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COPYCATTING: FISCAL POLICIES OF STATES AND THEIR NEIGHBORS

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ABSTRACT

This paper formalizes and tests the notion that state governments' expenditures depend on the spending of similarly situated states. We find that even after allowing for fixed state effects, year effects, and common random shocks between neighbors, as state government's level of per capita expenditure is positively and significantly affected by the expenditure levels of its neighbors. *Ceteris paribus*, a one dollar increase in a state's neighbors' expenditures increases its own expenditure by over 70 cents.

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"We do everything everyone else does."
—Arkansas State Senator Doug Brandon, describing his state's budgetary policies.[1]

1. INTRODUCTION

State and local governments consume a significant part of the economy's annual output, about 14 percent of GNP. In addition, there is considerable cross-sectional variation: in 1985, per capita direct expenditures ranged from $1,775 in Missouri to $4,166 in Wyoming.[2] An enormous amount of theoretical and empirical research has been devoted to explaining such differences. At this time, however, there is no consensus concerning the process that generates government spending decisions. Following the work of Black [1948], many investigators have found the median voter model to be a useful framework. However, a number of other candidates also have their advocates. The "Leviathan" model suggested by Brennan and Buchanan [1977], special interest group models (Mueller and Murrell [1986]), and general "political economy" models (Craig and Inman [1986]) are just a few that come to mind.[3]

When it comes to estimating the parameters of the various models, there is a striking similarity regardless of the underlying theoretical framework. In a generic estimating equation, a jurisdiction's spending depends on <u>its</u> income, <u>its</u> grants from other levels of government, and <u>its</u> demographic and/or

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[1]Applebome [1989, p. L267]

[2]Tax Foundation, Inc. [1988, p. 174].

[3]See Inman [1988] for a survey of various models of government expenditure determination.

political characteristics. Such differences in characteristics obviously need to be taken into account. However, this paper proposes that there is another important determinant of state and local government expenditures in the United States: the expenditures of neighboring governments.

Casual observation suggests that jurisdictions' spending levels do affect each other. When one state perceives that its spending levels are out of line with those of similarly situated states, this often leads to demands for change. For example, in April 1984 the governor of Texas called a special legislative session to consider a billion dollar increase in school expenditures. Part of the reason was that a few months earlier "...a study by the Federal Department of Education found that Texas ranked next to last among the states in the portion of income per capita spent on public education.... These and other indicators...spurred wide concern among Texans" (Reinhold [1984, p. 17]). Indeed, documents prepared for state legislators commonly focus on their state's spending in a given category relative to other states. Thus, a 1988 report for the New Jersey legislature noted that "Since 1976, New Jersey has ranked third or fourth nationally in per pupil expenditures" (Program for New Jersey Affairs [1988, p. 76]).

In this paper, we formalize and test the notion that a state's spending can depend on the spending of similarly situated states.[4] Instead of the somewhat awkward construction "similarly situated states", we will use the word "neighbors". It must be stressed, however, that <u>for our purposes, neighborliness does not necessarily connote geographic proximity</u>. States that are economically and demographically similar may have more effect on each

[4]There is also anecdotal evidence that changes in a state's tax structure are influenced by those of its neighbors. Because of the difficulties involved in characterizing state tax structures (see Feenberg and Rosen [1986]), we prefer to attack the relatively simpler expenditure issue.

other than two dissimilar states that happen to share a border. Citizens of New York, for example, might find comparisons to Illinois more relevant than those to Vermont.

Section 2 lays out our theoretical framework. We construct a simple model in which the optimizing level of expenditure by a state decision-maker is affected by the expenditure levels of that state's "neighbors." We discuss the empirical specification in section 3. Special attention is devoted to resolving the econometric problems that arise because various states' expenditure levels might be subject to common random shocks. The data, which consist of annual observations for the continental United States during the period 1970-1985, are described in section 4.

The results are presented in section 5. A major finding is that even after allowing for state individual effects, year effects, and correlated random shocks between neighbors, a state's level of per capita expenditure is positively and significantly affected by the expenditure levels of its neighbors. *Ceteris paribus*, a one dollar increase in a state's neighbors' expenditures increases its own expenditure by over 70 cents. We also analyze spending in specific categories such as education, and there too other states matter. Moreover, we find that failure to include neighbors' expenditures in the equation leads to substantially different estimated effects of other important explanatory variables such as federal grants and age structure of the population. In particular, failure to account for neighbor effects leads to a substantial upward bias in the estimate of a state's grants upon its expenditures. Section 6 concludes with a brief summary.

2. THEORETICAL CONSIDERATIONS

There are many reasons why one might expect the expenditures of one state to affect the fiscal policies of other states. In this section, we outline several possibilities that build upon traditional models of public expenditure determination.

In simple normative models of government choice, governments concerned with their citizens' well-being choose expenditure levels that equate the sum of individual marginal benefits from public services to their marginal costs.[5] Assume, for example, that all consumers in a state are identical, taxes are lump-sum, and that only one type of public good is provided by the government. Then the utility level of the (representative) consumer in state i can be expressed as:

$$V^i = V^i[Y^i - T^i, G^i] \tag{2.1}$$

where Y^i is per capita income in state i, T^i is the (lump-sum) tax burden of each consumer, and G^i is the level of public services provided. The price of private goods is the numeraire. If public services are measured in per-consumer cost units, budget balance requires:

$$T^i \geq G^i \tag{2.2}$$

Now, define $p_g{}^i$ as the consumer's marginal willingness to pay for public goods, $p_g{}^i = \partial V^i(\cdot)/\partial G^i \,/\, \partial V^i(\cdot)/\partial(Y^i - T^i)$. Then if the state government seeks to maximize consumer satisfaction (2.1), subject to the budget constraint (2.2), the first-order condition is the familiar $p_g{}^i = 1$: at the margin, the

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[5] See Samuelson [1954]. This description abstracts from benefit spillovers between communities and other potentially important phenomena.

consumer's willingness to pay for the public good just equals the resource cost of providing it.

