Eastern Economic Journal, **2008**, **34**, (41–55)
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www.palgrave-journals.com/eej

Is Local Government Spending Converging?

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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. develop a model that is consistent with the macroeconomic growth literature, which predicts convergence in government spending. Using this framework, we test for convergence in government spending using detailed data from Wisconsin for a variety of municipal government expenditure categories over the period 1990–2000. Our empirical investigation provides compelling evidence of convergence in per capita government spending for all the expenditure categories we study.
Eastern Economic Journal (2008) **34,** 41–55. doi:10.1057/palgrave.eej.9050019

Keywords: government growth; convergence

JEL: H7; R5

INTRODUCTION

Traditional models of public finance including the median voter [Bowen 1943; Black 1948], the Tiebout [1956] and Peterson [1981] view of competition among 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.[1] Assuming that elected officials 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.

The goods and services provided by local governments are seldom for immediate consumption and can be interpreted as inputs to productive activity in the private sector. This includes not only the obvious infrastructure spending like roads, bridges, and water treatment facilities 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 can probably be interpreted as some kind of investment. Even investments in "quality of life" attributes such as parks, recreational, and cultural services are playing an increasingly 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 demonstrating that as income increases the demand for public services will also increase, translating in

practice into a natural tendency to increase government spending. From a demand perspective, the question hinges on the income elasticity 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 in greater proportion. We hypothesize that this will lead to convergence of government spending across localities.

In the next section of this study, 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 lower initial levels of government spending. In the subsequent section, 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. We summarize our findings and discuss their implications in the last section.

LITERATURE REVIEW AND THEORETICAL CONSIDERATIONS

The existing work that examines convergence in government spending is relatively limited. In relation to the present study, the three most relevant articles are that of Scully [1991], Annala [2003], and Skidmore et al. [2004]. We begin by first reviewing the work of Scully [1991] and Annala [2003] as well as several other related studies, and then provide an in-depth review of Skidmore et al. [2004]. The work of Scully [1991] contends that migration may contribute to the convergence of fiscal policies. Scully begins his analysis with the assumption that voter preferences for net public income transfers are similar across regions. From this core assumption, Scully builds a framework to demonstrate that fiscal regimes will converge as incomes converge. Scully's accompanying empirical analysis shows that convergence of total state and local taxes coincides with convergence of per capital incomes across states. Annala [2003] extends the work of Scully [1991] by examining conditional convergence among fiscal policies of US states over the period 1977 to 1996. The theoretical basis of his work 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 predicts, 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 sub-categories (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. Merriman and Skidmore [2001] also find that US state government spending on health care converged over the period 1988 to 1998.

In a study of the convergence of real per capita government expenditures in the European Union, Afexentiou and Serletis [1996] offer a different theoretical and econometric framework. Despite policies that encourage harmonization across EU countries, Afexentiou and Serletis 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, Afexentiou and Serletis [1999] again find only limited evidence of convergence in government spending.

Building on Barro [1990] and Annala [2003], 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 study, we provide a concise outline of this theoretical framework.

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, bridges, and expensive capital items such as fire trucks) 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, depend 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.[2] Given this assertion, Skidmore et al. [2004] specify per capita output (Q/L) as a function of private 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 (public) input, as reflected in equation (2) below:

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

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

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

where $n_t = \ln(L_t/L_{t-1})$, that is, 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 τ_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 slower 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 slower spending growth rates.

Convergence requires that τ (the ratio of government spending to lagged output) is not systematically related to g (government spending per capita). Barro's [1990] dynamic model of endogenous growth with government spending suggests that τ should not increase with output. If we do not fully accept the conclusions of Barro's [1990] analysis, however, 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 growth in the median household income, the level of education, intergovernmental transfers, and other factors to isolate the impact of past government spending on growth in government spending.

Just as diminishing returns to government activity drive 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. In addition, Besley and Case [1995] show that local government spending decisions are often influenced by spending decisions in nearby communities. This so-called "yardstick" competition may also lead to the convergence result.

