THE IMPACT OF NEW INDUSTRY ON COUNTY GOVERNMENT PROPERTY TAX REVENUE

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The attraction of new industry is an ongoing concern for most local officials. Generally, local officials are aware of the private sector benefits of new jobs and income. Attention is beginning to be paid to secondary private sector impacts such as the effect of new industry on local wage rates and the problems associated with in-migration of labor to fill new jobs. Borts and Stein (Chapter 9) give a theoretical discussion of these issues.

In addition researchers and policy makers are interested in the development of models that estimate the impact of new industry on local government expenditures and revenues. Many computerized versions of local fiscal impact models are reviewed in a recently published text (Burchell and Listokin, pp. 345-59). The popularity of these models is understandable because of the potential benefits to be derived from accurate forecasts of local fiscal impact. For example, a community can determine the magnitude of a tax incentive it can offer to industry and still maintain a positive fiscal impact for local government. Zoning laws can be written to encourage land use patterns that will be efficient from the public sector's perspective if the public expenditures and public revenues associated with alternative land use patterns can be predicted. Finally, local areas may be able to demonstrate to state government that a large-scale industrial project will benefit the fiscal position of the state but be a burden to the local fiscal balance.

The development of fiscal impact models during the past 15 years since the work of Lowenstein and Hirsch has followed two basic lines. First, the economic models used have continued to range from simple economic base to primary input-output models. However, the demographic sector is clearly recognized in the more recent models (see Clayton; Hertsgaard et al.). These models are becoming more complex as they integrate economic, demographic, and residential location components. The need for this additional complexity is apparent from a policy maker's perspective. A municipal or county decision maker is concerned with the fiscal impact of new industry on his or her community, not the regional (multicounty) impacts. Thus, the economic-demographic impact must be allocated to the local area of interest to decision makers.

Second, fiscal impact models have become more sophisticated in the specification of the marginal costs of public service delivery. Use of per capita local expenditures is being replaced by engineering-economic studies and behavioral models that measure marginal expenditures. (See Borcherding and Deacon for a behavioral model and Chalmers and Anderson for examples of engineering-economic analysis.)

However, the fiscal impact models do not appear to have the same emphasis on refinement of the tax revenue side of the fiscal impact question. For property taxes, a common procedure is to make a judgment (usually on current per capita values) of the change in the value of the local property tax base. Per capita values of the current property tax base are used with estimates of the additional population associated with the new industry to estimate the secondary additions to the local property tax base.[1] The primary addition to the local property tax base is determined from the firm's estimate of the capital value of the new plant or equipment. Finally, local assessment ratios and millage rates are applied to the additional property tax base for the estimation of property tax revenues associated with the new industry (Burchell and Listokin, pp. 179-81).

Two sets of problems are involved in this per capita approach. One set of problems arise from the use of current average tax base effects when marginal or "new" average effects would be more appropriate. The second set of problems stem from the use of the current tax rate.

The secondary tax base effects of new industry depend on a variety of factors, some of which are wage levels paid by the new industry, local versus inmigrant labor requirements, and interindustry effects. Generally, one would expect high wage rates and low import requirements to result in large secondary tax base effects. In addition, if new industry induced inmigration rather than utilizing available labor,

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[1]Secondary additions to the property tax base include residential and commercial property, automobiles, farm land, and other components of the property tax base aside from the value of the new plant itself.

the secondary tax base effects would be large. Conversely, new industry that pays low wages, has large import requirements, and uses local labor would have relatively low secondary tax base effects.

These generalizations about secondary tax base effects require conceptual and expirical testing. However, in this article we address the set of problems related to use of the current tax rate and therefore proceed as though secondary additions to the property tax base can be accurately estimated. Accordingly, the new industry impact on the property tax base is the sum of the value of the plant and equipment of the new firm (primary addition) and the secondary addition resulting from increased employment and income in the region.

