

**BUREAU OF ECONOMIC  
AND BUSINESS  
RESEARCH**

David Eccles School of Business  
University of Utah

1655 E. Campus Center Drive  
Salt Lake City, UT 84112  
801-581-6333  
bureau@business.utah.edu  
bebr.business.utah.edu

Offices: 401 Business Classroom Bldg.

Dean: Taylor Randall  
Associate Dean: Natalie Gochnour  
Director: James Wood

Established in 1932, the Bureau of Economic and Business Research (BEBR) is an applied research center in the David Eccles School of Business at The University of Utah. BEBR's mission is to conduct and support research related to the structure of the Utah economy, its resources and its potential for expansion. BEBR also analyzes the economic and demographic impacts of economic events and policy initiatives on local and regional economies, provides advice on economic issues and conducts regional economic analysis.

As an applied center, BEBR interacts with both private and public entities, conducting independent studies and engaging in sponsored research. Since its inception, BEBR has been a primary source of information on the Utah economy. BEBR's professional staff gathers and analyzes data specific to both Utah and the Rocky Mountain Region to identify those factors which influence the state's economic growth. Areas of specialization include (1) economic development, (2) construction and housing, (3) demographic analysis, (4) economic impact analysis, and (5) tourism.



Bureau of Economic and Business Research  
DAVID ECCLES SCHOOL OF BUSINESS | UNIVERSITY OF UTAH

## Economic Impact: Measures and Definitions

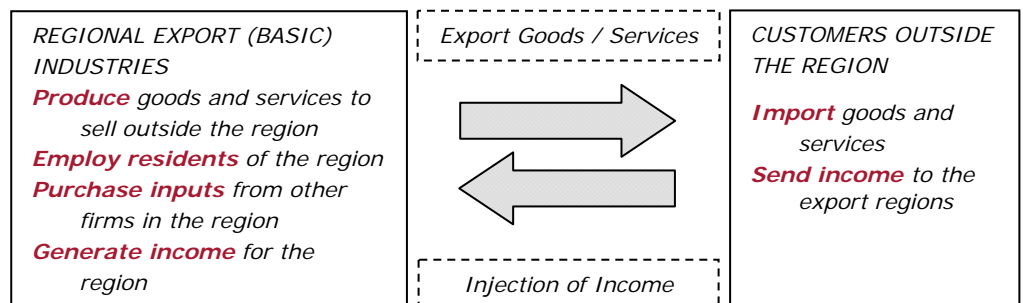
Pamela S. Perlich, Ph.D., Senior Research Economist

**R**egional exports provide external sources of income and are widely recognized as one of the primary engines of economic development and growth. These export base (or “basic”) industries can potentially lead to the development of backward-linked industries, which are local operations that provide necessary inputs and services to the primary export producer. Forward-linked industries contribute additional value to the exports before the products are sold outside the region. These backward- and forward-linked industries create additional economic activity and constitute an increase in the export base of the region (Figure 1). If the export entities purchase equipment, materials, labor, or other inputs from outside the region, this is a spending leakage that reduces the potential economic impact of the entity on the host region. Trade and transportation margins are derived by local organizations when they charge local customers to distribute and transport imported products.<sup>1</sup> Export base industries may be private firms or public entities. For example, within the tourism sector, the National Park Service as well as privately owned hospitality firms all generate export-based revenues and employment for the region when they sell goods and services to nonlocal visitors.

Public and private entities within the region also produce goods and services for the local population. These efforts are classified as nonbasic, or residentiary. Although these industries do not generate income from outside the region, they do capture some of the income earned in the community and this sustains jobs and contributes to the multiplier effect, which is defined below. Otherwise the residents of the area must import their consumer goods, resulting in a leakage of spending from the regional economy and a reduced multiplier effect (Figure 2). The “economic impact” of an export is evaluated by accounting for the in-region shares of all of these linked spending events.

The multiplier effect refers to all of the rounds of in-region spending that result from the initial injection of spending from the sale of the exports of locally produced goods or services. The revenue from the sale of the exports is the first round of spending and this initiates the multiplier effect. This injection of revenue is used by the local producer to

**Figure 1**  
**The Trade and Income Effects of Regional Export Industries**



<sup>1</sup> These transportation firms of course also charge to transport and distribute locally produced products, but this does not contribute to the export base.

# RESEARCH BRIEF

employ the required labor, to purchase necessary inputs (including equipment, materials, services, etc.) to produce the good or service, and to compensate investors or lenders who have financed the operations. The locally supplied portion of these payments that stay within the region will finance successive rounds of income and spending, a portion of which will remain in the region.

