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Does government fragmentation enhance or hinder metropolitan economic growth?

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Abstract. Economic growth is an important priority for many local governments. There is a long-standing theoretical debate on how to best organize government for economic growth. There is surprisingly little empirical research focusing on how government organization affects regional growth. In this paper we forward several recent measures of government fragmentation in contrast to the common measure of government units per capita to examine how government competition influences growth, testing them in a metropolitan statistics area (MSA) growth model for 1992–2002. Going somewhat against the current embrace of regional collaboration, our results suggest that regions with relatively fragmented governments had stronger relative economic performance over the study's time frame.

JEL classification: H11, H70, R11, R58

Key words: Economic growth, government competition, fragmentation, consolidation

1 Introduction

Regional economic growth is an important priority for many policy-makers. Accordingly, state and local governments have established numerous strategies to foster job and income growth, such as infrastructure investments, workforce training, relocation grants, and tax incentives (Isserman 1994). These efforts have been particularly prominent in the Northeast and Midwest of the United States, where the decline of manufacturing and subsequent out-migration of people has had important consequences for regional vitality.

In step with the policy-makers, economists and regional scientists have forwarded myriad theoretical and empirical studies looking at the endowments and policies that can positively impact growth (Bartik 1991; Goss and Phillips 1999; Gabe and Kraybill 2002). However, while we now have a good sense of the extent to which specific government *policies* might or might not affect growth we sorely lack empirical evidence on the effects of governmental *organizational form*. In particular, precious little work examines the extent to which competition between government units enhances or hinders growth, especially at the sub-state level (Foster 1993;

Nelson and Foster 1999). We address this shortcoming by exploring how government organization influenced economic growth in metropolitan statistics areas (MSAs) across the U.S. over the period 1992–2002. Simply stated, we ask whether fragmented or consolidated government is better for growth. Going somewhat against the current embrace of regional collaboration, our results suggest that regions with relatively fragmented governments – other things constant – had stronger relative economic performance over the study's time frame.

Our findings are important as they can profoundly influence how states should best organize government at the local and regional levels. Today, many states are endorsing regional governance perspectives as a requisite for economic growth, with little empirical foundation. For example, a recent Brookings Institution (2003) study in Pennsylvania – one of the most politically fragmented states in the country – suggests the state's relative economic stagnation results, in part, from the fact that it has more than 2,500 municipalities. Brookings Institution argues that this fragmentation leads to inefficient resource allocation and destructive competition between regions, with very little positive effect. However, they offer little empirical support, and instead depend on the two observations that the state's economy is relatively slow growing and its government structure is relatively fragmented. Our contribution, then, is providing a robust empirical test of the relationship between organization and growth. An important aspect of this is utilizing several new measures of fragmentation to provide the first real comprehensive empirical examination of this issue.

In this paper's next section we highlight literature addressing organizational form and its implications on economic growth. Our review suggests several competing hypotheses as to whether a fragmented system of government is beneficial or detrimental to economic growth, which we test in an expanded Carlino-Mills (1987) model in our empirical section. Subsequent sections offer interpretations and conclusions.

2 The role of government organization in economic growth

Beyond specific policies, how does local government affect economic growth? As a provider of public goods, governments use tax revenues to supply important inputs and services to both households and firms. For example, local governments provide businesses with an educated workforce, transportation infrastructure, police and fire services, etc., and households benefit from public services such as roads, libraries, parks, etc. In theory, then, profit-maximizing firms and utility-maximizing households will locate and grow in the jurisdictions that provide the desired amount and quality of inputs and services most efficiently, all else equal. Although the central issue is the efficient provision of public goods, our goal is not to explicitly determine what levels and sizes of governments are the most efficient producers.[1] Instead we take the perspective that efficiency differences manifest themselves in local economic growth outcomes, with 'better' outcomes, in part, the result of optimal government structuring.[2]

In the United States, metro areas are layered onto a complex system of federal government, fifty independent states, and 87,525 units of local government with different designations depending on the state, such as city, town, borough, and township. Of these, 38,967 are general-purpose local governments – 3,034 county governments and 35,933 subcounty general-purpose governments (including 19,429 municipal governments and 16,504 town or township governments). The remainder, more than half of the total number, are special-purpose local governments including school district governments. The total of 87,525 local governments in

[1] There is also a rich history on the efficient provision of public goods, nicely summarized by Cornes and Sandler (1996).

[2] An interesting side observation is the fact that the number of government units in the U.S. has changed very slightly since 1992 regardless of population changes. Some government units, primarily cities, increase in size through annexation of land on the outskirts.

2002 was only 72 more than that reported for the 1997 census (U.S. Census Bureau 2002). See Wallis and Oates (1988) for an overview of the history of decentralization in the public sector from 1952 to 1982.

Proponents of fragmentation contend competition between government units ensures that public services are provided efficiently and at levels that reflect voter preferences. Consolidation advocates believe that public goods and services have substantial economies of scale and scope; thus, they are provided most efficiently over larger populations. In theory, actual regional economic performance should help reveal this argument's winner.

2.1 Federalism and competition

Consolidation advocates base their arguments on (*i*) reduced transactions costs and (*ii*) economies of scale and scope in providing public goods and services. Regarding transactions costs, proponents of consolidation argue that combining smaller local government units into a larger single government reduces bureaucratic overlap, as well as inconsistent and confusing laws, with the end result of increased government efficiency. Ultimately, consolidation would reduce public policy fragmentation, thereby creating a unified front in regional efforts to attract new firms and households.

Oakerson (1999) supports larger units of government because many public goods and services can be provided more efficiently due to technical efficiencies gained through economies of scale and scope. A fragmented system of governments is theorized to be unable to take advantage of production efficiencies due to their limited scale. Consolidating government units into larger production units allows for more efficient production.

