like the IMPLAN regional economic modeling system. The IMPLAN system was originally developed in the USDA Forest Service in its Land Use Planning Unit to service the management of the National Forests. With the rapidly growing interest in its broader applications, it is now located at the University of Minnesota. It has more than 400 active users in the US and Mexico.

Exhibit 1

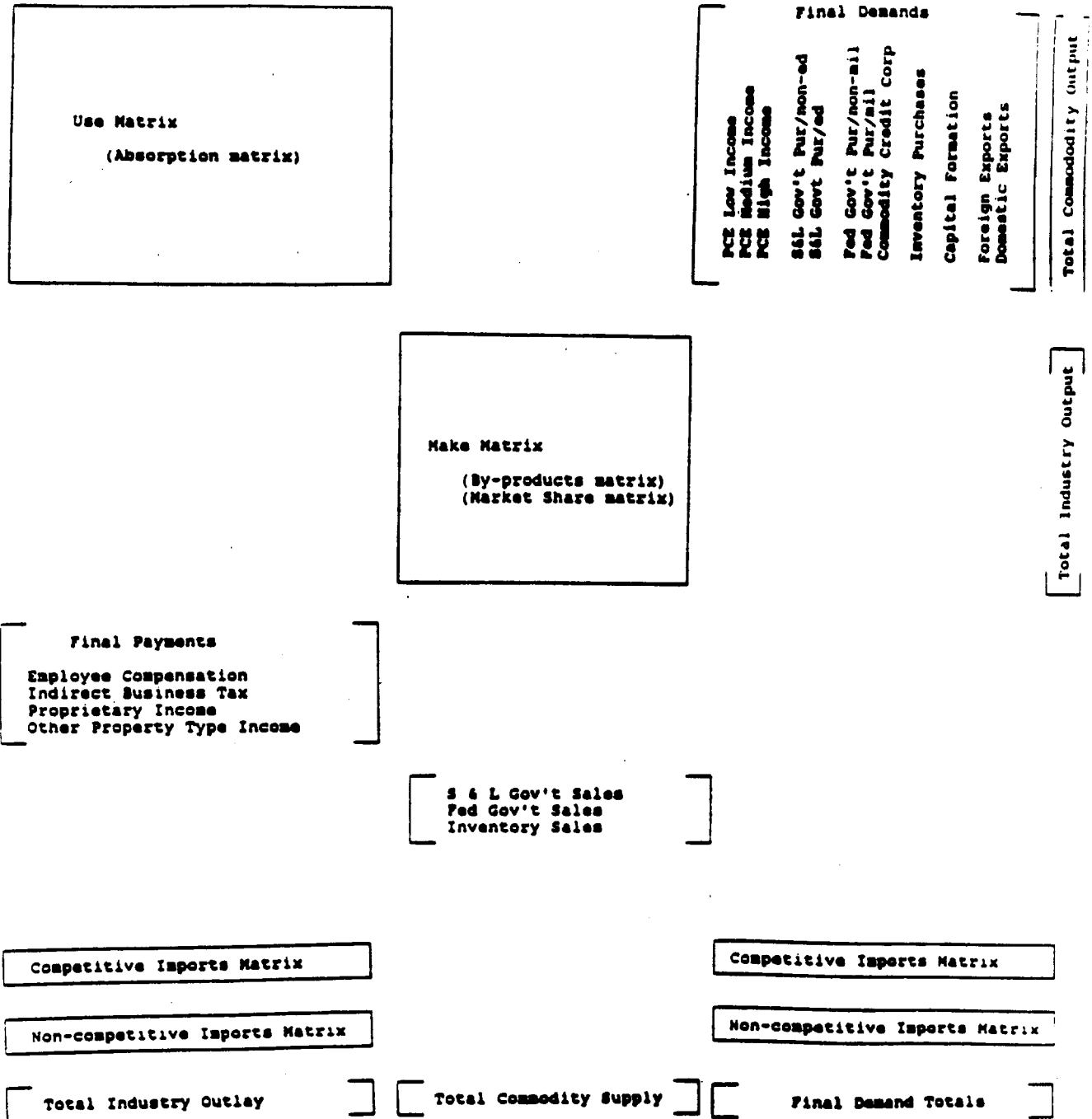
Complete Input-Output Accounts

	Industry				Commodity			Final Demands	Exports		Total
	A	B	C	D	A	B	C				
Commodity A	.05	0	.8	0				1.15	15	1	18
Commodity B	.25	.75	0	0				6.5	22.5	0	30
Commodity C	1.5	2.25	1.5	0				6	27.7	0	39
Industry A					9	0	1				10
Industry B					0	30	0				30
Industry C					4	0	36				40
Industry D					0	0	0				0
Inventory					1	0	0				1
State/Local					4	0	0				4
Federal					0	0	2				2
Households					0	0	0				0
Capital					0	0	0				0
Commodity A	.45	0	7.2	0				10.35			
Commodity B	.75	2.25	0	0				19.5			
Commodity C	.5	.75	.5	0				2			
Value Added	6.5	24	30	0							
Total	10	30	40	0	18	30	39	45.5	65.2	1	

Source: IMPLAN Development and Applications Group, 1991, IMPLAN Technical Manual. Department of Agricultural and Applied Economics, University of Minnesota, St. Paul.

Exhibit 2

Input-Output Structure in IMPLAN



Source: IMPLAN Development and Applications Group, 1991, IMPLAN Technical Manual. Department of Agricultural and Applied Economics, University of Minnesota, St. Paul.

