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From Urban Core to Wealthy Towns: Nonschool Fiscal Disparities across Connecticut Municipalities

Bo Zhao

Abstract:
Using a cost-capacity gap framework, this paper is the first study to quantify nonschool fiscal disparities across Connecticut municipalities. In the absence of a Uniform Chart of Accounts for municipalities, the paper uses a newly assembled dataset of multi-year local financial records, adjusted to be comparable across municipalities and therefore suitable for regression analysis. The paper finds significant nonschool fiscal disparities among Connecticut municipalities. Fiscal disparities are driven primarily by the uneven distribution of the property tax base across the state, while cost differentials also play an important role. State nonschool grants are found to have a relatively small effect in offsetting municipal fiscal disparities. Unlike previous research focused on a single state, this paper also conducts a comparison between Connecticut and Massachusetts. This paper's conceptual framework and empirical approach are generalizable to other states.

Keywords: fiscal disparities, municipal gap, municipal cost, revenue-raising capacity, property tax, state grants

JEL codes: H70, H71, H72, H73, H77, H83, H20

Bo Zhao is a senior economist in the New England Public Policy Center in the research department of the Federal Reserve Bank of Boston. His email address is bo.zhao@bos.frb.org.

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I. Introduction

Fiscal disparities occur when economic resources and public service needs are not evenly distributed across localities. There are two equity concerns associated with fiscal disparities. First, as Yinger (1986) shows, it is not considered fair to require two otherwise-identical households to pay a different amount of taxes for the same level of public services simply because they live in different towns. Second, fiscal disparities render some towns at a disadvantage in economic competition (Downes and Pogue 1992). These towns must impose a higher tax rate and/or provide a lower level of public services, which makes them less attractive to private businesses and residents.

This paper makes several contributions to the existing literature and the policy community. First, it is the first study to measure fiscal disparities associated with nonschool services across 169 Connecticut municipalities. Nonschool services such as police and fire protection and road maintenance are critical for the lives of ordinary citizens and the operations of businesses. While school fiscal disparities have received significant attention from researchers, policymakers, and practitioners for decades, nonschool fiscal disparities remain severely under-researched.

Second, this paper develops a comparison of municipal fiscal disparities and nonschool grants between Connecticut and Massachusetts, while previous research has focused on a single state. Third, in the absence of a Uniform Chart of Accounts for Municipalities in Connecticut, this paper has assembled a new dataset of local financial records, adjusted to be relatively comparable across municipalities and therefore suitable for regression analysis. Fourth, this paper uses five-year, town-level data instead of one-year, cross-sectional data commonly used in previous studies. The introduction of time-series data enables this paper to better control for unobserved confounding factors through the use of a fixed effects model. In addition, while this paper uses Connecticut data, its conceptual framework and empirical approach can be generalized to other states.

II. Conceptual Framework

This section presents a conceptual framework for measuring a jurisdiction's underlying fiscal condition. Factors affecting the local budget can be divided into two main groups: those controlled by local officials (for example, tax rates, service levels, and operating efficiencies) and those beyond the immediate control of local officials (for example, taxable resources and miles of road that must be maintained). Any measure of underlying fiscal condition on which a state aid formula is based should disregard the first group of factors and instead reflect the second group of factors. Hence, because such a measure is unaffected by municipal policy, it would not create an incentive for localities to game the state aid system through wasteful spending.

Following a strand of previous research (for example, Bradbury et al. 1984, Yinger 1988a and 1988b, Ladd and Yinger 1989, Ladd, Reschovsky, and Yinger 1991, Green and Reschovsky 1993, Ladd 1994, Chernick and Reschovsky 2001, and Bradbury and Zhao 2009), this paper uses a cost-capacity gap framework to measure the underlying fiscal condition. In this framework, cost is defined as the dollar amount of spending needed to fund a given bundle of public services, given the socioeconomic characteristics beyond the immediate control of local government. The number of road miles is an example of such influencing socioeconomic characteristics—so-called "cost factors." Holding everything else equal, a town with more road miles within its boundaries has to spend more on road maintenance and snow plowing than a similar town with fewer road miles. Revenue-raising capacity is defined as the underlying ability of local government to raise revenue from the local resources it is authorized to tax. The size of the local tax base is often considered the foremost determinant of local revenue-raising capacity.

The gap between cost and capacity reflects the degree of imbalance between service need and resource availability. A town with a larger gap is considered to be more fiscally disadvantaged and therefore in greater need of state funding than a town with a smaller gap. The following sections apply this framework to the Connecticut context and calculate the cost-capacity gap measure associated with nonschool services for each Connecticut municipality.

III. Measuring Municipal Cost

This section is divided into five subsections. The first presents a regression model to estimate the cost factors. The second explains some key variables used in the regressions. The third discusses the regression results. The fourth constructs a cost measure based on the regression results, and the last subsection analyzes how this cost measure is distributed across the state.

1. Regression model

Following previous studies, this paper uses a regression approach to isolate the cost factors. The regression is conceptually based on a production function for local public services and a corresponding expenditure function. On the production side, the level of local public services (*Qs*) is determined not only by the amount of local spending (*E*), but also by the efficiency of production (*F*) and the cost factors (*C*). Thus, the production function for local public services is formulated as

$$Qs = Qs\ (E, F, C).$$

The corresponding expenditure function can be obtained through a standard inversion of the production function; that is,

$$E = E\ (Qs, F, C).$$

The supply of local services (*Qs*) also depends upon the demand for local services (*Qd*). Thus, through a substitution of *Qd* for *Qs*, the expenditure function can be rewritten as

$$E = E\ (Qd, F, C),$$

where *Qd* is a function of various factors such as residents' preferences and economic resources available to local government to fund public services.

For simplicity, this paper estimates a reduced-form expenditure equation as follows:

$$E_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 D_{it} + \beta_3 A_{it} + \beta_4 P_{it} + \beta_5 S_{it} + G_{ij} + T_t + \epsilon_{it},$$

where E is per capita local nonschool expenditure; C is a vector of cost factors, such as the unemployment rate and town maintenance road miles relative to local population; D is a vector of demand variables, such as per capita income, property wealth, and the tax price of the median voter;[1] A is a vector of state grant variables that captures external resources available to fund local public services; P is a vector of preference variables, such as education attainment, age distribution, and political affiliation, that accounts for not only the preferences of local residents for public services but also their incentives for monitoring local government's operating efficiencies;[2] S is a vector of government forms and service delivery arrangement variables, such as whether the municipality has a mayor-council form of government and whether the municipal firefighters are paid or volunteer; G is a vector of county fixed effects that captures time-invariant unobserved confounding factors that vary across counties;[3] T is a vector of year fixed effects that captures time-variant unobserved confounding factors affecting all Connecticut cities and towns at the same time; i is an index for municipalities (i = 1, 2, …, 169); t is an index for years (t = 2007, 2008, …, 2011); j is an index for counties (j = 1, 2, …, 8). By adding county fixed effects, this paper is able to better address concerns about unobserved heterogeneity (especially regarding operating efficiencies) than previous studies without county fixed effects. Table 1 and Appendix Table 1 provide the summary statistics and data sources of each variable used in the paper.

This paper follows the criteria that Ladd (1994) lays out for a socioeconomic characteristic to qualify as a cost factor:

1. This socioeconomic characteristic must be outside the immediate control of local officials;

[1] Tax price is also sometimes called "tax share." In the median voter model, it is defined as the amount of taxes paid by the median voter for every dollar of taxes raised to fund public services. Because property taxes are virtually the only local own-source revenues and municipalities are required to tax all properties at the same rate in Connecticut, the tax price of the median voter is calculated as the ratio of the median house value to per household property tax base, assuming that the home value of the median voter is equal to the median house value in each municipality.

[2] One might argue that age distribution could be considered as a cost factor rather than a preference variable. This is because older people may rely more on some public services (for example, public transportation and public health service) than younger people. Yet, following previous studies, this paper treats age distribution as a proxy for residents' preferences. In addition, the share of population 65 and older is not statistically significant in the preferred specification in Table 2.

[3] There is insufficient variation within municipalities over the five-year period of study to allow for municipality fixed effects. It is possible that county fixed effects also capture unobserved cost factors.

2. A simple, plausible economic story can be told to explain why the factor would affect public spending;
3. The effect of the factor on local spending must be statistically significant.

2. Details of key variables

Looking first at the dependent variables, this paper constructs a measure of nonschool expenditure that is relatively comparable across municipalities and therefore amenable to regression analysis. Unlike other states, Connecticut lacks a Uniform Chart of Accounts to enforce the consistency of reporting fiscal data across cities and towns. Instead, I resort to the Municipal Fiscal Indicators Report series that the state produces based on municipalities' Comprehensive Annual Financial Report (CAFR).[4] Because there remain some consistency issues in the CAFR data, I adjust the data as described in the appendix.

After these adjustments, the bundle of public services underneath the local nonschool expenditure figures is relatively uniform across municipalities. It includes public safety, public works, general government, and other nonschool government functions such as health, culture, welfare, debt service, and the fringe benefits of government employees.

Turning to the independent variables of interest, the literature suggests a list of potential cost factors to be included in the regression analysis. For example, private-sector jobs (by place of work) relative to resident population of the workplace location is a proxy for cost pressures generated by employers and commuters who live outside their job areas, but consume municipal services (such as police and fire protection) during work time. This paper uses private-sector jobs instead of total jobs in the regression analysis because the figure for total jobs includes local public-sector jobs, which are determined endogenously by local public

[4] Using the CAFR data has two advantages over using the Census of Governments data. First, the CAFR data are available annually, whereas the Census of Governments is conducted only at five-year intervals and is released only after a long delay. Second, the CAFR data are often considered more accurate and reliable by local officials than the Census of Governments data. Because filing and returning the Census's survey is voluntary for municipal governments, the raw data inevitably have a significant amount of missing information. The Census Bureau uses imputed values to fill the missing information.

expenditures.[5] Similarly, the paper uses private-sector wages, not all-sector wages, to capture more accurately the salary pressure facing each municipal government. A municipal government in a high private-wage area presumably has to pay more to attract and retain employees than a municipal government in a lower private-wage area.[6] This paper borrows a formula from the Massachusetts school aid system to calculate a private-sector wage index for each Connecticut municipality. This index essentially compares a weighted average of private-sector wages for each municipality (by giving a higher weight, 0.8, to wages in its Labor Market Area (LMA) and a lower weight, 0.2, to wages in the municipality) relative to state average private-sector wages.[7]

To avoid the omitted variable bias, I include many control variables, as indicated in the reduced-form expenditure function. Some control variables account for differences in economic resources across municipalities. For example, the equalized net grand list (ENGL), which is discussed in Section IV, is a measure of local taxable property wealth in Connecticut. The Education Cost Sharing (ECS) grant is state school aid that increases with each town's education

[5] In an alternative version of the original, preferred specification (shown in Column 4 in Table 2), I replace per capita private-sector jobs with per capita total jobs. I then use per capita private-sector jobs as an instrumental variable to per capita total jobs. The regression results turn out to be very similar to the ones in the original, preferred specification.

