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DISCUSSION PAPER

Does Springfield Receive Its Fair Share of Municipal Aid? Implications for Aid Formula Reform in Massachusetts

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with the Federal Reserve Bank of Boston, Springfield Team – Marques Benton, Lynn Browne, Prabal Chakrabarti, DeAnna Green, Yolanda Kodrzycki, Ana Patricia Muñoz, Richard Walker

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ABSTRACT:
This paper examines the distribution of unrestricted municipal aid in Massachusetts, which has been a major concern to civic leaders and elected officials of many communities, including Springfield. The paper develops a measure of the municipal fiscal gap indicating the relative need of municipalities for state aid. The analysis shows that in recent years, unrestricted municipal aid has not been distributed in proportion to the gap measure among the 10 largest cities in Massachusetts. For example, despite having the largest municipal gap, Springfield received almost the lowest per capita amount of Additional Assistance—a key component of municipal aid. This pattern is the result of deep and uneven aid cuts in the past that distorted the distribution of municipal aid. This paper therefore suggests that state government consider adopting a formula that provides more aid to communities facing larger municipal gaps. To avoid disrupting local budgets, the state could consider holding existing aid harmless, and using the gap-based formula to distribute new aid. The simulations show that if the state commits to reasonably large increases in municipal aid, this new approach can be both equalizing and beneficial to a majority of municipalities in the Commonwealth within a relatively short time period. The paper provides various formula evaluations and policy recommendations that could support efforts to reform state aid in Massachusetts.

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State aid is an important component of the budgets of cities and towns in Massachusetts, enabling them to provide vital public services. In fact, other than property taxes, state aid is the largest revenue source for municipalities. According to the U.S. Census Bureau, revenue from state government accounted for 37 percent of the total general revenue of local governments in Massachusetts in fiscal year 2007 (FY 2007), compared with 34 percent nationwide.

The allocation of state aid has been a contentious issue in the Commonwealth. The basic goal of state aid to municipalities is to help equalize their ability to provide public services.[1] Local officials have argued that some aid programs are "archaic" and "arbitrary" (Schworm 2003). The Municipal Finance Task Force—established by the Metro Mayors Coalition—concluded in a 2005 report that "revenues through local aid should be provided fairly and the distribution of those resources should be readily understandable" (p. vii).

As the third-largest city in Massachusetts, Springfield has been particularly concerned about the fairness of the distribution of unrestricted municipal aid. In interviews with the Urban Land Institute, community representatives reported that the allocation of municipal aid to Springfield was "woefully out of balance," causing strain to city finances (Urban Land Institute 2006, p. 13). Local civic leaders expressed similar concerns in recent conversations with members of “Toward a More Prosperous Springfield, Massachusetts,” a project of the Federal Reserve Bank of Boston.[2] This paper directly addresses Springfield's concerns about aid allocation.

This paper examines the distribution of unrestricted municipal aid among Massachusetts cities and towns, with a focus on the 10 largest cities.[3] The paper develops a measure of local fiscal health based on local economic and social characteristics that are outside the direct control of local officials. The paper then compares this measure of local fiscal health with the level of municipal aid received by each of the 10 largest cities in Massachusetts. The state should distribute more aid to cities in worse fiscal health than to those in better fiscal health to fulfill its goal of fiscal equalization.[4]

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[1] Municipal Data Management and Technical Assistance Bureau (undated) states that the purpose of Chapter 70 School Aid is to “ensure both equitable and adequate funding of the Commonwealth’s public schools” (p. 5), and that the purpose of Lottery Aid is “to provide general-purpose financial assistance to municipalities on an equalizing basis” (p. 17).

[2] The Federal Reserve Bank of Boston is committed to supporting efforts to revitalize the City of Springfield. It has produced a series of discussion papers on issues important to Springfield. Browne, Green, et al. (2009) provide the motivation for “Toward a More Prosperous Springfield, Massachusetts,” a project of the Bank. Kodrzycki, Muñoz, et al. (2009) offer lessons from comparable resurgent cities for reinvigorating Springfield’s economy. Browne et al. (2009); Plasse et al. (2009); and Kodrzycki, Muñoz, et al. (2010) discuss job opportunities and barriers in Springfield.

[3] Evaluating restricted School Aid is beyond the scope of this paper and deserves a separate study.

[4] State government may want to equalize local fiscal health to ensure both equity and efficiency. Yinger (1986) states that it is not equitable for identical households or businesses in different communities to pay different amounts of taxes for the same level of local public services, or to receive different levels of local public services for the same taxes. Downes and Pogue (1994) suggest that disparities in local fiscal health may distort resource allocations, because households and businesses may move from their current communities to communities that are in a better fiscal health.

This paper, however, finds that relative fiscal health cannot explain the large intercity discrepancy in the allocation of Additional Assistance—a key component of municipal aid. For example, despite having the worst fiscal health among the 10 largest cities in recent years, Springfield has received the second-smallest per capita amount of Additional Assistance. This pattern is the result of deep and uneven aid cuts in the past that distorted the distribution of municipal aid.

This paper explores alternative methods for distributing unrestricted municipal aid in Massachusetts. The analysis suggests that state government should consider adopting a new formula that provides more aid to communities facing worse fiscal health.

Measuring local fiscal health

Municipalities may differ in their fiscal health because some have more resources to finance public services, or can provide a given level of services at lower cost. Following previous research (for example, Bradbury et al. 1984; and Bradbury and Zhao 2009), this paper measures local fiscal health by examining the gap between the costs of providing local public services ("costs") and communities' ability to raise revenue from local sources ("capacity").

Differing from actual spending and actual revenue, measures of both costs and capacity are based on local economic and social characteristics that are outside the direct control of local government. As such, they reflect a municipality's underlying fiscal health—not local officials' spending or taxing behavior. A community with a larger cost-capacity gap is thus considered to be in worse fiscal health, and should receive more state aid that aims for fiscal equalization. This gap concept is the basis for the Minnesota Local Government Aid formula and the now-defunct Massachusetts Resolution Aid formula, as well as foundation formulas for education aid in most states (Zhao and Bradbury 2009).

Defining municipal costs

In the context of evaluating local fiscal health, this paper defines costs as spending that local governments must incur to provide a common set of municipal services of average quality.[5] These include police and fire protection; public works; general government, health, welfare, culture, and recreation services; and debt services, fixed costs, and other services supported by the general fund.[6] The cost of providing these services depends on the given municipality's economic and social characteristics. Indeed, using a regression-based approach with data on Massachusetts cities and towns,[7] Bradbury and Zhao (2009)

[5] Other studies, such as Bradbury et al. (1984) and Ladd and Yinger (1989), use "expenditure needs" or "needs" as equivalent to "costs."

[6]Like Bradbury and Zhao (2009), this paper excludes elementary and secondary education; services supported by enterprise funds rather than general funds; and services provided by other entities (such as the MBTA and regional transit authorities). This paper also removes water, sewer, and solid waste disposal services, because most municipalities provide them through enterprise funds. And some municipalities do not provide those services at all, so their inclusion could cause a problem with the consistency of the data.

[7] One might argue that Boston should be treated differently because it is the state's largest city and job center, and the state capital. To test whether Boston is a special case, regressions were run with Boston included or

find that per capita municipal costs are proportional to four factors: population density, poverty rate, unemployment rate, and jobs per capita.[8]

A few examples help illustrate how these factors affect costs. For instance, higher population density and poverty and unemployment rates tend to increase costs for fire protection, because housing that is closely packed and poorly maintained creates a greater fire hazard than housing that is widely spaced and well maintained. The costs of providing police protection rise with poverty and unemployment rates, because low-income communities and those with higher unemployment rates tend to have higher crime rates. The number of jobs per capita indicates cost pressures from employers and workers who commute into the municipality, and who consume municipal services (including roads and police and fire protection) along with local residents.[9]

This section creates a cost measure based on these four factors. Table 1 explains how the cost measure is calculated for Springfield and an average community, and shows the source of cost differentials between the two. This paper defines the average community as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and capacity factors. As Table 1 shows, Springfield had a higher value for all cost factors than the state average in FY 2007. In particular, its poverty rate was 2.9 times the state average, which contributed to nearly two-thirds of the cost differential between Springfield and the average community. (Appendix Table 1 shows the value of cost factors for the other large cities.)

As Figure 1 shows, all the state's 10 largest cities except Quincy have high costs—10 percent to 46 percent higher than the average community.[10] These 10 cities fall within the top 25 high-cost municipalities among 351 cities and towns in Massachusetts. Among the 10 largest cities, Springfield has the second-highest costs, below only those of New Bedford.

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excluded, and using both weighted and unweighted regression techniques, with a municipality's population size as weight. The regressions produce basically the same results.

[8] Bradbury and Zhao (2009) and this paper include jobs in all sectors in the variable of jobs per capita, including jobs in federal, state, and local governments and tax-exempt nonprofit organizations. This broad measure of jobs reflects costs that cities and towns incur in hosting government agencies and educational and medical institutions, although such employers usually do not contribute to local property taxes. Those costs are significant in cities such as Boston and Cambridge, which have a higher concentration of government agencies, universities, and hospitals than other cities.

[9] State and local governments have used different approaches to ameliorate the added costs of commuters to cities and towns. Minnesota, for example, gives more municipal aid to cities with more jobs per capita (League of Minnesota Cities 2009). Elsewhere, city governments impose or have attempted to impose taxes, fees, and charges on commuters to recover some service costs. For example, Charleston, W. Va., and Pittsburgh, Pa., each imposes a user fee or municipal services tax ($2 per week and $52 per year, respectively) on persons working within the city limits (Lord 2009; Marks 2009). Pennsylvania allows municipalities to collect local-option payroll taxes (Brunori 2007). Pittsburgh also imposes a parking tax of 37.5 percent on parking fees (Lord 2009), while Denver, Colo., collects a parking surcharge from commuters (*Denver Business Journal* 2009).

[10] Cost measures for FY 2000–2006 show a similar pattern to those for FY 2007.

Defining municipal revenue capacity

Municipal revenue capacity is defined as the ability of local governments to raise revenues locally for municipal purposes. That capacity is determined by local economic and social characteristics that are outside the direct control of local officials.

A measure of municipal revenue capacity includes the capacity from property taxes and other smaller local revenue sources, minus the capacity reserved for non-municipal services (for example, schools). Based on a regression analysis of property taxes in Massachusetts cities and towns, Bradbury and Zhao (2009) show that a municipality's property tax capacity depends on its taxable property values and local residents' income.[11] The income levels of local residents constrain their ability to pay for local public services, and therefore their willingness to increase property taxes to support those services by passing overrides of the local levy limit imposed by Proposition 2 ½ (a local property tax limitation in Massachusetts). Local governments in lower-income communities are therefore less able to tap into their property tax bases, resulting in a lower property tax capacity for given property values.

Besides property taxes, other local sources that contribute to municipal revenue capacity include motor vehicle excises, local hotel/motel excises, urban redevelopment excises, local shares of racing taxes, and state payments in lieu of taxes for state-owned land. Because state law or service agreements require municipalities to reserve some portions of local revenue for non-municipal services, this paper removes statutorily required local contributions for public schools and payments for services provided by other entities, such as regional transits and regional planning authorities, from revenue capacity.

Table 2 shows that, based on this measure, Springfield has much lower revenue capacity than the average community. Property tax capacity largely fuels this difference: Springfield's per capita taxable residential and nonresidential property values are only 30 percent and 47 percent of the state averages, respectively, while income per capita is only 39 percent of the state average. However, Springfield has smaller required reductions in capacity, because it is required to contribute less to school spending than the state average. (Appendix Table 2 shows the value of capacity factors for the other large cities.)

Municipal revenue capacity varies widely among the state's 10 largest cities (Figure 2). For example, the capacity measure of Cambridge is nearly twice as large as that of the average community, reflecting the city's high property values. Boston also has higher revenue capacity than the average community. The per capita capacities of the other largest cities in Massachusetts ranged from 45 percent to 71 percent of the capacity of the average

[11] Bradbury and Zhao (2009) and this paper do not take into account nontaxable property values. Boston, Cambridge, and similar cities have a significant share of property values owned by universities and hospitals, which do not pay property taxes. These tax-exempt entities may contribute to their host municipalities through payments in lieu of taxes (PILOT), which are usually lower than property taxes. Because such payments are voluntary, based on an agreement between a municipality and an entity, Bradbury and Zhao (2009) and this paper do not include PILOT in the capacity measure, except for state PILOT for state-owned land.

community in FY 2007.[12] Lowell, Lynn, Springfield, and Worcester are in the bottom 20 percent of the statewide capacity distribution. Among the 10 largest cities, Springfield has the second-lowest per capita capacity—above only that of Worcester.