Note that in this model, a state's expenditure level does not respond directly to changes in the expenditures of its neighbors. Just as in the empirical models discussed above, a state's expenditures are determined entirely by variables relating to that state. However, we will show that with a more complicated political or economic environment, expenditure interdependence becomes a distinct possibility. Suppose, for example, that government decision-makers have tastes for controlling large "empires" as reflected in the size of G. (See Brennan and Buchanan [1977].) What holds the potentially avaricious budget appetites of government decision-makers in check? One mechanism that may limit state governments' abilities to misallocate resources is political voice. Hirschman [1970] observes that voice can be an effective method of forcing powerful entities to respond to consumers or voters. Voice takes obvious forms in struggles over subnational fiscal policies: dissatisfied citizens can (and do) complain publicly about their elected officials, they can vote for opposition candidates, and can contribute time and money to opposition election campaigns.[6]

Citizens may not, however, know _when_ to complain. It is hard to establish _de novo_ that any particular tax and spending package is wasteful. After all, it is very hard to measure the true flow of value from government-

[6] Another possible response to governmental inefficiency is exit. (See Tiebout [1956].) However, the Tiebout hypothesis assumes interjurisdictional movement to be costless, an unlikely condition to be met by population movement between _states_. The evidence suggests that such movement is rather uncommon. In 1985, only 8.7 percent of Americans lived in a different state than they did five years earlier. (U.S. Bureau of the Census [1986, p.25].) There is little evidence that a significant fraction of this migration is driven by differences in state and local fiscal policies. Another reason for preferring the voice approach is that, as a framework for econometric analysis, an exit model has a major drawback. If people shift in response to fiscal policies, then the economic and demographic characteristics of the states become endogenous, and the model is not identified.

provided services. In our model, citizens look to other states in order to evaluate the performance of their own legislators. In particular, suppose that consumers compare their current utilities to the utility levels they would obtain if they lived in neighboring states. Suppose further that legislators worry about the consequences of adverse political voice if they offer their citizens a fiscal package worse than one obtainable in a neighboring state. A possible objective function for such a government decision-maker[7] is:

$$\Psi^i = V^i(\cdot) + \gamma_1 G^i - (\gamma_2/2)\ (V^{ji} - V^i)^2[\mathrm{sgn}(V^{ji} - V^i)] \qquad (2.3)$$

$$\gamma_1,\ \gamma_2 > 0$$

where V^{ji} is the level of utility the representative consumer in state i would obtain if she moved to state j:

$$V^{ji} = V^i[Y^i - T^j,\ G^j] \qquad (2.4)$$

The first term on the right side of (2.3) expresses the degree to which legislators directly weigh the well-being of their own citizens, and the second term expresses legislators' tastes for large empires. The third term reflects the political costs government officials pay for providing their citizens a fiscal package that is worse than one available in neighboring state j. The sign of this quadratic term is defined so that a state government always faces incentives to improve the quality of its fiscal

[7] Without elaboration, we consider the objective function (2.3) to represent an approximation to the outcome of interest-group politics and other forces that determine state and local fiscal policies.

package.[8]

Another consideration that would change the simple objective function (2.1) is fiscal competition among states. States use both expenditure and tax policies to compete with each other for businesses. Businesses are desired because they provide tax revenues. Furthermore, additional business expands local shopping and employment opportunities, and business may be involved in beneficial activities such as supporting local charities. (Of course, businesses may also be associated with disamenities such as pollution and congestion.) Let B^i be state i's amount of "business," measured in dollars. Then the simplest way to include a "taste" for more business is to augment the objective function (2.3) as follows:

$$\Psi^{i'} = V^i(\cdot) + \gamma_1 G^i - (\gamma_2/2)(V^{ji} - V^i)^2 [\mathrm{sgn}(V^{ji} - V^i)] + \gamma_3 B^i \qquad (2.5)$$
$$\gamma_1, \gamma_2, \gamma_3 > 0$$

If τ^i is the tax rate on business in state i, the budget constraint becomes

$$T^i + \tau^i B^i \geq G^i \qquad (2.6)$$

Interdependence enters the picture because the amount of business that state i attracts depends both on its own tax rate, τ^i, and the tax rate of its neighbor, τ^j:

$$B^i = B^i(\tau^i, \tau^j) \qquad (2.7)$$

[8] Similarly, reductions in the utility available in other states are always advantageous to legislators.

where $\partial B^i/\partial \tau^i < 0$ and $\partial B^i/\partial \tau^j > 0$.[9]

The voice model and the fiscal competition model are not mutually exclusive. Nevertheless, to simplify the exposition it helps to analyze them separately. We begin with the voice model ($\gamma_2 > 0$, $\gamma_3 = 0$), and then turn to the fiscal competition model ($\gamma_2 = 0$, $\gamma_3 > 0$).

<u>Voice model.</u> Assuming for simplicity that $V^{ji} > V^i$, the first-order condition characterizing maximization of (2.3) over the choice of G^i, subject to (2.2) is:

$$\eta^i(p_g^i - 1) + \gamma_1 + \gamma_2\, \Delta^i\, \eta^i\, (p_g^i - 1) - \gamma_2\, \Delta^i\, (dV^{ji}/dG^i) = 0 \qquad (2.8)$$

where η^i is the marginal utility of income in state i and $\Delta^i = (V^{ji} - V^i)$ is the difference between the utility available to a citizen of state i in her own state and that obtainable in state j. The last term on the left side of (2.8) is a function of state j's expected response to spending changes in state i. Assume that this term is zero. Then (2.8) becomes:

$$(p_g^i - 1) = -\gamma_1/[\eta^i\, (1 + \gamma_2\, \Delta^i)] \qquad (2.9)$$

Note that the right side of (2.9) approaches zero as either γ_1 becomes zero or γ_2 becomes very large. Thus, we will obtain efficient provision of public goods ($p_g^i = 1$) only when the weight on government expenditure <u>per se</u> (γ_1) is low, or when the fact that citizens can obtain more utility in another state leads to a lot of trouble for legislators (γ_2 is large). More generally,

[9] In addition, business executives might compare their <u>own</u> utilities in states i and j along the lines suggested above. To keep things simple, we have not included this factor in equation (2.7). If we did, it would serve to reinforce the basic conclusion that one expects to observe expenditure interdependence.

$(p_g^i - 1)$ is negative, reflecting government overprovision of public goods.

Equation (2.9) suggests how changes in a state's expenditures affect the spending decisions of its neighbors: the effect comes through the Δ^i term in the denominator of (2.9), and generally takes the form that increases in V^{ji} are matched by shrinking G^i (increasing $p_g^i - 1$). More formally, totally differentiating (2.9) and rearranging yields:

$$\frac{dG^i}{dV^{ji}} = \frac{\gamma_2 \ \gamma_1}{\eta^i(1 + \gamma_2)^2 \ \left(dp_g^i/dG^i - \dfrac{\gamma_1 \, d\eta^i/dG^i}{\eta^{i2}(1+\gamma_2\Delta^i)} + \dfrac{\gamma_1\gamma_2(p_g^i - 1)}{(1 + \gamma_2\Delta^i)^2} \right)} \qquad (2.10)$$

Diminishing marginal utility of government expenditures implies $dp_g^i/dG^i < 0$. If we are further willing to assume that $d\eta^i/dG^i > 0$, then the right side of (2.10) is negative.[10]

An important question is whether states will necessarily match their neighbor's spending changes. Not necessarily: states can be expected to follow other states' spending increases, for example, only if spending increases in other states increase V^{ji}. While this certainly may be the case, it is not necessarily true. For example, suppose that residents of state i believe that i spends "too much," but that its neighbor, state j, spends "too little." Then according to our model, if j were to increase its spending, legislators in i would reduce their spending.

