

REGIONAL ECONOMIC ANALYSIS: THE NEW HAMPSHIRE - MAINE SEACOAST PROJECT

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INTRODUCTION

This report from the University of New Hampshire will cover in some detail the use of Input-Output analysis and Flow-of-Funds analysis in the study of a small region. But first we would like to explain the environment in which these analyses are being conducted, as regards both geography and the larger regional research project of which these are a part.

The Region involved is relatively small geographically, demographically, and economically. It includes 33 towns in southeastern New Hampshire and 7 towns on the southern tip of Maine. (See attached map) It is bordered to the east by the Atlantic Ocean and to the south by the State of Massachusetts. The land area enclosed is 755 square miles and the population is about 170,000, or 225 people per square mile. Only five towns in the Region have populations in excess of 10,000. These are Portsmouth, Dover, Rochester, and Somersworth, N. H., and Kittery, Maine. The largest of these by far is Portsmouth with about 30,000. These five cities form a discontinuous band up the Piscataqua and Cocheco Rivers, so they make up the population and industrial core of the Region.

The major physical feature of the Region is a water body made up of the Great Bay, the Little Bay, and the Piscataqua River emptying into the Atlantic Ocean at Portsmouth. This is probably the last under-developed major body of water on the East Coast. Some of the interested people hope it will stay that way, particularly Si Weeks, but others feel it has great potential for recreation and housing.

On the shores of the Great Bay is located another prominent feature of the Region: the Pease SAC Air Base. Many of you who attended the last meeting of this Council at the University of New Hampshire (which is also in the Region) can remember the jet bombers going over your heads while you drank bourbon in Bill Drew's backyard. Now the bombers are even bigger.

Also located on the Piscataqua River between Portsmouth and Kittery is the Naval Shipyard. This is by far the largest employer in the Region, having a work force at present of some 7,000 people. These two military installations provide about one-quarter of the employment in the Region and somewhat more of the income payments, so the Region obviously relies to an unusual degree on government payrolls for its economic sustenance.

The rest of the Region is made up mostly of small rural communities, but with established and extensive recreational development along the seashore and with new residential development in the towns along the Massachusetts border. Both of these depend heavily on the industrial and commercial activities and population pressures of Boston and the Merrimack Valley towns.

Before you get too critical of us for selecting such a Region, we would like to point out that the Region as is was handed to us on a take it or leave it basis. The Region is made up of parts of three counties and is about equivalent to a small county in size. We feel that if we were given the task of designing a so-called functional

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economic region based on the five industrial cities already mentioned we would probably come up with a somewhat different selection of towns than is contained in the Region we now work with. But we would find it fairly difficult to prove that we had devised an entity which was ecologically superior to the original. Perhaps it is true that the Region should not contain the towns that are located along its southern border because they are so strongly oriented toward Massachusetts, and that it should pick up another tier of towns to the west. But if we assume that the state lines are inviolate, then the southern towns must remain in the Seacoast Region.

We will have a good deal of information about the Region's economy and labor force by the time the study is over on which to base an assessment of whether or not it meets the criteria for a functional economic region. But we feel right now that it is a relatively self-contained labor market, except as regards its relationship to the Massachusetts cities. Otherwise it appears to be the labor-shed for the industrial and commercial activities it contains. It is quite self contained as regards markets for consumer goods, again excepting Boston stores and medical facilities.

The research project for this Seacoast Region is quite comprehensive and has as its goal a set of action proposals for the future development of the Region. We will have more to say about this matter of proposals because it is of some importance to show that the study is in fact relevant. The \$150,000 study covers all features of the Region: its natural resources, its people, its government, and its economy, and will answer three major questions: What does the Region already have? What does it want in the future? What are the best alternative ways of achieving its goals?

The Resources Development Center of the University of New Hampshire is running the research project, which is Phase I of a two-phase project for the region. Phase II will involve basically a number of planning activities. Some 25 faculty members make up the research staff. They are specialists in many fields, including economics, finance, statistics, population, minerals, water, sociology, forestry, government, and law. They are backed up by 12 research assistants and consultants.

Natural Resources

The Natural Resources segment of the study is conducting an inventory of and analyzing the water, land, wildlife, minerals, and forests of the Region. The Region must try to get the most out of its natural environment in all ways. This includes the economic side involving sales of products such as milk and sales of services such as forest recreation. Also it includes the public side in providing drinking water, open space, sewage disposal, and the like for residents of the Region. Our study of forests, for instance, analyzes both the commercial timber potentials and the use of forests for recreation, vistas, watershed, and wildlife production.

