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# Convergence in Local Government Spending: Evidence from Wisconsin

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# Convergence in Local Government Spending: Evidence from Wisconsin

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**Abstract**

A substantial body of theoretical and empirical evidence demonstrates that interregional competition for factors of production leads to convergence of per capita output. Is there an analogous process that leads to convergence of public sector activity? Skidmore, et al (2004) develop a model that is consistent with the macroeconomic growth literature, which predicts convergence in government spending. Based on this framework, we test for convergence in government spending using detailed data from Wisconsin for a variety of municipal government expenditure categories over the 1989/90-1999/2000 period. Our empirical investigation provides compelling evidence of convergence in capita government spending for all the expenditure categories we study. This work adds to the growing body of evidence demonstrating the existence of underlying dynamic forces that determine growth of government.

JEL Classification: H11
Key Words: Government, Growth, Convergence

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## 1. Introduction

Traditional models of public finance including the median voter (Bowen, 1943; Black, 1948), the Tiebout (1956) and Peterson (1981) view of competition amongst local governments, and the complementary theories of public choice (Bish and Ostrom 1979; March and Olsen 1989; McCabe and Vinzant 1999) are built on the assumption that government fiscal policies are a function of the preferences of economic agents. Assuming that political agents are responsive, these theoretical views of the public sector indicate that government fiscal policy will adjust to the changing preferences or circumstances of economic agents. Therefore, changes in government fiscal policies depend on agents' changing demands for government services.[1]

Much of what local government does is not for immediate consumption but can be interpreted as an input to productive activity. This includes not only the obvious infrastructure spending like roads, bridges, and government buildings, but also activities that facilitate the accumulation of human and social capital. Such activities include education, health care provision, environmental protection, safety and protection of property rights. In fact, most government activity probably can be interpreted as some kind of investment. Even investments in "quality of life" attributes such as parks, recreational and cultural services are playing an increasing important role in the functioning of local economies (Dissart and Deller 2000; Deller et al. 2001).

In a sense, government spending can be seen as an endogenous element in a regional growth process. There is significant empirical work that demonstrates that as income increases the demand for public services will also increase; there will be a natural tendency to increase government spending. From a demand perspective the question hinges on the income elasticity

[1] Another strand of the public finance literature emphasizes the potential for bureaucrats to use their position to expand government beyond the level desired by the median voter. See, for example, Niskanen's (1971) model of the budget-maximizing bureaucrat and Brennan and Buchanan's (1980) view of government as leviathan.

of demand. But from a supply perspective we argue that government spending is much like private capital and exhibits diminishing marginal returns. Local governments that have a high level of government spending therefore have limited incentives to expand spending while those with relatively small government sectors will want to increase public spending. We hypothesize that this will lead to convergence of government spending across localities.

In section 2, we review the literature on convergence in government spending and provide an outline of the analytical framework we use to explain why we expect faster spending growth in localities with a lower initial level of government spending. In section 3 we document a few basic stylized facts and proceed to provide more rigorous empirical analyses, which demonstrate convergence in local government spending even after we control for a large number of complicating factors. Section 5 summarizes our findings and discusses their implications.

## 2. Literature Review and Theoretical Considerations

The existing work that examines convergence in government spending is relatively limited. In relation to the present paper, the two most relevant articles are that of Annala (2003) and Skidmore, et al (2004). We begin by first reviewing the work of Annala (2003) and then provide an in depth review of Skidmore, et al (2004). Annala (2003) examined conditional convergence among fiscal policies of US states over the period 1977 to 1996. His theoretical framework hinges on the Solow (1956) model, noting that if taxes are a constant proportion of output and outputs are converging, as Solow's (1956) model suggests, then taxes and spending will also converge. While Annala does not provide an explicit justification of the constant tax rate assumption, Barro's (1990) analysis provides some support. Annala proceeds to test for convergence in total taxes and three subcategories (property, general sales and income taxes), finding that tax revenues are converging much more rapidly than cross-state GDP. He also finds evidence of rapid convergence in most categories of state government expenditure.

Skidmore, et al (2004) provide a more formal theoretical framework for evaluating why government expenditures might converge. Their empirical analyses focus on the international evidence, showing that government consumption, capital, and education spending converged over the 1960-2000 period. Given that we rely heavily on the theoretical construct presented in Skidmore, et al (2004) to guide the empirical analyses in the present paper, we provide a concise outline of this theoretical framework. For a more complete discussion, we refer readers to Skidmore, et al (2004).