<u>Fiscal competition model.</u> In this case, we set $\gamma_2 = 0$ in equation (2.5). The state chooses G^i, T^i and τ^i to maximize (2.5) subject to the constraint (2.6). The three first order conditions can be combined to yield the following equations

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[10]Because $dG^i = dT^i$ in this model, either strong separability of the utility function (2.1) and diminishing marginal utility of income <u>or</u> diminishing marginal utility of income and (uncompensated) complementarity of Y^i and G^i are sufficient conditions for $d\eta^i/dG^i > 0$.

$$\tau^i = -\gamma_3/\eta^i - B^i/(\partial B^i/\partial \tau^i) \tag{2.11}$$

$$p_g{}^i\eta^i = \eta^i - \gamma_1 \tag{2.12}$$

where $p_g{}^i\eta^i$ is the marginal utility of government expenditure ($\partial V^i/\partial G^i$) and, as before, η^i is the marginal utility of income ($\partial V^i/\partial Y^i$). Our strategy is to find the response of $p_g{}^i\eta^i$ to a shock in its neighbor's expenditures. Assuming that G^i and its marginal utility move in opposite directions[11], this will tell us whether G^i increases or decreases.

Suppose there is a "taste shock" in neighboring state j, meaning that for given values of ($Y^j - T^j$) and G^j, there is an increase in $p_g{}^j$. From equation (2.12) we know that $p_g{}^j = 1 - \gamma_1/\eta^j$, so that if $p_g{}^j$ increases, so will η^j and G^j. From equation (2.11), the impulse effect of this change is to raise τ^j -- the additional revenue to finance the increased government expenditure comes partly through increased business taxes. How do these increases in τ^j and G^j affect state i? Substituting the expression for η^i implied by equation (2.11) into (2.12), and differentiating, we obtain

$$\frac{dp_g{}^i\eta^i}{d\tau^j} = \frac{\gamma_3 \left\{ \dfrac{d\tau^i}{d\tau^j} + \left[\dfrac{\partial B^i}{\partial \tau^j}\dfrac{\partial B^i}{\partial \tau^i} - B^i \dfrac{\partial^2 B^i}{\partial \tau^i \partial \tau^j} \right] / (\partial B^i/\partial \tau^i)^2 \right\}}{[\tau^i + B^i / (\partial B^i/\partial \tau^i)]^2} \tag{2.13}$$

We have already shown that changes in $p_g{}^i\eta^i$ are linked to G^i, as are changes in τ^j to G^j. Hence, equation (2.13) establishes our basic proposition -- neighbors' expenditure levels are interrelated. In general, the sign is indeterminate. Suppose, however, that the cross effects of tax rates on

[11]A sufficient condition for this to be true is that $V^i(\cdot)$ is strongly separable, and both of the components are globally concave.

business location are zero ($\partial^2 B^i / \partial \tau^i \partial \tau^j = 0$), and that the direct effect of state j's tax rate change upon business in state i ($\partial B^i / \partial \tau^j$) exceeds the effect generated by the induced change in state i's tax rate $[(\partial B^i / \partial \tau^i)(\partial \tau^i / \partial \tau^j)]$. In this case, equation (2.13) indicates that $\partial p_g{}^i \eta^i / \partial \tau^j < 0$, which implies that $\partial G^i / \partial G^j > 0$. Thus, as in the voice model, it seems reasonable to expect that expenditures of neighbors will move in the same direction, although this is not necessarily the case.

Summary. We have shown that in both a voice model and a fiscal competition model of public expenditure, expenditures in one state may be affected by the expenditures of its neighbor, although one cannot know *a priori* whether they will move in the same direction. A reasonable question is whether it is feasible to distinguish between the two models. Data problems would make this very difficult. We simply do not know which taxes and expenditures are designed to attract business. Our goal, however, has been to develop a choice theoretic framework to explain why there might be interdependence among states' aggregate expenditures. For this particular purpose, it does not matter whether one or the other of the mechanisms is dominant.

A related observation is that both models are very simple. For example, they ignore the possibility that states will respond strategically to budgetary changes in other states. (See Johnson [1988].) While incorporating strategic behavior would enrich the models, it would not change the basic conclusion — consistent with casual evidence, we must take seriously the possibility that expenditure levels in one state exert an independent effect on expenditure levels in other states.

3. EMPIRICAL IMPLEMENTATION

3.1 Econometric Model

Our theoretical model implies that state i's per capita expenditures in year t, E_{it}, depend on its own characteristics (a vector X_{it}), and the expenditures of its neighbors. Continue to assume for simplicity that each state has only one neighbor, with per capita expenditure E_{jt}. Then in a linear specification we can write:

$$E_{it} = X_{it}\beta + \phi E_{jt} + u_{it}, \tag{3.1}$$

where β and ϕ are parameters, and u_{it} is a random error.[12]

Several econometric studies of sub-federal government expenditure have suggested that a state's public expenditures are characterized by an individual effect — an unobserved characteristic of the state that influences its fiscal decisions and does not change over time (for example, "climate" or "political make-up"). (See Holtz-Eakin [1986].) Hence, we use pooled cross-section time series data, and augment equation (3.1) with an individual effect. In addition, we allow for "time effects." (This amounts to including a series of year specific intercepts.) The time effects are intended to control for variables that might have a common effect on the states in a given year, such as business cycle conditions, the "national mood" toward government, etc. Also, year-to-year changes in federal matching rate programs that change the effective price of spending for all states are subsumed in the year effects. Including time effects is particularly important in the context

[12]Equation (3.1) assumes that the neighbor effects are transmitted concurrently, which is reasonable given that the data are yearly observations. We also analyzed a model in which $E_{j,t-1}$ appeared on the right hand side, and found that it did not perform as well as (3.1) — with $E_{j,t-1}$, the value of the log likelihood was substantially lower than with E_{jt}.

of our problem, because we do not want to attribute behavioral significance to any across-state correlations in spending that are really due to common national influences.

In short, our estimation equation takes the form

$$E_{it} = X_{it}\beta + \phi E_{jt} + f_i + h_t + u_{it} \tag{3.2}$$

where f_i and h_t are the individual and year effects, respectively.