[6] The Connecticut General Assembly Legislative Program Review and Investigations Committee (2006) reports that developments in private-sector wages and benefits are part of the seven statutory criteria considered in the arbitration process regarding the wages and benefits of municipal and school employees. In addition, to examine the relationship between public-sector wages and private-sector wages, I construct a public-sector wage index for each municipality using the same formula as for the private-sector wage index, with the only change being the replacement of private-sector wages with public-sector wages. The population-weighted correlation across 169 municipalities between the public-sector and private-sector wage indexes is 0.41 and is statistically significant at the 1 percent level.

[7] This index is easy to calculate and understand. However, it does not take into account that: (1) some private-sector industries (such as agriculture and mining) are so different from the public sector that they are unlikely to compete with municipal governments for the same job candidates; (2) some areas have a higher concentration than other areas of these private-sector industries that do not resemble industries in the public sector. To take these facts into account, I calculate an alternative measure of private-sector wages. It applies the employment industry composition (at the two-digit NAICS code level) in the public sector to the annual average wages of the corresponding industries in the private sector. Because the employment figures at the two-digit NAICS code level are not available for many small towns, I calculate this alternative measure of private-sector wages only for each of the nine LMAs and then compare it with a statewide alternative measure of private-sector wages. The population-weighted correlation between this alternative private-sector wage index and the original private-sector wage index across 169 municipalities during the 2007–2011 period turns out to be 0.91. Moreover, using this alternative private-sector wage index instead of the original private-sector wage index has little impact on the cost regression results and the following cost measure. This paper chooses the original private-sector wage index because it is simpler and can be calculated at the municipality level.

foundation budget and decreases with each town's wealth. The grant is restricted to public schools. However, some local officials suspect that more school aid frees up more local own-source revenue for nonschool services.

Some control variables account for differences in the delivery of police service across Connecticut municipalities. Unlike most states, Connecticut does not require municipalities to have their own police department. Therefore, in FY 2011, 25 towns that are relatively small in terms of both population and area relied entirely on state police without having to pay directly for the service. In the same year, 56 other towns received state-subsidized police service by participating in the so-called "Resident Trooper Program." In this program, state troopers act as local police officers in the participating municipalities. Under the contract, these municipalities must pay 70 percent of each state trooper's salary and benefits as well as the full overtime cost. The remaining 88 Connecticut cities and towns had their own police departments in FY 2011.

In addition, dummy variables to control for different types of K-12 school districts account for the possibility that school-related spending may be combined with nonschool expenditure in some municipalities. For example, debt service may include interest paid for borrowing to build school facilities. Benefits and compensation of general government employees may include teachers' health insurance. However, no data exist to enable direct separation of these school-related expenditures from total operating expenditure. Instead, I include control variables to account for K-12 education partly or completely provided by regional schools, on the assumption that regional school members have lower amounts of school-related expenditures in their municipal operating expenditure than municipalities running their own K-12 schools.

3. Regression results

I ran several variants of the aforementioned expenditure equation in order to identify the robustly significant cost factors and to estimate their impact on local nonschool spending. The first column of Table 2 shows the results from a regression including all potential cost factors and control variables other than year and county fixed effects. I used the robust standard error estimator (also called Huber-White sandwich estimator) to address potential heteroskedasticity

and normality concerns.[8] The second column drops the statistically insignificant cost factors, which turns out not to affect the adjusted R-squared. The third and fourth columns sequentially add year and county fixed effects. The specification in the last column is the same as the one in the fourth column, except that the dependent variable takes the logarithmic form to account for potential nonlinearity. I chose the linear regression with both year and county fixed effects (that is, the fourth column) as the preferred specification because it has more comprehensive controls and (relative to the nonlinear specification) is simpler for policymakers to understand.

Five cost factors show robust significance across these regression specifications. These five cost factors are the unemployment rate, population density, the private-sector wage index, town maintenance road mileage per thousand people, and per capita private-sector jobs.[9]

There are plausible economic reasons for these local socioeconomic characteristics to act as cost factors. For example, a municipality with a higher unemployment rate or higher population density tends to experience a higher crime rate, raising the cost of police protection.[10] Higher population density also means that houses are in tighter proximity, increasing the fire hazard and raising the cost of fire protection.[11] Previous sections have provided economic rationales to explain the effects on nonschool spending of the private-sector wage index, town maintenance road mileage, and per capita private-sector jobs. Importantly, the significant control variables in

[8] I also tried the Newey-West standard error estimator to address both heteroskedasticity and autocorrelation concerns. The maximum lag order of autocorrelation is set at four. Under this Newey-West estimator, only one originally significant cost factor—town maintenance road mileage—becomes statistically insignificant at the 10 percent level. This is not surprising since road mileage was constant during the five-year period of study. This paper keeps this variable as a cost factor because state and local officials believe that town maintenance road mileage is an important budget driver. In addition, I tried clustering standard errors at the municipality level. The unemployment rate and per capita private-sector jobs remain statistically significant at the 10 percent level. Population density and the private-sector wage index become only significant at the 20 percent level.

[9] These cost factors are ranked in descending order by their Beta coefficient (also called "standardized regression coefficient"). In other words, a one standard deviation change in the unemployment rate (per capita private-sector jobs) has the largest (smallest) effect on standard deviations of per capita nonschool expenditure among the five cost factors.

[10] Based on the 2007—2011 FBI Uniform Crime Reports data for 81 Connecticut towns with populations of 10,000 or more, the population-weighted correlation between the crime rate and the unemployment rate is 0.73. The population-weighted correlation between the crime rate and population density is 0.83 among these municipalities during the same period. Both correlation measures are statistically significant at the 1 percent level.

[11] Across 111 municipalities with the complete 2007—2011 fire incident data from the Connecticut Fire Incident Reporting Systems, the population-weighted correlation between fire incidents per capita and population density is 0.2 and statistically significant at the 1 percent level.

the preferred specification show the expected sign, supporting the general intuitions and rationales for including them.

To further reveal the specific work mechanism through which each cost factor operates, the paper runs the same preferred regression specification on four exhaustive and mutually exclusive subcategories of nonschool expenditure: public safety, public works, general government, and other (Table 3).[12] In order to account for the potential correlation among the error terms of these spending subcategories, I use seemingly unrelated regressions.

The results further confirm our intuition. First, municipalities with a higher unemployment rate must spend more on public safety, public works, and the "other" subcategory because the crime rate tends to increase with the unemployment rate, and the unemployed are more likely to rely on public assistance for transportation, health, and welfare. Second, the positive effect of population density is mostly evident in the public safety and public works subcategories. This supports the notion that higher density is associated with a greater fire hazard and more crime as well as a greater need for public infrastructure.[13] Third, the cost effect of the private-sector wage index channels almost entirely through the general government subcategory, which includes the salaries of government employees. This finding matches the expectation that municipalities in a higher-wage labor market must pay a higher salary to recruit and retain their employees than municipalities in a lower-wage labor market. Fourth, the main channel through which town maintenance road mileage affects nonschool expenditure is indeed by raising spending on public works. Fifth, also as expected, more employers and commuters (approximated by per capita private-sector jobs) increase the need for most local public services.

These subcategory regressions also confirm the specific mechanisms through which some key control variables operate, as previously hypothesized. For instance, municipalities receiving free or state-subsidized police services indeed spend significantly less on public safety than municipalities that use their own police. Relative to municipalities that rely completely on local

[12] Because these are all linear regressions, the coefficients from the four subgroup regressions sum to the corresponding coefficient from the regression on total nonschool expenditure.

[13] The negative effect of population density on the general government subcategory suggests an economy of scale in government administrative services.

school districts, member towns of regional school districts spend less on the "other" subcategory because they have a smaller chance of mixing school-related spending (such as teachers' health insurance and debt service associated with school buildings) with general government operating expenditure.

4. Constructing a cost measure

This paper uses the five significant cost factors from the preferred regression specification to construct a measure of municipal cost for each Connecticut city and town. It is calculated as follows:

$$\widehat{COST}_{it} = \sum_{j=1}^{5} \hat{\beta}_{jt} C_{ijt} + \hat{\gamma}_t,$$

where $\hat{\beta}_{jt}$ is the regression coefficient on cost factor j in the preferred specification (that is, the one shown in the fourth column of Table 2) and $\hat{\gamma}_t$ is a statewide constant that varies only by year. I make one small adjustment to incorporate the effect of public-sector jobs on municipal cost. While maintaining the coefficient on per capita private-sector jobs, I use per capita total jobs in place of per capita private-sector jobs in calculating the above cost measure. In other words, I assume that the marginal cost effect of public-sector jobs is equal to that of private-sector jobs.[14] The statewide constant is constructed under the assumption that statewide municipal cost is equal to statewide local nonschool expenditure in each year. It could be considered as a fixed cost facing every municipality.

5. Distribution patterns of the cost measure

I first examine how different types of municipalities fare under this cost measure. I use a classification of Connecticut municipalities developed by a group of researchers at the University of Connecticut (Levy, Rodriguez, and Villemz 2004). Based on median family income, the poverty rate, and population density, the researchers divide 169 cities and towns into five groups: wealthy, suburban, rural, urban periphery, and urban core (see Appendix

[14] Footnote 5 provides evidence in support of this assumption.

Table 2 for details). In addition, I find significant variation in property wealth within the rural type, as rural towns along the western border of the state and the southern shoreline have a larger concentration of expensive vacation homes. Therefore, I further divide the rural type into wealthier-property rural and less-wealthy-property rural, using average property wealth in the state as a threshold. As Appendix Figure 1 shows, these municipality types (especially the rural and wealthy types) are unevenly distributed geographically. This has important implications for the spatial distribution of municipal cost, capacity, and gap, which I discuss later.

The municipal cost measure varies significantly across different types of municipalities in the state. As the top panel of Table 4 shows, urban core municipalities exhibit the highest average per capita municipal cost, mainly because they have the highest unemployment rate and population density, and the most jobs per capita. Even though only seven cities are classified as urban core, they are home to over 18 percent of the state population. This means that nearly one-fifth of Connecticut residents live in the highest-cost environments. Wealthy municipalities have the second-highest per capita municipal cost due to their high-wage environments (indicated in the highest private-sector wage index), and relatively many jobs per capita and high population density. At the other end of the spectrum, rural towns with above-average property wealth have the lowest average per capita municipal cost—more than 25 percent lower than the urban core municipal cost. The cost measure of these rural towns is low because they have close to the lowest value of all the cost factors except for town maintenance road mileage per thousand people (which is actually the highest across municipality types).

