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With-Without Perspectives in Growth Impact Models

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CONTENTS

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WITH-WITHOUT PERSPECTIVES IN GROWTH IMPACT MODELS[1]

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INTRODUCTION

Since 1973 economic growth impact models have been developed in six states following the model used by Shaffer and Tweeten in Oklahoma.[3] The impacts on income and local government can be defined as the difference in the outcomes *with* the growth being considered compared to the outcomes that would occur *without* this growth. Conceptually, the with-without comparison is so obvious that it seems unnecessary to discuss it at length. However, the operational application of this concept to *ex ante*[4] impact studies is more difficult than the conceptual distinction. None of the six *ex ante* applications of Shaffer's model fully incorporates a with-without perspective. Generally they incorporate the less accurate, but more manageable, before-after comparison.

In this circular the differences between before-after comparisons and with-without comparisons are examined, and the importance of using the latter is illustrated. The discussion then focuses on four aspects of impact models requiring a with-without comparison: 1) public expenditures under excess capacity conditions, 2) the geographic distribution of labor, 3) state aid to education, and 4) inducement policies. Alternative empirical procedures for incorporating a with-without perspective are discussed for handling population trends, excess capacity in public services, and the effectiveness of local inducement policies.

WITH-WITHOUT OR BEFORE-AFTER

Benefits, costs, and impacts are all defined in a with-without context. Benefits of a local policy to encourage growth reflect the value of the policy's consequences *with* the proposed policy minus the value of the consequences achieved *without* the policy. Similarly, costs of the local growth policy reflect the value of all goods and services, interest on capital expenditures, and induced costs for expanded governmental services used with the establishment and operation of the policy less the level of such costs in the absence of the policy.

The public sector consequences in most economic growth impact models include changes in revenues and expenditures rather than benefits and costs. While there is considerable overlap in the concepts, they are distinctly different.[5] As with benefit-cost analysis, revenue-expenditure studies should examine the changes in local revenues and expenditures *with* the proposed policy compared to the levels *without* the policy.

In *ex post* studies, the before-after approach compares the level of a characteristic at two points in time and assumes that the difference is due to the project or policy being studied. *Ex ante,* the before-after approach, projects changes in employment, income, or other variables using the current level as the base. Occasionally a with-without comparison yields the same results as a before-after analysis. However, frequently these two approaches will produce different results. The difference results from changes in underlying economic or social conditions over time.[6] The impacts of such trends are inappropriately ignored if the project under consideration is viewed from a before-after perspective.

With-without considerations are particularly important if the period of analysis covers more than a few years. If only a very short time period such as 1 to 3 years is considered, it is likely that the with-without and before-after comparisons will be similar. However, underlying changes in economic and social conditions over a 15 or 20-year period may create considerable divergence in these two types of analysis.

One of the policy uses of growth impact models is to examine the effect on revenues and expenditures for local units of government considering the use of tax abatements or other types of local inducement policies. In Ohio, these abatements may run up to 15 years. An analysis of only the first year ignores the fiscal gap which may develop from inflation in local

[1]Prepared for the North Central Interest Network on **Ex Ante** Growth Impact Models, Columbus, Ohio, March 6-7, 1979. Helpful comments were received on an earlier draft from Edward Ives, Leroy Hushak, John D. Gerard, Glen Pulver, Fred Hitzhusen, and Francis Walker.

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[3]The six states are Wisconsin, Indiana, South Dakota, Texas, Florida, and Ohio. These models are described respectively by Shaffer and Tweeten (32); Darling (5); Morse, Bateman, and Taurer (25); Jones (18); Clayton and Whittington (3); and Morse and Gerard (24). These models have examined the impacts of new jobs on local income and local government revenues and expenditures. Neither technological externalities (**e. g.,** water and air pollution) and fiscal impacts on state and federal governments have been examined in these models. Several important with-without issues are related to these types of impacts. However, discussion of these issues is beyond the scope of this paper.

[4]**Ex ante** implies the model is used to estimate the impacts prior to rather than after growth actually occurs.

[5]Burchell and Listokin (1) describe the difference between cost-benefit, revenue-expenditure, and cost effectiveness analysis.