If one now proceeds to estimate new property tax revenue with current assessment and millage rates, several problems will be encountered. When the local property tax base grows, local government may respond by lowering tax rates to generate the desired level of tax revenues (Penniman). The desired level of tax revenues is the critical variable in the subsequent decision about the local tax rate. The tax revenue decision depends on the desired mix between public and private goods as perceived by local governmental units. Consequently, use of current tax rates to estimate property tax revenue from new industry oversimplifies the tax estimation problem.

The purpose of this article is to develop an alternative framework for analyzing the property tax impact of new industry.

THE MODEL

The model treats tax-expenditure behavior of the local public sector as a problem of maximizing community welfare subject to a budget constraint (Gramlich). The objective in formulating the model is to develop an equation for estimating the impact of new industry on local property tax rates.

We start by defining the community welfare function in equation 1.

(1) $U = U(Y,E,C)$

where

U = community welfare
Y = personal income of the community
E = local government operating expenditure
C = local government capital expenditure and
$\partial U/\partial Y > 0$; $\partial U/\partial E > 0$; $\partial U/\partial C > 0$

The budget constraint is formed by noting that operating expenditures and capital expenditures must equal the total of local taxes, intergovernmental transfers, and local borrowing as shown in equation 2.

(2) $E + C = G + T + BR + GRS + SSR$

where

G = grants-in-aid
T = local taxes
BR = local borrowing for capital improvement
GRS = federal general revenue sharing funds
SSR = state revenue shared with local government

The Gramlich approach treats the local government budget process as one whereby local preferences are expressed for public service (via E and C) and for after tax income (Y−T). In addition, the budget constraint (equation 2) requires that local revenues equal local expenditure. By using the standard Lagrangian maximization formulation and selecting a utility function that corresponds to the Gramlich model, one can form equation 3.

Inman (1979, pp. 274-5) notes two major advantages of this approach in comparison with ad hoc approaches. "First, the potential role of Federal and Fiscal policy variables can be clearly stipulated and specific hypotheses as to their effects on local choices can be tested. Second, because of legal requirements for a balanced budget, the between service effects of service-specific policies can be explicitly incorporated into the analysis through the models imposed budget constraint."

The following constrained utility function can be formed with the usual public and private good arguments (Gramlich, p. 164).

(3)
$$\begin{aligned} U = {} & a_1 (E-\alpha G-\beta SSR-(1-\beta)SSR-GRS)-\frac{a2}{2} \\ & (E-\alpha G-\beta SSR-(1-\beta)SSR-GRS)^2 + a_2\alpha G - \\ & \frac{a4}{2}\alpha^2 G^2 + a_5\beta SSR - \frac{a6}{2}\beta^2 SSR^2 + \\ & a_7(1-\beta)SSR - \frac{a8}{2}(1-\beta)^2 SSR^2 + a_9 GRS - \\ & \frac{a10^2}{2} GRS^2 + a_{11}(Y-T) - \frac{a12}{2}(Y-T)^2 + a_{13} \\ & (C-BR) - \frac{a14}{2}(C-BR)^2 + \\ & \lambda(E+C-G-BR-T-GRS-SSR) \end{aligned}$$

with the following parameter interpretations.

a_1, a_2 — the addition to community welfare associated with a unit increase in local expenditure from own local sources.[2] Note that G, GRS, and SSR are all nonlocal revenues and

[1]Note that each variable's influence on the utility level, by the nature of this utility function, is one where marginal utility of additional expenditures or income first rises, then falls. Thus, diminishing marginal utility of additional local expenditures is assumed after some level.

E is total local expenditures. Thus the difference is financed by local sources of revenue.

a_3, a_4 — reflect the influence of matched grants-in-aid on the community welfare where α is the legal matching ratio of local and federal funds.

a_5, a_6 — represent the impact of state-mandated expenditures financed by SSR transfers on the community welfare where β represents the share of SSR transfers that is tied to mandated functions.

a_7, a_8 — represent the additional utility from local spending financed by state-shared revenues not dedicated to some local function.

a_9, a_{10} — represent the utility of increments of GRS-financed expenditures by local government.

a_{11}, a_{12} — reflect the utility of increments of local private expenditures on community welfare with the (Y−T) term measuring after tax income, a proxy for private expenditures.

a_{13}, a_{14} — represent the additional utility from local government construction outlays net of current borrowing. The (C−BR) term implies that local areas "suffer increasing marginal disutility, the higher borrowing is relative to their current construction (capital) outlays. The planning horizon for construction periods is longer than one period and they can be considered as predetermined for the moment" (Gramlich, p. 164).

