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ABSTRACT

Predictions and forecasts are the most critical features of rational planning as well as the most vulnerable to inaccuracy. Because plans are only as good as their forecasts, current planning procedures could be improved by greater forecasting accuracy. Economic factors explain and predict more than any other set of factors, making economic analysis the most reliable forecasting tool available. Among various models of economic analysis, one based on regional income and product accounts is preferable for its construction and manipulation ease. (RA)

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BETTER FORECASTING FOR BETTER PLANNING: A SYSTEMS APPROACH

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BETTER FORECASTING FOR BETTER PLANNING: A SYSTEMS APPROACH

The burden of providing new and replacement facilities is a critical problem for virtually every local government. Building to an optimum design has always been important, but is now reaching critical proportions with the rising costs of construction and money.

How often has the "ultimate" street improvement proven inadequate within a few years? Is the odor from the waste water treatment plant caused by mechanical problems or is it prematurely overloaded ? How much of the city financial problem has its roots in not taking future requirements adequately into account when with a bit more effort they could have been foreseen?

Management is constantly being alerted to improvements in administrative methods and technical breakthroughs, yet one seldom hears about the possibilities of the economies to be realized through better planning provided through better forecasting of the demand for capital improvements. Even the best management is crippled if it lacks good forecasts.

Most policies and projects, both public and private, are based on assumptions as to a quantity to be served such as a number of automobiles per hour, dollar volume of retail sales per year, number of pupils, tons of waste or gallons of sewage. In each case there is an informal or formal forecast involved, usually based on population. For some types of projects the most likely outcome can be quickly judged by intuition and a safety factor inserted into the design calculations, or as an alternative, the facility can be designed for easy expansion. However, in other cases the capacity designed into a facility at the beginning is critical, for if it cannot meet the demands put upon it, it must be abandoned or duplicated at considerable cost.

It is obvious from past performances that better forecasts are needed. As critical to the success of a project as forecasts can be, they are often treated in a very elementary or even slipshod way, even when they are prepared as justification for the expenditure of millions of dollars. As yet there is little technical expertise expended in forecasting factors related to metropolitan growth and many technicians who are depended upon to deliver expert determinations use very primative methods.

Economic factors are either directly of indirectly responsible for most of the difficulty in arriving at the proper capacity criteria for the design of facilities. For instance, the bulk of the population changes which occur in the metropolitan areas can be traced to such economic factors. Although older people may respond slowly or not at all, young people are quick to leave an area of

little economic promise and settle in an area which provides opportunities to their liking. In many metropolitan areas a careful study of demographic factors and their extrapolation is meaningless due to the overriding influence of migration spurred by economic opportunity. If we are to make better population forecasts we must put more effort into determining the part economics plays in population changes.

Throughout the country many planning activities are based on an economic base study which is little more than an encyclopedia of historical data extracted from government publications. This is a worthwhile activity but more suited to a chamber of commerce and hardly a sound basis for planning. In such cases the more common analysis of the data is a short discussion of the past trends followed by extrapolations into the future. Project budgets which provide little time or money for economic studies are partially responsible for the need to do this.

The shortcomings of the current practice in economic analysis and forecasting indicates a need for the widespread use of something better. What is clearly called for is an economic analysis and forecasting system. The institution of such a system can provide a framework within which it is feasible to understand and to monitor local development.

Briefly stated, an economic analysis system involves establishing a relationship between the current economic activities and a careful study, by component groups of industries, of future relationships and magnitudes of activity. The end products include (1) orderly sets of current data to explain the current situation, (2) forecasts with numerical values for selected dates in the future suitable as inputs to final design, and (3) a framework within which the impact of alternative economic assumptions, events and policies can be evaluated. It implies continual or periodic updating and reevaluation. If desired, the data can be computerized if allowances are made for considerable subjective calibration.

Is such detailed analysis worthwhile? Can the cost be justified by the possible additional accuracy in the forecast?

The effort may not pay off when the stakes are small or where the size of the study area is so small that the functioning of the economy can be readily grasped. It is not badly needed where the facility can be conveniently and economically designed for incremental additions to meet additional demand.

The economic analysis system is most beneficial when the stakes are large or when the service area is so large that the important factors cannot be easily grasped or can be grossly misinterpreted. It is most important when the project must be built to an optimum size at initial construction and when increases

in capacity are difficult or costly. Generally, any urban area over 25,000 population would profit by maintaining an economic analysis system upon which to base all of its comprehensive and project planning.

A local economic analysis system should be built around a system of regional accounts. Regional accounts are defined as a consistent set of information which shows the interrelationship among the sectors of the economy.

There are two general types of regional account models currently promoted for analyzing local economies. One is an adaptation of inter-industry input-output tables, and the other is a modified regional income and product account system.

