THE ECONOMICS OF COMMUNITY GROWTH: AN IMPACT MODEL

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Rapidly rising public sector costs are at issue in a great many communities. Quite often blame has been placed on recent development. This has caused communities to become wary of growth that might result in costs greater than benefits received.

A model is described in this paper that permits ex ante evaluation of the economic effects of community growth. The paper begins with a brief discussion of community growth and previous impact modeling efforts. The Economic Growth Impact Model is then presented. This is followed by a description of the package within which the model is incorporated. Finally, an application of the model is highlighted.

COMMUNITY GROWTH DEFINED

A definition of community growth is needed at the outset. The popular perception would assign it a physical context—increased numbers of residents or employees, more new homes or businesses, and so forth. An economic definition is possible, too, based on increases in such measures as personal income, net surplus or deficit in the public sector, regional income and value added by manufacturing.

For the model under development, community growth is defined in physical terms as changed employment and resident population. Its impact is evaluated in economic terms as the net dollar effect on private and public sectors. Private sector impacts are specified in terms of both business sales and employee income.

COMMUNITY GROWTH THEORY

Residential development generally occurs in a community as a result of expansion in its economic base [13]. The economic base is simply defined as consisting of those industries that export their goods and services outside the community. Basic industry thereby brings in the local income necessary to generate additional commercial, residential and service industry development.

Basic industry may thus be looked upon as the prime mover behind community growth. This not to say, however, that residential growth can occur only as a result of industrial expansion—Florida's "retirement industry" is a notable case in which residential growth occurs autonomously through expenditure of personal savings and government transfer payments. Commercial development, moreover, may actually assume the form of a primary industry if its sales are to customers outside the community, as in the case of tourism.

Total growth in a community thus consists of the employment and resident population effects of primary industry growth, service industry expansion, primary or indirect commercial development and primary or indirect residential development.

PREVIOUS STUDIES

As discussed in Schaenman and Muller [9], a number of measures are possible for gauging impacts of land development and community growth. Broadly

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categorized these include local economic activity, quality of natural environment, aesthetics and cultural values, quality of public and private services and housing and social conditions.

Impact on the local economy is of primary interest in this paper. Community growth induced by industrial, commercial or residential development may be expected to have economic impacts on both public and private sectors. Fiscal impact analysis focuses on effects that growth has on the public sector. A general approach to fiscal impact analysis is provided by Muller [8]. Recent case studies [7, 11, 14] employ a more detailed accounting procedure.

Economic impact analysis broadens the perspective of fiscal analysis to include the private sector. Several attempts at modeling the local economic impact of development are notable [1, 5, 10, 12]. Some of these models are too complex, however, in terms of input and output requirements and user expertise to be readily adaptable as educational tools for use with citizens and decision-makers. Many others are simplified or restricted to the point that they provide less information than desired. Unfortunately, an economic impact model is not presently available that combines adequate detail with ease of application. Such a model should accommodate any size community. It should also incorporate user-access and reporting capabilities that maximize its usefulness to planners and decision-makers.

THE ECONOMIC GROWTH IMPACT MODEL

An economic impact model that builds on previous efforts is described in this section. It is designed to assist those who must deal with community growth questions. The model has application for growth that occurs as either industrial, residential or commercial development.

The model provides a general representation of the economic structure of a community that can be subjected to change and evaluated with reference to impacts. It relies primarily on input/output relationships for the private sector and revenue/expenditure data for public school district sectors. While it is recognized that such a modeling approach cannot yield the specificity of impacts that, for example, an econometric model might provide, results obtained are sufficiently detailed to be extremely useful. A major benefit is the model's general applicability and the fact that it does not require re-estimation for each study area.

The model estimates a two-dimensional array of impacts. On the one hand, impacts are identified according to their economic sector, including (1) private sector, (2) public sector and (3) school district. A second dimension involves the spatial location or political unit within which impacts occur. Spatial boundaries are specified according to (1) city, (2) county, (3) region[1] and (4) school district. Economic impacts are said to occur in the private and public sectors of the city, county and region. The school district serves as both an economic sector and a political unit.

Model Structure

The Economic Growth Impact Model is structured as four modules. The first is demographic in nature. It computes employment and resident population effects of a particular development—basic operatives within the model. Housing needs and school enrollment are also determined. The computational logic of this module is depicted in Figure 1.