Compensation to individuals will support household and personal consumption expenditures. Purchases from local suppliers will employ additional labor and result in future business-to-business purchases. At every successive round, part of the spending stays in the region and the balance is a leakage to other regions. Each round of spending is progressively smaller until the process eventually runs its course. The full cycle of in-region spending resulting from the initial injection of revenues from the sale of locally produced exports is referred to as the multiplier effect.

Multipliers of various types are normalized ratios that account for the entire local impact of each additional dollar of export sales.

The magnitude of multipliers varies by region and is dependent on the composition of the regional economy. Most products consumed by residents of isolated rural areas must be imported from outside the region, although a local retailer often serves as the middleman and will make retail margins on sales to locals. Large, economically integrated metropolitan areas produce a much greater share of the goods and services purchased by households within the region. The development of these businesses that serve the local population, referred to as nonbasic or residentiary firms, means that more of the income that has been generated by the export sector can circulate internally to support additional businesses and households. This results in a greater multiplier effect as compared to a small, isolated community. As regions develop, the growth of the nonbasic sector is known as import substitution. All other things being equal, a region with a larger population will have a more diversified economy and a greater multiplier effect compared with a region with a smaller population. Defining the region is a fundamental determinant of impact study results.

## Methods of Finance

Changes in methods and sources of finance also alter the economic impact of regional spending patterns. If debt is the source of financing, economic activity can be shifted to occur sooner in time than would otherwise be possible. The repayments of the associated debt result in a decline in spending potential at some time in the future. This repayment of debt is often treated differently (ignored) in impact analyses of construction, the

assumption being that the financing has originated outside the region. Importantly, if the composition of spending financed by the debt differs from the spending that would have otherwise occurred, the structure of the economy, industrial composition, and growth path can all potentially be altered.

Disposable income is after-tax household income. In aggregate, a fraction of this disposable income is saved and the rest is, by definition, expended. A fraction of household spending is for goods and services produced in the region and the balance is for goods and services produced outside the region – regional imports.<sup>2</sup> The share of regional disposable income that stays within the region is

determined by the availability of the right mix of locally produced goods and services. Again, larger metropolitan areas have more fully developed residentiary sectors and therefore larger multipliers.

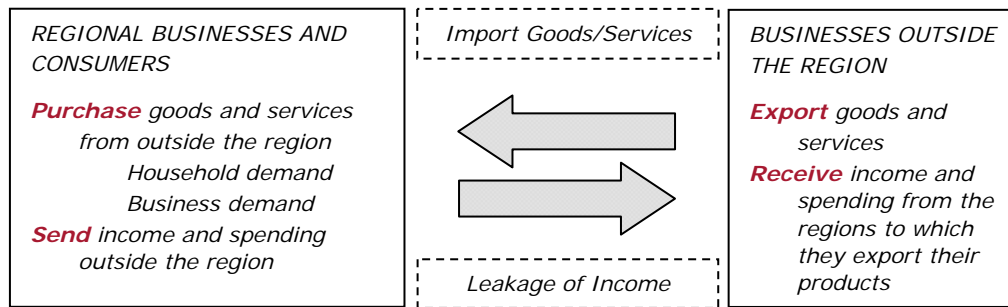
If taxation of households is used to

finance public sector spending that occurs within the region, an accurate assessment of the economic impact of this policy requires the comparison of the baseline spending patterns without the tax-financed spending (just described) with the spending patterns financed by the implementation of the tax policy. For example, at one extreme, these new tax revenues could be completely devoted to employment within the region. In this case there would be a greater first round net economic impact for the region than the baseline spending patterns. This is because the untaxed income would have been used by the households to both save and spend, and these expenditures would have been a mix of goods and services that are either locally produced or imported. These alternative impacts are dependent on household spending patterns and the structure of the regional economy. If the public spending introduces a structural change to the regional economy, then the composition of the regional economy has changed in comparison to what it would have been in the absence of the policy. If the spending that is financed by these taxes is in an investment sector (such as construction or education) rather than a consumption sector (such as retail purchases of consumer electronics), the regional growth path will potentially be altered, and industrial composition will have been changed as well.

