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ARTICLES

ALSO INSIDE

In March...

- **Employment ..... up 200**
- **Unemployment rate 5.2%**
- **Consumer Price Index 3.0%**

Estimating the Impact of Public Policy and Investment Decisions

By W. Michael Regan, Deputy Director and Mark Prisloe, Chief Economist, DECD

Introduction

For every cause there is an effect and for every action there is an equal and opposite reaction. You may recall these concepts from your high school physics class and how they were used to illustrate the rules of motion. If the thought of your high school physics class frightens you, you can relax. This article is not about Newton's third law of motion, but rather another science: economics. And these concepts, which were originally conceived under an apple tree in merry old England, are surprisingly but equally at home in the world of economics and aptly describe the nature and dynamism of an economic impact analysis.

An economy is fluid. It ebbs and flows in a constant struggle for equilibrium. Imagine a marble dropped in a bowl. It will continue to roll around the inside of the bowl until it comes to rest. At this point it has reached its "stationary state" (or "steady state" if all relevant variables grow at an identical rate). It will remain stable until it encounters another stimulus. The magnitude of the stimulus will determine the path the marble takes and the amount of time it will spend rolling around in search of its "stationary" or "steady" state.

An *economic impact* is the path the marble takes around the inside of the bowl, and is measured by its velocity and the span of time it takes to reach equilibrium. An *economic impact analysis* is an attempt to quantify the overall effects (economic impacts) that various actions and events have on an economy. In other words, it is an attempt, through the use of a quantifiable, systematic, and scientific methodology, to understand what has happened to the marble when it reaches its "stationary" or "steady" state.

What follows is a brief discussion of the process of conducting an economic impact analysis, the role of economic analysis in economic development and the creation of public policy, the different types of economic impact studies and tools used to prepare them, and the limitations of economic impact analysis.

The Role of Economic Impact Analysis

The primary goal of economic development policy must be to build stronger and better communities through sustained economic growth. Sound public policy begins with a firm understanding of the challenges and opportunities that exist within the geopolitical environment. Within that context, governments also have a fiduciary responsibility to their taxpayers to invest their tax dollars in an efficient and responsible manner, while also maximizing economic and social benefit.

It is important to realize that a

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principal reason for doing many economic and community development projects is to achieve public policy objectives other than job creation and retention, such as, brownfield remediation and redevelopment, urban revitalization, infrastructure improvements, job training, cultural/quality of life improvements, promoting economic diversity, and maintaining and expanding the state and local tax base. While job creation and retention is certainly one of the more important goals of a government's economic development efforts, it is not the only goal. The other socio-economic benefits derived from economic and community development investments must not be overlooked. And to ensure that public funds are appropriately directed, government has at its disposal numerous tools in which to gain insight into the needs of its citizenry and to construct and test public policy alternatives.

One such tool is the Economic Impact Analysis (EIA), which is utilized to determine the economic development need of a project, its return on investment and, ultimately justify public funding. These studies are an assessment of the likely impacts of proposed actions and/or possible events or the economic activity associated with past or current actions on the economy. Such studies are used in the assessment of numerous types of projects such as business expansion, business retention, industrial or commercial park development, transportation (highways, rail, airports, ports), downtown revitalization, or the impact of state and/or local tax policies, environmental remediation, and community development projects.

Based on an EIA, governments can develop a *fiscal impact* study, which determines the cost/benefit ratio of an action or activity. A "fiscal impact" is an effect on government finances resulting from or related to economic policies or activities. Fiscal impacts, while related to economic impacts, are not the same and the differences between the two should be noted. A fiscal impact study can assist decision makers in making informed decisions on the highest and best use of public funds.

Many modeling methodologies exist to assist in the preparation of an economic impact assessment and range from simplistic, accounting-based, pencil-driven cost benefit formulations to complex equation-intensive computerized econometric models. These tools can be used in conjunction with one another or independently. Some of the more notable tools are as follows:

Input-Output Modeling–IMPLAN

Input-output modeling begins with an input-output table which basically shows inter-industry relationships. The table is a matrix of rows and columns, each labeled with the name of different industries. The "cells" within the table contain the amount of output from some other industry that is used to produce final goods in the "row industry".
The "cells" of the table represent "row-industry" demand, or input for "column-industry" output. The origin of such models is generally attributed to the writing of Francois Quesnay in 1758. In the twentieth century, Wassily Leontief would develop the concept of "multipliers" from input-output (I-O) tables in work for which he received a Nobel Prize in 1973.

