# LEVIATHAN REVISITED (AGAIN): IS THERE AN OPTIMAL LEVEL OF FRAGMENTATION IN LOCAL GOVERNMENT ORGANIZATION?

November 24, 1998

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**Abstract**

The view of government as Leviathan holds that, without restraint, a public bureaucracy will grow in size and spending. Tiebout conjectures that inefficiency in local government is held in check by the natural competition between jurisdictions. Competition has commonly been measured by the number of local jurisdictions in a region and has generally been found to have a negative impact on the size of local government. An opposing view of local government is that there is a economy of scale in providing public services. This paper looks at a 1992 cross section of US metropolitan areas to re-examine the relationship between local government fragmentation and government fiscal policy. A new measure of regional government fragmentation is computed using a Herfindahl index, a commonly used measure of industrial concentration. Looking at both linear and nonlinear effects of competition on the size of government evidence for both theories is found. From the results it is possible to approximate an optimal level of fragmentation among local governments that balances the two forces of leviathan and scale.

## I. Introduction:

Local government in the United States is characterized by a multitude of layers and a seemingly inefficient level of complexity. A representative citizen will receive public services from a state government, a county government, one or more municipalities, a school district and possibly additional special assessment districts such as a water or sewage authorities. Furthermore, the pattern of local public service provision is not consistent across states or even counties within states. The heterogenaity in government finances provides an opportunity to study the relationship between government structure and the magnitude of overall government spending.

How this complexity should affect government size has two main competing theories. The public choice perspective relies heavily on the fundamental hypothesis of Tiebout. Citizens induce efficiency by being able to move between jurisdictions, or "vote with their feet" and choose the government jurisdiction that best meets their individual preferences in the provision of public services. Local governments are in competition with each other for citizens and are forced to provide services efficiently. This leads to the corollary view of government as a Leviathan, growing in size and inefficiency when this competition is minimal or does not exist. This may be the case if there are just a few local governments serving an entire region. This typifies many regions in the US where a single city government serves a large population and even incorporates many of the duties normally provided by county and state government. If this theory holds than more governments in a given region will lead higher efficiency and lower costs.

The competing view is that excess fragmentation induces a range of inefficiencies in the provision of local public services. This could include the duplication of services across jurisdictions, difficulty in intergovernmental coordination or merely by creating jurisdiction too small to have a needed economy of scale for basic services. If this hypothesis is true than fewer and larger governments are necessary to induce efficiency and lower costs.

The ability of individuals to choose public service levels is affected by the structure of local government in many ways. Counties encompass a far larger region than typical cities or smaller communities. If the citizen is unhappy with county level government it is much more difficult to move to another county as compared to moving out of a particular municipality. Thus regions that have a structure that relies more on county vs. municipal governments give the individual citizen less choice. Competition is also affected by the number and distribution of governments at the municipal level. The latter issue is studied by creating a Herfindahl index to measure the concentration of local governments in a region. Government structure will be studied with respect to their impact on various fiscal policies including per capita taxation, expenditures for a number of categories and the size of public debt.

Evidence of Leviathan government has been mixed up to this point. Oates(1985) and Nelson (1987) produced inconclusive results as to the relationship between government concentration and size at the state level. Zax (1989) finds a negative correlation between the number of governments and public expenditures at the county level. Eberts and Gronberg (1988) find a different relationship between the number of general purpose governments and the number of special purpose governments on the size of government. The former having a negative relationship on public spending, consistent with Tiebout, and the latter having a positive relationship. Some recent case studies of local government look at two counties with some of the governments per capita in the country: St. Louis County in Missouri and Allegheny County in Pennsylvania studies (Advisory Commission on Intergovernmental Relations, 1988 and 1992 respectively). These studies generally dispute the idea that numerous small governments spend more than is necessary on public goods. Municipalities in both counties were found to exhibit significant levels of intergovernmental cooperation that mitigated duplication along with generally efficient provision of local public services.

