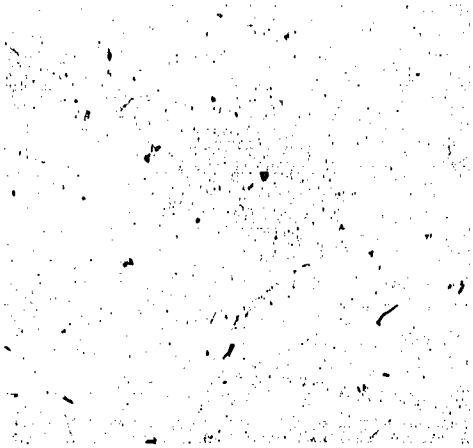

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ABSTRACT

Intended to provide guidance to Extension specialists and agents faced with requests for impact analyses from communities experiencing economic development, this report also summarizes issues that need to be considered. The first section, on private sector impacts, addresses questions on predicting changes in production, employment, and housing resulting from proposed developments. A second section discusses public sector impacts and highlights methods for estimating changes in public expenditures (using school expenditures as an example) and public revenues resulting from economic development events. In the third section, the economic base and input-output models are covered, with a review of the basic data needs and assumptions of the models, which describe links (jobs, income, and output) between a development event and the rest of the community. Some other important changes which may occur in a community but are not easily estimated with economic models are reviewed in the fourth section, on nonmarket impacts (population changes, employment-related changes, and changes in political atmosphere). The final section defines Extension's role in impact analysis; reviews differences between facts, values, and beliefs; identifies points in the decision-making process where Extension education programs are most appropriate; and outlines various approaches to deliver impact analyses. (MH)

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How Extension Can Help Commun Conduct Impact Analyses

A Report Prepared by
the Extension Committee on Organization and Policy
Task Force on Economic Impact and Data Analysis

RC014606

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Because many communities are facing significant economic changes, the Community Development Subcommittee of the Extension Committee Organization and Policy appointed a task force to explain the basic elements of impact analysis and to explore the role Extension could play in delivering impact analyses for community decision-making. This publication is a product of the national task force's efforts.

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Introduction

This report was commissioned by the Community Resource Development Subcommittee of the Extension Committee on Organization and Policy. The purpose of the report is to provide guidance to Extension specialists and agents faced with a request for an impact analysis from communities experiencing economic development. The report will suggest some basic issues that need to be considered in an impact analysis. It is not a technical report, but is a summary of issues that need to be considered. The report is divided into five sections. They are: impacts on the private sector, impacts on the public sector, input-output and economic base methodologies, nonmarket impacts, and the role of Extension.

The section on private sector impacts addresses questions about predicting changes in production, employment and income resulting from a proposed development. It also raises some important questions concerning gross and net changes in these economic variables and the distribution of the changes. The application of multipliers and the timing of development-related impacts are also discussed.

The discussion of the public sector impacts highlights different methods for estimating changes in public expenditures and public revenues resulting from an economic development event. The second section also emphasizes the need to distinguish between changes directly attributable to a development project and changes that are consequences of ongoing trends. The difference in the perspectives of local officials and citizens is addressed.

The discussion of the economic base and input-output models in the third section reviews the basic data needs of the models and the assumptions that are included in the two models. These models describe the links between a development event and the rest of the community. These links are jobs, income, and output, which are categorized into public and private impacts. Where labor resides and where supplies and raw materials are purchased, as well as the types of businessee already in the community, are important considerations when projecting the types of local impacts that will occur.

The section on nonmarket impacts reviews some of the other important changes that may occur in a community, but that are not easily estimated with economic models. Some of the nonmarket impacts discussed in the fourth section include population changes, changes in the political atmosphere of the community, and employment-related changes. The relative magnitude of a project is a major determinant of the size of the "shock" that the community may experience, and a community will adjust to certain impacts over time.

The final section defines Extension's role in impact analysis. The authors review the differences between facts, values, and beliefs, which are the main components of the community decision-making process. They also identify the points in the decision-making process where Extension education programs are most appropriate and outline various approaches to deliver impact analysis.

The commentary in these sections, for the most part, presumes an increase in economic activity. However, impact analysis is just as appropriate in a situation of economic decline. The same questions remain important, but the answers may not simply be the opposite of those addressing an increase in economic activity.

Other Issues

Economic development and economic growth are often viewed as synonymous terms. For purposes of this report the more encompassing term, economic development, will be used. Economic development carries a connotation of improved welfare which may mean more jobs and income or a better distribution of jobs and income or even fewer jobs that are perceived to be undesirable. Economic growth generally means that more jobs, income, and output have resulted.

Economic development is usually associated with the arrival of a new business. However, changes in income, employment, output, etc., can result from the expansion of businesses already existing in the community or the improved profitability of these businesses.

Any impact analysis must consider the geographical and political units in which the development will be located. The geographic boundaries might be a watershed or drainage area. The political boundaries could be that of a municipality (city, village) or a school district, for example. The magnitude and the incidence of the impacts from an economic development event will vary according to the units included in the analysis and, in turn, the units selected will depend on the questions asked. Once the units are determined, the group conducting the analysis should confine its efforts to estimating impacts that will occur within those units. This does not mean external changes are to be ignored, rather they should be addressed in a separate analysis.

Time is an important variable in an impact analysis. All of the community changes do not occur on the first day of the economic development event, but often take several years to occur. Furthermore, a community is a dynamic "organism" that responds to the forces an economic development event generates by either absorbing or adjusting to those forces over time.

There is no methodology that can provide precise estimates of future social and economic changes within a community, even if they can be analyzed in an economic model. This suggests that any impact analysis should provide a range of estimated values for the social and economic changes studied. Since an output of impact analysis is information on potential social-economic changes arising from an economic development event, variations in the configuration of the development event can and should be explored. These variations imply the need to explore the sensitivity of impacts to project design and community characteristics. Consequently, the analyst must explicitly state the assumptions inherent in the model used to assess the impacts of the economic development event.

Chronology of Economic Development Events

Figure 1 displays one possible chronology of events that may occur when a community experiences economic development. The development event can be the arrival of or start-up of a new firm, the expansion of an existing firm, or other economic activity. Project configuration refers to the type (manufacturing, service, etc.), size, production processes, etc. of the new economic activity. These decisions are usually made by the firm, although public input may exert some influence. After the project configuration is largely established, a site or alternate sites are selected and the community or communities are contacted. Firm representatives may make on-site visits and may contact community officials early in the decision-making process. However, a firm may not contact a community until after it has made its decision. If the community contact occurs before the final decision is made, community leaders and firm representatives may negotiate labor availability, needed public services, etc. The negotiations can range from informal checks to lengthy discussions about project needs and community services. After the site is determined, physical preparations at the site begin, and development impacts begin to be felt in the community's private and public sectors.

In those cases where the community becomes aware of a possible development prior to its implementation, impact analyses can be completed before any physical steps are taken. The analyses can vary in detail and sophistication from, for example, a simple estimate of the total number of new jobs anticipated to a detailed estimate of new jobs categorized according to skill and occupational levels. At this early stage, impact analyses can affect project configuration, e.g., a shortage of housing may convince a firm to slow project implementation, persuade a firm to select a different site, or identify issues to be included in the negotiations between firm and community. The impact analysis and negotiations produce information that is mutually beneficial to the firm and community, allowing each to diagnose the implications of potential changes in the project configuration.

Extension education can occur at several junctures in the decision-making process. The educational topic is likely to be how to use impact analysis to change present configuration, if necessary, or how to use project configuration information to anticipate community changes. An elemental portion of the Extension education program will be building local capacity to use the impact analysis.

When using impact analyses, constraints must be recognized. The major output of impact analysis is information on possible future changes. However, this estimate of future change is sensitive to the adequacy of data used, changes in the configuration of the development project, and the analytical accuracy of the model used.

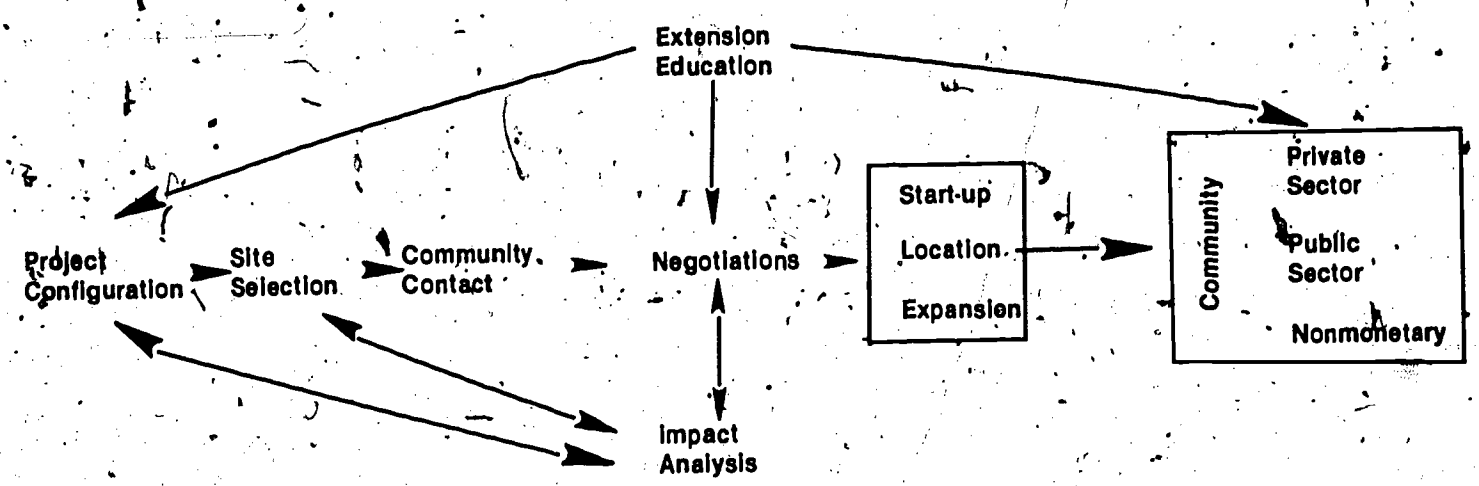
Summary

To summarize this introduction to the discussions that follow, the important educational issue is that the realities of community economic development can be quite different from those expected, and this issue is a legitimate topic for educational efforts.

Extension's primary role in impact analysis is to help communities or people understand what impact analysis is, how to do or evaluate impact analyses, and how to use the impact analysis in their own community development efforts. An especially important educational role is to heighten awareness of the incidence of benefits and costs within a community and among communities.

Each community and economic development event is unique. Thus, there is no model that can be applied to each and every impact situation. Each situation requires that the model

Figure 1. Chronology of Economic Development Showing Where Extension Education and Impact Analysis Are Appropriate.



be adjusted for such things as state laws governing municipal and school revenue and expenditure systems, presence of consumer businesses, etc. Furthermore, the relative magnitude of the project in the community affects the types of changes that may occur. While there is no single model, there are several models that offer partial answers to specific community situations. Some of these models provide better estimates of private sector changes, while others provide better estimates of public sector changes. Some models are more flexible—giving the community a wider latitude of options in testing changes—and others require less data. The bibliographies at the end of some of the sections identify additional resources for the interested reader.

CONSIDERING ECONOMIC CHANGE IN THE COMMUNITY'S PRIVATE SECTOR

by John Gordon

Introduction

Economic growth and development affect both the private and public sectors of the local economy. These impacts are manifested as changes in employment, income, sales, investment, and governmental receipts and expenditures. To assess the costs and benefits of economic change, the community must have solid information on the type of impacts, including their distribution, that can accompany a specific type of development.

This section focuses on the consequences of economic growth and development for the community's private sector. Public sector and nonmonetary impacts and specific techniques for estimating private sector impacts are addressed in succeeding sections. This section discusses the sources of growth that may affect the community's private sector, but it concentrates on explaining the several major questions that citizens should address when examining the implications that economic change poses for the private sector.

The discussion that follows pertains not only to community with growing economies, but also to those with relatively stagnant or declining economies. Economic change, whether growth or decline, has implications for the community. With some modifications in interpretation, the following discussion is also relevant to communities experiencing economic decline.

Sources of Community Economic Growth

Often community economic change is related to the expansion of an existing establishment or to the arrival of a new industrial plant or business. Growth of this type is commonly referred to as industrial development, although the terminology is not meant to exclude nonmanufacturing businesses.

Industrial development, however, is not the only means by which a community can achieve economic growth. Growth may also occur when an industrial plant or a business locates in another community and local residents commute to work. Or, a new residential development for retired persons may spur population and income growth. The implications of these latter types of economic growth are different from these accompanying industrialization.

Government programs are another important source of economic change in communities. These programs may be initiated and administered at the national, state, or local level and may include, for example, poverty programs, Social Security and other retirement programs, highway construction, and improvements of community services and facilities. All of these programs affect income flow and, therefore, affect the local economy.

Private Sector Impact Considerations

The remainder of this section discusses several important questions communities need to consider when studying how economic change will affect the local private sector. By answering these key questions a community can determine whether a specific project will complement its overall goals for economic development. Without question, the desirability of a given development proposal will vary from community to community, as will economic goals. The discussion following each question assumes that the source of economic change is a new business or industry locating in the community. However, with some changes in interpretation, the same questions are relevant to other types or sources of economic change.

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1. How many workers will be hired by the new business activity?

What is the dollar value of the anticipated payroll?