Defining municipal gap as a measure of fiscal health

The gap between municipal costs and revenue capacity reveals the relative level of fiscal health experienced by cities and towns. In FY 2007, most of the 10 largest cities had large municipal gaps, because of high costs and low revenue capacities (Figure 3). Except for Cambridge, the per capita gap for each city was in the top 20 percent of the statewide distribution. Furthermore, 6 of the 10 cities (Fall River, Lowell, Lynn, New Bedford, Springfield, and Worcester) ranked in the top 10 among 351 Massachusetts cities and towns. Among the 10 largest cities in Massachusetts, Springfield had the largest municipal gap—nearly six times that of Cambridge. This measure of the municipal gap provides the basis for evaluating the distribution of municipal aid, with a larger gap signifying worse fiscal health and hence a greater need for financial assistance.

Evaluating unrestricted municipal aid

Before FY 2010, state government operated two separate programs to allocate unrestricted municipal aid: Additional Assistance and Lottery Aid. In FY 2009, Additional Assistance and Lottery Aid totaled about $342 million and $844 million, respectively. The FY 2010 state budget merged the two programs into one called Unrestricted General Government Aid, and cut total funding by 21 percent compared with the previous year.

Additional Assistance

Introduced in the early 1980s, Additional Assistance was initially distributed as a residual aid source. That means the state first calculated each community's share of statewide School Aid and Resolution Aid (the total of School Aid and Additional Assistance)—each based on its own formula. The amount of Resolution Aid awarded to each community was determined by a needs-based formula (Municipal Data Management and Technical Assistance Bureau 2003). Additional Assistance for each community was then defined as the amount remaining after School Aid was subtracted from Resolution Aid.

In the 1980s, School Aid grew faster than Additional Assistance statewide. Crowded out by School Aid, some communities' Additional Assistance fell to zero. Furthermore, state government cut total Additional Assistance funds significantly during the severe fiscal crisis in the early 1990s. In FY 1992, for example, statewide Additional Assistance was cut 35 percent from the previous year.[13]

However, individual communities experienced uneven percentage cuts (Municipal Data Management and Technical Assistance Bureau, undated). Sixty-six communities received 100 percent reductions in their Additional Assistance, pushing the number

[12] The pattern is similar for FY 2000–2006.
[13] State government cut Additional Assistance by 4 percent across communities in FY 1991.

receiving no Additional Assistance up to 192—more than half the state's communities. Among the state's 10 largest cities, Springfield lost 84 percent of its Additional Assistance in FY 1992—the largest reduction experienced by any of these cities (Table 3). In contrast, Boston lost just 18 percent of this aid source.

After FY 1992, state government stopped using the formula to calculate Resolution Aid, and no longer distributed Additional Assistance as residual aid. Since then, total Additional Assistance has been funded at the previous year's nominal level, except in FY 2003, 2004, and 2009, when state government made across-the-board cuts of 15.2 percent, 6.2 percent, and 9.7 percent, respectively, to cope with new rounds of fiscal crisis.

Lottery Aid

Lottery Aid is funded by revenue from the state lottery, and distributed through an equalizing formula (Municipal Data Management and Technical Assistance Bureau, undated). In general, municipalities receive Lottery Aid in proportion to their populations, and inverse to their equalized property valuation (EQV). EQV represents the state government's estimate of the fair cash value of all taxable properties in each municipality, and is thus a measure of the local property tax base. The state cut lottery aid in FY 2003, 2004, and 2009 by 9.4 percent, 6.2 percent, and 9.7 percent, respectively.

Distribution of unrestricted municipal aid

The components of unrestricted municipal aid varied widely across the 10 largest cities in FY 2007 (Table 4). Boston received the largest per capita amount of Additional Assistance ($269.93)—almost 35 times the smallest amount, received by New Bedford (only $7.80). However, Lottery Aid was distributed with less variation than Additional Assistance, with a ratio of 3.5 from the highest to the lowest. In contrast to its low level of Additional Assistance, New Bedford received the highest level of Lottery Aid among the 10 largest cities.

Municipal aid should be positively associated with the municipal gap measure, to equalize fiscal health across cities and towns. However, Figure 4 shows that Additional Assistance is not positively aligned with the municipal gap among the 10 largest cities. Indeed, the weighted correlation between Additional Assistance and the municipal gap measure (weighted by population size) was -0.61 in FY 2007. Excluding Boston—which received the highest amount of Additional Assistance—yields an even stronger negative correlation of -0.90. This indicates that cities with larger gaps received substantially less Additional Assistance per capita than cities with smaller gaps.

For example, despite experiencing the largest gaps among the 10 largest cities, Springfield and New Bedford received the smallest amounts of per capita Additional Assistance: 4.5 percent and 2.9 percent of the amount received by Boston. Furthermore, Additional Assistance is only weakly associated with the municipal gap measure across all 351 cities and towns in Massachusetts, with a weighted correlation of 0.23. Weaker still is the relationship between Additional Assistance and the municipal gap measure across the 159 communities receiving Additional Assistance, with a weighted correlation of 0.18.

Overall, the evidence suggests that Springfield has not received its fair share of Additional Assistance, and the same is true for many other large cities such as New Bedford, as well as smaller communities statewide.

Lottery Aid has been more effective than Additional Assistance in equalizing municipal gaps. While not directly based on any measure of municipal gap, the Lottery Aid formula distributes aid inversely to property values, which are a major source of the variation in municipal gap. Communities with lower property values (EQV) usually have larger municipal gaps; the weighted correlation between the two is -0.88. As a result, Lottery Aid is positively correlated with the municipal gap measure, with a weighted correlation of 0.68 across 351 cities and towns, and 0.85 across the 10 largest cities (Figure 5). The large cities facing the biggest gaps (Springfield, New Bedford, and Fall River) received more Lottery Aid per capita than other cities in FY 2007.

The combined unrestricted municipal aid (sum of Lottery Aid and Additional Assistance) has delivered mixed results in equalizing municipal gaps. Statewide, unrestricted municipal aid is considerably equalizing, with a 0.65 correlation with the municipal gap measure. This is mostly due to the equalizing patterns of Lottery Aid, and the larger amounts of Lottery Aid compared with Additional Assistance. However, Additional Assistance and Lottery Aid in effect cancel out each other's equalizing impact on the 10 largest cities (Figure 6). Combined unrestricted municipal aid has zero correlation with the municipal gap measure across these cities. If Boston is excluded, the correlation increases to 0.81. Despite having the largest gaps, Springfield and New Bedford received smaller amounts of unrestricted municipal aid per capita than Boston, Fall River, and Lynn.

Including restricted state non-school aid and federal revenue has virtually no impact on the correlation between municipal aid and the municipal gap measure (Figure 7). Massachusetts cities and towns receive restricted state funding for local and regional public libraries, as well as some revenues from the federal government (for example, Community Development Block Grants).[14] However, these kinds of aid are too small to affect the overall distribution of aid. The total amount of restricted state non-school aid and federal revenue equaled less than 5 percent of combined unrestricted municipal aid in FY 2007. The percentage is even below 1 percent for Springfield, New Bedford, Lynn, and Brockton.

Closing the gaps: Reforming unrestricted municipal aid

These findings suggest that the municipal aid formula needs reform, so that aid distribution is more reflective of local fiscal health. This section discusses several reform scenarios, which yield different outcomes for municipalities. The aid distribution in these scenarios is simulated based on the FY 2009 allocations of unrestricted municipal aid. This section assumes that the per capita municipal gap in each simulation period is the same as in FY 2007. The municipal gap measures changed very little from FY 2000 to FY 2007, and will likely continue to be slow moving in the near future.

[14] State government also provided Highway Funds until FY 2003.

Using the Lottery Aid formula to distribute all unrestricted municipal aid

Because Additional Assistance is less equalizing than Lottery Aid, policymakers could consider simply using the Lottery Aid formula to distribute all Additional Assistance, adding the resulting "new aid" to the existing Lottery Aid for each municipality. In that case, the Lottery Aid formula would be the only formula used to allocate unrestricted municipal aid.

As Figure 8 shows, the statewide distribution of combined unrestricted municipal aid changes modestly with this redistribution. The weighted correlation of aid with the municipal gap measure increases from 0.65 to 0.69. A more significant change occurs among the 10 largest cities. For these cities, the weighted correlation of aid with the municipal gap measure increases from zero to 0.86. Among these cities, Springfield gains the most, receiving nearly 40 percent more aid than under the actual FY 2009 allocation (Table 5).

However, several communities, including Boston and Cambridge, would lose significant portions of their state aid under such a scheme. That is mainly because the Lottery Aid formula does not take into account the cost differentials across municipalities, and therefore does not compensate communities for having higher costs. Lottery Aid per capita is distributed only inversely to EQV per capita. However, the statewide weighted correlation between EQV and the cost measure is only -0.20.[15] Communities such as Boston and Cambridge have both high costs and relatively high per capita EQVs. Under the Lottery Aid formula, they receive less per capita aid than a community with a lower per capita EQV, even with the same municipal gap. As Table 5 shows, if the Lottery Aid formula were used to redistribute Additional Assistance, Boston would lose 58 percent of its unrestricted municipal aid. In this scenario, Boston's aid allotment would be even lower than if aid were distributed simply in proportion to population, despite Boston's large municipal gap.

Using a gap-based formula to distribute all unrestricted municipal aid

To link aid directly to the municipal gaps faced by individual municipalities, policymakers could consider adopting a new gap-based aid formula. Because the gap measure uses local economic and social characteristics that are outside the direct control of local officials as inputs, that approach would not create incentives for local officials to change their behavior to exploit the aid system.

As Figure 9 shows, a gap-based formula would require policymakers to set three key parameters: the aid pool, minimum aid, and the baseline gap. The aid pool is total state funding for the formula. Policymakers would likely want to select a minimum level of per capita aid, to provide some state assistance to all communities regardless of their gap measures. Although introducing this minimum aid would interfere with the equalization

[15] The statewide weighted correlation between EQV and the capacity measure is 0.93.

goal, it would help gain broader political support for the new aid formula.[16] Policymakers would also need to select a baseline gap above which communities would be eligible to receive aid more than the minimum amount—to fill a fraction (r) of their gaps above the baseline.[17] Because some communities have negative measures of the municipal gap, distributing (positive) aid simply in proportion to the gap measures is impossible without setting a baseline.

The fraction r is an indicator of the equalization achieved by the formula, because it shows the degree to which aid is focused on communities with the largest gaps. Given each community's gap and population, r is determined by the three parameters: r is larger (that is, the formula is more equalizing) if state government has a larger aid pool to allocate, or if the state sets a higher baseline gap or a lower minimum level of per capita aid.

Some examples help illustrate how this formula works. In Figure 9, for instance, a community with a gap measure of gap_1 receives aid_1—minimum aid—because gap_1 is below the selected baseline gap. Another community with a gap measure of gap_2 receives aid_2, which fills a fraction (r) of gap_2 above the baseline. The fraction r is represented by the slope of the upward-sloping line. The line is steeper as r increases.

This section simulates two scenarios in which all unrestricted municipal aid is redistributed through a gap-based formula, achieving different degrees of equalization. In the high-equalization scenario, minimum aid is set at 10 percent of the average per capita aid statewide, defined as state total unrestricted municipal aid divided by state total population. The average per capita aid statewide in FY 2009 was $182.4. The baseline gap is set at the 40th percentile of the statewide gap distribution, so 60 percent of communities could potentially receive aid above the minimum level. In the low-equalization scenario, minimum aid is set at 40 percent of the average per capita aid statewide, and the baseline gap is set at the 10th percentile of the gap distribution. Because no new state funding is added in these simulations, the total aid pool in both scenarios equals the FY 2009 state total of combined unrestricted municipal aid, which is $1.2 billion.