Skidmore, et al (2004) note that the current level of government spending $G_t$ can be described as a share ($\tau_t$) of the previous period's output ($Q_{t-1}$):

$$G_t \equiv \tau_t Q_{t-1} \tag{1}$$

It is well known that government budgets are, in part, a lagged reflection of past events and conditions (White 1994). For legal, administrative, and practical reasons, government spending is nearly always budgeted prior to the start of the fiscal year. Infrastructure and capital expenditures (e.g. roads and bridges) are often budgeted years, or even decades in advance. Also, expenditures for public pensions and health benefits, a substantial share of total government spending for most local governments, depends on the quantity of labor previously employed and the level of benefits previously agreed upon. In addition, at the local level budgeting processes for the next fiscal year often begin with the current budget as a starting point. During good (bad) economic times it is not uncommon to see budgets set as a simple percent increase (decrease) from the current budgeted levels. For each of these reasons, current policymakers view a large portion of expenditures as predetermined. In the context of local government spending, we acknowledge that current conditions are relevant to current spending, but we emphasize here that past conditions are also important.

It must also be recognized that local government spending has, at least the potential, to be productive in the sense that it enhances economic output. Given this assertion, Skidmore, et al

(2004) specifies per capita output (Q/L) as a function of privately input capital ($K_t$) as well as the social input of government ($G_t$). It is also assumed that the private input is separable from the government (social) input, as reflected in equation (2) below:

$$\frac{Q_t}{L_t} = q_t = f\left(\frac{K_t}{L_t}, \frac{G_t}{L_t}\right) = v_P\left(k_t\right) v_S\left(g_t\right) \tag{2}$$

where lower case letters represent per capita values.

Substituting equation (2) into (1) and approximating the production function with a constant returns to scale Cobb-Douglas form yields:

$$G_t \equiv \tau_t L_{t-1} q_{t-1} \approx \tau_t A L_{t-1} k_{t-1}^{\alpha} g_{t-1}^{\beta} \tag{3}$$

Dividing through by the population at time t multiplied by the lagged level of per capita government spending (i.e. $g_{t-1}$, $L_t$) yields:

$$\ln\left(\frac{g_t}{g_{t-1}}\right) \approx \ln A\tau_t - n_t + \alpha \ln k_{t-1} + \left(\beta - 1\right) \ln g_{t-1} \tag{4}$$

where $n_t = \ln(L_t/L_{t-1})$, i.e. the rate of population growth.

Through equation (4) we show that the growth in capita government spending depends on lagged values of private and public inputs, population growth, and $\tau_t$, the share of output devoted to government. As long as there are diminishing returns to government spending ($\beta<1$) equation (4) implies that, holding other variables constant, higher levels of past government spending will lead to a lower rate of growth in current government spending. That is, government spending will tend to converge over time—local governments with lower levels of government spending will experience rapid government growth while those that have higher initial levels of government spending will experience lower spending growth rates.

Convergence requires that $\tau$ (the ratio of government spending to lagged output) is not systematically related to g (government spending per capita). Barro's (1990) dynamic model of endogeneous growth with government spending suggests that $\tau$ should not increase with output.

However, if we do not fully accept the conclusions of Barro's (1990) analysis, we can still test the convergence hypothesis by controlling for factors other than lagged government spending that cause the ratio of government spending to output to change over time. In our empirical analysis we control for factors such as population growth and other demographic characteristics, per capita income, the level of education, the level and growth of income, and other factors to isolate the impact of past government spending on growth in government spending.

In a study the convergence of real per capita government expenditures in the European Union Afxentiou and Apostolos (1996) offer a different theoretical and econometric framework. Despite policies that encourage harmonization across EU countries Afxentiou and Apostolos (1996) find no evidence of convergence in government consumption expenditures, transfers or subsidies. They attribute their finding to strong domestic political forces that overwhelm economic forces in determining government spending. In a separate study of Canadian provinces Afxentiou and Apostolos (1999) again find limited evidence of convergence in government spending. Merriman and Skidmore (2002), however, find that U.S. state government spending on health care converged over the 1988 through 1998 period, suggesting that convergence is the result of a higher marginal benefit of health care spending in low spending states. Again, Skidmore, et al (2004) using the same theoretical structure outlined here find strong evidence of convergence across a sample of more than 120 countries over the period 1960-2000.

Just as diminishing returns to government activity drives the convergence result on the production side, diminishing marginal utility could lead to convergence on the demand side. This issue returns us to the debate centering on the size of the elasticity of income in public goods demand equations. Diminishing marginal utility in the consumption of government goods and services suggests that citizens in localities with lower levels of government spending will receive a higher marginal benefit from additional government spending than will citizens in localities with a high level of government spending. As a result, citizens in localities with low levels of government spending will exhibit a higher willingness to pay for expanded government services

than those in high spending localities, which could lead to higher spending growth in low spending localities than in high spending countries.