Proponents of a fragmented government system contend that consolidating governments actually increases transaction costs for households and firms by increasing heterogeneity of public policy preferences. It is argued that with more constituents, public goods and services need to accommodate a wider variety of potential benefit recipients, thereby pitting different interest groups against each other. The effect is to reduce the potential for co-operative solutions, thus increasing transaction costs. In addition, as government size increases, residents are further removed from public officials, reducing their ability to hold elected officials accountable.

Countering Oakerson, proponents of a fragmented government system contend that local residents may willingly forego the efficiency gains from a more centralized production for the benefits of a localized provision geared toward unique preferences (Oates 1999). A centralized provision of public goods and services is theorized to be unable to focus public policies on the local needs, instead providing public goods and services with a 'one size fits all' approach.

Beyond these counterclaims, proponents of government competition ultimately believe that Tiebout-style competition is the surest way to generate efficiency. Tiebout (1956) saw competition among government units, in combination with the ability of households to relocate as the primary driver for efficient and responsive government units. Oates and Schwab (1991) extended Tiebout's model by explicitly modelling competition among government units for mobile capital stock and arrived at a similar conclusion. Marlow (1988); Grossman (1989); and Joulfaian and Marlow (1990) in a series of papers investigated the link between fiscal decentralization and government size, providing empirical support for Tiebout's hypothesis. All three studies come to similar conclusions that fiscal decentralization appears to constrain government expenditures.[3]

Opponents of government consolidation often refer to the Leviathan hypothesis advanced by Brennan and Buchanan (1980), who posit that "the potential for fiscal exploitation varies

[3] Additional empirical studies do not support the presence of a negative relationship between fiscal decentralization and expenditure government size (Stein 1999).

inversely with the number of competing governmental units in the inclusive territory" (Brennan and Buchanan 1980, p. 185). In the case where government's power to tax is not constrained through some mechanism, government units are allowed to levy excessive taxes to support unnecessarily large and inefficient government bureaucracies. Households and firms are thus burdened by excessive taxes and unresponsive government services that reduce household utility and firm profits, thereby hindering economic growth. In the literature, few studies test this hypothesis and mixed results emerge (see Forbes and Zampelli 1989; Joulfaian and Marlow 1991). Another strand of literature investigates the strategic interaction in fiscal policy decisions of local governments in terms of tax rate and public expenditures of neighbouring local government units (see Santolini 2008).

Proponents of a consolidated system of government see the market-like mechanism in determining the efficient allocation of public resources as unable to prevent market failures in public markets. One such argument is that the spillover of benefits from the provision of public goods and services encourages free riding by residents of neighbouring governments; consequently, government units are inclined to produce and provide public goods and services at sub-optimal levels. Consolidated government units are theorized to alleviate the problem of benefit spillovers from the local provision of public goods and services by including a larger amount of potential recipients of public goods and services benefit to compensate for their provision (Savitch and Vogel 2000a, 2000b; Brookings Institution 2003; Rusk 2003).

In addition there is a large literature on tax competition and its implications for economic growth, which goes beyond the scope of this study (see Wilson 1986, 1987; Zodrow and Mieszkowski 1986; Wilson and Wildasin 2001 for a detailed discussion). In summary, proponents of government fragmentation argue that increased competition among local government units will result in tax competition lowering taxes. In contrast, proponents of consolidation would argue that too much competition would reduce local government revenues beyond efficient levels.

All of the above theories are compelling reasons why consolidation or fragmentation encourages or deters economic growth. Yet the empirical question remains. The number of empirical studies investigating the link between government fragmentation and metropolitan growth are rather limited. Hirsch in his investigation of the link between metropolitan growth and consolidation concludes, "efficiency considerations, thus, do not appear to warrant across-the-board consolidation of metropolitan area governments" (1959, p. 240). He later adds that consolidation proposals should not be judged only on expenditure and efficiency criteria, but also on socio-political considerations.

Akai and Sakata (2002) assess the impact of fiscal decentralization on economic growth at the state level. Xie et al. (1999) look at fiscal decentralization and economic growth across different time frames in the U.S. Nelson and Foster (1999) investigate the link between metropolitan government structure and income growth; Foster (1993) explores the link between political structure and metropolitan population growth across different time frames; Stansel (2005) examines the relationship between local decentralization and economic growth; while Brueckner (2006) explores the connection between fiscal federalism and economic growth. While empirical evidence is limited, the debate on how to organize government is long-standing (see, for example, Tiebout 1956; North 1990; Kenyon and Kincaid 1991; Niskanen 1994; Lewis 1996; Oakerson, 1999; Oates 1999; Stephens and Wikstrom 2000; Feiock 2004). Our first step in testing this is developing an appropriate measure of fragmentation.

2.2 Defining competition

One problem with previous empirical work on competition and economic growth at the county and metro level is that it typically uses simplistic measures of competition, such as the

absolute number of government units (per capita) (Stansel 2005). Yet while describing behaviour, this definition does not fully acknowledge the various fields on which governments compete. Specifically, the federal structure of government in the U.S. gives rise to two unique types of competition among different types of government units: intergovernmental and interjurisdictional.

Intergovernmental – or *vertical* – competition involves government units with different political powers, such as states, counties, municipalities, and special purpose governments like economic development and water districts. Interjurisdictional – or *horizontal* – competition takes place between government units with similar powers in the federal system, such as municipalities within a metro area. It is reasonable to expect that these two types of competition may have unique effects on regional economic outcomes, and each deserves attention.

To provide context, we acknowledge that government actors compete not only across MSAs, but within their respective MSA as well. For example, if we imagine a Philadelphia suburb interested in attracting a new firm, it competes not only with other communities across the country, but with other Philadelphia suburbs. In such instances, the specific delegation of political and economic power within a metro area may have a significant impact on the competition among government units and its implications for economic growth. In particular, if an interested government unit wields little power, then it will likely have little ability to compete.