Building on such an analysis system is the "Impact Analysis for Planning" model known as IMPLAN. One of its primary advantages is that it offers the user very great industry detail and a capability to examine how a "shock" in one industry ripples through all other industries. One major disadvantage, however, is that it does not depict change over time. As a "static," or unchanging measure of inter-industry relationships at an existing point in time, such a model is less suitable for forecasting or for predicting

longer-term trends.

Since in I-O models the inter-industry relationships are defined for a given geographic region, such as the U.S. or a given state, I-O tables and multipliers are state-specific. The Connecticut I-O tables and multipliers used in a typical statewide impact analysis are available through the United States Department of Commerce's Bureau of Economic Analysis (BEA). Currently, the BEA offers what are known as Regional Input-Output Modeling System or RIMS-II multipliers for both major industry aggregations and detailed industries of which the larger groups are composed.

RIMS-II Multipliers

In general, a "multiplier" relates the change in output, earnings, or employment in any one industry to its total effect on all other industries, or it may show the change that results in earnings or employment in all other industries from a given dollar amount of change in spending in any row-industry. Multipliers are used to measure the "ripple effects" of spending that results in other rounds of spending, earning, and employment generated by an initial change in investment, earnings, or employment. RIMS II provides five types of multipliers: final-demand multipliers for output, for earnings, and for employment, and direct-effect multipliers for earnings and for employment.

The 1997 BEA RIMS-II documentation for the Connecticut multipliers shows, for example, that the direct-effect earnings multiplier for the insurance industry is 2.6342. This means that there would be an additional $1.6342 in earnings in all industries for each $1.00 change in payroll in the insurance industry. (Such multipliers are generally around the magnitude of 2.0.) Note that the total effect is the initial change in new payroll multiplied by 2.6342, but the total includes a "direct" and an "indirect" effect. That is, the total effect includes the change in insurance payroll as well as the earnings indirectly "generated" because new insurance employees are spending some of their earnings in the region, which means another round of "indirect" earnings by the recipients of their new "income." The "rounds" of spending continue – an "induced effect," and so forth. The ripples expand.

Multiple Regression

In the real world, many variables are changing simultaneously. It is often of interest to examine the influence of a single variable, holding other things constant. In economic modeling, this is approximated by a methodology that introduces numerous "independent" variables and estimates their effect on a single "dependent variable." The process is known as "multiple regression." It is perhaps the most widely used technique in the quantitative economic field of econometrics. In this methodology, parameters are estimated which measure the degree ("statistical significance") or nature (positive or negative) of association of the independent variables and the dependent variable. For example, consumer spending or "demand" could be the dependent variable for which price and income could be used as "explanatory" or "independent" variables. Demand is then said to be a function of both price and income. Price would likely have a negative or inverse correlation and income a positive association, meaning price and income would move in opposite directions, but price and demand would move in the same direction.

REMI Model

Expanding on the multiple regression technique and estimating numerous equations, one could build an entire model to explain the workings of a given regional or national economy. An internationally known example of such a model is the Regional Economic Model, Inc. (REMI) model. As a recent user guide explains: "Founded in 1980, REMI constructs models [for specific geographic regions] that reveal the economic and demographic effects that policy initiatives or external events may cause on a local economy." Moreover, "A major feature of REMI is that it is a dynamic model which forecasts how changes in the economy and adjustments to those changes will occur on a year-by-year basis. The model is sensitive to a very wide range of policy and project alternatives and to interactions between the regional and national economies."

The REMI model is structured to rely on a solid grounding in economic theory. A "control" forecast is the basis for comparison with the "simulation" forecast. Differences between the two constitute the "economic impact" of a given project or development. One of the greatest challenges of the model is choosing from among thousands of policy variables. Employment, sales, changes in investment in plant or equipment, for example, are among the input variables that can be modified. The dynamic nature of the model also makes it unique. As input variables are modified, one can examine their impact on other results variables such as personal income (the aggregate of new income for the whole state or county), gross state product (a measure of final output for state or county), total employment (after taking into account multiplier effects), and the tax revenues (plus or minus) after the model takes into account induced state and local spending. Population, for example, is one of the dynamic variables. Users are sometimes surprised to find that population expands in a rapidly growing economy. This may in turn induce changes in local government spending as towns meet new demand for schools, fire, police, and other municipal services.