Much like the convergence versus divergence debate in the international and regional economics growth literature, convergence in government spending levels reduces to an empirical question. We move this discussion forward by applying the theoretical and empirical frameworks of Skidmore, et al (2004), Annala (2003) and Merriman and Skidmore (2002) to municipalities in Wisconsin over the period 1990-2000.

## 3. Stylized Facts and Empirical Analysis

We use data for 1,830 municipalities in Wisconsin to test the convergence hypothesis. Municipalities in Wisconsin are composed of 190 cities, 395 villages and 1,250 towns. Missing data for a handful of municipalities reduces the final sample to 1,778 cities, villages and towns. Expenditure and property valuation data are drawn from the Wisconsin Department of Revenue's annual municipal and county revenues and expenditure report and the socioeconomic data are from the 1990 and 2000 Census. To minimize the potential for large one time spending projects that can introduce spikes into annual data we use a two-year average for 1989-1990 and 1999-2000.

### 3.1 Stylized Facts

To set the stage for our more in-depth analysis, we present some *prima fascia* evidence of convergence. As a preliminary test we regress the change in per capita total spending from 1990 to 2000 on the initial real per capita government spending in 1990. A negative coefficient on initial spending indicates convergence. The results (with t-values in parentheses) are:

$$\text{Growth in Gov't Spending} = \underset{(13.35)}{681.30} - \underset{(-212.72)}{0.9802}(\text{Initial Gov't Spending})$$

Without controlling for other factors that may determine growth in government, we find strong evidence of convergence: The relationship between initial spending and growth is negative and

significant at the 99 percent level of confidence. A simple scatter plot of the data used in the above regression model is provided in Figure 1. Next, we conduct more thorough empirical analyses to demonstrate that the convergence result is very robust for all primary municipal government expenditure categories.

### 3.2 Convergence of Government Spending

As discussed in section 2, growth in government is a function of the level of technology (A), the share of output devoted to government ($\tau_t$), population growth (n), lagged private capital stock per capita ($k_{t-1}$), and lagged government spending per capita ($g_{t-1}$). In a manner similar to the empirical growth literature, we examine growth over the 1990-2000 period using 1990 as the base year.[2] We examine total municipal expenditures as well as several categories of disaggregated spending: protective services (police, fire, and ambulance), road maintenance, waste collection and disposal (solid and water), and quality of life services (parks and recreation, cultural and educational services, and conservation and development services).

The model presented in Skidmore, et al (2004) implies that the level of technology should be included as an explanatory variable. Unfortunately, data specifically on the level of technology in a given community is not available. At the international and state levels, it is well known that regions with high levels of human capital can absorb technology more quickly. If this is also true at the sub-state level, then community-specific changes in the level of technology are likely to be strongly correlated with the level of human capital. We measure this by the percent of population in a given community with a college degree. The model also indicates that lagged private capital stock should also be included as an explanatory variable. We use a proxy

[2] Thanks to a project funded by the University of Wisconsin—Extension, data on revenues and expenditures for all municipalities in Wisconsin is available over the 1987-2002 period. We evaluate spending over the 1990-2000 period so that we can appropriately match economic and demographic data from the Census with our fiscal data. Also recall that in order to minimize spikes in the data we use an average for 1989-1990 and 1999-2000. Unless otherwise noted references to 1990 fiscal data is in reality an average over 1989-1990 and 2000 fiscal data is an average of 1999-2000.

for capital stock the median value of housing in 1990. In addition to population growth, lagged median house value, percent of population with a college degree, and lagged government spending, in some specifications we also include initial per capita income and income growth to determine the extent to which convergence in government spending is an artifact of convergence in output. Finally, we also include a series of variables that control for other factors that may determine the growth in municipal spending (percent of population over the age of 20, percent of employment in manufacturing and professional services, number of households in 1990, change in the number of households, and percent of households with less than $15,000 in 1990). Summary statistics for all variables used in the analysis are presented in Appendix Table A.

Consistent with framework presented in Equation (5) and the macroeconomic literature on convergence, we specify growth in per capita government spending equations as:

$$\Delta g_{j,i,t} = g_{j,i,t-1}\beta_1 + X_{i,t}\beta_2 + \varepsilon_{it} \qquad (5)$$

where $j$ represents type of government expenditure (total expenditures, protective services, road maintenance, waste collection and disposal, and quality of life services) for municipality $i$ in period $t$. $g_{j,i,t-1}$ is an $n$x1 vector of lagged per capita government spending. $X_{i,t}$ is an $n$x$m$ vector control variables ($m$ is the number of controls) and where $\beta_2$ represents an $m$ x1 vector of coefficients, and $\varepsilon_{it}$ is the residual. While equation (4) suggests that a logarithmic specification should be employed, our model is specified as a level change model for one primary reason: Because our analysis includes all municipalities in Wisconsin, including small rural towns, there are a number of observations that have zero spending levels for some of our expenditure categories. This is particularly true for the category we have labeled quality of life services. We elected to use a functional form that did not arbitrarily remove observations from the analysis.

