Local Government Fragmentation & the Local Public Sector: A Panel Data Analysis*

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This study analyzes the influence of fragmentation and concentration variables on per capita direct expenditures for all counties in the United States from 1982 to 2002. Building on recent research, fragmentation and concentration variables are developed to incorporate the horizontal as well as the vertical dimensions. This analysis explicitly takes into account the potential simultaneity between individual preferences for the spatial arrangement of local governments and the size of the local public sector using the element of time. The findings suggest that increased levels of fragmentation lead to an enlargement of the local public sector; however, the results are more complex than expected. Similarly, the concentration of service delivery responsibilities into counties and single purpose districts tends to increase the size of the local public sector.

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JEL Classification: H72, H77

Introduction

The influence of the spatial arrangement of local government has long been studied by a wide variety of the social sciences. Perhaps the most persuasive line of reasoning comes from Brennan and Buchanan (1980) suggesting that a large number of local governments in a federal system can constrain the Leviathan and keep the size of government in check. The mechanism is the Tiebout (1956) model. Tiebout theorizes that competition between sufficiently large numbers of small municipal governments for mobile capital will lead municipal governments to provide local public services at or near lowest average cost. This competition between small municipal governments is akin to a market mechanism that forces citizen-voters to reveal their preferences for bundles of services and taxes. The threat of inter-jurisdictional migration constrains the fiscal actions of local governments (Brennan and Buchanan 1980).

A principle assumption of the Tiebout model is the existence of only municipal or general-purpose governments. However, the actual political landscape of local governments in the context of the United States suggests something very different from the assumptions of the Tiebout model. There are a large number of non-overlapping, municipal governments in the United States; however, there are a larger number of overlapping, single purpose local governments. Rather than competing horizontally (as general purpose governments do), single purpose governments compete vertically (Berry 2008). And rather than Tiebout working in the horizontal and vertical space, Berry (2008, 2009) suggests there are different effects in each direction. In the horizontal space,

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Tiebout very well may dominate. However, in the vertical space, single purpose governments have little incentive to compete with each other in the manner of Tiebout.

In addition to the governmental structure aspect of fragmentation, fiscal federalism suggests a different path for vertical fiscal arrangements. This relationship hinges on whether local public services are complements or substitutes for each other. The empirical literature is strongly slanted toward a complementary relationship, increasing the size of the local public sector. This paper seeks to more fully understand the horizontal and vertical aspects of local government fragmentation and vertical fiscal arrangements influence the size of the local public sector by bringing robust panel data to bear. The paper will proceed as follows. First, an overview of the literature pertaining to the complicated nature of fragmentation and concentration is conducted. The expected influence of such measures is examined and variables for this analysis are defined. Next, a fully specified empirical model of local expenditures is developed based on the median voter model and measures of fragmentation and concentration are incorporated. Econometric results are presented and extensions to the model are discussed. Finally, conclusions are discussed and contributions of this research are explored.

Measuring and Understanding Fragmentation and Concentration

Much of the confusion surrounding the influence of fragmentation/concentration on the size of the local public sector is from issues of measurement. Boyne (1992) provides much needed guidance in this realm. First, a distinction between fragmentation and concentration is drawn. Fragmentation is defined as the number of governmental units in a given area. Typically, fragmentation variables are standardized by population or geographic area. A *fragmented* local government system is one in which there are a large number of local governments. Conversely, a *consolidated* local government system is one in which there are few (or in some cases, one) local government(s). Concentration is related to the "distribution of responsibilities and revenues" (Boyne 1992, 334). A *concentrated* local government system is one in which service delivery responsibilities and revenue generation is held within a small number of local governments. Boyne (1992) notes that concentration is similar to market share. A local government system can be highly *fragmented* (i.e. has a large number of local governments), but service delivery responsibilities can be *concentrated* in just a few of those local governments.

In addition to the fragmentation/concentration distinction, a distinction must be drawn between vertical or horizontal structure. The vertical component relates to the number of tiers in a local government system. The horizontal component refers to the distribution of responsibilities among the tiers. A vertically fragmented system is one in which there are multiple layers of local government. Vertical concentration is a situation where one or two of the tiers of local government control a large amount of the service delivery or revenue generation responsibility. A horizontally fragmented system is one in which there are a large number of local governments in each tier. Horizontal concentration is how the service delivery/revenue generation responsibilities are arranged inside each tier of local government.

Horizontal Elements

In the horizontal direction, the literature suggests two diverging theoretical expectations. Public choice theory suggests that the fragmentation of local governments will lead to a reduction in overall expenditures by the local public sector. Brennan and Buchanan (1980) suggest this

phenomenon works through the Tiebout (1956) mechanism whereby the power to exploit local residents is tempered by the threat of outmigration. Information on the actions of government officials also plays an important role in limiting the ability of local governments exploit their residents. In a more fragmented government market, the individual cost of keeping local officials accountable to the preferences of residents is somewhat lower (Schneider 1989). As Hendrick, Jimenez, and Lal (2011) note, there are additional citizens actions beyond migration to constrain the actions of local governments. Citizens can attempt to constrain the size of local government through internal means such as voting or activism. These actions are equivalent to Hirschman's (1970) "voice" mechanism. Implicit in this mechanism is comparisons to neighboring jurisdictions. In this yardstick competition (Besley and Case 1995), local politicians seek re-election from voters who consider the performance of their jurisdiction and neighboring jurisdictions. Local politicians have a strong incentive to be competitive in the cost of service provision. To the extent that this phenomenon occurs, per capita expenditures should be reduced.