Figure 10 shows that municipal aid is better aligned with the municipal gap measure in both scenarios than under the actual FY 2009 aid allocation. Large-gap communities (at the far right of the figure) receive much more aid in the high-equalization scenario than in the low-equalization scenario or under the actual aid allocation. In contrast, communities with low or medium gaps (less than $800 per capita) receive more aid in the low-equalization scenario than in the high-equalization scenario. The fraction r of the gap above the baseline filled by aid is 0.48 in the high-equalization scenario and 0.15 in the low-equalization scenario.

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[16] Bluestone et al. (2006) find that virtually all communities in Massachusetts faced fiscal stress—another argument for minimum aid.

[17] A community with a gap measure larger than the baseline gap is eligible for the proportionally distributed aid. But if the proportionally distributed aid is smaller than the minimum aid amount, the community would instead receive minimum aid. As Figure 9 shows, this is often the case for communities with gap measures slightly larger than the baseline gap.

A majority of the 10 largest cities lose aid if the degree of equalization is set low. Table 6 shows that of these cities, only Springfield, New Bedford, and Worcester gain in the low-equalization scenario relative to the actual aid allocation: 10 percent, 7 percent, and 0.4 percent, respectively. Considering that this is the low-equalization scenario, the result implies that these cities' actual aid allocations are too low to fill even a small percentage of their gaps. Despite having large gaps, other cities would lose aid in this redistribution scenario, because their existing aid fills a higher fraction of their gaps above the baseline than the fraction mandated by the formula. These cities' aid amounts under the current scheme lie above the green line in Figure 10, which represents the distribution of aid in the low-equalization scenario.

In the high-equalization scenario, 7 of the 10 largest cities experience an aid increase (Table 6). The exceptions are Boston, Cambridge, and Quincy. Springfield again benefits the most from the redistribution, receiving nearly double its actual amount of municipal aid. Cambridge loses 92 percent its aid in the high-equalization scenario, compared with a 49 percent loss in the low-equalization scenario.

A new gap-based aid formula with a hold-harmless provision

Redistributing existing aid is politically difficult, and thus may not be feasible in practice. As the simulations above show, some communities, including a few large cities, would experience substantial losses if municipal aid were redistributed. Such losses could disrupt these communities' budgets and strain their finances. Based on such concerns, the report by the Municipal Finance Task Force (2005) recommended that reform of the aid formula should protect existing aid—that is, hold it harmless—"but use additional funding as a base to broaden non-school aid" (p. xv). According to this recommendation, each community should retain the aid dollars it received the previous year, while state government should use a new formula to allocate incremental aid dollars.[18]

State government could consider adopting a gap-based formula to distribute new aid while holding harmless each community's existing aid.[19] To use such a formula, policymakers would need to commit to adding some amount of new aid statewide each year, and to select the baseline gap and the minimum amount of new per capita aid. [20]

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[18] Policymakers could also consider holding harmless only some fraction of existing aid, rather than 100 percent, and then redistributing the reminder of existing aid along with new aid.

[19] A potential compromise between redistribution and hold harmless is to redistribute Additional Assistance through a gap-based formula that holds Lottery Aid harmless.

[20] Besides revenue growth from existing state taxes and lottery sales, tax revenues from the proposed gambling industry are a potential source of added state funding for local aid. Gambling legislation recently approved by the Massachusetts House would authorize two resort-type casinos and up to 3,000 slot machines at two horse-racing tracks and two former dog-racing tracks (Levenson 2010). State government would tax revenues from slot machines and casinos at a rate of 40 percent and 25 percent, respectively. Rep. Brian Dempsey, House chair of the Economic Development and Emerging Technologies Committee, estimated that casinos and slot machines would provide $300 million to $600 million in tax revenues each year (O'Sullivan 2010). The legislation designates all tax revenues from slot machines before casinos start operating—and 30 percent of tax revenues from casinos and racetrack slot machines thereafter—to fund local aid accounts.

Two approaches to hold harmless

The gap-based aid formula could use two different approaches to accommodate the hold-harmless provision, depending on what function existing aid is considered to fulfill. In Approach 1, existing aid is treated as completely equivalent to new aid in filling a municipal gap. Therefore, this approach would use combined (existing and new) aid to fill a fraction of the gap above the baseline. Communities with gaps below the baseline would receive the minimum amount of new per capita aid in addition to existing aid.

In Approach 2, existing aid is considered part of each community's revenue capacity, and added to the measure of that capacity. As a result, the gap measure is reduced by the amount of per capita existing aid—creating a new, smaller gap measure called the "redefined gap." Approach 2 would then use new aid to fill a fraction of the redefined gap above the baseline.

Zhao and Bradbury (2009) show that Approach 1 gives existing aid and new aid equal weight in filling the original gap. Approach 2, in contrast, gives less weight to existing aid, and more weight to new aid, in filling the original gap, thereby treating equal-gap communities that receive more existing aid more favorably. For this reason, this paper calls Approach 1 the "equal-weights approach," and Approach 2 the "unequal-weights approach."

Table 7 provides an example of aid calculations for several cities under the two approaches. To consider a simplifying comparison, suppose the state has only three cities, with identical populations (10,000 residents) and identical original gaps ($1 million total gap)—and hence identical needs for state aid. The cities differ only in the amount of existing aid, with City 1 receiving the most ($140,000), City 2 receiving a medium amount ($50,000), and City 3 receiving a small amount ($10,000). Existing statewide aid totals $200,000. The statewide new aid pool, baseline gap, and minimum amount of new per capita aid are assumed to be $400,000, $0, and $10, respectively. Therefore, each city is guaranteed at least $100,000 in new aid (that is, $10 per capita minimum aid times 10,000 residents).

Under the equal-weights approach (Table 7, upper panel), aid calculations involve two iterations to ensure that no city receives less than the minimum amount of new aid. In the first iteration, City 1 receives $200,000 in combined aid and $60,000 in new aid, using the statewide ratio of combined aid to original gap. Because this new aid amount is below the minimum level ($100,000), City 1 receives the minimum aid instead.

In the second iteration, combined aid minus what is spent on City 1 is distributed to fill 18 percent of the original gaps of Cities 2 and 3—calculated as the ratio of their combined aid to their combined original gaps. These two cities receive the same amount of combined aid, but City 3 receives more new aid than City 2, because City 2's existing aid amount is larger. City 1 receives only the minimum amount of new aid, but its combined aid still exceeds that of Cities 2 and 3, because of its large amount of existing aid. Furthermore, City 1 could stay in this minimum aid status for several more years, if the other two cities do not receive enough new aid to enable them to catch up with City 1's combined aid amount.

Under the unequal-weights approach (Table 7, lower panel), new aid is distributed to fill a constant fraction (14.3 percent) of the redefined gaps of all cities. The 14.3 percent is calculated as the ratio of statewide new aid to the statewide redefined gap. Because their redefined gaps are well above the baseline gap, all three cities receive more than the minimum amount of new aid. However, their new aid amounts differ, because different amounts of existing aid are subtracted from equal original gaps, producing different redefined gaps. City 2 receives more combined aid than City 3, and City 1 receives more than the other two, even though all three have the same original gap.

In summary, different hold-harmless approaches have different effects on the distribution of aid. The unequal-weights approach treats communities with more existing aid more favorably than the equal-weights approach. The equal-weights approach targets new aid to large-gap communities that receive a low level of existing aid more effectively than the unequal-weights approach. However, the equal-weights approach could force some high-existing-aid communities to wait longer to move beyond minimum new aid under the new formula. As the simulations in the next section show, this could potentially cause some large cities to withhold support for reforming municipal aid formulas.

Ten-year simulations of the distribution of municipal aid

This section simulates the distribution of municipal aid over a 10-year period. The actual distribution in FY 2009 is used as the starting point. Alternative scenarios show the effect of using a gap-based formula to allocate aid in FY 2010—2019. The municipal aid that each community receives each year would be held harmless, and moved into existing aid the following year. In Figure 11, scenarios (a) and (c) employ the equal-weights approach to hold harmless, while scenarios (b) and (d) employ the unequal-weights approach.

Under each approach, different sizes of the new aid pool show the impact of changing the pool on aid distribution. In scenarios (a) and (b), statewide unrestricted municipal aid is assumed to grow 6.2 percent per year,[21] to create a relatively large new aid pool.[22] The new aid pool is $73.5 million[23], $93.5 million, and $126.3 million in the first,

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[21] At the annual growth rate of 6.2 percent, statewide unrestricted municipal aid would grow in line with total personal income and tax revenues over the long term (Massachusetts Taxpayers Foundation 2006).

[22] The Massachusetts Taxpayers Foundation (2005) recommends that state government dedicate 40 percent of annual revenues from three state "growth taxes" (sales and personal income taxes, and corporate excise) to Chapter 70 School Aid and unrestricted municipal aid. The Massachusetts Municipal Association (2006) further recommends that one-quarter of the 40 percent amount (that is, 10 percent of these growth tax revenues) should be reserved for unrestricted municipal aid, phased in over five years.

Both recommendations are based on average ratios of local aid to state revenues from growth taxes from the early 1980s to the early 2000s. However, given deep cuts in state aid in recent years, unrestricted municipal aid dropped below 7 percent of state revenues from growth taxes in FY 2009. To increase that ratio to the recommended 10 percent in five years, unrestricted municipal aid would need to grow 14.7 percent per year—much faster than the 6.2 percent annual growth rate assumed for the simulation scenarios with a "relatively large" new aid pool. The 6.2 percent annual growth rate would simply allow the ratio of fifth, and tenth years of simulation, respectively. In comparison, scenarios (c) and (d) assume that statewide unrestricted municipal aid grows by only 1 percent per year, resulting in a small new aid pool. In this case, the new aid pool is only $11.9 million, $12.3 million, and $13.0 million in the first, fifth, and tenth years of simulation, respectively.

In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is $1.13, $1.44, and $1.94 in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and $0.18, $0.19, and $0.20 in the first, fifth, and tenth years of simulation in scenarios (c) and (d).

In the first year, the baseline gap is set at the 20th percentile of the statewide distribution of the original gap under the equal-weights approach, and of the redefined gap under the unequal-weights approach. Scenarios (a) and (b) allow the baseline gap to move down by one percentile per year, so more communities become eligible to receive more than the minimum amount of new aid over time. If the new aid pool is small, the baseline gap should decrease at a slower pace, to avoid a decline in the fraction r of the gap above the baseline filled by aid. Therefore, the baseline gap is assumed to decrease by only one-quarter percentile per year in scenarios (c) and (d). For comparison, Figure 11 also shows the actual distribution of unrestricted municipal aid in FY 2009 (represented by blue diamonds).

Compared with other scenarios, aid distribution becomes more equalizing more quickly in scenario (a), which uses the equal-weights approach to hold harmless and has a relatively large new aid pool. After only five years, 239 communities—or more than two-thirds of Massachusetts cities and towns—lie on the sloping line in scenario (a), as their combined aid is distributed proportionally to their original gaps. The weighted correlation between combined aid and the original gap across 351 cities and towns increases from the current 0.65 to 0.79 (Table 8). In the tenth year, the combined aid of 287 communities—or 82 percent of Massachusetts cities and towns—is perfectly aligned with the original gaps. The weighted correlation with the original gap increases to 0.84.

Municipal aid also becomes more equalizing over time in scenario (b), but the changes are slower and less significant than those in scenario (a). The relationship between combined aid and the original gap is increasingly positive over time in scenario (b). The weighted correlation between them increases to 0.79 in the tenth year—although it is the same as the correlation in the fifth year in scenario (a) (Table 8). Unlike the clear-cut pattern in scenario (a) in Figure 11, municipal aid receipts are scattered and do not form straight lines in scenario (b). Because the unequal-weights approach is less targeted than the equal-weights approach, 273 communities immediately receive more than the minimum level of new aid in scenario (b)—compared with 104 communities in scenario (a). Because the aid funds are shared more broadly, the relationship between combined aid and the

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unrestricted municipal aid to state tax revenues to stay at the current level, rather than falling further over time.

[23] That is, $1.2 billion in FY 2009 times 6.2 percent.

original gap is less positive in scenario (b) than in scenario (a). Furthermore, the group receiving more than the minimum level of new aid expands fairly slowly in scenario (b), with only 36 more communities added by the tenth year.