[6]For further discussion of the difference between these two approaches, see Haveman and Weisbrod (15) and Regan and Weitzell (29).

government expenses and Ohio's freeze on property tax revenues. To judge the merits of a proposed abatement requires an analysis over a 10 to 20-year period, during which the effects of inflation may become quite significant.[7] However, as soon as the impacts are considered over a longer period of time, it is necessary to incorporate the with-without analysis to handle underlying trends.

Now the discussion focuses on the four areas in impact models needing the with-without comparisons.

ASPECTS OF GROWTH IMPACT MODELS REQUIRING WITH-WITHOUT COMPARISONS

With-without comparisons are particularly important in several aspects of *ex ante* economic growth impact models. These include the estimation of: 1) changes in expenditures for public services with current or projected excess capacity, 2) changes in income tax revenues related to the geographic distribution of labor, 3) changes in state aid to education, and 4) the impacts of inducement policies. Unfortunately, these aspects are difficult ones to use explicit and realistic with-without comparisons. Each will now be explored.

Demands on Local Public Services

Previous research on local public services has assumed that if a plant employs only local people, this will place no additional demands on local services.[8] Conversely, it has been assumed that no additional tax revenue comes from housing or income taxes. This approach ignores the impacts of employees who would have migrated out of the area but instead remain to take a job at the plant.

[7]Examples of 15 and 20-year decision periods are found in Gordon and Darling (11), Morse and Hushak (23), Shaffer and Tweeten (32), and Tweeten and Brinkman (34).

[8]In a few studies the demand is adjusted for increasing incomes of local residents. Empirically, this impact has been very small and is ignored here.