Public administration scholars largely see consolidation of local government as a means to control costs. The primary concern is economies of scale and duplication of services. A large number of small local governments can potentially lead to higher per unit costs. Consolidating these small local governments into large units can take advantage of potential economies of scale thereby reducing per unit costs (Oakerson 1999). Similarly, the fragmentation of service delivery can lead to many local governments providing the same or similar services. This is considered wasteful as consolidating these numerous local governments into one consolidated government could reduce administrative costs. Administrative cost savings come from consolidating fixed inputs such as computing services, central administrative services, and other back office functions (Boyne 1992). In the absence of consolidation, fragmentation will lead to higher expenditures. Spillovers or externalities in production of local public goods can create costs and benefits for neighboring local governments leading to higher expenditures (Cowing and Holtmann 1976). In the case of spatially indivisible services (services whose benefits spillover into neighboring jurisdictions), the preferences of neighboring jurisdictions are not accounted for in the determination of spending on such services. As a result, the preference across all horizontal local governments is much higher than what is reflected in the single jurisdiction demand function for this service. Finally, citizen knowledge of costs in local government will be less in a more fragmented system leading less citizen oversight and higher expenditures than demanded (Buchanan and Wagner 1977).

In general, the literature indicates that increased numbers of general purpose governments leads to lower local government expenditures (Eberts and Gronberg 1988; Zax 1989; Campbell 2004; Stansel 2006). The influence of only municipalities is considered in the literature and the results of these analyses are similar to the aggregated analyses (Eberts and Gronberg 1990) suggesting an increase in the number of municipalities leads to lower local expenditures. The results for single purpose and special districts generally move in the opposite direction. The evidence from the literature indicates that increases in single purpose or special purpose government is associated with an increase in the size of the local public sector (Eberts and Gronberg 1988; Zax 1989; Eberts and Gronberg 1990; Stansel 2006; Berry 2008, 2009; Hendrick, Jimenez, and Lal 2011).

There are a number of potential variables in the literature to choose from for this analysis. Table 1 outlines the specific variables chosen to measure the horizontal elements of fragmentation and concentration. Total local government fragmentation is measured as the total number

of local governments per 10,000 residents.[1] Horizontal fragmentation, the number of local governments in a particular government tier, is measured using two variables relating to two tiers of local governments, general purpose[2] and single purpose.[3] These two variables are measured as the number of each government per 10,000 residents. A disaggregation of single purpose governments into its component parts is included in certain models presented below to ascertain what, if any, independent effect these variables have on the size of the local public sector.

Horizontal concentration is not considered in this analysis. However, total concentration is considered. Total concentration is measured as a Hirshman-Herfindahl index of local government expenditures by local government type.[4] This operationalization of Hirshman-Herfindahl index is somewhat different than many previous applications. It is ranged between zero and one. A value of zero is indicative of complete concentration of expenditures in one level of government (a county, for instance) and a value of one would be indicative of even concentration of expenditures in all five types of local government. Hendrick, Jimenez, and Lal (2011) suggest that operationalizing total concentration in this manner is a more comprehensive approach than others taken in the literature. However, Hendrick, Jimenez, and Lal (2011) find no statistical relationship between total concentration and per capita expenditures or expenditures per dollar of personal income.

Vertical Elements

At the heart of issues surrounding vertical fragmentation and concentration is how the decisive citizen-voter treats the public good provided by these overlapping governments. Most local governments provide similar services and may provide them concurrently (e.g. a county police force and a city police force). If the citizen-voter perceives the municipal service to be a *substitute* for the same county service, overall expenditures demanded will decline. However, if the citizen-voter sees the municipal service to be a *complement* to the identical county service, overall expenditures demanded will rise. In the former case (substitutes), the tiers of government are in competition with each other to provide services. Citizen-voters use information on one level of government to benchmark the performance of another, overlapping government (Breton 1998). This benchmarking process induces vertically stacked governments to compete for the consent of the citizenry thereby constraining the growth of government. In the latter case (complements), the tiers of government have little incentive to compete as one level of governments expenditures depend on the other and may collude to increase the size of the local public sector (Turnbull and Djoundourian 1993). Berry (2009) suggests that there is little incentive for vertical competition. In particular, single purpose districts only must make sure their spending is not out of line with other single purpose districts so as to not form a voting block against themselves. This function tends toward a complementary relationship, increasing the size of the local public sector.

The empirical evidence is strongly slanted toward the complementary relationship. Turnbull and Djoundourian (1993), Revelli (2003), Campbell (2004), and Berry (2008, 2009) all find evidence of a complementary relationship between overlapping jurisdictions. Turnbull and Djoundourian

[1] See Hendrick, Jimenez, and Lal (2011) for an extensive outline of the measurements of the various aspects of fragmentation and concentration.

[2] General purpose local governments consist of counties, municipalities, and towns/townships.

[3] Single purpose local governments consist of special districts and school districts.

[4] HHI is defined as $\left(\frac{1-\sum_{i=1}^{n} G_i^2}{1-100\%/n}\right)$ where G_i iis the proportion of total expenditures derived from each local government type and n is the total number of local government types. There are five types of local governments: counties, municipalities, towns and townships, independent school districts, and special districts.