Consider first Table 1, which contain estimates of the total expenditure equations. In Model A we include as explanatory variables per capita income, number of households, and lagged government spending. In Model B, include all the variables found in Model A along with

the change in income and the change in the number of households over the period of analysis. Model C, like Model B, includes the variables found in Model A and a vector of other controls (percent of population with college degree, percent of population under the age of 20, percent of employment in manufacturing and professional services, percent of households with income less than $15,000 in 1990, median house value in 1990, and property taxes per capita in 1990). Finally, in Model D, we include the full range of controls as explanatory variables. Tables 2-5 repeat these estimations for the disaggregated expenditure categories.

Before moving on the discussion of our results we report several summary statistics and model reliability tests including a test for heteroskedasticity using an LM heteroskedasticity test, which indicates, in some cases, heteroskedastic variance of the error term, a condition index which serves as a measure multicollinearity, and the standard equation statistics including the adjusted $R^2$ and F-statistics. Consider the set of equations estimated for total expenditures (Table 1). In three of the four specifications of the model, heteroskedasticity appears to be a concern for only one of the models (Model C) and using a critical value of 70 for the condition index, multicollinearity does not appear to be a concern. The adjusted $R^2$ runs from .1989 to .2688 suggesting that the models explain between one-fifth to one-quarter of the variation in the change in total per capita government expenditure for Wisconsin municipalities. The equation F-statistics are also all statistically significant at or above the 95 percent level of confidence.

Our primary variable of interest, lagged expenditures in negative and highly significant in all four models, and the magnitude of the coefficient is stable in all four regressions. The negative coefficient indicates that municipalities with lower initial spending experienced higher growth in expenditures than did municipalities with higher initial spending, evidence in favor of convergence. According to Model A, holding 1990 per capita income and number of households constant at sample means of $11,709 and 972, respectively, a municipality with per capita spending of $600 in 1990 would have experience growth in spending of $148 per capita, whereas a municipality with per capita spending of $1,000 in 1990 would have experienced negative

growth of ($32) per capita. Alternatively, the elasticity estimate of -5.7738 suggests that a ten percent increase in per capita total spending in 1990 would be a 57.7 percent decline in the level of growth in spending between 1990 and 2000.

The control variables generally have signs one might expect. From Model 4, base year per capita income and the number of household are not significant determinants of spending growth. Changes in income and the number of households are both significant determinants of spending growth: higher income growth leads to higher spending growth, but the there is a negative relationship between growth in households and spending growth. Percent of the population with a college degree, percent of the population under the age of 20, and percent of the population employed in manufacturing are all positively correlated with spending growth, but the percent employment in professional services and the percent of households with income less than $15,000 are not significant determinants of growth. The higher is the median housing value in 1990 the slower is expenditure growth, and a higher per capita property taxes in 1990 is positively correlated with expenditure growth over the period of analysis. These results are consistent with previous studies looking at the demand structure of public services in Wisconsin (Deller and Maher (forthcoming), and Deller, et al (forthcoming)).

While the results of the control variables are of interest, the central role these variables play in our analysis is to test for the sensitivity of the estimated coefficient on lagged expenditures to changes in the specification of the model. While we do not explicitly test for equivalence of the central coefficient across the four specifications, they appear to be relatively stable ranging from -.4275 to -.5008 and the elasticity of expenditure ranges from -5.5 to -6.4. The stability of these results across specifications lends confidence to the robustness of the convergence conclusion.

While our primary objective is to examine whether total municipal expenditures exhibit convergence, we also wanted to examine the individual expenditure components. In Table 2 we present the estimates for protective service expenditures. Again, the coefficient on lagged

protective service expenditures is negative and significant at the 99 percent confidence level. While space limitations prevent us from discussing the other coefficient estimates for these regressions in detail, we note the adjusted $R^2$ is considerably higher, ranging from 0.55 to 0.60. In Table 3 we report the estimates for per capita road maintenance regressions. The coefficient on lagged per capita road expenditures is again negative and highly significant, exhibiting convergence. The adjusted $R^2$ is very high for a cross-sectional analysis, ranging from 0.66 to .069 in the four regressions. The coefficient estimates for the per capita waste services and quality of life services equations are present in Tables 4 and 5, respectively. Again in both sets of regressions we observe the convergence result: the estimated coefficients on lagged expenditures are negative and highly significant. Although the adjusted $R^2$ is a little lower in the waste services regressions (0.30 to 0.33), it is quite high in the quality of life regressions (0.71 to 0.74)

The results reported in Tables 1-5 provide strong evidence of convergence in total expenditure as well as for every primary expenditure category. The approach offered here examines growth in government spending in the context of neo-classical growth theory, or a supply-side focused approach. As long as there are diminishing returns to government spending we would expect to see convergence in government spending over time. The results presented here confirm these expectations.