Also, intergovernmental transfers from state governments to the local level may also play a role in convergence. In Wisconsin (as well as other states), state aid depends in part on tax effort and tax base; poorer communities with correspondingly low spending tend to receive more assistance than wealthier and higher spending communities. This is most evident in public education aid formulas that are aimed at equalizing spending levels. It may be that this structure encourages low-spending municipalities to grow at a faster pace than high-spending communities. In our empirical analysis, we control for the level of state aid in order to disentangle the possible reasons for convergence in spending.

Much like the convergence *vs* divergence debate in the international and regional economics growth literature (e.g., Barro and Sala-i-Martin [1992]; [1995]; Durlauf [2000]; Deller et al. [2003]; [2005]), convergence in government spending reduces to an empirical question. We move this discussion forward by applying the theoretical and empirical frameworks of Annala [2003], Skidmore et al. [2004] and Merriman and Skidmore [2001] to a selection of local governments, specifically municipalities in Wisconsin, over the period 1990–2000. Although our theoretical discussion emphasizes the role of diminishing marginal product of government "capital", we also highlight several other possible driving forces that might also lead to convergence in government spending (e.g., diminishing marginal utility of government services, yardstick competition, and intergovernmental transfer

mechanisms). One last important point should be highlighted: the model presented above demonstrates that convergence in government spending is not merely an artifact of converging output, although convergence in output may also play a role. In the empirical analysis, we attempt to disentangle the differing potential sources of convergence, but we acknowledge that we are not able to completely isolate the production-side effect. Nevertheless, as shown in the next section our empirical analysis documents a robust convergence result.

STYLIZED FACTS AND EMPIRICAL ANALYSIS

We use data for 581 cities and villages in Wisconsin to test the convergence hypothesis. Municipalities in Wisconsin are composed of 190 cities and 395 villages.[3] Missing data for some municipalities reduce the final sample to 543. Expenditure and commercial/industrial 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.[4] To minimize the potential for large one-time spending projects that can introduce spikes into annual data, we use a 2-year average for 1989–1990 and 1999–2000.[5]

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 *ln*(real per capita total spending in 2000/real per capita total spending in 1990) on *ln*(initial real per capita government spending in 1990). A negative coefficient on initial spending indicates convergence. The results (with absolute value of t-values in parentheses) are

$$ln(g_{2000}/g_{1990}) = 2.0797 - 0.2347 \times ln(g_{1990}) \quad (5)$$
$$(7.73) \quad (5.42)$$

Without controlling for other factors that may determine growth in government, we find strong evidence of absolute convergence: the relationship between initial spending and growth is negative and significant at the 99 percent level of confidence and initial spending levels explain 5.2 percent of the variation in spending growth (adjusted $R^2 = 0.0516$). A simple scatter plot (Figure 1) of lagged spending on the percent change in spending provides visual evidence supporting our hypothesis of convergence. To demonstrate that the convergence result is robust, we expand the specification of the model as well as examine specific municipal government expenditure categories including protective services, road services, waste services, and a broad category that we call quality of life services.

Convergence of government spending

As outlined in the previous section, growth in government is a function of the level of technology (A), the share of output devoted to government (τ_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. We examine total municipal expenditures as well as several categories of disaggregated spending: protective services (police, fire, and ambulance), road maintenance, waste collection