(1993)) find an increase in county expenditures leads to a concurrent increase in municipal expenditures. Campbell (2004) finds a similar relationship with an increase in municipal expenditure leading to an increase in county expenditure. In an examination of English local governments, Revelli (2003) finds results similar to Turnbull and Djoundourian and Campbell. An increase in upper tier services tends to lead to a similar increase in lower tier service provision suggesting a complementary relationship. Berry (2008, 2009) finds that an increase in the amount of overlap between special districts and municipalities increases the overall size of the public sector (measured as either own-source revenues or expenditures).

The vertical influence of fragmentation and concentration has not received nearly as much empirical attention as the horizontal. Using Boyne's (1992) typology, vertical fragmentation, the relative number of local governments in each tier compared to the other tiers, is operationalized using two variables: the percentage of independent school districts and special districts of the total number of local governments. These two operationalizations demonstration the relative number, vertically, of local governments. Combining the findings outlined above, it is expected that increased levels of single purpose governments will lead to an increase in the size of the local public sector. Vertical concentration is operationalized using three variables: the percentage of total county area spending made by counties, independent school districts, and special districts. Increased levels of spending concentrated at the county level is indicative of centralization (Hendrick, Jimenez, and Lal 2011) and therefore is expected to increase the size of the local public sector. Similar to vertical fragmentation, it is expected that concentration of expenditures in school districts and special districts will lead to an increase in the size of the public sector since there little if any incentive for competition.

Data & Empirical Strategy

The objective of this analysis is to incorporate the measures of fragmentation and concentration outlined above into a fully specified model of per capita local government expenditures. Building upon Borcherding and Deacon (1972) and Bergstrom and Goodman (1973), a model is specified using the following functional form.

$$EXP = EXP_{t-5}^{\lambda} X^{\beta} IGR^{\rho} FRAG^{\theta} CON^{\phi} \tag{1}$$

Equation 1 is of constant elasticity form incorporating the traditional demand, cost and taste variables (income, tax price, population) with the variables outlined in the previous section measuring local government fragmentation and concentration. The constant elasticity functional form is similar to that taken by Campbell (2004) and Sjoquist (1982). However, much of the literature makes no such assumption (Schneider 1989; Zax 1989; Stansel 2006; Berry 2008, 2009; Hendrick, Jimenez, and Lal 2011).

The application of a logarithmic transformation to this equation reveals the estimating equation for this analysis.

$$\begin{aligned} LEXP_{it} =& \alpha_0 + LEXP_{it-5}\lambda + \sum_{1}^{k} LX_{it}\beta_k + \sum_{1}^{m} LIGR_{it}\rho_m \\ &+ \sum_{1}^{j} LFRAG_{it}\theta_j + \sum_{1}^{l} LCON_{it}\phi_l + \gamma_i + \delta_t + \varepsilon_{it} \end{aligned} \tag{2}$$

Table 1: Summary Statistics

Variables	Mean	p25	p50	p75	St. Dev.
Dependent variable					
Direct expenditures, per capita	$2,566.42	$1,807.69	$2,338.85	$3,067.52	$1,200.21
Total Fragmentation					
Total governments per 10,000 residents	14.60	3.28	7.23	15.48	22.45
Horizontal Fragmentation					
Total general purpose governments per 10,000 residents	6.44	1.00	2.47	6.07	13.72
Total single purpose governments per 10,000 residents	7.34	1.59	3.48	7.84	11.28
School districts per 10,000 residents	7.34	1.59	3.48	7.84	11.28
Special districts per 10,000 residents	5.00	0.94	2.15	5.18	8.08
Vertical Fragmentation					
Percent single purpose governments	52.08%	37.21%	52.38%	66.67%	20.35%
Percent special districts	16.27%	20.51%	34.38%	50.00%	11.46%
Percent school districts	35.82%	8.51%	14.29%	22.22%	19.56%
Total Concentration					
Hirschman-Herfindahl index of local government direct expenditures by type	0.66	0.63	0.76	0.82	0.26
Vertical Concentration					
Percentage of direct expenditures by counties	33.88%	14.53%	24.15%	39.76%	28.37%
Percentage of direct expenditures by single purpose governments	46.07%	37.83%	51.54%	62.58%	23.98%
Percentage of direct expenditures by school districts	39.55%	30.78%	44.21%	54.32%	21.92%
Percentage of direct expenditures by special purpose districts	6.51%	0.47%	2.50%	7.88%	9.97%
Demand, costs & taste variables					
Personal income, per capita	$20,428.48	$17,119.45	$19,795.43	$22,938.44	$5,102.17
Tax price, proportion of all revenues from property taxes	42.18%	29.27%	41.78%	54.13%	17.20%
Population	81.590	11.215	24.050	58.803	276.075
Employment, per capita	0.36	0.28	0.35	0.43	0.13
Population under 19	29.33%	27.23%	29.04%	31.01%	3.46%
Population over 65	14.92%	12.15%	14.52%	17.31%	4.25%
Intergovernmental relations variables					
State aid, per capita	$917.67	$651.72	$834.70	$1,091.27	$413.76
Federal aid, per capita	$73.81	$20.43	$45.02	$88.64	$115.72

[a] All variables are entered into estimation in natural logarithms.
The variables are presented here in levels for ease of interpretation.

Where $LEXP$ is the natural logarithm of per capita direct local government expenditures for county area i in time t, LX is a vector of demand, cost and taste variables for county area i in time t measured in natural logarithms, $LIGR$ is a vector of intergovernmental relations variables for county area i in time t measured in natural logarithms, $LFRAG$ is a vector of variables measuring the extent of local government fragmentation, total, horizontal, and vertical, in county area i in time t in natural logarithms, $LCON$ is a vector of variables measuring concentration influences in county area i in time t in natural logarithms, and ε is the usual composite error term. Additionally, time (δ) and county area (γ) fixed effects are included.