**4. Conclusion**

In this study, we utilize a simple theoretical framework based on fundamental macroeconomic growth models to illustrate why government spending might converge. We document the convergence of government spending using data on Wisconsin municipal governments for total expenditures, protective services, road maintenance, waste collection and disposal, and quality of life services. The results show that total expenditures as well as all five expenditure sub-categories are indeed converging.

Much of the previous research that has sought to explain growth in government has focused on factors such as changing income, changing voter preferences, increased tax

competition, and bureaucratic power. The findings presented here illustrate a dynamic process that plays a role in the evolution of government spending. Past levels of government activity are important determinants of current government spending. Our study fits nicely into the limited empirical study of convergence in government spending. Specifically, Skidmore, et al (2004) document convergence in government spending using international data, Annala (2003) provides evidence of convergence using data government finances from U.S. states. Our work complements this previous literature by showing that at the local level, there is also compelling evidence of convergence in government spending. Therefore, we urge those engaged in work aimed at studying the growth of government (federal, state, and local) to include initial spending as a control in order to avoid omitted variable bias.

Figure 1
Absolute Convergence in Per Capita Total Municipal Spending

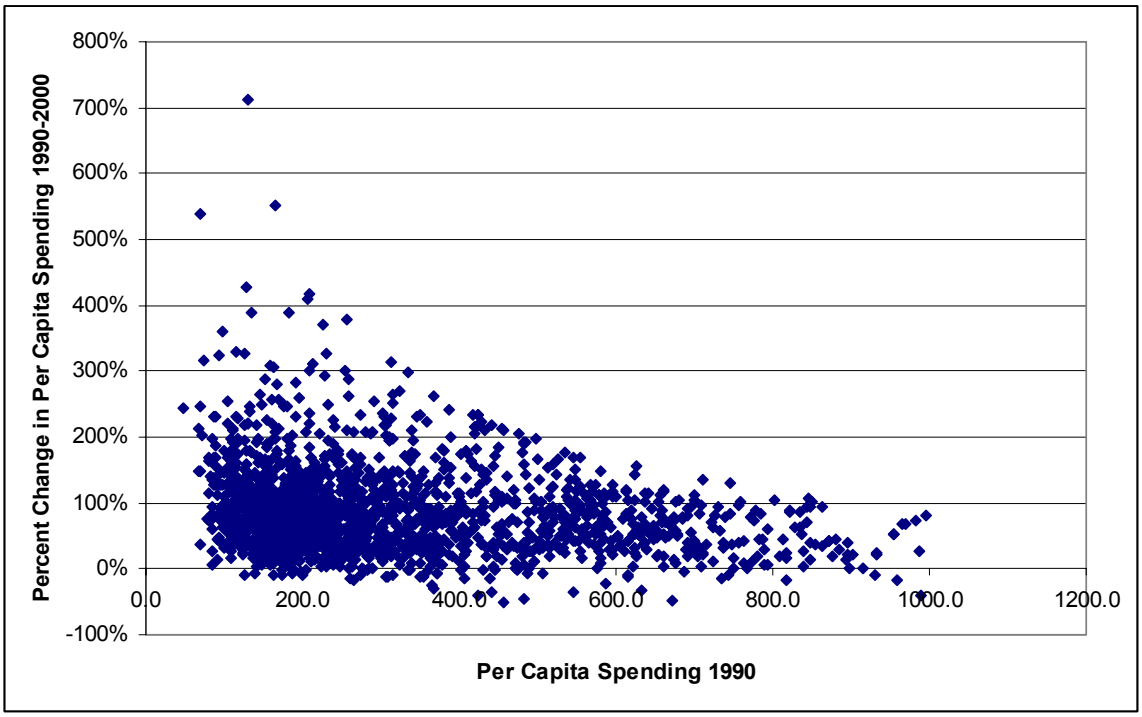

Table 1. Change in Per Capita Total Expenditures

| | Model A | Model B | Model C | Model D |
|---|---|---|---|---|
| Per capita total expenditures 1990 | -0.4487 | -0.4275 | -0.5008 | -0.4782 |
| | (20.99) | (19.80) | (23.55) | (22.22) |
| Elasticity of expenditure | -5.7738 | -5.5010 | -6.4442 | -6.1534 |
| Per capita income 1990 | -0.0157 | -0.0208 | -0.0336 | -0.0213 |
| | (1.30) | (1.68) | (1.46) | (0.87) |
| Number of households 1990 | -0.0108 | 0.1178 | -0.0242 | 0.0927 |
| | (0.16) | (1.69) | (0.36) | (1.31) |
| Change in per capita income 1990-2000 | | 0.0424 | | 0.0427 |
| | | (2.98) | | (2.65) |
| Change in number of households 1990-2000 | | -0.8681 | | -0.7456 |
| | | (5.80) | | (5.09) |
| Percent of population with college degree 1990 | | | 4385.1241 | 3578.8024 |
| | | | (4.32) | (3.47) |
| Percent of the population under age 20 1990 | | | 2617.4927 | 2696.5744 |
| | | | (2.58) | (2.66) |
| Percent of employment in manufacturing 1990 | | | 3008.3811 | 2921.8598 |