Annual dollar impact on the private sector is estimated within the second module. Included as private sector effects are direct and indirect industry sales, employee income and sales and employee income resulting from final consumer demand. As depicted in Figure 2, regional effects are computed through input-output multipliers; city impacts are derived according to propensity to consume and local income multipliers; and county private effects may be calculated using either of these approaches. Additionally, short-term impacts, likely during a construction phase, are identified separately from the more permanent effects.

Public sector impacts for city and county, exclusive of schools, are evaluated in the third module, as outlined in Figure 3. Major revenues, including ad valorem property tax receipts resulting from community growth are computed. Changes in operating expenditures for an array of services plus incremental capital outlay are likewise estimated. The resulting net annual surplus or deficit is calculated and its effect on property tax millage is determined.

In the fourth module, school district impacts are identified. Computational logic is nearly identical to that of Figure 3. Changes in annual revenue occur in terms of property taxes and various state and federal aid distributions. Changes in annual expenditures are computed on the assumption that excess capacity exists within the school system. Provision is made, however, to include extraordinary capital outlay at the user's discretion if appropriate data are provided.

[1] In development of the model, regions have been specified as coincidental with Florida's multicounty planning districts. The model is adaptable to any regional definition, however, if appropriate default data are provided.

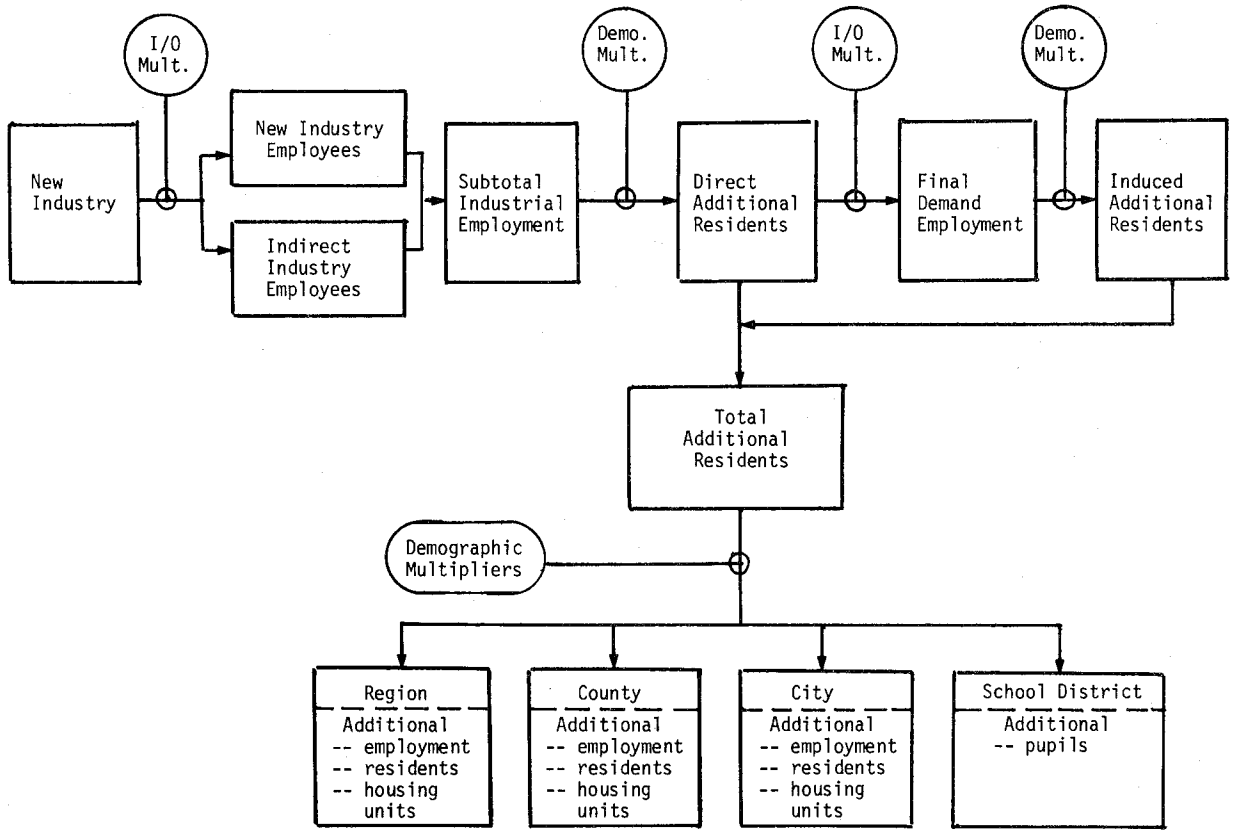

FIGURE 1. DEMOGRAPHIC MODULE, ECONOMIC GROWTH IMPACT MODEL

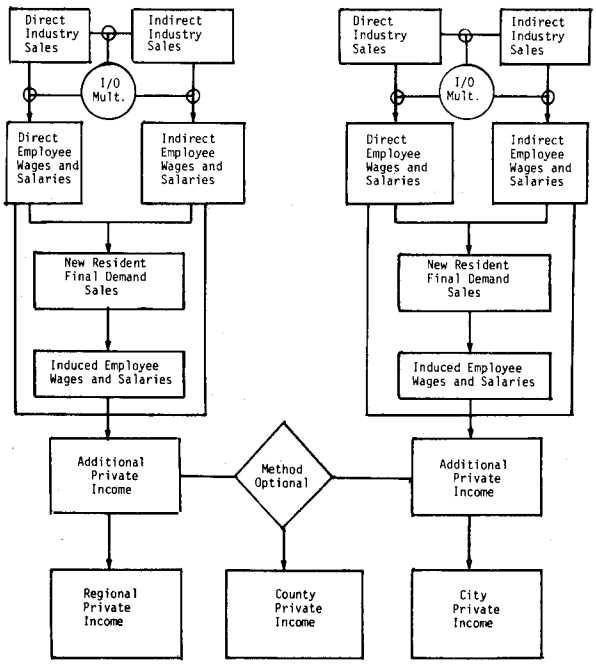

FIGURE 2. PRIVATE SECTOR MODULE, ECONOMIC GROWTH IMPACT MODEL