The REMI model forecast horizon is currently 2035. Typically a 20-year or 10-year analysis is done. Because the dollar

values may come many years from the present, the future dollar values are usually "discounted," or adjusted for their present value. The choice of a discount rate is usually made consistent with the "opportunity cost" of money, that is the rate at which money available now could earn a return if it were otherwise invested.

One of the most important "results variables" is gross state product (GSP), a measure of the dollar value of all final output produced in Connecticut in a given year as a result of the employment or investment. A strong positive change in GSP is a typical indicator of a successful project, because GSP is a very comprehensive measure of impact. Other key variables are growth in total personal income and total state and local tax revenues. [See Inset on page 5]

Gravity Model

In a few cases, proposed projects may be examined with the application of a "gravity model." A new entrant into a sales territory, for example, may "steal" sales from existing merchants. Density of population and distance from the project location are factors that influence the probability of sales. A widely accepted version holds that migration between two cities is proportional to the product of the two cities' populations and inversely proportional to the intervening distance. Unlike the other "models" discussed so far, a gravity model uniquely incorporates spatial considerations in location decisions. In transportation modeling or travel demand forecasting these can have major consequences.

Other Models

Still other models can be employed to conduct "what if" scenarios. Sometimes a policymaker may raise the question of the source of past trends. To what extent is some policy variable changing as a result of a shift in composition and to what degree is it changing as a result of market share? Such "shift/share" analysis may be employed to measure the nature of an industry trend for example. Suppose a state has exceptionally large employment in a slow growth industry. To some extent, overall employment may "suffer," but as the composition of overall employment reduces this share and employment "shifts" to other sectors, the overall employment may be compensated. Shift/share analysis may be conducted to examine the interplay between intensity of employment and its source of change.

Measuring Economic Impacts

Economic impacts are most routinely measured in these terms: Business Output/Sales Volume, Gross State Product/ Added Value, Wealth, Personal Income, and/or Jobs (employment).

Employment is the measure most often highlighted, not because it is the most accurate or informative, but because it is the most tangible or understandable. A job is something the average person can relate to. The other measures, listed above, are more abstract and their importance can often be overlooked. Business Output is the broadest measure of economic activity. It is the gross dollar value of final goods and services produced. Gain in total state output represents the full income effect - the contribution to final goods and services as a result of both government (public investments) and private spending (wages, capital expenditures, profits generated within an economy). Wealth is the economic value captured within property or other tangible and intangible assets. New Personal Income: This is the collective gain in the aggregate of all income received in total by state residents as a result of the initial spending. The amount is based on multiplier effects and summation of income from all sources including income that may accrue to state residents from out of state sources. It includes proprietor's income, income from rent, wages and salaries, and other sources. This is pre-tax income. (Disposable income is income after taxes).Employment reflects changes in the level of labor within an economy.

None of these measures is absolute or perfect. They each have their shortcomings or limitations. Employment often does not reflect the quality of the jobs created or retained and cannot easily be equated to the public costs associated with their creation or retention. Business output does not distinguish between high and low value added activities. Increases in property values (wealth) may indicate a redistribution of wealth rather than a net increase of wealth within an economy. Workers that reside outside of a specific economic area (the study area) will dilute the impact of personal income growth and must be accounted for. It is because of the limitations of each of these measures that an economic impact analysis should seek to include as many of them as possible and consider them in aggregate.

Garbage In Garbage Out: The Importance of Accurate Data and Assumptions

It has been said (and correctly so) that there is no substitute for good data (or for that matter, accurate assumptions). The sophistication of one's model matters not, if the inputs are incomplete or erroneous and/or based on incomplete or flawed assumptions. The most important component of any economic impact analysis is the collection and verification of data, the formulation of assumptions and the selection of appropriate measures.