Governmental competition's effect on economic growth is further influenced by how local government units perceive their relationship with other government units within the metro area. The mere existence of multiple government units in a metro area does not necessarily result in more competition. Rather it is how government units perceive other government units and how government units interact that is important. Yet the empirical literature on economic growth and/or governmental organizational form has not rigorously investigated how different forms of competition among government units within a metro area affect economic growth. In particular, the literature has not investigated different methods in defining governmental organizational form.

3 Measuring fragmentation

To date, the majority of empirical studies incorporating government organization on the substate level have used the number of government units either per capita or per land area. Stansel (2005) used the number of general-purpose governments per 10,000 residents in 1962 to measure the level of decentralization.[4] An important implication is that each government unit is given equal weight – for example, counties and townships. Yet this approach fails to acknowledge the heterogeneity of government units with respect to legal responsibilities and capabilities.

Akai and Sakata (2002) tweak the state centralization index (SCI) developed by Stephens and Wikstrom (2000) by incorporating the allocation of authority within a county, utilizing four indices of local autonomy based on (*i*) own revenue raised, (*ii*) ratio of local revenue to combined state and local revenue, (*iii*) ratio of local expenditures to combined state and local expenditure, and (*iv*) a combination of the latter two. The SCI index is a valuable step towards measuring government fragmentation, but it fails to fully represent the distribution of economic and political authority within a state. What is needed is a measurement that incorporates ownership of power within a region and extent of that power.

[4] Stansel (2005) took the government units per capita measure a step further and subdivided the units of government into counties, cities, and townships per capita.

One important motivation for our work, then, is to address the neglect of clearly defined measures of governmental organization in regional economic growth regressions, and, more generally, the lack of research on governmental organizational forms. Casual observation of the distribution of governmental economic power exhibits tremendous variation across the U.S. For example, in Connecticut and Rhode Island any notion of county primarily distinguishes areas on the state map. For these states, power is distributed between the state and municipalities. In contrast, other places have municipalities formally established, but few have any economic power. For example, 89% of townships in North and South Dakota, Nebraska, Iowa and Minnesota have no full-time equivalent employees, a reasonable indicator of the lack of both political and economic power. In these states the high number of inert local government units, in combination with the low population density, effectively inflates the government units per capita measure without considering the actual distribution of power.

We measure governmental organizational form with the Hirschman-Herfindahl Index (HHI) and a variant of HHI, the metropolitan power diffusion index (MPDI). Our central assumption is that government units with political and economic power to influence economic growth are those with spending authority[5] (positive government expenditures on infrastructure, education, social welfare, fire and police protection, parks and recreation, natural resources, welfare, and other government programmes). It is assumed that a government unit with large expenditures will have more economic power and influence on local economic growth than a government unit with relatively low expenditures.

A common critique of measuring government fragmentation with a variation of a power diffusion index in public policy studies is the perceived endogeneity. Critics often assert that both MPDI and HHI are endogenous, as population change and economic growth will affect governmental organizational form; thus government fragmentation cannot be an exogenous variable in a study. Over the last 30 years, the number of government units has barely changed across the U.S., particularly in metro areas, with the exception of a few cases of city-county consolidation. A simple correlation analysis demonstrates that change in population and change in fragmentation are correlated only by a small degree. See Appendix 1 for the correlation coefficient.[6]

The Hirschman-Herfindahl index measures the market power of companies by using the market share of the company within its industry. Similarly, we measure a government's market power by looking at the market share of the local government unit (township, town, borough, city, and county) in relation to the total government unit market (metro area). In order to accomplish this, we examine the direct expenditure categories covering current operations and capital outlays that are hypothesized to influence economic growth from the census of governments (detailed later). The advantage of this technique is the ability to distinguish between active and/or powerful government units and those with little economic and/or political power.

For our analysis the Hirschman-Herfindahl Index (HHI) of fragmentation is defined as:

$$\mathrm{HHI}_i = \sum_{j=1}^{n} \left(\frac{E_{ij}}{TE_i} \right)^2 \tag{1}$$

[5] Similarly, one can look at the revenue-generating side of local government units. Local government unit revenues are tricky, as intergovernmental transfers may blur local authority. While expenditures are often financed and specified by state or federal agencies, local government units are able to exercise some autonomy in their spending. More importantly, expenditures helps identify decision-makers within the metro area.

[6] We tested for simultaneity bias (endogeneity) with the Hausman test for each measure of fragmentation. For each equation we could reject the null hypothesis that there is no simultaneity with a 99% confidence except one with a 95% confidence.

where E_{ij} is the expenditure in government unit j in metro area i, and TE_i is the total expenditures in metro area i. The fragmentation index increases with the number of units of governments, unless the additional government unit has no expenditures. An additional government unit with just 1 unit of expenditure will change the HHI towards a higher fragmentation score. A HHI score close to 1 indicates a high level of consolidation, while a HHI score close to 0 indicates a high level of fragmentation. One minus HHI (1 – HHI) can be interpreted as the probability that two dollars of expenditure in a metro area will come from two different units of government.

We also examine a variant of the HHI fragmentation index that Miller (2002) introduced: the Metropolitan Power Diffusion Index (MPDI). In contrast to the HHI, the MPDI is calculated by taking the square root of each government unit's expenditure in relation to the total spending:

$$\mathrm{MPDI}_i = \sum_{j=1}^{n} \left(\frac{E_{ij}}{TE_i} \right)^{\frac{1}{2}} \tag{2}$$

An MPDI score close to 1 indicates a high level of consolidation, while an increase in the MPDI score indicates higher levels of fragmentation. Theoretically the MPDI has no limit.