Figure 1 shows that per capita municipal cost is not evenly distributed across the state area. The highest-cost areas tend to be located in the three largest cities—Bridgeport, Hartford, and New Haven—and in the southwestern corner of the state where wealthy municipalities are concentrated.

IV. Measuring Municipal Capacity

This section first details the preferred approach used to measure municipal capacity for Connecticut municipalities. It then examines the distribution patterns of this capacity measure.

Finally, it discusses three alternative capacity measures and compares and contrasts them with the preferred measure.

1. Preferred approach to measuring municipal capacity

This paper measures local revenue-raising capacity using a common approach called the "Representative Tax System" (RTS). The Advisory Commission on Intergovernmental Relations (ACIR) developed this approach to measuring capacity as the amount of revenue that a government would be able to raise from its authorized tax base at a "standard" tax rate (ACIR 1962). By construction, this capacity measure is directly proportional to the size of the municipality's tax base, regardless of the actual tax rate charged in each municipality. In doing so, it avoids penalizing municipalities for having a stronger tax effort than the standard. The RTS approach has been widely accepted and used in measuring state and local revenue-raising capacity in the past 50 years.

In the Connecticut context, property tax is the only tax vehicle authorized for municipal governments and virtually the only own-source revenue available to support the local general fund. For instance, the property tax made up over 94 percent of statewide municipal own-source general fund revenue in Connecticut in FY 2011. Licenses and permits, charges for services, and program fees generated the remainder, which constituted less than 6 percent of statewide municipal own-source general fund revenue.

The property tax base in Connecticut is officially indicated by the "equalized net grand list" (ENGL). This is a state estimate of the full fair market value of all property in a municipality net of state-authorized property exemptions. Taxable property includes residential property (including apartments), business property (commercial and industrial property, the property of utilities, and farm land), and specified personal property (including motor vehicles).[15] Exempted property includes property owned by the state, hospitals, and private colleges, as well as the property of other nonprofits. The state applies a locality-specific sale-to-assessment

[15] Connecticut does not allow municipalities to tax different types of properties at different statutory rates.

ratio to locally assessed property values in order to remove the differences across municipalities in assessment practice and derive the equalized property value.

In order to measure revenue-raising capacity for local nonschool services, I assume that, under the to-be-determined standard tax rate, statewide municipal capacity is just sufficient to cover statewide local nonschool operating expenditure. Therefore, the standard tax rate is mathematically equal to statewide local operating expenditure divided by statewide ENGL. Thus, the measure of municipal capacity for each municipality in each year is calculated as

$$\widehat{CAPACITY}_{it} = \hat{\tau}_t \times ENGL_{it}.$$

2. Distribution patterns of the capacity measure

This municipal capacity measure varies significantly across municipality types. As the middle panel of Table 4 shows, wealthy and urban core municipalities have the highest and lowest average per capita municipal capacity, reflecting the fact that wealthy municipalities' per capita ENGL is more than eight times that of urban core. Moreover, the variation in capacity is much larger than the variation in cost. The highest-to-lowest ratio for municipal cost among the six municipality types is only about 1.3.

Municipal capacity shows some geographic clustering patterns (Figure 2). The high-capacity areas tend to be in the northwestern and southwestern corners of the state and along the southern shoreline (where wealthy municipalities and wealthier-property rural towns are concentrated). The low-capacity areas tend to be in the center and in the northeastern corner of the state (where urban core and less-wealthy-property rural towns are concentrated).

3. Alternative capacity measures

To test the robustness of this municipal capacity measure, this paper explores three alternative measures. The first alternative is still based on the RTS approach, but with a different measure of the property tax base. State education aid formulas in Connecticut use the so-called "adjusted equalized net grand list" (AENGL) to measure local "financial capacity" and consider the rank of each town's AENGL in determining the distribution of state education grants. Different from

the original ENGL, AENGL is scaled by the relative position of each municipality's personal income:

$$AENGL_{it} = ENGL_{it} \times \left(\frac{INCOME_{it}}{HINCOME_t}\right),$$

where INCOME is each municipality's per capita income and HINCOME is the highest per capita income across 169 municipalities. Income is introduced because the State Department of Education stipulates that "the income from which taxes are paid has an important effect on town taxing capacity."[16] Yet, this AENGL formula is not directly derived from any economic model.

Using AENGL obviously shrinks the measured property tax base of each municipality except for the one with the highest per capita income. The ratio of AENGL to ENGL (that is, $\frac{INCOME_{it}}{HINCOME_t}$) ranges from 16 percent to 100 percent during the 2007–2011 period.

The new measure of municipal capacity is therefore computed as

$$\widehat{CAPACITY}_{it}^{I} = \hat{\tau}_t^I \times AENGL_{it},$$

where $\hat{\tau}_t^I$ is the new statewide standard tax rate. Under the previous assumption that statewide municipal capacity is equal to statewide local nonschool operating expenditure, the new standard tax rate is calculated as more than twice the one in the original capacity measure, because the measured statewide property tax base is smaller after adjustment.

As Figure 3 shows, the new capacity measure has a wider range than the original measure. On the one hand, wealthy towns' municipal capacity measures have increased significantly. This is so because these towns' AENGL is only slightly lower than their ENGL, whereas the statewide standard tax rate has more than doubled as a result of the adjustment. On the other hand, the municipal capacity measure of poor towns has decreased, because the shrinkage in the assumed property tax base is more than enough to offset the increase in the statewide standard tax rate.

[16] See http://www.sde.ct.gov/sde/cwp/view.asp?a=2635&q=320578.

Nonetheless, the overall distribution pattern of this new capacity measure is similar to that of the original capacity measure. The population-weighted correlation across 169 municipalities between the two measures is 0.97.

Following Bradbury and Zhao (2009), the second alternative measure directly takes into account revenue demand for schools and its draining effect on municipal capacity. In Connecticut (and other New England states), school districts depend upon their home municipalities for revenue, since they lack independent taxing authority. Therefore, municipal capacity can be considered as total revenue-raising capacity from local property taxes (for both school and nonschool purposes) net of required municipal contributions for schools.

Unlike Massachusetts, Connecticut does not directly specify each municipality's required contributions for schools. Instead, each year, the state sets each municipality's "minimum budget requirement" (MBR), which is defined as the municipality's minimum budget appropriation required for education. It must be funded by local property taxes and certain state and federal education grants. Therefore, the local share of each municipality's MBR—that is, the portion of MBR funded by local property taxes, not state or federal grants—is essentially the municipality's required contributions for schools.

By reviewing state documents and consulting state agencies and practitioners, I have identified three state and federal grants that are surely counted toward MBR and therefore should be removed from the local share of MBR: state ECS grants, state transportation grants for public schools, and federal impact student aid. State officials suspect that other state and federal grants may also be counted toward some individual municipalities' MBR for unknown historical reasons. However, since no one has been able to pinpoint those grants that should also be removed from the local share of MBR, I may overestimate these municipalities' local share of MBR.[17]

[17] As evidence of the overestimation, there are six cases during the 2007–2011 period when the estimated local share of MBR is even greater than total property tax collections in the same year.

The estimated local share of MBR is then deducted from the total property tax capacity to derive municipal capacity for each municipality. I use the RTS approach to measure total property tax capacity, which is a product of another new statewide standard tax rate and each municipality's ENGL. To calculate the new statewide standard tax rate, I assume that statewide total property tax capacity is equal to the statewide sum of the local share of MBR and local nonschool operating expenditure. Because the statewide local share of MBR has been added to the numerator, the new standard tax rate is nearly twice the standard tax rate in the original municipal capacity measure.

In sum, the formula for this new measure of municipal capacity is

$$\widehat{CAPACITY}_{it}^{II} = (\hat{\tau}_t^{II} \times ENGL_{it}) - \widehat{LMBR}_{it},$$

where $\widehat{LMBR}$ is the estimated local share of MBR.

Not surprisingly, this new capacity measure is highly correlated with the original capacity measure because both are based on the same ENGL (Figure 4). The population-weighted correlation between the two measures during the 2007–2011 period is 0.95. Yet, this new measure shows a wider range than the original capacity measure. The higher end increases mostly because the new measure imposes a higher standard tax rate. The lower end decreases due to a large deduction of the local share of the MBR from the total property tax capacity.

Deviating from the RTS approach used in the two previous measures, the third alternative measure of municipal capacity is based on the "income-with-tax-exporting" approach. Ladd and Yinger (1989) and Ladd (1994) argue that income represents the ability of local residents to pay taxes, regardless of which tax bases are actually used, and that therefore income should be the starting point for measuring revenue-raising capacity. Instead of imposing a "standard" tax rate, this approach imposes a "standard" tax burden on income across localities. Tax burden is defined as a share of the residents' income paid to local taxes. This approach also takes into consideration the ability of localities to export local taxes to nonresidents. Under this approach, municipal capacity is calculated as

$$\widehat{CAPACITY}_{it}^{III} = \hat{k}_t^* \times INCOME_{it} \times (1 + \hat{e}_{it}),$$

where $\hat{k}^*$ is the standard tax burden imposed on local residents' income, and $\hat{e}$ is the tax export ratio, which is defined as the amount of taxes paid by nonresidents for every dollar of taxes paid by local residents. To estimate $\hat{e}_{it}$, this paper follows Ladd (1994) and makes two simplifying assumptions about the incidence of the property tax: (1) residents bear a 100-percent tax burden on residential and personal properties; (2) nonresidents bear a 100-percent tax burden on business properties. Therefore, $\hat{e}_{it}$is estimated as the ratio of business ENGL to residential and personal ENGL in each municipality in each year. Again, I assume the equality of statewide municipal capacity and local nonschool operating expenditure to obtain the statewide standard tax burden $\hat{k}_t^*$.

This new capacity measure and the original capacity measure turn out to be highly correlated (Figure 5). The population-weighted correlation between the two measures across 169 municipalities is 0.93. However, the new measure shows smaller variation than the original measure does, because income is more equally distributed across municipalities than ENGL.[18] In particular, wealthy towns such as Greenwich and New Canaan have a new capacity measure much smaller than their original capacity measure.

Overall, this paper finds that the original measure of municipal capacity is relatively robust. It is highly correlated with each of the three alternative measures, indicating that they move closely together. No matter which measure is used, the relative positions of different municipalities are very similar. In other words, low-capacity municipalities tend to remain low-capacity municipalities and high-capacity municipalities tend to remain high-capacity municipalities, regardless of the measure used. The choice of which measure to use does not alter the overall conclusion that municipal capacity varies widely across Connecticut municipalities.