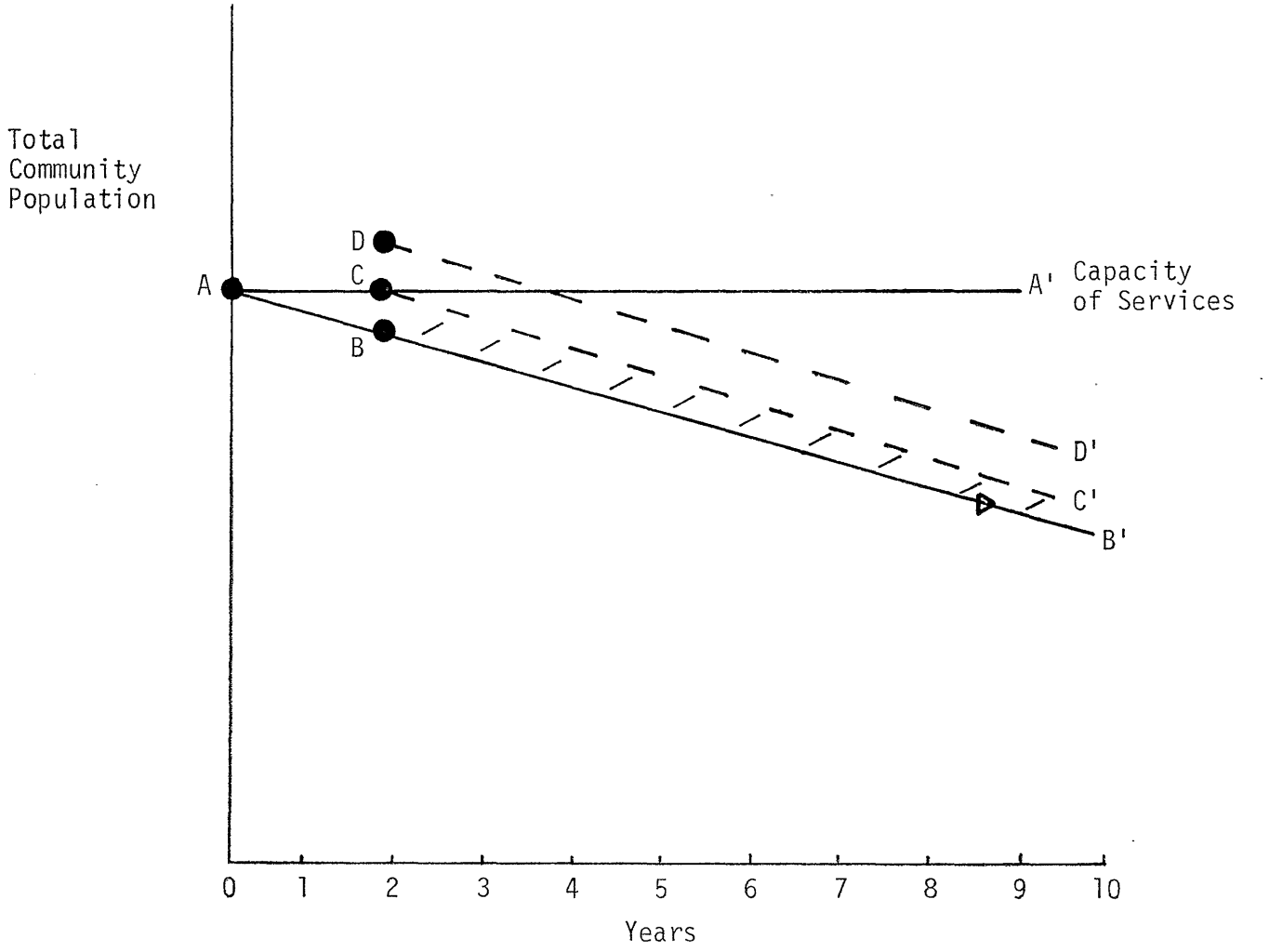

FIG. 1.—With-without comparisons of community service demands and capacity.

Figure 1 provides a graphic illustration of this point. Line BB' shows the projected population without the firm. Line DD' shows the projected population with the firm. At year 2 a new plant opens and hires new workers. Some of these employees are persons who would have moved to other areas if the jobs had not become available. These employees and their families are shown by line CC' minus line BB'. In addition, some employees migrate into the area. This is shown by adding CD to the population.[9]

Now Figure 1 will be used to show demand curves for public services rather than population. Assume that the community services were operating at full capacity at the starting point; *i.e.,* at point A. This assumption says that the community services were just adequate to provide the "desired" level of service for all local residents before any changes in population. If the plant does not locate in the community, there is excess capacity equivalent to AA' minus BB'. With a new plant, additional capacity would be required for the first few years, or else a reduction in service quality would be experienced. Eventually the capacity of the service AA' exceeds the demand DD'. The local residents retained in the community *with* the addition of a plant would add to the operational expenditures for these services as compared to the *without* situation.

A before-after analysis would incorrectly project the population impact of the plant to be the difference between DD' and CC'. If the underlying decline in population (BB') was also ignored, then the before-after analysis would conclude that additional service capacity is needed throughout the time period.

Figure 1 illustrates retention of local persons when a community is experiencing population decline. However, the same phenomenon occurs when the projected population is constant; *i.e.,* a situation where gross out-migration and deaths are just balancing gross in-migration and births. Likewise, even an area with projected increases in population experiences gross out-migration and gross in-migration. In both cases, a new plant will not only increase the in-migration stream, but also reduce the out-migration stream.[10]

Excess capacity in a public service also requires a with-without rather than a before-after approach. The difference between these two approaches can be illustrated by examining school enrollments. For example, consider the impacts on school enrollments and expenditures of a firm whose in-migrant employees add 100 new children to the district's elementary school. Table 1 shows the elementary school enrollment in three hypothetical districts prior to such a firm moving to the area. Before (or without) this change, all three districts had 1,000 students. District A is expected to remain at this level over the next 10 years. District B is expected to lose 300 students by the tenth year while District C is projected to gain 300 students during this period.

TABLE 1.—Elementary School Enrollments Without the New Firm Being Studied.

	Year			
District	1	2	5	10
District A	1000	1000	1000	1000
District B	1000	900	800	700
District C	1000	1050	1100	1300

In each district, how many of the 100 new students coming into the area should be counted as an impact of the new plant? And how can expenditures be expected to change? How will current or future excess capacity affect expenditures?

One perspective is that the 100 additional students in the district *after* the addition of the plant will require 100 more spaces than *before* this addition regardless of the enrollment base. This straightforward before and after approach needs to be explored more carefully before reasonable expenditure predictions can be made.

Assume that each of the three school districts had student enrollment capacity of 1,100 students given its present physical facility. District A has excess capacity of 100 students and would require no additional capital expenditures now or during the next 10 years to handle the growth from the new firm.[11] District B would also not need any additional capital expenditures.

In District C, however, the excess capacity will only be 50 students by year 2. Further, the physical facilities will be completely utilized by the fifth year due to the community's projected growth *without* the new plant.