The MPDI gives greater value to the smaller players in government by taking the square root of the proportion of expenditures per government unit j in metro area i, while the HHI gives greater value to the larger players by squaring the proportion of expenditures. One advantage of using both the HHI and MPDI to measure vertical and horizontal government fragmentation is the ability to further investigate whether larger or smaller government units within a metro area in terms of expenditure amounts exert more influence in enhancing or deterring economic growth.[7]

When measuring vertical fragmentation, the expenditure of each unit of government (E_{ij}) for all census of government types within the metro area is taken as a percentage of total expenditures in the metro area (TE_i) either squared or the square root depending on the index. See Appendix 2 for detailed examples of fragmentation index calculations.

Previous studies employed the government units per capita measure. We hypothesize that measuring government fragmentation with government units per capita index disregards the tremendous differences between different levels of government units with a metro area. For example, by using government units per capita the city-county of Philadelphia would have equal weight compared to a small township in the suburbs, as government units per capita cannot distinguish between government units with different population sizes and government units with different political and economic power. We hypothesize that especially in states with a large number of formally defined but economically powerless government units in terms of government expenditures – such as Minnesota, Iowa, Nebraska and the Dakotas – the government units per capita measure may bias estimation results in favour of consolidation. Government units per capita would count each of these government units, while both MPDI and HHI would disregard these government units as they do not exert any significant influence on economic growth. This study will use governments per capita in addition to the HHI and MPDI indexes as a control group to provide empirical evidence that the use of government units per capita may cause opposite results for new (MPDI and HHI) and old (government units per capita) indexes. Thus, we employ three indexes (MPDI, HHI, and Government units per capita) to measure the competition among government units within a metro area.[8]

[7] A further variation of the HHI in calculating government fragmentation relies on population. However, a change in population would affect the government fragmentation index and be measured as one of the dependent variables, causing serious endogeneity problems.

[8] A further extension would be to include decentralization measures for states in the analysis, as it may be hypothesized that whether the state is centralized or decentralized may influence economic growth in metro areas. Metro areas in the U.S. are often situated on the border of two (three) states such as New York (New York, New Jersey and

We used the 1990 definition of MSA classification from the Census website (U.S. Census Bureau 2000) in designating metropolitan areas within the U.S. The census designation of MSAs in New England is at the sub-county level; thus MSAs are defined by the list of townships, boroughs, and cities representing a portion of a county. For metro areas in New England, we limited the fragmentation score to the designated sub-county units aggregated at the MSA level as defined by the census.

4 Empirical models

The fundamental question is whether competition among government units is beneficial or detrimental to economic growth. However, governmental organizational form and economic growth can only be linked indirectly. We say this because government organizations affect economic growth and development only in a roundabout manner, through the success and failure of firms within governmental boundaries and the surrounding communities, and through the net in-migration of people.

In order to test this link, we use a variant of the county population and employment growth model first estimated by Carlino and Mills (1987) and extended by Deller et al. (2001) to include per capita income growth as a third endogenous variable (including the per capita income equation allows for measuring the quality of economic growth). The underlying theoretical framework rests on the mobility of households and firms. For the sake of brevity we will not discuss the Carlino and Mills or Deller et al. models; please refer to the original model for more detail.

We focus on the spatial variation in governmental organization. In the original Carlino and Mills (1987) paper, the authors allow that spatial variation in government action can uniquely affect population and employment growth, primarily through activities such as land use controls, state and local taxes, public expenditure efficiency, and productive and efficient public policies.

Equations (3)–(5) represent the system we are interested in (again Deller et al. 2001 provide a more comprehensive discussion of the overall model).

$$\Delta E = \alpha_0 + \alpha_{1E}E_{-1} + \alpha_{2P}P_{-1} + \alpha_{3I}I_{-1} + \alpha_{4E}\Delta P + \alpha_{5E}\Delta I + \beta_1 D + \beta_2 L + \gamma G + \delta A + \varepsilon \tag{3}$$

$$\Delta P = \alpha_0 + \alpha_{1E}E_{-1} + \alpha_{2P}P_{-1} + \alpha_{3I}I_{-1} + \alpha_{4P}\Delta E + \alpha_{5P}\Delta I + \beta_1 D + \beta_2 L + \gamma G + \delta A + \varepsilon \tag{4}$$

$$\Delta I = \alpha_0 + \alpha_{1E}E_{-1} + \alpha_{2P}P_{-1} + \alpha_{3I}I_{-1} + \alpha_{4I}\Delta P + \alpha_{6I}\Delta E + \beta_1 D + \beta_2 L + \gamma G + \delta A + \varepsilon \tag{5}$$

where E_{-1}, P_{-1}, I_{-1} are the initial values of the dependent variable in 1992; ΔP, ΔI, and ΔE are the change in the dependent variables from 1992 to 2002; D, L, and A are vectors describing the demographic, labour market characteristics, and amenity values respectively; and G is a set of variables describing the governmental organizational form in the metro area.

Equations (3)–(5) are simultaneous. Because we are primarily interested in the role of government organizational form on economic growth, we estimate reduced forms.[9] The depen-

Connecticut), Philadelphia (Pennsylvania, New Jersey and Delaware), Cincinnati (Ohio and Kentucky), Kansas City (Kansas and Missouri), and Louisville (Kentucky and Indiana) to name a few of the larger, well-known metro areas. Even though the central city can be clearly placed in a particular state, suburbs, often located in a different state, may play an important role in enhancing or deterring economic growth. How to accurately reflect individual states' influence on metro area growth is beyond the scope of this study. In the end, state centralization indexes were excluded from the analysis. Furthermore, the distribution of economic and political power varies among states and regions of the U.S.