This paper prefers the original measure over the alternative measures for several reasons. First, Downes and Pogue (1992) argue that when the capacity measure is used as the basis for distributing state aid to reduce revenue-related fiscal disparities, the RTS approach is more appropriate than the income-with-tax-exporting approach. This is because allocating aid

[18] Ladd, Yinger, and Rechovsky (1991) draw similar conclusions when comparing the RTS with income-with-tax-exporting approaches in measuring municipal capacity in Minnesota.

according to the capacity measure using the RTS approach equalizes tax rates to fund any target level of service provision across localities, whereas allocating aid according to the capacity measure using the income-with-tax-exporting approach does not do so. Second, the original measure is easy to implement. In contrast, it is challenging to calculate accurate local shares of MBR or tax export ratios for the alternative measures, given data constraints. Third, the original measure is more accepted by policymakers and researchers.[19] The RTS approach has been well established for more than half a century and has received wide political acceptance.

V. Measuring the Municipal Gap

Municipal gap is defined as the difference between municipal cost and municipal capacity. By construction, the statewide municipal gap is zero because both statewide municipal cost and capacity are assumed to equal statewide local nonschool operating expenditure.[20] In other words, the state as a whole is assumed to have just sufficient revenue-raising capacity to support all existing local nonschool services. Therefore, a positive (negative) gap means that a municipality is in a worse (better) underlying fiscal condition than the state as a whole. The larger the gap, the worse the underlying fiscal condition.

The paper finds that a significant share of Connecticut municipalities and populations face positive municipal gaps. For example, 46 percent of Connecticut municipalities experienced positive gaps in FY 2011. More importantly, nearly 60 percent of the state population resides in these positive-gap municipalities.

The municipal gap varies widely across municipality types. As the third panel in Table 4 shows, urban core municipalities have the largest positive municipal gap, which is, on average, more than $1,000 per capita. Such a large gap is driven by the lowest municipal capacity and the highest municipal cost. On the other hand, wealthy towns have the largest negative municipal

[19] This preference is not unique to Connecticut. Ladd, Yinger, and Rechovsky (1991) presented to Minnesota policymakers capacity measures using both the RTS and income-with-tax-exporting approaches. Minnesota policymakers chose the measure using the RTS approach, crediting its consistency with past practices and its broader political acceptance.

[20] This paper gives economic meaning to a zero gap, which significantly helps policymakers to understand the municipal gap measure. This is an improvement over previous studies, such as Bradbury et al. (1984) and Bradbury and Zhao (2009), which do not normalize the statewide municipal gap to zero.

gap per capita (-$3,591 on average). This result occurs because wealthy towns have the highest municipal capacity, outweighing the fact that they have the second highest municipal cost as well. Furthermore, the table shows that the distribution pattern of the municipal gap is mostly determined by that of municipal capacity, because the capacity measure varies more widely than the cost measure. The ranking of municipal types in terms of municipal gap is identical to their ranking in terms of municipal capacity.

Similar to the municipal capacity, the municipal gap exhibits some geographic clustering (Figure 6). Municipalities with the largest negative gaps tend to be located in the southwestern and northwestern corners of the state and in three towns along the southern shoreline. On the other hand, municipalities in the central and eastern parts of the state tend to have a large positive municipal gap.

In addition, the distribution of the municipal gap shows very strong time-persistence. The population-weighted correlation across 169 municipalities between the FY 2007 and FY 2011 municipal gap measures is 0.99. This is the case because the underlying cost and capacity factors are fairly slow to change.

VI. Evaluating State Nonschool Grants

The municipal gap measure can be used to evaluate the role of state nonschool grants in addressing municipal fiscal disparities. The state of Connecticut provides nearly a dozen grants to municipalities to support the delivery of local nonschool services. The three largest nonschool grants are: payments in lieu of taxes (PILOT) for private college and hospital property, state property PILOT, and Pequot grants. These constituted about 70 percent of total state nonschool grants between FY 2007 and FY 2011.

These nonschool grants do not have an explicit equalization goal. Instead, colleges and hospitals PILOT is distributed to reimburse municipalities for a portion of revenues forgone due to exempting private colleges and hospitals from property taxes under state statutes. Similarly, state property PILOT pays municipalities a certain percentage of forgone property taxes on exempted state-owned real properties, such as public universities, correctional facilities, state

forests, and government buildings. The Pequot grant program provides unrestricted grants to municipalities using multiple distribution formulas, one of which considers population, ENGL, and income.

In aggregate, nonschool grants are much smaller and therefore play a smaller role in local budgets than ECS grants. In FY 2011, statewide nonschool grants were less than one-fifth of ECS grants. They account for about 8 percent of local nonschool expenditure statewide, compared with nearly 26 percent of local education expenditure accounted for by ECS grants. In addition, the distribution of nonschool grants among municipalities has been very stable over time. The population-weighted correlation across 169 municipalities between the FY 2007 and FY 2011 of per capita nonschool grants is 0.97.

There are several ways to evaluate nonschool grants in relation to the municipal gap. First, I examine the division of statewide nonschool grants between positive-gap and negative-gap municipalities, each as a whole. Between FY 2007 and FY 2011, around 20 percent of aggregate nonschool grants were awarded to negative-gap municipalities. This suggests that the distribution of nonschool grants is broadly spread and not well targeted to fiscally disadvantaged municipalities.

Second, I directly compare the distribution of nonschool grants among 169 municipalities with the distribution of municipal gaps. As Figure 7 indicates, the two distributions are positively, but loosely, associated with each other. The population-weighted correlation between the two is only 0.47, although it is statistically significant at the 1 percent level. This suggests that nonschool grants exert some limited equalizing effect.

Third, I examine whether and how much the distribution of the municipal gap is more equalized after netting out nonschool grants. As the fourth panel of Table 4 shows, municipality types with larger gaps tend to receive more in nonschool grants.[21] As a result, the difference in

[21] One exception is that wealthier-property rural towns receive more grants than suburban towns. This is because they benefit more from the state's Town Aid Road grant, whose formula takes the number of town maintenance road miles into consideration. On average, wealthier-property rural towns have a higher town maintenance road mileage per thousand people than suburban towns.

net gap between urban core (the largest-gap municipality type) and wealthy towns (the smallest-gap municipality type) is smaller by $250 per capita than the difference between the two types in the original gap. Nonetheless, the range in net gap is still very wide, and the order of the net gap across municipality types remains the same as the order of the original gap, given the relatively small size and spread of nonschool grant distribution.

In addition, Table 5 compares the net gap with the original gap in three commonly used dispersion measures.[22] For each measure of dispersion, a lower value indicates more equality among municipalities. The table shows that the dispersion measures all exhibit a small decline after nonschool grants are netted out from the original gaps, confirming that nonschool grants play a small positive role in fiscal equalization.

VII. Comparison with Massachusetts

Unlike previous research that is focused on a single state, this paper conducts a comparison between Connecticut and Massachusetts. A cross-state comparison could help policymakers understand the relative severity of Connecticut municipal fiscal disparities. More importantly, it would enable Connecticut policymakers to learn from the Massachusetts experience in using nonschool grants to address municipal fiscal disparities more effectively.

Massachusetts is a good subject for comparison with Connecticut for several reasons. First, these states are geographic neighbors. Second, they have similar socioeconomic characteristics, such as a high average income level and a high percentage of college-educated residents. Third, and most importantly, they have similar state-local fiscal structures. For example, neither state has an active county government system. In both states, municipalities are responsible for providing a wide range of public services, while school districts are dependent upon municipal governments. Property taxes are almost the only own-source revenues for municipalities. Both states provide nonschool grants to assist municipalities in delivering public services.

[22] Because these dispersion measures do not allow negative values to be used in the calculations, I deduct from all gap values the minimum gap value less one.

In addition, the data on the FY 2007 municipal gap are available for both Connecticut and Massachusetts. Zhao (2015) calculates Massachusetts municipalities' FY 2007 gap in a manner similar to that used in this paper. Therefore, the gap measures across the states are fairly comparable. While the comparison is made for FY 2007, the results are very likely to apply to other years. This is so because both distributions—the distribution of the municipal gap and the distribution of state grants—are relatively stable over time.

The paper finds that Connecticut has greater nonschool fiscal disparity across municipalities than Massachusetts. Table 6 compares the two states in three dispersion measures of the original gap and the net gap (all weighted by municipal population). Connecticut turns out to have a higher degree of dispersion than Massachusetts, regardless of which gap measure or dispersion measure is used.

An important reason that Connecticut exhibits greater municipal fiscal disparity than Massachusetts is that a larger share of its population lives in the smallest-gap municipalities. If cities and towns in each state are ranked by municipal gap from highest to lowest, the bottom 10 percent of municipalities in Connecticut is home to 6.2 percent of the state population. In contrast, the bottom 10 percent of municipalities in Massachusetts includes only 3.0 percent of the state population. This is so because the lowest-gap municipalities in Connecticut tend to be in Fairfield County, which has a relatively large population, unlike the small resort towns in the Cape and the Islands, which have the lowest gaps in Massachusetts.

While Connecticut exhibits greater municipal fiscal disparity than Massachusetts, its nonschool grants are smaller and appear less equalizing than Massachusetts nonschool grants. Connecticut nonschool grants per capita were only about 61 percent of Massachusetts nonschool grants per capita in FY 2007. The population-weighted correlation across Connecticut municipalities between nonschool grants and the municipal gaps is 0.47, which is considerably lower than the correlation of 0.63 between nonschool grants and the municipal gaps across Massachusetts municipalities.

Massachusetts nonschool grants are more equalizing than Connecticut nonschool grants, because it has a more explicit equalization goal and its main distribution formula directly considers the differences across municipalities in revenue-raising capacity. The largest nonschool grant program in Massachusetts in FY 2007 was lottery aid, which comprised about 64 percent of total nonschool grants in that year.[23] This program is mandated to "provide general purpose financial assistance to municipalities on an equalizing basis" (Municipal Data Management and Technical Assistance Bureau, 2003, p. 26). To achieve this goal, the state distributes per capita lottery aid in direct reverse proportion to the per capita property tax base of each municipality. The underlying rationale is that municipalities with larger property tax bases have higher revenue-raising capacity according to the RTS approach and therefore have less need for state aid. However, the lottery aid formula does not take account of cost differences across municipalities.

To improve the equalization effect of nonschool grants in Connecticut, policymakers could consider adopting an aid distribution approach similar to the Massachusetts lottery aid formula. They may even want to consider a formula based on the municipal gap measure in order to account not only for capacity differences but also for cost differences across municipalities. The gap-based formula would allocate more grants to municipalities with larger municipal gaps.

VIII. Conclusion

Using a cost-capacity gap framework, this paper is the first study to quantify nonschool fiscal disparities across Connecticut municipalities. It finds that Connecticut municipalities differ significantly in revenue-raising capacity, driven by differences in their property tax bases. They also vary considerably in the costs of providing nonschool services, due to differences in the five cost factors (the unemployment rate, population density, the private-sector wage level, local road mileage, and the number of jobs relative to the number of local residents). As a result, there are substantial nonschool fiscal disparities among Connecticut municipalities. Across

[23] There are 11 nonschool grants in Massachusetts in FY 2007. They are lottery aid; additional assistance; local share of racing taxes; regional public libraries grants; public career incentive; urban renewal projects grants; veterans' benefits; veterans, blind persons, and surviving spouses exemptions; elderly exemptions; state owned land PILOT; and public libraries grants.

different types of municipalities, urban core and wealthy towns experience the largest and smallest municipal gaps, respectively. While state nonschool grants help to offset fiscal disparities, the equalization effect is relatively small.