Included in equation 1 and 2 is a lag of the dependent variable to account for any potential time dependence of per capita expenditures. The assumption that the choice of public expenditures is chosen independently in each period is relaxed. Instead, public expenditures in the current period are dependent upon public expenditures in the previous period. This method of estimation assumes an incremental local budget process that is likely a more realistic representation of local budgeting. In order to deal with the endogeneity introduced by a lagged dependent variable on the right-hand side, estimation proceeds using the method outlined in Arellano and Bover (1995).[5] An added benefit of this estimation strategy is the explicit instrumenting for all right-side variables using their own first differences and a one period lag in levels. This procedure eliminates any concerns about simultaneity bias between the dependent variable and all the independent variables (Cameron and Trivedi 2005, 763-768).

Data

The data for this analysis is derived from five consecutive *Census of Governments* from 1982 to 2002. The full *Census of Governments* is conducted ever five years so this results in data from 1982, 1987, 1992, 1997 and 2002. This analysis focuses on the county area as the unit of analysis. Data aggregated to this level is common among analysis interested in the size of the local public sector (Zax 1989; Berry 2008, 2009). The remaining data in the dataset is derived from various federal statistical agencies. To allow for comparability over time, the local governments in Alaska and the smaller independent cities in Virginia have been dropped from the dataset.[6] This elimination of county areas, the loss of one year of data for the lagged dependent variable, and missing data associated with nonresponse to the *Census of Governments* survey result in an unbalanced panel of 11,337 observations. The original dataset contains 15,266 observations: 3053 observations are lost for the lag of the dependent variable, 19 independent cities over 4 years for a total of 76 observations are eliminated in Virginia and 7 boroughs over 4 years for a total of 28 observations are lost in Alaska. The remaining 772 observations are lost due to missing data in the *Census of Governments*.

The fragmentation and concentration variables have been outlined above. Following the literature, demand variables include income, tax price and preference variables. The natural logarithm of per capita personal income is included to control for the endowment of local residents. To approximate a tax price, the natural logarithm of the percentage of total revenues derived from the property tax is used. Unfortunately, this is a poor proxy for tax price but is necessitated by the

[5] A requirement of this type of estimation is that while the error term may exhibit first-order serial correlation, second- order serial correlation must be absent. Testing for this phenomenon on a base model without fragmentation or concentration variables using the Arellano and Bond (1991) AR[1] and AR[2] tests demonstrates an AR[1] process but not an AR[2].

[6] A list of the eliminated county areas or independent cities is available upon request.

data. Consistent with previous analyses population is included in the model. The expected influence of population depends on the "publicness" of the goods being provided.[7] Preferences are measured by the proportion of the population under the age of 19, the proportion of the population older than 65 years of age, and the ratio of employment by place to population. Each of these measures the preferences of those other than the decisive voter. Summary statistics for all variables are reported in table 1.

Results

Before running the various models in this analysis, several specification tests were conducted to determine the appropriate estimating technique. The nature of these data would suggest that a fixed effects model would be the most appropriate technique. This assumption is confirmed using the Hausman test. A joint F test on year fixed effects suggests that the inclusions of these variables are warranted. Therefore, estimation will proceed using a two-way fixed effects model. Testing for heteroskedasticity using the Modified Wald Test for Groupwise Heteroskedasticity suggests that heteroskedasticity is an issue. Additionally, testing for autocorrelation using the Wooldridge Test for Serial Correlation suggests there is an AR[1] disturbance in this data. To account for these issues, standard errors will be clustered on the panel unit, the county area (Arellano 2003).

Table 2 presents six models incorporating different measures of fragmentation and consolidation. Models I and IV present the most limited specification of fragmentation and concentration variables. Models II and V add vertical components to the basic models presented in models I and IV. Model III and VI disaggregate the vertical components added in the previous models. As expected, the influence of lagged expenditures is positive and statistically significant across all six models. Somewhat surprising is the small coefficient; however, given the lag is five years in this analysis, the connection between expenditures in time t and time $t-5$ is somewhat weak. The control variables for demand, cost and taste preferences preform as expected.

The total number of local governments per 10,000 resident was found to have a positive and statistically significance relationship with per capita direct expenditures in the first three models. This is most supportive of the consolidationist or reformist argument that increased proliferation of local governments leads to higher expenditures. For example, using model III, a 10 percent increase in the total number of local governments leads to a 0.9 percent increase in direct expenditures per capita on average. To put these results in context, moving from the 25^{th} percentile to the 50^{th} percentile in the distribution of total local governments—a movement of approximately 3 governments to 7 local governments per 10,000 residents—results in a 7.19 percent increase in local expenditures, per capita.[8] Evaluated at the median ($2,338.85), this percentage increase represents a $168.22 increase in local expenditures per capita.

Disaggregating these results into the component horizontal parts demonstrates that both general purpose and single purpose government fragmentation have a positive and statistically significant effect on per capita expenditures. These two results provide a confusing set of predictions. An increase in general purpose governments per 10,000 residents leads to higher expenditures on average lending support to the reformist argument that fewer general purpose governments

[7] A positive sign indicates that goods provided by local government are more like private goods and a negative sign indicates goods are more like public goods (Borcherding and Deacon 1972).

[8] This result is calculated by converting the logged values to percent changes and evaluating at β. $ln(7.23) - ln(3.28) = 79\% * 0.091 = 7.19$.