λ is the Langrangian multiplier.

There is ample reason to believe that these parameters will differ in value. First, local decision makers and their constituents are likely to place higher values on the a_1 parameter than the a_3, a_5, a_7, or a_9 parameters because a more immediate sacrifice is apparent in raising own-source revenues than in financing local expenditures either partially with other funds (i.e., matching grant) or totally with other funds (GRS or SSR).[3]

Second, the a_{11} and a_{12} parameters are expected to be different from the others because they reflect the influence of private expenditures rather than public expenditures on community welfare. Finally, a_{13} is likely to differ from the others in that it reflects both past and current decisions to provide public capital for current and future residents of the community.

If the levels of C, G, Y, SSR, and GRS are *given* to the local community, the utility problem reduces to the maximization of the constrained function with respect to the local policy variables, E, T, and BR.

(4) $$\partial U/\partial E = a_1 + a_2(E - \alpha G - \beta SSR - (1-\beta)SSR - GRS) + \lambda = 0$$

$$\partial U/\partial BR = a_{13} + a_{14}(C - BR) - \lambda = 0$$

$$\partial U/\partial T = a_{11} + a_{12}\, Y - T) - \lambda = 0$$

$$\partial U/\partial \lambda = E + C - G - B - T - GRS - SSR = 0$$

This system of equations can now be solved for two structural equations for local taxes, T, and local expenditures, E.

(5) $$E = b_0 + b_1 G + b_2 T + b_3 GRS = b_4 SSR$$

(6) $$T = c_0 + c_1 Y + c_2 [E - G - GRS - SSR]$$

By substitution, the reduced form equations are found.

(7) $$\bar{\bar{T}} = \pi_1 + \pi_{11} Y + \pi_{12} G + \pi_{13}\, GRS + \pi_{14}\, SSR$$

(8) $$\bar{\bar{E}} = \pi_2 + \pi_{21} Y + \pi_{22} G + \pi_{23}\, GRS + \pi_{24}\, SSR$$

Equation 7 can be estimated by using ordinary least squares although structural equation 6 is unidentified. If our only objective is to forecast local property taxes, we need not be concerned with estimating these structural parameters. However, our purpose is to evaluate the impact of new industry on local property taxes. Accordingly, we consider that equation 7 indicates the relevant explanatory variables for property tax variation and now turn our attention to local property tax variation in response to new industry.

Property Tax Identity

Local property taxes can be defined to equal the product of the market value of the property (B), the assessment ratio (A), and the millage rate (M). The effective tax rate = AM = RATE.

(9) $$T = A \times B \times M$$

The A and M variables are the policy tools available to local decision makers in their determination of tax rates. These local policy variables are influenced by changes in Y, GRS, SSR, and G as suggested by equation 7. GRS, SSR, and G tend to serve as substitutes for A or M (Penniman).[4] Higher per capita income indicates an increase in demand for public goods and thus in the property tax levies required to

[3]Of course, rational individuals are aware that GRS, GRANTS, and SSR are paid partially from their own state and federal taxes. However, the "partial" nature of these revenue sources for expenditures implies less sacrifice than "own taxes."

[4]Wilde (p. 87) describes a wide range of potential expenditure responses by local governments to intergovernmental transfers depending on the type of grant and type of model used to assess the impact of the grant.

provide them. In addition to the behavioral influences on the tax rate, the tax identity defines an inverse relationship between the tax base and rate. The variables that influence the local tax rate are summarized in equation 10.

$$(10)\quad \text{RATE} = F(\text{G, GRS, SSR, B, Y})$$

A property tax base equation could also be developed. However, our concern is to test for variations in property tax rates in response to changes in the exogenous variables in equation 10 while holding the tax base constant.