| | | | (6.29) | (6.13) |
| Percent of employment in professional services 1990 | | | 7.2205 | 359.5821 |
| | | | (0.01) | (0.46) |
| Percent of households with income less than $15,000 1990 | | | 444.8244 | 305.3777 |
| | | | (0.81) | (0.56) |
| Median house value 1990 | | | -0.0137 | -0.0158 |
| | | | (3.61) | -3.83 |
| Property taxes per capita 1990 | | | 4.6074 | 4.4869 |
| | | | (9.32) | (9.14) |
| Intercept | 616.4096 | 367.6273 | -999.8702 | -1292.9412 |
| | (20.99) | (2.31) | (1.84) | (2.31) |
| Adjusted R2 | 0.1989 | 0.2164 | 0.2557 | 0.2688 |
| F-statistic | 148.18 | 99.18 | 62.08 | 55.47 |
| sample size | 1778 | 1778 | 1778 | 1778 |
| Condition Index | 7.33 | 8.91 | 42.50 | 46.87 |
| Heteroskedasicity Chi-Square (marginal significance) | 11.45 | 38.88 | 63.94 | 76.86 |
| | (0.2463) | (0.0069) | (0.5138) | (0.3868) |

Table 2. Change in Per Capita Protective Services Expenditures

| | Model A | Model B | Model C | Model D |
|---|---|---|---|---|
| Per capita protective services expenditures 1990 | -0.6817 | -0.6675 | -0.7054 | -0.6905 |
| | (47.05) | (45.44) | (49.59) | (47.94) |
| Elasticity of expenditure | -1.2986 | -1.2715 | -1.3437 | -1.3154 |
| Per capita income 1990 | 0.0059 | 0.0048 | 0.0065 | 0.0107 |
| | (2.94) | (2.33) | (1.72) | (2.69) |
| Number of households 1990 | 0.0033 | 0.0223 | 0.0097 | 0.0281 |
| | (0.31) | (0.19) | (0.86) | (2.41) |
| Change in per capita income 1990-2000 | | 0.0077 | | 0.0111 |
| | | (3.27) | | (4.20) |
| Change in number of households 1990-2000 | | -0.1312 | | -0.1107 |
| | | (5.29) | | (4.60) |
| Percent of population with college degree 1990 | | | -262.9337 | -443.3401 |
| | | | (1.59) | (2.63) |
| Percent of the population under age 20 1990 | | | 205.3754 | 247.9567 |
| | | | (1.23) | (1.49) |
| Percent of employment in manufacturing 1990 | | | 296.7904 | 271.2499 |
| | | | (3.79) | (3.48) |
| Percent of employment in professional services 1990 | | | 354.2246 | 412.5536 |
| | | | (2.74) | (3.22) |
| Percent of households with income less than $15,000 1990 | | | 111.2129 | 97.9619 |
| | | | (1.23) | (1.06) |
| Median house value 1990 | | | -0.0012 | -0.0021 |
| | | | (1.87) | (2.95) |
| Property taxes per capita 1990 | | | 0.9504 | 0.9267 |
| | | | (11.72) | (11.54) |
| Intercept | 13.7841 | -28.6444 | -233.3849 | -317.6784 |
| | (0.59) | (1.09) | (2.60) | (3.44) |
| Adjusted R2 | 0.5549 | 0.5636 | 0.5899 | 0.5985 |
| F-statistic | 739.75 | 460.28 | 256.73 | 221.85 |
| sample size | 1778 | 1778 | 1778 | 1778 |
| Condition Index | 7.30 | 8.89 | 42.52 | 46.89 |
| Heteroskedasicity Chi-Square (marginal significance) | 9.00 | 43.07 | 47.36 | 104.01 |
| | (0.4372) | (0.0020) | (0.9510) | (0.1484) |