As stressed above, the unique aspect of equation (3.2) is the presence of the neighbor's expenditure as a right hand side variable.[13] The inclusion of E_{jt} raises several related issues that have to be addressed.

Multiple neighbors. A state may have more than one neighbor. In the context of our voice model, citizens of a given state compare themselves simultaneously to those of several other states — people in New Jersey, for example, might be concerned about developments in both New York and Michigan. Similarly, with a fiscal competition model, a state may try to lure away business from several other states. This does not imply that all neighbors have equal influence. The impact of state j on state i's spending may, for example, depend on the extent to which they are demographically similar. A state that is very much "like" Wisconsin will have more of an impact on Wisconsin's decisions than one that is less so. We assume that the impact of other states' spending on state i depends on a weighted average of all other states' spending, where the weights depend on the "degree of neighborliness." Specifically, we allow for the possibility of multiple neighbors by replacing E_{jt} in equation (3.2) with

[13] Gramlich and Laren [1984] estimate a model in which a state's welfare expenditures are influenced by those of surrounding states. However, their model does not allow the benefits in a state to influence its neighbors.

$$\sum_{j=1}^{n} w_{ij} E_{jt}, \tag{3.3}$$

where $\Sigma_j w_{ij} = 1$, and $w_{ij} = 0$ if state j is not a neighbor of state i.[14]

Every state is associated with a vector of w's that indicates the relative importance of its neighbors' expenditures. We take note of this fact by writing the system of expenditure equations for all the states in year t in matrix form,

$$E_t = \phi W E_t + X_t \beta + u_t \tag{3.4}$$

where E_t is a (48 × 1) vector of state expenditures for the continental U.S. in year t; X_t is a (48 × k) matrix of explanatory variables that includes year and state effects; and W is a (48x48) weighting matrix that assigns neighbors to every state. That is, the ith row of W assigns to E_{it} a weighted average of neighbors' spending: $\Sigma_j w_{ij} E_{jt}$. In principle, it would be desirable to estimate the elements of the W matrix along with the other parameters. In practice, such an approach is out of the question because of insufficient degrees of freedom. We discuss below strategies for specifying W *a priori*, and the problems associated with each. For the moment, however, we will put this issue aside, and continue the discussion assuming that the W matrix is known.

Correlated random shocks. While the presence of time effects in the model controls for systematic influences common to all states in a given year, neighbors might be subject to correlated random shocks. For example, if neighbors are defined by physical proximity, state cleanup of floods or shared

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[14]That weights sum to one for each state's neighbors imposes the restriction that all states have neighbors.

toxic waste sites would lead to positively correlated random shocks between neighbors. If a foreign company selects a state in which to place a new factory, the company's short list of possible sites may include states that are close demographic neighbors. To the extent that state i's selection as the new site influences the state's spending, the choice of state i over its neighbors would induce negative correlation in the errors of neighbors.[15]

Whatever their cause, the presence of such shocks produces a correlation between neighbors' levels of spending that can lead one to "find" causal influences of one state's spending on another's that are not actually present. To avoid drawing such incorrect conclusions, we allow for potential correlation between the errors of neighbors by writing

$$u_t = \rho W u_t + \epsilon_t \tag{3.5}$$

where ϵ is idiosyncratic error, uncorrelated between states: $E(\epsilon_{it}\epsilon_{jt}) = 0$ for i not equal to j.

Analogous to the time series phenomenon in which the presence of a lagged dependent variable $[Y_t = f(Y_{t-1})]$ and serial correlation $[u_t = f(u_{t-1})]$ mimic each other, in this work there is potential for dependence on neighbors through spending (E) and through errors (u) to mimic each other. As with time series, the presence of other right-hand side variables (X) can be used to identify the effects separately.

<u>Simultaneous estimation of expenditures across states.</u> As Equation (3.4) stands it cannot be estimated consistently since the errors are correlated

[15]To see this more formally, consider replacing (2.7) with $B^i = B^i(\tau^i, \tau^j, \epsilon^i)$, in which ϵ^i is a random shock to the level of business in state i ($\partial B^i/\partial \epsilon^i > 0$). Then ϵ^i affects tax collections and optimal state tax and expenditure policies; under normal circumstances $dG^i/d\epsilon^i > 0$. If ϵ^i and ϵ^j are negatively correlated for neighbors i and j, then the residuals in the two states' spending equations (3.2) may exhibit negative correlation as well.

with the right-hand side dependent variables. But inverting the system[15] allows us to remove the dependent variables from the right-hand side:

$$E = (I-\phi W)^{-1} X\beta + (I-\phi W)^{-1}(I-\rho W)^{-1}\epsilon. \tag{3.6}$$

In (3.6), where the potential correlation between errors of neighbors has also been incorporated, expenditure is now written as a nonlinear function of exogenous variables X. Note that ignoring the presence of correlation in neighbors' errors would not bias estimation of β, but would reduce the efficiency of the estimation and produce biased estimates of standard errors. Ignoring the influence of neighbors' levels of E can cause more severe problems. If state i's neighbors' expenditures belong in (3.6), but are ignored, state i's right-hand side variables (X_i) are correlated with state i's errors, leading to inconsistent estimates of β.

Equation (3.6) indicates that despite the constancy of the β vector across states, the ultimate effect of a change in an exogenous variable differs across states. When one of the Xs changes exogenously in state i, the induced change in E_i then affects spending by state i's neighbors. These changes feed back to state i through ϕW and induce a tertiary effect on E_i. Because two neighbors may weight each other differently, the diagonal elements of $(I-\phi W)^{-1}$ vary between states, and the ultimate effects of changes in X differ. Algebraically, a change in state i's level of a single exogenous variable x, after allowing for reverberations between state i and its neighbors, can be written:

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[15]The matrix $(I - \phi W)$ is invertible if ϕ lies strictly between (-1,1). See Case [1987, Appendix 3] for a proof and discussion of this result.

$$\frac{\partial E_i}{\partial x_i} = A^{ii}\beta \;, \tag{3.7}$$

where A^{ii} is the (i,i) element of $(I-\phi W)^{-1}$. Intuitively, one expects the derivatives in (3.7) to differ substantially from β in the presence of large neighbor effects (ϕ) for those states with close neighbors.

We estimate (3.6) using maximum likelihood methods. Defining $A = (I-\phi W)^{-1}$ and $C = (I-\rho W)^{-1}$, the likelihood function (L) for (3.6) can be written,

$$L = \text{constant} - N/2 \ln(E'C'A'M\; A\; C\; E) + \ln |A| + \ln |C| \tag{3.8}$$

where the likelihood has been concentrated with respect to β and σ^2; and where $[\ln |A| + \ln |C|]$ is the log of the Jacobian of the transformation between ϵ and E; M is the matrix $[I - AX\,(X'A'AX)^{-1}\,X'A']$; and N is the total number of observations. Maximum likelihood estimates can be obtained using standard non-linear estimation techniques. See Case [1987] for details.