Population and Labor

Population analysis of the Region, another segment of the overall study, goes well beyond the regular Census report. Characteristics of the population such as age, education, and migration are covered. But in addition, a survey of households will yield heretofore unavailable information on incomes, labor skills, and commuter patterns. Projections of population and labor force to 1980 will provide information critical for both public planning and private decisions of industrial firms and builders.

Government and Social Aspects

The governmental segment of the study includes extensive analysis of local and regional government. It will propose governmental organizations to enhance economic

development. Some government policies should be revised, some operations streamlined, some activities expanded; and these will be identified. Analysis is in process for governmental finances, public capital investment, county government, and educational facilities, as well as the attitudes of the people of the Region on planning, promotion, economic development, taxing systems, and political leadership. Wide interests in the Region will focus on the proposals from this study on how to organize for regional planning and development. These proposals will show how the laws and regulations in the State and Region need to be changed to develop a viable regional organization.

Economics and Business

The largest part of the study, economics and business, will analyze the Region's economic base as well as project the effects of economic changes. Research models are being used, that we will describe in more detail later, so that proposals for the future are soundly based rather than being wishful thinking.

To conduct this research a great deal of basic information is needed from the industrial, commercial, business, and government establishments in the Region. The inventory of economic activity shows that there are 5,600 establishments in this small 40-town area. An average 15 percent sample of the firms and public units is being surveyed to get information on their costs, incomes, sources of capital, labor and material use, and special problems.

Reports

No completed reports are yet available from the Seacoast Development Study. A number of factual reports are now in process and will be published this summer. The analytical reports, particularly on governmental organization, prediction of economic activity, and optimum land use, will not be published until the late fall of this year.

Data Problems

Every regional economic study is probably unique. The Seacoast study is no exception. As mentioned, it includes parts of two states and within those two states, parts of three counties. The fact-collecting problem, therefore, is exacerbated: state-wide statistics, to the extent that they exist, are of no help, and the meagre county-wide statistics--some are available in recently published area series based on the 1963 Census of Manufactures released by the Bureau of the Census--are even less usable.

Why not allocate to the Seacoast Region that proportion of the data for the two states or the three counties which is accessible? Because there is no reason to assume that the Region is representative of the larger or smaller political divisions of which it is a part. Our study covers what is essentially a non-metropolitan area. The largest communities in it are Portsmouth and Dover, neither of which is a major population center by usual standards. On the other hand, the study includes the largest single employer in New Hampshire, viz.--the Portsmouth-Kittery Navy Yard, as well as one of the largest private employers. Then to compound statistical matters, the Region contains the Pease Air Force Base, hardly representative of either New Hampshire, Maine, or the typical county in either state. Moreover, in our study large manufacturing is considered to include all firms with 20 or more employees. There are 86 such firms ranging from the bare minimum to the Navy Yard.

INPUT-OUTPUT ANALYSIS

In determining the type of Input-Output approach for a "small-area," which is the term suggested by Miernyk in his recent Elements of Input-Output Analysis, the choices

seem to narrow down to two: (1) input coefficients derived from national studies and applied to estimates of gross output for the small area; (2) direct collection of the data. The first is obviously unsuited to the Seacoast Region and perhaps to any regional study because the assumption that national input distributions are applicable to smaller areas is erroneous. The second approach mainly founders on the question of great expense. Fortunately the Seacoast study is well-financed and the cost constraint can be largely ignored.

It would be misleading, however, to conclude that no data problems have developed. Some could be anticipated, such as the fact that small firms have a strange conception of bookkeeping. Others were totally unexpected, for example, the blanket refusal to date of lawyers, catalogued in the services sector, to divulge any information whatsoever. But before elaborating on these and other practical difficulties it seems desirable to point out the main features of the Input-Output model we are using.

The Model

Our model is a typical from whom-to whom square matrix, with an equal number of rows and columns divided into producing sectors and final demand (autonomous) sectors. There are presently 28 producing sectors, including 12 manufacturing ones, as well as eight final demand sectors. Greater or less aggregation is still possible and will depend on the responses to questionnaires and the absolute necessity of our implementing our pledge of complete anonymity for any respondent firm.

The model is an open type with the Inputs and Outputs of the producing sectors functionally related, but those of the final demand sectors exogenously determined. In other words, the total value of Inputs and Outputs of any producing sector must be equal, but this need not be the case for autonomous sectors. Any of the latter, such as households, can produce Outputs in excess of inputs (or vice versa), the difference being saving (or dissaving). The only requirement for the autonomous sectors is that the total of all their Inputs and Outputs be equal in dollar terms. This preserves macroeconomic saving - investment equality.