What will be the value of production or sales from the new business activity?

The creation of new jobs is the most frequently enunciated goal of community economic development programs, perhaps because additional employment is one of the most easily observed effects. Increasing personal income is another primary goal, as income levels are a general indication of the welfare of people. The contribution of a new industry to total value of sales in a community is also a useful impact measure.

The importance of these changes is widely recognized. Generally, when a new business moves into town the local news media carry stories with information about the number of new workers to be hired, the payroll of the workers, and the estimated value of annual sales from production at the new plant. But these data are just the beginning of the information needed to adequately evaluate the impacts on the private sector.

2. What is the "multiplier" effect and how can it be appraised in a community?

Multiplier effect refers to the total or overall impact stimulated by the initial changes in economic activity. The total impact of business "X" can be traced through the chain of events that results when the sales of business X increase causing it to expand production. The increase in sales represents new economic activity as the additional dollars generated are spent (direct effect) to employ additional labor and to produce goods and services necessary to produce the additional output.

This additional spending triggers a chain reaction (indirect effect). The business establishments selling goods and services to business X must also increase their production to meet the demand of business X. Likewise, the sales increases of these suppliers generate more business for the firms that supply them. At the same time, each dollar in additional employee income earned in the direct and indirect activities, when spent in the community, triggers an additional chain of spending of its own (induced effects).

The respending process is not infinite. At each round of the process some dollars leak out of the community's economy in the form of savings, taxes to the federal and state governments, corporate profits which accrue to stockholders outside the region, and perhaps most importantly, as payment for goods and services that are imported from outside the community.

So, the multiplier for a particular industry is a measure of the total economic activity associated with the initial increase in sales. Although multiplier effects can be important, they are often overemphasized. Note that the multiplier effect is reduced when business or household purchases are made outside the community and when the local economy's existing capacity is sufficient to meet the increased demand without creating new jobs. Generally, the more the industry is linked to other local businesses, the larger and more diversified the community's economy, and the more isolated the community's economy is from competing economic centers, the larger the local multiplier effect.

Impact analyses utilize income, employment, and sales (output) multipliers depending upon the economic dimensions relevant to the particular study. These various multipliers are closely related and tend to be influenced by similar factors within the economy. However, it is important to recognize that they are different concepts and are not likely to be of the same magnitude. Sales and employment multipliers are generally expressed as total effect per dollar of final sales, whereas income multipliers are generally expressed as total income per dollar of household income generated in the expanding industry.

3. When will the new workers be hired?

When will the payroll be generated?

And when will the new purchases and sales be made in the local economy?

It is important to know when the new economic activity will begin and how employment, payroll, and sales might change in the future. A permanent labor force with growth potential obviously has different implications for the community than temporary employment or employment that is expected to decline over the long term.

Multiplier effects do not occur instaneously. New jobs and associated population growth may have implications for school enrollment, housing needs, and retail sales, but business managers and community leaders must plan for these developments well in advance. For example, knowing when the new business will purchase supplies, as well as the total dollar amount of such purchases, is essential to the purchasing and inventory plans of the local businesses affected.

4. Is the new economic activity associated with construction or operation of the business?

Employment, income, and sales generated by the normal operation of the new business are generally expected to continue indefinitely once begun. However, investment in capital structures, such as buildings, roads, and public facilities, is likely to be a one-time event. In addition, construction employment is temporary and the construction employees are not likely to be part of the permanent local work force. Construction-related impacts should, therefore, be identified separately from the economic activity associated with normal operation of the plant.

5. Will the new economic activity stimulate construction in related businesses, housing, and service and trade sectors of the economy?

The additional business from the new industry may also spur new construction. Businesses supplying the new industry may expand or new workers and their families may require additional housing. Community services, such as schools and existing retail businesses, may not be adequate for a growing population. These impacts are extremely difficult to estimate because investment decisions depend on many variables, including the capacity of existing facilities.

6. Do the changes in employment, income, and sales represent net or gross additions to the community's economic base?

This very important aspect of community economic growth is frequently overlooked. If workers in the new plant were previously employed in the community, and if their old jobs are refilled by local residents, then the total number of workers in the community has in fact increased. But if the old jobs are not refilled or if the residents filling the new jobs previously commuted to work in another city, the implications for the community will be different since the community's total employment has not increased.

A new business often replaces an existing business or economic activity. Perhaps the most obvious example is a new industrial building located on a farm. The foregone agricultural production, employment, and income is a cost that must be considered in order to arrive at the net additions of economic activity to the community.

7. How does the new economic activity complement the local economic situation?

One aspect of this question relates to whether the new production, employment, and income provided by the new business are permanent or seasonal. Seasonal employment can fulfill special needs, e.g., summer work for students, but temporary unemployment may burden public unemployment programs.

Many communities wish to diversify their economic base. Their intent is to form a stable employment base that is not overly responsive to cyclical ups and downs of the national economy nor vulnerable to economic problems that might result if a large percentage of local businesses is dependent upon the economic fortunes of one commodity or economic activity. Too much concentration in one industry can render the community's economy vulnerable to external forces that cause expansion and contraction within the particular sector. Detroit is an example of a community with a large concentration of automobile-related firms. When the automobile industry is expanding the local economy moves ahead vigorously, but during slumps in automobile sales, Detroit has a very serious unemployment problem that spreads to other segments of the city's economy. So, the question of how the new business relates to existing businesses, in terms of purchasing linkages and the nature of product markets served, can be important from the standpoint of broadening and strengthening the local economy.

8. What will be the incidence of the impacts?

More specifically, which people and businesses are likely to benefit, and which people and businesses are likely to bear the costs of the economic development?

Typically, the initial interest in the consequences of economic development focuses on the size of the total impact. Although this interest is justified, it neglects distributional concerns that are very relevant to community economic goals. More specific information on who is likely to benefit and who is likely to bear the costs associated with the new economic activity is also needed. The distributional impacts that are most relevant will vary from community to community and from one economic development possibility to another. But, in general, it is useful to identify the characteristics of the people who are likely to benefit from the activity, including age groups, income classes, racial groups, and the persons with the desired work skills. For example, if one of the community's objectives is to increase employment among existing residents, it must identify the particular skills among the existing labor force and seek a new or expanding firm requiring those skills. Similarly, if the community wishes to increase employment for a certain segment of its population, such as women or youth, then care must be taken to match the new business with those groups of workers.

The number of employees that will be hired locally versus the number that will move into the community is a related, and important, aspect of economic impact assessment. Whether the new workers are residents of the community or live outside and commute to work is also important. The location of the employees' homes determines, to some extent, where family income is spent, where property taxes are paid, and where local government services are demanded. Wages paid to incommuters obviously leave the community more rapidly than wages paid to residents.

increasing the number of jobs generally leads to increased total personal income in the community. But, just because a new business will employ a certain number of new workers, it does not necessarily follow that per-capita income will increase. A business that pays very low wages and attracts workers to a community may actually lower per-capita income in the community. On the other hand, relatively low-paying jobs may be beneficial if they are filled by residents who would otherwise be unemployed and/or if they provide employment for secondary income earners in a family.

Information on the distribution of the new business' purchases indicates what types of existing businesses may have an opportunity to sell services and supplies to the new business. Local purchases are desirable from the community's standpoint because, in general, the greater the extent of local purchases the greater the return to the community. Also, if the volume of additional local purchases is large enough, existing businesses may expand or new local establishments may appear.

Some existing local businesses may view a new firm as unwanted competition. If a new business pays wages that exceed the local average, it may lure employees away from existing businesses. The existing businesses may not be able to hire new workers with comparable skills at the original wage rate. While workers benefit from this competition, existing businesses are forced to bear increased operating costs. In the long run, property values and associated taxes may also increase. Also, existing businesses may face increased competition if new trade and service businesses are established. As a community's population grows, the location of shopping areas may change. New shopping areas may be more convenient for consumers, causing sales in older shopping areas to decline.

Concluding Observations

Some impacts of economic development are more difficult to pinpoint than others. Yet a community must make some assumptions about the importance and acceptability of the impacts addressed in these questions if it is to plan for its economic future. Failure to do so implies that the impacts are either considered desirable or unimportant.

It is also important to underscore the fact that economic impacts cannot, at first view, be considered good or bad. The desirability or acceptability of the impacts can only be evaluated in view of community economic development goals. The particular set of economic development goals desired by a community are unique to the values and needs of its citizens. Therefore, desirability of a particular type of economic development will vary from community to community.

Summary

This section identified many of the relevant questions that need to be considered in an assessment of the impacts of economic growth or decline on a community's private sector. When a community addresses these questions it can evaluate the impact of economic development within the context of its overall goals.

Jobs and income are the traditional measures of economic development although changes may also be experienced in such other economic dimensions as value of output, retail sales and investment. The initial stimulus for economic change may come from new or expanding industry, natural resource development, residential growth, retirement-oriented growth, tourism-based development, or government programs. But regardless of the source of economic change, the impacts need to be carefully identified and considered.

The discussion accompanying each of the eight questions posed in this section assumes that the source of economic change in the community is a new business, although both economic growth or decline can be considered in this framework.

The first question addressed the size of the economic activity directly associated with the new business. Size can be measured in terms of economic characteristics, such as employment, payroll, and value of production. Careful identification of these direct impacts is an important first step of impact assessment.

But employment, payroll, and expenditures of the new business create additional economic activity for related businesses. A realistic appraisal of multiplier, or total, effects stimulated by the new business is also important, but they must not be overemphasized. Multiplier effects are reduced when purchases are made outside of the local economy and when the community's existing capacity is sufficient to accommodate the needs of the new business and its employees.

Many indirect and induced effects lag the activities of a new business. Information on the timing or scheduling of employment, payroll, and sales at the new business is important in anticipating multiplier effects. In addition, knowing the projected growth of jobs and payroll will facilitate the planning by local businesses and the community.

The community must also distinguish between impacts associated with construction and those resulting from the operation of the business. Although frequently impressive in size, construction impacts are generally temporary, whereas impacts from the operation of the business are usually of a permanent, recurring nature.

Another consideration relates to construction and expansion of establishments serving the new business. Further population increases may require new housing and additional service and retail businesses.

The important distinction between gross and net additions to the local economy is frequently overlooked. If some jobs at the new business are filled with workers who were previously employed in the local economy and their previous jobs are not refilled, then the net addition of jobs to the community is less than the total number of employees at the new business.

A community must also examine how the new business complements the local economy. For example, will the new business be a source of seasonal or permanent employment? Or,

will it make the local economy more or less vulnerable to business cycle?

Finally, after establishing the size and considering certain characteristics of the total impact, the distribution of impacts is a significant concern. The community must know who will benefit and who will pay the costs associated with the new business. Then it must determine whether or not the benefits exceed the costs. Further, the community must determine whether the beneficiaries are members of target groups identified as needing and deserving assistance. Distributional consequences are crucial to understanding pro and con positions regarding the merits of the economic development and should not be overlooked.

Information relevant to these considerations is important although not always easy to obtain. Judgment on the desirability of the impacts will vary from community to community and from one type of economic development to another.

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11

ESTIMATING THE IMPACTS OF GROWTH ON LOCAL GOVERNMENTS

*by George W. Morse and George McDowell**

Introduction

A major function of local government is the organization and delivery of the agreed-upon level and mix of services to the people of a community. These publicly provided services, such as schools, water, roads, and parks, are strongly related to the quality of life within a community. The quality and scope of local services is critical to the operation of many businesses, affects households, and may entice visitors to a community.

The services provided by local government depend heavily upon money generated by local taxes and user fees. Nationally, 60.4 percent of local government revenues are generated in this way, although the range is from 37.8 percent to 79.4 percent when state averages are compared. Economic growth, or decline, and population gains, or losses, can significantly affect the demand for services and the amount of local-government revenues available to provide a satisfactory level and mix of services.

Fiscal impact analysis, the subject of this section, can help a community evaluate how local development and how alternative policies, including those designed to control growth and those intended to induce growth, will affect the community treasury.

The products of fiscal impact analysis are estimates of the fiscal consequences of alternative community economic development policies. When evaluating the implications of various policies, local leaders and planners should use these estimates as information for their decision-making. The final decision will, ultimately, be a value judgment, or a subjective opinion on the desirability of a specific policy, but the soundness of the final decision will depend upon the accuracy of the estimates on which it is based. In short, fiscal impact analysis is a tool that allows leaders and planners to remove some of the uncertainties in predicting the consequences of community policies.

Before discussing the issues that should be addressed in a fiscal impact analysis, it is important to note that all fiscal impact models produce estimates of facts and not truth itself. These estimates frequently depend on unverifiable assumptions. When the value of a critical variable is uncertain, leaders and planners should make several estimates, using the best information available, and then present their results in the form of a range, rather than a single estimate. Additional advantages of producing multiple estimates is discussed later under the discussion of sensitivity analysis.

Local Official's Perspective

Inevitably, discussion of economic change within a community centers on taxes. In this time of taxpayer revolts, local officials are very hesitant to raise tax rates, but are eager for opportunities, such as those that may accompany economic development, to lower tax rates. Changes in tax rates depend on whether additional revenues from development are greater or less than the additional costs of serving the development. Alternatively, the level of public services could be increased or decreased with tax rates remaining constant. Answering the "taxes" question for local officials is the essence of the fiscal impact analysis.