3.2 Specifying the Weighting Matrix.

Estimation of the system requires that we determine which states are neighbors. We indicated earlier that estimating the parameters of the W matrix is infeasible, so that its elements must be specified *a priori*. According to the theory developed in Section 2, state j is a neighbor of state i if the citizens and/or decision-makers of state i take into account state j's fiscal package when they are evaluating their own state's situation. Unfortunately, this does not give us too much guidance with respect to observable variables that would tell us whether two states are neighbors. An obvious possibility is geographical proximity — two states are neighbors if they share a common border, for example. However, it is not obvious that geography is the most relevant factor. In terms of the voice model, citizens might compare their well-being to those of people in states that are demographically similar. If so, then states with similar racial compositions would view themselves as neighbors. Alternatively, in a fiscal competition model, certain types of businesses might prefer high (or low) income states to others. In this case, decision-makers would view themselves as competing with other states with similar income levels. In short, states may regard as neighbors other states that are similar to them economically or demographically, regardless of geographical proximity.

These considerations suggest that we explore several alternative criteria for neighborliness, and see which one is most consistent with the data. We construct W matrices based on geography, per capita income, and percentage of the population that is black.[17]

This procedure is somewhat arbitrary. However, we stress that the typical practice of ignoring neighbor effects also amounts to an arbitrary assumption: that parameters describing the relationships between neighbors are equal to zero. There is no reason why the arbitrary assumption that $\phi = \rho = 0$ should have primacy over all other values of ϕ and ρ. In addition, we reduce the arbitrariness of our neighbor selection process by nesting potential candidates for neighborliness in order to test the strengths of various measures. For example, in order to test whether income or geography is a better way to characterize neighborliness, we can nest these two criteria:

[17]We also constructed W matrices based on proportion of population employed in agriculture, in manufacturing, in services, and in trade. None of these criteria improved the likelihood as much as geographic neighbors did, and further analysis was not carried out using these W matrices.

$$W = \alpha W^{Income} + (1-\alpha) W^{Geography}$$

and estimate the model, varying α between 0 and 1. By comparing the likelihoods of the models while varying α, we can assess the merits of different candidates for neighborliness.[18]

Once we have selected a criterion (or criteria) for neighborliness, we still face the problem of using it to compute the individual elements of W. This step requires that some assumptions be made. Consider the geographical criterion, for example. One possibility is to make this a dichotomous variable: to set $\omega_{ij} = 1$ if states i and j share a common border, $\omega_{ij} = 0$ otherwise, and specify $w_{ij} = \omega_{ij}/k$, where $k = \Sigma\, \omega_{ij}$. An alternative is to view proximity as a continuous variable. One could define d_{ij} as the distance between the capitals of states i and j, set $\omega_{ij} = 1/d_{ij}$, and construct w_{ij} from ω_{ij} as before. One might also try $\omega_{ij} = 1/d_{ij}^2$ or $\omega_{ij} = 1/d_{ij}^4$. This highlights another potential stumbling block in defining neighborliness: even after we have specified the qualitative nature of the criterion, a decision regarding functional form must be made. However, we found that in practice various measures of distance between neighbors yield similar results, as long as the measures are powerful enough to select a small number of states as a given state's neighbors.[19]

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[18]This idea was suggested to us by James Poterba.

[19]For example, using q_i as the characteristic according to which neighbors are being measured, the distance measures $\omega_{ij} = 1/|q_i-q_j|$ and $\omega_{ij} = 1/(q_i-q_j)^2$ yield answers that are insignificantly different from one another. Other measures we tried (for example $\omega_{ij} = 1/[1+(\log(q_i/q_j))]^2$ did not single out any states as more neighborly than others. As a consequence, the algorithm for maximizing (3.8) did not converge.

We estimated equation (3.6) using combinations of the following alternatives for W:

W^G, neighbors with common borders. $w_{ij} = 1/S_i$ if i and j share a border; $w_{ij} = 0$ otherwise; and S_i = the number of borders state i shares.

W^I, neighbors with similar incomes. $w_{ij} = 1/|INC_i - INC_j|/S_i$ where INC_i is per capita income in state i (mean over sample period)[20]; and S_i is the sum $\Sigma_j\ 1/|INC_i - INC_j|$.

W^B, neighbors with similar proportions of blacks in their populations. $w_{ij} = 1/|BLACK_i - BLACK_j|/S_i$ where $BLACK_i$ is the proportion of state i's population that is black (mean over the sample period); and S_i is the sum $\Sigma_j\ 1/|BLACK_i - BLACK_j|$.

4. DATA

We estimate the model using annual data on the continental U.S. over the period 1970-1985. All dollar figures are put on a per capita basis, and deflated using the personal consumption expenditure deflator. (The base year is 1982.) Our measure of government expenditures for state i in year t, E_{it}, is the sum of the direct expenditures of state and local governments, exclusive of expenditures for interest, state-run liquor and utility concerns, and insurance. An alternative strategy would have been to analyze state but not local government expenditure. However, wide cross-sectional variation in the division of spending responsibilities between state and local jurisdictions, along with the possible substitutability of state and local spending in response to exogenous changes, make the current approach of aggregating state and local expenditures less likely to run afoul of features

[20] Because W^I depends on between state differences in mean income while the X vector depends on within state differences in income, there is no induced correlation between the X vector and the error term.

of political hierarchy.

The following variables comprise the X_{it} vector of equation (3.2): real per capita income, income squared, real per capita total federal grants to state and local governments, population, proportion of the population at least 65 years old, proportion of the population between 5 and 17 years old, and proportion of the population that is black. This selection of conditioning variables is fairly uncontroversial. Income and grants are measures of the resources available for state and local spending. The square of income picks up possibly nonlinear effects of changing resources and also the effect of federal deductibility on the cost to citizens of state and local taxes.[21] State population captures the possibility that there are congestion effects or scale economies in the provision of state and local government services. States with different age and racial structures may have different demands for publicly provided goods — hence the presence of the demographic variables.[22] In addition, the conditioning matrix X contains state and year indicator variables. Federal matching rate programs exert potentially important influences on state and local spending. Year-to-year changes in the structure of these programs affect all states similarly; hence, their impact is subsumed in the time effects.