A criticism of many local government finance studies is the use of aggregated data of states and various local governmental units (Inman, p. 273). We avoid this problem by considering only county governments in South Carolina. However, even at this level there are some significant data problems. Chief among them in our study is the use of grant outlays data by county. These grant outlays represent a mixture of matching grants aid with ceilings, open-ended matching aid, and specific nonmatching aids. As noted by Wilde, these aid forms may have different impacts on local government fiscal behavior.

EMPIRICAL RESULTS

Using 1977 data for all 46 South Carolina county governments, we estimated rate equation 10 by ordinary least squares in double log form.[5]

Rate Equation

$$(11)\quad \log \text{RATE} = \underset{(-2.5)}{-2.26} + \underset{(2.5)}{.71} \log Y \underset{(-3.7)}{-1.37} \log \text{SSR} \underset{(-2.0)}{-0.15} \log \text{GRANTS} \underset{(-12.9)}{-0.90} \log \text{BASE/POP} + \underset{(10.8)}{0.90} \log \text{GRS}$$

where t-values are in parentheses ($R^2 = .90$; $F = 70.1$).

The parameter estimates of equation 11 yield interesting results. First, increases in the per capita tax base yield reductions in the tax rate as indicated by the negative and significant base coefficient, *ceteris paribus.* This outcome is expected from the property tax revenue identity. Second, as hypothesized, higher income results in higher tax rates, *ceteris paribus.* County tax rates are found to increase by .71 percent for a 1 percent increase in income.

Third, intergovernmental transfers to county governments in the form of grants and state-shared revenues are found to substitute for local tax rate increases because the negative coefficients of the GRANTS and SSR variables are statistically significant by the t-test criterion. The positive and significant GRS coefficient appears counterintuitive if GRS funds are a substitute for local tax rate increases. There are several possible explanations for this positive coefficient. First, GRS funds may be viewed as outside funds that are used for local public goods that would not otherwise be provided. This would imply a neutral relationship between the local tax rate and GRS transfers. However, because the GRS allocation formula is to some extent dependent on local tax efforts, this coefficient may indicate that local officials are aware of the incentive to increase the local tax effort in order to obtain increases in GRS allocations. Second, there may be a statistical simultaneity bias because of the relative tax effort factor in the GRS allocation formula for county government. Accordingly, equations can be formed to represent this simutaneous system. Equation 12 is identical to equation 10.

$$(12)\quad \text{RATE} = F(\text{B, SSR, GRS, GRANTS, Y})$$

$$(13)\quad \text{GRS} = G(\text{RATE, Y, Pop, SER, MAN, TRD})$$

where

SER = county employment in services
MAN = county employment in manufacturing
TRD = county employment in trade

Equation 13 is derived from the local factors that determine GRS allocations to county government.[6] The potential simultaneity bias can be eliminated by the following procedure. First, solve for the reduced form equations. Second, estimate the reduced form GRS values and substitute these values into equation 12. By this two-state least squares procedure, the following results are obtained.

$$(14)\quad \text{Log } \overline{\text{GRS}} = \underset{(1.5)}{5.6} \underset{(-1.7)}{-0.16} \log \text{MAN} + \underset{(.01)}{0.003} \log \text{TRD} + \underset{(.76)}{0.13} \log \text{SER} + \underset{(3.5)}{1.03} \log \text{POP} \underset{(-.81)}{-0.41} \log \text{Y/POP}$$

$$R^2 = .84 \qquad F = 42.2$$

$$(15)\quad \text{Log RATE} = \underset{(-2.4)}{-4.3} + \underset{(.29)}{0.13} \log \overline{\text{GRS}} + \underset{(.59)}{.09} \log \text{GRANT} \underset{(-1.69)}{-1.17} \log \text{SSR} + \underset{(1.90)}{1.04} \log Y \underset{(-6.92)}{-0.92} \log \text{BASE/POP}$$

$$R^2 = .65 \qquad F = 14.5$$

[5]Data sources: South Carolina Comptroller General, *Annual Report*, 1978. U. S. Office of General Revenue Sharing, *Tenth Period Entitlements and Data Element Listing for Local Areas; Federal Outlays in South Carolina, 1977.* Only county government functions were considered. Thus, school district and municipal taxes were not included.