Table 3. Change in Per Capita Road Expenditures

| | Model A | Model B | Model C | Model D |
|---|---|---|---|---|
| Per capita road expenditures 1990 | -0.9118 | -0.9068 | -0.9167 | -0.9130 |
| | (58.80) | (57.28) | (61.18) | (59.67) |
| Elasticity of expenditure | -4.0619 | -4.0397 | -4.0838 | -4.0673 |
| Per capita income 1990 | -0.0001 | -0.0001 | -0.0002 | -0.0002 |
| | (0.30) | (0.39) | (0.87) | (0.69) |
| Number of households 1990 | -0.0002 | 0.0002 | 0.0001 | 0.0004 |
| | (0.30) | (0.22) | (0.08) | (0.45) |
| Change in per capita income 1990-2000 | | 0.0001 | | 0.0001 |
| | | (0.80) | | (0.64) |
| Change in number of households 1990-2000 | | -0.0031 | | -0.0021 |
| | | (1.65) | | (1.17) |
| Percent of population with college degree 1990 | | | 12.6621 | 10.5645 |
| | | | (1.01) | (0.82) |
| Percent of the population under age 20 1990 | | | -21.2858 | -21.0175 |
| | | | (1.69) | (1.66) |
| Percent of employment in manufacturing 1990 | | | -2.1080 | -2.2430 |
| | | | (0.36) | (0.38) |
| Percent of employment in professional services 1990 | | | 4.6334 | 5.5648 |
| | | | (0.47) | (0.57) |
| Percent of households with income less than $15,000 1990 | | | -8.1111 | -8.4750 |
| | | | (1.19) | (1.24) |
| Median house value 1990 | | | -0.0002 | -0.0002 |
| | | | (3.28) | (3.13) |
| Property taxes per capita 1990 | | | 0.0665 | 0.0663 |
| | | | (10.94) | (10.89) |
| Intercept | 8.7679 | 7.9336 | 19.6045 | 18.6964 |
| | (4.94) | (3.96) | (2.90) | (2.66) |
| Adjusted R2 | 0.6604 | 0.6606 | 0.6872 | 0.6872 |
| F-statistic | 1153.42 | 693.20 | 391.64 | 484.99 |
| sample size | 1778 | 1778 | 1778 | 1778 |
| Condition Index | 7.26 | 8.85 | 42.38 | 46.75 |
| Heteroskedasicity Chi-Square (marginal significance) | 12.52 | 26.60 | 92.34 | 95.12 |
| | (0.1858) | (0.1470) | (0.0145) | (0.3357) |

Table 4. Change in Per Capita Waste Services Expenditures

| | Model A | Model B | Model C | Model D |
|---|---|---|---|---|
| Per capita waste services expenditures 1990 | -1.1497 | -1.1467 | -1.1856 | -1.1815 |
| | (27.81) | (27.71) | (28.89) | (28.64) |
| Elasticity of expenditure | -1.2426 | -1.2394 | -1.2814 | -1.2770 |
| Per capita income 1990 | -0.0029 | -0.0041 | -0.0092 | -0.0073 |
| | (1.19) | (1.59) | (1.92) | (1.43) |
| Number of households 1990 | -0.0089 | -0.0094 | -0.0152 | -0.0141 |
| | (0.66) | (0.66) | (1.07) | (0.96) |
| Change in per capita income 1990-2000 | | 0.0056 | | 0.0035 |
| | | (1.90) | | (1.02) |
| Change in number of households 1990-2000 | | -0.0072 | | -0.0020 |
| | | (0.24) | | (0.07) |
| Percent of population with college degree 1990 | | | 807.4383 | 754.9151 |
| | | | (3.84) | (3.48) |
| Percent of the population under age 20 1990 | | | 710.9790 | 734.2005 |
| | | | (3.38) | (3.48) |
| Percent of employment in manufacturing 1990 | | | 567.3916 | 556.1277 |
| | | | (5.74) | (5.58) |
| Percent of employment in professional services 1990 | | | 100.3032 | 110.3424 |
| | | | (0.61) | (0.67) |
| Percent of households with income less than $15,000 1990 | | | 231.5718 | 236.9154 |
| | | | (2.03) | (2.07) |
| Median house value 1990 | | | -0.0009 | -0.0013 |
| | | | (1.22) | (1.51) |
| Property taxes per capita 1990 | | | 0.5300 | 0.5257 |
| | | | (5.21) | (5.16) |
| Intercept | 95.9848 | 66.6451 | -355.9048 | -387.7203 |
| | (3.30) | (2.03) | (3.15) | (3.30) |
| Adjusted R2 | 0.3028 | 0.3034 | 0.3290 | 0.3286 |
| F-statistic | 258.40 | 155.91 | 88.17 | 73.52 |
| sample size | 1778 | 1778 | 1778 | 1778 |
| Condition Index | 7.23 | 8.82 | 42.29 | 46.62 |
| Heteroskedasicity Chi-Square (marginal significance) | 7.46 | 15.13 | 68.91 | 83.34 |
| | (0.5891) | (0.7688) | (0.3466) | (0.6768) |