When determining the additional community costs that would result from serving a new development while maintaining pre-existing service levels, officials must address a number of important questions: Are totally new services necessary to accommodate (or attract) the development? Will the development require major changes in the organization, production, and delivery of existing services? If changes are deemed necessary, are all changes attributable to this particular development or would some have been required as a matter of course?

Beyond questions related to the quantity of services and the methods of their delivery; officials must evaluate present and potential revenues. Where more than one governmental unit is involved, such as a township, a school district, and a county, the additional revenues to all from the development must be considered. Changes in state (and federal) aid may result from development. In many cases, aids are allocated on the basis of total property valuation, population, miles of [illegible], school enrollment, or combinations of these and other variables. An expansion of the local tax base may increase locally generated revenues, but in some states reductions in state aid revenues may offset these gains.

If the estimated costs associated with development exceed anticipated revenue increases, local officials have the options of increasing tax rates or reducing the quantity of services provided. If the opposite were true, officials could reduce tax rates or increase services. Although important, treasury impacts are only one part of the development equation. It does not necessarily follow that when costs are estimated to exceed revenues the appropriate community response is to oppose the development. Nor does a positive fiscal impact mean that the project should be supported. Non-treasury impacts are always part of local development policy decisions. Depending on the nature of the development, officials may consider, among other factors, environmental impacts and the effect of a development on income. For example, a community may support a housing project for the elderly even though it will incur added costs without increasing revenues. Further, policymakers must evaluate the distribution of impacts. If a development adversely affects certain segments of the community but benefits others, it may be possible to compensate the groups that will bear the costs of development.

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Citizen's Perspective

Local officials and individual citizens do not always see eye to eye on new developments, as anyone who has been involved in the siting of landfills within a community will attest. Citizens' divergent perspectives perhaps clarify best the role and limits of the overall impact analysis.

Individual citizens will evaluate a development according to whether they perceive themselves as being benefited, harmed, or unaffected. Their assessments are derived from tax reductions or increases, from personal income gains or losses, from a sense that their friends or neighbors are helped or hindered, or from a belief that their total community is better or worse off. Consequently, changes in the mix, level, or quality of community-provided services are likely to evoke support or opposition from groups of citizens. The more accurately fiscal impact analyses can predict these changes, the better citizens will be able to evaluate the merits and costs of a project. Ultimately, those projects that evoke the most powerful support or the least opposition are likely to be approved. Support or opposition, however, is not likely to be uniformly distributed, nor is the intensity of feelings with which people view the development.

Obviously, approval or disapproval of a project can be a divisive issue, particularly when a change in tax rates may result or when impacts are anticipated to vary. Therefore, additional costs and revenues for local governments must be estimated carefully. The next two sections discuss alternative methods of making these estimates and their respective strengths and weaknesses.

Estimating Additional Costs for Local Governments

A new development will almost always result in additional community-borne costs. Demand for services will increase if more people come to the community to live, work or play, or if the new plant or facility requires community-provided services in order to function efficiently. Sometimes both influences are at work. Frequently, the availability of a community service is a prerequisite for a business to operate efficiently. For example, some businesses will only locate where they have continuous access to large amounts of municipal water.

Alternative Estimation Methods

A variety of techniques are available for estimating the additional public expenditures that result from a new development. The five most frequently used estimating techniques are described below. To highlight the advantages and disadvantages of these techniques, the cost of providing police protection to an area proposed for annexation to Athens, a small city in southeastern Ohio, is estimated with each technique. The area proposed for annexation was a 194-acre strip of land about one mile long and one-fifth of a mile wide.[1]

Expenditures Per Capita

The first method assumes that the average cost of providing police protection is constant, that is the average expenditure per person remains the same, although total cost increases with each new resident. According to this method, since the expenditure per person in Athens for the police department was $22, the addition of 200 new residents to the city would increase police protection costs by $4,400 ($22 x 200).

Since, for the most part, public service costs are not measured on the basis of resident population, an estimate of costs on a per-capita basis can be misleading. For example, costs of providing water are expressed in terms of cost per 1,000 gallons; roads are measured in terms of miles of a particular quality; and parks may be measured in terms of acres of parkland. When costs are expressed on a per-capita basis, there is the impression that costs are distributed equally or that each additional person will increase costs by that amount.

There are several reasons why costs may not increase by an average increment for each new person served. First, all individuals do not use public services in the same ways. Single adults or couples without children do not generate the same school costs as do families with school-age children. The costs of extending a sewerage system to new apartments is lower on a per-capita basis than it is for extending the same services to a development of single-family houses. Second, for some public services there will be either economies or diseconomies of scale or size. Thus, projecting the current costs to the future world overstate or understate the change. Third, there is the matter of confusing the concept of average cost with marginal cost, the correct measure for evaluating a project. Per capita costs are estimates of average costs, but marginal costs can be higher, lower, or occasionally equal to average costs. Finally, some publicly provided services may result in very low or no additional costs when the number of users increase. This is the "public goods" dimension of these services. For instance, community costs for snow plowing and roads would not increase if a development did not require new roads to be built.

While the per-capita-costs approach is simple and fast, it does not consider unique circumstances in the case being studied, such as excess capacity, changes in demand factors, or increasing costs.

Department Official Estimates

The head of the service department that would devote staff and equipment to a new development can estimate the additional personnel and equipment his/her department would require. While service department personnel are familiar with the local situation, their cost estimates may be biased by budgetary concerns. Further, these estimates rarely can be compared with standard criteria. To evaluate these estimates one needs to ask many questions: Do the estimates insure that the quality and quantity of service provided to current residents will be maintained? Do the estimates assume that existing personnel will be distributed over a larger population, reducing the quality and quantity of services? Are there incentives for the department heads to overestimate or underestimate growth-induced expenditures?

[1] A complete description of this case study is available in Morse, 1978-a and Morse, 1978-b.

In the Athens annexation study, this approach initially resulted in an estimate of between $60,000 and $76,000. However, remedies to correct existing manpower deficiencies were included in the estimate. The police chief argued that his department could not handle additional responsibilities until his department was adequately staffed to cover its current area. The police chief estimated that to bring the police department up to par would require four to five additional officers, regardless of whether or not Athens annexed the land. As this example illustrates, the rationale and estimation procedure for department heads needs to be explicit and well understood. Frequently, as in the Athens study, department heads will be very helpful in providing information for the next procedure to be explained.

Service Budget

The service budget approach is also called the economic engineering or partial-budgeting approach. It begins with a detailed description of the type and amount of equipment and manpower needed to provide the service. Then the cost of labor and materials is added. This process involves explicit assumptions about the physical, engineering, and personnel components of the service.

In the Athens annexation issue, this approach yielded an estimate of $7,277 per year. Only officer patrol time and vehicle operational costs were included, since existing back-up personnel and vehicles were believed adequate for serving a larger area. The estimate was based on the following information from the police department.

1. Three 20-minute patrols in each of three shifts in the annexed area, totaling three hours per day.
2. The average annual cost per officer for salary, fringe benefits, and all other nontransportation expenses is $15,200.
3. Twenty-seven miles (three miles per patrol at nine patrols per day) would be traveled daily at an operational cost of 16 cents per mile.

In summary, the total additional annual costs would be:

Personnel costs:	
(3 hrs/day ÷ 8 hrs/shift) × $15,200	$5,700
Vehicle operation costs:	
27 miles/day × $0.16/mile × 365 days	$1,577
Total additional costs:	$7,277

This method most accurately reflects the additional costs related to the new growth, and it clearly shows the assumptions made in these estimates. Considerable time and money, however, are spent in data collection. In many situations the date needs are much greater than the example used here.

Standard Manpower Requirements

Estimates of manpower requirements are based on Census of Government data that show the number of service personnel per thousand of population.[2] This standard is multiplied by the number of new residents that are anticipated. Local information on the cost per employee then yields the estimate of additional costs.

For example, the standard for police in communities of 10,000 to 25,000 is 1.72 officers per 1,000 residents. Thus, in the case of Athens, annexation would increase costs by $5,229 (1.72 officers/1,000 residents × 200 residents × $15,200 per officer).

This approach provides a measure of excess capacity. If Athens, for example, had 50 officers for its population of 25,000, or two per thousand, its police force would have had an excess of seven officers, and no additional manpower expenditures would be required. However, Athens' force of 38 officers, counting both city police and university security, was five officers short of the standard.

While simple and fast, this approach does not address unique circumstances or community preferences.

Regression Analysis

In regression analysis, changes in expenditures per person are related to characteristics of the community. Regression analysis shows how the expenditures per person are associated with community population, rates of growth, income levels, age distributions, crime rates, and other socioeconomic characteristics.

While this approach allows objective consideration of several variables, there are few completed studies which provide the needed coefficients.[3] Furthermore, this approach assumes the community's existing services are at capacity, and cannot handle situations with significant excess or deficient capacity.

In the Athens annexation study, regression analysis was done on a random sample of 25 Ohio cities with populations under 50,000. Independent variables included population, population growth rates, and income levels. Only population was significantly related to expenditures per person. The coefficient was $30.77 with a standard error of 5.32. This means we can be 95 percent confident that the true value is between $20.12 and $41.40. This yields an expected increase of $6,154 (200 × $30.77) with only a 5 percent chance of an increase less than $4,024 or greater than $8,280.

Which Method Should Be Used?

As the examples for the annexation issue have shown, the estimates vary widely, ranging from $4,400 to $76,000 per year. With this large range, some planners may be tempted to avoid any quantitative estimates. But local decision-makers cannot determine whether a project is worth supporting without cost estimates and will need to make implicit cost estimates if these procedures are not used. Consequently, quantitative estimates cannot be avoided. Several conceptual considerations may help in choosing the most appropriate technique.

[2] Burchell and Listoken provide these estimates using 1972 data.

[3] Coefficients are available in Burchell and Listokin for broad geographic regions in the U.S.

Marginal Versus Average Cost Estimates

Economic theory argues that the relevant concept for decision-making is marginal cost. *Thus, regardless of the technique that is chosen, the estimate attempts to measure marginal costs.* The choice of an estimating technique is based largely on how good an estimate of the marginal cost of the development can be generated.

The marginal cost of providing a higher level of community service is the difference between the total cost at the new level of service and the total cost at the old level of service. Average costs at either the old or the new level of service are figured by dividing the total cost at that level by the units of service provided. Table 1 demonstrates the difference in average and marginal costs.

The total cost of providing police protection in the small town of 5,000 people is $165,000, but if the population grows to 10,000 residents the total cost increases to $300,000. With 5,000 people the average cost per resident is $33 ($165,000 ÷ 5,000); with 10,000 people the average cost falls to $30 ($300,000 ÷ 10,000). The marginal cost per person for providing police protection for 5,000 new residents, however, is only $27. To determine marginal costs per person, the difference in total costs at the two levels of service is divided by the new population. In our example, the marginal cost —the difference between the total for the new and old service levels—is $135,000 ($300,00 – $165,000). The marginal cost is then divided by the total number of new residents, yielding a marginal cost per person of $27 ($135,000 ÷ 5,000).

The extent to which average and marginal costs differ may vary with the size of community. For example, in a community with 5,000 residents, if the average costs ($33) were used to estimate the change in police protection costs for 200 new residents, the additional costs will be over estimated by $1,200 [($33 – $27) × 200] since the true marginal costs are lower ($27).

When average costs and marginal costs are equal, e.g., 20,000 to 25,000 population in Table 1, there is no overestimate or underestimate generated by the use of average costs. However, if the additional 200 residents in this example increased the population of the town from 25,000 to 25,200, then average costs would substantially underestimate the annual change in costs [($50 – $26) × 200 = $4,800].

Since the approaches using average costs or per capita costs are generally simpler than the other approaches, cost conscious planners may prefer these techniques over the others, and indeed, the estimates generated may be acceptable. The decision as to what is "acceptable," however, will depend on the consequences of making an error.

In general, officials prefer to err on the side of caution, that is, they would opt for an overestimate of the marginal costs rather than an underestimate. In most cases in which a community's existing service capacity is sufficient to accommodate a new development, the average cost method will yield an estimate that is higher than the marginal cost of servicing the development. In instances where personnel are the major component of providing a service, per capita cost estimates may be a close approximation of the marginal costs. Conversely, average cost estimates will be lower than the marginal costs when the existing physical plant of community services, such as a water treatment facility, is inadequate to meet the needs of a new development. If facility expansion and, consequently, new capital spending is required, estimates based on expenditures per capita or standard manpower requirements should be avoided or used only if the community clearly recognizes that marginal costs will exceed the estimates generated with these methods.

Constant vs. Changed Quality and/or Mix of Services

Where there is a change in the quality and/or mix of services necessitated by the development, data other than that based on local experience will be required to estimate the expenditures of the new service. If this is the situation, the service budget and regression analysis are likely to be the appropriate techniques. Both of these approaches allow the explicit consideration of unique socio-economic forces.

With-and-Without Comparisons

When estimating the community-borne costs of development, planners and officials must distinguish between the impacts attributable to the development and those that are not. This sorting process recognizes that changes already in motion may increase public expenditures with or without development. It is essential to separate the effects of a development from other growth that may be occurring in the community. It should be pointed out that one of the primary effects of a new development and new people arriving in the community is a changed demand or preference for services from the community.

Capital Expenditures

Service budget estimates yield the basic data for projecting capital expenditures. City and county engineers should play a major role in developing these estimates.