Table 2: Fragmentation, Concentration and Direct Expenditures per Capita

Variables	I	II	III	IV	V	VI
Direct expenditures, per capita$_{t-5}$	0.205**	0.192**	0.187**	0.198**	0.186**	0.174**
	(4.61)	(4.26)	(4.23)	(4.42)	(4.07)	(3.86)
Total governments per 10,000 residents	0.072**	0.079**	0.091**	–	–	–
	(10.88)	(11.12)	(11.57)			
Fragmentation variables						
Total general purpose governments per 10,000 residents	–	–	–	0.009*	0.016**	0.047**
				(2.24)	(3.55)	(8.20)
Total single purpose governments per 10,000 residents	–	–	–	0.053**	0.059**	–
				(9.99)	(8.51)	
School districts per 10,000 residents	–	–	–	–	–	−0.027**
						(3.16)
Special districts per 10,000 residents	–	–	–	–	–	0.051**
						(7.48)
Percent single purpose governments	–	0.029**	–	–	0.013	–
		(5.04)			(1.88)	
Percent school districts	–	–	0.086**	–	–	0.123**
			(12.32)			(11.04)
Percent special districts	–	–	0.000	–	–	0.001
			(0.01)			(0.16)
Concentration variables						
HHI	−0.003**	−0.001	0.010**	−0.003**	−0.001	0.014**
	(5.88)	(1.96)	(8.54)	(4.82)	(0.91)	(8.44)
Percent county government expenditures	–	0.050**	0.049**	–	0.053**	0.048**
		(7.54)	(7.09)		(7.72)	(6.98)
Percent single purpose government expenditures	–	0.007*	–	–	0.007*	–
		(2.41)			(2.23)	
Percent school district expenditures	–	–	−0.067**	–	–	−0.090**
			(9.67)			(8.71)
Percent special district expenditures	–	–	0.014**	–	–	0.012**
			(7.81)			(6.78)
Demand, cost & taste variables						
Personal income, per capita	0.578**	0.568**	0.542**	0.585**	0.569**	0.563**
	(15.69)	(15.04)	(14.65)	(15.72)	(14.99)	(14.68)
Tax price	−0.183**	−0.185**	−0.170**	−0.178**	−0.184**	−0.158**
	(16.34)	(15.91)	(16.17)	(15.84)	(15.74)	(14.86)
Population	−0.009	−0.002	0.002	−0.016**	−0.005	−0.014**
	(1.84)	(0.43)	(0.36)	(3.34)	(1.01)	(2.58)
Population under 19	0.164**	0.188**	0.185**	0.184**	0.210**	0.206**
	(3.37)	(3.79)	(3.55)	(3.75)	(4.15)	(3.89)
Population over 65	−0.026	−0.020	−0.043	−0.010	−0.011	−0.030
	(1.00)	(0.73)	(1.48)	(0.38)	(0.40)	(1.03)
Employment, per capita	0.197**	0.206**	0.198**	0.198**	0.208**	0.199**
	(11.10)	(11.31)	(11.10)	(11.06)	(11.24)	(10.79)
Intergovernmental relations variables						
State aid, per capita	0.270**	0.259**	0.256**	0.276**	0.263**	0.269**
	(16.22)	(15.55)	(15.45)	(16.40)	(15.65)	(15.61)
Federal aid, per capita	0.032**	0.031**	0.028**	0.031**	0.031**	0.029**
	(15.00)	(14.87)	(13.90)	(15.08)	(14.92)	(14.17)
Constant	−0.481	−0.504	−0.197	−0.370	−0.305	−0.152
	(1.78)	(1.89)	(0.73)	(1.37)	(1.13)	(0.54)
n	11,337	11,337	11,337	11,337	11,337	11,337

All variables in natural logarithms. Robust t statistics in parentheses,
year and county fixed effects excluded, ** p<0.01, * p<0.05.

would achieve cost savings. Depending on the specification, a 10 percent increase in the number of general purpose governments per 10,000 residents leads to a 0.09 to a 0.47 percent increase in per capita expenditures on average. Again, to put these results in context, consider moving from the 25th percentile to the 50th percentile in the distribution of general purpose local governments—a movement of approximately 1 to 2.5 general purpose governments per 10,000 residents. This movement results in a 0.81 to 4.25 percent increase in per capita expenditures on average. Evaluated at the median ($2,338.85), this percentage increase represents between a $19 and $99 rise in local expenditures per capita. This is a contrary finding to that found in the empirical literature (Eberts and Gronberg 1988; Zax 1989; Stansel 2006; Hendrick, Jimenez, and Lal 2011). An important caveat to these findings regarding general purpose governments is the influence of the components of such governments. When model VI is re-estimated disaggregating general purpose governments into municipalities and towns/townships per 10,000 residents, the influence of municipalities is not statistically significant. However, the influence of towns/townships is positive and statistically significant.[9] As Berry (2008) notes, the powers and arrangement of towns and townships vary considerably in the states that allow such governments. As such, these results are preliminary and the contribution of towns and townships to the growth of local government requires significantly more research.