A small new aid pool significantly constrains the ability of the new formula to affect the distribution of municipal aid. In scenario (c), only 149 communities receive more than the minimum level of new aid in the tenth year—about half as many communities as in scenario (a). The weighted correlation between combined aid and the original gap increases somewhat from the current 0.65 to 0.73. In scenario (d), aid distribution barely changes over the 10 years. The weighted correlation moves up only slightly to 0.69 at the end of the period.

The approach to hold harmless and the size of the new aid pool affect how much aid each of the 10 largest cities receives over the 10-year period. Table 9 compares the number of years in which the 10 largest cities receive the minimum amount of new aid per capita under the four scenarios. In scenario (a), Springfield, New Bedford, Lowell, and Worcester immediately receive more than the minimum amount of new aid, as their existing aid fills only a small fraction of their large gaps. Other cities have to wait one or a few more years. Boston and Cambridge remain in the minimum aid group for 7 years and all 10 years, respectively, because of their large amounts of existing aid per capita relative to their gaps.

The largest cities spend more time in the minimum aid group in scenario (c), as the formula still uses the equal-weights approach and the new aid pool is small. In this case, the formula achieves a much lower degree of equalization. Only Springfield and New Bedford receive more than the minimum in the second or third year. Other cities wait much longer than in scenario (a). In fact, Brockton, Quincy, Boston, and Cambridge receive the minimum level of new aid during the entire simulation period.

When the aid formula relies on the unequal-weights approach, the 10 largest cities all immediately receive more than the minimum in scenarios (b) and (d), because all have large redefined gaps. For example, Boston receives only the minimum new aid of $1.13 per capita in the first year in scenario (a), but receives $13.31 per capita in scenario (b) (Table 10, panel A).[24] While their new aid per capita is still the highest among the 10 largest cities, Springfield and New Bedford receive significantly less new aid per capita (about half as much) in the first year in scenario (b) than in scenario (a). Their combined aid remains lower than those of Fall River, Lynn, and Boston, which have somewhat smaller gaps.

Over the 10-year period, cities with large gaps and relatively low levels of existing aid benefit more under the equal-weights approach than under the unequal-weights approach. In the tenth year, the combined aid of each of the 10 largest cities in scenario (b) is either nearly the same as or larger than that in scenario (a) (Table 10, panel C). One might conclude from this pattern that almost all the 10 largest cities fare better in scenario (b) than in scenario (a). In fact, however, four cities—Springfield, New Bedford, Worcester, and

[24] Appendix Table 3 shows distributions of per capita aid dollars among the 10 largest cities in scenarios (c) and (d).

Lowell—receive less total aid over the 10-year period in scenario (b) than in scenario (a). Springfield and New Bedford lose $348 and $265 per capita, in total, if the formula uses the unequal-weights approach instead of the equal-weights approach. This occurs because these cities receive much less aid in the early years of the simulation in scenario (b) than in scenario (a).

The equal-weights approach clearly targets these communities—which need state assistance the most—better than the unequal-weights approach. In fact, when considering only the 10 largest cities in Massachusetts, this analysis finds that the weighted correlation between combined aid in the tenth year of simulation and the original gap is 1.00 in scenario (a) but only 0.86 in scenario (b). This indicates that the equal-weights approach provides greater equalization than the unequal-weights approach.

Conclusion

This paper develops a measure of the fiscal gap between municipal costs and revenue capacity based on local economic and social characteristics that are outside the direct control of local officials. This gap measure is an indicator of local fiscal health, and signifies the relative need of each municipality for state aid.

The paper shows that most of the 10 largest cities in Massachusetts experienced worse fiscal health (larger gap measures) than other municipalities in the state in FY 2007. However, deep, uneven cuts in state aid over the past 20 years distorted the distribution of municipal aid. As a result, unrestricted municipal aid has not been distributed in proportion to the gap measure among the 10 largest cities in the state.

Indeed, the state allocated more Additional Assistance—a key component of unrestricted municipal aid—to cities with smaller gaps. Springfield and New Bedford experienced the largest gaps but received the least Additional Assistance among the state's 10 largest cities in FY 2007. These results are consistent with the concerns of Springfield's civic leaders that the city has not received its fair share of unrestricted municipal aid.

This paper explores several options for reforming the formulas for distributing municipal aid. First, policy simulations show that relying solely on the Lottery Aid formula is not a long-term solution, even though many large-gap communities—including Springfield and New Bedford—benefit significantly from Lottery Aid. The Lottery Aid formula does not take into account cost differentials across communities, so it does not provide enough assistance to communities with high costs and high EQVs such as Boston.

This paper suggests that state government consider adopting a gap-based formula that provides more aid to communities with larger gaps. To avoid disrupting local budgets, policymakers could consider holding existing aid harmless, and using the gap-based formula to distribute only new aid. The simulations show that if the state commits to reasonably large increases in municipal aid, this new approach can be both equalizing and beneficial to a majority of municipalities in the Commonwealth within a relatively short time period. Of the two hold-harmless approaches examined, municipal aid is more equalizing under the equal-weights approach than under the unequal-weights approach.

This analysis could support efforts to reform state aid formulas. In his FY 2011 state budget proposal, Governor Deval Patrick recognized that unrestricted municipal aid "is no longer based on a current funding formula," and noted that "the Administration is proposing a local aid study commission to evaluate local aid formulas" (Massachusetts Office of the Governor 2010). This paper evaluates formulas for municipal aid that the commission and other reform groups could consider and recommend for use in future budgets.

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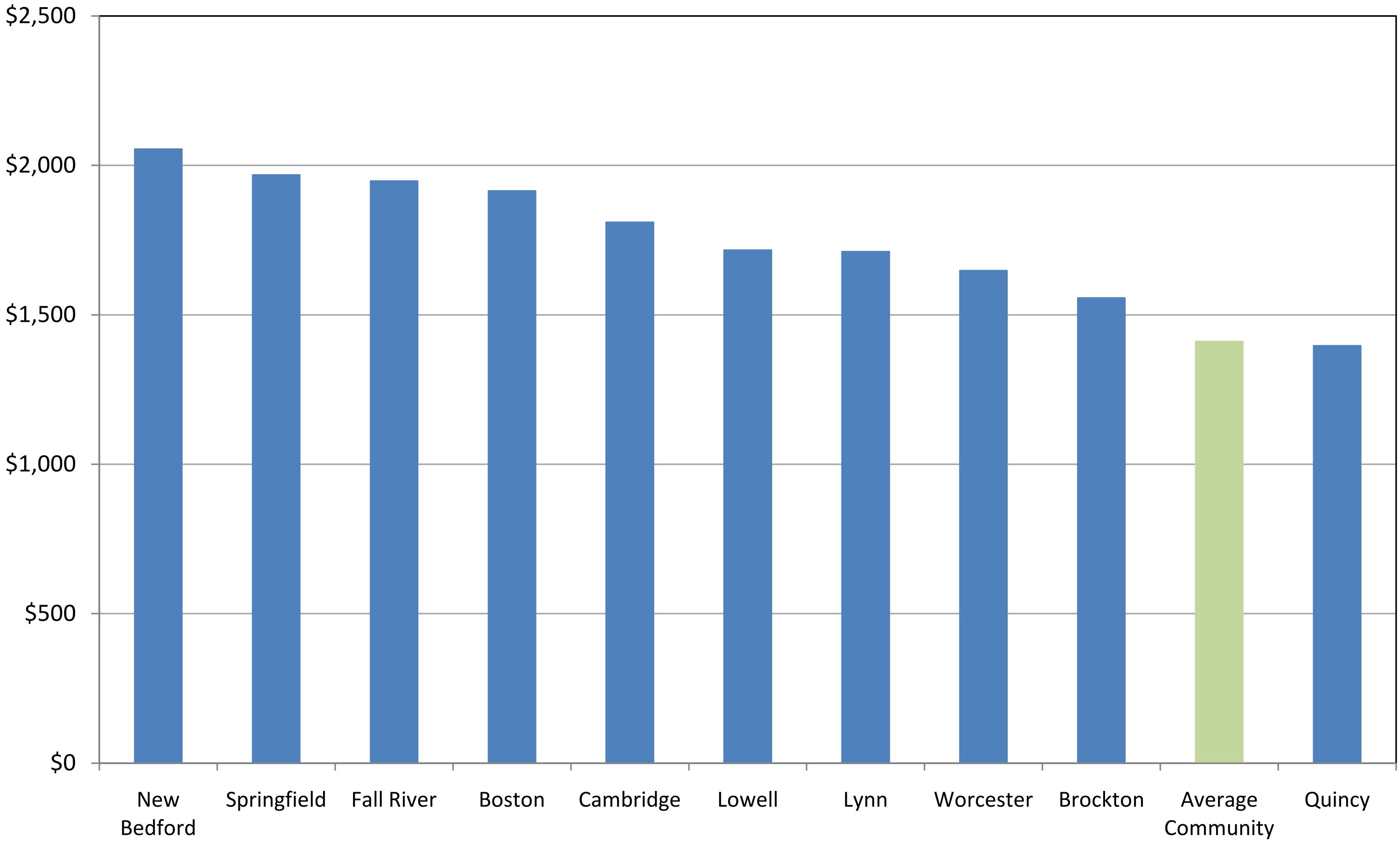
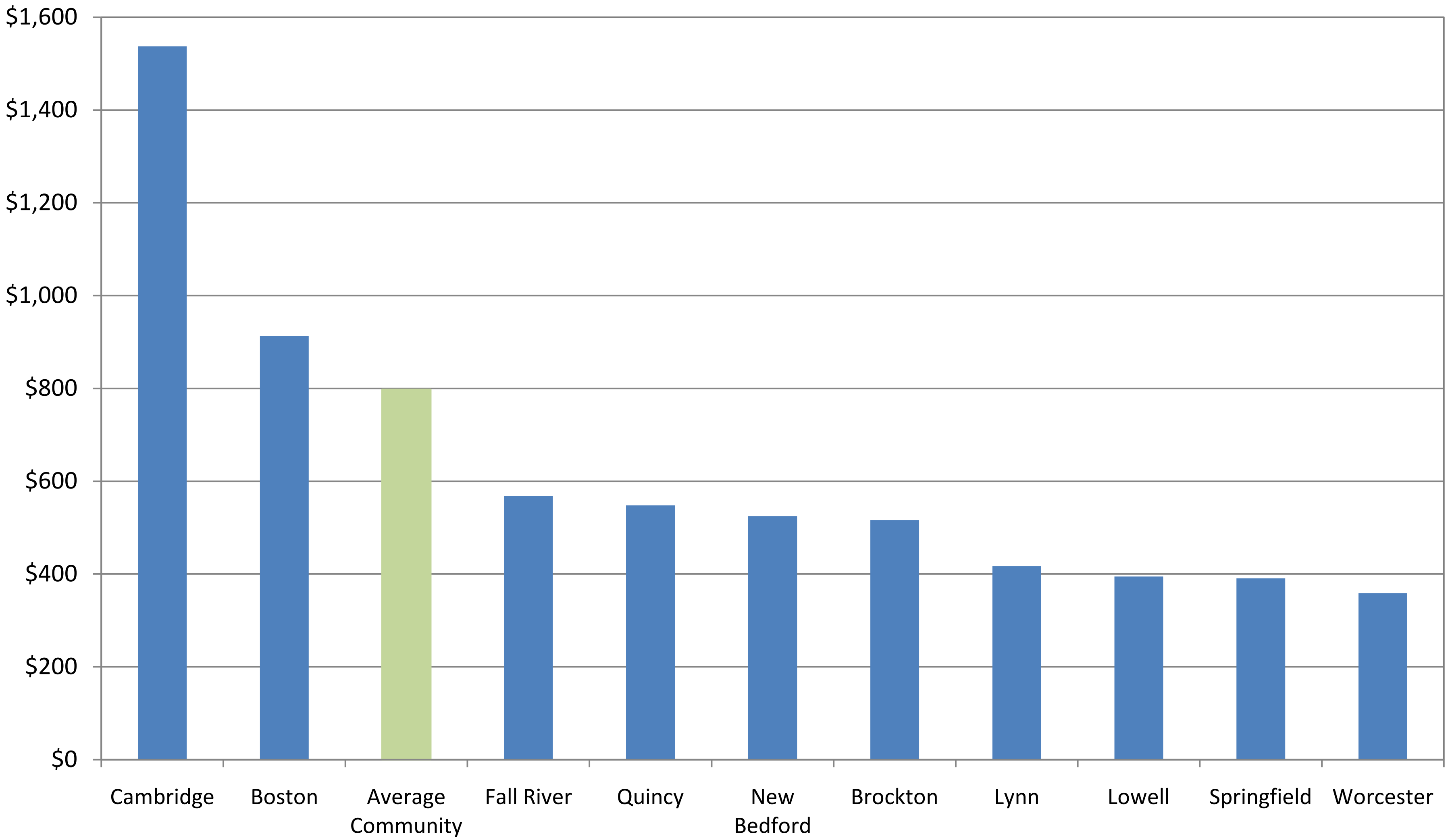
Figure 1. Municipal Costs of the 10 Largest Massachusetts Cities (per capita, FY 2007)