The methodology typical of the econometric studies has been to use the total number of governments per capita as a measure of government concentration. This will ignore significant differences in the sizes and distribution of local jurisdictions. As an example consider two regions each with the same population and the same number of governments. The calculated number of governments per capita would be the same for both regions. Suppose that one of the regions is composed of a very large city encompassing the majority of the regional population and a large number of small communities on the periphery. Compare this to another region, which is composed of more equal sized municipalities. The level of choice available to an individual citizen is far larger in the later region than in the one dominated by a large city. It is reasonable to think that a large dominating city can exercise some form of monopoly power that is the essence of the theory of government as Leviathan. This problem in measurement is accounted for in this paper by the use of a Herfindahl index to measuring the level of competition that exists between governments. This measure will take into account not only aggregate statistics but distributional differences between regions.

This paper extends upon previous work by including non-linear relationships between competition and government size. This is done by including a quadratic as well as a linear term in the model. Both the computed measure of competition and its square are used as explanatory variables in determining government size. With this term included it is possible to produce a clearer view of how fiscal fragmentation affects government size.

## II. Data and Methodology

A standard measure of concentration in an industry is the Herfindahl Index. This measure calculates the sum of the squares of firm market shares in an industry. Market share can be defined as the fraction of total gross sales in an industry produced by a specific firm. This can be extended to an analysis of local government if some measure of government size is used to measure market share instead of gross sales. Here local government taxes are used as a measure of government size.[i] The ratio of a particular government's total tax collections to total tax collections in a given area is assumed to be analogous to market share in an industrial context. This concentration index takes the form:

$$1)\quad C_i = \sum_j \left(\frac{t_{ij}}{T_{ij}}\right)^2,\ T_i = \sum_j t_{ij}$$

where i indexes MSA's and j is an index for individual taxing jurisdictions within each MSA. $t_{ij}$ is the total tax collections of jurisdiction j in MSA i , $T_i$ is the total tax collections in MSA i.

This index is more useful than a measure of average government size in determining concentration. An industry dominated by one large producer and a number of much smaller or marginal producers may have a small average firm size even though the level of concentration is high. The Herfindahl Index gives a measure of how much choice consumers have in a product market and thus how effective firms can be at engaging in predatory pricing or other anti-competitive behavior. Likewise a region dominated by a large center city government has the effect of limiting the choices available to the citizen-consumer who wishes to shop for public services.

Data from the 1992 Census of Governments is used to calculate a Herfindahl index of the degree of concentration for tax collections within each MSA. Total tax collections for all governments within each MSA is calculated. All county and municipal governments are included here as are special assessment districts such as water and sewer authorities. School districts are not included in this analysis. For each government the ratio of its own total tax collections to the total tax collections in the MSA is computed. These tax ratios allow for the calculation of a Herfindahl index as defined above. This study looks at a universe of MSA's in the United States with populations in excess of 100,000. Tables 1 and 2 show the MSA's which have the highest and lowest concentration indices as defines above.