The net effect of new development is determined and its impact on property tax millage is calculated.

The Modeling Package

The Economic Growth Impact Model is packaged for use on an IBM 370 computer according to the approach put forth by Candler, *et. al.* [2]. Included in this package are an input booklet, the model, a report-writer and a default data set.

The concept of "input by exception" [2, p. 75] is employed with default values available for all but a basic data set. As user-supplied data are provided, default values are automatically overridden. In this way, added complexity is built into the model without necessitating burdensome data input from users. Of course, it is always possible to customize an application with specific local data.

The input booklet serves to describe the model's various data requirements, display available default values, and provide space for user-supplied data entries. Default and user-provided data are then merged within the model, giving rise to estimated growth impacts in private, public and school district sectors. The report-writer organizes and presents this information in report form.

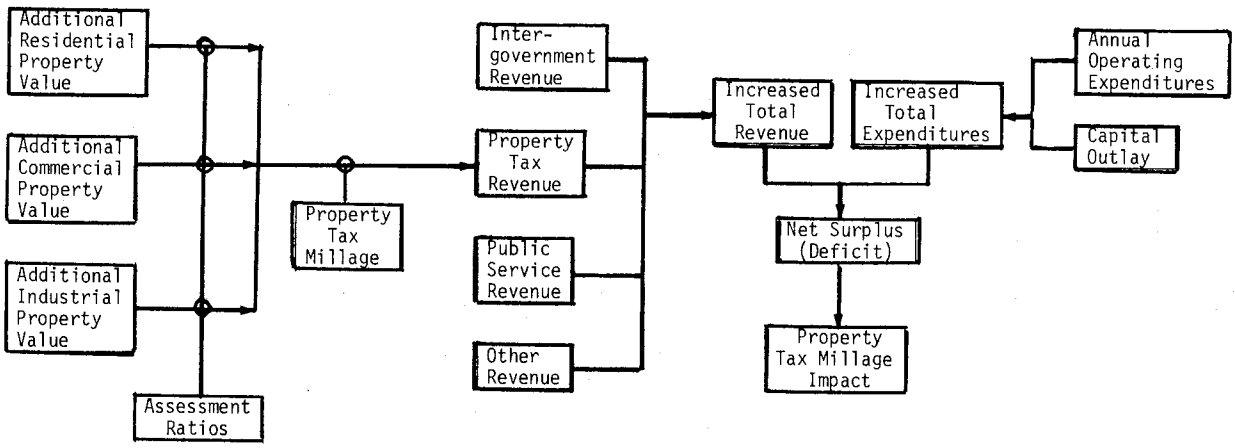

FIGURE 3. PUBLIC SECTOR MODULE, ECONOMIC GROWTH IMPACT MODEL

Default Values

Default values are provided wherever possible for parameters included in the Economic Growth Impact Model.[2] Of particular interest are revenue and expenditure data for cities and counties. Average per capita values have been computed for thirteen city and nine county size-groupings using 1973-74 comptroller data for the state of Florida. Using this same data, annualized capital outlay functions have been estimated for cities and counties.[3] School district revenues and expenditures have been computed as per pupil coefficients for nine district size-groupings. For the private sector, finally, multipliers have been derived through a series of input-output analyses for all counties and regions (multicounty planning districts) in the state of Florida.[4]