We also estimate our basic equation for selected categories of spending. The categories studied are: expenditures on health and human services (health

[21]For a taxpayer who itemizes deductions, the cost of an additional dollar of state and local tax payments is only one minus her marginal federal tax rate. Since marginal federal tax rates (and the propensity to itemize) are nonlinear functions of income, we include income squared to proxy for the price effect of federal deductability. As a consequence, we are unable to disentangle the resource effect and the tax price effect of income changes, but this is not necessary for our purposes.

[22]Data are from the following sources: Expenditure, grant, and state per capita income are from the Bureau of Census, U.S. Government Finance Series; data on population demographics are from Current Population Reports and unpublished data from the Bureau of Census consistent with the Current Population Reports.

and hospital spending plus public welfare expenditures); expenditures on administration (financial administration and general control); expenditures on highways; and expenditures on education.

Table 1 presents descriptive statistics for these data; the numbers represent unweighted averages of state means, so they differ slightly from national averages. Of the average annual total state and local expenditure of \$1,865 per person, 40% is spent on education (\$746); 20% on health and human services (\$367); and 12% on highways (\$220). The coefficients of variation for these expenditure categories reveal that there is a great deal more variation in per capita spending on various components than there is in total spending.

5. RESULTS

5.1 Total Expenditure

Testing the Neighbor Model. Table 2 presents the results of estimating model (3.6) for state and local expenditures. The first column presents conventional OLS results; these can be estimated in our framework by constraining $\phi = \rho = 0$. The results are not dissimilar to those found in the literature. Here, we see no significant effect of population on per capita spending; economies of scale and congestion effects either offset each other, or are not present. Both state per capita income and income squared are significant. As mentioned earlier, these represent both resource effects and tax price effects; we do not attempt to distinguish between them. The coefficient on grants (1.03) suggests that, *ceteris paribus*, states spend roughly one dollar for each dollar obtained in grants. This is an enormous effect compared to the derivative of spending with respect to changes in personal income (0.07 at mean income). This "flypaper effect" — the apparent proclivity of subnational governments to spend much more out of their grant income than personal income of their residents — has been observed by several researchers.[23] The results in the first column of Table 2 also suggest that a 0.01 increase in the proportion of elderly in the state population, *ceteris paribus*, reduces state per capita spending by about $67, and a 0.01 increase in the proportion black reduces state per capita spending by about $16.

Columns (2), (3), and (4) present the results using geographic proximity, per capita income, and proportion black, respectively, to define neighborliness. A striking result is that <u>any</u> of these specifications suggests that neighborliness matters. For W^I and W^B, one can reject the joint hypothesis that $\phi = \rho = 0$ by a wide margin. For W^G one cannot quite reject this joint hypothesis, but on an individual basis, ϕ and ρ are statistically significant.[24]

Given the success of all the W matrices exhibited in Table 2, a skeptical reader might wonder whether there is something inherent to the econometric procedure that produces significant results regardless of how "neighbors" are defined. In order to investigate this possibility, we re-estimated the model with an intentionally absurd W matrix. Specifically, we set $w_{ij} = 1$ if state j followed state i in the alphabet, and zero otherwise.[25] The estimates of ϕ and ρ were both less than 10^{-4} in absolute value, and the log likelihood did not change measurably. Of course, there are an infinite number of silly criteria that one could use to construct a W matrix. This experiment with an alphabetical criterion, along with a few others, convinced us that the results

[23]See, for example, the papers surveyed by Inman [1979].

[24]The joint hypothesis is examined by using a likelihood ratio test: twice the difference in log likelihoods is distributed chi-square with 2 degrees of freedom. Using geography as the weighting matrix, this statistic is only 4.57 while the 95% critical value is 5.99.

[25]The last state, Wyoming, was assigned the second to the last state, Wisconsin, as a neighbor.

in columns 2 through 4 are not merely artifacts of the statistical procedure.

As an additional check on the model, we ran OLS regressions of state expenditure on exogenous variables X and neighbors' exogenous variables WX. Neighbors' variables, WX, were found to be jointly significant. It could be argued that the reason neighbors' X's (or expenditures) are statistically significant is that the states' <u>own</u> X's are measured with error, and the neighbors' X's (or expenditures) just happen to be proxying for the true values of the own X's. Of course, such an interpretation can be given to virtually any right hand side variable in any regression model. As always, one must make a judgement as to which interpretation is more plausible. Is it really believable that Michigan's expenditures affect New Jersey's expenditures because Michigan's expenditures are helping to improve the measurement of New Jersey's per capita income? We think not. The "copycatting" interpretation suggested by our theoretical model is more persuasive.

The increase in the log likelihood is most marked in the case in which neighbors are defined as states with similar racial compositions. The use of W^B increases the log likelihood a full 40 points above the case in which both coefficients of correlation are constrained equal to zero. The chi-square test for significance is 80; ϕ and ρ are jointly significant with a probability of 0.9999.

We can confirm the superiority of the W^B matrix by nesting neighbor assignment based on geographic proximity with W^B, and nesting assignment based on income with W^B. In both cases, the maximum likelihood is obtained by assigning all weight to proportion black. Algebraically, if $W = \alpha W^B + (1-\alpha)W^{other}$, the maximum likelihood is reached at $\alpha = 1$.

Several readers of an earlier draft of this paper suggested that proportion black "must be proxying for something else," perhaps the income distribution or degree of urbanization of the population. In response, we constructed W matrices based on proportion of the population below the poverty line (in 1980), and on the proportion of the population living in metropolitan areas (in 1980). Neither of these criteria improved the log likelihood as much as W^B; indeed, neither did as well as W^G. Another possibility is that the success of the W^B matrix simply reflects the high correlation between spending and region of the country. Of the nine states with the highest proportion black, eight are in the south, and one (Maryland) is a border state. To investigate this possibility, we deleted these nine states from the sample and re-estimated the model. With this smaller sample, $\phi = 0.7103$ (s.e.= 0.0367) and $\rho = -0.7732$ (s.e.= 0.0538).[26] These results are essentially identical to those in column (4) of Table 2. Hence, our results are not due to the dominance of a "region effect."

On the basis of these experiments, we feel that the results in Table 2 should be taken at face value: racial composition has an important impact on state expenditure patterns, and states with similar racial compositions look to each other as points of reference. One should note that the importance of race in state and local public finance is well established: Craig and Inman [1986, p. 203], for example, show that proportion black is a statistically significant determinant of state spending; Gramlich and Rubinfeld [1982, p. 547] argue that micro demand equations for some public budget items are affected by race; and according to Aronson and Marsden [1980, p. 101], even Moody's municipal credit ratings of a jurisdiction are influenced by its racial composition, *ceteris paribus*. In short, we view the success of the W^B matrix as noteworthy, but not anomalous.