As this simple example shows, the additional capital cost related to the firm hinges on the projected growth in the district *without* the firm. In districts currently with excess capacity and expectations of steady or declining enrollments, no additional capital expenditures need be included. In districts expecting

[9]Two other categories of workers are ignored in this illustration, commuters and local persons who would not have moved out of the region without the plant. The omission does not affect the results. For this simple example, a one-time addition to the labor force is composed of BC and CD plus the commuters and local non-movers. Consequently, the decline in population after year 2 is at the same rate with and without the new plant.

[10]Muller (27) provides a discussion of ways to estimate the private employment impacts and their residential distribution. He does not include a discussion of the impact of potential out-migrants.

[11]There are very difficult questions involved in estimating the exact enrollment capacity of schools. The age distribution of a cohort of new students would influence the actual excess capacity. This discussion abstracts from these issues since this would seldom be known **ex ante.**

growth, current excess capacity may not exist in a few years and increases in enrollment due to the growth policies will require additional capital expenditures, or at least speed the necessity of such expenditures.

The human resources of a school also have capacity limits which may affect additional expenditures. For illustrative purposes, assume that each of the three school districts in Table 1 also had teaching and support staff capable of handling 1,100 students at the starting point. Would the same analysis hold as with the capital expenditures? The answer appears to depend on how schools A and B adjust their excess capacity. If they retain all of the teaching staff over the entire period, then the same analysis applies here as with capital expenditures. But this reaction implies a reduction in the pupil-teacher ratio and thus higher per pupil costs.

At the other extreme, schools might attempt to maintain a standard pupil-teacher ratio and consequently reduce the teaching staff. If they react in this fashion, then the excess capacity in human resources essentially will disappear. This suggests that the marginal labor cost per pupil is likely to be about the same for all of these districts.[12]

Income Tax Revenues and State Aid to Education

In the example shown in Figure 1, local governments collecting income tax revenue will receive additional revenue from all BD employees rather than simply from CD employees. Likewise, the population base for state aid to education depends on the BB' population rather than the CC' level. Here, as above, the with-without perspective is significantly superior to the before-after perspective.

Inducement Policies

Inducement policies have been gaining in popularity as growth in the manufacturing sector has slowed. These policies include tax abatement programs, extension of utilities at less than full cost, and sale of industrial sites at subsidized rates. Growth impact models offer local governments an opportunity to examine the expected changes in revenues and expenditures from the use of these inducement policies. To use an impact model in this fashion requires knowledge of whether or not the firm will locate in the area without any type of inducement. Obviously if it will locate in the area anyway, such local costs are unnecessary. However, the key problem facing local officials is that they usually have no way of accurately determining the probability that the inducement will make a difference in the firm's location decision. Several options for handling this problem are discussed in the next section of the paper.

[12]Economies or diseconomies of scale may influence the per pupil costs and should not be ignored. The question being dealt with here is primarily determination of the starting point for the analysis.

ALTERNATIVE ESTIMATION PROCEDURES

With-without comparisons must consider three important types of empirical issues: 1) population and school enrollment trends without the development, 2) the measurement of public service excess or deficient capacity, and 3) the effectiveness of locational inducement policies such as tax abatements or industrial parks.

Items 1 and 2 deal with existing demographic and service conditions and trends. With-without analysis of these issues differs from the treatment needed for item 3. For items 1 and 2, attention must be focused on the value for the demographic or service level variables without the anticipated growth. That is, will the base population or enrollment decline or increase without the anticipated growth? If it is declining, will this trend result in less population in future years even if the development being examined occurs? These questions must be answered to judge the extent of excess capacity in services and the need for additional capital expenditures.

In contrast, the third item considers the effectiveness of local actions in attracting new firms or encouraging existing ones to expand. The key question is the degree to which a policy leads to new jobs in the locality.

All three types of issues may need to be considered in a given problem. This section reviews the alternative empirical approaches for dealing with these issues.

Population and School Enrollment Trends

Previous work on fiscal impacts has not considered these trends. Programs are available to project the population of minor civil divisions up to 50 years (14). In this paper no assessment is made of the advantages and disadvantages of these models vs. more informal approaches. At least the analyst should examine past population and enrollment trends in the area and seek available projections or opinions on future trends. If there appears to be considerable doubt or difference of opinion, alternative base projections could be used to examine the sensitivity of the results.