**Table 1: MSA's with the Lowest Government Concentration Indices**

| | MSA | Population | Number of Governments | | | | Total Tax per Capita | Concentration Index |
|---|---|---|---|---|---|---|---|---|
| | | | Counties | Municipalities | Special Districts | Total | | |
| 1 | Detroit—Ann Arbor. MI | 4,665,236 | 16 | 88 | 520 | 624 | 883.4 | 0.05 |
| 2 | Saginaw—Bay City—Midland | 399,320 | 6 | 30 | 144 | 180 | 581.1 | 0.06 |
| 3 | San Francisco--Oakland, CA | 6,253,311 | 9 | 387 | 102 | 498 | 800.8 | 0.07 |
| 4 | Cleveland—Akron--Lorain, OH | 2,759,823 | 7 | 54 | 224 | 285 | 642.6 | 0.07 |
| 5 | Minneapolis--St. Paul MN | 2,464,124 | 11 | 84 | 291 | 386 | 611.6 | 0.08 |
| 6 | Scranton—Wilkes-Barre PA | 734,175 | 5 | 134 | 191 | 330 | 248.3 | 0.08 |
| 7 | Grand Rapids MI MSA | 688,399 | 4 | 16 | 116 | 136 | 548.1 | 0.08 |
| 8 | Harrisburg—Lebanon, PA | 587,986 | 4 | 119 | 129 | 252 | 235.9 | 0.09 |
| 9 | Dallas—Fort Worth TX | 3,885,415 | 9 | 101 | 172 | 282 | 605.0 | 0.09 |
| 10 | Allentown—Bethlehem, PA | 686,688 | 4 | 100 | 108 | 212 | 369.7 | 0.09 |
| 11 | Benton Harbor MI | 161,378 | 2 | 26 | 78 | 106 | 520.4 | 0.10 |
| 12 | Lansing—East Lansing MI | 432,674 | 6 | 24 | 148 | 178 | 641.2 | 0.10 |
| 13 | Muskegon MI | 158,983 | 2 | 6 | 54 | 62 | 414.4 | 0.10 |
| 14 | Albany—Schenectady,NY | 874,304 | 6 | 116 | 118 | 240 | 632.0 | 0.11 |
| 15 | Youngstown--Warren OH | 492,619 | 2 | 18 | 59 | 79 | 302.2 | 0.11 |
| 16 | Baltimore MD | 2,382,172 | 12 | 84 | 40 | 136 | 1951.2 | 0.11 |
| 17 | Seattle—Tacoma WA | 2,559,164 | 3 | 201 | 67 | 271 | 668.2 | 0.11 |
| 18 | Los Angeles--Anaheim, CA | 14,531,529 | 5 | 462 | 172 | 639 | 733.4 | 0.11 |
| 19 | Chicago—Gary, IL | 8,065,633 | 11 | 651 | 484 | 1146 | 704.4 | 0.11 |
| 20 | Denver—Boulder CO | 1,848,319 | 5 | 399 | 39 | 443 | 717.2 | 0.12 |

**Table 2: MSA's with the Highest Government Concentration Indices**

| | MSA | Population | Number of Governments | | | | Total Tax per capita | Concentration Index |
|---|---|---|---|---|---|---|---|---|
| | | | Counties | Municipalities | Special Districts | Total | | |
| 1 | Little Rock--North Little | 513,117 | 4 | 104 | 33 | 141 | 5339.8 | 0.90 |
| 2 | Huntington--Ashland WV | 312,529 | 6 | 51 | 40 | 97 | 3060.9 | 0.88 |
| 3 | Louisville KY--IN | 952,662 | 7 | 92 | 159 | 258 | 2260.4 | 0.70 |
| 4 | Fayetteville NC | 274,566 | 1 | 4 | 8 | 13 | 386.1 | 0.69 |
| 5 | Columbus GA--AL | 243,072 | 2 | 5 | 5 | 12 | 272.6 | 0.67 |
| 6 | Bradenton FL | 211,707 | 1 | 18 | 6 | 25 | 475.9 | 0.66 |
| 7 | Baton Rouge LA | 528,264 | 3 | 3 | 17 | 23 | 475.0 | 0.66 |
| 8 | Jacksonville FL | 906,727 | 3 | 19 | 15 | 37 | 426.9 | 0.58 |
| 9 | Las Vegas NV | 741,459 | 1 | 11 | 5 | 17 | 502.7 | 0.57 |
| 10 | Huntsville AL | 238,912 | 1 | 11 | 6 | 18 | 526.4 | 0.56 |
| 11 | Lincoln NE | 213,641 | 1 | 20 | 13 | 34 | 384.4 | 0.56 |
| 12 | Lexington-Fayette KY | 348,428 | 5 | 20 | 12 | 37 | 393.8 | 0.55 |
| 13 | Albuquerque NM | 480,577 | 1 | 6 | 3 | 10 | 408.5 | 0.54 |
| 14 | Gainesville FL | 204,111 | 2 | 5 | 13 | 20 | 360.0 | 0.52 |
| 15 | Lubbock TX | 222,636 | 1 | 7 | 7 | 15 | 364.9 | 0.52 |
| 16 | Savannah GA | 242,622 | 2 | 6 | 11 | 19 | 633.4 | 0.51 |
| 17 | Sarasota FL | 277,776 | 1 | 13 | 3 | 17 | 471.8 | 0.50 |
| 18 | El Paso TX | 591,610 | 1 | 18 | 6 | 25 | 360.5 | 0.50 |
| 19 | Memphis TN--AR--MS | 981,747 | 4 | 38 | 32 | 74 | 644.2 | 0.50 |
| 20 | Lakeland--Winter Haven FL | 405,382 | 1 | 11 | 17 | 29 | 305.0 | 0.48 |