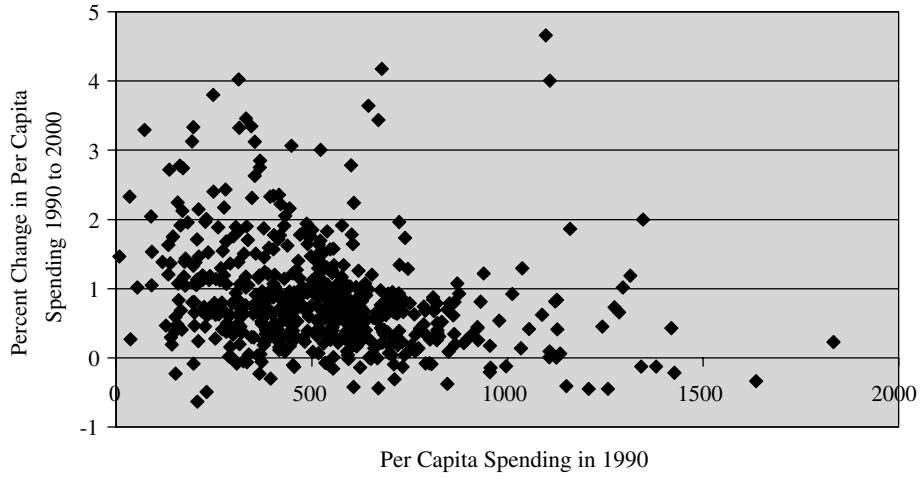

Figure 1. Convergence in per capita spending for Wisconsin municipalities.

and disposal (solid and water), and quality of life services (parks and recreation, cultural and non-K12 educational services, and conservation and development services).

Consistent with the framework presented in equation (4) and the macroeconomic literature on convergence, we specify growth in per capita government spending equations as:

$$ln\left(\frac{g_{j,i,t}}{g_{j,i,t-1}}\right) = \delta + (\beta_1) ln\, g_{j.i.t-1} + X_{m,j,i}(\beta_2) + \varepsilon_{j,i} \tag{6}$$

where j represents the type of government expenditure as described above for municipality i in period t. $g_{j,i,t-1}$ is an $n \times 1$ vector of lagged per capita government spending, $X_{m,j,i}$ is an $n \times m$ vector control variables (m is the number of controls), where β_2 represents an $m \times 1$ vector of coefficients, and $\varepsilon_{j,i}$ is the residual.

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 are 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. Our proxy for technology is therefore the percent of population in a given community with a college degree.[6] The model also indicates that lagged private capital stock should also be included as an explanatory variable. Our measure of capital stock is the per capita value of all commercial and industrial property in 1990.

In addition to the specification closely linked to equation (4), which includes population growth, commercial, and industrial property value, percent of population with a college degree, and lagged government spending, we offer a third specification of the empirical model where we include growth in per capita income and the share of state aid out of total expenditure in 1990 to test whether convergence in government spending is an artifact of convergence in output or intergovernmental transfer formulas. Finally, in this third specification we also

include a series of variables that control for other factors that may determine the growth in municipal spending (gini coefficient of income inequality, poverty rate, percent of employment in manufacturing and professional services, and public services). These additional variables reflect demand-side factors as suggested by the median-voter framework.[7] As noted earlier, we are less interested in the empirical results of these additional variables and are more interested in the stability of the convergence result over alternative specifications of the empirical model. Summary statistics for all variables used in the analysis are presented in Table 1.

We report our findings in Table 2. The first set of regressions estimates the determinants of the growth in total per capita spending, which is followed by the four disaggregated spending categories. In the first column of each expenditure category, we include just lagged government spending as an explanatory variable. In the second column for each expenditure category, we include the variables our basic theoretical model indicates as determinants of government growth (lagged government spending, lagged capital stock, human capital as a proxy for technology, and growth in population). Finally, to test the robustness of our primary interest in the convergence phenomenon, in column 3 of each expenditure category, we include the additional control variables described above.

Before moving to the discussion of our results, we report several model reliability tests including a test for heteroskedasticity using an LM heteroskedasticity test, which indicates, in some cases, heteroskedastic variance of the error term. We also report 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 (first three columns). In all specifications of the model, neither heteroskedasticity nor multicolinearity appears to be a concern. The adjusted R^2 runs from 0.05 to 0.60, indicating that the expanded models explain more than half of the variation in the percentage change in