This paper also adds to the literature by conducting a comparison between Connecticut and Massachusetts. It finds that nonschool fiscal disparities in Connecticut are more severe than those in Massachusetts, and nonschool grants in Connecticut are less equalizing than those in Massachusetts. To improve fiscal equalization in Connecticut, policymakers could consider increasing nonschool grants and adopting a more equalizing aid formula. One option is to use a gap-based formula that would allocate more nonschool grants to municipalities with larger municipal gaps.

This paper's conceptual framework and empirical approach can be generalized to other states. More studies of nonschool fiscal disparities using other states' data will help policymakers across the country to have a deeper and more comprehensive understanding of local fiscal condition and potentially improve their grant systems.

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Appendix: Data Adjustments

I take each municipality's general fund operating expenditure from the Municipal Fiscal Indicators Reports that the state compiles based on municipalities' CAFRs. The state defines the general fund operating expenditure as total general fund expenditure minus general fund expenditure for education. I then make three adjustments to reduce data inconsistency across municipalities.

First, I remove the expenditures on water, sewer, and solid waste services, if they are included in the general fund. One reason for making this adjustment is that there are differences across municipalities in the way they account for water, sewer, and solid waste-related spending in the CAFRs. The majority of municipalities report the expenditures on these services in either enterprise funds or special funds, but some small towns include them in their general funds. Another, more important reason for making this adjustment is that there are differences across municipalities in whether they provide these services in the first place. Unlike urban cities, rural towns often do not provide these services. It leaves their residents to rely on private wells, sewer systems, and trash collectors and to bear the cost directly. Therefore, keeping water, sewer, and solid waste-related spending in the nonschool expenditure measure would lead to inflating the cost for urban cities relative to the cost for rural towns.

Second, I add back two public works-related expenditures—Town Aid Road and Local Capital Improvement Program (LOCIP)—to the general fund operating expenditure measure, if they are reported outside the general fund. This adjustment is needed because about a third of municipalities choose to report these expenditures in special funds, while the remaining municipalities include them in their general funds.

Third, I add back expenditures from eight boroughs and many special taxing districts (for example, fire districts) that are located within town boundaries and provide some nonschool services.[24] If they are not accounted for, municipalities with overlapping boroughs or special

[24] I do not need to take into consideration county governments, because they do not exist in Connecticut. I exclude two types of special taxing districts: (1) districts whose sole purpose is to provide water, sewer, and solid waste

taxing districts would appear to have lower costs than they actually have. Because the state law in Connecticut does not require boroughs and special taxing districts to report to the state, the state government does not have a centralized source of information about these government entities.[25] Instead, I estimate the expenditure of boroughs and special taxing districts using data from the 2007 Census of Governments.[26]

These three adjustments turn out to have a significant impact on some municipalities' general fund operating expenditure measure. The adjusted operating expenditure ranges from 72 percent to 215 percent of the original operating expenditure across municipalities. Nevertheless, the population-weighted correlation across 169 municipalities between the two measures is still very high, at 0.98, with a p value of less than 0.001.

services, and (2) private-purpose special taxing districts such as homeowner associations, beach and lake associations, and environmental conservation districts.

[25] As a unique case, the City of Groton is located within the Town of Groton. Different from boroughs, the City of Groton produces and supplies its CAFRs to the state's Municipal Fiscal Indicators Report series. Therefore, I am able to add its general fund operating expenditure figures to the Town of Groton's.

[26] I first calculate the ratio of FY 2007 boroughs and special taxing districts spending (which is from the Census of Governments) to their home municipality's FY 2007 general fund operating expenditure (which is from the CAFR). Assuming that this ratio does not change over time, I then multiply it by each municipality's general fund operating expenditure in FY 2007–FY 2011 to obtain an estimate of boroughs' and special taxing districts' spending in each of those years.

Table 1. Summary Statistics
(FY2007–FY2011, 2012 dollars per capita)

Number of observations=845	Mean	Standard Deviation	Minimum	Maximum
Per capita adjusted operating expenditure:				
Total	1,156.64	427.84	418.41	3,178.50
Public safety	236.33	159.45	0.00	865.93
Public works	197.64	95.17	0.00	1,083.60
General government	266.27	148.25	46.49	765.22
Other	456.39	314.42	0.00	2,090.09
Log (per capita adjusted operating expenditure):	6.99	0.35	6.04	8.06
Cost factors:				
Unemployment rate (%)	6.98	2.60	1.30	20.20
Population density (000s per square mile)	0.94	1.33	0.02	9.11
Private-sector wage index (%)	95.86	7.27	85.06	121.39
Town maintenance road mileage (per 000 people)	8.79	6.47	1.65	41.26
Per capita private-sector jobs	0.30	0.19	0.02	1.06
Per capita total jobs	0.36	0.21	0.06	1.30
Logarithm of population	9.39	1.09	6.50	11.89
Percentage of housing units that are renter-occupied and were built before 1970	11.10	8.41	0.49	49.10
Percentage of population in poverty	5.97	5.05	0.20	33.90
Percentage of population that is foreign born	8.38	5.52	0.25	37.73
Control variables:				
Per capita equalized net grand list (000s)	189.86	117.30	48.02	920.96
Per capita income (000s)	41.74	14.41	16.45	106.11
Ratio of state nonschool grants to thousand dollars of income	2.83	3.46	0.19	25.30
Ratio of state Education Cost Sharing grant to thousand dollars of income	14.12	13.16	0.42	96.34
Tax price	2.00	0.48	0.92	5.10
Percentage of population 25 and older with some college	17.90	3.26	6.60	27.00
Percentage of population 25 and older with a bachelor's degree or higher	38.25	14.55	12.00	82.20
Percentage of population 65 and older	14.95	3.89	6.10	33.40
Percentage of housing units that are owner-occupied	79.23	13.18	24.06	97.82
Percentage of registered voters who are Republican	23.70	7.58	3.88	51.32
Dummy variable for council-manager form of government	0.17	0.38	0.00	1.00
Dummy variable for mayor-council form of government	0.17	0.38	0.00	1.00
Dummy variable for having paid firefighters	0.15	0.36	0.00	1.00
Dummy variable for municipalities with resident state trooper contract	0.34	0.47	0.00	1.00
Dummy variable for municipalities completely relying on state police	0.14	0.35	0.00	1.00
Dummy variable for mixed school system	0.16	0.37	0.00	1.00
Dummy variable for K-12 regional schools	0.12	0.32	0.00	1.00

Source: See Appendix Table 1.

Note: Private-sector wage index=$\left(1+\frac{0.8\times\text{Labor market area average annual private-sector wage}+0.2\times\text{Municipal average annual private-sector wage}-\text{State average annual private-sector wage}}{3\times\ \text{State average annual private-sector wage}}\right)\times 100$.

By construction, statewide private-sector wage index=100.

Tax price=Median house value÷Per household equalized net grand list.

Table 2. Results of Cost Regressions

	Per Capita Adjusted Total Operating Expenditure				Log (Per Capita Adjusted Total Operating Expenditure)
	Extensive List of Potential Cost Factors	Significant Cost Factors Only	Year Fixed Effects	Year and County Fixed Effects (Preferred Specification)	
Cost factors:					
Unemployment rate (%)	20.48***	20.55***	27.55***	24.80***	0.02***
	(4.65)	(4.44)	(4.80)	(4.89)	(0.00)
Population density (000s per square mile)	43.69***	50.40***	45.59***	36.48***	0.03***
	(15.49)	(13.00)	(13.02)	(12.42)	(0.01)
Private-sector wage index (%)	5.32***	5.59***	6.21***	6.66***	0.00*
	(1.97)	(1.99)	(2.03)	(2.08)	(0.00)
Town maintenance road mileage (per 000 people)	7.65**	6.68**	7.33**	6.73*	0.01***
	(3.40)	(3.14)	(3.12)	(3.61)	(0.00)
Per capita private-sector jobs	123.33*	131.20**	125.36**	217.92***	0.13**
	(67.29)	(63.62)	(62.83)	(60.48)	(0.05)
Logarithm of population	12.89				
	(18.72)				
Percentage of housing units that are renter-occupied and were built before 1970	2.81				
	(3.28)				
Percentage of population in poverty	−3.27				
	(3.57)				
Percentage of population that is foreign born	2.01				
	(3.35)				
Control variables:					
Per capita equalized net grand list (000s)	0.86***	0.90***	0.79***	0.40	−0.00
	(0.26)	(0.25)	(0.26)	(0.30)	(0.00)
Per capita income (000s)	11.03***	11.12***	11.32***	12.53***	0.01***
	(2.82)	(2.57)	(2.54)	(2.54)	(0.00)
Ratio of state nonschool grants to thousand dollars of income	9.43**	8.16**	6.77*	7.21**	0.00
	(3.98)	(3.77)	(3.71)	(3.58)	(0.00)
Ratio of state Education Cost Sharing grant to thousand dollars of income	1.62	1.11	1.09	2.75**	0.00
	(1.65)	(1.45)	(1.45)	(1.38)	(0.00)
Tax price	−73.01**	−68.06**	−65.13**	−94.12***	−0.14***
	(32.66)	(31.59)	(31.59)	(31.68)	(0.03)
Percentage of population 25 and older with some college	9.36**	9.40**	10.58***	7.69**	0.01*
	(3.89)	(3.72)	(3.77)	(3.77)	(0.00)
Percentage of population 25 and older with a bachelor's degree or higher	3.17*	2.97*	3.84**	4.00**	0.00***
	(1.74)	(1.65)	(1.70)	(1.62)	(0.00)
Percentage of population 65 and older	5.03*	4.45	6.17**	3.74	0.01**
	(2.91)	(2.78)	(2.97)	(3.04)	(0.00)
Percentage of housing units that are owner-occupied	−1.63	−2.69**	−3.06***	−3.21***	−0.00***
	(2.15)	(1.12)	(1.12)	(1.04)	(0.00)
Percentage of registered voters who are Republican	−4.72*	−4.91**	−4.64*	−4.36*	−0.00
	(2.49)	(2.46)	(2.41)	(2.61)	(0.00)
Dummy variable for council-manager form of government	−19.49	−14.19	−11.82	37.60	0.04**
	(24.52)	(23.06)	(22.83)	(23.11)	(0.02)
Dummy variable for mayor-council form of government	72.05**	80.94**	81.60***	32.79	0.05*
	(32.54)	(31.42)	(31.56)	(30.97)	(0.03)
Dummy variable for having paid firefighters	135.17***	136.51***	138.39***	173.60***	0.11***
	(31.58)	(30.77)	(30.63)	(28.47)	(0.02)
Dummy variable for municipalities with resident state trooper contract	−189.04***	−193.61***	−187.95***	−154.86***	−0.14***
	(27.90)	(27.03)	(26.60)	(27.67)	(0.02)
Dummy variable for municipalities completely relying on state police	−323.40***	−332.56***	−332.07***	−263.30***	−0.27***
	(39.88)	(39.98)	(39.02)	(43.68)	(0.04)
Dummy variable for mixed school system	−12.10	−16.18	−19.27	−35.23	−0.06***
	(29.41)	(29.38)	(29.20)	(30.00)	(0.02)
Dummy variable for K-12 regional schools	−171.41***	−174.67***	−174.91***	−202.60***	−0.20***
	(30.82)	(30.94)	(30.86)	(32.94)	(0.03)
Constant	−340.88	−121.01	−249.34	−105.57	6.47***
	(349.09)	(246.15)	(255.81)	(269.08)	(0.21)
Observations	845	845	845	845	845
Adjusted R^2	0.72	0.72	0.72	0.75	0.76
Year fixed effects	No	No	Yes	Yes	Yes
County fixed effects	No	No	No	Yes	Yes