[9] Evans (1997) and a subsequent paper by Higgins et al. (2006) suggest using a 3SLS-IV method in a growth model for more consistent estimates. Evans and Higgins et al. are interested in the convergence of growth. Both Evans and Higgins et al. show that convergence rates can differ between OLS estimation and the proposed 3SLS-IV estimation.

dent variables are changes in employment, population, and per capita income from 1992 to 2002, drawn from BEA-REIS (Bureau of Economic Analysis-Regional Economic Information System). On the right-hand side we include the employment rate, population, and per capita income to account for the initial values in the dependent variable. We use the log form of the initial values to control for size effects in the data; metro areas with a high employment or population generally are unable to replicate the high percentage changes by smaller metro areas.

The labour market and demographic variables are percentage of non-white population, percent of population over the age of 65, and percentage of people with at least a bachelor's degree, all drawn from the 1990 census. Further, we include the amenity scale values developed by McGranahan (1999) to control for amenity-related growth.[10] In general, metro areas in warmer and sunnier regions of the country tend to grow faster. In addition, we included regional dummy variables for New England (Maine, New Hampshire, Vermont, Maryland, Connecticut, and Rhode Island), New York, and Pennsylvania for the model limited to states with three levels of government units (counties, cities and townships), plus an additional Midwest and North-central dummy variable for the U.S. model.

Defining and quantifying government fragmentation in a comprehensive and rigorous manner is central to our work. We use expenditure data from the 1992 census of government (CG). In the CG all expenditure amounts are classified by function and character into two main categories: (*i*) direct expenditures and (*ii*) intergovernmental expenditures. We assume that only direct expenditures are closely related to economic activity.[11]

As discussed above, we explicitly assume that only government units actively involved in the economy are influential in determining the region's economic growth prospects. As was noted earlier, competition among government units can be either vertical or horizontal. A critical part of this study is the fact that we employ four measures of governmental fragmentation. Three measures consider horizontal fragmentation, with different subsets of sub-county level government units: (*i*) MPDI for all sub-county municipalities (townships, towns, cities and boroughs) combined (CG class 2 and 3), (*ii*) for city alone (CG type 2), and (*iii*) townships alone (CG type 3). By creating three separate categories for horizontal competition, we are able to distinguish between different roles each level of government plays in the metro area.[12] In addition we created one vertical fragmentation indicator HHI for the entire metropolitan area (includes counties, cities, boroughs, towns and townships (CG type 1, 2 and 3).[13,14]

A critical aspect of this study is the use of different measurement techniques in quantifying government fragmentation. We ran several different models using different combinations of HHI and MPDI indexes at the MSA, municipality, city and township level. By construction the HHI and MPDI emphasize different parts in the organizational form of a metro area. The HHI uses the squared percentages, hence magnifying the importance of larger government units (in terms

However, sign and significance only change in one of many estimated equations. In contrast to Higgins et al., whose Hausman test confirmed the appropriateness of the IV approach, the Hausman test in this study did not confirm the appropriateness of the IV approach. We believe as this study is primarily interested in the sign and significance of coefficient, not the rate of convergence, a 3 SLS-IV method is not necessary.

[10] McGranahan (1999) developed a scale of 'natural amenities' for U.S. counties, based on climate measures (average number of days of sun in January, average January temperature, lowness of average July humidity, and temperateness of July weather), water area (ponds, lakes, and oceans), and topographic variation (relief).

[11] Specifically, we made use of the data on current operations (code E in the data set), assistance and subsidies (codes E, I, and J), construction (code F), purchase of land and existing structures (code G), and purchase of equipment (code K). All five categories of expenditures can be directly linked to the active involvement of government in the economy.

[12] We are primarily interested in horizontal competition at the sub-county level. In addition, most MSA do not encompass many counties to warrant a separate measure. On average MSA encompass 2.4 counties. See summary statistics for details.

[13] See Appendix 1 for correlation coefficients.

[14] Some may argue that the link between government fragmentation and economic growth may not be linear, with something akin to a humped-shaped pattern. We initially used the quadratic term of MSA fragmentation in both models without altering the results in any meaningful manner.

Table 1. Summary statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
Vertical Frag. (MSA HHI in 1992)	281	0.37	0.17	0.04	0.82
Horizontal Frag. (City MPDI in 1992)	277	2.59	1.47	1	10.69
Horizontal Frag. (Tws. HHI in 1992)	110	0.13	0.08	0.01	0.44
Horizontal Frag. (Muni. MPDI in 1992)	281	3.18	2.05	1	12.24
Log. Pop. 1992	280	11.87	0.77	9.44	14.77
Log. PCI 1992	280	9.83	0.15	9.23	10.36
Log. Emp. Rate 1992	281	–0.08	0.03	–0.30	–0.02
Chg. in Pop. 1992 to 2002	280	0.12	0.11	–0.10	0.57
Chg. in PCI 1992 to 2002	280	0.38	0.05	0.26	0.56
Chg. in Emp. 1992 to 2002	281	0.15	0.10	–0.15	0.56
Amenity Scale	281	–0.04	0.97	–1.19	1.84
Pct. of Pop. Over 65	280	12.56	5.63	4.48	67.20
Pct. of Pop. Nonwhite	280	15.39	12.55	1.07	106.41
Pct. of Pop. With Bachelor	280	8.78	4.95	3.77	72.45
Government Units within MSA	281	43.67	71.29	2	629
Counties within MSA	281	2.38	2.56	0	18
Cities within MSA	277	25.57	43.49	1	393
Townships within MSA	110	41.07	40.73	5	228
Municipalties within MSA	281	41.29	69.46	1	611
Gov. Units per Capita (1,000)	280	0.11	0.11	0.01	0.74

of percentage of total expenditures), while the MPDI uses the square root of percentages, hence emphasizing smaller government units (in terms of percentages of total expenditures) in determining economic growth within a metro area. In effect, regression results would indicate whether smaller or larger government units within the same category exert greater power in determining economic growth. An additional benefit of measuring fragmentation with HHI and MPDI for horizontal competition is reduced correlation between the two measures (See Appendix 3). Results tended to be quite similar regardless of how government fragmentation was measured; therefore, we only present the two models with the highest adjusted R-Square.