Excess Capacity

Excess capacity in schools and other public services presents another set of empirical problems.[13] As the example in the first section illustrates, these are closely related to changes in population and student enrollment.

This section evaluates four empirical approaches for estimating school expenditures when there is excess capacity: 1) per capita multipliers, 2) case study esti-

[13]Cassels (2) points out some of the difficulties of formulating a quantitatively exact definition of excess capacity for private firms which may prove helpful in the public sector.

mates, 3) engineering-economic estimates, and 4) service standard estimates. Similar approaches can be applied to other public services.

The *per capita multiplier* approach simply derives additional costs as the product of the number of new students and the per capita operational and capital costs. Even if there is no excess capacity, the per capita capital expenditures may not reflect future costs. For example, what time period is used to derive the estimate? If there has been no recent expansion, this will underestimate the future costs. Inflation or excess capacity may bias results. The amount of excess capacity may change over time due to underlying population trends.

A *case study approach* has been recommended by Burchell and Listokin (1) when there is excess capacity. They define excess capacity as "capacity beyond that needed to accommodate the existing service or target population at current public service levels" (p. 433). To operationally determine excess capacity, they recommend asking local officials to identify the "desired" service level. The amount by which the current level exceeds (falls short of) the desired level is the amount of excess (deficient) capacity.

Judging the accuracy of the public official response is the central problem with this approach. Political budgetary concerns can easily become part of the considerations. Muller (28) suggests that the case study approach frequently underestimates required increases in expenses. A case study in southeastern Ohio found both under and over-estimates of expenditure impacts depending on the political aggressiveness of the local officials (21).[14]

An *economic-engineering approach* appears more satisfactory than either the per capita multiplier or the nebulous case study approaches if excess capacity exists. Mackey (19) has suggested a relatively simple procedure that might prove useful in growth impact models. The average square footage per student is simply multiplied by the average construction cost and then amortized to an annual charge. It will be illustrated using the example in Table 1.

Recall that Districts A and B have excess capacity throughout the 10 years while District C has excess capacity during years 1 and 2. In the first year District C has the same level of excess capacity as A and B sufficient to absorb the 100 new students. In the second year only 50 students can be absorbed and the other 50 would add $1,686 each or $84,300.[15] By the fifth year the growth in District C, without the development being studied, would completely remove excess capacity and the additional costs to the district would be $168,600.

This example illustrates the importance of making with-without estimates rather than simply before-after estimates. If a before-after estimate had been made, it is conceivable that the excess capacity at the start would have led to the assumption that there were no additional costs for capital expenses, or perhaps no additional costs for either capital or instructional expenses.

While the economic-engineering analysis can be conducted in more depth, the time and data may become prohibitive.[16]

Service standards may also prove useful in an economic engineering approach. The above example assumes a capacity level of 1,100 students for both capital facilities and human resources. But how would the current capacity be determined without the problems inherent in the case study approach? The service standards suggested by Burchell and Listokin (1, pp. 67-95) provide a means of setting the capacity levels.[17]

In summary, it appears best to use a combination of several approaches. Initially, examine service criteria to estimate approximate capacity. Check this against the opinions of local officials about excess or deficient capacity. Also ask for opinions on local trends of population and enrollment. Using service standards, possibly adjusted to the locality, estimate expenditures with a simple engineering-economics approach.

Local Inducement Policies

Economic growth impact models can be used to assess the impacts of an individual firm or to evaluate local inducement policies; *e.g.,* tax abatements or industrial parks.[18] In either case the model needs data on changes in employment, income, real property, tangible personal property, and corporate incomes.[19] Before initiating the analysis it is essential to determine whether the focus is on an individual firm without any inducement or on the impacts of an inducement policy when applied to various firms.

If the impacts of inducement policies are to be studied, information is needed on the effectiveness of

[14] In one service the department head allocated expenditures to correct current deficiencies to the new department. The rationale for this was that if current manpower was inadequate, additional growth could only be permitted by removing all of the current deficiencies.

[15] The current expenditures per pupil ($1,388) are from Digest of Educational Statistics (13, p. 78). The capital expenditures ($298) are computed by assuming that each student requires 90 square feet and that the average cost per square foot is $34, and then amortizing this at 9% over 30 years (19, pp. 17-19).