Similar to general purpose governments, the competitive model fails to restrict spending for special purpose governments as well. This result is well documented in the literature (Eberts and Gronberg 1988; Zax 1989; Stansel 2006; Berry 2008, 2009; Hendrick, Jimenez, and Lal 2011) and is replicated here. Moving from the 25th percentile to the median level of single purpose district per 10,000 residents—a movement from approximately 1.5 to 3.5 single purpose districts—leads to between a 2.33 and 2.59 percent increase in local expenditures per capita. Evaluated at the median level of per capita expenditures, this represents between a $55 and $61 increase in local expenditures, per capita. Model VI further disaggregates single purpose governments into its component parts. The number of special districts per 10,000 residents has a positive and statistically significant relationship with per capita expenditures. On average, a 10 percent increase in the number of special districts per 10,000 residents leads to 0.5 percent increase in total per capita expenditures. Moving from the 25th percentile to the median level of special district per 10,000 residents—a movement from approximately 1 to 2 special districts—leads to 4.2 percent increase in local expenditures per capita. Similar results have been documented in the literature (Berry 2008, 2009) and are further confirmed here. However, school districts per 10,000 residents have a negative and statistically significant relationship with per capita expenditures. A 10 percent increase in the number of independent school districts leads to a 0.27 percent decrease in total per capita expenditures. Moving from the 25th percentile to the median level of school districts per 10,000 residents leads to a 2.55 percent reduction in local per capita expenditures. This represents a decrease of approximately $60 per capita when evaluated at the median level of local public spending. It is possible that this finding is the result of increased salience of local school budgets leading to better monitoring; however, the current data does not allow for testing of this proposition.

The influence of vertical fragmentation using the percentage of total governments that are single purpose reveals a positive relationship with per capita expenditures. However, only in model II are the results statistically significant. The disaggregation of the percentage of single purpose governments in models III and VI reveals that the percentage of school districts is positively associated with per capita expenditures. On average, a 10 percent increase in the percentage of all

[9]These regression results are available from the author upon request.

local governments that are school districts leads to between a 0.86 and 1.2 percent increase in per capita expenditures. These results suggest an increase from the 25th percentile to the median—a movement from 8.51 percent to 14.29 percent of school spending—leads to between a 4.46 and 6.38 percent increase in local spending, per capita. Evaluated at the median level of public spending per capita, this represents between a $104 and $149 increase in spending per capita. This is similar to the findings of Hendrick, Jimenez, and Lal (2011). However, the vertical fragmentation of special districts is positive but fails to achieve statistical significance.

The influence of total concentration fluctuates among the different models. In four of the six models, total concentration has a negative influence on per capita expenditures. This result suggests a decrease in total concentration is associated with a decrease in per capita expenditures. However, this result is only statistically significant in two of the four positive results. In models III and VI, the coefficient on total concentration is positive suggesting an increase in the index, signaling a decrease in concentration, is associated with an increase in per capita expenditures. Ultimately, these results do not present a consistent influence of total concentration on per capita expenditures. The robustness of the results of differing specifications is in doubt.

The influence of the percentage of total expenditures made by the county is consistently positive and statistically in the four models it is included in. On average, a 10 percent increase in the percentage of total expenditures made by the county leads to a 0.5 percent increase in per capita expenditures. Moving from the 25th percentile level of the percentage of total expenditures made by the county to the median—a movement from approximately 14.5 percent to 24 percent of total local expenditures—leads to between a 2.5 and 2.78 percent increase in local expenditures per capita. Evaluated at the median, this represents between a $59 and $65 increase in local expenditures per capita. An increase in county spending is indicative of increased centralization; therefore, this result suggests increased centralization at the county level leads to higher expenditures. These results are consistent with the complements effect discussed in Section 2.2.

Consistent in the two models they are presented, the influence of the percentage of total expenditures made by single purpose governments is positive and statistically significant. A 10 percent increase in the percentage of total expenditures made by single purpose governments leads to a 0.07 percent increase in the size of the local public sector. Substantively, this result is small. Moving from the 25th percentile to the median—from approximately 37 percent to 52 percent—leads to an increase in per capita local expenditures of just 0.22 percent. This is consistent with complements effect and is suggestive there is little competition. When disaggregating single purpose governments, the results change. School district expenditures become negative while special district expenditures are positive. The expected decrease in local spending per capita as the result of a movement from the 25th percentile to the 50th is between 2.43 and 3.26 percent. As the percentage of total expenditures made by school district increases, per capita expenditures decline suggesting a substitution effect. School expenditures are substituted for other forms of spending, holding total expenditures constant. As the percentage of total expenditures made by special district increases, per capita expenditures increase suggesting a complementary effect. Increasing the percentage of total expenditures made by special district from the 25th percentile to the median is associated with between a 2 and 2.34 percent increase in local public spending, per capita.

Model Extensions

Section 4 presents a myriad of results concerning the influence of local government fragmentation and concentration on per capita expenditures at the county level inclusive of the vast majority of counties. Approaches such as this are common in the literature (Zax 1989; Berry 2008, 2009); however, issues have been raised as to whether this unit of analysis is appropriate (Stansel 2006). Where exactly the Tiebout (1956) mechanism is operative is still up for debate. Additionally, Stansel (2006) suggests that in addition to normalizing expenditures by population, expenditures should be normalized by income. Expenditures per capita can be nearly identical in two areas, but public spending can mean significantly different things when incomes vary substantially. For these two reasons, a number of model extensions are presented in this section. Specifically, the analysis presented in model VI from table 2 is limited to only counties belonging to a primary metropolitan statistical area in 1999 and in a separate analysis aggregating those counties to the primary metropolitan statistical area level. Finally, all three geographic aggregations (all counties, urban counties, and MSA) are examined with the dependent variable being direct expenditures per dollar of personal income. For the sake of brevity, this analysis limited to model VI from table 2.