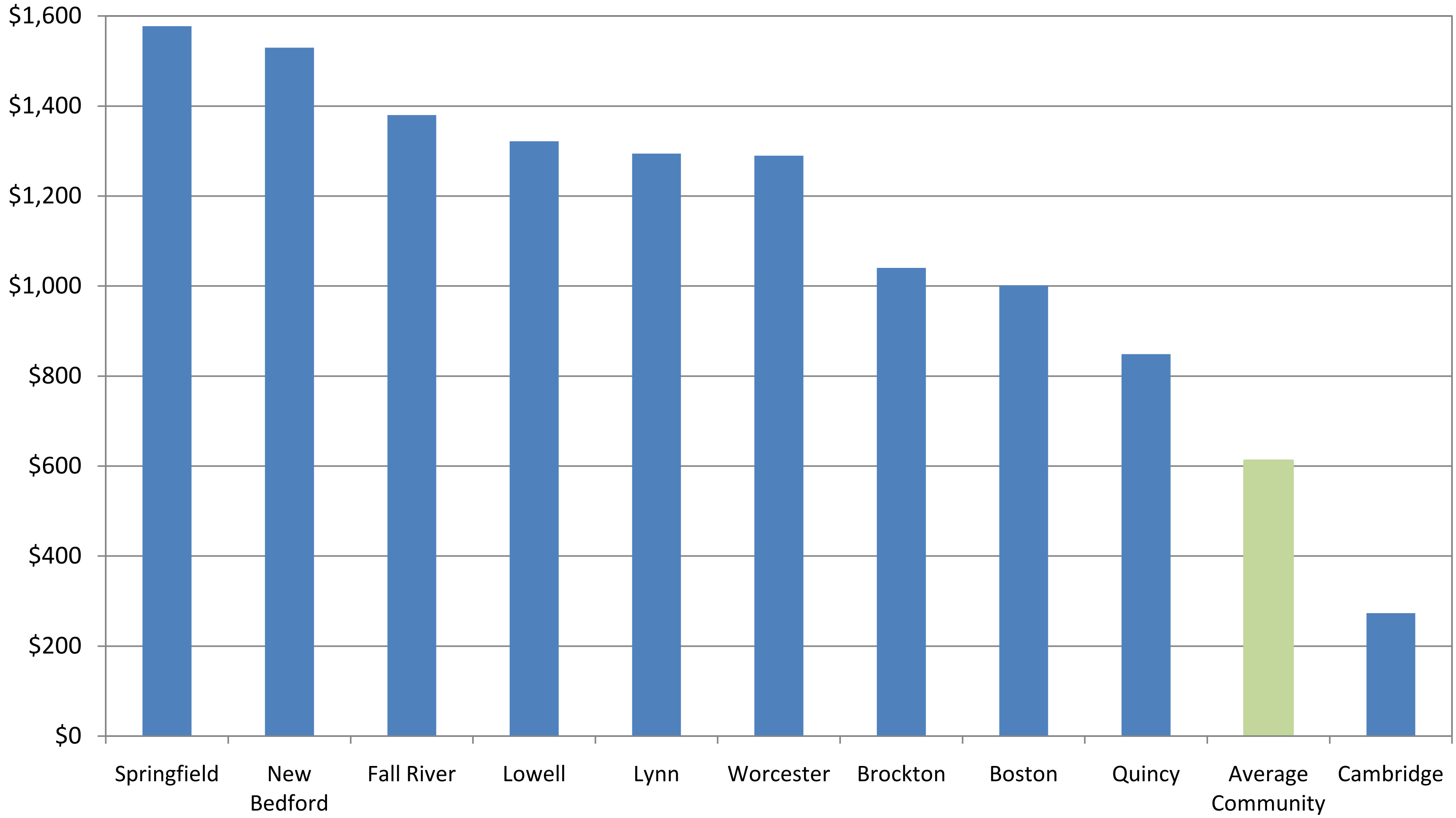
Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors.

Figure 2. Municipal Revenue Capacity of the 10 Largest Massachusetts Cities (per capita, FY 2007)



Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors.

Figure 3. Municipal Gap of the 10 Largest Massachusetts Cities (per capita, FY 2007)



Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors. The municipal gap is defined as the difference between municipal costs and revenue capacity.

Figure 4. Comparing Additional Assistance with the Municipal Gaps of the 10 Largest Massachusetts Cities (per capita, FY 2007)

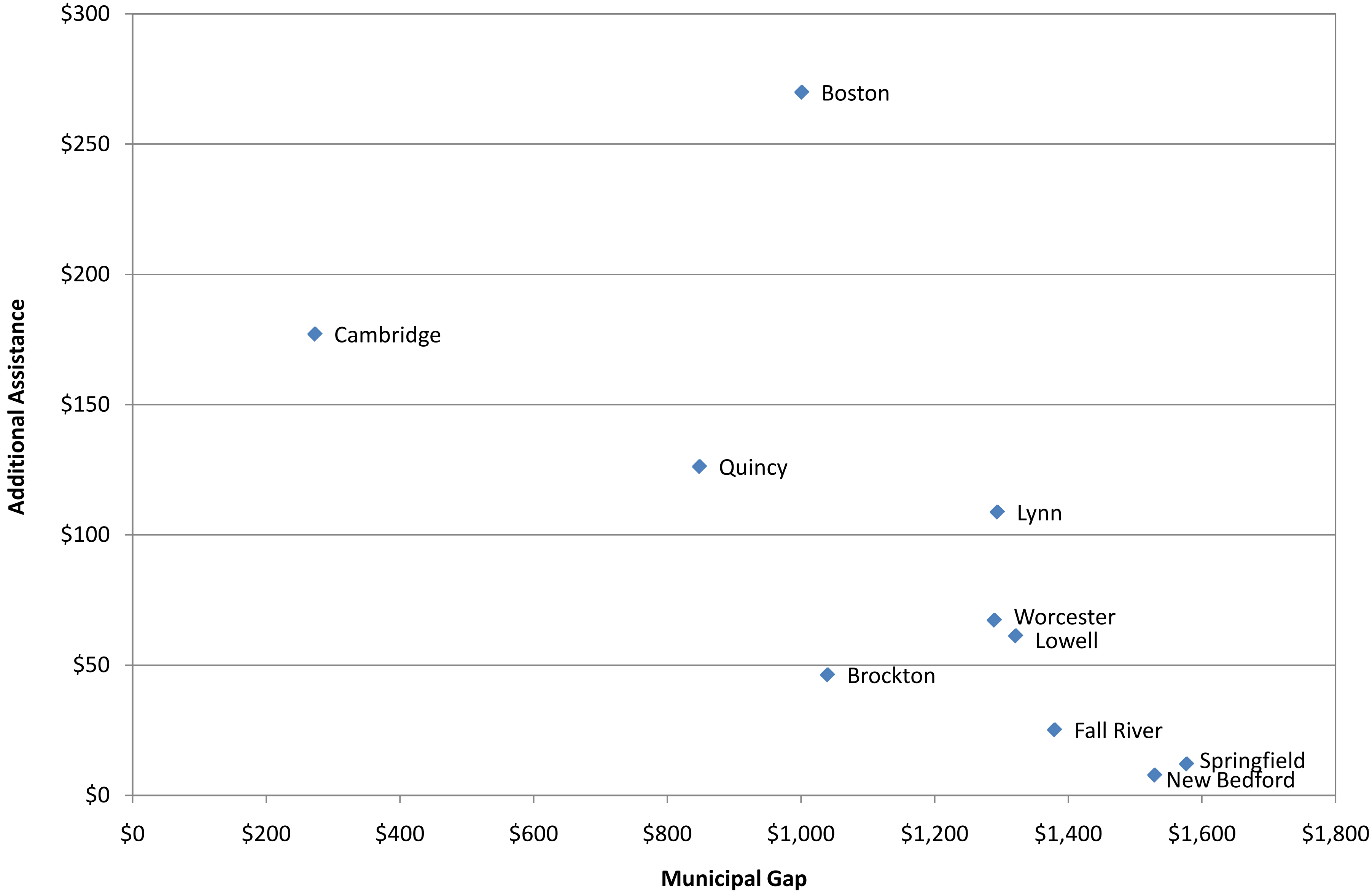


Figure 5. Comparing Lottery Aid with the Municipal Gaps of the 10 Largest Massachusetts Cities (per capita, FY 2007)