Other factors are generally accepted as affecting the size of government. Median voter models show that there should be a positive correlation between median income levels and the provision of public goods. Size and population densities affect the scale economies of local public service provision. Much of local government is financed through the use of property taxes. For this reason the percentage of households that are owner occupied along with the value and age of the local housing stock may affect local fiscal policy. Finally, different demographic groups may have different needs for some public goods. Here the percentage of the population over 65 years of age is included in the analysis.

OLS is used to determine the relationship between taxation and expenditure levels and the degree of concentration in the public sector. Including the other factors described above the following equation is estimated:

$$1)\quad g_i = a + b_1 C_i + b_1' C_i^2 + b_2 Income_i + b_3 OOC_i + b_4 OLD_i + b_5 Density_i + b_6 HouseVal_i + b_7 Pop_i + e_i$$

Data is calculated by MSA's which are indexed with i. This equation is estimated for different measures of fiscal policy denoted by $g_i$. These include total tax collections, total debt, spending on police, fire protection, and health services. Each of these are measured in per capita terms and logged. Income is the log of per capita income. OOC is the percentage of housing units that are owner occupied. Density is the defined as persons per square mile of land area. HouseVal is the median value of housing units. OLD is the percentage of individuals over the age of 65. POP is the total population of the MSA. $C_i^2$ is the square of the competition index defined in (1). 246

MSA's are included in the estimation. This includes all MSA's in the US with total populations in excess of 100,000 and lower than 5,000,000 in 1992.

Tables 2-6 show the results for the above model. For comparison the same model without the quadratic term of the competition index is estimated. A third model is estimated with the competition index replaced with a variable computed as the total number of governments per capita. This allows for comparison to much of the previous work on this subject. Note that the competition index and governments per capita variable should have opposite signs. More governments per capita is a sign of greater competition that roughly corresponds to lower values of the competition index defined here.

**Table 2: Dependent Variable: Taxes Per Capita**

| Model: | With Quadratic Term | Linear Term Only | Governments per capita |
|---|---|---|---|
| Concentration | -1.25** (2.42) | 0.63** (3.86) | |
| Concentration^2 | 2.24** (3.82) | | |
| Gov's per capita | | | -0.44** (2.39) |
| Density | 0.23 (0.63) | 0.55 (1.49) | 0.21 (0.53) |
| Old | 0.24 (0.27) | -0.37 (0.41) | 0.05 (0.05) |
| OOC | -0.55 (0.90) | -0.17 (0.27) | -0.59 (0.95) |
| Income | 1.15** (5.86) | 1.19** (5.87) | 1.13** (5.51) |
| Population | 0.05 (2.31) | 0.04* (1.83) | 0.03 (1.32) |
| YearBuilt | 0.00 (0.30) | 0.00 (0.61) | -0.00 (0.98) |
| HouseVal | -1.48 (1.34) | -0.72 (0.64) | -0.57 (0.50) |
| Intercept | -10.18** (2.53) | -9.89** (2.39) | -6.86 (1.45) |
| N | 246 | 246 | 246 |
| R2 | 0.35 | 0.31 | 0.28 |

* Significant at .10 level

** Significant at .05 level

**Table 3: Dependent Variable: Local Public Debt Per Capita**

| Model: | With Quadratic Term | Linear Term Only | Governments per capita |
|---|---|---|---|
| Concentration | -1.78* (1.80) | -0.12 (0.41) | |
| Concentration^2 | 1.97* (1.75) | | |
| Gov's per capita | | | -0.50 (1.48) |
| Density | 0.41 (0.58) | 0.69 (1.00) | 0.29 (0.40) |
| Old | 0.12 (0.07) | -0.42 (0.24) | -0.43 (0.23) |
| OOC | -0.87 (0.74) | -0.53 (0.46) | -0.48 (0.43) |
| Income | 1.65** (4.37) | 1.68** (4.44) | 1.71** (4.55) |
| Population | 0.07 (1.64) | 0.06 (1.44) | 0.06 (1.60) |
| YearBuilt | 0.03 (3.72) | 0.03** (3.57) | 0.02** (2.34) |
| HouseVal | -5.67** (2.67) | -5.00** (2.38) | -5.07** (2.43) |
| Intercept | -40.28** (5.22) | -40.02** (5.16) | -33.67** (3.90) |
| N | 246 | 246 | 246 |
| R2 | 0.19 | 0.18 | 0.18 |