As mentioned above, two alternative geographic aggregations are utilized to attempt to determine if the unit of analysis has any influence on the outcome of the original models. The Office of Management and Budget (OMB) develops metropolitan statistical areas based population of a central place and social and economic integration between counties based on commuting. Since this measure is explicitly county based,[10] it is easy to restrict the analysis to only those counties or aggregate up the MSA level. The analyses that follow utilized the primary metropolitan statistical area (PMSA) rather than the combined metropolitan statistical area (CMSA) in order to provide a larger sample size for the MSA level analysis. This action results in 768 counties included in a PSMA and 2,990 observations. For the MSA level analysis, there are 315 PMSAs with 1,249 observations.

Panel A of table 3 presents the results for the alternate geographic aggregations for model VI in table 2. As can be seen, the sign on total general purpose local governments per 10,000 residents is still positive with coefficients somewhat smaller than those found in table 2. These two findings are statistically significant. The results suggest that regardless of geographic aggregation, the influence of general purpose local governments is positive and contradictory to many of the findings in the literature (Eberts and Gronberg 1988; Zax 1989; Stansel 2006; Hendrick, Jimenez, and Lal 2011). School districts per 10,000 residents are still negative and statistically significant with a similar coefficient to that found in table 2. Among urban counties or at the MSA level, an increase in school districts per 10,000 residents leads to a reduction in per capita expenditures. Special districts per 10,000 residents are positive for both urban counties and at the MSA level; however, it fails to achieve statistical significance. This result is at odds with Hendrick, Jimenez, and Lal (2011) and Stansel (2006) for the MSA level analysis, but is similar to the urban counties findings in Hendrick, Jimenez, and Lal (2011).

In the vertical direction, the percentage of school districts is positively associated with per capita expenditures. At both aggregations, the variable is statistically significant; however, the

[10]In New England, MSAs are often town based. OMB developed the New England County Metropolitan Area (NECMA) to make these MSAs county based. In these instances the NECMA definition replaces the PMSA definition. Unfortunately, OMB does not generate PMSA equivalents for the components of the Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH CMSA. Therefore, the component PMSAs are eliminated from the dataset.

Table 3: Model Extensions

	Total general purpose governments per 10,000 residents	School districts per 10,000 residents	Special districts per 10,000 residents	Percent school districts	Percent special districts	HHI	Percent county government expenditures	Percent school district expenditures	Percent special district expenditures
(A) Alternative Geographic Aggregations									
Urban Counties	0.023**	−0.022*	0.014	0.070**	0.004	0.006**	0.010	−0.061**	0.009**
$i = 768, n = 2,990$	(3.03)	(2.02)	(1.65)	(4.52)	(0.47)	(2.62)	(0.99)	(3.99)	(2.78)
Metropolitan Statistical Areas	0.035**	−0.028*	0.004	0.081*	0.031*	0.009*	0.019	−0.067**	0.001
$i = 315, n = 1,249$	(2.85)	(1.97)	(0.32)	(2.44)	(2.42)	(2.16)	(1.87)	(2.62)	(0.20)
(B) Alternative Dependent Variable									
Direct Expenditures, Percent of Personal Income									
All Counties	0.047**	−0.025**	0.048**	0.117**	0.000	0.013**	0.045**	−0.087**	0.013**
$i = 3,007, n = 11,336$	(9.03)	(3.16)	(7.97)	(11.68)	(0.00)	(8.69)	(7.20)	(9.04)	(7.13)
Urban Counties	0.023**	−0.021	0.015	0.076**	0.003	0.007**	0.014	−0.064**	0.010**
$i = 768, n = 2,990$	(2.81)	(1.82)	(1.72)	(4.88)	(0.31)	(2.80)	(1.24)	(4.03)	(2.83)
Metropolitan Statistical Areas	0.039**	−0.034*	0.007	0.098**	0.035**	0.012**	0.023*	−0.080**	0.000
$i = 315, n = 1,249$	(2.95)	(1.99)	(0.47)	(2.96)	(2.92)	(2.65)	(2.12)	(2.82)	(0.08)

[a] All models presented in this table use the VI specification and estimation technique from table 2

[b] All models include the control variables utilized in table 2 (coefficients not reported)

[c] Urban counties includes all counties included in MSAs; All models include county or MSA fixed effects and year fixed effects

[d] Robust t-statistics in parentheses

[e] ** $p<0.01$, * $p<0.05$

coefficients are smaller than those found in table 2. The percentage of special districts is positively associated with per capita expenditures; however, only at the MSA level is it statistically significant. This result suggests that the complementary relationship for special districts is only operative at the MSA-wide level. This result is not surprising as many special districts or public authorities cross county boundaries (Stephens and Wikstrom 1998). These results are similar to those of Hendrick, Jimenez, and Lal (2011) where the percent school districts are positive and strongly statistically significant for urban counties and MSAs and special districts are positive but not as consistent in terms of statistical significance.

The influence of total concentration is positive and statistically significant for urban counties and MSAs. However, given the previous experience with this variable in table 2, these results are likely not robust. The influence of the percentage of all public spending by counties is positive; however, it fails to achieve statistical significance in either model. This is at odds with the results in table 2 where county spending is positive and strongly statistically significant across the four models it is included. Similar to the findings in table 2, the influence of school district spending is negative and statistically significant. This again suggests that school district expenditures are substitutes. Special district spending gives evidence of a complementary relationship with a positive relationship with per capita expenditures at the urban county and MSA level. Only the urban county coefficient is statistically significant. Both of these results largely confirm the findings of Hendrick, Jimenez, and Lal (2011) with respect to school district and special district spending.