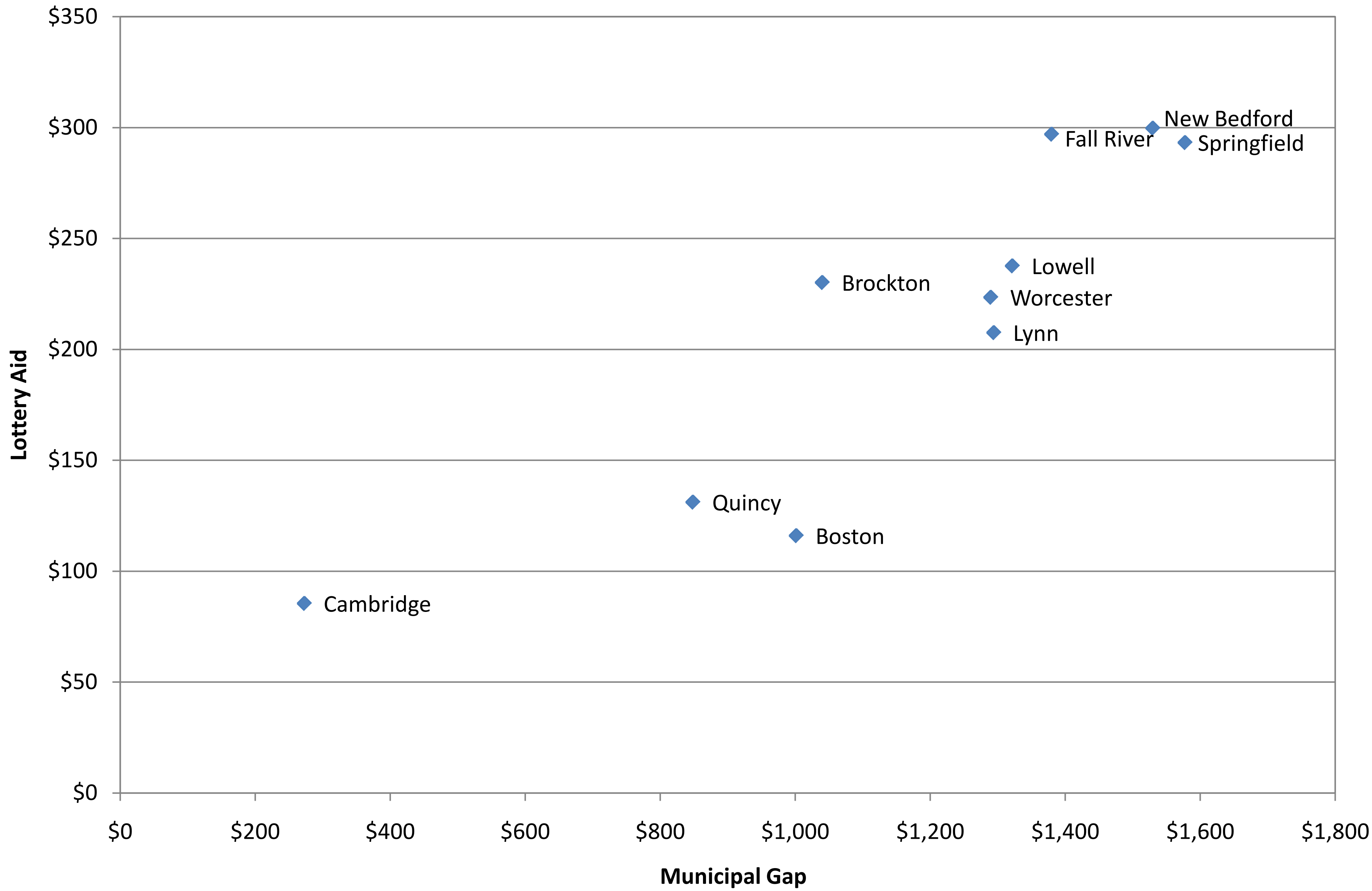
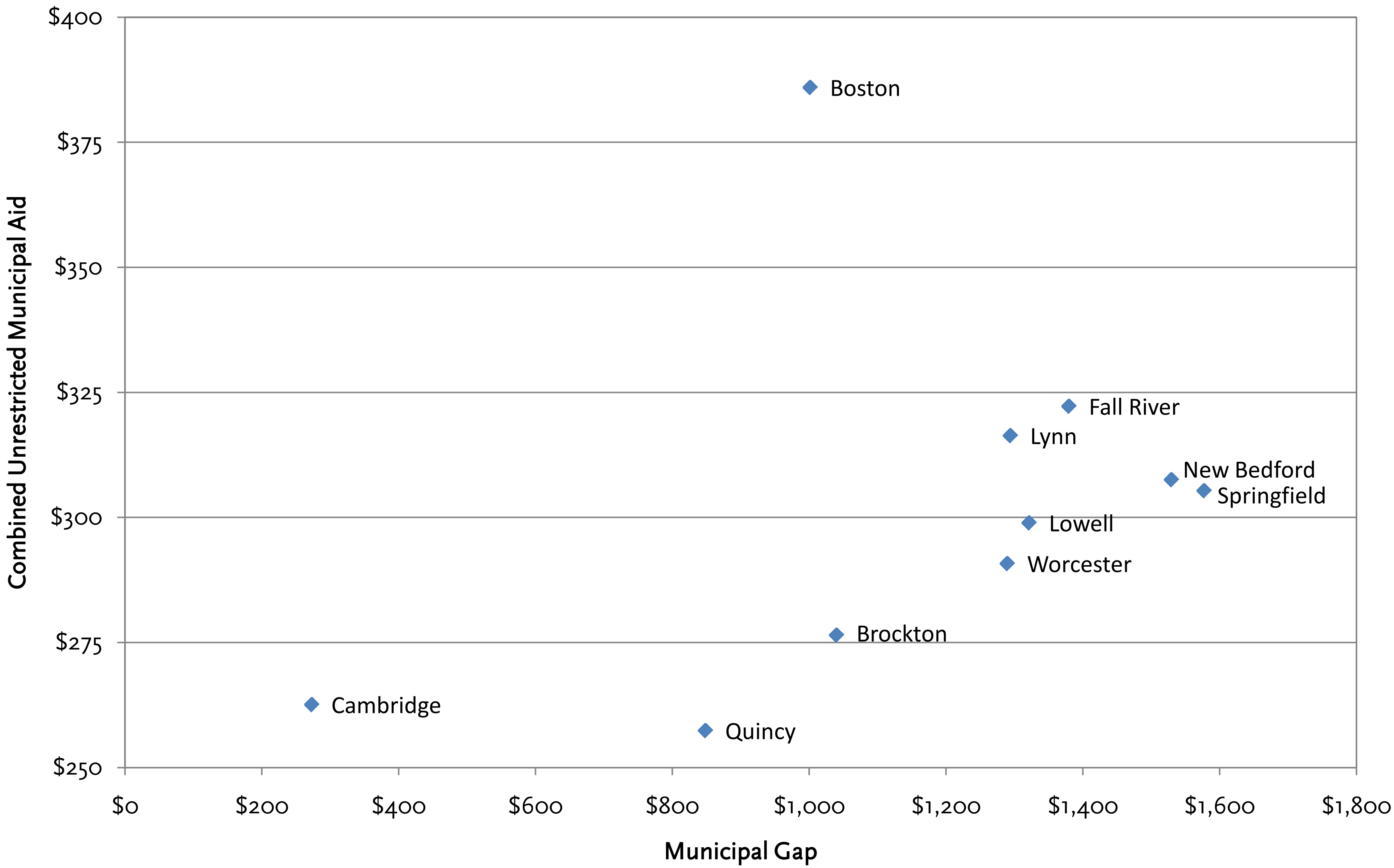
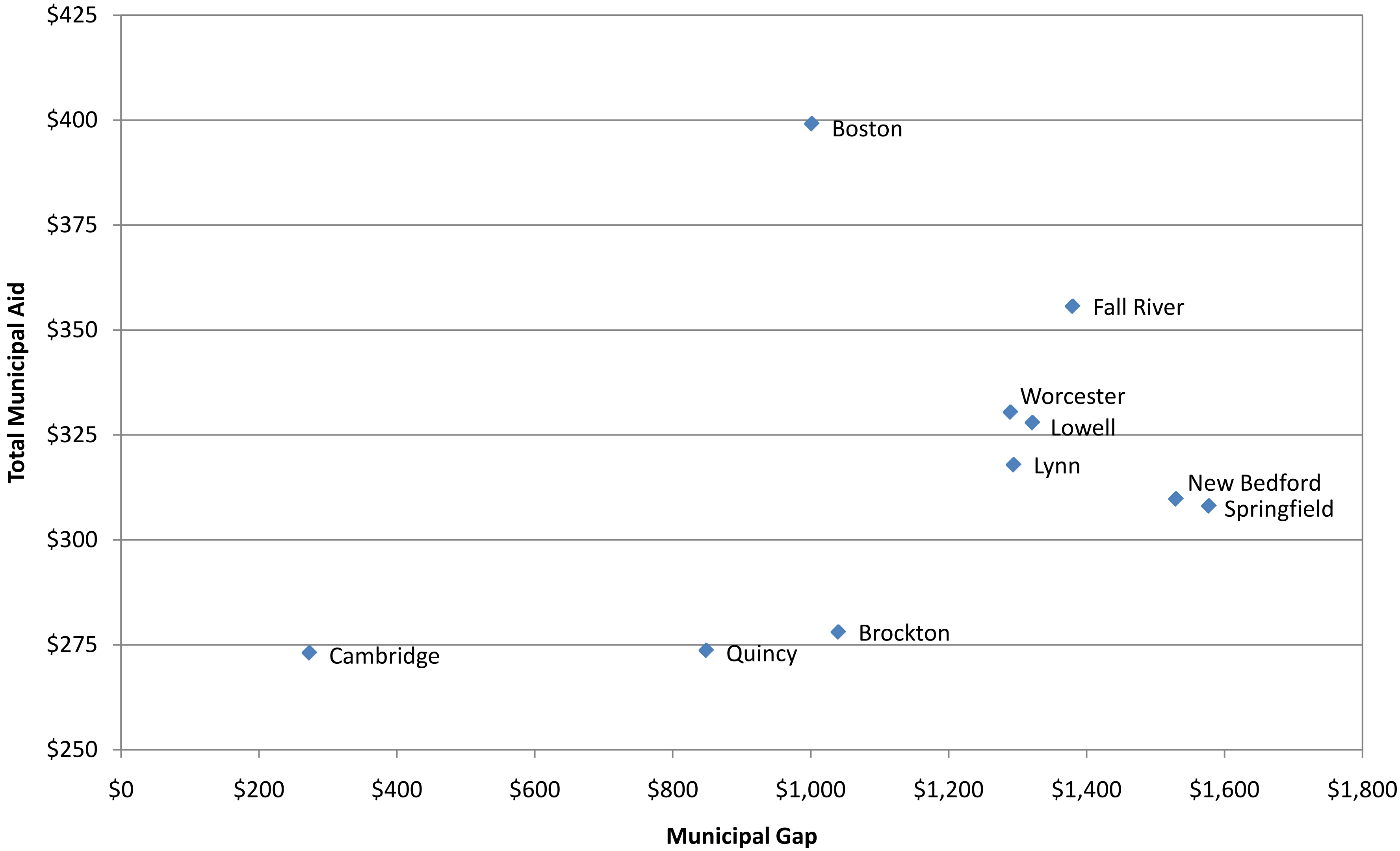


Figure 6. Comparing Combined Unrestricted Municipal Aid with the Municipal Gaps of the 10 Largest Massachusetts Cities (per capita, FY 2007)



Note: Combined unrestricted municipal aid is the sum of Additional Assistance and Lottery Aid.

Figure 7. Comparing Total Municipal Aid with the Municipal Gaps of the 10 Largest Massachusetts Cities (per capita, FY 2007)



Note: Total municipal aid is the sum of unrestricted municipal aid (Additional Assistance and Lottery Aid), restricted state aid for local and regional public libraries, and revenues from the federal government.

Figure 8. Using the Lottery Aid Formula to Distribute All Unrestricted Municipal Aid in Massachusetts (per capita, FY 2009)