Exhibit 3

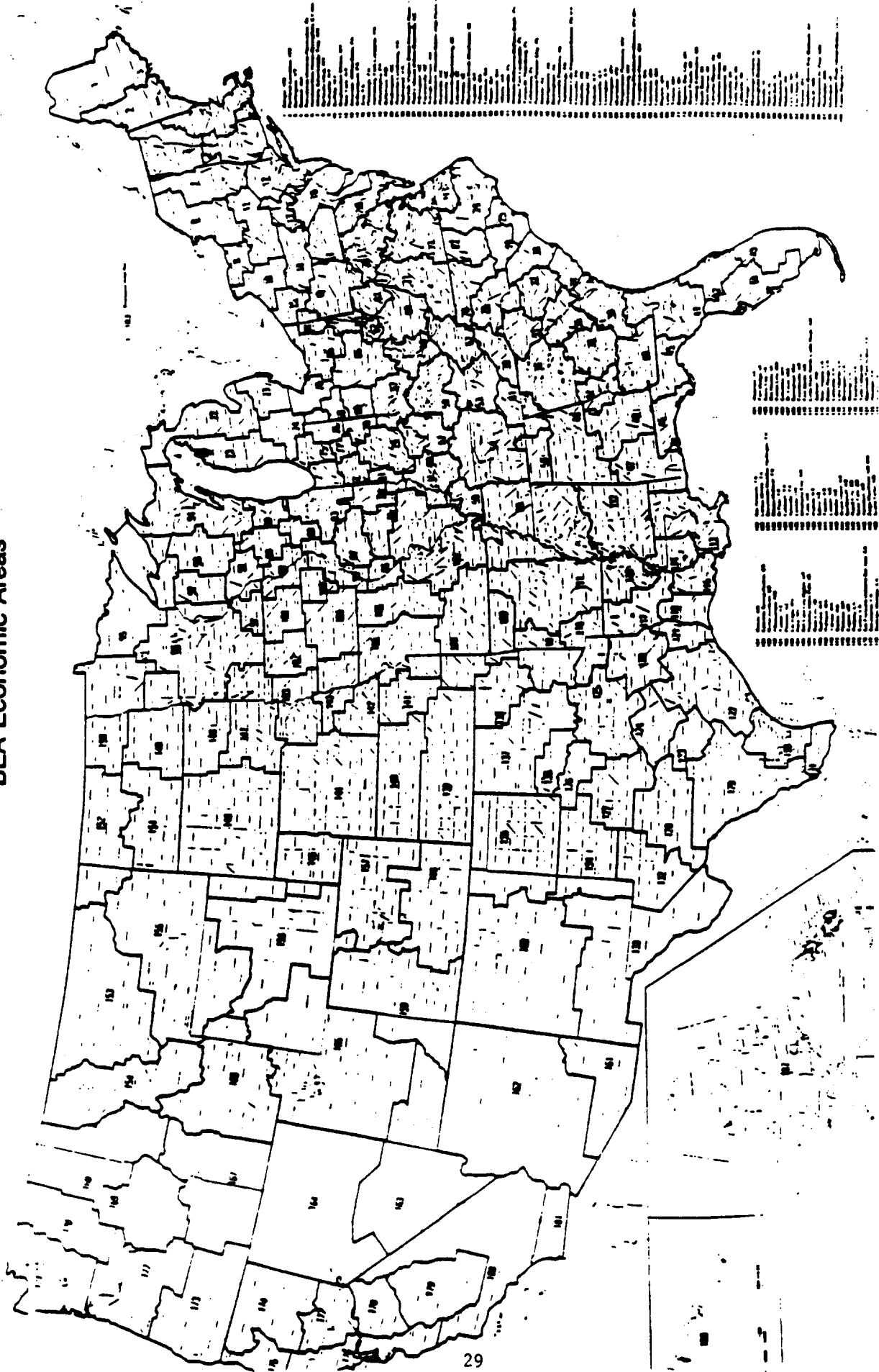
Regional Economic Accounts

	Industry	Commodity	Factors	Institution	Exports	TOTAL
Industry		<i>Make</i>				Total Industry Output
Commodity	<i>Use</i>			<i>Consumption</i>	<i>Exports</i>	Total Commodity Output
Factors	<i>Value Added</i>				<i>Exports</i>	Total Factor Income
Institution	<i>Sales & Taxes</i>	<i>Sales</i>	<i>Distribution</i>	<i>Transfers</i>	<i>Exports</i>	Total Institutional Income
Imports	<i>Imports</i>		<i>Imports</i>	<i>Imports</i>	<i>Trans-shipment</i>	Total Imports
TOTAL	Total Industry Outlay	Total Commodity Outlay	Total Factor Outlay	Total Institutional Expenditures	Total Exports	

Source: IMPLAN Development and Applications Group, 1991, IMPLAN Technical Manual. Department of Agricultural and Applied Economics, University of Minnesota, St. Paul.