*   Significant at .10 level

** Significant at .05 level

**Table 4: Dependent Variable: Police Expenditures Per Capita**

| Model: | With Quadratic Term | Linear Term Only | Governments per capita |
|---|---|---|---|
| Concentration | -1.29** (2.56) | -0.07 (0.42) | |
| Concentration^2 | 1.46** (2.56) | | |
| Gov's per capita | | | -0.25 (1.47) |
| Density | 0.17 (0.48) | 0.38 (1.07) | 0.18 (0.47) |
| Old | 0.75 (0.85) | 0.35 (0.39) | 0.34 (0.39) |
| OOC | -0.90 (1.51) | -0.65 (1.09) | -0.62 (1.06) |
| Income | 0.95** (4.96) | 0.97** (5.02) | 0.99** (5.13) |
| Population | 0.04* (1.87) | 0.03 (1.57) | 0.04* (1.73) |
| YearBuilt | 0.02** (4.45) | 0.02** (4.20) | 0.01** (2.90) |
| HouseVal | -1.24 (1.15) | -0.75 (0.69) | -0.78 (0.73) |
| Intercept | -26.44** (6.73) | -26.25** (6.60) | -23.00** (5.19) |
| N | 246 | 246 | 246 |
| R2 | 0.31 | 0.29 | 0.29 |

* Significant at .10 level

** Significant at .05 level

| Table 5: Dependent Variable: Fire Expenditures Per Capita | | | |
|---|---|---|---|
| Model: | With Quadratic Term | Linear Term Only | Governments per capita |
| Concentration | 0.27 (0.45) | -0.25 (1.34) | |
| Concentration^2 | -0.61 (0.91) | | |
| Gov's per capita | | | -0.51** (2.56) |
| Density | 0.14 (0.32) | 0.05 (0.12) | -0.36 (0.83) |
| Old | 0.93 (0.89) | 1.09 (1.06) | 1.01 (1.00) |
| OOC | -1.40** (2.00) | -1.50** (2.18) | -1.38** (2.04) |
| Income | 1.30** (5.75) | 1.29** (5.72) | 1.33** (5.98) |
| Population | -0.01 (0.33) | -0.01 (0.23) | 0.00 (0.11) |
| YearBuilt | 0.00 (0.90) | 0.00 (0.98) | -0.00 (0.69) |
| HouseVal | -0.13 (0.10) | -0.34 (0.27) | -0.45 (0.36) |
| Intercept | -18.30** (3.95) | -18.38** (3.97) | -11.43** (2.23) |
| N | 246 | 246 | 246 |
| R2 | 0.24 | 0.23 | 0.25 |

* Significant at .10 level

** Significant at .05 level

**Table 6: Dependent Variable: Health Expenditures Per Capita**

| Model: | With Quadratic Term | Linear Term Only | Governments per capita |
|---|---|---|---|
| Concentration | -6.34** (4.55) | -1.15** (2.60) | |
| Concentration^2 | 6.18** (3.92) | | |
| Gov's per capita | | | 0.86* (1.74) |
| Density | -2.82** (2.84) | -1.94* (1.95) | -1.28 (1.19) |
| Old | -0.21 (0.08) | -1.91 (0.77) | -2.68 (1.08) |
| OOC | -1.48 (0.90) | -0.43 (0.25) | 0.35 (0.21) |
| Income | 1.31** (2.47) | 1.40** (2.57) | 1.50** (2.74) |
| Population | 0.07 (1.22) | 0.04 (0.75) | 0.06 (1.09) |
| YearBuilt | -0.01 (0.85) | -0.01 (1.15) | -0.01 (0.65) |
| HouseVal | -1.27 (0.42) | 0.84 (0.28) | 0.57 (0.19) |
| Intercept | -4.78 (0.44) | -3.96 (0.35) | -10.15 (0.90) |
| N | 246 | 246 | 246 |
| R2 | 0.14 | 0.09 | 0.08 |