Table 1 Summary statistics

Variable name	*Number of observations*	*Mean*	*Standard deviation*
Per capita assessed value in commercial and manufacturing	543	1791.454	10690.802
Percent of persons over 16 with at least a college degree	543	0.094	0.064
Growth in population 1990–2000	543	12.314	40.253
Growth in median household income 1990–2000	543	57.213	22.838
Intergovernmental aid as a share of total revenue 1990	543	60.667	19.940
Gini coefficient of income equality	543	0.208	0.105
Poverty rate	543	9.753	6.162
Percent of occupations classified as professional	543	22.272	9.705
Percent of employment in manufacturing	543	27.388	10.006
Percent of employment in the public sector	543	24.256	11.389
Change in per capita total expenditures 1990–2000	543	180.525	813.375
Per capita total expenditures 1990	543	818.839	526.087
Change in per capita protective services expenditures 1990–2000	543	17.705	107.257
Per capita protective services expenditures 1990	543	190.937	1448.050
Change in per capita road maintenance expenditures 1990–2000	543	165.411	793.802
Per capita road maintenance expenditures 1990	543	90.221	515.364
Change in per capita waste management expenditures 1990–2000	543	489.654	4536.520
Per capita waste management expenditures 1990	543	95.870	412.584
Change in per capita quality of life expenditures 1990–2000	543	424.687	1638.790
Per capita quality of life expenditures 1990	543	120.128	1079.52

Table 2 Regression results (Absolute value of asymptotic *t*-statistics in parentheses)

Dependent variable: change in ln(Per capita expenditures)	*Total expenditures*			*Protective services*			*Road maintenance*		
Lagged per capita expenditures	−0.2347	−0.2598	−0.2946	−0.1709	−0.2588	−0.2645	−0.2827	−0.2626	−0.2641
	(5.42)	(8.21)	(8.62)	(4.82)	(8.66)	(8.14)	(6.96)	(8.55)	(7.95)
Assessed land value in commercial and manufacturing		0.0325	0.0327		0.0635	0.0598		0.0047	−0.0037
		(3.08)	(2.96)		(4.86)	(4.44)		(0.40)	(0.28)
Percent of persons over 16 with at least a college degree		0.0134	0.0055		−0.0203	−0.1462		0.0021	−0.0132
		(0.40)	(0.12)		(0.51)	(2.70)		(0.05)	(0.24)
Growth in population 1990–2000		−0.9040	−0.9030		−0.9291	−0.9350		−0.9135	−0.9144
		(24.59)	(25.06)		(21.49)	(21.92)		(21.19)	(21.25)
Growth in median household income 1990−2000		−0.0139	0.0490		0.1660	0.2800		−0.1452	−0.1362
		(0.10)	(0.34)		(1.02)	(1.66)		(0.89)	(0.80)
Intergovernmental aid as a share of total revenue			−0.2646			−0.1568			−0.1781
			(4.29)			(2.16)			(2.51)
Gini coefficient of income equality			0.0120			0.0081			−0.0407
			(0.46)			(0.26)			(1.28)
Poverty rate			−0.0612			−0.1321			0.0216
			(1.76)			(3.20)			0.52
Percent of occupations classified as professional			−0.2228			−0.0076			−0.1117
			(3.18)			(0.09)			(1.33)
Percent of employment in manufacturing			0.0553			−0.0522			−0.0352
			(1.03)			(0.82)			(0.55)
Percent of Employment in the public sector			0.1012			0.0844			−0.0131
			(2.03)			(1.44)			(0.22)
Intercept	2.0797	1.8612	1.6150	1.3981	0.8339	0.1700	1.6532	1.6118	1.3247
	(7.73)	(7.51)	(4.73)	(8.51)	(3.35)	(0.48)	(9.94)	(6.32)	(3.65)
Adjusted R^2	0.0516	0.5756	0.6000	0.0412	0.5131	0.5349	0.0822	0.5102	0.5208
F-statistic	29.41	145.66	72.4	23.23	113.19	55.52	48.45	111.87	52.46
Chi-square for homogeneity	2.05	28.50	76.91	3.44	48.78	101.38	7.54	51.17	96.49
Condition index for collinearity	20.35	35.94	69.33	11.17	31.15	60.00	11.64	31.71	60.51