Input-output tables are popular with many economists, a fact which may be patially responsible for the low level of progress in local economic analysis. They are difficult to construct and use at the local level because they require detailed and precise information which is almost impossible to obtain. This forces the use of partially applicable and outdated national information which usually does not represent the local situation. The tables are commonly based on gross sales which do not identify the magnitude of the purely local input. These and other problems make input-output tables unsatisfactory as a basis for a local economic analysis system.

Regional income and product accounts are similar in concept to the national income and product accounts used to measure the performance of the country's economy. They are modified to handle the characteristics of the smaller, more open local economies and to make them more useful as a forecasting tool. They focus on value added locally by groups or sub-groups of industries. The use of value added reduces the chance of double counting and the counting of non-local inputs.

The Keynesian economics point of view is introduced by careful attention to differentiating the value added for export to the rest of the world from that directed toward the local sector. It is important that each industry group's contribution to both export and local consumption be estimated. The underlying economic reasoning which aids in forecasting is that growth in the export sector tends to generate a calculable proportion of activity in the local sector. A further modification measures indirect export earnings through the supply of components to an exporting activity.

Other accounts in the system treat transfer payments, tax flows, capital investment, savings and other processes which explain the local economy. One of

the prime conceptual advantages of this model is that it can be operated at many levels of detail and partial refinements can be inserted from time to time.

Value added in production is of most interest to planners and is the account which is most closely monitored for changes. It is also the account in which the bulk of the impact of local policies and investments can be measured. It is not an end in itself but rather a supplier of data and insights needed in forecasting and in planning for land use, transportation, utilities, tax yields and other functions.

Little is heard of operational economic analysis systems, but one has been and continues to be in successful use. The City of Sioux City, Iowa prepared an economic analysis system in 1959 on which to base its comprehensive planning. This was later updated by SIMPCO, the Siouxland Interstate Metropolitan Planning Council (a Council of Governments), in 1969 as the basis for a regional plan and comprehensive transportation study.

The 1959 analysis was guided by Professor Charles L. Leven, and executed and extended to planning forecasts by the local staff, principally W. Burnet Austin and Arlo Herbold. The basic analytical model was Leven's adaptation of regional income and product accounting.

The data base for the system was tied into a land use data bank designed to supply planning data including those items needed for construction of gravity model type transportation trip tables. Employment was the proxy measure for economic activity within the data bank. The dollar figures necessary to translate employment into value added was obtained by mail questionnaires to all of the smaller enterprises and by personal interviews with those having larger employment. Questions asked included gross sales by class interval, information needed to estimate value added, proportion of sales to customers outside of the study area, sales to other local businesses, locale of ownership and capital investment.

Questionnaire response was considered good, even though only about 30 percent of those mailed were returned. Considerable indirect estimation aided by cooperative businessmen was needed to fill the gaps. The estimation technique was to assign an average value added per employee for each subgroup of industries and expand this by the reasonably accurate employment figures in the data bank. A truism emerged from the work to the effect that the more successful a businessman was the more cooperative he was. Strict confidentiality of information was promised and adhered to and local industry leaders enthusiastically participated in providing insights into growth potentials for the forecasts. In reporting the results, industries were grouped so that it was impossible to identify the status of any individual firm.

Once the magnitude of the exporting industries was determined, the forecasts were completed by using multipliers to calculate the value added and employment potential for those industries depending upon locally available purchasing power.

The 1969 update using 1968 as a base year revealed that the forecasts for most of the industry groups were very accurate as to employment. The local industrial development organization had used them as an objective and was moderately successful. The two industry groups which were badly forecast were construction and wholesale trade. In retrospect, the latter could easily have been properly forecast if more industry contacts had been made and national trends heeded.

Value added forecasts were missed badly, being much too low. A shorter updating cycle would have allowed for more timely adjustment. What actually happened in the nine year interval was that the relative well-being of the population increased through an appreciable increase in value added while total employment increased only moderately. Viewing the economic analysis along with the preliminary 1970 Census indicates a stable population with a decided increase in economic welfare. The accounts revealed another significant aspect of this change in that in 1959 probable capital consumption was taking place, whereas, in 1968 there was a healthy rate of capital investment.

In both time periods the economic analysis system was an integral part of the comprehensive planning process. The changes needed in updating the Regional General Plan were minimal and mostly confined to extending the geographic area and the time horizon. This can be attributed to several prime factors. First, there was wide participation in developing the 1960 General Plan beginning with the economic analysis, and the plan was thus sensitive to the needs of all of the people and to each section of the city. Second, the economic forecasts, as they affected the land absorbtion rate (urbanization rate), proved to be surprisingly on schedule.