Although essential to the community's evaluation, estimates of capital costs can be fraught with uncertainty, particularly when it comes to deciding

Table 1. Marginal vs. Average Costs: Police Protection in a Hypothetical Town

Community Population	Total Costs	Average Costs Per Person	Marginal Costs	
			Total	Per Person
5,000	$165,000	$33	$135,000	$27
10,000	300,000	30	120,000	24
15,000	420,000	28	100,000	20
20,000	520,000	26	130,000	26
25,000	650,000	26	250,000	50
30,000	900,000	30		

how to distribute the costs. If additional water treatment capacity is needed, it may be less expensive per unit of water to build a plant that can handle more than the new project would require. Also, water treatment plants, as well as many other capital items, only come in distinct sizes. This "lumpiness" in capital goods raises some difficult quesions. If the capacity of a community-financed facility built to accommodate a new development exceeds the development's demand, how much of the capital costs should be charged to this particular project? What if the additional growth anticipated never materializes? In most cases, it seems fair to divide the costs between the specific project and other future growth. But there are no objective means for doing this, since the extent of future development is unknown. Alternative assumptions for dividing costs between this project and future growth should be considered.

For some public services, federal or state aid reduces local costs. In some cases, property owners who benefit pay all or part of the costs through special assessments, so that no additional costs accrue to local governments. If local governments must borrow to pay their share of the project, then the capital expenditures should be amortized to a yearly obligation. For example, a $600,000 capital expenditure with an expected life of 20 years at 8 percent interest results in an annual capital cost of $60,264.[4]

Conclusions on Which Cost Technique is Best

Any effort to estimate the increased costs associated with an economic development event in a community requires a judgment about the best way to make the estimates. That judgment must also include decisions about special circumstances that are unique to a community and not recognized in fiscal impact models.

If resources and time permit, the service budget method should be used. It provides the most detailed and accurate method of estimating the marginal costs of providing additional services. The suggestions of department officials, especially when accompanied by a detailed rationale, should supplement other approaches. Regression analysis should be used when the socio-economic forces affecting the demand for services are changing. Expenditures per capita and standard manpower requirements should only be used when there is excess capacity in the physical plant of the service.

In the final analysis all of the methods produce "estimates" of expected changes. While each approach provides a starting place for community debate on the issues, careful attention should be given to the marginal cost concept, changing levels of service, with-without comparisons, and capital expenditures.

Local Government's Additional Revenue from Growth

Types of Revenue Changes

Growth from industrial, commercial, or residential developments usually affects four types of local government revenues: (1) local taxes, primarily property taxes but also local income and sales taxes, where relevant; (2) state and federal aid; (3) user fees and hookup charges for public utilities; and (4) mitigation fees, where relevant.

In 1977, property taxes provided 81 percent of the revenue raised by local governments in the United States (Stat. Abstract, U.S., 1979). The amount of property taxes that a property owner pays depends on both the effective local tax rates and the amount of property owned.[5] Tax rates depend on the level of local government budgets and the total wealth within the community. Thus, individual tax burdens should change inversely with the change in the total tax base if expenditures do not change.

In some states, state aid formulas for schools and other local governmental units may offset the changes in tax rates and services just outlined. California, Colorado, Illinois, Kansas, Maine, Michigan, Minnesota, Montana, Ohio, Wisconsin, and others have school state aid programs related to the local tax base per student. Rich districts receive less aid than poor districts. As the property tax base increases, state aid per pupil declines. Consequently, growth may produce additional property tax revenue for schools, but reductions in state aid may partially or totally offset this gain.

Local governments generally have hookup fees for connecting new construction to city or county water and sewer systems. In many areas, this charge only covers the cost of inspecting and installing these services, but some rapidly growing areas have levied charges based on the cost of developing such services. These mitigation fees are added to the traditional hookup fees for utilities and are used to finance the development of water and sewer systems, parks, and recreation facilities, as well as those facilities directly serving the new development alone.

Issues in Estimating Revenues

Generally, it is easier to estimate new revenues from growth than it is to estimate additional expenditures. The key assumptions for the analysis of revenue changes are: (1) the location of the new workers' residences; (2) the income level and geographic spending patterns of new residents; (3) the multiplier effects of the development; and (4) lags in revenue collection. In addition, the implications of tax incentives to attract the development, and of freezes on property tax rates must be examined in those communities where such policies have been established.

If a new industry locates in the community, where will the workers live? How many workers will be new residents? How many new students will enroll in the schools? Obviously, the new revenues from property taxes, local income taxes, and local sales taxes will probably depend on the location of the workers, although not in all cases. (For example, Ohio municipalities with income taxes generally collect the income tax revenue regardless of the residential location of the workforce.) Likewise, property taxes

[4] The procedure for calculating the annual capital cost is the same as for determining the annual payment on a home mortgage.

[5] The effective tax rate is the nominal rate times the ratio of assessed property values to the full market value.

from the new plant are not changed by the residential location of the worker.[6]

How much new income is generated by the growth, and how much of this will be spent locally? New spending patterns and multiplier effects may evolve, influencing both local sales tax revenues and income tax revenues. Some developments may have multiplier effects that result in more growth than that represented by the new development alone. Multipliers must be estimated for each development and community being considered, because they vary with the size and type of community, type of development, and the stage of the project. If this information is not available, remember that multipliers are seldom over 2 for small communities (see sections on private sector impact and input-output and export-base models).

Property taxes are usually not collected until after project construction is completed. On the other hand, the community may need to hire more teachers, police, and other workers during the construction phase of large projects. Thus, new public expenditures may be required several years before the new tax revenues start to come in from the project.

Tax abatements are popular means of attracting new industry. The effect on local government revenues depends on the specific type of tax abatement and the type of firm. For example, in Ohio, tax abatement is provided for new buildings but not for equipment and inventories. Local income and sales taxes are also not abated.

Twenty-five states have limited growth in property tax revenues from existing properties.[7] This means that the property tax benefits from new developments is limited.

Sensitivity Analysis

The "actual" or "true" fiscal impact can seldom, if ever, be determined. The accuracy of estimates depends both on the methods and assumptions used. Even for a given problem and estimation procedure, the assumptions used will influence the results. When the value of a critical variable is uncertain, several estimates should be used to see how the results change. This is called sensitivity analysis.

For example, the number of new children in the district will dictate changes in local school expenditures and state aid. Two pieces of information needed for either expenditure estimates or state aid estimates are: (1) the number of in-migrant employees and (2) the number of children per in-migrant employee. It is not possible to predict either of these very accurately, but informed guesses are possible for both. The management of new firms will have some feel for the availability of local labor versus in-migrants. It may be assumed that in-migrants have the same number of children as current residents of the same age. But any set of assumptions may overestimate or underestimate the actual change.

Sensitivity analysis is illustrated in Table 2 for estimates of additional school expenditures associated with a new plant employing 200 persons. If 20 percent of the new workers are in-migrants and if there are 0.66 students per worker (the national average in 1977), then the additional expenditures are $39,600. But the results range from just below $15,000 to nearly $74,000, depending on the assumptions used. If there is uncertainty about the correct values for these variables, the impact analysis should present the range of results rather than a single estimate.

Fiscal impact studies are frequently sponsored by groups with vested interests. Thomas Muller argues that: "Wittingly or unwittingly, the self interest of the sponsor may influence initial assumptions and the selection of a methodology which can influence the findings." The use of sensitivity analysis helps other groups and leaders to evaluate the conclusions. It shows which variables are critical, and which can be ignored. If considerable uncertainty exists about a key variable, sensitivity analysis can help the local decision-makers decide whether further study is justified.

If estimates range from positive to negative, depending on the assumptions used, a community can conclude it is not possible to predict the results. If the economic and fiscal impacts are ambiguous, decision-makers may decide to concentrate on environmental or social criteria. Even if the economic and fiscal impacts cannot be predicted with any accuracy, that knowledge is of some value to the community; for as Artemus Ward once said, "It ain't so much what you don't know that gets you in trouble, it's what you know that ain't so."

Have the "Right" Questions Been Asked?

The first step in measuring the benefits and costs of growth to local government is asking the "right" questions. This is generally the most difficult step in solving local problems. Some of the usual questions are listed below, but only after careful consideration of your local situation and goals can you really ask the "right" questions. Although outside consultants may be needed to develop estimates, local planners, Extension agents, and citizens need to be sure that the right questions are being addressed.

This section described alternative means of estimating the fiscal impacts of growth. Each of the issues raised in the following questions were discussed earlier, and are listed here as a review.

Table 2. Additional School Expenditures Under Alternative Assumptions.*

	School Children per Employee		
In-Migrant Employees	.49	.66	.82
10 percent	$14,700	$19,800	$24,600
20	29,400	39,600	49,200
30	44,100	59,400	73,800

*This example uses the expenditure per student method for a firm employing 200 workers and a school district spending $1,500 per student.

[6] The location of the workers' residences can also affect local government expenditures.

[7] Pascal (p. 65) reports 24 states, but omitted Ohio.

Questions for Estimating Fiscal Impacts of Residential, Commercial, or Industrial Growth

1. Within what governmental jurisdictions will new families live?
2. How many in-migrant families are expected, and what is their anticipated income level?
3. How many school-age children are expected?
4. Do the public services and schools have excess capacity, or would expansions be required to maintain the quality of service at predevelopment levels?
5. Are there migration fees to cover additional public service costs?
6. Will state and federal aid increase as population growth?
7. When will the project be completed?
8. Does the expenditure estimation procedure used include only the additional costs associated with the new growth?
9. Will new revenues be divided among more than one governmental unit, such as city, county, and school district? If so, how much additional revenue will each receive?
10. When will the public expenditures for the project begin and when will the community begin receiving project-generated revenues? How will these change over time?
11. Will projected demands for services require a change in tax rates or a change in the level of service?
12. Who benefits and who loses from the development?
13. Will tax abatements or other publicly supported inducements be used to encourage this growth?
14. Is the project capital- or labor-intensive?
15. What is the probability that the firm will remain in the area and operate successfully over a five, 10, or 20 year period?
16. What are the income and employment multiplier effects of the new industry?
17. How will this development and associated population growth affect state aid to education and local property tax revenues in your state?

Summary

Nationally, more than 60 percent of local government revenues are raised locally. Economic growth or decline can have significant impacts on local government finances. This section provides guidance to local leaders and planning professionals on the major issues to be considered in estimating the fiscal impacts of growth.

The advantages and disadvantages of five procedures for estimating expenditures were discussed: (1) expenditures per capita; (2) department official estimates; (3) service budgets; (4) standard manpower requirements; and (5) regression analysis. If time and budgets permit, the second and third methods are recommended. If the physical facilities of a service has excess capacity then the first approach provides conservative or high estimates of marginal costs. If physical facilities must be expanded, estimates based on expenditures per capita or on standard manpower requirements will be lower than marginal costs.

The marginal cost concept should be used to evaluate the validity of the technique used. Likewise, it is essential to make the appropriate with-without comparison. That is, only changes resulting from the new development being studied should be considered rather than changes which would have occurred without the development. If new capital expenditures are required, city or county engineering officials should be able to provide the necessary information.

When estimating the revenues a new development may generate for the community, the following information is needed: (1) the location of the new workers' residences; (2) the income level and geographic spending patterns of new residents; (3) the multiplier effects of a new development; and (4) lags in revenue collection. In addition, communities that use tax incentives to lure development projects or whose revenues are constrained by a freeze on property taxes must examine the implications of these policies for community revenues.

Sensitivity analysis is used to evaluate a range of assumptions for variables that have uncertain values. In many situations it is not possible to predict the future value of a critical variable. Sensitivity analysis shows how the results change if this variable changes in value.

The correct answers to fiscal impact issues can only be obtained if the "right" questions have been asked. While outside consultants and experts may provide valuable contribution in estimating fiscal impacts, local leaders and planners must be sure the right questions are addressed. A review list of these questions is provided.

References for Further Study

The publications listed below can be used to help communities evaluate the fiscal impacts of economic development. Additional information may be available from your county Extension office and from state Extension specialists who are working in this subject area.

Barrows, Richard L. and George W. Morse, *Community Growth Policy: Economic Impacts of Growth and Local Policy Choices*, North Central Regional Publication No. 79, Central Public Policy Education Committee (1979) [$1.25].

Community Growth Policy is aimed at helping citizens understand the economics of growth and the growth policy alternatives in their local community. It is aimed particularly at communities where there is a debate about local growth policies. For communities that have already decided to encourage growth, this report may help them decide what kind of growth best suits their needs.

Burchell, Robert W. and David Listokin, *The Fiscal Impact Handbook: Estimating Local Costs and Revenues of Land Development*, New Brunswick, New Jersey: Center for Urban Policy and Research (1978) [$20.00].

This 480-page volume provides a very detailed discussion of empirical techniques for estimating fiscal impacts. Not all of the approaches suggested have been tested by other economists. This reference is excellent for persons actually computing the changes in local government revenues and expenditures.

Gordon, John and Glen Nelson, *As Your Community Grows. . . . Some Economic Considerations*, Cooperative Extension Service Bulletin EC446, Purdue University Department of Agricultural Economics, West Lafayette, Indiana (1976).

This 14-page bulletin describes and demonstrates the type of economic impacts due to residential growth, capital intensive growth, and low capital growth.

Muller, Thomas, *Fiscal Impacts of Land Development*, Washington, D.C.: The Urban Institute (2100 M Street) [$3.95].

This publication reviews the major studies on fiscal impacts of development and analyzes the basic problems in estimating the cost of public services for new development. It is fairly technical publication but is of use to those who are estimating the fiscal impacts of growth in their community.