Pitfalls and Limitations

As mentioned previously, economic impact analyses are not without their limitations. They are, after all, only estimations

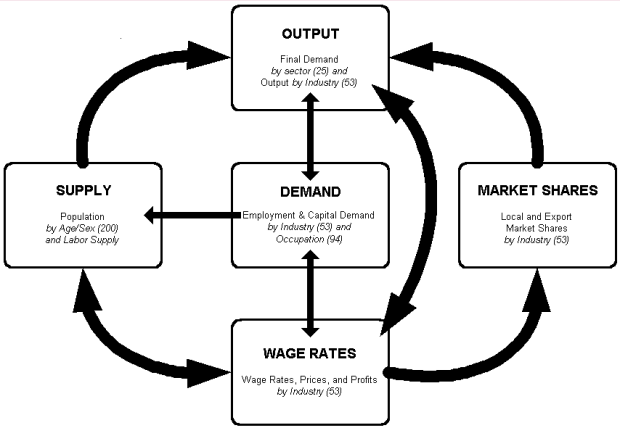
based on, hopefully, the best available data. As valuable as they are, economic impact analyses can be misleading if they are not appropriately constructed and executed. Problems that can occur include confusing the gross effect of a project with its net impact and using these interchangeably. Also, applying measures inappropriately or combining different measures of the same economic change will lead to overstating the economic effects of an activity as will blurring or confusing different time-frames, such as the immediate and long-term effects of a project. Ignoring the effect of market forces on inputs (such as labor and fixed capital) and confusing the capacity of a facility or full occupancy of a residential or commercial building with actual or historic activity levels can also distort the results of the analysis.

Conclusion

Economic impact analysis is an important and valuable tool available to decision makers in government. If implemented and interpreted correctly, it can be extremely powerful and provide incredible insight into the benefits and costs of public decisions. Economic impact analysis, however, is only one of many sources of information on which policy makers and the investors of public funds should rely upon in the creation of public policy and the investment of public funds. The results of any economic impact analysis should be balanced against other important considerations, such as the fiscal impacts on state and local revenues, quality of life issues and other socio-economic benefits/impacts, environmental impact, local zoning laws and traffic patterns, and consistency or compatibility with state and local development strategies and policies. ■

REMI INSET

The real strength of the REMI model is its strong grounding in tested economic theory. There are five key linkages all directly and indirectly interrelated with each other. An alteration of one can have ripple effects on all the others which are computed automatically by the model. For example, loss of an employer can lead to population shifts over time which can further result in wage and price shifts for both factors of production and consumer goods, or housing costs. All of these are taken into account simultaneously to provide a realistic simulation of the real world result. Sometimes short-run decreases can yield long-term gains and vice versa depending on the forecast horizon. National macro-level variables are also ìdriversî of some of the state and regional variables.



Linkages Among the Major Parts of the REMI Model
(REMI is a product of Regional Economic Models Inc.)

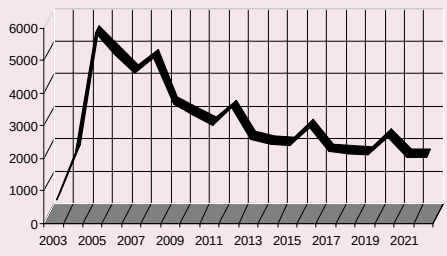
The five linkages are as follows: (1) output, (2) demand, (3) wage rate, (4) supply, and (5) market share. Investment and/or government demand might shape relative factor prices and influence consumption which depends on income. The model takes all this interaction into account. Ultimately it calculates this interaction providing explicit estimates on profitability, inter-state and international exports or commodity flows to and from the region, as well as effects on income and population.

REMI provides output measures that can be displayed in table or graphic formats. The example in Table 1 and Figures 1 are from a REMI model run of a hypothetical company relocating to Connecticut. Table 1 displays some of the key results variables. The plant boosts gross state product, a measure of total new output in Connecticut. It can be noted, for example, that gross state product increases on an annual average basis by $637 million dollars. The new plantís economic activity also generates an increase in total employment across the state. This averages 3,045 persons each year, but is not cumulative.

Table 1: Summary of Economic Impact Statistics
Hypothetical Manufacturing Plant Relocation
2003-2022

Economic Variable	Average Annual Impact
Gross State Product	$637 million (in 2000 dollars)
Total Employment	3,045
Private Non-Farm Employment	2,854
Personal Income	$265 million
Disposable Income	$216 million
Population Change	5,078

Figure 1: New Total Employment, 2003-2022



These year-by-year additions to total employment are shown in Figure 1. The new employment eventually tapers off, reflecting a growth in productivity in the industries that service the new firm and their employees. Also, after a period of time, new capital investment in support businesses is induced by the new plant until it reaches its desired capacity and then only replacement investment remains. Another benefit to the state is the increase in personal income, forecast to grow on an annual average basis by $265 million.