Exhibit 4

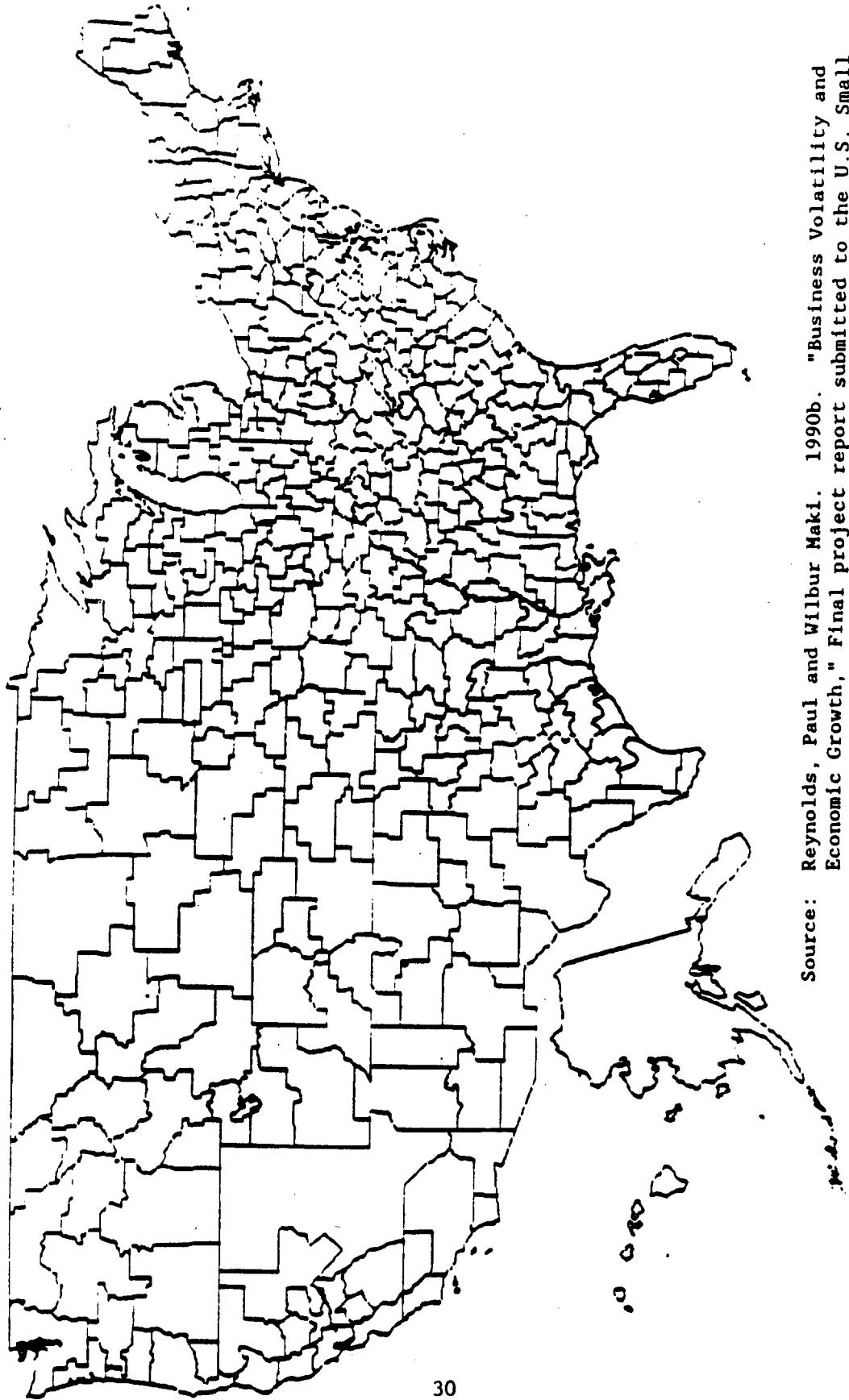
BEA Economic Areas



Source: Reynolds, Paul and Wilbur Maki. 1990b. "Business Volatility and Economic Growth," Final project report submitted to the U. S. Small Business Administration in fulfillment of Contract SBA 3067-0A-88, Regional Economic Development Associates, Incorporated, 4520 Oxford Avenue, Minneapolis, MN, May 28, 1990.