[16] The possibilities of integrating partial budgeting approaches similar to those described in Doeksen and Schmidt (7) need to be explored in more depth.

[17] Burchell and Listokin do not discuss this use of the standards.

[18] The fiscal impacts of local policies on rural subdivisions have been studied by Weber, Youmans, and Harrington (36). This is the only research found that clearly uses a with-without approach to examine local policies.

[19] The models discussed here are similar to Shaffer's (31, 32).

TABLE 2.—Maximum Investment by Local Governments in an Industrial Park.*

Year Firm Locates	City	County	Total City and County
1	$116,373	$69,415	$185,788
5	69,816	25,648	95,464
10	35,087	3,781	38,868
20	3,556	0	3,556

Source: Computed using the Ohio Economic Growth Impact Model (24).

*The maximum investment is the present value of the net gains to each unit of government over the next 20 years. These results are based on the typical machine tool firm (SIC 3542).

inducement policies in attracting firms. Research on industrial parks and tax abatements is now examined for use in this model.

Industrial parks are frequently advocated as a means of attracting new firms. The benefits depend on how rapidly the park is filled.

Table 2 illustrates the importance of time on an industrial park investment decision. The present value of the net gains to the city of Athens of a typical machine tool firm locating in the first year after the investment is $116,373. If this firm did not locate until the fifth year, the present value of the benefits (at 9% discount) is only $69,816.

For the county the maximum investment justified if the machine tool firm located in the park immediately is $69,415. This rapidly declines to $25,648 if it takes 5 years to secure this plant.[20] This suggests that communities should hold investments in industrial parks to a minimum until the probability of attracting firms is favorable.

However, practitioners in industrial locations claim that there are increasing pressures to have fully developed sites. The reduced growth in manufacturing gives firms a competitive advantage in dealing with communities. This suggests the need for developing parks earlier.

To measure the benefits and costs of industrial park development, information is needed on their effectiveness in attracting new firms. Research on this question is now reviewed.

Opinion surveys of firm management can suggest the relative importance of various inducements in firms' location decisions, but this type of research has not provided information on quantitative relationships between location and inducements (17, 26). Regression analysis has been used to examine the relationship of taxes, public services, and other factors to employment growth and income.

Research on the specific impact of industrial parks, the availability of sewer and water lines in the industrial park, the availability of speculative buildings, and tax abatements is very scarce. Several studies have used the change in manufacturing employment or income in a county as the dependent variable (9, 35).

The probabilities of attracting one or more plants and the effects of alternative local policies on the probabilities have been reported by Smith, Deaton, and Kelch (33). Industrial site quality and ownership were reported to increase the probability of attracting manufacturing plants to Kentucky or Tennessee nonmetropolitan communities. This research comes close to providing the type of information needed. If it is possible to disaggregate this approach to at least the two-digit SIC level, then better estimates could be made on the expected changes in employment, income, and capital levels.

Without this disaggregation, only the probability of attracting a manufacturing firm can be predicted. This will only allow the estimation of the changes associated with the "average" manufacturing plant, averaging over 18 two-digit SICs. Since these studies only provide information on the changes in the entire manufacturing sector, it is not possible to derive reasonable estimates of the concomitant changes in real estate property, equipment, inventories, and corporate income.

Hitzhusen and Gray (16) have explored the impact of industrial parks on primary employment and wages. Using regression analysis, they explored the impact of several park characteristics and controlled for several community and geographic location characteristics.[21] These results were applied to a 20-acre industrial park in Athens, Ohio, giving predicted increases of 62 jobs and $597,400 wage income annually.[22] While this research comes the closest to meeting the needs of the growth impact models, it does not contain information on changes in real estate, equipment, inventories, and corporation profits.

Unfortunately none of the current research provides sufficient detail for the impact simulations. If the Smith, Deaton, and Kelch (33) work was extended to a two or three-digit SIC level, the impact of typical firms in each SIC could be determined. If the Hitzhusen and Gray study (16) was broadened to include real estate, equipment, inventory, and corporate profits, this could be used directly for examining the impacts of industrial parks.

[20] This example is based on a specific plant but could be repeated for other industries or for an "average" firm.