Panel B of table 3 presents the results for the alternate dependent variable for model VI in table 2. Instead of per capita direct expenditures, these three models utilize direct expenditures as a percentage of personal income as the dependent variable. All other control variables for model VI are unchanged. A cursory examination of the results indicate that may of the coefficients are similar to those found in table 2 and in panel A of table 3. The coefficients on general purpose governments per 10,000 residents for all and urban counties are unchanged from their per capita counterparts. The MSA level results are slightly larger. These results suggest that an increase in the number of general purpose governments leads to an increase in the size of the public sector. The influence of school districts per 10,000 residents is uniformly negative; however, it only achieves statistical significance in the all counties and MSA level analysis. Again, the coefficients are of similar size to the per capita expenditures analysis. Special districts per 10,000 residents is positive in all three specifications and similar to the per capita models, is only statistically significant in the all counties model. The two vertical fragmentation variables, the percentage of school districts and special districts, are both positive. Similar to the previous analysis, school districts are statistically significant across all specifications and special districts are statistically significant only in the MSA level analysis. The coefficients are qualitatively similar to those found in the per capita analysis.

The results for total concentration are positive yet small. Issues with robustness aside (see above), these results are statistically significant in all three models suggesting an increase in HHI (a decrease in concentration) leads to higher expenditures as a percentage of personal income. Overall, increased county spending leads to higher expenditures as a percentage of personal income. This result is statistically significant in all but the urban counties model. Similar to the per capita analysis, these results suggest that more centralization of spending leads to an enlargement of the public sector. The percentage of school district expenditures is uniformly negative and statistically significant across all three specifications. The percentage of special district expenditures is uniformly positive and statistically significant in all specifications except the MSA level analysis.

Discussion & Conclusions

Overall, increased total fragmentation leads to higher per capita expenditures. The point estimates vary slightly, but the findings are uniformly in the positive direction. This is in contrast to findings in the empirical literature outlined above. In disaggregate models (IV-VI), horizontal competition between general purpose governments and single purpose districts are both driving increases in per capita expenditures. The results for general purpose local governments is unexpected. Theoretically, Tiebout (1956) suggests that increased fragmentation among municipalities will lead to more efficient provision of local public goods. Brennan and Buchanan (1980) suggest this mechanism will lead to lower expenditures. The findings here stand in contrast to those found in the literature outlined above. This result calls for more research as to exactly the dynamics between general purpose governments and the local public sector as service delivery norms change.

The influence of single purpose districts is positive, suggesting a complementary relationship with overlapping jurisdictions or interest group capture. This positive finding enjoys much support in the literature. An interesting wrinkle in this finding is that while horizontal competition among special districts leads to higher per capita spending as suggested by the literature, competition among school districts leads to lower per capita expenditures. It is possible that this finding is the result of increased salience of local school budgets leading to better monitoring; however, the current data does not allow for testing of this proposition. Vertical competition among single purpose governments leads to increased spending similar to the horizontal measure for the same type of local government. However, vertical competition among school districts leads to higher per capita expenditures and is similar to the results found by Hendrick, Jimenez, and Lal (2011). Vertical competition among special purpose districts is not statistically significant. This result is not unprecedented in the literature (Hendrick, Jimenez, and Lal 2011), though given the limited study of these variables in the literature, it warrants further study.

Concentration variables demonstrate a variety of influences. The analysis suggests the robustness of the total concentration variable is in question. Therefore, this analysis is quantitatively and qualitatively unable to assign a relationship between total concentration and per capita expenditures. Across all the models, a larger portion of total local government spending done by counties, a measure of concentration into one geographically large government, leads to higher per capita spending. This result indicates that concentration of service delivery responsibilities into a geographically larger local government tends to provide little incentive to keep costs low. In a similar vein, increased concentration of spending in single purpose districts leads to higher levels of per capita expenditures. Concentration of spending in special districts which tend to be smaller, overlapping, and have limited service delivery obligations has a positive relationship with per capita total expenditure. An increase in the percentage of total local spending from school districts decreases per capita expenditures on average. Speculatively, this is likely the result of increased public scrutiny that befalls public school systems budgets when they occupy a larger proportion of total local government spending. These two results are supportive of that found in Hendrick, Jimenez, and Lal (2011).

It is important to note that all of the results presented here are effects while holding all other variables in the model constant. Given that numerous variables measure different aspects of the same governments, this outcome requires some nuanced explanation. For instance, what exactly does it mean when special districts per 10,000 residents increases holding the percentage of all local governments that are special district and the percentage of total county area expenditures

made by special districts constant? The number of special districts would rise, holding population constant, and this rise is in no way accompanied by any changes in ratio of special districts to all governments or the ratio of special district expenditures to all local expenditures. This is no way realistic, especially for the ratio of special districts to all governments. The lack of a ceteris paribus relationship call into question any causal inference attempted herein. This is an important limitation of the study.

The primary contributions of this study are threefold. First, building upon Hendrick, Jimenez, and Lal (2011) excellent contribution to the literature, this analysis utilizes a significantly larger spectrum of variables to explain the intricacies of local fragmentation and concentration. Second, this analysis puts significant weight on the vertical influences of fragmentation and concentration. Until recently, this was a largely unexplored facet; however, federalism in the United States has placed significant emphasis on vertical governmental structures Third, this analysis utilizes a dataset with significantly more years of data than is typical in the literature. This analysis utilizes data from 1982 to 2002 that allows for better econometric control of endogeneity issues inherent in analyses such as these.

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