Source: Author's calculations.
Note: Robust standard errors are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Results of Cost Regressions by Spending Subcategory

Dependent variable: Per capita adjusted operating expenditure	Total	Public Safety	Public Works	General Government	Other
Cost factors:					
Unemployment rate (%)	24.80***	6.35***	8.07***	−1.51	11.88**
	(4.89)	(1.85)	(1.84)	(3.14)	(4.83)
Population density (000s per square mile)	36.48***	36.77***	10.17***	−17.66***	7.19
	(12.42)	(6.75)	(3.39)	(6.55)	(12.78)
Private-sector wage index (%)	6.66***	1.51**	1.12**	5.21***	−1.19
	(2.08)	(0.68)	(0.55)	(1.42)	(1.73)
Town maintenance road mileage (per 000 people)	6.73*	−1.08	9.49***	4.81***	−6.49***
	(3.61)	(0.94)	(1.74)	(1.17)	(2.34)
Per capita private-sector jobs	217.92***	89.15***	−75.07***	90.34**	113.50**
	(60.48)	(26.47)	(20.12)	(38.68)	(55.44)
Control variables:					
Per capita equalized net grand list (000s)	0.40	0.03	−0.28***	−0.21**	0.86***
	(0.30)	(0.07)	(0.07)	(0.10)	(0.27)
Per capita income (000s)	12.53***	1.27	1.62**	1.33	8.31***
	(2.54)	(0.83)	(0.68)	(1.37)	(1.98)
Ratio of state nonschool grants to thousand dollars of income	7.21**	1.10	3.28***	1.30	1.54
	(3.58)	(1.47)	(1.24)	(2.16)	(3.49)
Ratio of state Education Cost Sharing grant to thousand dollars of income	2.75**	−0.59	−1.82***	2.26***	2.90**
	(1.38)	(0.60)	(0.45)	(0.83)	(1.30)
Tax price	−94.12***	−2.50	−37.46***	−44.88***	−9.27
	(31.68)	(17.87)	(10.25)	(15.00)	(34.11)
Percentage of population 25 and older with some college	7.69**	−1.08	1.84	−2.42	9.34***
	(3.77)	(1.17)	(1.45)	(2.16)	(3.45)
Percentage of population 25 and older with a bachelor's degree or higher	4.00**	0.75	−0.00	−1.90**	5.16***
	(1.62)	(0.54)	(0.54)	(0.90)	(1.39)
Percentage of population 65 and older	3.74	−0.87	1.18	4.67***	−1.25
	(3.04)	(0.94)	(0.92)	(1.43)	(2.41)
Percentage of housing units that are owner-occupied	−3.21***	−1.54***	−0.97***	1.05	−1.75*
	(1.04)	(0.39)	(0.37)	(0.65)	(0.96)
Percentage of registered voters who are Republican	−4.36*	0.57	2.16***	−1.56	−5.53***
	(2.61)	(0.67)	(0.70)	(1.41)	(1.99)
Dummy variable for council-manager form of government	37.60	1.41	37.22***	−81.91***	80.88***
	(23.11)	(9.89)	(7.66)	(16.26)	(22.86)
Dummy variable for mayor-council form of government	32.79	12.01	−2.88	−36.85*	60.51**
	(30.97)	(11.53)	(8.68)	(20.72)	(29.65)
Dummy variable for having paid firefighters	173.60***	24.91***	−2.94	14.02	137.61***
	(28.47)	(8.93)	(7.66)	(17.11)	(25.38)
Dummy variable for municipalities with resident state trooper contract	−154.86***	−127.45***	−16.02**	−36.53**	25.14
	(27.67)	(8.02)	(7.41)	(16.14)	(26.53)
Dummy variable for municipalities completely relying on state police	−263.30***	−171.40***	−61.55***	−40.03*	9.68
	(43.68)	(14.72)	(20.75)	(23.64)	(31.80)
Dummy variable for mixed school system	−35.23	12.19	15.09*	6.57	−69.08***
	(30.00)	(7.89)	(7.85)	(13.96)	(26.56)
Dummy variable for K-12 regional schools	−202.60***	12.67*	−26.43**	66.20***	−255.03***
	(32.94)	(7.60)	(10.32)	(17.01)	(28.04)
Constant	−105.57	128.86	32.25	−154.91	−111.77
	(269.08)	(88.84)	(71.22)	(168.63)	(208.31)
Observations	845	845	845	845	845
Adjusted R^2	0.75	0.79	0.42	0.24	0.60
Year fixed effects	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes

Source: Author's calculations.

Note: In order to account for the potential correlation among the error terms of these spending subcategories, I use seemingly unrelated regressions. Robust standard errors for coefficients are presented in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 4. Municipal Cost, Capacity, and Gap by Municipality Type
(FY2007–FY2011 population-weighted average, 2012 dollars per capita)

	Wealthy	Wealthier-Property Rural	Suburban	Urban Periphery	Less-Wealthy-Property Rural	Urban Core
Cost factors:						
Unemployment rate (%)	5.89	5.95	6.11	8.37	7.36	13.78
Population density (000s per square mile)	1.07	0.38	0.82	2.21	0.34	6.48
Private-sector wage index (%)	115.29	92.42	98.79	100.13	92.34	98.33
Town maintenance road mileage (per 000 people)	5.64	10.23	6.51	3.44	8.43	2.03
Per capita total jobs	0.47	0.37	0.42	0.48	0.33	0.50
Per capita municipal cost ($)	1,398.01	1,230.22	1,280.47	1,386.75	1,243.82	1,658.91
Capacity factor:						
Per capita equalized net grand list (000s)	611.36	242.19	192.43	144.79	118.20	73.16
Per capita municipal capacity ($)	4,989.08	1,979.35	1,571.69	1,181.18	965.33	595.92
Per capita municipal gap ($)	−3,591.07	−749.13	−291.22	205.57	278.49	1,062.99
State grants:						
Per capita state nonschool grants ($)	35.79	76.23	64.95	99.23	115.50	285.79
Per capita municipal gap net of nonschool grants ($)	−3,626.86	−825.36	−356.17	106.34	162.99	777.19
Number of municipalities	8	21	61	30	42	7
Share of state total population (%)	5.25	3.99	26.44	35.41	9.59	18.41

Source: Author's calculations and Levy, Rodriguez, and Villemz (2004).

Note: Rural municipalities with five-year average per capita equalized net grand list above the state five-year average are labeled as "wealthier-property rural"; the remaining rural municipalities are labeled as "less-wealthy-property rural."

State nonschool grants include Colleges & Hospitals PILOT, State Property PILOT, Pequot Grants, Town Aid Road, LoCIP, Elderly Circuit Breaker, Veterans' Exemption, DECD PILOT Grant, DECD Tax Abatement, Elderly Freeze, and Disability Exemption.

Table 5. Comparison of the Dispersion of Two Gap Measures (population-weighted)

	Original Gap	Net Gap
Relative mean deviation	0.062	0.060
Coefficient of variation	0.206	0.200
Standard deviation of logs	1.141	1.138

Source: Author's calculations.

Note: Net gap = Original gap - State nonschool grants.
Both the original gap and the net gap for each municipality are FY2007–FY2011 average.

Table 6. Comparison of Gap Dispersions between Connecticut and Massachusetts (FY2007, population-weighted)

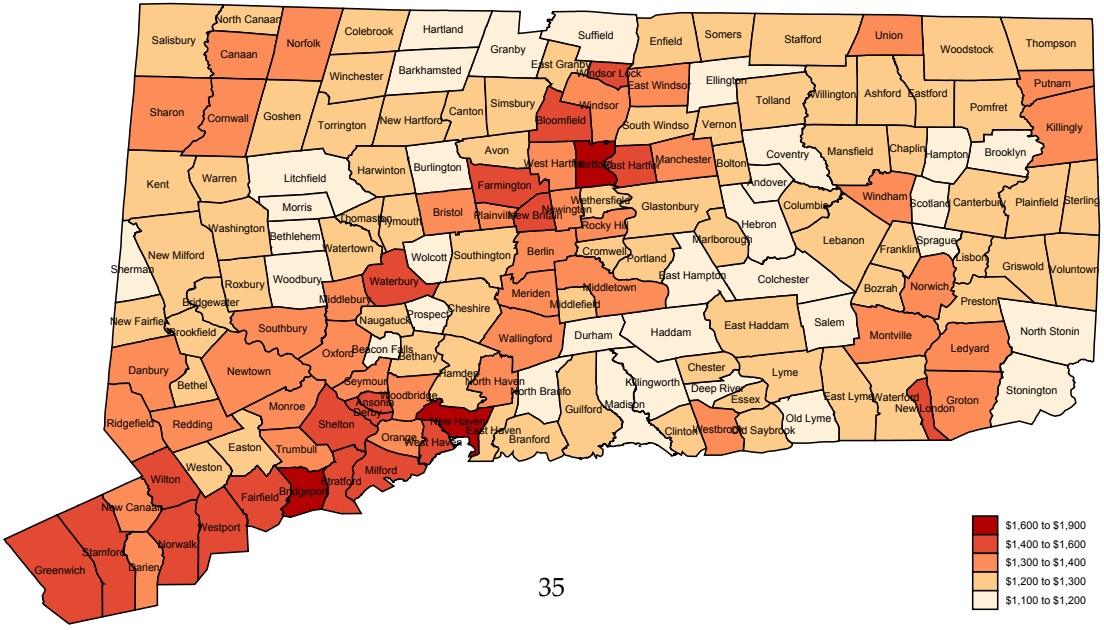
	Original Gap		Net Gap	
	CT	MA	CT	MA
Relative mean deviation	0.068	0.020	0.066	0.018
Coefficient of variation	0.218	0.064	0.211	0.061
Standard deviation of logs	1.142	0.136	1.138	0.134

Source: Author's calculations.