AN APPLICATION

An electronics equipment manufacturer is planning to locate a plant at Gainesville, Florida. Total value of the plant is set at $1 million with an anticipated 250 employees to be hired at an annual salary of $10,000. Annual sales for the plant are projected to be $7.5 million. Current population is 71,376 with an additional 53,759 persons in surrounding Alachua County. The Alachua County School District has 22,835 pupils enrolled.

Operating costs and revenues for city and county governments are taken from available default data. Capital outlay for the public sector is computed using estimated outlay cost functions. Private sector multipliers are those included in the default set of the modeling package. For the city, a propensity to

[2]Default data, as computed for the model, pertain to Florida. It is highly unlikely these data would be valid for use in other states. Application of the model in these latter instances could be handled in either of two ways: (1) default data could be overridden with user-supplied data or (2) new default data could be prepared and substituted for that in the model.

[3]Annual capital outlay functions based on cross-section data for Florida cities and counties, 1973-74, have been estimated as follows:

for cities

$$\ln CO^{ci} = 2.190 + 1.148 \ln POP \qquad \bar{R}^2 = 74.9$$
$$(0.037)$$

and for counties

$$\ln CO^{co} = 5.669 + 0.794 \ln POP + 0.001\ POPX \qquad \bar{R}^2 = 90.1$$
$$(0.061) \qquad (0.004)$$

where

CO^{ci} = annual capital outlay for cities
CO^{co} = annual capital outlay for counties
POP = population
POPX = population/1000
( ) = standard error
$\bar{R}^2$ = multiple correlation coefficient, adjusted for degrees of freedom.

[4]Industrial mix between counties was sufficiently dissimilar to warrant separate estimation of multipliers. It would be possible to use some type of grouped multiplier data in the model, although some modification to the computer routine might be necessary.

consume locally of 50 percent is assumed along with a local income multiplier of 1.60. School district costs and revenues used in the analysis are also default values. Excess capacity is known to exist in the school system.

Results

Various impacts the electronics plant would have on the city of Gainesville, surrounding Alachua County, the north central Florida region, and the Alachua County School District are summarized in Tables 1-4.[5]

Table 1 provides an overview of demographic impacts. Employment of 250 persons at the electronics plant would, in turn, mean increased additional employment of 101, 178 and 198 persons, respectively, in city, county and regional businesses. Total resident population would increase by 240 in the city, 834 in the county and 972 in the region. Housing requirements would increase and likewise school enrollment would grow by 378 pupils.

Private sector impacts are reported in Table 2. Permanent annual industry sales are found to increase by $12.7 million, $12.1 million and $10.1 million, respectively, in the region, county and city. As industry expansion and residential construction occur in the short-run, additional sales of $6.3 million, $4.3 million and $2.4 million would be expected.

Permanent employee income would be anticipated to amount annually to $5.1 million, $5.0 million and $4.3 million above existing levels in region, county and city. Over the short term, wages and salaries would be expected to increase an additional $1.9 million in the region, $1.3 million in the county and $1.0 million in the city.

In Table 3, public sector impacts of the electronics plant are summarized. The city of Gainesville is shown to benefit only slightly by presence of the plant. City revenue would increase by some $88,000 but would be nearly offset by increased expenditures. The existing property tax millage for the city would remain basically the same if all property is charged equally. If the new development is taxed alone to cover its impact, a somewhat lower rate of $7.61 per

TABLE 1. ECONOMIC GROWTH IMPACT ANALYSIS: DEMOGRAPHIC IMPACTS, ELECTRONICS PLANT, GAINESVILLE, FLORIDA

	Demographic Impact			
	City	County	Region	Public School District
Employment				
Direct	250	250	250	--
Indirect	52	92	99	--
Induced (permanent)	49	86	99	--
Total (permanent)	351	428	448	--
Induced (short-term)	21	125	176	--
Total (short-term)	372	553	624	--
Residents				
Net Employees	134	298	347	--
Total	240	834	972	--
Housing Units	35	248	297	--
Public School Enrollment	--	--	--	378