For the Sioux City metropolitan area, the extra effort involved in establishing a good economic analysis and forecasting system has paid off. Because of its integration with the entire planning analysis, it was probably less costly than the conventional study approach of executing sequential ad hoc studies.

At present the analysis system is integrated with a computerized land use data system which is kept up to date by the SIMPCO staff under the direction of Don Meisner. It is readily available for updating any plan element or its extension to use in other interests of local government such as in capital improvement programming.

Summary and Conslusions

This paper has attempted to make a case for more detailed studies of local economies and for more care and attention to forecasts. It must be recognized that no one can predict history and that the guaranteed forecast is impossible. However, it is believed that there is room for large increases in forecast accuracy if a reasonable amount of effort is expended in doing so. Present practice is to spend too large a proportion of available funds for data manipulation and design procedures and too small a proportion on the basic assumptions upon which the designs are based.

An economic analysis system can be of benefit to planners, engineers and managers in supplying more credable inputs to the solution of problems of urban development. Decision makers in some cities where there is critical dependence upon sales or income taxes may find that the use of the economic analysis system for forecasting short and intermediate range revenue yields overshadows its importance for facility planning.

The analysis system recommended here centers around the use of a regional adaptation of the income and product account model. This is not the only model which can be developed, but it does have advantages in being easier to construct and manipulate. It can be useful through a wide range of sophistication in its execution. The plea is to use an analysis system at an appropriate level of detail and update it periodically, rather than continue with no meaningful economic analysis. The system provides basic data for improved performance in the tasks of of population migration forecasting, preparing land absorbtion tables and in forecasting traffic demands.

There are little explored possibilities for better forecasting which are made possible by an economic analysis system. An example is the preliminary indication that airline passenger boardings will correlate well with value added in the local economy. There are a wide variety of possible uses in marketing research.

APPENDIX

WORK ELEMENTS FOR REGIONAL ACCOUNTS CONSTRUCTION

The detail of developing an economic analysis system based on income and product accounting would be of considerable length and can be treated only in a summary manner here. Part of the technique involves the development of usable data from different sources. This requires statistical detective work and a basic understanding of how local economies are inclined to work. A knowledge of regional economics and economic geography would be helpful, but the services of a professional economist is not mandatory. A knowledgeable consultant could be used to help a local staff over difficult conceptual problems.

The elements of the task, with some comments , are these:

1. Define the study area. The study area should be an identifiable semi-independent economy, yet it can be a political subdivision if desired. The most rewarding grouping of economic activity to study i the metropolitan area. However, for planners use, some of the detai. must be preserved by subareas as small as a traffic origin and destination zone.

There are many conventions which can be adopted to solve conceptual or data availability problems. For instance, commercial agriculture physically located within an urban study boundary can be considered as part of the rest-of-the-world , or an important industry located just beyond the study boundary can be treated as being within the local economy.

2. Prepare a study design. At the very least, a detailed outline of the work program is needed. It would be better if each work item were detailed as done in the custom of preparing a procedure manual for a comprehensive transportation study. By far the preferred procedure is to prepare a procedure manual supported by scheduling on a network diagram. City planning studies have a nasty habit of dragging on and missing their intended completion dates by a wide margin. The use of proper management and control procedures, such as critical path programming, can reduce this undesirable charactreistic to a minimum.

3. Gather basic information and prepare a data bank. This data bank should be the same one used for land use and transportation planning. The likely modifications are the need for proper classification of land use and the collection of meaningful employment data, but these should already be a part of a good land use data system. Employment data should be handled

as man-years of work for this has been found to be the best proxy for detailed sales figures. Employment information has consistently been the easiest characteristic to obtain on a nearly 100 percent basis.

Data should be coded under the Standard Industrial Classification Code (SIC) sponsored by the Bureau of the Budget. This coding will facilitate the use of federally collected statistics in constructing the original accounts and in subsequent monitoring and updating. Use of the Standard Land Use Code promoted by HUD and BPR is a needless waste of resources and time because it is difficult and expensive to convert for compatibility with the mass of available economic statistics.

The fact that a new and incompatible code was promoted by HUD and BPR is evidence that a sixable number of leading planners and engineers, at least in the 1960's, had a very narrow view of the sum total of the factors controlling the urban systems for which they are planning. The SIC Code has problems for urban planning, but these are easily and simply corrected without destroying data continuity. To depart from a system which has generated decades of comparable statistics with which to work, is wasteful. Other data needed by planners for other plan elements will normally be collected and put into the data bank along with the data needed for economic analysis. Caution must be used to avoid collecting more information than is necessary. If all of the possibly useful information were to be collected and put into the data bank it could make it less useful. If at all possible, all of the data should fit onto one physical record such as a computer card. Collection of all essential information at one time is good economy, but there is a point of diminishing returns. After this point, additional information collection multiplies the difficulty of quality control and materially increases the time and money needed to finish the economic analysis. There is a danger that data collection can become a nominal end product rather than just an input for an analysis system.