Note: Net gap = Original gap - State nonschool grants.

Figure 1. Per Capita Municipal Cost by Municipality

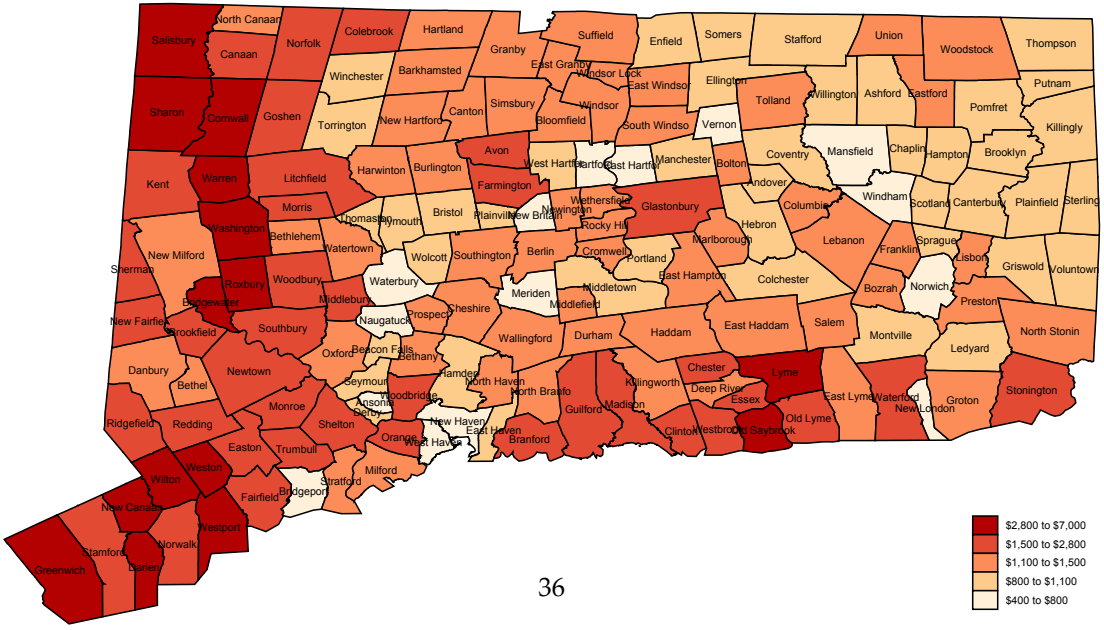
(FY2007–FY2011 average, 2012 dollars)



Source: Author's calculations.

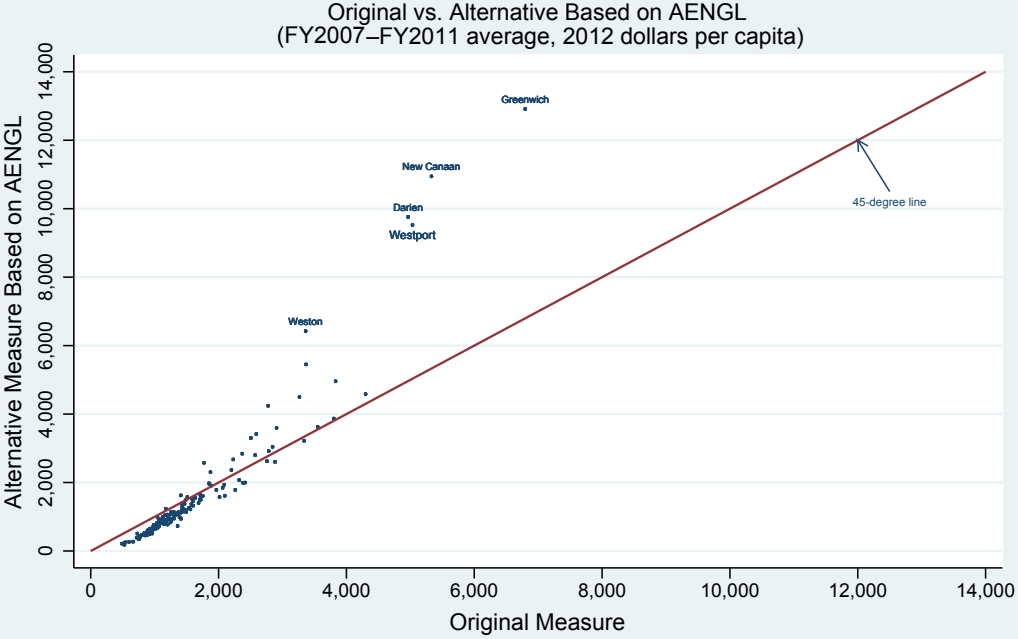
Figure 2. Per Capita Municipal Capacity by Municipality

(FY2007–FY2011 average, 2012 dollars)



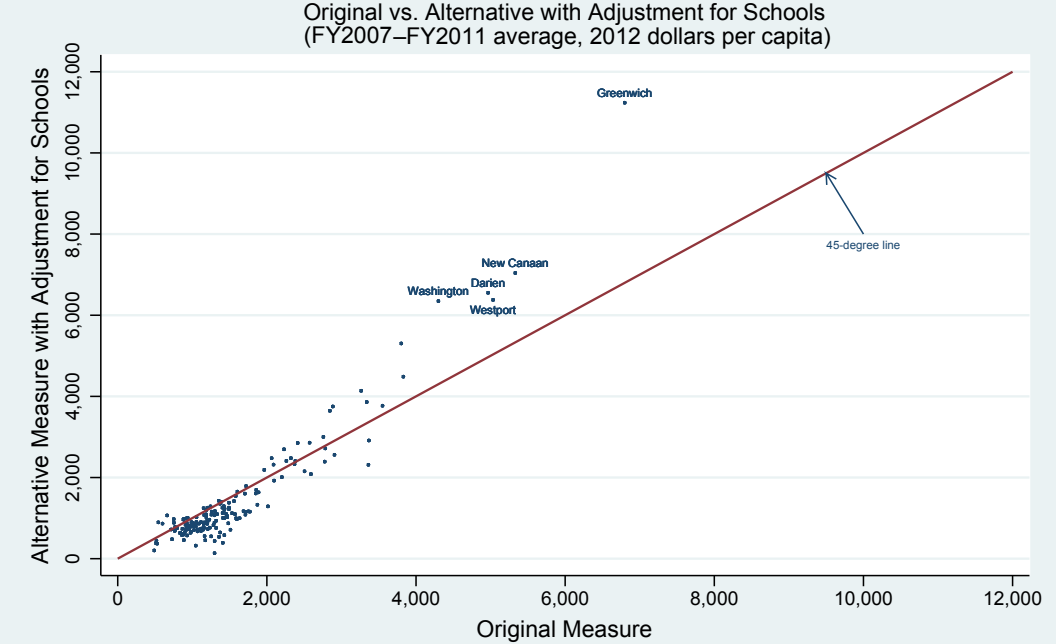
Source: Author's calculations.

Figure 3. Comparison of Two Municipal Capacity Measures



Source: Author's calculations.
Note: AENGL is an abbreviation of Adjusted Equalized Net Grand List. AENGL=ENGL*Per capita income / Highest per capita income.

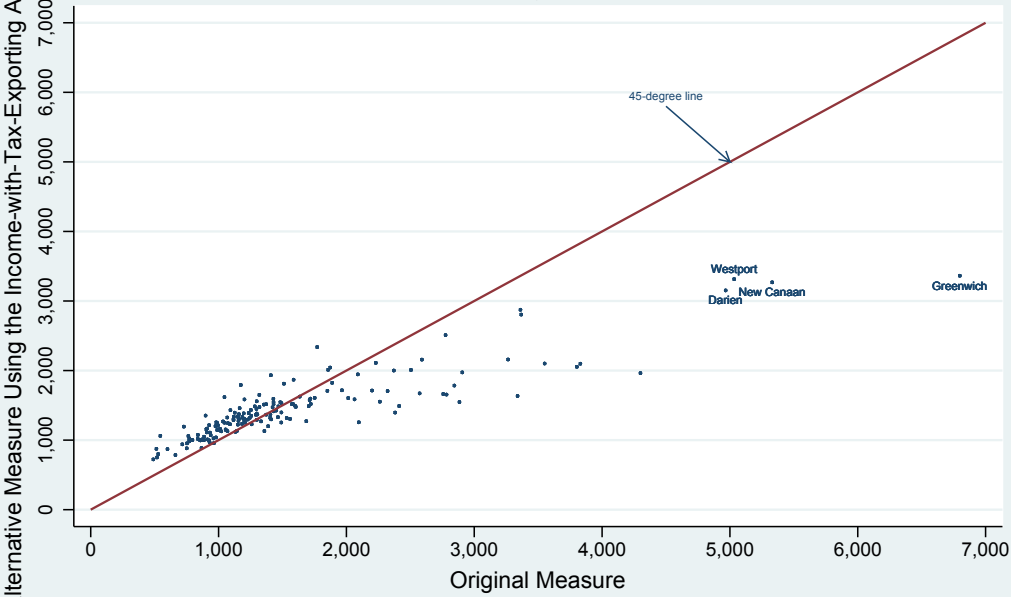
Figure 4. Comparison of Two Municipal Capacity Measures



Source: Author's calculations.

Figure 5. Comparison of Two Municipal Capacity Measures

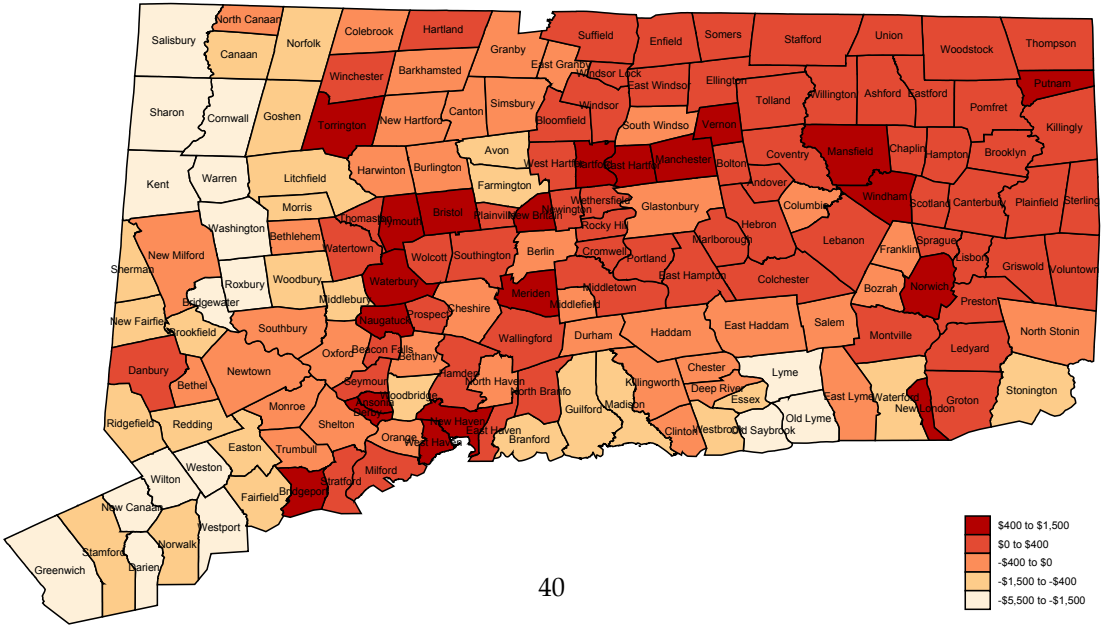
Original vs. Alternative Using the Income-with-Tax-Exporting Approach
(FY2007–FY2011 average, 2012 dollars per capita)



Source: Author's calculations.