$N = 543$

Table 2 *Continued*

Dependent variable: change in ln(Per capita expenditures)	*Waste services*			*Quality of life services*		
Lagged per capita expenditures	−0.6090	−0.6335	−0.6484	−2.6271	−2.9588	−2.9677
	(13.11)	(14.90)	(15.39)	(4.62)	(5.65)	(5.32)
Assessed land value in commercial and manufacturing		0.0108	0.0084		0.5245	0.4007
		(0.45)	(0.33)		(1.48)	1.04
Percent of persons over 16 with at least a college degree		−0.0224	−0.0497		0.4566	−0.3121
		(0.27)	(0.45)		(0.41)	(0.20)
Growth in Population 1990 to 2000		−0.9346	−0.9408		−18.3904	−18.4006
		(10.52)	(10.78)		(15.14)	(15.08)
Growth in Median household income 1990–2000		−0.1368	0.0617		8.5374	10.1021
		(0.41)	(0.18)		(1.85)	(2.09)
Intergovernmental aid as a share of total revenue			−0.4861			−3.2243
			(3.45)			(1.63)
Gini coefficient of income equality			0.0102			0.0260
			(0.16)			(0.03)
Poverty rate			−0.2117			−0.8513
			(2.55)			(0.72)
Percent of occupations classified as professional			−0.5102			−0.8809
			(3.00)			(0.37)
Percent of employment in manufacturing			0.0854			1.3856
			(0.66)			(0.76)
Percent of employment in the public sector			0.2049			1.3446
			(1.71)			(0.79)
Intercept	2.5265	2.5103	1.2574	15.1130	7.2418	4.8818
	(13.95)	(4.87)	(1.79)	(6.72)	1.06	(0.50)
Adjusted R^2	0.2411	0.3752	0.4080	0.0379	0.3364	0.3420
F statistic	171.87	64.49	33.27	21.34	54.45	25.09
Chi-square for homogeneity	12.2	35.09	79.34	2.52	23.55	51.35
Condition index for collinearity	7.56	31.49	58.44	6.24	31.35	57.60
$N = 543$						

the 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, is negative and highly significant in all three specifications of the total expenditure model, and the magnitude of the coefficient is stable. 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 the regression in column 1, a coefficient of -0.23 indicates that, all else equal, each one percent increase in lagged government spending per capita is associated with 0.77 percent of additional current government spending.[8] For concreteness, consider two otherwise identical municipalities, one of which has twice the level of spending in the initial period as the other. After year 1, the higher spending municipality will spend 77 percent more (rather than 100 percent). After 5 years, the higher spending municipality will spend 27 percent more, and after 10 years it will spend just 7 percent more. This is a relatively slow rate of convergence, but note that the cumulative effect is substantial.[9]

The control variables generally have signs that one might expect. From columns 2 and 3 in the total expenditure category, the coefficient on per capita assessed value of commercial and industrial property is positive and significant, but the percent of persons with a college degree is insignificant. Consistent with our simple model, growth in population is also significant, reducing per capita spending growth. Somewhat surprising is the insignificance of the coefficient on growth in median household income. Note, however, that municipalities with high poverty rates grow more slowly. The share of intergovernmental transfers out of total revenues is inversely related to spending growth, suggesting that dependence on higher levels of government for revenue may dampen municipal government expenditure growth. As expected, a larger proportion of the labor force in professional services reduces spending growth, but a larger proportion working in the public sector increases spending growth.

These results are largely consistent with previous studies examining the demand structure of local public services in Wisconsin [Deller and Maher 2005; 2006]. We acknowledge that in a Tiebout/Peterson-type framework, variables such as income and population growth are arguably endogenously determined. Our key objective in the present study is to examine the robustness of the convergence result to the inclusion/exclusion of other possible determinants of per capita spending growth. Our regressions show that the convergence result is indeed robust and that the coefficient on initial per capita government spending is very stable across alternative specifications. While we do not explicitly test for equivalence of the central coefficient across the three specifications, note that they are quite stable, ranging from -0.235 to -0.295. Given our objective and the stability of our convergence result, we do not further explore endogeneity issues.