Table 5. Change in Per Capita Quality of Life Services Expenditures

| | Model A | Model B | Model C | Model D |
|---|---|---|---|---|
| Per capita quality of life services expenditures 1990 | -0.8525 | -0.8473 | -0.8770 | -0.8727 |
| | (66.44) | (64.88) | (71.48) | (69.72) |
| Elasticity of expenditure | -2.7946 | -2.7776 | -2.8749 | -2.8608 |
| Per capita income 1990 | 0.0002 | -0.0004 | -0.0049 | -0.0038 |
| | (0.16) | (0.28) | (1.73) | (1.25) |
| Number of households 1990 | 0.0083 | 0.0139 | 0.0020 | 0.0069 |
| | (0.99) | (1.57) | (0.23) | (0.78) |
| Change in per capita income 1990-2000 | | -0.0043 | | 0.0029 |
| | | (2.39) | | (1.45) |
| Change in number of households 1990-2000 | | -0.0435 | | -0.0307 |
| | | (2.27) | | (1.67) |
| Percent of population with college degree 1990 | | | 549.3036 | 502.3803 |
| | | | (4.38) | (3.90) |
| Percent of the population under age 20 1990 | | | 85.1010 | 96.3791 |
| | | | (0.67) | (0.76) |
| Percent of employment in manufacturing 1990 | | | 496.2863 | 489.6670 |
| | | | (8.36) | (8.21) |
| Percent of employment in professional services 1990 | | | 175.5685 | 191.6242 |
| | | | (1.79) | (1.95) |
| Percent of households with income less than $15,000 1990 | | | 111.5432 | 108.2371 |
| | | | (1.63) | (1.58) |
| Median house value 1990 | | | -0.0015 | -0.0017 |
| | | | (3.15) | (3.27) |
| Property taxes per capita 1990 | | | 0.7039 | 0.6985 |
| | | | (11.50) | (11.41) |
| Intercept | 52.8944 | 28.8929 | -147.4435 | -169.3005 |
| | (2.92) | (1.41) | (2.16) | (2.40) |
| Adjusted R2 | 0.7129 | 0.7143 | 0.7445 | 0.7449 |
| F-statistic | 1472.82 | 889.97 | 519.00 | 433.67 |
| sample size | 1778 | 1778 | 1778 | 1778 |
| Condition Index | 7.23 | 8.84 | 42.39 | 46.77 |
| Heteroskedasicity Chi-Square (marginal significance) | 8.36 | 38.56 | 83.82 | 131.29 |
| | (0.4987) | (0.0076) | (0.0581) | (0.0030) |

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Appendix A
Summary of Statistics of All Variables Used in the Analysis

| | | Mean | Standard Deviation |
|---|---|---|---|
| Per capita total expenditures 1990 | $ | 750.40 | 10,929.39 |
| **Change in per capita total expenditures 1990-2000** | $ | (**46.45**) | 11,043.24 |
| Per capita protective services expenditures 1990 | $ | 190.60 | 2,170.32 |
| Change in per capita protective services expenditures 1990-2000 | $ | 5.72 | 2,053.32 |
| Per capita road expenditures 1990 | $ | 8.93 | 156.92 |
| Change in per capita road expenditures 1990-2000 | $ | 1.76 | 161.47 |
| Per capita waste services expenditures 1990 | $ | 25.16 | 799.89 |
| Change in per capita waste services expenditures 1990-2000 | $ | 54.87 | 1,200.78 |
| Per capita quality of life services expenditures 1990 | $ | 156.20 | 2,931.28 |
| Change in per capita quality of life services expenditures 1990-2000 | $ | (40.47) | 2,947.84 |
| Per capita income 1990 | $ | 11,708.72 | 3,808.26 |
| Change in per capita income 1990-2000 | $ | 7,766.95 | 3,160.56 |
| Number of households 1990 | | 972.31 | 6,265.40 |
| Change in number of households 1990-2000 | | 191.22 | 1,018.84 |
| Percent of population with college degree 1990 | | 11.4% | 0.08 |
| Percent of the population under age 20 1990 | | 30.5% | 0.05 |
| Percent of employment in manufacturing 1990 | | 24.7% | 0.10 |
| Percent of employment in professional services 1990 | | 21.9% | 0.08 |
| Percent of households with income less than $15,000 1990 | | 25.6% | 0.11 |
| Median house value 1990 | $ | 52,808.16 | 23,153.54 |
| Property taxes per capita 1990 | $ | 98.02 | 100.09 |