* Significant at .10 level

** Significant at .05 level

**III. Conclusions**:

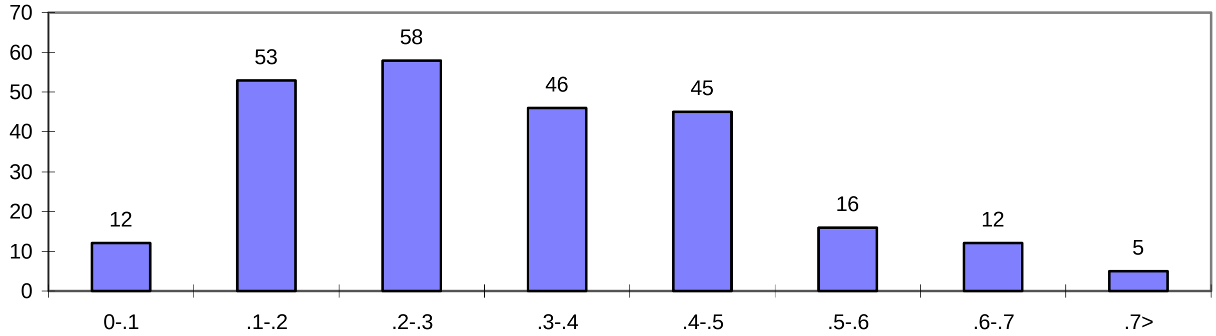
The results of the model with the quadratic term show consistent patterns. With the exception of fire protection the linear and quadratic concentration terms are always significant in the main model. The quadratic competition term has a positive and significant effect on government size, which is consistent with the Leviathan theory of government: less competition increases the overall size of government. At the same time the linear term is negative and significant which offers some counter evidence. It is not necessary to view these results as contradictory. It is possible that the forces of leviathan or scale dominate at respectively very low and very high levels of government fragmentation. If this is true then it is necessary to look at the estimated coefficients on the competition variables to determine if the existing level of fragmentation is closer to one extreme or the other. An interpretation of this quadratic model is that there is an optimal level of government fragmentation where government size is minimized. This optimal level of fragmentation could be less than or in excess of the fragmentation observed in regions now.

Consider the coefficients on the two competition variables from table 2 which uses total tax revenues as the dependent variable in (2) : -1.25 and 2.24 for the linear and quadratic terms respectively. Abstracting from the other factors affecting government size the reduced form equation becomes: $g_i = -1.25 c_i + 2.24 c_i^2$. In this abstracted reduced form the lowest level of government size is reached at a value of .294 for the competition index. There are regions with competition indices both greater and lower than this value. All of the regions in table 1 have lower concentration indices and all of the regions in table 2 have higher values. This value breaks up the entire set of MSA's into two kinds. Those with concentration indices greater than .294 may find the forces of Leviathan dominating any economies of scale. Those with values less then

. 294 may have an excess of fragmentation in local government. Looking at the entire universe of MSA's used in this paper, 118 have concentration indices less than .294 and 128 have a value between .294 and 1. The distribution of the concentration index is shown in figure 1. A concentration value of .294 is close to the average concentration of .326 and fairly evenly divides this set of MSAs. A large percentage of regions have concentration indices within 0.2 of this optimal value. At the same time a number of regions are far from the optimal level of concentration including 12 with a concentration value between 0 and .1 and 17 with values in excess of .6.

The overall conclusion is that the competing theories of government outlined in the introduction may not be mutually exclusive in their applicability to local government in the United States. Efficiency may require a balance between the forces of Leviathan and scale. Extreme consolidation or fragmentation may both lead to inefficiency in government both in terms of per capita taxation and spending levels.

**Figure 1. Distribution of MSA's by Concentration Index**



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## Notes

[i] Another obvious way to measure the size of governments would be to use the population of individual jurisdictions. As pointed out in the introduction a citizen may receive services from multiple governments and the standard use of the Herfindahl index does not account for this type of double counting.