Interpreting the Coefficients. Because our preferred specification is

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[26]The chi-square test statistic for the joint significance of the two parameters is 63.80.

the one in column (4) of Table 2, we discuss those coefficients. Note the strikingly large, positive significant degree of correlation in the level of expenditure between neighbors (ϕ = 0.7256), and the negative and significant degree of correlation between neighbors' errors (ρ = -0.7753). The correlation in states' expenditures suggests that the ultimate effect of a spending increase by state i's neighbors is, ceteris paribus, to increase state i's spending by seventy-three cents.

Furthermore, incorporation of neighbors' expenditures into our analysis substantially changes the parameter estimates for the explanatory variables, X. The effect of state population becomes positive and obtains marginal significance, suggesting that if state population increased by one million, state spending per person would increase by ten dollars. The increase in spending out of grants, *ceteris paribus*, drops from the dollar for dollar estimate in column 1 to sixty-six cents on the dollar in column 4, diminishing the impact of the "flypaper" effect. One interpretation of this difference is that conventional estimates of the flypaper effect overstate its impact by ignoring simultaneous changes in other jurisdictions. Since federal grants are often made available to many states at the same time, each state's expenditure responses are magnified by its neighbors' spending changes, which are induced by the same federal grant program. The spending impact of proportion elderly also diminishes with the inclusion of state neighbor effects; its coefficient falls in magnitude from -6667 in column 1 to -1988 in column 4. Interestingly, the coefficient on proportion black becomes insignificant in column 4. This suggests that the influence of race found in conventional equations is not due to the fact that racial composition directly affects tastes for public expenditure. Rather, the channel through which race operates is the determination of states' neighbors.

The presence of neighbors changes not only the magnitudes of the β's; it affects their interpretation as well. As suggested by equation (3.7), the ultimate effect of a change in a right-hand side variable on state expenditure differs from β, due to interactions among states. Specifically, to compute the effect of a conditioning variable on state i, one must multiply that variable's β by A^{ii}, the (i,i) element of the matrix $(I-\phi W)^{-1}$. We computed the diagonal elements of A corresponding to the estimates in column (4) of Table 2; i.e., $W = W^B$ and $\phi = 0.7256$. We found that few values of A^{ii} exceeded 1.10. (A table with all the values is available upon request.) For most states, then, the change in expenditures induced by a change in X is not very different from β. Hence, the first impression one gets from comparing columns (1) and (4) of Table 2 is correct: standard models that ignore neighbor effects substantially overstate the size of response parameters.

The A matrix also can be used to calculate the cross effects of one state's X variables on the spending of other states. Specifically, suppose that the conditioning variables in state i change by dX_i. Then the ultimate effect of this change on state j is $A^{ij}\beta\, dX_i$. By the definition of the A matrix, the cross effects depend on how neighborly states are - the effect of state i on any state j dies away if i is distant from j. Indeed, for most states, the cross effects appear to die away quite rapidly with "distance." Our computations for New Jersey, for example, suggest that $A^{ij} = 0.57$ for its closest neighbor, but only 0.05 for its fourth closest neighbor.

5.2 Categories of Spending

As suggested earlier, there is no reason to assume that patterns of expenditure interdependence are the same for all categories of spending. In the voice model, for example, the sign and magnitude of the impact in state i of an expenditure change in neighboring state j depends on the change in potential utility (V^{ji}) produced by the expenditure change; this effect may be positive for some spending categories and negative for others. Furthermore, heterogeneous consumers within a state may desire different services, pay taxes at different rates, and have different abilities to influence their state's fiscal policies in response to changes in neighboring states.

To explore these possibilities, we estimate the model separately for four different types of expenditures: health and human services, administration, highways, and education. These categories account for 75% of total expenditure. Omitted categories include fire and police protection and expenditures on the environment. In order to keep down the number of computations, we use only the W^B matrix for estimation. That is, we assume that the criterion for neighborliness that does best for total expenditures also is most suitable for the various categories.[27] We continue to analyze expenditures on a per capita basis, except for education, where we deflate expenditures by the number of school-aged children.[28]

The results are presented in Table 3. Chi-square test statistics for the joint significance of ϕ and ρ are presented at the bottom of each column. Strikingly, in each category one can reject the hypothesis that taking into account interdependence does not enhance the explanatory power of the equation. Apparently, the results for aggregate expenditures that we found in Table 2 are not due to the dominating presence of a single spending category for which neighbor effects matter.

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[27]However, a persuasive case can be made that, for highway expenditures, geography is more relevant than demographics for determining neighborliness. We therefore estimated the highway equation using W^G as well as W^B. The chi-square test for the joint significance of ϕ and ρ using W^G is 48.36. This is more that twice the value obtained using W^B. (See the discussion of Table 3 below.)

[28]In theory, one might want to use a separate deflator for every expenditure category—highway expenditures per automobile, for example. However, only for education is it fairly obvious what the appropriate deflator should be.

6. SUMMARY AND CONCLUSIONS

Subnational governments do not make their decisions in isolation. Citizens and public servants are likely to have information relating to governmental activity in neighboring states, and this information is likely to affect what they want their own state government to do. In this paper, we employ data on state and local spending in the continental U.S. to test a model that explicitly allows for such expenditure interdependence. We find that states' expenditures are indeed significantly influenced by their neighbors. In our preferred specification, the impact effect of a dollar of increased spending by a state's neighbors increases its own spending by more than seventy cents. This expenditure interdependence appears even though our model allows for individual effects on state spending, year effects that might affect all states in the same year systematically, and unobserved shocks that might induce spurious correlation in neighbors' expenditures.

The most difficult methodological problems in this study arise in the course of assigning neighbors. What frame of reference do people use in evaluating the adequacy of their own state's fiscal package? Theory does not provide firm answers, so we experiment with several alternatives. One measure of neighborliness, similarity in racial composition as measured by percent of the population that is black, performs significantly better than any other. The selection of criteria for neighborliness inevitably introduces some arbitrariness into the analysis. We find it extremely encouraging, then, that each of several reasonable alternatives suggests that interdependence is present. And each does better (in the sense of statistical significance) than the conventional assumption that no interdependence is present.

We also showed that taking into account neighbor effects substantially changes the estimated impacts of various conditioning variables on state expenditures. This suggests that conventional estimates of the impact of grants on state and local expenditures might be wide of the mark. Moreover, the importance of neighbor effects casts doubt on the validity and usefulness of several popular models of government behavior. Neighbor effects might be present because governments lack complete information on the costs and benefits of public services, and hope to learn about these by looking at other states. Alternatively, as observed in Section 2, neighbor effects could arise because governments are not attempting to maximize efficiency at all. In any case, it is not easy to reconcile the conventional view that fully informed governments choose fiscal policies that maximize the well-being of their citizens with the observed importance of neighbor effects.