## Models and Methods

There are several models that are commonly used to evaluate regional economic impacts. These are generally custom-built with data from the study region. The key inputs to these models are the direct impacts, which are the spending injections into the local community from the basic activity or industry. The detail

**Figure 2**  
**The Trade and Income Effects of Purchasing Imports**



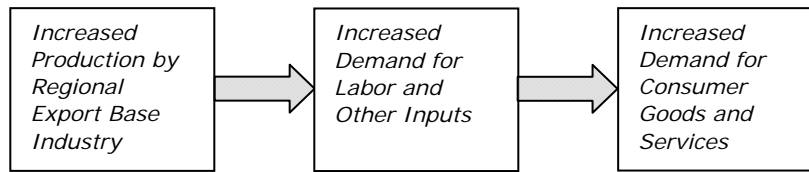
<sup>2</sup> There may also be consumption or sales taxes levied.

# RESEARCH BRIEF

and precision of these spending data and estimates largely determine the quality and accuracy of any given study. Regional impact models generate estimates of the resulting indirect (business-to-business purchases) and induced (household spending) economic activity.

The most commonly used model for regional analysis is the single-region input-output model. Several vendors produce these under different names (RIMS, IMPLAN, etc.). Input-output models capture business-to-business purchases within the region. If an export base industry purchases raw materials, equipment, or other inputs from local producers, this effectively increases the size of the export base of the region; these are the indirect effects. (However, if a completely new industry comes into the region, the input-output model, which has been calibrated to current industry structure and interindustry purchases, will not automatically create the forward- and backward-linked industries. The analyst must model these independently.) Input-output models also account for induced spending created when households supported by these direct and indirect industries purchase goods and services within the region. Importantly, these are static models measuring impact in only one year. (Figure 3)

**Figure 3**  
Key Impacts of an Increase in an Export Base Industry of a Region  
Structure of the Input-Output Model



*Note: This is a static model accounting for one time period.*

The REMI model is a dynamic, multiregional simulation model that forecasts economic, population, and labor market impacts for many years into the future. Although REMI has many complex, interrelated submodels and features, the essential logic of the REMI model is derived from the economic base, input-output, and cohort component (demographic) submodels. Further, the baseline forecast for the region is embedded within an economic geography specification that accounts for relative competitiveness and interregional trade flows.

The cohort component model accounts for the changing size and age composition of the regional population over time. Births and in-migration contribute to population growth while deaths and out-migration contribute to population decline. The model also accounts for the number of males and females in each age group and ages the resident population year-by-year. Deaths occur

disproportionately to older age groups and economic migrants tend to be in their 20s and 30s (often with dependent children). REMI also allows for separate modeling of special populations, such as those at universities and military installations.

The economic base and input-output submodels have been described above. Regional exports inject income while regional imports are leakages. Economic growth results from increases in basic industries (export base) and import substitution industries. To the extent that this residentiary demand can be satisfied internally by nonbasic industries, the export-based dollars have additional economic impact in the community. If the goods and services are imported, those dollars leave the regional economy.

The REMI model connects these submodels through labor, capital, financial, and product markets. It simulates the size and composition of the population and economy over time. If there is an increase in the production of an export base industry in the

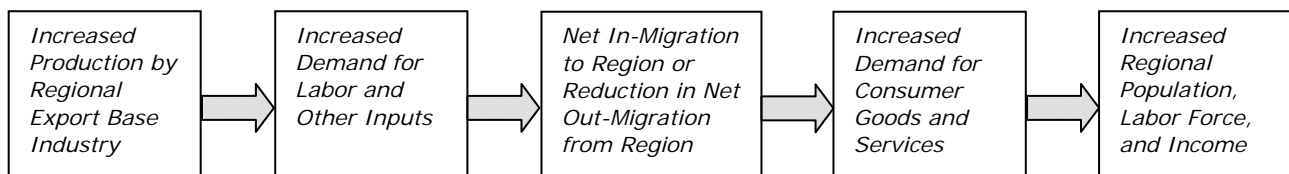
region, regional employment and income increase as well. There may not be adequate workers to meet this increased demand for labor, and net in-migration to the region could result. Economic migrants tend to be young, bringing children with them and having additional children once they become established. This increasing

population adds to the local demand for housing, consumer goods and services, public schools, and so forth. Over time, as this population ages, the children of the original migrants enter the labor force and form households of their own. The end result of an increase in regional export base industries is a larger and younger population, larger labor force, and higher levels of income and spending (Figure 4). The magnitude of these changes and other non-modeled costs and consequences depends on the specific situation and sequence of events. Events reducing the economic base result in mirror-image (symmetric) negative impacts.