Shaffer, Ron and Luther Tweeten, "Estimating Net Economic Impact of Industrial Expansion: An Oklahoma Case," *Journal of Community Development Society*, Vol. 5, No. 2 (Fall 1974).

This article provided one of the early empirical analyses of the income and fiscal impacts of new or expanding plants in rural areas. A number of the impact models available through the Cooperative Extension Service follow the basic procedures outlined in this article.

Western Rural Development Center, *Coping with Growth Series*, Oregon State University, Corvallis, Oregon, 97331.

Eight of the 12 fact sheets in this series deal with fiscal impacts of rapid growth in rural areas. The principles outlined in these fact sheets also apply in areas wishing to encourage additional growth.

These fact sheets were a cooperative project between the 14 states in the Western Region and are excellent Extension publications.

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COMPARATIVE FEATURES OF INPUT-OUTPUT AND EXPORT BASE MODELS AS TOOLS FOR EXTENSION PROGRAMMING

by Frank Goode*

Introduction

Extension specialists are frequently asked to develop programs and materials that will help communities plan for changes within their economies. Input-output and export base models, which are described here, provide a framework embodying some of the major economic relationships that are important to understanding economic change, and they provide a vehicle for empirically estimating the magnitude of economic change. Although these models do not provide estimates of all the changes that may interest local communities, they do provide key information that is the basis for estimating other changes.

Perhaps the role of these impact models can best be understood in the context of an example. Suppose a plant plans to move into a community. The plant will employ 200 individuals, half of whom are highly skilled technicians and managers that the company will bring with it. The remaining 100 employees will be hired from the local labor market. Public officials may, for example, be interested in knowing how the new plant will affect demand for public schools and the size of the local tax base. By oversimplifying, one can argue that the increase in demand for public schooling will be determined primarily by the number of new families that move into the community. In turn, the number of new families will be determined primarily by the number of new jobs created. Likewise, increases in the tax base will be a function of the number of new homes constructed, since the majority of local tax revenues are property-based. Again, the number of new homes constructed in the community will be a function of the number of new families which is, in turn, influenced by the number of new jobs. Thus, predicting the impact of the new plant on the demand for public schools and on local tax revenues depends upon the estimated change in employment associated with the new plant.

In instances such as this example, the total change in community employment will probably exceed the 200 employees associated with the new plant. The new plant may purchase some of its inputs from local businesses, and these businesses may have to add to their staffs. Also, the new families will purchase goods and services from local merchants, who may also have to hire additional employees.

Input-output models and export base models allow one to estimate the changes in employment and/or income in the other sectors of the economy that are associated with the new plant. The estimates generated by input-output or export base models actually comprise an intermediate step to estimating the impact of the new plant on the demand for public schools and on the tax base.

In general, the models generate empirical estimates in multiplier form. An export base study results in a coefficient that is multiplied by the number of employees in the new plant to yield an estimate of the total employment change in the community. The multipliers generated by input-output models are generally measured in dollar amounts, indicating the total change in output and income in each sector of the community associated with a $1 increase in the sales of the new plant. But input-output multipliers can be expressed in terms of employment. For example, if output in one of the local sectors is predicted to double, then it is assumed that employment will double. If employment in the local sector is increasing from 20 to 40, then the employment multiplier is estimated as follows. Since 20 new jobs in the local sector result from the 200 new plant jobs, each new plant jobs creates 0.1 job (20 ÷ 200 = .1) in the local sector. The employment multiplier is 1.1. Thus, the multipliers are simply the mechanisms for estimating the total impact of the new plant. Although this discussion is in terms of a new plant coming into the community, the same procedures could be used to estimate decreases in the demand for education and in tax revenues if a plant was closing and moving its employees. We now turn to a general discussion of input-output and export base models.

The Export Base and Input-Output Models

Both models assume the level of economic activity in communities is related directly to the extent to which these communities produce goods and services for sale outside the community. There are alternative explanations for community growth, including such things as technology, capital availability, and the quantity and quality of human and natural resources. However, it would appear that in most instances, the questions communities ask are in response to anticipated changes in export activities. The two models described here are appropriate for addressing these types of questions.

The Input-Output Model

The input-output model has been a popular tool for regional and local analysis for a number of years. Its popularity derives from its detailed accounting of the transactions between economic sectors and from its capacity to generate sector-specific multipliers. The following sections discuss the basic components of the input-output model and highlight some of the major assumptions implicit in the model.

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The Transaction Table

The input-output model takes its name from one of the tables typically constructed in such studies. This table shows the distribution of sales of each of the sectors in an area economy to each of the other local sectors and to the export sector. Suppose that we have a rural community in which we can assign each of the firms to one of four sectors: the agricultural sector, the manufacturing sector, the retail sector, or the household sector. The input-output transactions for such a community are shown in Table 1. The first for of Table 1 indicates the distribution of total sales of the agricultural sector to the other sections in the local economy and for export. Agricultural production in the region totals $100. Of that $100, sales to other agricultural firms accounts for $5; sales to manufacturing firms for $10; sales to retail establishments, such as grocery stores, for $10; and direct-marketing sales to the household sector for $15. The balance of $60 of agricultural output is exported to individuals and firms outside the region. Conversely, each column of the table represents the distribution of input purchases for each of the four sectors. Thus, the columns of such a table represent the inputs and the rows represent the outputs of the sectors in the local economy. Generally, these flows are measured in dollars.

The Input Coefficient Table

The next step in input-output analysis is to use the information in Table 1 to develop an input coefficient table. The input coefficients for a particular sector indicate the amount of input purchases by that sector, per dollar of output, from each of the sectors. The input coefficients in Table 2 are obtained by dividing the entries of each column of Table 1 by the total of the corresponding row. For example, each of the entries in the first column would be divided by the total of the agricultural row. To produce one dollar's worth of agricultural output requires 5 cents' worth of input from other agricultural firms, 20 cents' worth of inputs are required from the manufacturing sector, 30 cents' worth of inputs from the retail sector, 25 cents' worth of inputs from the household sector in the form of labor, and 20 cents' worth of various imported inputs.

The Multipliers

The next step in input-output analysis is to develop multipliers. There are a variety of multipliers, but those most commonly used reflect the total change in output in the economy associated with a $1 increase in exports from one of the sectors. That is, for an economy such as that represented by Tables 1 and 2 there would be four multipliers. These multipliers would indicate how much total output in the local sectors would increase as a result of a $1 increase in exports from the agriculture, manufacturing, retail, or household sector. These multipliers are obtained as follows.

Suppose we are interested in finding the multiplier for the manufacturing sector because of an anticipated increase in export demand for that sector's output. This could be reflected in the expansion of employment in an existing firm or the arrival of a new firm. If the manufacturing sector's exports increased by $1, the immediate and so-called *direct effect* is the $1 increase in output in the manufacturing sector. However, increasing output by $1 in the manufacturing sector requires inputs of other sectors. Namely, the $1 increase in manufacturing output requires 6 cents' worth of inputs from the agricultural sector, 3 cents' worth of inputs from both the manufacturing and retail sector, and 44 cents' worth of inputs from the household sector. These increases in output are referred to as the first-round *indirect* effects.

The first-round increases in output require each of the four sectors to increase their input purchases. For example, the first round required agricultural production to increase by 6 cents; thus, the agricultural sector must purchase additional inputs. The increased output of 6 cents in the agriculture sector again required inputs of 2 cents from the agricultural sector, and 1 cent each from the manufacturing, retail and agricultural sector, and 1 cent each from the manufacturing, retail and household sectors.* Likewise, the first-round increased output of 3 cents in the manufacturing and retail sectors and 44 cents in the household sector requires additional inputs from the other sectors. The inputs required to support the first round are referred to as the second-round *indirect effects* and are found in Column 3 of Table 3. That is, to support the first-round impacts listed in Column 2 of Table 3 requires 5 cents' worth of input from agriculture, 4 cents from manufacturing, 25 cents from the retail sector, and 4 cents

Table 1. Transactions Table for an Area Economy.

Economic Sectors	Agriculture	Manufacturing	Retail	Household	Export	Total
	dollars					
Agriculture	5	10	10	15	60	100
Manufacturing	20	5	5	10	140	180
Retail	30	5	5	90	15	145
Household	25	80	30	10	25	170
Import	20	80	95	45		
Total	100	180	145	170		

Table 2. Input Coefficients for an Area Economy.

Economic Sectors	Agriculture	Manufacturing	Retail	Household
	dollars			
Agriculture	.05	.06	.07	.09
Manufacturing	.20	.03	.03	.06
Retail	.30	.03	.03	.53
Household	.25	.44	.21	.06

* The interested reader is referred to William H. Miernyk, *The Elements of Input-Output Analysis* for a full description of the mathematics.

from the household sector. The round-by-round procedure continues until the magnitudes are so small as to be negligible. Summing all of the rounds yields the amount that output in each of the four sectors would increase in response to the original $1 increase in demand for the manufacturing sector's output. These sums are found in the last column of Table 3. Specifically, a $1 increase in manufacturing-sector exports would require increased output of approximately 16 cents in the agricultural sector, $1.12 in the manufacturing sector (this includes the original $1 increase in demand), 45 cents in the retail sector, and the total income of the household sector would increase by about 67 cents. In total, the entire economy will increase by $2.40 in response to the original $1 dollar increase in export sales of the manufacturing sector. Put another way, each dollar increase in export sales from the manufacturing sector generates an additional $1.40 worth of business in all four sectors in the economy. The multipliers for all of the sectors are shown in Table 4.

Input-Output Multiplier Assumptions

The procedures outlined above are those typically used in regional input-output studies. These procedures embody a variety of assumptions which must be recognized, particularly when using the input-output model for small areas.

Fixed Coefficient Assumption

The first assumption is that the input coefficients, such as those found in Table 2, do not change. Consequently, the input-output model assumes that the *production technology does not change* and that *spatial purchasing patterns for inputs do not change*. For relatively small changes in export demand, these assumptions may be reasonable. However, if the change in export demand is large, relative to current output levels, these assumptions become very questionable. For example, the manufacturing sector may have been importing some of its labor from outside the community, suggesting that at current production levels there is not adequate labor in the area to sustain production. If such a situation does exist in our example area, the manufacturing sector may not continue to hire 44 cents' worth of local labor for every $1 increase in export sales. Rather, the manufacturing sector may be forced to import the majority of any additional labor required.

Obviously, many factors influence how adequately the coefficient reflects what will happen if additional employees are hired. It may be that two-thirds of the manufacturing firm's workforce consists of laborers and one-third of technical workers. If there are unemployed laborers in the study area, the new labor positions may be filled by local residents and the technical positions by imported workers. The precision of multiplier estimates depends upon knowing whether or not the fixed coefficient assumption holds when analyzing a particular rural community and a particular economic change. If secondary data or familiarity with the local labor market conditions indicates that only one-third of the additional labor requirements can be met locally, then the input coefficient should be changed from .44 to .22 (1/3 of .66) before calculating the multipliers.

Net vs. Gross Income Changes

Input-output procedures also assume that the increased payments to labor—again assuming that the new jobs will be filled by local people—represent new income to area residents. This second assumption is particularly critical when small areas are analyzed because the magnitude of the indirect effects is determined largely by net additions to household income. That is, in small communities many manufacturing plants purchase little, if any, of their inputs other than labor in the community. Therefore, new wages are often the only way in which the plant has an indirect effect on the community's economy. For example, in Table 3, the indirect effects associated with a $1 increase in manufacturing exports amounted to $1.40. Of that $1.40, approximately $1.12 accrued in the form of additional income for the household sector and additional business in the retail sector. That is, the majority of the indirect impacts was a result of increased income in the household sector and of the household sector's increased purchases from the retail sector. Thus, if

Table 3. Direct and Indirect Effects Associated with a $1 Increase in Manufacturing Exports.

Economic Sectors	Direct	Indirect Rounds (dollars) (1)	(2)	(3)	(4)	Total
Agriculture		.06	.05	...	....	.16
Manufacturing	1	.03	.04	...	...	1.12
Retail		.03	.25	...	...	.45
Household		.44	.04	...	...	.67
					Total:	2.40

Table 4. Direct and Indirect Requirements (Sector Multipliers).

Economic Sectors	(1) Agriculture	(2) Manufacturing	(3) Retail	(4) Household
	dollars			
Agriculture	1.18	.16	.13	.19
Manufacturing	.30	1.12	.09	.15
Retail	.71	.45	1.28	.81
Household	.61	.67	.36	1.36
Total	2.80	2.40	1.86	2.51

the increased income in the household sector is not as great as the coefficient in Table 2 suggests, then the indirect impacts will be grossly overstated. If the new employees hired by the manufacturing sector were previously unemployed and did not receive income aid or are in-migrants into the area, then the assumptions embodied in the input-output procedures are likely to be valid. However, if the new employees are local residents who were originally unemployed but receiving some type of public assistance, or who were employed outside the region, all the income paid to these individuals by the manufacturing sector does not represent new income in the community. That is, these individuals will be foregoing income they were receiving either through public assistance or through employment outside the area. Conceivably, there is a net increase in income, but it is not as large as that implied by the coefficient in Table 2. If an individual was receiving public assistance or was employed outside the region, then he was, in essence, exporting labor services from the area. Once employed in the local manufacturing sector, that person simply represents an increase in the use of local labor and a simultaneous decrease in exported labor. The impact on the community's household income will be the net difference between these two effects. One way of handling this is to estimate the gross impact of increased manufacturing exports and subtract out the impact of decreased labor exports, or the loss of outside income brought into the community economy. For example, if manufacturing exports are to increase $1,000, the gross impact would be $1,000 times the manufacturing income multiplier. If labor exports were expected to decrease by $200, then, to get the net impact, the household multiplier (see Table 4, Household row and column) is multiplied by $200 and the product subtracted from the gross impact of manufacturing.

