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CONCEPTUAL ISSUES AND AN ALTERNATIVE APPROACH
TO THE DETERMINATION OF PUBLIC EXPENDITURE LEVELS

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For over two decades researchers have attempted to econometrically estimate the variables that determine public expenditure levels. Most of these studies employ linear regression to estimate the relationship between per capita expenditure on a particular public function and socio-demographic and economic variables.

Since the purpose of many of these studies is to determine statistically significant relationships between per capita public spending and the socio-demographic variables, these studies are often, and appropriately, criticized for their lack of an underlying economic theory. However, the lack of adequate measures of either public sector output or the price of public output makes conventional empirical analysis of the demand and supply of public output difficult, if not impossible.

This paper will examine the implications of the lack of adequate measures of public sector output or prices on the analysis of demand for public output, and suggest an alternative approach to determining public expenditure levels. The conclusion is that the alternative approach suggested in this paper, i.e., the determination of public sector inputs and input price levels, is both operational and more useful in terms of explaining public expenditure patterns.

Conceptual Issues

In order to derive a demand curve for a private good, one assumes the maximization of a given utility function, i.e., changing the price of the good to determine the optimal quantities demanded of the good at different prices, assuming prices of other goods and income constant. In specifying a demand equation for estimation, one would use the quantity of the private good as the dependent variable. The independent variables might be the price of the good, the price of other goods that are substitutes and complements, income, and possibly some variables that would capture taste differences among consuming units for a cross section study, or taste changes over time in a time series study.

In order to obtain a measure of the quantity of the private good for the dependent variable in the demand equation, if the quantity itself is not available, or if the estimate is for a group of goods whose quantities are not measured in similar units, the usual procedure is to deflate total expenditure on the good(s) by the price(s) or by an index of the price(s) of the good(s). The remaining variation in the deflated expenditure variable is due to differences in quantities of the good(s).

This technique for estimating the demand for a private good would seem transferable to the estimation of the demand for a public good. In order to estimate the demand for a good, one must obtain some measure of either the quantity or price of the good. The problem of measuring the quantity of public goods has stymied all researchers who have considered it. In the absence of a measure of the quantity of a public good, one might deflate expenditures on a public good by the price or by an index of prices of the public good in order to obtain a measure of the variation in quantity useful for empirical work, as is often done in the estimation of the demand for a private good. This approach is not (yet) feasible, since there are no measures of the prices of public goods. Until recently, researchers have used an obvious and convenient method of analyzing the determinants of public expenditures. The approach is to regress per capita expenditures on the public good against socio-demographic and economic variables that could influence the choice of the amount of expenditures on the good.

Recent Estimates of Demand Elasticities

The problems associated with the measurement of public output and prices have, until recently, precluded the estimation of income and price elasticities of demand for public goods. Recent attempts by Borcherding and Deacon [4] and Bergstrom and Goodman [3] to estimate the determinants of public expenditures have proven more successful in terms of estimating these demand parameters. These studies estimate an equation with per capita public expenditures as the dependent variable and attempt to derive measures of the price of the public good. Borcherding and Deacon employ a utility maximization framework and estimate a demand function for the median preference holder in the community (they use state and local data aggregated to the state level). In addition, they assume public sector output is produced via the same Cobb-Douglas production function in all communities with labor and capital as inputs which are in perfectly elastic supply. They also assume that labor is immobile and capital is mobile among jurisdictions; these mobility assumptions imply that the price of capital will not vary among communities in their cross-section while the price of labor, i.e., the wage rate will vary among communities.

Since all the inputs are in perfectly elastic supply, public output is in perfectly elastic supply. Moreover, the price of a unit of the public good varies with the price of labor, since the unit price of output is a weighted sum of the prices of the two inputs and the price of capital is assumed not to vary. Therefore, the price of the output that Borcherding and Deacon use in their estimating equation is the wage rate. While this approach is useful, it is operative only under a rather restrictive assumption of efficient input use.

Bergstrom and Goodman also employ a community utility maximi-

zation procedure when the preference pattern of the median voter is presumed to be maximized. Their price measure of the public good is the tax price of the median voter multiplied by the unit price of the public good. However, in their regression equation, due to the lack of a measure of the price of a public good, they "must assume that prices of private goods and unit costs of public goods are the same in each community observed" [3, p. 283]. The results they obtain are cast in doubt by these restrictive assumptions on the prices of private and public goods.

While measures of the price of public output will make conventional demand analysis in the public sector feasible, the prospect of developing such a price index does not seem propitious. The analysis of the two studies cited above, while representing important developments in the study of the determination of public expenditure levels, is also inadequate, since the results are based on restrictive assumptions and omit important variables from the estimated demand equation due to inadequate measures for prices of public goods. Recent research on the demand for public employment and the determination of public sector wage rates is suggestive of an alternative approach to determining public expenditure levels.

An Alternative Approach

Public expenditure on any function (EXP) can be viewed as the sum of labor costs (LC) and non-labor costs (NLC) on that public function. In symbols:

$$EXP = LC + NLC \qquad (1)$$

Moreover labor costs can be represented as the product of the average total compensation of an employee (TC) and the number of employees (L). That is:

$$EXP = TC(L) + NLC \qquad (2)$$

From equation (2) the estimation of expenditure determinants can be accomplished via the estimation of the determination of average total compensation of an employee in the public sector and the demand for public sector employees.

Several studies have determined the wage rate for teachers, firefighters and policemen in the public sector [1; 5; 7; 8]. These studies have focused primarily on the estimation of the effects of union strength on the wages of public sector employees. In addition, two studies have estimated demand relationships for public sector employees in various public functions [6; 2]. Both of these studies employ an assumption of a stable and fixed input-output relationship between labor and output in the public sector. This fixed input-output assumption seems plausible, since there is probably little ability to substitute between labor and other

inputs in the delivery of public services. The approaches used in these studies for the determination of public wage and employment levels can then be used to estimate the total compensation and demand for public employees in equation (1) above. If the assumption of a fixed input-output relationship is maintained for public functions and non-labor inputs are in perfectly elastic supply, then the amount of non-labor expenditure per employee (NLC_L = B) is fixed and B is estimable directly from data on non-labor costs and employment. Once the number of employees is determined, the costs of non-labor can be estimated by the product of the non-labor cost per employee and the number of employees. Since NLC/L = B, equation (2) can be written:

$$EXP = (TC + B)L \qquad\qquad (3)$$

Each component on the right side of equation three can be estimated, and expenditures can be determined. In this type of analysis, the determinants of public expenditure will be those variables that determine public sector employment and compensation levels.

Conclusion

The estimated compensation and employment equations for each public function can be substituted into equation (2) to explain expenditures for that public function. The effect of variables that influence public compensation levels, such as public sector union strength, can be traced through this model to their effects on the level of public employment and on public expenditure levels.

In light of the recent increase in union strength, rising public sector wages, and increasing employment, the estimates of relative importance of each of these variables on increasing expenditure levels may prove invaluable as a policy tool in forecasting as well as explaining expenditure in the public sector.

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