The summary statistics presented in Table 1 reveal the large range in governmental organizational form across U.S. metropolitan areas. The average metropolitan area comprises almost 44 government units with a range between 2 government units up to 629 in the New York metro area. Other MSAs with the large numbers of government units are Chicago (495), Philadelphia (414), Pittsburgh (360), St. Louis (293) and Minneapolis (296). In terms of fragmentation indexes, the average metropolitan fragmentation score measured with the HHI is 0.365, with a range from 0.04 to 0.82. A HHI score of 1 indicates complete consolidation, while a score of 0 indicates extreme fragmentation, with economic power distributed evenly across several government units.

In terms of horizontal fragmentation, the combined fragmentation score for both levels of government – cities and townships – is measured by the MPDI with a mean of 3.18 and a range of 1 to 12. The horizontal fragmentation scores for cities measured by the MPDI, is 2.59, with a range from 1 to 10.7. A MPDI score of 1 indicates complete consolidation, while higher scores indicate a more fragmented system. The mean horizontal fragmentation score for townships, measured by the HHI, is 0.12, with a range from 0.012 to 0.44. Because township fragmentation is measured by the HHI, a score of 1 indicates complete consolidation, while a score close to 0 indicates a high degree of fragmentation. Turning to the dependent variables, the average change in employment level was 15%, the average per capita income growth was 38% and the average population change was 12%, all for the 1992 to 2002 period.

We estimate two distinct new models plus the control model with government units per capita. In the first model we limit the scope of analysis to MSAs with three levels of government units – counties, cities and townships (CG type 1, 2 and 3). By limiting the scope of the analysis to metro areas with townships, we are able to specifically assess the impact of small local government units in metro areas, as most of the criticism of government fragmentation centres around the inability of small local government units to develop and execute regional development plans. Limiting the scope to metro areas with townships reduces our number of observations from 281 metropolitan areas with cities as sub-levels to 106. In the second model we include all 281 MSAs in the continental U.S.

5 Empirical results

We estimate three models that vary only in how we measure governmental organizational form.[15] In the first and second model we include a measure of vertical fragmentation (fragmentation across all three levels of government – county, city and township – within the metro area). In model 1 we estimate the model with two separate indicators of horizontal fragmentation at the city level and township level. In model 2 we estimated the model with a combined indicator of horizontal fragmentation for both sub-county levels of government (city and township combined). In model 3 we estimated the model with the traditional measure of government fragmentation of government units per capita.

In Table 2 we present the OLS estimation results. The control variables in our model have been commented on extensively by other researchers; our only comment is that our estimates are generally consistent with previous findings.

Accordingly, our remaining discussion focuses on the role of governmental organization. Overall, we find that how government fragmentation is measured and quantified has important implications on what conclusion can be drawn from regression results. In addition, the way by which horizontal fragmentation (competition among similar government units) is defined provides insight into how local government units may affect economic growth prospects. In the following paragraphs we discuss the results in reverse order, starting with the simplest model and progressing towards the full model.

We first reference government units per capita, the traditional measure (model 3). The coefficient is statistically significant and negative in the employment and population growth equations, supporting previous findings on the detrimental nature of high government fragmentation on economic growth (Paytas 2001).

However, we caution about drawing any conclusions based on this result. As we outlined above, we believe that this is a flawed measure of fragmentation, as it does not consider the economic and political power distribution among local government units within a metro area. In addition, using government units per capita fails to exclude government units that are mere political establishments, lacking economic or political authority. As a consequence, we believe that government units per capita incorrectly measures the true extent of government fragmentation and therefore, estimation results tend to lean towards public policy conclusions favouring consolidation.

We estimate the regression with the two alternative specifications of government fragmentation that we posit will provide better and more reliable information on the role of government fragmentation on economic growth: (model 1) separate horizontal government fragmentation measures for cities and townships and (model 2) combined municipal fragmentation (cities and

[15] Please see footnote 5 as well for results of exogeneity test for all fragmentation indexes in all regressions.