Minimum data tabulation needed is the number of employees (man-years of work) by three diget SIC sub-grouping with one and two diget summaries. Additional tabulations of floor area and site area by three diget SIC Code can be worked into the analysis to yield valuable insights for land use planning. The other tabulation needed is information on the larger firms within the study area. These are commonly interviewed in person in an effort to arrive at the most accurate information they will reveal. Such information will materially increase the overall accuracy of the analysis with minimal additional effort.

4. Prepare work sheets. The next step is to prepare work sheets upon which the tabulated data will be entered along with the results of further analysis procedures such as the allocation of value added between the exogenous and the endogenous sectors. The summary work sheet entries provide the publishable data for the final report. Industries should be listed in the tables at a level of aggregation suitable to the needs of a majority of the potential users. For example, if a region is a meat processing center that three diget sub-group would be broken out of the two diget Food and Kindred Products group. Large employers should be given a distinct entry so that they may be treated in greater detail. The detailed work sheets will be confidential because it should contain much information on individual enterprises which is not generally available to the public. In any publication, data must be aggregated so as not to reveal such confidential information. Respect for confidentiality will aid cooperation in updating activities.

Data entered for each industry group include the name or classification of the industry, number of man-years of employment, gross sales, average value added per employee, total value added, portion of value added earned from sales outside of the study area (exogenous), value added earned supplying others who will in turn export, and value added by providing for the local sector (endogenous). The original data in the gross sales, average value added per empooyee and total value added columns can be any one of these with the other two derived. The best information readily available dictates the source to use.

The task of arriving at the total value added for an industry group can be difficult as well as fascinating. The easiest method is to ask the manager of a typical business within the group. Often he will give significant information for the group as a whole and very precise data for his operation. Sometimes national data will have to be used because no one will supply information locally. Business executives will usually comment on how to calibrate a national factor to fit the local situation even if they are prevented by company rules from giving information about the local operation.

As a general rule, the most prosperous and the locally controlled businesses will be the most cooperative in giving information. Businesses not doing very will are inclined to be hostile toward inquiries about their business volume. A most difficult problem is the business which is willing to cooperate but which has inadequate records to do so. This has greatest impact when several different types of business are done out of one location such as manufacturing, wholesaling and retailing. As an aid in getting better information, it is often better to base the study on data an extra year old and which will be more freely revealed than to try to work with current data which will be withheld in a significant number of situations.

Determining the proportion of sales which are endogenous and those which are exogenous can be the most difficult problem to solve in some industry groups. There will be those activities which obviously sell over 99 percent of their output outside of the study area, but there will be many more where such a determination will require a good guess. For instance, the medical specialist is likely to have patients from both inside and outside of the study area and will have no solid information as to how his revenues are distributed. Small samplings can give insights for making a good estimate on this division.

The completion and summarization of the work sheets allow construction of the rest-of-the-world account. For most study areas it is the key account in understanding the local economy and offers the opportunity to calculate multipliers as an aid in forecasting local sector responses to export sector impulses. Other elements of the analysis system are important to account for other economic factors such as transfer payments, taxes, savings and investment, and disposable personal income.

In a retirement locality, transfer payments would be highly significant. In a region which has had a negligible rate of growth, investigations of capital investment and savings would be very important. However, it is the rest-of-the-world account which reflects most of the forces which cause change in facility requirements, land use and population, and therefore, is the most useful to planning forecasters.

5. Prepare forecasts. The final step is to prepare forecasts based on the empirical beginning points and insights as to the workings of the local economy provided by the regional accounts. Judgement and subsidiary studies of secular trends by industry group are important ingredients of a good forecast. The best technique is to go through the accounts by group or subgroup of industries and assess their likely future market performance, technological change and labor utilization. Usually this subject is discussed when establishments or industry leaders are first approached for data needed to construct the regional accounts. Follow-up interviews are often needed. Highly competent industrial observers are often available and willing to aid in this phase as a public service. A series of seminars involving industry leaders would be an interesting activity, but are difficult to arrange. In some cases publications from national sources will shed light on impending technological or marketing changes which may not be admitted at the local level.

Multiplier analysis based on the regional accounts can be used to assess the changes expected in the endogenous component of each industry group. Forecast target date columns may be included on the basic work sheets for value added and employment. It is important that all sources used for making judgements and all multiplier calculations are preserved so that they can be reexamined and improved upon at updating time.

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