Our primary objective is to examine whether total per capita municipal expenditures exhibit convergence, but we also explore the individual expenditure components to further test for the consistency and stability of the convergence hypothesis. In the remaining columns of Table 2, we present the estimates for expenditures on protective services, road maintenance, waste services, and quality of life services. 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

that the adjusted R^2 is somewhat low, ranging from 0.171 to 0.265. The road maintenance regressions also exhibit convergence with the coefficient on lagged per capita road expenditures negative and highly significant. The adjusted R^2 in these regressions ranges from 0.082 to 0.521 in the three specifications. The coefficient estimates for the per capita waste services and quality of life services equations are presented next. Again, in both sets of regressions the estimated coefficients on lagged expenditures are negative and highly significant. The adjusted R^2 in these two sets of regressions show that we are explaining a reasonable portion of the variation in growth for these two spending categories; the range of adjusted R^2 for waste services and quality of life services expenditures are 0.241 to 0.408 and 0.038 to 0.342, respectively. Also note that the rates of convergence for waste services and quality of life services are considerably faster than for the total, protective services and road maintenance spending categories.[10]

The results reported in Table 2 provide compelling evidence of convergence in total expenditure as well as for all primary expenditure categories. 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.

The empirical macroeconomic and regional growth literature generally supports the notion that outputs are converging (e.g., Barro and Sala-i-Martin [1992]; [1995]; Levine and Renelt [1992]; Sala-i-Martin [1997]; Durlauf and Quah [1999]; Islam [2003]). In the context of our work here, it may be useful to examine evidence of convergence in output in order to determine whether the rate of convergence in government spending is greater or less than the rate of convergence in output. Such a comparison may also shed light on whether convergence in government spending is an artifact of output convergence or whether there is a separate dynamic process driving government spending convergence. Using the same simple specification presented in equation (5), we run a regression to estimate the rate of convergence in median household income (a proxy for output).[11] A negative coefficient on initial median household income indicates convergence. The result (with t-value in parentheses) is

$$ln(I_{2000}/I_{1990}) = 1.07573 - 0.20055\, ln(I_{1990}) \quad (15.21) \quad (12.50) \tag{7}$$

The relationship between initial median household income and income growth is negative and highly significant (equation F-statistic is 156.12), and the adjusted R^2 of 0.2143 indicates that about 21 percent of the variation in household income growth is explained in this regression. To test for the sensitivity of the "non-conditional" convergence coefficient, we estimated an expanded or "conditional" income convergence model and provide those results in Appendix A. For all practical purposes, there are no changes in the rate of income convergence for Wisconsin cities and villages over the 1990s between the non-conditional and conditional specifications.

If the coefficients on initial median household income and initial government spending are equal, then the rates of convergence are identical. The coefficients on initial government spending in the total expenditure, protective services, and road maintenance categories, however, are roughly one-quarter to one-third larger than the size of the coefficient on initial median household spending. Thus, the rates of convergence for these expenditure categories are faster than that of median household income, but note that the rates of convergence for waste services and

quality of life services are multiple times faster than the rate of median household income convergence.

CONCLUSION

In this study, we utilize a simple theoretical framework based on fundamental macroeconomic/regional 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 confirm our simple theoretical predictions that total expenditures as well as all the expenditure sub-categories examined are indeed converging. We also examined two alternative explanations of convergence in government spending: income convergence and intergovernmental transfer mechanisms. Inclusion of income growth and the share of intergovernmental transfers out of total revenues has virtually no effect on the initial government spending coefficient. While each of these two variables influences growth in per capita spending, they do not alter the fundamental conclusion on convergence. In fact, inclusion of a wide range of factors that may play a role in government spending growth has little effect on the coefficient on lagged government spending.