Table 2. Regression results

	Model with cities and townships			Model with municipalities			Trad. model with gov. units per capita	
	Log. of emp. Growth rate	Log. of PCI Growth rate	Log. pop. Growth rate	Log. of emp. Growth rate	Log. of PCI Growth rate	Log. of pop. Growth rate	Log. of emp. Growth rate	Log. of PCI Growth rate
Intercept	–0.987	1.234***	–2.326***	–0.064	1.121***	–0.298	–0.020	0.986***
	(1.46)	(2.78)	(3.94)	(0.16)	(5.75)	(0.74)	(0.05)	(4.97)
Log. pop. 1992	0.001	0.006	–0.012	0.022***	0.003	0.024***	0.020**	0.005
	(0.12)	(0.80)	(1.20)	(2.76)	(0.82)	(2.94)	(2.48)	(1.25)
Log. emp. rate 1992	–0.495	0.657***	0.056	–0.575***	0.568***	–0.361*	–0.615**	0.539***
	(1.32)	(2.65)	(0.17)	(3.03)	(6.12)	(1.90)	(3.26)	(5.74)
Log. PCI 1992	0.131*	–0.099**	0.286***	–0.007	–0.077***	0.015	–0.004	–0.063***
	(1.80)	(2.06)	(4.48)	(0.15)	(3.59)	(0.35)	(0.10)	(2.92)
Pct. of pop. nonwhite	–0.004**	–0.001	–0.003**	–0.003***	0.0004	–0.002***	–0.003***	–0.0003
	(2.58)	(1.32)	(2.19)	(4.66)	(1.33)	(3.40)	(4.76)	(0.87)
Pct. of pop. over 65	–0.020***	0.002	–0.020***	–0.005***	–0.001	–0.004***	–0.005***	–0.001
	(5.56)	(0.74)	(6.40)	(3.93)	(1.16)	(3.55)	(3.89)	(1.45)
Pct. of pop. with BA	–0.001	0.004	–0.005	0.010***	0.001*	0.011***	0.010***	0.002*
	(0.26)	(1.50)	(1.51)	(5.92)	(1.82)	(6.58)	(6.16)	(1.84)
Vertical Frag. (MSA HHI in 1992)	0.088*	0.079**	0.019	0.047	0.028	–0.019		
	(1.71)	(2.35)	(0.42)	(1.13)	(1.38)	(0.45)		
Horizontal frag. (city MPDI in 1992)	0.016***	0.012***	0.015***					
	(3.21)	(3.66)	(3.31)					
Horizontal frag. (tws. HHI in 1992)	–0.211**	–0.015	–0.066					
	(2.47)	(0.28)	(0.88)					
Horizontal Frag. (muni. MPDI in 1992)				0.009**	0.007***	0.004		
				(2.08)	(3.07)	(1.01)		
Gov. units per capita							–0.152**	–0.012
							(2.33)	(0.36)
Amenity scale	0.012	0.002	0.000	–0.004	–0.001	–0.006	–0.006	–0.001
	(1.37)	(0.27)	(0.01)	(0.74)	(0.40)	(1.08)	(1.06)	(0.46)
New England dummy	0.012	0.074***	0.013	–0.156***	0.042***	–0.167***	–0.149***	0.046***
	(0.47)	(4.24)	(0.55)	(6.06)	(3.34)	(6.50)	(5.95)	(3.70)
Pennsylvania dummy	–0.017	–0.043***	–0.006	–0.149***	–0.058***	–0.159***	–0.085***	–0.029**
	(0.79)	(3.06)	(0.34)	(4.77)	(3.84)	(5.07)	(3.03)	(2.07)
New York dummy	–0.053***	–0.063***	–0.039**	–0.188***	–0.082***	–0.193***	–0.147***	–0.061***
	(2.69)	(4.80)	(2.25)	(6.24)	(5.55)	(6.41)	(5.18)	(4.37)
Northcentral dummy				–0.064***	–0.003	–0.081***	–0.030	0.007
				(2.83)	(0.25)	(3.60)	(1.24)	(0.54)
Midwest dummy				–0.110***	–0.020***	–0.103***	–0.082***	–0.009
				(6.93)	(2.60)	(6.49)	(5.21)	(1.16)
N	106	106	106	280	280	280	280	280
Adj. R-squared	0.47	0.52	0.58	0.33	0.29	0.36	0.33	0.27

Number in parenthesis are absolute values of t-statistics.
* Two tailed statistical significant at 90% confidence.
** Idem., 95%.
*** Idem., 99%.

townships – CG type 2 and 3).[16] We estimate several alternative models with alternating MPDI and HHI indexes with only minor changes to the results and adjusted R-squared. Unfortunately, due to limited space we only present one regression result for each of the three models.

The second measure of horizontal fragmentation considers all sub-county government units, such as cities and townships within metro areas (model 2). We find metro areas with a higher initial horizontal fragmentation in 1992 tended to experience higher employment and per capita income growth over the next 10 years, all else equal. The positive effect supports Tiebout's hypothesis that competition among government units encourages economic growth. Proponents of consolidation contend that economies of scale and scope in public good and service provision will be limited in a fragmented system of government and therefore, economic growth will suffer in such a governmental organizational form. Our empirical results refute this.

In implementing the first measure of horizontal fragmentation among sub-county government units, we calculated separate fragmentation indexes for city-type government units and townships-type government units (model 1). The coefficient for city horizontal fragmentation is statistically significant and positive in all three growth equations. This result further supports the beneficial effect of government fragmentation from the previous model with a combined fragmentation score for all sub-county government units.

Turning to the measure of horizontal fragmentation among townships within metropolitan areas, we find statistical significance only in the employment growth equation. The coefficient for township fragmentation is only statistically significant and negative in the log of employment growth equation. Township fragmentation is measured with the HHI index; a higher value is indicative of higher consolidation while the negative sign indicates that a higher degree of consolidation tends to reduce employment growth over the next 10 years. This result does not support the argument that government fragmentation discourages employment growth. It is important to note that by employing the HHI index we place greater emphasis on the role of larger townships within a metro area in contrast to the MPDI, which places emphasis on the role of smaller government units.

Moving onto vertical competition – which measures the distribution of power among different levels of government – the parameter estimates are statistically significant and positive only in model 1 in the log of employment and per capita income growth equation, but statistically not significant in model 2. Once again the vertical fragmentation is measured with the HHI index. Therefore, the negative sign means, a metro area with a high degree of government consolidation in 1992 tended to experience slower employment and per capita income growth over the next 10 years all else constant. This result suggests that fragmentation resulting from multiple layers of government does impact economic growth prospects once horizontal fragmentation is accurately specified through separate fragmentation scores for each sub-county level of government. This result supports an important argument of consolidation proponents that too much vertical fragmentation may be detrimental to economic growth.

6 Conclusions and policy implications

Whether government fragmentation is beneficial or detrimental to economic growth has important implications. Overall, as municipalities and regions try to figure out how best to manage their economic future in a changing environment, they must decide the extent to which governmental co-operation and potentially consolidation, should lead public policy. To date, however, the literature has offered surprisingly sparse guidance. Somewhat swimming against the current

[16] We also investigated the impact of the interaction between fragmentation index and population size without any significant changes to the results.

stream favouring regional co-operation, we do find limited support for the hypothesized negative consequences of government fragmentation on the competitive position of metropolitan areas, primarily based on vertical fragmentation.