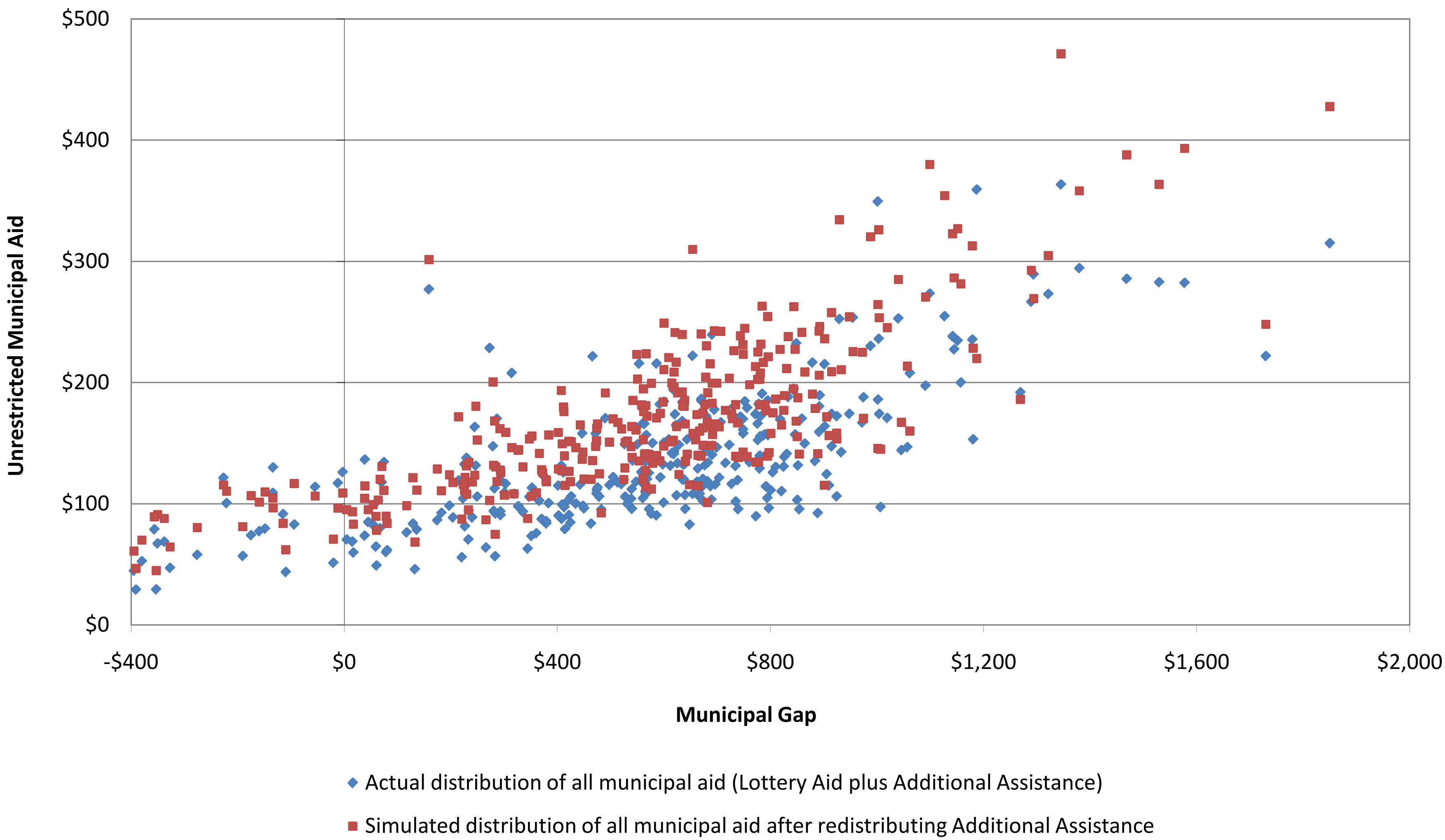


Figure 9. Using a Gap-Based Formula to Distribute per Capita Aid

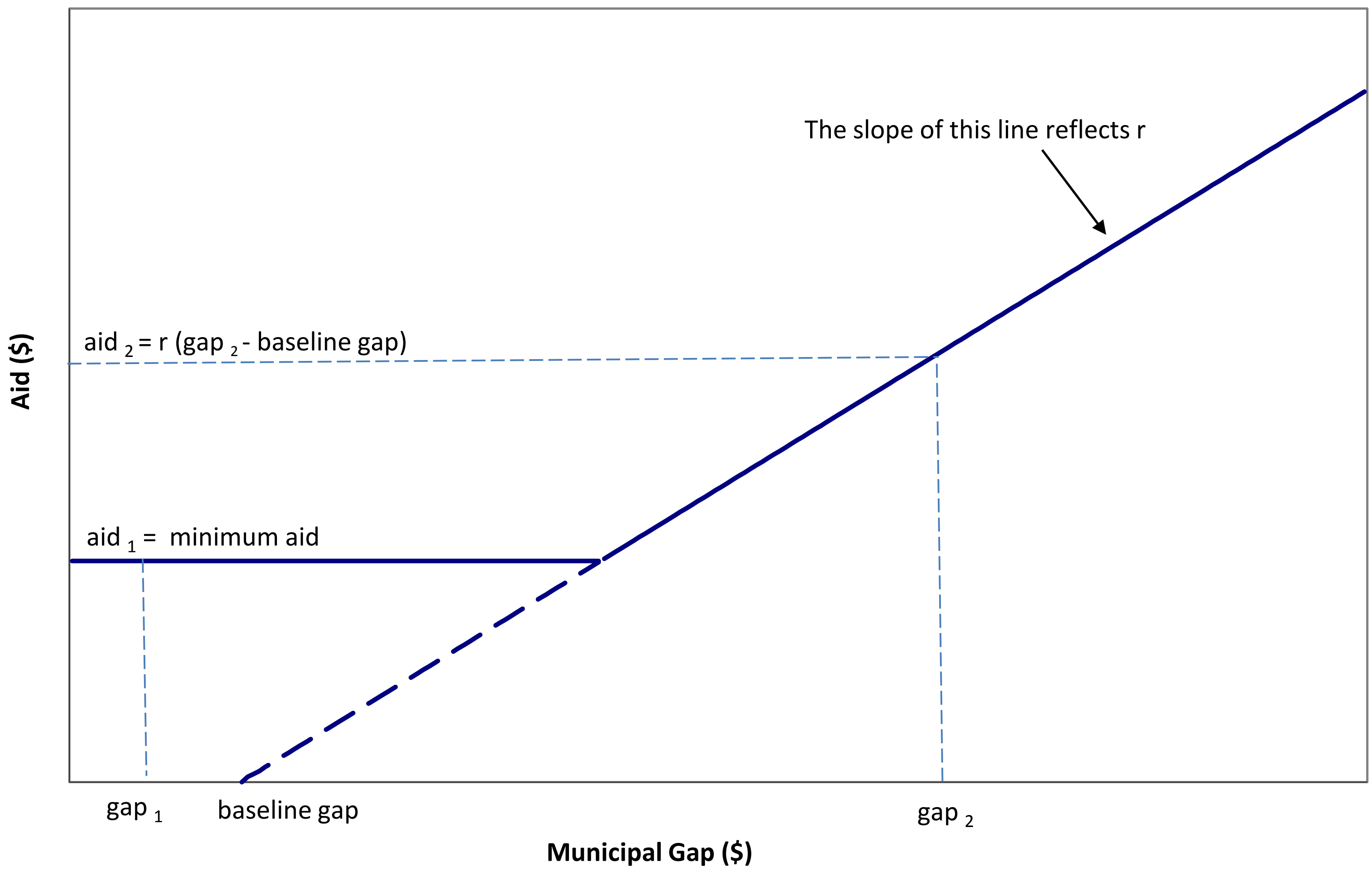
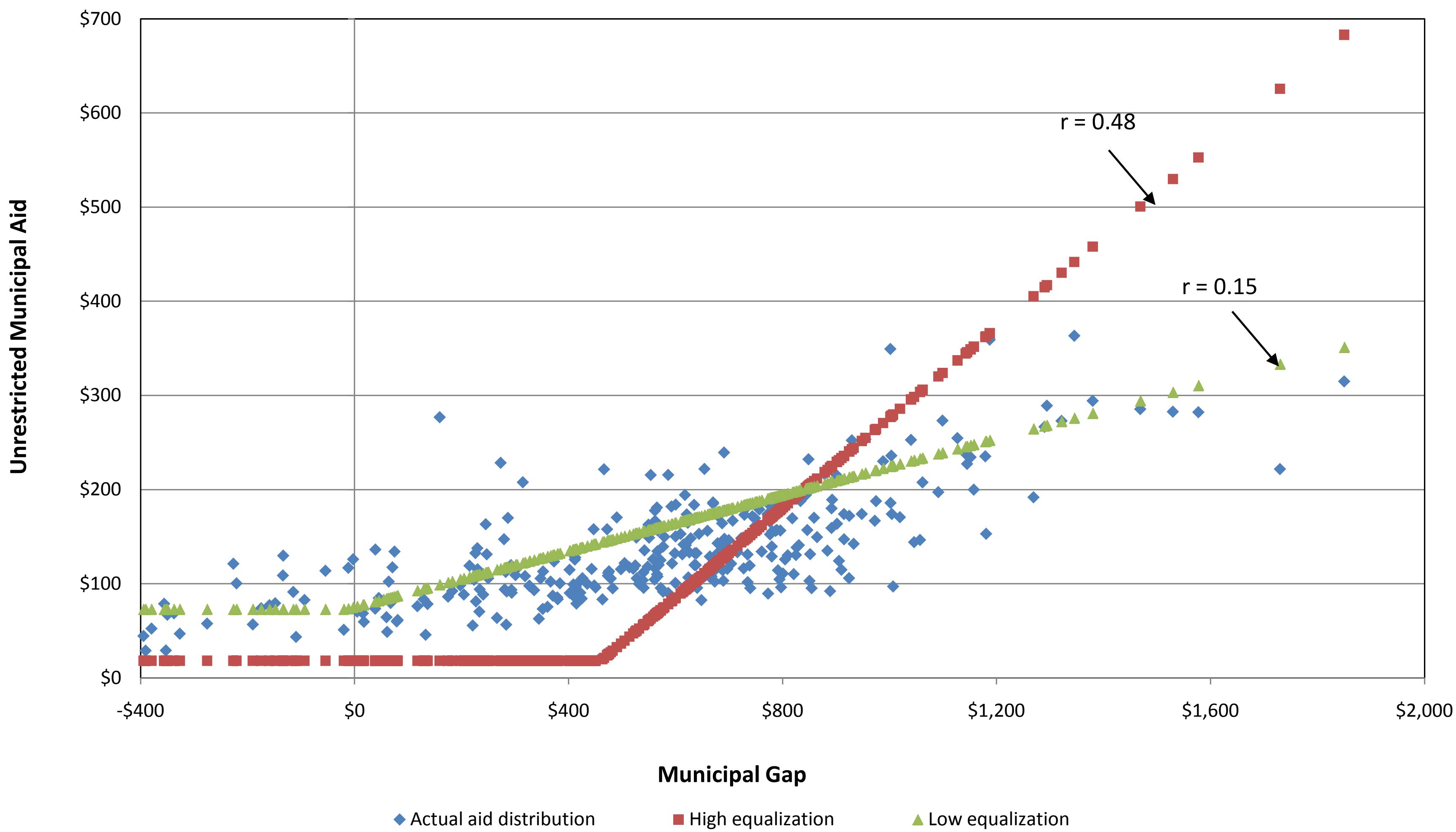
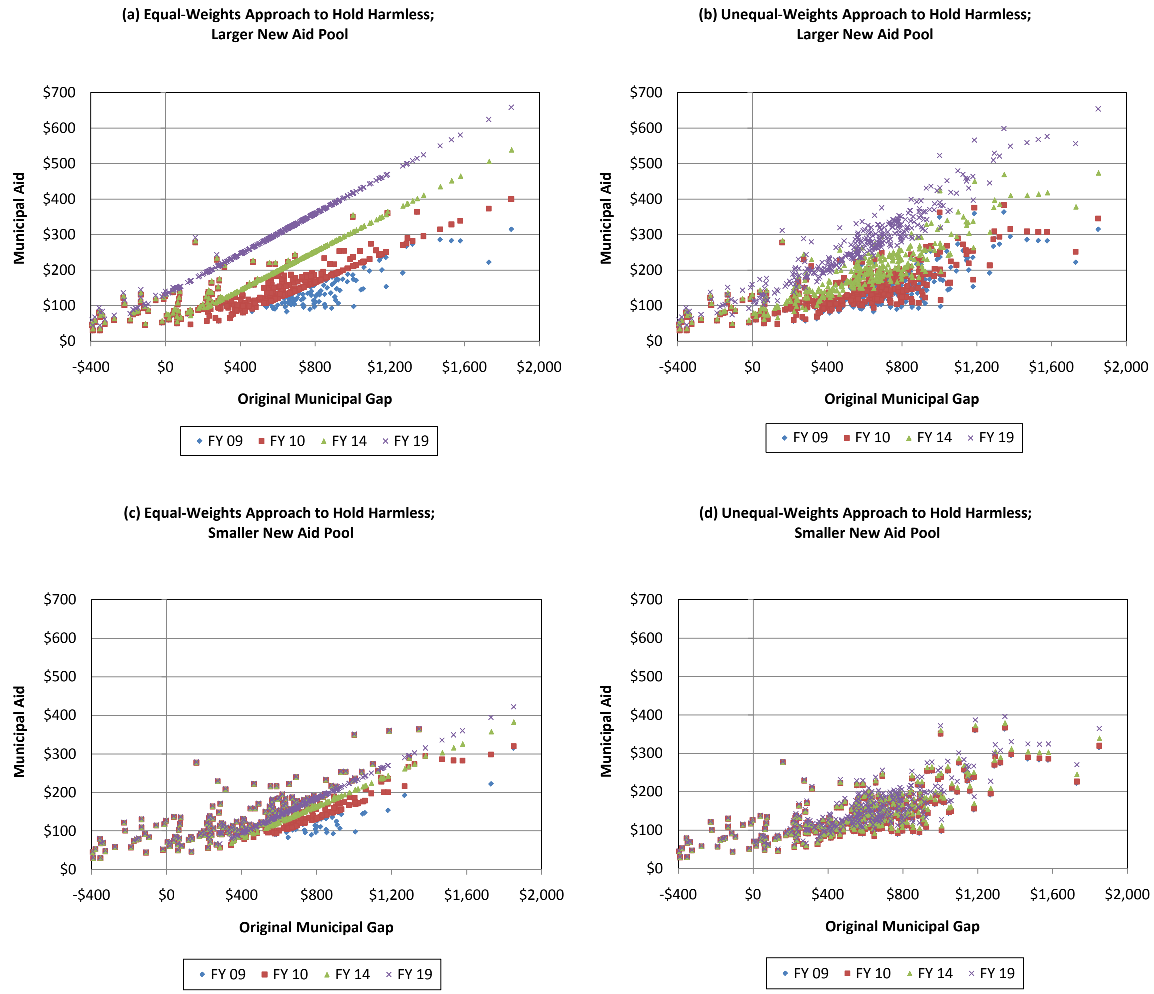


Figure 10. Using a Gap-Based Formula to Distribute All Unrestricted Municipal Aid in Massachusetts (per capita, FY 2009)



Note: In the high-equalization scenario, minimum aid is set to be 10 percent of the state average per capita aid and the baseline gap is set at the 40th percentile of the statewide gap distribution. In the low-equalization scenario, minimum aid is set to be 40 percent of the state average per capita aid, and the baseline gap is set at the 10th percentile of the gap distribution. The total aid pool in both scenarios is $1.2 billion.