In general, the data for the producing sectors are primary data obtained from questionnaires administered on the spot by trained interviewers. The data for the autonomous sectors are derived from these but will be checked in all likelihood by some primary sampling. Below is a list of sectors as currently conceived:

Producing Sectors

1. Agriculture and Forestry
2. Mining and Fishing
3. Construction
4. Manufacturing
 - A. Food and Kindred Products
 - B. Textiles and Apparel
 - C. Lumber, Wood Products, Furniture and Fixtures
 - D. Paper, Printing and Publishing
 - E. Chemicals, Petroleum, Rubber and Plastics
 - F. Leather and Leather Products
 - G. Stone, Clay and Glass
 - H. Metals
 - I. Non-Electrical Machinery
 - J. Electrical Machinery
 - K. Portsmouth Navy Shipyard
 - L. Miscellaneous

5. Transportation
6. Communications and Utilities
7. Trade
8. Finance
9. Insurance and Real Estate
10. Services
 - A. Lodging
 - B. Personal and Miscellaneous
 - C. Auto and other Repair
 - D. Amusement and Recreation
 - E. Medical and Other Health
 - F. Legal
 - G. Educational
 - H. Nonprofit Organizations

Autonomous Sectors

1. Households
2. Federal Government
3. Pease Air Base
4. State Government
5. Local Government
6. Fixed Investment
7. Inventories
8. Exports

In general, the sectors are defined according to Standard Industrial Classification specifications, but local adaptations have been made. Thus, the overriding significance of the Navy Yard led us to establish it as a separate manufacturing sector insofar as its shipbuilding and repair activities are concerned. In this regard, the Navy Yard is competitive with private shipyards. Its other activities, a Naval hospital and a nationwide disciplinary barracks, are included under Federal government. A more or less similar decision was reached with respect to education, which is treated as a private service sector. This is so because the Seacoast Region includes the University of New Hampshire and Exeter Academy, as well as the usual public and parochial schools. The economic impact of these institutions is such as to warrant a separate non-government producing category. Finally, the Pease Air Force Base has been segregated out among the autonomous sectors to point up its very large economic contribution.

Even before any detailed analysis it is apparent that regional exports and imports will constitute a large amount of total transactions. It can be assumed that most industrial output will be exported and that most industrial as well as many non-industrial inputs will be imported. These exports and imports, of course, are classified as autonomous.

The Questionnaires

The questionnaires which yield the basic Input-Output data are fundamentally designed to elicit sales-cost information. This means that the respondent firm is being asked to open up its books, particularly its income statement. Nor does the inquiry stop there. It is not only a matter of total sales and a typical accounting breakdown of costs and profits, but a further disaggregation of sales to whom (by sectors) and purchases of Inputs from whom (by sectors). As a consequence, trained interviewers must be on hand to wheedle out the details which will not be revealed by a company's annual income statement. In our study, two years were selected, 1963 and 1964, partly because we wanted to check against the 1963 Census of Manufactures, partly because we began collecting data in mid-1965, and partly because we desired to examine changes.

To complicate things even more, the Input-Output questionnaire must be tailored to each industry. What is appropriate for manufacturing is not germane to transportation or finance, for example. Moreover, these questionnaires seemed to be a reasonable non-duplicative place to record other information needed for the overall Seacoast Regional Study, such as labor force statistics, capital stock data, and figures on water and electrical power usage.

In order to isolate transportation costs, respondents were asked to estimate sales at f.o.b. prices. This is in accord with the typical Input-Output procedure of using producers' rather than purchasers' prices. Anticipating the inability of many respondents to provide such information, the questionnaires were designed to pinpoint those respondents who could not arrive at reasonable estimates. The method of computing transportation costs will be to combine known data with information from the transportation firms themselves, including direct sampling of the transportation sector. Given this conception of the transportation sector, it was decided to reassign all firms except for those moving freight to other sectors. Thus, taxicabs have been placed under personal services, as have bus lines, moving and storage companies, and travel bureaus. Marinas, party boats and airports (there are no air freight facilities in the Region) have been reclassified under amusement and recreation.