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 also plays a role in the evolution of government spending; specifically, public services can be viewed as an input into the local economic production function. Within our simple growth theoretical framework, past levels of government activity are important determinants of current government spending. There may exist, however, alternative explanations to explain the convergence pattern that we identify. In the public administration literature, some, such as Besley and Case [1995], argue that local government spending decisions are often influenced by spending decisions in nearby communities. This so-called ''yardstick'' competition may also lead to the convergence result.[12]

Our study fits well into the limited empirical work on convergence in government spending. Specifically, Skidmore et al. [2004] document convergence in government spending using international data; Scully [1991] and Annala [2003] as well as the recent work of Coughlin et al. [2006] provide evidence of convergence using data on government finances from US states. Our research complements this previous work 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 consider the underlying production-side forces as well as the more traditional demand-side factors.

Acknowledgements

We thank two anonymous referees and the editor for a number of helpful comments and suggestions. Any remaining errors are the sole responsibility of the authors.

Notes

1. Another strand of the public choice 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.
2. Public spending as an input to private output has been modeled in the economic development literature. See for example DeSoto [2000] and Acemoglu [2005].
3. Unincorporated towns are not included because of the fundamentally different statutory authority between cities/villages and towns.
4. Thanks to a project funded by the University of Wisconsin-Extension, data on revenues and expenditures for all municipalities in Wisconsin are available over the 1987–2004 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 are in reality an average over 1989–1990 and 2000 fiscal data are an average of 1999–2000.
5. Given that convergence is generally considered a long-run phenomenon, the 10-year time period analyzed here is a relatively short time frame. Unfortunately, data limitations prevent us from examining the issue over a longer period.
6. Human capital may also be a determinant of public expenditures on the demand side.
7. These factors may also to control for factors that may lead to differences across municipalities in the average tax rate.
8. The 0.77 figure can be derived from equation (4),

$$ln\left(\frac{g_t}{g_{t-1}}\right) = cons\tan t + (\beta - 1)lng_{t-1},$$

   which implies that $ln\, g_t = \text{constant} - 0.23 ln\, g_{t-1} + ln\, g_{t-1} = \text{constant} + 0.77 ln\, g_{t-1}$.
9. We note that actual rates of convergence are much slower than this estimate suggests because of the offsetting effects of other factors that determine growth in spending.
10. In fact, the coefficient on initial quality of life spending implies a negative marginal product. This seemingly unrealistic result may be due to other unexplained factors not controlled for in the regression. Also note that the work of Deller and Maher [2005] indicates that in Wisconsin quality of life services may be overprovided in a handful of municipalities. While this finding may not fully explain a negative marginal product, it is not inconsistent with a negative marginal product. A more straightforward explanation could be the "luxury" nature of these services. During times of fiscal stress [boom], these services may be the first to be cut [or expanded].
11. The "non-conditional" convergence model can be formally expressed as

$$ln\left(\frac{I_{2000}}{I_{1990}}\right) = \alpha + \beta ln(I_{1990})$$

    "Conditional" convergence models expand upon this formulation by addition of control variables such as the structure of the economy and other socioeconomic variables.
12. Some existing research has examined convergence in the context of spatial econometric techniques [Coughlin et al. 2006; Ertur et al. 2006], which is one approach to account for spatial relationships such as inter-jurisdictional competition. In addition to the traditional spatial econometrics literature methods of Geographically Weighted Regression where coefficient values are allowed to vary over space may provide an avenue to explore the idea of yardstick competition. Alternatively, if one identified a methodology for determining "competitor" communities, it would be possible to explicitly develop a measure of "yardstick" competition. Further examination of convergence in the context of inter-jurisdictional competition is an important avenue for future research.

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Appendix A

Table A1 Income convergence regressions (Absolute value of asymptotic *t*-statistics in parentheses)

	Unconditional	*Conditional*
Lagged income	−0.2006	−0.2073
	(12.50)	(6.31)
Percent of persons over 16 with at least a college degree		0.1713
		(2.41)
Unemployment rate		−0.0624
		(0.81)
Percent of occupations classified as professional		−0.0897
		(1.96)
Percent of employment in manufacturing		−0.0403
		(1.57)
Poverty rate		−0.1117
		(1.98)
Gini coefficient of income equality		0.0955
		(3.07)
Intercept	1.0757	1.1150
	(15.21)	(7.72)
Adjusted R^2	0.2142	0.2389
F-statistic	156.13	26.51