Practical Input-Output Modeling for Regional Development

Introduction

Because individual businesses and entire industries are connected in a complex web of interdependent relationships, regional planners can never afford to make decisions based solely on changes affecting a single employer or industry sector. Any changes in one will have very real ripple effects not only on suppliers but also indirectly on local businesses that depend on the spending of affected employees. How will these indirect effects be addressed by the region’s government agencies, economic development council, workforce board, and community college?

Solution Outline

Using input-output modeling for development purposes can be summarized as follows:

1. Using the model descriptively to analyze the current regional economy
2. Using the model predictively to simulate policy alternatives
   a. Translate alternatives into direct effects.
   b. Input effects into model and generate total effects.
   c. Interpret total effects.

Best Practices for Practical Input-Output Analysis

Introduction

When a region is planning for its economic future, or facing the challenges posed by growth or decline in local industries, stakeholders need to know the total impacts—in terms of either total jobs or total dollars—of looming events or proposed initiatives. To look only at the jobs or revenue of a single industry is extremely shortsighted.

Estimating such effects from scratch is indeed a daunting process, especially when staff, time, and money are limited. Many organizations simply give up at the thought of trying to come up with these figures, especially at the local level.

The good news is that no one needs to start from scratch. With advances in computer technology and vast stores of economic data, time-tested economic theory can now be put to work with a readily available tool known as a “regional input-output model.” Such analysis could only be dreamed of just ten years ago, but now it is within anyone’s grasp.

Unfortunately, few non-economists ever make use of this powerful tool. To those who have heard of it, it conjures up images of a complex accounting system requiring advanced mathematics and tedious data collection. Applied regional input-output modeling programs also have a reputation of being difficult to understand and operate, a problem further aggravated by a lack of user support on the part of vendors.

In this article, I want to introduce input-output modeling to policy professionals as a practical tool. I’ll provide some background, practical tips and usage scenarios, and some specific tools that are available.
What Is Input-Output?

Modern input-output models are based on large tables of data that describe the interconnectedness of the industries, households, and government entities that occupy a given geographic area. They are called “input-output” because a portion of the output (i.e., sales) of one industry will appear as the input (i.e., purchases) of other industries. These numbers help us track the flow of money from one entity to the next.

Why You Need Input-Output Analysis

The practical uses of input-output are of two kinds—descriptive and predictive.

In descriptive uses, the model simply informs users about the current regional economy: which industries have how many jobs and earnings, what portion of an industry’s supply needs are likely purchased inside and outside the region, which industry clusters are most developed, what the sources of residents’ income are, and so on. It is even possible to analyze a region’s economic base (vital income-generating industries) using an input-output model. Using a model descriptively can reveal new knowledge about an area’s economy that would be impossible to get otherwise, or it may confirm anecdotal evidence. In either case, when correctly interpreted it provides a great starting point for community discussion.

Predictive uses are just as important. For example, the model can estimate the total impact of a looming event in one industry. The event and its impact are described in terms of jobs, workers’ earnings, or sales. For example, entering a loss of 100 jobs in a local industry might reveal a loss of 75 additional jobs in several other local industries as a result of the economic ripple effects. Without the model, planners would not have been as well prepared for these indirect effects on the local economy.

Input-output can also be used proactively to assess alternative policies in economic development. We simply need to formulate these economic development goals into scenarios understood by an input-output model—that is, increased or decreased jobs, earnings, or sales in certain industries. Common scenarios might include attracting new businesses in a certain industry, increasing an industry’s earnings per worker, increasing economic diversity, substituting local for imported goods, expanding various industry clusters, attracting quality-of-life migrants, and so on. The current state, or baseline, of each of these measures is contained within the input-output model and is used to benchmark proposed goals. Development planners can thus see where the economy might benefit from improvements, and conversely, where an investment is unlikely to generate substantial returns.

With development goals in place, input-output is used to identify the best approach to attain those goals. Suppose, for example, there are competing uses for some parcel of industrial land, and suppose also that among community development goals is utilization of some underemployed community resource, perhaps a group of unemployed workers in a certain set of occupations. The input-output model is used to simulate various alternative uses of the land, and among its many indicators, the impact of each use on the target occupations is examined. Alternative uses of existing resources, the impact of departing industries, the impacts of new industries—these are but a few of the policy issues addressed by a regional input-output model.

How to Use Input-Output

The general steps involved in using a regional input-output model for policy analysis are indicated in the accompanying figure. The model conveys a tremendous amount of baseline information right “out of the box,” so in the first step of the process, the model’s base data are used to inform the policy discussion. Policy makers might want to focus on the relative magnitude of residents’ outside versus inside incomes, the importance of trade center industries, the leading industry clusters, and so on.
The next step—and this one is a barrier for many would-be users—is to translate policy issues into their associated “direct effects” in terms of jobs, earnings, or sales in various industries. The policy issue might be the effects of constructing a new freeway, for example, and there may be interest in the economic impacts during the project’s construction phase. This might be translated into increased sales in the local construction, engineering, and raw materials industries. Long-term impacts of the freeway may need to be translated into increased residents’ outside income (due to larger presence of out-commuters) or higher earnings for a local manufacturer (due to lower cost of transporting products). As you can see, negotiating this step can be somewhat “fuzzy,” and policy makers may need the assistance of the model’s vendor or an outside consultant to ensure that the assumptions used are valid.

After the direct effects are entered, the model runs millions of calculations in a few seconds and displays total impact of the chosen effects, which (again) represent a policy alternative. The model will show the change, positive or negative, in regional jobs and earnings by industry.

**Advanced Input-Output: Customizing the Model**

Regional input-output models at best are built from estimates about how industries purchase from each other and how much of each industry’s purchases are made within the region. If you have better local knowledge of these numbers, you can customize many commercial models to account for this.

In addition, some input-output tools (such as EMSI’s Economic Impact model) also provide built-in economic base analysis and may allow you to customize the economic base sectors in the model. For example, the default sectors in a region’s economic base may be “Government,” “Visitors,” “Services,” and so on. For a college town that depends heavily on a university, portions of these default sectors that can be empirically tied to the university should be aggregated and renamed to create a more expressive economic base analysis.

**Conclusion**

Regional input-output models are powerful and readily available, but have only recently begun to enjoy widespread use. Though they may initially seem daunting, they can provide crucial information to help regional economies thrive. In the end, regional development is all about fostering innovation, staying
competitive, increasing wealth, and raising quality of life. Input-output is just another tool to use for that goal.

**References & Further Reading**


**About EMSI**

Economic Modeling Specialists Inc. (EMSI) is a professional services firm that offers integrated regional data, web-based analysis tools, data-driven reports, and custom consulting services. EMSI has served thousands of workforce, education, economic development, and other policy professionals in the U.S., Canada, and the United Kingdom, and the company’s web-based Strategic Advantage research and analysis suite is used by over 2,500 professionals across the U.S. For more information, call (866) 999-3674 or visit [www.economicmodeling.com](http://www.economicmodeling.com).