One must be especially careful, when using input-output models to estimate the impact of changes in export demand, to distinguish between new income and income that is merely substituted for earnings that had been brought into the community by exported labor. If the new jobs are filled by local workers the coefficients in Table 2 will be a more accurate reflection than if former out-commuters or job shifters fill the new jobs. In this latter case the income impact will be overstated.

Unchanging Economic Structure

The input-output model does not allow for structural changes in the local economy. This procedure assumes that the level of output of various sectors may increase but that there will be no new lines of business established as a result of the increased business activity. Again, if the increases are large relative to current levels of economic activity, this assumption is probably not valid. For example, it was assumed in constructing Table 1 that certain types of services utilized in the agricultural sector, such as farm implement repairs, were not available in the local community. However, if output in the agricultural sector expands significantly there may be enough business in the area to support such an establishment. If this is the case, then the agricultural sector will purchase more than 30 cents from the local retail sector for every dollar of output. Obviously, if such structural changes occur, then estimates of the impact based upon the coefficients in Table 2 will be understated. If structural change is anticipated it can be handled in the input-output model by adding a new row and column to Table 2.

In general, then, the use of input-output models to estimate economic impacts must take into account the assumptions involved in the models, and the best information available must be used to determine whether or not the assumptions are valid. If the information indicates that the assumptions are not likely to hold, then adjustments must be made in the model when estimating economic impacts. We now turn to a brief discussion of the export base model.

The Export Base Model

The export base model characterizes all of the production (or employment) in a regional economy as being for export or for local consumption. The information in Table 1 provides the basis for making this distinction. First, the export column of the table indicates the amounts of goods and services from each of the sectors that are exported *directly*. However, some of the production of these sectors may be exported indirectly and these indirect exports must be estimated. An example of the procedure used to make this estimate is as follows: According to information in Table 1, the retail sector exports only $15 of its output. However, consider the $5 that the retail sector sells to the manufacturing sector. Assume that the manufacturing sector is involved in the production of shoes and its $5 in retail purchases are for shoelaces. Although this $5 represents a transaction within the area, it is obvious that some of the shoelaces are an indirect export. In fact, 77 percent of the shoes manufactured are exported; therefore 77 percent of the shoelaces are indirectly exported. Of the $5 in shoelace purchases from the retail sector, $3.85 are indirect exports, and that $3.85 must be added to the $15 directly exported from the retail sector. Through similar calculations for all of the entries in Table 1, total production in the regional economy can be classified as exports (either direct or indirect) or local or domestic consumption. The ratio of total production to export production is the export-base multiplier. This ratio provides the basis for estimating the total change in the production of the local economy resulting from a change of $1 in exports. This multiplier has the same interpretation as the input-output multipliers. The major difference between the two is that input-output multipliers are estimated for each sector, and the export base multiplier can be viewed as an average multiplier for all sectors. If a new firm locates in the community, then the amount of exports by this firm is multiplied by the export base multiplier to yield an estimate of the total change in the local economy associated with the new firm.

Data Requirements

Obtaining data to reflect local economic conditions has been the biggest impediment to wide-scale use of economic impact models. Numerous sub-state, input-output studies have been conducted utilizing primary data. However, given the high cost of such studies there is a growing feeling that alternative methods for estimating the

transactions table must be found or alternative models must be used. This section contains a discussion of alternative methods to empirically implement the input-output and export base models.

Empirically Implementing Input-Output Models

In general, three approaches can be used to obtain the data used in the transactions table (e.g., Table 1). The first method, used in a relatively large number of studies, is to collect primary data from all of the firms and households in a given area. For example, for a particular manufacturing firm, the study needs information on the level of sales to each of the other sectors in the area and on the amount exported outside of the area. Also, information concerning the quantity of inputs purchased from each of the other sectors and imported from outside the region is needed.

In a large area, or an area that has a reasonably complex economic structure, the cost of collecting primary data is often prohibitive. In these instances, those conducting the study have frequently used the second method, which is to obtain primary information from a sample of firms or households from each of the sectors rather than to do a complete census. Frequently, however, even the costs of sampling procedures are prohibitive. In addition, the sampling procedures invariably introduce sampling error into the estimated transactions table, and it is difficult to determine the impact of the sampling error on the multiplier estimates.

Due to the high cost of collecting primary data, a third set of methods have been developed to estimate the transactions table by using secondary data. The basic elements of this procedure are outlined as follows. The first step is to assume that the technical production coefficients found in the national input-output studies represent the technical coefficients in the area being studied. For example, Table 5 includes a hypothetical set of national input-output coefficients for the four sectors in an area input-output model. The second piece of information required is the total output of the four sectors in the study area. Multiplying each column in Table 5 by the total output of the corresponding sector yields a table of input requirements. The entries in Table 6 are estimates of each sector's input requirements necessary to sustain existing production levels.

The sum of a row (Column 5) in Table 6 indicates the total amount of inputs from a particular sector that is required to support the local economy. For example, inputs from the retail sector totaling $220 are required to support production in the four sections combined. However, total production in the local retail sector, as indicated in Column 6, is only $145, or $75 less than the total economy requires. This shortfall leads to the assumption that retail goods valued at $75 must be imported and that the imports must be distributed across the four sectors in proportion to each sector's requirements. That is, actual production in the retail sector is about one-third (34.1 percent) less than required from that sector. Thus, it is assumed that one-third of the requirements of each sector is imported. For example, the agricultural sector requires $40 of inputs from the retail sector, but only two-thirds ($26.36) of those requirements are supplied by local retailers, with the remaining one-third ($13.64) imported. For sectors like agriculture and manufacturing in which total production exceeds the input requirements of the total economy, the balance is assumed to be an export. This process yields the estimated transactions shown in Table 7. The procedures outlined in the beginning of this paper are applied to this estimated transactions table to derive input coefficients and multipliers.

Table 5. National Input Coefficients.

Economic Sectors	Agriculture	Manufacturing	Retail	Household
	dollars			
Agriculture	.10	.06	.07	.09
Manufacturing	.25	.11	.52	.06
Retail	.40	.17	.10	.79
Household	.25	.67	.31	.06

Table 6. Estimated Input Requirements.

Economic Sectors	(1) Agri-culture	(2) Manu-facturing	(3) Retail	(4) Household	(5) Total Req'ments	(6) Total Output
	dollars					
Agriculture	10	10	10	15	45	100
Manufacturing	25	20	75	10	130	180
Retail	40	30	15	135	220	145
Household	25	120	45	10	200	170

Table 7. Estimated Transactions Table for an Area Economy.

Economic Sectors	Agriculture	Manufacturing	Retail	Household	Export	Total
	dollars					
Agriculture	10.00	10.00	10.00	15.00	45.00	100.00
Manufacturing	25.00	20.00	75.00	10.00	50.00	180.00
Retail	26.36	19.77	9.89	88.98	0.00	145.00
Household	21.25	102.00	38.25	8.50	0.00	170.00
Import	17.39	28.23	11.86	47.52		
Total	100.00	180.00	145.00	70.00		

Again, two pieces of information are required for this metohd of constructing an input-output model: national input-output coefficients and total output of the various sectors. National input-output coefficients are readily available, with the most recent being for the year 1974. Total output figures for the sectors are not so readily available. In general, it is difficult to obtain total production figures for four-digit Standard Industrial Classification industries for geographic areas smaller than a state. Procedures are available to estimate the output of these sectors at the county level. These procedures involve obtaining the total value of production in a given sector at the state or national level. These production figures are divided by total employment in that sector at the state or national level, respectively, to obtain an estimate of the output per man. Multiplying this output-per-man estimate by the sector's employment in the study area yields an estimate of that sector's total output in that area.

In general, employment figures required by this procedure are not available for areas smaller than a county. For sub-county areas the only available source of employment and output data is the *Dunn and Bradstreet Market Indicators File*. This file contains both employment and value-of-shipments (production) information for firms, and these firms can be identified at sub-county geographical locations. Research and Extension personnel are just beginning to use the Market Indicators File. Thus, the accuracy of the data is not well established. The author's experience with the file indicates the data are good except in sectors where *Dunn and Bradstreet* are not the primary source of credit ratings (e.g., local governments).

Empirically Implementing Export-Base Models

As was indicated previously, export base multipliers can be estimated from the information contained in transactions tables, such as Table 1 and Table 4. However, this is a very inefficient way to construct export base multipliers. That is, if one has the information to construct a transaction table, an input-output study should be conducted instead of aggregating the information to form the export base multiplier. The more efficient procedure for developing export base multipliers is based on generally available secondary data. Specifically, the first step in the procedure is to obtain the employment total in each sector of the area economy, either through surveys or such sources as the *Dunn and Bradstreet Market Indicators File*. Next, the total employment of that sector at the national level is divided by the national population to obtain a requirements coefficient, which indicates the number of employees in that sector per individual in the U.S. This ratio may be based on state or regional information if there is reason to believe that state or regional data more accurately reflect requirements in the area being studied. Also, the denominator can be total employment rather than population. The selection of employment or population is based on data availability and the degree to which the data need to reflect local consumption rather than output. Regardless of which geographic units and denominator are used, the assumption is that this ration reflects the requirements of the residents in the study area. This ratio is multiplied by the population in the study area to yield an estimate of the requirements of the area's population for that sector. If the employment in that sector exceeds the local requirements, then the difference is assumed to be available for export. If the requirements of a particular sector exceed the employment in the area, then it is assumed that all of the employment in this sector is associated with domestic consumption rather than export. In this fashion the employment in each sector is allocated to the domestic (service) or export (basic) category. The sum of employment in all sectors divided by the sum of export employment in all sectors yields an export-base multiplier. This multiplier is used to determine by what amount total employment will increase for each new employee involved in export activities. Thus, the only information required by this procedure is employment and population data, which are generally much easier to obtain at the community level than the information required for input-output analyses.

Quasi-Data Requirements for Both Input-Output and Export Base Models

In the discussion of the input-output model, the precision of multiplier estimates for small areas was said to be heavily influenced by the validity of three assumptions. These assumptions are also implicit in the export base model. Unfortunately, there is relatively little information available for checking the validity of these assumptions. Generally, the best that one can do is to check with sources familiar with the economic structure of the area and get their judgment concerning these assumptions. For example, if one constructs a transactions table for a local community, it is possible that local residents can identify potential major bottlenecks. Special attention should be devoted to areas in which the requirements for a particular input exceed current production. In such cases, any increases in production may be supported, almost exclusively, by increased importing of the necessary inputs.

In terms of information concerning the labor issue, some information on labor force participation rates is available from the U.S. Census of Population. This information might help a community identify potential sources of workers to fill new jobs, particularly if the labor requirements of the new firm are known.

Changes in the structure of the local economy are very difficult to predict. However, in certain instances, structural changes may be inevitable and, therefore, obvious. For example, a new plant locating in a community may know or expect that subsidiary industries which either sell inputs to the plant or further process its products are also likely to locate in the community.

Although the information on these three assumptions is likely to be fragmentary and less than perfect, any information is better than blindly accepting the assumptions of the input-output and export base models.

Concluding Comments

Determining which impact model to use and how extensive the procedure to estimate the multipliers should be is largely a matter of judgment. The decision depends upon what types of questions are being asked, the precision required of the multipliers and, last but not least, the amount of human and financial resources available for analyzing a local situation. One of the major distinctions between these two models is sector-specific multipliers. The last row of Table 4 provides the total multipliers for each of the sectors in the example economy, which are based on the input-output model. These output multipliers range from 1.86 to 2.80. The export base multiplier for the same economy would fall within this range, since it is essentially the weighted average of these four multipliers. Thus, one of the issues involved in selecting between the export base model and the input-output model depends upon the specificity required for the multipliers. For example, if the community knows that a particular type of firm is going to locate in their community, then perhaps the input-output model is more appropriate because multiplier estimates can be developed that are specific to that type of industry. On the other hand, if the community asks a more general question, such as what are the expected impacts if we attract an unspecified type of exporting activity, then perhaps the export base multiplier provides an adequate estimate of the economic impacts. Thus, one factor in the choice of a model depends upon the specificity of the questions asked.

A second criteria for deciding between the models is the amount of financial resources available for the study. If a community is going to make public investment decisions based on the estimated impacts, then very precise estimates are important. In these instances, the input-output model should be used, and extreme care should be exercised in estimating the multipliers. Constructing the transactions table and verifying whether or not the critical assumptions of the input-output model are valid also requires detailed consideration. If the resources are not available to develop precise estimates, then it is probably best to either not conduct the study or to present ranges of the estimates rather than specific estimates, which falsely imply precision. It is probably less costly for the local government to respond to economic changes after the changes occur than it is to make investments based on inaccurate forecasts.

In conclusions, there is no formula for determining which of these models to use in a specific case. After the practitioner has developed an understanding of these models, that understanding in conjunction with knowledge of special circumstances permits judgment about the appropriateness of various models and procedures.