Finally, we note that "copycatting" need not be confined to subfederal jurisdictions. For national governments, there is some anecdotal evidence that even apart from considerations of macroeconomic coordination, fiscal policies in one country are affected by people's perceptions of changes in other countries. Andersson [1988, p. 2] notes that a "factor precipitating the [recent Scandinavian] tax reforms was the tax reforms undertaken elsewhere in the 1980's. The Scandinavian countries...have by tradition always carefully followed developments in other countries." Similarly, McLure [1988, p. 28] states that one of the reasons that Colombia adopted income tax indexing was that indexing was being considered in countries that Colombia wanted to emulate. The extent to which nations' budgetary policies affect each other is an important topic for future research.

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Table 1

Variables Used in Analysis of State Spending

Variable	Mean	S.D.	Minimum Value	Maximum Value	Standard Error of Mean	C.V.
Total expenditure	1865	304.7	1363	2826	43.97	16.33
Health and human services	367.3	96.49	235.7	745.5	13.93	26.26
Highway	219.7	74.71	117.2	520.5	10.78	34.01
Administration	81.77	22.37	51.01	157.1	3.229	27.36
Education	745.8	123.7	561.2	1180	17.86	16.59
Population (10^6)	4.541	4.640	0.425	22.61	0.670	102.2
Income	10050	1274	7350	12837	183.9	12.67
Grants	430.1	90.13	285.0	770.0	13.01	20.95
Prop. elderly	0.109	0.017	0.076	0.168	0.003	15.72
Prop. school age	0.228	0.012	0.201	0.261	0.002	5.187
Prop. Black	0.112	0.088	0.006	0.362	0.013	78.70

Sources: Expenditure, grant and state per capita income data are from the Bureau of Census, Government Finance Series, General Revenue Tables. Data on population are from Current Population Reports and unpublished data from the Bureau of Census consistent with the CPR.

Notes:

1. All dollar figures are real per capita expenditure dollars.

2. Total expenditure is the sum of direct expenditures of state and local governments, exclusive of expenditures for interest, state-run liquor and utilities concerns, and insurance.

3. Health and human services expenditure includes spending on health and hospital expenditures plus public welfare expenditures.

Table 2

Estimation of State Expenditure Levels 1970-85
Using Different Measures of Neighbor Characteristic

(standard errors in parentheses)

	Model	W^{Geog}	W^{Income}	W^{Black}
Coefficient of spatial correlation in dep.var. (ϕ)	—	-0.2271 (0.1045)	0.1246 (0.0972)	0.7256 (0.0324)
Coefficient of spatial correlation in errors (ρ)	—	0.3022 (0.0899)	-0.3210 (0.0999)	-0.7753 (0.0485)
State population*	-1.0943 (1.1809)	-2.1049 (1.1698)	-1.1324 (1.1157)	1.1761 (0.8935)
State per capita income	0.1408 (0.0328)	0.1344 (0.0339)	0.1109 (0.0310)	0.1576 (0.0248)
State per capita income^{2}*	-0.3589 (0.1416)	-0.3329 (0.1467)	-0.2233 (0.1331)	-0.4741 (0.1077)
Grants	1.0274 (0.0836)	1.0410 (0.0823)	0.9938 (0.0804)	0.6652 (0.0677)
Proportion of population above age 65	-6666.6 (786.66)	-6921.7 (871.90)	-6798.4 (748.69)	-1987.6 (870.27)
Proportion of population aged 5-17 years	-474.63 (692.72)	-351.34 (724.60)	-391.71 (692.65)	75.753 (559.94)
Proportion of population Black	-1648.6 (781.27)	-1642.1 (704.96)	-2549.4 (754.67)	78.755 (540.86)
Chi square test statistic+		4.574	14.772	79.498

*Coefficients and standard errors multiplied by 10^5.

+ For column j, chi square test statistic is twice the difference in log likelihoods between models in column j and column 1. It is distributed chi square with 2 degrees of freedom.

Table 3

Estimation of State Expenditure Levels 1970-85
Using Mean Proportion Black in State Population
as the Neighbor Characteristic

	State Administration		Health and Human Services		Highway		Education	
Coefficient of spatial correlation in dep. var.	—	0.5955 (0.0505)	—	0.4446 (0.0580)	—	0.5251 (0.0546)	—	0.7189 (0.0350)
Coefficient of spatial correlation in errors	—	-0.6068 (0.0747)	—	-0.5891 (0.0647)	—	-0.5751 (0.0671)	—	-0.7781 (0.0346)
State population*	-0.1500 (0.0621)	-0.0618 (0.0606)	-0.8130 (0.3116)	-0.2518 (0.2343)	0.3102 (0.2610)	0.2884 (0.2302)	-2.3011 (2.4112)	3.0259 (1.9254)
State per capita income	-0.0044 (0.0024)	-0.0029 (0.0020)	0.0146 (0.0122)	0.0151 (0.0104)	0.0279 (0.0104)	0.0249 (0.0099)	0.2379 (0.0752)	0.2978 (0.0618)
State per capita income squared *	0.0321 (0.0101)	0.0235 (0.0087)	-0.0272 (0.0533)	-0.0277 (0.0461)	-0.0834 (0.0459)	-0.0755 (0.0442)	-0.5112 (0.3213)	-0.8872 (0.2676)
Grants	0.0243 (0.0061)	0.0137 (0.0057)	0.3129 (0.0299)	0.2764 (0.0289)	0.2435 (0.0241)	0.2122 (0.0255)	0.8611 (0.1859)	0.3200 (0.1603)
Prop. population above age 65	-588.555 (58.253)	-375.401 (64.206)	366.037 (334.500)	-419.801 (333.760)	-388.005 (313.217)	-42.260 (256.959)	-16082.2 (1969.7)	-5867.33 (1802.72)
Prop. of population aged 5-17 years	-167.572 (45.201)	-138.292 (37.150)	-88.449 (251.349)	-80.230 (217.377)	-453.702 (189.087)	-422.746 (166.780)	-9889.98 (1451.58)	-8070.45 (1057.69)
Prop. of population Black	-95.7664 (52.8001)	-21.4554 (43.8195)	-916.451 (265.850)	-629.655 (219.005)	516.684 (254.785)	503.257 (229.476)	-3873.56 (1982.93)	272.845 (1436.22)
Chi square test+		36.06		15.82		21.23		77.76

*Coefficients and standard errors multiplied by 10*E5
+For each expenditure category, the chi=square test is twice the difference in the log likelihood of the models with and without neighbor effects.