[6]Total GRS allocations are based primarily on population, relative income, and local tax effort (Stolz, p. 38). The employment variables serve as a proxy for the local tax base and the RATE variable allows for variations in local tax effort.

The results of equation 15 indicate GRS simultaneity bias does exist and it alters individual parameter estimates. At the 10 percent level of significance, neither GRS nor GRANTS has a nonzero coefficient.[7] However, SSR, Y, and per capita base enter the equation with the expected signs and are statistically significant.

The following conclusion can be drawn from the empirical results. South Carolina local government property tax rates are influenced by variations in the tax base, intergovernmental transfers, and the demand for government services as expressed by county personal income. If the tax base and intergovernmental transfers are held constant, higher personal income levels result in higher tax rates. The relationship appears to be one of approximate unitary income elasticity. Alternatively, if the tax base, personal income, and other intergovernmental transfers are held constant, the local property tax rate is not significantly affected by GRS or GRANT revenues but is reduced by increases in SSR revenues.

Finally, the relationship between new industry and new local property tax revenues involves interdependencies between tax base, intergovernmental transfers, and tax rates. Fiscal impact analysts who predict the change in property tax revenues from new industry need to capture these interdependencies in their modeling efforts.

REFERENCES

Borcherding, T. and R. Deacon. "The Demand for the Services of Non-Federal Governments." *Amer. Econ. Rev.* 62(1972):891-901.

Borts, G. and J. Stein. *Economic Growth in a Free Market.* New York: McGraw-Hill, 1964.

Burchell, R. and D. Listokin. *The Fiscal Impact Handbook.* New Brunswick, N.J.: Rutgers University Press, 1978.

Chalmers, J. and E. Anderson. *Economic/Demographic Assessment Manual.* Tempe, Ariz.: Mountain West Research, Inc., 1977.

Clayton, K. *The Community Economic Growth Impact Model,* Department of Food and Resource Economics, University of Florida, 1979.

Ecker-Racz, L. *The Politics and Economics of State-Local Finance.* Englewood Cliffs, N.J.: Prentice-Hall, 1970.

Gramlich, E. "State and Local Governments and Their Budget Constraint." *Int. Econ. Rev.* 10(1969):163-81.

Hertsgaard, T., et al. *The REAP Economic-Demographic Model: Technical Description.* Bismarck, N.D.: North Dakota Regional Environmental Assessment Program, 1977.

Hirsch, W. F. "Fiscal Impact of Industrialization on Local Schools." *Rev. Econ. and Statist.* 41(1964):191-9.

Inman, R. "Fiscal Performance of Local Government" in *Current Issues in Urban Economics,* P. Mieszkowski and M. Straszem, eds. Baltimore: Johns Hopkins University Press, 1979.

Lowenstein, L. "The Impact of New Industry on the Fiscal Revenues and Expenditures of Suburban Communities." *Nat. Tax J.* 16(1963):113-36.

Penniman, C. "General Revenue Sharing and the Nonmetropolitan Small Community." *National Conference on Nonmetropolitan Community Services Research.* Washington, D.C.: Committees on Agriculture, Nutrition, and Forestry, U.S. Senate, July 1977.

Stolz, O. *Revenue Sharing: A Legal and Policy Analysis.* New York: Praeger Publishers, 1974.

Wilde, J. "Intergovernmental Revenues: Current Theoretical and Policy Issues." *National Conference on Nonmetropolitan Community Services Research.* Washington, D.C.: Committee on Agriculture, Nutrition and Forestry, U.S. Senate, July 1977.

[7] The "t"-values must be interpreted with care because they are valid only asymptotically in equation 15.