[21] In this study the direction of causation was assumed to run from parks to jobs and income. Possibly these are determined simultaneously. For example, investors may be more willing to develop parks in communities with recent records of employment growth. If so, the Hitzhusen and Gray results (16) over-estimate the actual impact of the industrial development parks.

[22] Since the smallest park was 8 acres, setting the park size at zero stretches the use of this data.

TABLE 3.—Estimates of Additional Revenues from Route 56 Annexation, Athens, Ohio, 1978.

Source	Existing Firms	Planned Expansions	Potential Firm A	Potential Firm B	Potential New Homes	Total
Property Taxes	$ 4,828	$ 370	$1,058	$ 128	$ 227	$ 6,611
Municipal Income Tax	21,175	1,124	2,100	834	1,000	26,233
Water Fees	9,378	46	322	235	1,350	11,331
Sewer Fees	7,802	37	206	156	918	9,119
	$43,183	$1,577	$3,686	$1,353	$3,495	$53,294

Source: Morse (22).

Even if these modifications were made, one additional concern remains. Will the results from 1970-73 hold in 1979-81 or later years? Or will the national trend of reduction in the growth of manufacturing change these relationships?

A final approach, called the *typical firm approach,* reports the impacts of the typical firm in industries which might locate in the park. Park sponsors or local planners, utility company representatives, and state development agency personnel are asked to suggest the types of firms they believe are most likely to locate in the park. Given the type of firm, secondary data on employment, profits, etc, can be used to analyze the impacts of a typical firm (10).

Table 3 illustrates one manner of reporting such results which the author recently used (22). Estimates for planned expansions are based on data from existing manufacturers in this area. The procedure described above was used to identify potential new firms and number of new homes. The authors used some *ad hoc* screening of the suggestions but did not conduct feasibility studies.[23] Reporting the impacts of each type of firm separately allows local decision makers to use their own judgment about the effectiveness of the inducement. The most optimistic view would accept a projection of $53,294 annually, while the most pessimistic view would only accept an additional $43,183.

Tax Abatements

Research on the location impacts of tax abatements appears even less conclusive than the work on industrial location. In a recent review of state and local fiscal incentives, Cornia *et al.* (4) confirmed the conclusions of an earlier review by John F. Due (8):

> "On the basis of all available studies, it is obvious that relatively high business tax levels do not have the disastrous effects often claimed for them . . . However, without doubt, in some instances the tax element plays the deciding role in determining the optimum location, since other factors balance. This is most likely to be the case in the selection of the precise site in a metropolitan area."

Morgan and Hackbart (20) used sensitivity analysis to examine the impacts of tax exemption programs. Since no data were available on the proportion of the investment induced by the tax abatements, they assumed levels of 1, 5, and 10%. The results of the benefit-cost analysis were then reported for each level.

A simple way of reporting the impacts of tax abatement when there is uncertainty is illustrated in Table 4. The results show the impact of a firm on three local goals (*i.e.,* the fiscal soundness of the city, county, and school district) of three community policies under two alternative firm decisions.[24] Column 1 shows the impacts of a community policy to provide no tax abatements. If the firm has taken decision I, *i.e.,* to locate with or without the inducement, the city and county have net gains with the present value of $116,373 and $69,415, respectively. The school district has a net loss of $29,845. However, if the firm has chosen decision II, no local benefits or losses would accrue.

The only community goals shown are net revenues (*i.e.,* additional revenues minus additional expenditures due to the firm) for the city, county, and school. Obviously others could be included such as the number of new jobs, the increased aggregate income, the increased incomes to low income groups, or the minimization of pollution.

A 5-year tax abatement reduces the present value of the benefits if the firm selects decision I. But if the firm selects decision II there are no positive impacts on the community.

Under a 10-year tax abatement, the impacts on the community are identical for both firm decisions I and II.

Since the estimated impacts range from 0 to $119,569 for the city, how do city officials decide on

[23]For example, the typical firm in one of the industries initially suggested required 860 acres of land and the park only had 9 acres available. This firm was eliminated.

[24]This manner of presentation was suggested by Glen Pulver, although in a more general format.