Exhibit 5

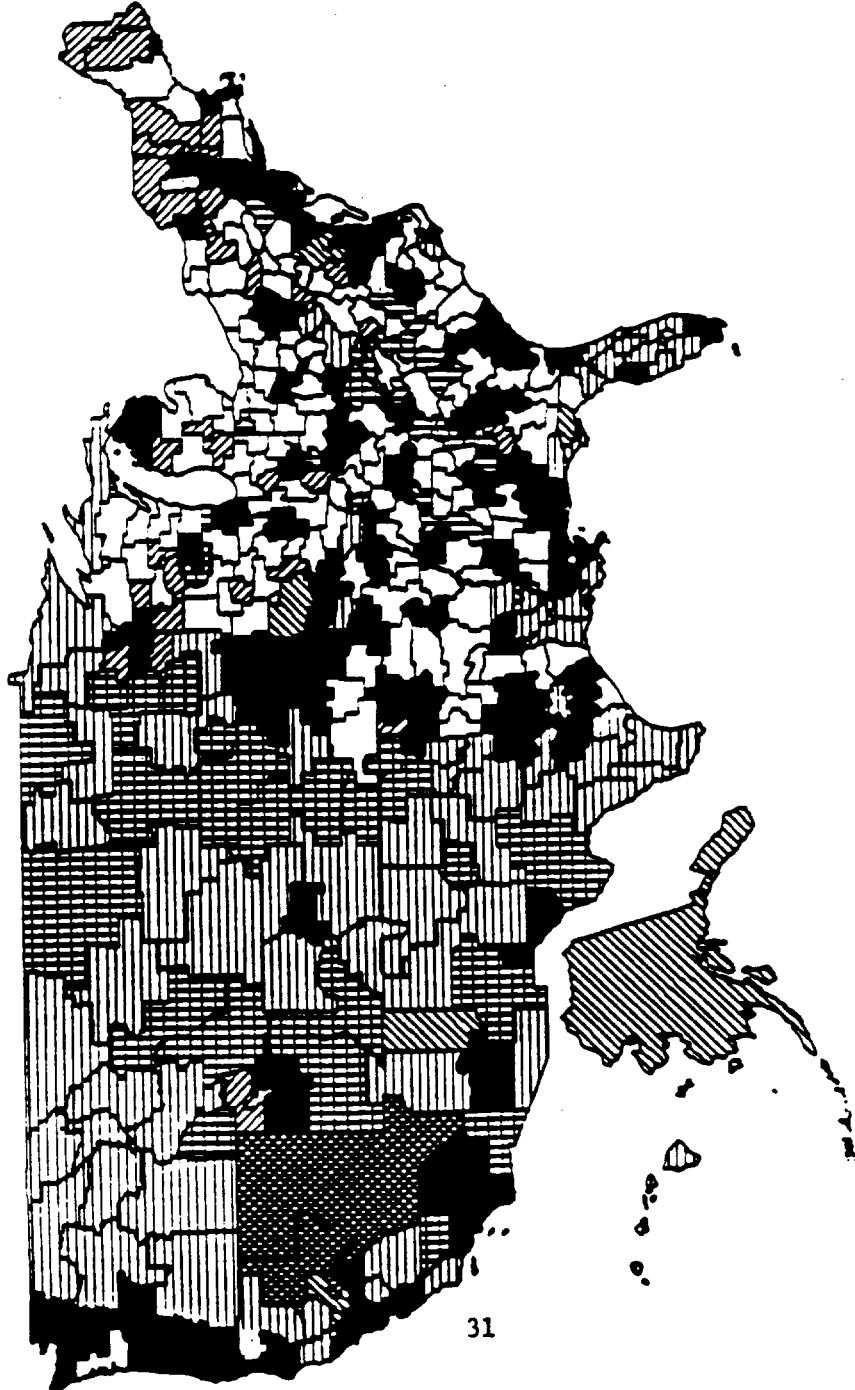
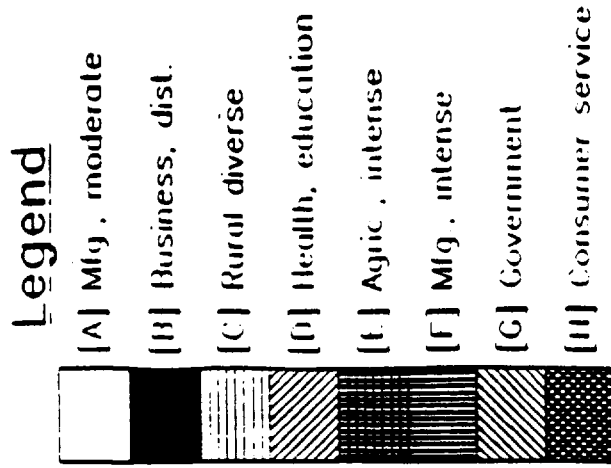
Labor Market Areas for the United States



Source: Reynolds, Paul and Wilbur Maki. 1990b. "Business Volatility and Economic Growth," Final project report submitted to the U.S. Small Business Administration in fulfillment of Contract SBA 3067-0a-88, Regional Economic Development Associates, Incorporated, 4520 Oxford Avenue, Minneapolis, Mn, May 28, 1990.

Exhibit 6

Location of Eight Types of LMAs



Source: Reynolds, Paul and Wilbur Maki. 1990b. "Business Volatility and Economic Growth," Final project report submitted to the U.S. Small Business Administration in fulfillment of Contract SBA 3067-0a-88, Regional Economic Development Associates, Incorporated, 4520 Oxford Avenue, Minneapolis, Mn, May 28, 1990.