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NONMARKET IMPACTS FROM ECONOMIC DEVELOPMENT

*by Ron Shaffer**

Introduction

A community's evaluation of an anticipated economic development event will rely almost exclusively on monetary, or market-determined, values, because they are measurable indicators that community members can judge. Recently, environmental issues, which are not easily translated into monetary values, have entered into community decision-making, usually on a political and legal basis because the market typically undervalues environmental quality. While physical environmental factors are increasingly being recognized in community decision-making, other changes are seldom considered in a systematic fashion because they cannot be translated into a common denominator, as can the number of new jobs or increases in income and public revenues, for example. Evaluation of nonmarket impacts and of the trade-offs among them is based on people's values, and there is no easy way to measure or determine these trade-offs. For example, which is better, a job in the local area that pays a lower wage, or a job in another community that pays a higher wage?

Extension education programs on impact analysis should not ignore nonmarket changes, even though our ability to provide precise answers is very limited. The models for estimating nonmarket changes are not as rigorously as the models available for estimating monetary changes.

Some suggest that raising questions about nonmarket changes unfairly detracts from community economic development. Further, some argue that since a market value cannot be placed directly on these changes, these considerations should be discarded from community decision-making. Quite the contrary. If a community is to make an informed judgment about economic development, it needs to have as complete a list of impacts as possible. Then the community's value structure can be used to judge whether to support or to oppose an economic development event. In addition, evaluating nonmonetary impacts offers greater opportunities for community involvement than do market phenomena. Market values typically are determined outside the community, while the valuation of nonmonetary impacts is a local phenomenon. Citizens of a community can and should ask what type of nonmonetary changes are possible. Once the possible changes have been itemized, then the community needs to compare these changes with community goals and to set about insuring that the appropriate changes do occur. In many cases, problems can be resolved or reduced by alerting the community during the early phases of an economic development event.

Three important concepts must be clarified before proceeding. First, economic development refers to *all* forms of economic activity that improve the job and income situation within a community, and it is not limited to attracting a manufacturing plant. Economic development also results from the formation of new local businesses or the expansion of existing businesses. More importantly, economic development is as diverse as a new shopping center, expansion of farm-implement dealership, construction of a new motel/restaurant, modernizing the local hospital, or the opening of a retirement center. The critical point is that economic development and industrial (manufacturing) development are *not* synonymous. Second, each form of economic development will have different types of impacts on the community. For example, the labor requirements of a nursing home will differ from those of a farm-implement dealer. Third, the level of impacts in a community will vary with the size of the economic development event relative to the size of the community. A new insurance agency with five employees in a community of 10,000 will probably cause no discerible changes. However, the location of a regional insurance company headquarters (50-75 employees) in that same community will cause noticeable changes.

At the end of this section there is a partial listing of nonmonetary impacts that might arise from an economic development event. All of the items in the list need not occur for any specific economic development event. The nonmonetary impacts likely to occur are a function of the size of the community involved relative to the size and type of the economic development event that occurs. As indicated earlier, the perceived significance of these impacts will depend on the value system of the community. Thus, this section cannot provide answers, but can only enumerate some of the questions regarding the nonmarket impacts from economic development.

In this section, four types of nonmarket impacts will be discussed. These nonmarket impacts are related to: (1) employment, (2) changes in population, (3) social changes affecting individuals and the entire community, and (4) the implications for local government and publicly provided services. Before proceeding with these discussions a review of distributional issues is necessary.

Distribution

Distributional impacts are best exemplified by the question of who receives the benefits and who carries the burden of an economic development event. This question can be examined over space, over groups of people, over components of the economy, and over time.

Distribution over space refers to who is affected based on their place of residence. Are impacts limited to community residents or are residents of other communities affected? In many instances, the impacts of an economic development event will be dispersed by commuters, new residents, and purchases of consumer goods and business inputs outside the community.

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Distribution over groups of people can refer to income groups, age groups, racial groups, or property ownership. Do the benefits of economic development accrue to the higher, middle, or lower portion of the income scale? Does this economic development event lead to changes in property ownership? Are there any distributional implications based on whether people owned property prior to the economic development event? Will the event affect the availability and costs of medical services for elderly residents? Is the economic status of minorities affected by this economic development event?

There can also be distributional implications for the different sectors of the local economy. A new shopping mall, for example, will have minimal effects on manufacturing but it may have a major impact on the existing retail sector. Likewise, any new development may stimulate the finance and real estate sectors, and it may affect farming through significant land use changes.

Distributional questions related to time refer to when the benefits and costs of an economic development event occur. Even though the total tax revenues from the project may pay for the public investments, the revenues may not be available until after the public investments are made. There may be a lag between the time public service investments are made and the time the private investment is placed on the property tax roll. It could be two or more years before local property taxes are collected from the new plant and equipment. A similar temporal difference in public revenues and expenditures can arise when communities face a state-mandated freeze or restraint on the local tax levy. Several Western states where major energy projects are underway or anticipated have begun impact funds to finance the local government infrastructure investments necessary before local tax revenues start flowing from the project.

Employment Related Changes

Many nonmarket impacts of an economic development event are employment-related. While this may sound contradictory, many employment considerations are not measured in terms of annual salary. The satisfaction or personal fulfillment received from the new job is such a nonmarket impact. Do the new jobs offer workers a better opportunity to utilize their skills more fully? What about job openings and opportunities for female workers, younger or older workers, or minorities? Do residents have an opportunity to acquire skills that permit personal and emotional satisfaction?

Another employment-related nonmarket impact is commuting. Commuting workers will have less time for personal use, e.g., family, recreation, etc. Can this offset the benefit of a higher wage or more stable jobs? A potential gain would be if the worker commutes to a closer job or no longer must commute to another community for work.

Similarly, new jobs may have implications for the services provided in the community. If married women enter the labor force, for example, child-care services may be needed. Families may have to reallocate home and family respohsibilities, which may be difficult for some. Balanced against these adjustments are the emotional and personal satisfactions derived from the job along with the added income.

One of the subtle emotional phenomena resulting from the arrival of a new plant or the expansion of an existing plant is the concern that the plant may close. Although a plant closing is generally not considered during the euphoria of a new development, there will be times when rumors (founded and unfounded) suggest that the plant is closing or reducing its work force. This can cause personal and familial trauma among the people who feel their jobs are in jeopardy.

New jobs created by the economic development event may reduce seasonal and cyclical employment by offsetting employment fluctuations in other sectors of the community. These fluctuations are strikingly evident in Detroit where employment is prone to the ups and downs of the auto industry.

An economic development event may spur development in other community sectors. New jobs may result in greater optimism about the community's economic future, and this optimism may induce businesses and others to invest time and money in the community.

Population Changes

Demographic Implications

In a sparsely settled rural area, the occurrence of a major economic development event will have a profound impact on the demographic composition of the community through in-migration. The in-migrants may be new people or they may be individuals who previously lived in the community and left for a variety of reasons.

The majority of new residents may be in a different age group (typically younger) than the existing residents. New residents may demand different goods and services from both public and private sectors than do longtime residents.

The advent of an economic development event can change population density in the community, and the residential and commercial expansion that may follow can affect land use adjacent to the community boundaries and along transportation routes, resulting in more travel time, increased traffic volume, and increased demands on the community's land use planning capabilities.

The values of new residents may differ from the community's present value system. Conflicts may result, but at the same time, newcomers may introduce new and innovative ideas that can assist the community in charting its economic future.

Housing

Economic development may also alter a community's housing situation, monetarily and otherwise. Changes in the price of existing housing within a community represents a monetary dimension. If the community has declined economically, the occurrence of an economic development event will increase or at least stabilize the price of existing housing. For individuals, especially those of retirement age, with housing available for sale or rental this may be an economic windfall. However, these same price increases may place renters at a competitive disadvantage if rent increases faster than their income. In this case, some renters may find themselves unable to afford local housing.

Another dimension of the housing market relates to the quantity and quality of the housing stock. With the occurrence of an economic development event, owners may repair and

modernize existing housing, and investors may finance construction of new homes and apartments. However, there is also the possibility that some property owners will seize upon this opportunity to extract housing resources from the community through disrepair and abuse.

The mix of housing will change with an economic development event. To accommodate new residents apartments may be built, or existing houses may be remodeled into multifamily dwellings. If the proportion of renters to owners changes, social conditions within the community may also change. Renters frequently have perspectives about long-term community investments and involvement in local organizations that are different from those of homeowners.

Housing needs may also change, based on workers' job duration and existing housing availability. There is also the possibility that a surge in housing demand will be temporary if workers are brought in for construction only. In such cases, mobile homes or work camps are the most logical and efficient mechanism to meet temporary housing needs. The availability of housing in nearby communities will also affect the intensity of local housing pressure.

Community Ecology

One of the social changes likely to occur as a result of a major economic development event is the disruption of informal communication networks and organizations. Particularly if there is a large influx of newcomers, traditional channels for keeping people informed may be inadequate. People will find they need to rely on different sources of information to keep informed of the community. These changes will be temporary and new communication channels will be quickly formed.

Religious organizations will also make adjustments as a result of economic development. Their memberships are likely to increase, and new denominations may appear in the community. Because of the changes that result from economic development, religious organizations will need to play a larger role in providing social stability and communication in the community.

Participation of individuals within community organizations, both formal and informal, will also change. Formal organizations, such as civic groups, the chamber of commerce, etc., will have to accommodate larger memberships and associated challenges. Informal organizations may also emerge in response to the needs of new families as they become integrated into the community.

Political and Local Government

Political Impacts

The most obvious political implication of economic growth and accompanying increases in population is the potential change in the leadership structure of the community. New residents may assume leadership roles, or longtime residents may assume new leadership responsibilities. New residents in the community will bring a different perspective about the type of community desired, which may or may not be compatible with existing perspectives.

Community growth may also spawn the need for substantial investment in public facilities. Bond issues and other controversial matters may be presented as referenda, which may increase voter participation in various elections, as will attempts to shift political leadership.

With substantial growth, a community may discover it needs to establish formal regulations, either because new problems have arisen or because informal standards and controls are not known or unheeded by new residents. Some will perceive these changes as beneficial to the community, and for others, the more formal structure will represent the demise of a lifestyle.

Public Recreation

A larger population could encourage private investment in new entertainment facilities; concomitantly, a larger tax base may allow the local government to provide more public recreational services and facilities. However, substantial numbers of new residents could also result in congestion of existing facilities, and in a decline in the availability of certain forms of recreation (wilderness areas, streams, etc.).

Physical Safety

Just as the population growth associated with economic development can strain the capacity of existing public recreational facilities, it is just as likely that a community's safety services may be poorly equipped to handle larger numbers of people and the greater potential for criminal activity. The increased criminal activity can be crimes of aggression, e.g., assault and battery; or crimes against property, e.g., burglary; or social crimes, e.g., intoxication.

The potential for criminal activity is likely to be greatest when a community is host to a large transitory population that is involved in the early phase of the development project. However, increases in local government revenues as a result of development may also allow the community to expand its police department. Part of the perceived change may be due to better recording of certain crimes and unsubstantiated opinions about "those new people." The perceived change in crime may be an age-related phenomena linked to younger workers. In many cases improved economic conditions can reduce the incidence of some crimes simply because more people are employed.

Health

Another nonmarket impact of economic development concerns physical and mental health of community members. Social adjustments, even something as minor as increased commuting time, can be stressful to certain individuals. Depending on the size and type of development, residents may find themselves exposed to more physical risks, e.g., the new jobs may also pose a higher degree of physical risk. Of course, safety standards in the new work place may be superior to those in the community's other businesses. The most difficult dimension to consider and to be alert to is the possibility of latent, long-term health problems, e.g., the abestos peril.

The project, by increasing public revenues or community population or

by attracting private investors, could open the door to improving a community's health-care facilities. In communities that were unable to attract a sufficient number of doctors, the development project and the accompanying population growth may provide the necessary enticements.

Decline vs. Growth

Numerous communities have experienced the trauma of a major employer closing operations or significantly reducing its labor force. This type of economic change will also yield changes in the community that are not easily assessed with economic models. The concerns raised above are also applicable, with some modification, to a situation of economic decline, and not all will be the reverse of economic growth. For example, if a major firm closes, people will leave the community, but many will take a less satisfactory job (less challenging, lower pay, etc.) and remain in the community. The issues or questions remain the same, but the answers may be altered.

Summary

This section reports some of the nonmarket changes that may occur because of an economic development event. The distinction of market and nonmarket changes is somewhat artificial. Both types of changes are linked and not easily separated for analysis.

The nonmarket changes mentioned in this section, for the most part, represent scenarios of communities experiencing major economic development events relative to the existing community population and economy. Not all of the nonmarket changes that occur in a community result from economic development, irrespective of the size of the development. The community may be experiencing the same social changes that are occurring elsewhere in society.

In some cases, the anticipated nonmarket impacts are legitimate issues of public concern. In other instances, the anticipated nonmarket impacts are relevant only to the individual or family. Yet awareness of the potential changes is necessary in community decision-making. Once recognized, these potential changes can be measured against community values. Obviously, value judgments defy consensus; no change will be universally viewed as beneficial or as adverse. Thus, it is critically important to raise the question of what types of nonmarket changes are possible, and then to compare these changes against community goals. If the expected change is undesired, then action to reduce or negate the adverse impact can be initiated. Likewise, actions to encourage or reinforce desired changes can be implemented.