Figure 6. Per Capita Municipal Gap by Municipality

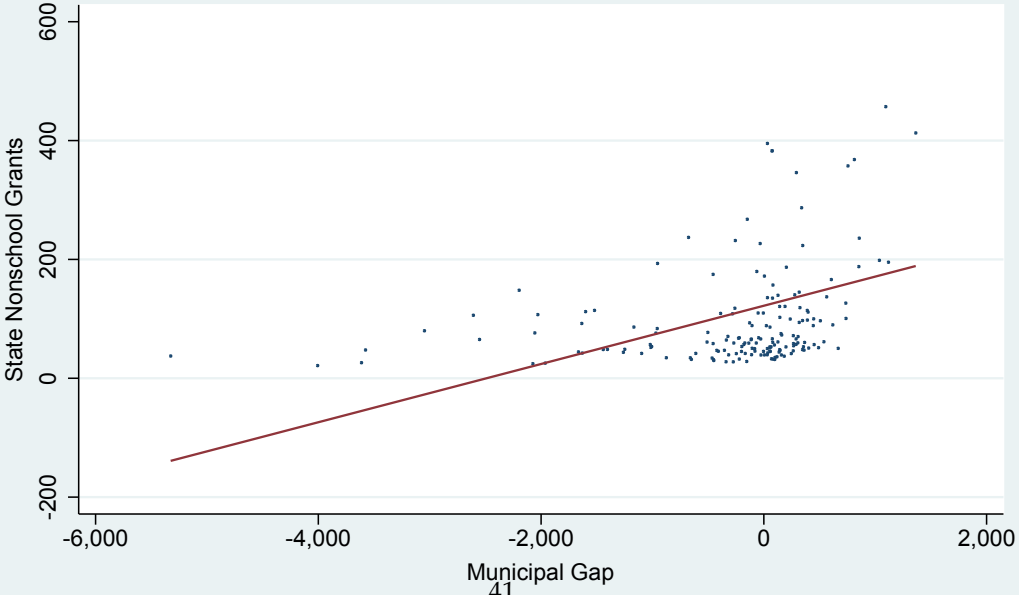
(FY2007–FY2011 average, 2012 dollars)



Source: Author's calculations.

Figure 7. State Nonschool Grants versus Municipal Gap

(FY2007–FY2011 average, 2012 dollars per capita)



Source: Author's calculations.
Note: The straight line is created from a population-weighted regression of five-year average per capita state nonschool grants on five-year average per capita municipal gaps over all 169 cities and towns.

Appendix Table 1. Data Sources

Variables	Source(s)
Per capita adjusted operating expenditure:	
Total	Connecticut Municipal Fiscal Indicators Reports, the 2007 Census of Governments, the FY 2012 Comprehensive Annual Financial Reports of each Connecticut municipality
Public safety	Connecticut Municipal Fiscal Indicators Reports, the 2007 Census of Governments, the FY 2012 Comprehensive Annual Financial Reports of each Connecticut municipality
Public works	Connecticut Municipal Fiscal Indicators Reports, the 2007 Census of Governments, the FY 2012 Comprehensive Annual Financial Reports of each Connecticut municipality
General government	Connecticut Municipal Fiscal Indicators Reports, the 2007 Census of Governments, the FY 2012 Comprehensive Annual Financial Reports of each Connecticut municipality
Other	Connecticut Municipal Fiscal Indicators Reports, the 2007 Census of Governments, the FY 2012 Comprehensive Annual Financial Reports of each Connecticut municipality
Cost factors:	
Unemployment rate (%)	The American Community Survey: 5-year Estimates
Population density (000s per square mile)	The American Community Survey: 5-year Estimates
Private-sector wage index (%)	Connecticut Department of Labor: Labor Market Information
Town maintenance road mileage (per 000 people)	Connecticut Department of Transportation: Public Road Mileage
Per capita private-sector jobs	Connecticut Department of Labor: Labor Market Information
Per capita total jobs	Connecticut Department of Labor: Labor Market Information
Logarithm of population	The American Community Survey: 5-year Estimates
Percentage of housing units that are renter-occupied and were built before 1970	The American Community Survey: 5-year Estimates
Percentage of population in poverty	The American Community Survey: 5-year Estimates
Percentage of population that is foreign born	The American Community Survey: 5-year Estimates
Control variables:	
Per capita equalized net grand list (000s)	Connecticut Municipal Fiscal Indicators Reports
Per capita income (000s)	The American Community Survey: 5-year Estimates
Ratio of state nonschool grants to thousand dollars of income	Connecticut Office of Fiscal Analysis, the American Community Survey: 5-year Estimates
Ratio of state Education Cost Sharing grant to thousand dollars of income	Connecticut Department of Education, the American Community Survey: 5-year Estimates
Tax price	Connecticut Municipal Fiscal Indicators Reports, the American Community Survey: 5-year Estimates
Percentage of population 25 and older with some college	The American Community Survey: 5-year Estimates
Percentage of population 25 and older with a bachelor's degree or higher	The American Community Survey: 5-year Estimates
Percentage of population 65 and older	The American Community Survey: 5-year Estimates
Percentage of housing units that are owner-occupied	The American Community Survey: 5-year Estimates
Percentage of registered voters who are Republican	Connecticut Secretary of the State: Registration and Party Enrollment Statistics
Dummy variable for council-manager form of government	Connecticut Municipal Fiscal Indicators Reports
Dummy variable for mayor-council form of government	Connecticut Municipal Fiscal Indicators Reports
Dummy variable for having paid firefighters	Connecticut General Assembly Office of Legislative Program Review and Investigations
Dummy variable for municipalities with resident state trooper contract	Connecticut General Assembly Office of Legislative Program Review and Investigations
Dummy variable for municipalities completely relying on state police	Connecticut General Assembly Office of Legislative Program Review and Investigations
Dummy variable for mixed school system	Connecticut Department of Education
Dummy variable for K-12 regional schools	Connecticut Department of Education

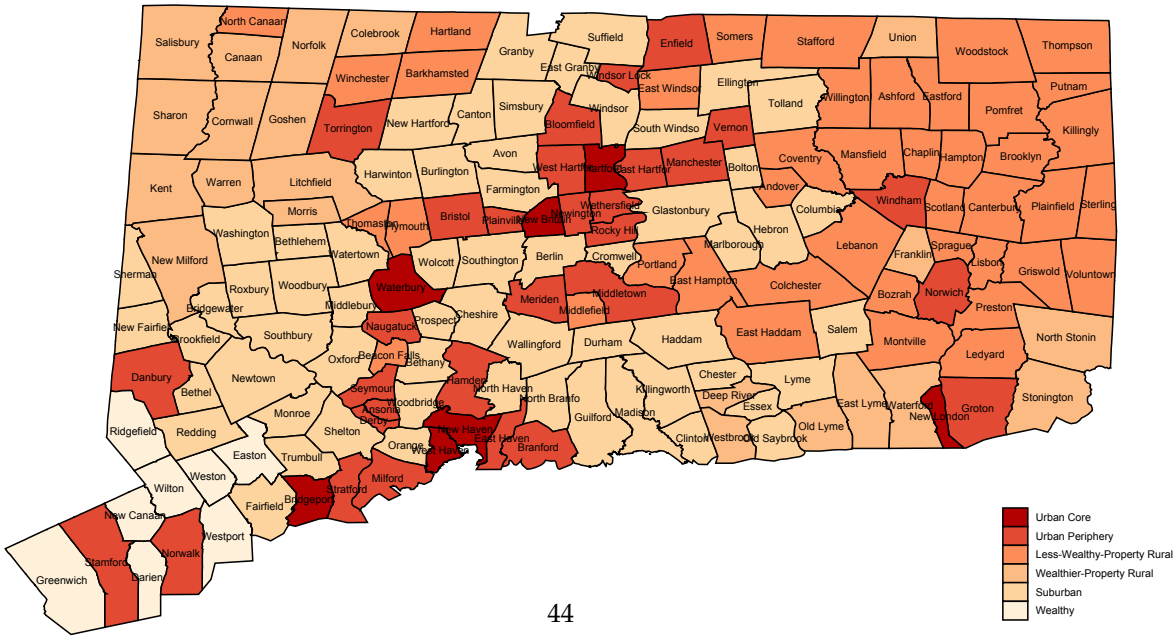
Note: Private-sector wage index=$\left(1+\frac{0.8\times\text{Labor market area average annual private-sector wage}+0.2\times\text{Municipal average annual private-sector wage}-\text{State average annual private-sector wage}}{3\times\ \text{State average annual private-sector wage}}\right)\times 100$.
By construction, statewide private-sector wage index=100.
Tax price=Median house value÷Per household equalized net grand list.

Appendix Table 2. Connecticut Municipality Types

	Wealthy	Suburban	Rural	Urban Periphery	Urban Core
Group characteristics:					
Median family income	Exceptionally high	Above average	Average	Below average	Lowest
Poverty rate	Low	Low	Below average	Average	Highest
Population density	Moderate	Moderate	Lowest	High	Highest
Geographic concentration	Southwestern Connecticut	Midsection of Connecticut	Northwestern, northeastern, and southeastern corners of Connecticut	Mostly between the urban cores and the suburbs	–
Number of municipalities	8	61	63	30	7
Representative municipality	Westport	Cheshire	North Stonington	Manchester	Bridgeport

Source: Levy, Rodriguez, and Villemz (2004).

Appendix Figure 1. Connecticut Municipalities by Type



Source: Author's calculations and Levy, Rodriguez, and Villemz (2004).

Note:Rural municipalities with five-year average per capita equalized net grand list above the state five-year average are labeled as "wealthier-property rural "; the remaining rural municipalities are labeled as "less-wealthy-property rural."