TABLE 2. ECONOMIC GROWTH IMPACT ANALYSIS: PRIVATE SECTOR IMPACTS, ELECTRONICS PLANT, GAINESVILLE, FLORIDA

	Annual Economic Impact		
	City	County	Region
	($)		
Industry Sales			
Direct	7,500,000	7,500,000	7,500,000
Indirect	1,528,800	2,730,000	3,045,750
Induced (permanent)	1,054,717	1,883,424	2,208,960
Total (permanent)	10,083,517	12,113,424	12,754,710
Induced (short-term)	2,430,476	4,340,136	6,263,547
Total (short-term)	12,513,993	16,453,560	19,018,257
Employee Income			
Direct	3,231,750	3,231,750	3,231,750
Indirect	658,913	1,103,319	1,116,892
Induced	400,792	632,224	741,312
Total (permanent)	4,291,455	4,967,293	5,089,954
Induced (short-term)	1,020,799	1,272,684	1,856,300
Total (short-term)	5,312,254	6,239,997	6,946,254

TABLE 3. ECONOMIC GROWTH IMPACT ANALYSIS: PUBLIC SECTOR IMPACTS, ELECTRONICS PLANT, GAINESVILLE, FLORIDA

	Annual Economic Impact	
	City	County
	($)	
Revenue	88,921	143,848
Expenditures		
Operating	75,451	71,831
Capital Outlay	12,766	24,399
Total	88,217	96,170
Net Surplus (Deficit)	704	47,170
Property Tax Millage*		
Existing Rate	8.00	10.40
All Property Impact Rate	7.998	10.31
New Development Only Rate	7.61	1.84

*Per $1000 assessed valuation.

[5] Space limitations permit only a summary of the model's output in Tables 1-4.

$1000 of assessed valuation would result.

The county government, in contrast, would realize an annual net surplus of nearly $48,000. Property tax millage, if new development alone were charged, would amount to only $1.84 per $1000 of assessed valuation. The difference between city and county impacts is due primarily to a difference in property tax receipts. With up to eighty percent of all industry located in the county, expansions occurring as a result of the electronics plant tend to benefit the county to a greater extent than the city.

Table 4 provides information on school district impacts. As reported, revenues and expenditures essentially offset each other. Property tax millage would decrease slightly for the new development if it alone were charged according to its impact.

The overall annual local impact (city, county and school district) of the electronics plant can be summarized as follows:

Private Sector		
Industry Sales	$12,113,424	
Employee Income		$4,967,293
Public Sector	48,382	48,382
School District	4,432	4,432
	$12,166,238	$5,020,107

A net increase in community income of $5.1 million (or $12.2 million) can thus be expected if this particular type of community growth occurs.

TABLE 4. ECONOMIC GROWTH IMPACT ANALYSIS: SCHOOL DISTRICT IMPACTS, ELECTRONICS PLANT, GAINESVILLE, FLORIDA

	Annual Economic Impact ($)
Revenue	288,881
Expenditures	284,457
Net Surplus (Deficit)	4,432
Property Tax Millage*	
Existing Rate	10.00
All Property Impact Rate	9.99
New Development Only Rate	9.21

*Per $1000 assessed valuation.

CONCLUSIONS

It has been possible to present only a brief overview of the Economic Growth Impact Model. However, the type of model developed and its user-orientation should be apparent.[6]

Applications of the Economic Growth Impact Model may take several forms. The example presented in this paper demonstrates a straight-forward application, relying heavily on default data. It would also be possible to utilize actual local data for all parameters Once an initial assessment is completed, moreover, various sensitivities may be tested. Such factors as assessment ratio, tax rate, and propensity to consume are typical of parameters that can be adjusted and evaluated in terms of their impact.

Perhaps the greatest value of the Economic Growth Impact Model is its capacity for quick analysis of the complicated economic implications of alternative community growth options. Its use by planners and decision-makers should contribute to development of communities in a manner that enhances the quality of life.

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[6] Accuracy of the Economic Growth Impact Model, particularly as it relates to other modeling approaches, appears to be quite good. An econometric model being estimated for the study area has yielded results strikingly similar to those reported in this paper.

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