Undoubtedly, judgments about the changes wrought by economic development is related to the individual's perceptions of their community. As a consequence of development, some may now perceive their community as being a dynamic, progressive, growing entity, while others will see their community as experiencing various degrees of degradation.

An important point to remember is that a community is a dynamic social organism that adjusts and adapts to new conditions. Over time, the community will absorb or remedy many of the adverse impacts. The goal of this section is to help community leaders anticipate these potential changes and ease the transition.

Types of Nonmarket Impacts

I. Distribution: Who will be Affected?
- A. Will effects vary among geographic sectors of the community?
- B. What income groups will be affected and in what ways?
- C. Will all or just certain economic sectors of the community have to make adjustments?
- D. Will the impacts vary over time?

II. Employment-Related Impacts.
- A. Will the new jobs be satisfying to workers?
- B. Effects on commuting time and distance. How far must local residents travel to their new jobs?
- C. Will the jobs be permanent of will they be highly sensitive to managerial decision and economic trends?
- D. Will the worker perceive the new jobs as an improvement over previous conditions?

III. Population-Related Impacts.
- A. Demograpic.
  1. How much in-migration will occur?
  2. Will the newcomers and their families match or be different from the prevalent age and family structure of the community?
  3. What value changes might occur?
  4. Can the newcomers easily be integrated into the community social structure or will adjustments be needed?
- B. Housing.
  1. How will the value of housing change?
  2. How will the quality of housing change?
  3. What changes in housing ownership will occur?
  4. What type of new housing will be needed?

IV. Community Ecology.
- A. How will communication networks be affected?
- B. How will religious organizations be affected?
- C. How will participation in community affairs be affected?
- D. What different internal-external linkages will appear?
- E. Will satisfaction with the community change?

V. Political and Local Government.
- A. Political
  1. What leadership changes will occur?
  2. Will voter participation change?
- B. How will public recreation facilities and use be altered?
- C. Will physical safety of workers and residents change?
- D. What short- and long-term health effects could occur?

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EXTENSION'S ROLE IN ECONOMIC IMPACT ANALYSIS

*by David L. Debertin and George E. Goldman**

Introduction

Extension education has a long tradition in community development work. Its central focus has historically been on providing information useful in the group decision-making process. The role of the Extension educator is to assist communities in delineating alternative solutions to problems, including the probable consequences of each alternative, and to serve as an unbiased source of technical information. In this section, we further define Extension's role in economic impact analysis. The role of facts and values in community decision-making are discussed. Alternative functions that Extension personnel may perform are outlined, as are methods for helping communities select impact models appropriate for their needs and resources.

Extension's role in economic impact analysis grows out of its usual role in community development and its public policy education role. Basically, Extension's role in community development is to educate the community so that residents are better able to choose among policy alternatives. When a community is confronted with economic change, typically it must wade through estimates of the consequences of various alternatives, as well as an assortment of other relevant information. While local government staff and interested citizens may understand the policy choices, frequently they do not have the analysis that predicts the outcomes of the different policy alternatives. Explaining the connection between the policy choices and the projected economic impacts is an important responsibility for Extension staff. By carrying out this responsibility, Extension staff helps the community decipher fact from fiction, allowing it to evaluate change on the basis of its perceived values.

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Facts and Values in Impact Analysis

Any problem involving group decision-making involves three components: (1) facts, (2) beliefs that individuals within the group, rightly or wrongly, think are facts, and (3) value judgments.

Facts are relatively easy for the Extension community development educator to deal with since they cannot be disputed. On the other hand, value judgments lie beyond the realm of fact and are often the source of disagreement. The Extension specialist jeopardizes his role as a source of unbiased information if he attempts to influence value judgments within a group. Extension specialists should be wary of becoming an advocate rather than a facilitator of group decision-making. But when it comes to beliefs, which often confuse fact with fiction, the educator can dispel falsehoods and verify facts. *Citizen beliefs can influence interpretations of facts.* Some beliefs, when carefully examined, will be found to be factual, while others will be found to be based on erroneous information. In this regard, impact analysis models can be very useful to the Extension educator as a tool for distinguishing between beliefs based on factual information and those that are based on incorrect information.

Facts, beliefs, and value judgments will be at the heart of any community impact analysis. For example, it is a fact that a firm, employing 500 workers, intends to locate a new plant in the community. Nearly everyone in the community holds values with regard to the potential goodness or badness of such employment growth. Some may view the new plant as an opportunity to obtain a higher-paying job. Others may resent the outsiders, the noise, the loss of farmland, and the construction activity that would result. It is clear that no amount of advocacy for or against the new plant by the Extension educator or others will change strongly held opinions on these issues.

An impact analysis, however, may be a quite useful tool for separating beliefs that are factual from those that are not factual. For example, members of a group may argue that the new plant would result in overcrowded schools. An impact analysis can provide more accurate information as to the potential number of new students attending local schools and whether that number would result in overcrowding. Others may argue that the taxes paid by the new firm will be more than sufficient to offset the additional costs of public services. An impact analysis can determine if this is likely to be true. Still others might suggest that the secondary impacts of the employment growth will stimulate a large amount of business in the local community. An impact analysis can provide precise estimates that verify or disprove this contention. Growth impact models require that community leaders make explicit the assumptions used. Moreover, effects of changes in assumptions on the consequences for the community can readily be addressed.

When a community asks: "If this event occurs, then what will be the consequences?" growth impact analysis can be a useful tool for group decision-making. The analysis is not a replacement for the Extension educator, nor is it intended to be a device for changing people's values. Rather, it is an educational tool, one that *is consistent with Extension's role of helping people assess alternative solutions and probable consequences of each.*

Functions for Extension in Impact Analysis

The basic function of Extension staff in economic analysis is to assist local government staff or citizen groups in any phase of the impact analysis process. Community problems share a common characteristic in that all require group decision-making. Once community residents

become aware of a problem, many become interested in the decision-making process, and some may even want to participate in efforts to solve the problems. When community members recognize a problem, the time is right for some specific Extension educational programs. These can include: (1) education and training in basic economics and economic impact methodology, (2) advice on selecting outside consultants, (3) assistance in interpreting and understanding an impact report and in making use of a report for planning, and (4) working with local government and citizens in doing an impact analysis.

Perhaps Extension's most important role is training and educating citizens and government staff. The natural place to start is the selection of policy alternatives to be analyzed. If the range of alternatives chosen is limited, this will limit the usefulness of the analysis. Also among the primary considerations is the type of analysis to be performed and the facts that are necessary for the community's evaluation. For example, estimates of a change in average income can imply a different conclusion than an estimate of change in total incomes. In this capacity, the Extension educator can aid the community in its fact-finding efforts, help it identify the economic impacts to be estimated, and assist in choosing the methods to estimate these impacts. The time horizon—how far into the future—the analysis will cover needs to be chosen. No impact analysis can assess the total range of potential impacts. Most analyses, for example, include economic but not social or environmental impacts. The Extension educator can serve an important function in assisting the community residents as they determine the list of impacts that are important, and of those impacts which are amenable to estimation. These are difficult questions; Extension personnel can conduct programs and provide useful information to communities as they sift through these questions. When estimates from impact models are presented, the predicted economic impacts are never as exact as they seem on paper. Most economic impact reports do not indicate the potential variability of the estimates, but the limitations of these predicted impacts should be included in any discussion of economic impacts or in any training program on the subject.

A second role for Extension is assisting a community in choosing an outside consultant, if the community has decided to do so. One way for local government and its citizens to cope with the problem of limited technical capacity is by hiring consultants. This approach has shortcomings: First, this is an expensive way to proceed, and second, consultants usually only leave a report behind. If a similar problem arises later on, it may be necessary to hire a consultant again. If possible, it is better to train local staff or local people to do some of the analysis, and, as a result, the community will develop the capacity to address other problems requiring impact analysis.

If a community opts to hire a consultant, it should discuss these issues with potential consultants: (1) the alternatives to be considered, (2) the methodology to be employed, (3) the kind and frequency of reporting by the consultant to the community, (4) the format of reports, and (5) the structure of the contract. Of course any educational program involving an outside consultant would depend upon the community's past experience and capabilities.

A third role for Extension education is to assist citizens in interpreting, understanding, and using a completed impact report. In addition to helping community members understand and critique the report, Extension educators can help decision-makers incorporate report information into the planning process.

Finally, the Extension educator can work with local government staff (e.g., planning staff) in doing an impact study on a critical issue facing the community. By using this self-help approach, the community can save money relative to hiring an outside consultant. This approach also affords more opportunities for education and training than a consulting firm usually does. In addition, there is a good possibility that there will be continual contact over the years between the Extension staff and the local community on further use of the data and models developed.

One of the Extension's main objectives should be upgrading the abilities of local staff and citizens for addressing questions concerning economic development. The first step is to convince staff and citizens that training in impact analysis is a worthwhile investment of time. Perhaps the time most conducive to proving the value of this investment is when the community is facing an important decision or when it is confronting the effects of someone else's decision. The teachable moment with respect to capturing interest in the impact analysis process is when a knotty problem is perceived, and group decision-making at the local level is required. If the Extension educator can impress upon the community the benefits to be reaped from impact analysis, then he or she can assume one or more of the roles outlined.

Modes of Delivery

Assuming a community decides to proceed with an impact analysis, it will need to determine the appropriate impact model. The Extension educator can assist the community as it evaluates various models against the following selection criteria: (1) the simplicity, or complexity, of the model, (2) the cost of delivery, (3) the need for special equipment, and (4) the time required for an answer.

Simple models and delivery methods may be preferred over complicated models and methods. However, a community should not overlook the possibility that a simple model may not yield the detailed information necessary to solve the problem.

Low-cost models and methods of delivery may also be attractive to a community, for obvious reasons. But costlier models may be necessary to evaluate all facets of the problem.

Models that do not require special equipment, such as computer terminals, may be preferred to those that do. However, computers may allow for a more comprehensive analysis and may shorten the time required to answer the community's questions.

The time available can be an important consideration when conducting an impact analysis. If a community must reach a decision by the end of a public meeting, the amount of detail involved in the impact analysis will be

limited. Obviously, analyses needing more detailed information, which is necessary for solutions to complicated problems, require longer lead times.

Computers are commonly thought of as the only mode for performing an impact analysis, but other, noncomputerized modes are available as well. The complexity of the problem and the amount of time and money available will dictate the type of impact model and the mode of analysis chosen.

Forms and Worksheets

Some analyses may not require any equipment other than a worksheet or decision form to trace through the logical consequences of the impact. Because calculations are done by hand, this method is primarily suited to tracing impacts in situations where there are relatively few variables to be considered and a minimum number of linkages. This method is particularly useful for introducing clientele to impact analysis and the many steps and assumptions entailed in calculating the impact estimates.

Hand Calculations

Recently, Extension staffs in a few states have been designing impact models suitable for solving on a hand calculator. The availability of low-cost programmable calculators now makes it is possible to work with impact models somewhat more complex than can be handled without the aid of a calculator, but at a level of complexity below that which can be provided through a computer terminal. Multiple memories allow for storing a limited number of coefficients and model parameters. Work sheets need to be carefully designed to ensure that the steps required by the calculator program are followed.

Computers: Batch Mode

A growth impact model can be programmed in the computer for use in batch mode. Each user of the model would complete an input form which would detail the specific characteristics of the community he wished to study as well as outline the policy alternatives a community is contemplating. Information on the input form is then keypunched, the computer job submitted, and the analysis returned to the user within a few hours or days. With this approach users can assess the impacts of each policy alternative. The batch mode allows the community to use a very comprehensive impact model, which yields a lengthy and detailed analysis.

Data for models requiring calculations in the batch mode can be collected through mail surveys, personal interviews, or phone interviews. With either method, Extension educators will probably play an intermediary role, making arrangements for computer analysis. While local decision makers might be required to travel some distance from their home communities, a two- or three-day workshop would force the decision-makers to concentrate on the social and economic relationships governing the growth or decline of their communities. In all applications, this mode requires a well designed input form and, in most cases, Extension personnel who are knowledgeable about the capabilities of the model.

Computers: Interactive Mode

A growth impact model might be made available to clientele through computers operating in an interactive mode. A computer can be programmed to request specific information from the local decision-maker without a person trained with computers performing an intermediary role. The interactive mode allows the computer to come to the decision-maker rather than the decision-maker to the computer. Early interactive computer systems were often quite limited in processing, input, and output capabilities. Recent advances in interactive programs now allow users to run impact models that are nearly as sophisticated as those that can operate in batch mode. These advances have reduced processing costs and new computer terminals allow output to be printed at four to six times the speed of their forerunners. The interactive mode is perhaps the showiest method of impact model delivery, and will almost invariably get decision-makers interested in impact analysis. It is also the most costly method in terms of model design and preparation time.

A Combination of Delivery Methods

No single impact model or delivery method will serve all the needs of Extension. Each model and delivery method has its proponents and detractors. Development is expected to continue for each method of delivery, since the complexity of the issues addressed and the time and resources available for impact analysis will vary among communities. At the same time, calculators capable of solving more complex impact analysis problems are quite inexpensive and the methodology for working with impact analysis on a hand calculator is progressing rapidly. The impact model operating in batch mode allows for models with very complex interrelationships. The batch workshop forces decision makers to focus on these interrelationships. The interactive mode is attention getting, and recent advances in computer technology allow for the solving of models nearly as sophisticated as those that can be solved in batch mode.

COOPERATIVE EXTENSION PROGRAMS UWEX

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