TABLE 4.—Present Value of Net Gains to the City, County, and School of a Machine Tool Firm.*†

Firm Decision		Community Inducements: None (without) (1)	Tax Abatement (with) 5 years (2)	Tax Abatement (with) 10 years (3)
Decision I:				
Locate with or without inducements	City	$199,569	$118,277	$117,338
	County	100,701	97,732	95,962
	Schools	—47,654	—48,418	—47,873
Decision II:				
Locate only with inducement of	City	0	0	$117,338
10 years or more	County	0	0	95,962
	Schools	0	0	—47,873

Source: Calculated for Athens County, Ohio, using the Ohio Economic Growth Impact Model.
*The typical firm in the machine tool industry employs 130 persons and pays an average annual wage of $12,726.
†The present value is computed at a 9% discount rate over 20 years.

the appropriate policy? A cautious approach is to provide the 10-year abatement. In this case the city has positive impacts under both firm decisions.

A second way to handle this situation is to vary the probabilities depending on available information or subjective judgments. For example, if the city leaders assume that there is a 90% chance that the firm would locate without the tax break, the expected net gain to the city without the tax abatement is $107,613 as compared to $117,338 with the 10-year abatement. Since this is lower than the gain with the abatement, the abatement policy is obviously advantageous. For the county, if the probability that the firm would locate without a tax abatement falls below 95%, then abatement policy becomes advantageous.

FURTHER RESEARCH NEEDS

Seven areas need additional research to facilitate the use of a with-without perspective in economic growth impact models.

1. Specific inducement policies such as speculative buildings, extension of water and sewer lines, and existence of industrial parks need to be investigated in more depth. The approaches taken by Smith, Deaton, and Kelch (33) and Hitzhusen and Gray (16) provide promising examples. The former needs to be disaggregated to a two or three-digit SIC and the latter needs to examine changes in real estate, equipment, and corporate profits.

2. Location factors and the role of inducements for non-manufacturing need additional work. The service sector includes many basic industries when considered from a local perspective. Since manufacturing growth is slowing while services are expanding, it seems reasonable to look at this area more intensively.

3. Tax abatements have received little attention at the intrametropolitan level. There appears to be general agreement that it is only at this level that they are likely to influence location decisions.[25] The approach used by Fox (9) should be extended to intraregional effects in rural areas.

4. Conceptual and operational definitions are needed for excess capacity in public services. This is particularly important for elementary and secondary schools since they utilize the major share of local expenditures. Reactions of schools to declining enrollments need to be better understood to assess excess capacity.

5. Existing research on migration needs to be explored to see if it can adequately describe the existing trends in population without the development being studied.

6. Procedures are needed for projecting the geographic distribution of labor.[26]

7. Technological externalities and fiscal spillovers need to be incorporated into these models.

CONCLUSIONS

Ex ante economic growth impact models are frequently used on local policy issues. The consequences of these policies must be compared *with* the policy and *without* it. This with-without comparison is frequently replaced by an incorrect before-after comparison. While these are occasionally the same, they yield different results if there are underlying economic or social conditions changing over time.

[25]This is a zero-sum game on which economists frown. Maybe this explains the lack of research on this issue. However, communities appear to be using this approach more commonly as the competition for firms increases.
[26]Some suggestions are provided by Muller (27).

With-without comparisons are particularly important when examining the impacts of inducement policies, changes in expenditures for public services with current or projected excess capacity, changes in income tax revenues related to the geographic distribution of labor, and changes in state aid to education.

Alternative estimation procedures are not well developed. Previous research has ignored this aspect of growth impact models. To incorporate a with-without perspective, the analyst needs data on population and school enrollment trends, excess capacity in public services, and the effectiveness of locational inducement policies. Several procedures for generating this data are described. Currently, however, the state of the art is too incomplete to allow accurate with-without estimates. Honesty and practicality require that alternative assumptions be used in many situations. In the long run, additional research may provide the knowledge base necessary to reduce dependence on this approach. In the short run, careful use of the economic growth impact models may help local decision makers understand their policy options and the range of impacts. Also in the short run, widespread use of these models through the Extension Service may create greater awareness and support for the additional basic research required.

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Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 502 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Appalachian Experimental Watershed, Coshocton, Coshocton County: 1047 acres (Cooperative with Science and Education Administration/Agricultural Research, U. S. Dept. of Agriculture)

Northwestern Branch, Hoytville, Wood County: 247 acres

Pomerene Forest Laboratory, Coshocton County: 227 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Fremont, Sandusky County: 105 acres

Western Branch, South Charleston, Clark County: 428 acres