The result was a lengthy complicated questionnaire asking for very sensitive material. Our experience suggests that the simpler the questionnaire, the more cooperative the respondent. The alternative which we followed in view of the otherwise attendant paucity of data, was to invest heavily in softening up our clientele. The same procedure was applied to the matter of individual exposure. In brief, it is a sine qua non to seek the good will and cooperation of business and the general public through contacts with public officials, trade organizations, service clubs and the like. The potential respondent must be assured of the worth of the research effort as well as the guarantee of confidentiality for each questionnaire. Fortunately, a University research organization is in an excellent position to do both.

Even so unanticipated problems may arise, as previously suggested. What makes a funeral director so cooperative that you suspect his motivation while a town selectman threatens to do bodily harm to a well-mannered interviewer? How do you account for a 100 percent response from a specific industry in one town and a zero response from the same industry in another town no more than ten miles from the first? Some generalities are possible. Sectors which would obviously benefit from a careful economic study--the finance sector, for instance--will cooperate to the hilt. Firms whose central headquarters are outside the region will tend to remain aloof. The higher the level of government, the greater the degree of response. The smaller the private enterprise, or the greater the financial problems of any firm, the less the ability or willingness to participate. Another conundrum is the corporation which readily reports all sales and cost data but refuses to confirm a profits figure or to disaggregate profits between taxes, dividends and retained earnings.

All of this underscores the necessity of carefully pretesting each sector questionnaire and using every resource (even up to the Governor's office and the Department of Defense) to win over the potential respondents. In our work, citizens' committees proved to be exceedingly helpful.

The Matrix

Once the transactions matrix is completed, the flow of information should be bountiful. There will be, of course, an errors and omissions row and column, the numerical total of which should be a reasonable indication of reliability and accuracy. The matrix itself will show the dependence of the Region on exports, the dependence on

non-local Government, the degree to which Regional industries depend on imports, the ability of the trade and service sectors to satisfy Regional final demand, and so on. The matrix will also reveal the true extent to which certain industries are the mainstays of the Region and whether various speculations, in particular about the recreation sector, are justified by the facts.

Through the use of the University's computer facilities, Input coefficients can be obtained rather handily by dividing the column entries for each sector by that same sector's adjusted gross Output (i.e., subtracting the relevant inventory depletion from each sector's total gross Output). These coefficients show the direct purchases per dollar of Output. Thus, it might be found that the Portsmouth-Kittery Navy Yard buys so many cents worth of Inputs from the Regional construction industry, so many cents worth of Inputs from the Regional communications and public utilities industry, nothing from the Regional rubber and plastics industry, and the like--all per dollar of Navy Yard Output.

Another computer - derived set of data will be the combined direct and indirect dollar requirements on each industrial sector made necessary by the delivery to the final demand sectors of a dollar's worth of Output. Accordingly, for each row, coefficients will be computed to show column by column the impact on each sector of the delivery of one dollar of final output. It might be found that delivery of one dollar of finished construction required a total gross Output of so many cents from chemicals and petroleum, so many cents from stone and clay, etc. The method used here is matrix inversion which is explicated with unusual clarity in such standard works as Chenery and Clark, Interindustry Economics, and William Miernyk, The Elements of Input-Output Analysis.

The transactions matrix, and the several treatments of it just detailed, will reveal a great deal about the interdependencies in the Region and the technological relationships. One should be able to postulate, for example, the consequence of the closing down of either the Navy Yard or the Air Base (perhaps both) on the individual sectors of the Regional economy. Or what it would take in the way of ancillary facilities to make the Great Bay a widely used recreational area. To what extent should resources be devoted to growth industries such as electronics, which already have a good foothold in the region, the major part of whose Output is exported?

Much other derivative information should be forthcoming. Income and employment data and multipliers are examples. With luck and some refinements it might be possible to estimate gross and net regional product. The luck comes in with respect to the reliability and accuracy of the data; the refinements include, among other things, the ability to convert usual bookkeeping measures of inventory change into Department of Commerce "net inventory change," expressed in physical terms.

The pitfalls of the Seacoast Regional Input-Output study are many and the value of the results has yet to be determined. It can be predicted, however, that compared with the usual economic base methods, the flow of information and the analytic possibilities are sufficient in themselves to generate a great deal of optimism.

FLOW-OF-FUNDS ANALYSIS

The economic development of the Seacoast Region, or any region, is determined in large part by the rate of real investment in the Region, which in turn, is largely determined by the cost and availability of capital funds. In our comprehensive study we go beyond the usual treatment of paying lip service to the financial aspects of regional economic development by using a Flow-of-Funds system of accounts for tracing capital market flows. Flow-of-Funds social accounting is the brain-child of Professor