## Classification of Industries

While some industries clearly fall into either the basic or nonbasic categories, others are more complicated. Agriculture, mining, and manufacturing are generally assumed to be export base industries. Similarly, federal government employees (military and civilian)

**Figure 4**  
Key Impacts of an Increase in an Export Base Industry of a Region: REMI



*Note: This is a static model accounting for one time period.*

# RESEARCH BRIEF

bring income from outside the region and are also classified as basic. Local government (municipal services, public education, etc.) is overwhelmingly nonbasic because the internally financed operations serve the local population. Financial services (finance, insurance, and real estate) and trade (retail and wholesale) are generally seen as nonbasic, although in tourist areas a portion of the retail sales should be considered as part of the export base. Similarly, financial services may have customers who reside outside the region. Classification of transportation, communication, and public utilities depend upon the location of the customers. The source of finance also affects the classification of spending by industry, as explained above. Construction is generally treated as having a positive economic impact regardless of financing source.

Another consideration in impact analyses is whether a new economic activity directly competes with, and therefore crowds out, existing activity. If all of the modeled industries are initially assumed to be export base industries in the region, then the resulting scenario simulates economic growth that is by definition augmentation. This means that these new firms do not compete with existing firms and sell their products to nonresidents of the region. In the case of additions to retail trade, this is most often not the case. For example, the introduction of a big-box retailer such as Wal-Mart to a small community generally means that residents do not have to leave the region to purchase goods and services as they have in the past. This represents import substitution. However, there are undoubtedly local merchants that will be adversely affected by the competitive pressures introduced by the large retailer.

## Terminology Used in Impact Studies

*Employment* is a job count of the annual averages for full- and part-time employment as well as proprietors of businesses. Employment is reported by place of work (job site). This is consistent with the measures developed by the Bureau of Economic Analysis and Bureau of Labor Statistics.

*Direct Employment* is the in-region employment of the export base industry (e.g., mining company employees).

*Indirect Employment* is the in-region employment associated with all business-to-business transactions up the supply chain from the direct and other indirect employers.

*Multipliers* have a variety of definitions and meanings. Generally, an employment multiplier is the ratio of total employment impact to direct employment. If the impact has been computed using a Type II input-output model, the total employment impact is the sum of direct, indirect, and induced effects. Since the REMI model accounts for population and economic structure and change over time as well as market dynamics, the total employment impact for REMI includes direct, indirect, induced, and all other REMI-generated impacts. For REMI results, the employment “multiplier” is the ratio of total employment impact to direct employment. If data for purchases from local firms by industry are known for the impact being analyzed, indirect employment

can be estimated using a Type I input-output model. This model also estimates indirect employment generated by the purchases. This may create an upward bias in the on-site employment and a downward bias in the approximation of the employment “multiplier.”

*Personal Income* is a financial measure of the total income received by the residents of a county, minus personal contributions for social insurance. This includes earned income (wages and salaries, other labor income, and proprietors’ income); rental, interest, and dividend income; and transfer payments (retirement, disability, and income support). These are annualized dollar flows. Personal income may be measured in current dollars or constant dollars (adjusted for inflation). This is consistent with the measures developed by the Bureau of Economic Analysis ([www.bea.gov](http://www.bea.gov)). If a person works in Salt Lake County and lives in Davis County, the employment (job count) and earned income are reported in Salt Lake County while the total personal income is counted in Davis County.

*Disposable Personal Income* is total personal income minus total personal current taxes.

*Wages and Salaries and Proprietors’ Income* are components of personal income that are reported at the place of work. Wages and salaries are paid to employees while proprietors’ income is paid to the owners of companies. These are annualized dollar flows that may be measured in current or constant (inflation-adjusted) dollars.

*Population* is a person count of residents of a given county. It is estimated at mid-year (July 1).

*NAICS* is the North American Industry Classification System. This system organizes firms into industries according to a set of definitions. Definitions of this classification system are available online from the Bureau of the Census at: [www.census.gov/eos/www/naics/](http://www.census.gov/eos/www/naics/).

## Further Reading:

H. Craig Davis (1990) “Income-Expenditure Analysis,” Chapter 3 in *Regional Economic Impact Analysis and Project Evaluation*, (Vancouver: University of British Columbia Press).

Regional Economic Models, Inc. (2007) *REMI Policy Insight 9.5 User Manual*.

Roger E. Miller (1999) “Regional and Interregional Input-Output Analysis,” Chapter 3 in Izard, et.al., *Methods of Interregional and Regional Analysis*, (Aldershot: Ashgate).

U.S. Department of Commerce (2013) *RIMS II: An Essential Tool for Regional Developers and Planners*, available from [www.bea.gov/regional/rims/index.cfm](http://www.bea.gov/regional/rims/index.cfm).