Instead, we believe we find stronger support for Tiebout's hypothesis. In both the combined city and township model (model 2) and the model with separate township and city fragmentation index (model 1), parameter estimates are statistically significant and indicative of the beneficial effect of government fragmentation. This supports the notion that government fragmentation and competition does not deter economic growth; rather it may drive it. We believe that this is our most important result.

Governmental organizational form is a very complex system of interactions and simple government variables may hide some of the rich details in the data. Current research on competition among government units and its implications on the competitive position of government units is in the early stages, and this study serves as a starting point for future work on governmental organizational form and economic growth. Until now, empirical work has been inhibited by the lack of clear measuring techniques. Our results do not necessarily prove the notion that fragmented government units are more efficient in producing and providing public goods and services. But they suggest households and firms may be willing to forego additional efficiency for more localized control over public policies, thus supporting Oates' hypothesis that citizens may choose a more decentralized system of government "than [one] chosen simply on the grounds of an exercise in economic optimization" (1999, p. 1138).

Our findings should not be taken as prescriptive. It is important to recognize that this study measures economic growth in a narrowly defined form through employment, population and per capita income growth. We do not measure economic *development* or the creation of economic structures that may influence future quality of life within a region. Indeed, policy-makers may find that other benefits of co-operation/consolidation, such as integrated land use planning, may outweigh any reductions in employment growth.

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Appendix 1. Correlation coefficients at the county level

	Chg. in pop. 1972 to 2002	Chg. in pop. 1982 to 2002	Chg. in pop. 1992 to 2002
Chg. in MPDI 1972 to 2002	0.10	0.06	0.03
Chg. in MPDI 1982 to 2002	0.05	0.003	0.03
Chg. in MPDI 1992 to 2002	0.06	0.08	0.04

Appendix 2. Examples of fragmentation calculations

Example 1 – Dominant city, second smaller city, weak county and small townships in metro area

Government	Vertical fragmentation			Horizontal fragmentation		
	E_{ij}	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$	(TE_i)	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$
County A	100	0.0035	0.2425			
City B	1200	0.4983	0.8402	1,500	0.640	0.894
City C	300	0.0311	0.4201	1,500	0.040	0.447
Township D	50	0.0009	0.1715	100	0.250	0.707
Township E	50	0.0009	0.1715	100	0.250	0.707
Total Expenditures – TE	1700				**HHI**	**MPDI**
HHI = Sum of $(E_{ij}/TE_i)\wedge 2$		0.5346		City	0.68	1.342
MPDI = Sum of $(E_{ij}/TE_i)\wedge 0.5$			1.8458	Township	0.50	1.414

Example 2 – Two cities and large townships, weak county in metro area

Government	Vertical fragmentation			Horizontal fragmentation		
	E_{ij}	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$	(TE_i)	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$
County A	100	0.0035	0.2425			
City B	500	0.0865	0.5423	850	0.346	0.767
City C	350	0.0424	0.4537	850	0.170	0.642
Township D	400	0.0554	0.4851	750	0.284	0.730
Township E	350	0.0424	0.4537	750	0.218	0.683
Total Expenditures – TE	1700				**HHI**	**MPDI**
HHI = Sum of $(E_{ij}/TE_i)\wedge 2$		0.2301		City	0.52	1.409
MPDI = Sum of $(E_{ij}/TE_i)\wedge 0.5$			2.1774	Township	0.502	1.413

Example 3 – Two cities and large townships, weak county in metro area with 1 additional Township

Government	Vertical fragmentation			Horizontal fragmentation		
	E_{ij}	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$	(TE_i)	$(E_{ij}/TE_i)\wedge 2$	$(E_{ij}/TE_i)\wedge 0.5$
County A	100	0.0035	0.2425			
City B	500	0.0864	0.5422	850	0.346	0.767
City C	350	0.0423	0.4536	850	0.170	0.642
Township D	400	0.0553	0.4849	751	0.284	0.730
Township E	350	0.0423	0.4536	751	0.217	0.683
Township F	1	0	0.0242	751	0.000	0.036
Total Expenditures – TE	1701				**HHI**	**MPDI**
HHI = Sum of $(E_{ij}/TE_i)\wedge 2$		0.2298		City	0.52	1.409
MPDI = Sum of $(E_{ij}/TE_i)\wedge 0.5$			2.2010	Township	0.501	1.449

Appendix 3. Correlation coefficients

	Vertical frag. (MSA HHI in 1992)	Horizontal frag. (city MPDI in 1992)	Horizontal frag. (tws. HHI in 1992)	Horizontal frag. (muni. MPDI in 1992)	Gov. units per capita
Vertical frag. (MSA HHI in 1992)	1	–0.63	0.43	–0.66	–0.18
Prob > |r| under H0: Rho = 0		<0.0001	<0.0001	<0.0001	0.0025
Number of observations	281	277	110	281	280
Horizontal frag. (city MPDI in 1992)	–0.63	1	–0.52	0.90	0.09
Prob > |r| under H0: Rho = 0	<0.0001		<0.0001	<0.0001	0.1449
Number of observations	277	277	106	277	276
Horizontal Frag. (tws. HHI in 1992)	0.43	–0.52	1	–0.62	–0.03
Prob > |r| under H0: Rho = 0	<0.0001	<0.0001		<0.0001	0.7323
Number of observations	110	106	110	110	110
Horizontal Frag. (muni. MPDI in 1992)	–0.66	0.90	–0.62	1	0.25
Prob > |r| under H0: Rho = 0	<0.0001	<0.0001	<0.0001		<0.0001
Number of observations	281	277	110	281	280
Gov. units per capita	–0.18	0.09	–0.03	0.25	1
Prob > |r| under H0: Rho = 0	0.0025	0.1449	0.7323	<0.0001	
Number of observations	280	276	110	280	280