Figure 11. Distribution of Combined Unrestricted Municipal Aid in Massachusetts: 10-Year Simulation Results (per capita, FY 2009—2019)



Note: Statewide unrestricted municipal aid is assumed to grow 6.2 percent per year in scenarios (a) and (b), and 1 percent per year in scenarios (c) and (d). Therefore, the new aid pool is $73.5 million, $93.5 million, and $126.3 million in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and $11.9 million, $12.3 million, and $13.0 million in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is $1.13, $1.44, and $1.94 in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and $0.18, $0.19, and $0.20 in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In the first year, the baseline gap is set at the 20th percentile of the statewide distribution of the original gap for the equal-weights approach, and of the redefined gap for the unequal-weights approach. The baseline gap is assumed to decrease by one percentile per year in scenarios (a) and (b), and by one-quarter percentile per year in scenarios (c) and (d).

Table 1. Municipal Costs of Springfield and an Average Massachusetts Community (per capita, FY 2007)

		Springfield		Average Community		
	Coefficient (1)	Factor Value (2)	Contribution to Cost ($) (3) = (1) X (2)	Factor Value (4)	Contribution to Cost ($) (5) = (1) X (4)	Cost Differentials ($) (6) = (3) - (5)
Cost Factors						
Population density (thousands per square mil	28.0	4.71	132.01	4.02	112.60	19.41
Poverty rate (%)	19.8	28.40	562.31	9.93	196.57	365.74
Unemployment rate (%)	81.0	7.00	567.00	4.90	397.20	169.80
Jobs per capita	272	0.50	136.40	0.49	134.34	2.07
Statewide Constant	570.2	1.00	570.2	1.00	570.2	0.00
Municipal Costs			1,967.88		1,410.86	557.02

Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors. The coefficients are from Bradbury and Zhao (2009). Municipal costs per capita are the sum of the column entries above.

Table 2. Municipal Revenue Capacity of Springfield and an Average Massachusetts Community
(dollars per capita, FY 2007)

	Springfield	Average Community	Differentials
Property Tax Capacity Factors			
Taxable residential property value	38,171.59	128,549.00	-90,377.41
Taxable nonresidential property value	10,946.64	23,314.87	-12,368.23
Income	13,117.66	33,240.16	-20,122.50
Property Tax Capacity	517.93	1,457.51	-939.58
Other Local Revenue Capacity	86.87	124.64	-37.77
Required Reductions in Capacity	-214.28	-784.32	570.04
Municipal Revenue Capacity	390.53	797.84	-407.31

Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors. Based on the approach developed by Bradbury and Zhao (2009), property tax capacity = 0.0142 * (taxable residential property value)$^{2/3}$ * (income)$^{1/3}$ + 0.0126 * taxable nonresidential property value (all in per capita terms). The sources for other local revenue capacity include motor vehicle excise, hotel/motel excise, urban redevelopment excise, local share of racing taxes, and state government payments in lieu of taxes for state-owned land. Required reductions in capacity include net minimum required local contribution for schools; county taxes; charges for MBTA, regional transit, Boston metro transit, and regional planning authorities; and state assessments for air pollution control and mosquito control. Municipal revenue capacity = property tax capacity + other local revenue capacity + required reductions in capacity.

Table 3. FY 1992 Cut in Total Additional Assistance to the 10 Largest Cities in Massachusetts

	Change from FY 1991 to FY 1992 (%)
Boston	-17.92
Cambridge	-21.06
Quincy	-26.24
Lynn	-34.00
Worcester	-44.61
Lowell	-46.70
Brockton	-56.79
New Bedford	-61.39
Fall River	-69.22
Springfield	-83.95
State Total	-35.16

Table 4. Unrestricted Municipal Aid in Massachusetts by Component (dollars per capita, FY 2007)

	Additional Assistance	Lottery Aid	Combined Unrestricted Municipal Aid
10 Largest Cities			
Boston	269.93	116.03	385.96
Fall River	25.20	297.03	322.23
Lynn	108.78	207.57	316.36
New Bedford	7.80	299.75	307.55
Springfield	12.09	293.26	305.35
Lowell	61.26	237.67	298.92
Worcester	67.28	223.50	290.78
Brockton	46.30	230.17	276.48
Cambridge	177.10	85.48	262.59
Quincy	126.25	131.14	257.39

Table 5. Using the Lottery Aid Formula to Distribute All Unrestricted Municipal Aid in Massachusetts
(compared with FY 2009 aid allocation)

	Aid Change (%)	EQV per capita ($, FY 08)
10 Largest Cities		
Springfield	39.3	56,292
New Bedford	28.5	78,149
Fall River	21.7	79,290
Brockton	12.7	92,758
Lowell	11.6	79,008
Worcester	9.7	79,007
Lynn	-6.9	87,558
Quincy	-27.6	140,220
Cambridge	-55.0	247,399
Boston	-58.3	173,847

Note: EQV = equalized property valuation.

Table 6. Using a Gap-Based Formula to Distribute All Unrestricted Municipal Aid in Massachusetts
(% change compared with FY 2009 aid allocation)

	Low-Equalization Scenario	High-Equalization Scenario
10 Largest Cities		
Springfield	10.0	96
New Bedford	7.3	87
Worcester	0.4	56
Lowell	-0.2	58
Fall River	-4.5	56
Lynn	-7.2	44
Brockton	-8.9	17
Quincy	-13.1	-12
Boston	-35.7	-21
Cambridge	-49.2	-92

Note: In the high-equalization scenario, minimum aid is set to be 10 percent of the state average per capita aid, and the baseline gap is set at the 40th percentile of the statewide gap distribution. In the low-equalization scenario, minimum aid is set to be 40 percent of the state average per capita aid, and the baseline gap is set at the 10th percentile of the gap distribution. The total aid pool in both scenarios is $1.2 billion.

Table 7. An Example of Calculations of Aid Dollars under Two Hold-Harmless Approaches
(population per city = 10,000; statewide new aid = $400,000; minimum amount of new aid per city = $100,000; baseline gap = $0)

Equal-Weights Approach	City 1	City 2	City 3	Statewide Total
Original gap	1,000,000	1,000,000	1,000,000	3,000,000
Existing aid	140,000	50,000	10,000	200,000
Existing aid as % of original gap	14.0%	5.0%	1.0%	6.7%
First iteration				
Combined aid as % of original gap (= statewide combined aid/statewide	20.0%	20.0%	20.0%	20.0%
Combined aid (= % above * original gap)	200,000	200,000	200,000	600,000
New aid (= combined aid - existing aid)	60,000	150,000	190,000	400,000
New aid (= minimum aid if new aid above < minimum aid)	100,000			
Second iteration				
Combined aid as % of original gap (= its own combined aid/its own original gap for City 1, or [statewide combined aid - City 1's combined aid]/[statewide original gap - City 1's original gap] for Cities 2 and 3)	24.0%	18.0%	18.0%	20.0%
Combined aid (= % above * original gap)	240,000	180,000	180,000	600,000
New aid (= combined aid - existing aid)	100,000	130,000	170,000	400,000

Unequal-Weights Approach	City 1	City 2	City 3	Statewide Total
Original gap	1,000,000	1,000,000	1,000,000	3,000,000
Existing aid	140,000	50,000	10,000	200,000
Redefined gap (= original gap - existing aid)	860,000	950,000	990,000	2,800,000
New aid as % of redefined gap (= statewide new aid/statewide redefined gap)	14.3%	14.3%	14.3%	14.3%
New aid (= % above * redefined gap)	122,857	135,714	141,429	400,000
Combined aid (= existing aid + new aid)	262,857	185,714	151,429	600,000
Combined aid as % of original gap	26.3%	18.6%	15.1%	20.0%

Note: Aid amounts are expressed as totals, not per capita amounts.

Table 8. Summary of 10-Year Aid Distribution Simulation for Massachusetts

		(a) Equal-Weights Approach; Larger New Aid Pool			(b) Unequal-Weights Approach; Larger New Aid Pool			(c) Equal-Weights Approach; Smaller New Aid Pool			(d) Unequal-Weights Approach; Smaller New Aid Pool		
	Year 0 (FY 09)	Year 1 (FY 10)	Year 5 (FY 14)	Year 10 (FY 19)	Year 1 (FY 10)	Year 5 (FY 14)	Year 10 (FY 19)	Year 1 (FY 10)	Year 5 (FY 14)	Year 10 (FY 19)	Year 1 (FY 10)	Year 5 (FY 14)	Year 10 (FY 19)
Number of communities receiving minimum new aid	--	247	112	64	78	60	42	312	250	202	78	76	67
Number of communities receiving more than minimum new aid	--	104	239	287	273	291	309	39	101	149	273	275	284
Percent of state population in communities receiving more than minimum new aid	--	32.8	66.8	88.0	86.9	90.6	94.4	7.5	28.0	44.5	86.9	87.1	89.0
Weighted correlation of combined aid with original gap	0.65***	0.71***	0.79***	0.84***	0.68***	0.74***	0.79***	0.67***	0.70***	0.73***	0.66***	0.67***	0.69***

Note: *,**, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. Statewide unrestricted municipal aid is assumed to grow 6.2 percent per year in scenarios (a) and (b), and 1 percent per year in scenarios (c) and (d). Therefore, the new aid pool is $73.5 million, $93.5 million, and $126.3 million in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and $11.9 million, $12.3 million, and $13.0 million in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is $1.13, $1.44, and $1.94 in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and $0.18, $0.19, and $0.20 in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In the first year, the baseline gap is set at the 20th percentile of the statewide distribution of the original gap for the equal-weights approach, and of the redefined gap for the unequal-weights approach. The baseline gap is assumed to decrease by one percentile per year in scenarios (a) and (b), and by one-quarter percentile per year in scenarios (c) and (d).

Table 9. Number of Years before the 10 Largest Massachusetts Cities Receive More Than Minimum New Aid

	(a) Equal-Weights Approach; Larger New Aid Pool	(b) Unequal-Weights Approach; Larger New Aid Pool	(c) Equal-Weights Approach; Smaller New Aid Pool	(d) Unequal-Weights Approach; Smaller New Aid Pool
Springfield	0	0	1	0
New Bedford	0	0	2	0
Lowell	0	0	5	0
Worcester	0	0	5	0
Fall River	1	0	6	0
Lynn	1	0	8	0
Brockton	2	0	10+	0
Quincy	3	0	10+	0
Boston	7	0	10+	0
Cambridge	10+	0	10+	0

Note: Statewide unrestricted municipal aid is assumed to grow 6.2 percent per year in scenarios (a) and (b), and 1 percent per year in scenarios (c) and (d). Therefore, the new aid pool is \$73.5 million, \$93.5 million, and \$126.3 million in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and \$11.9 million, \$12.3 million, and \$13.0 million in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is \$1.13, \$1.44, and \$1.94 in the first, fifth, and tenth years of simulation in scenarios (a) and (b), and \$0.18, \$0.19, and \$0.20 in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In the first year, the baseline gap is set at the 20^{th} percentile of the statewide distribution of the original gap for the equal-weights approach, and of the redefined gap for the unequal-weights approach. The baseline gap is assumed to decrease by one percentile per year in scenarios (a) and (b), and by one-quarter percentile per year in scenarios (c) and (d).

Table 10. Distributions of per Capita Aid Dollars among the 10 Largest Massachusetts Cities, Scenarios (a) and (b)

(A) First Year of Simulation (FY 2010)

	Existing Aid (FY 2009 Aid)	(a) Equal-Weights Approach; $1.13 Minimum New Aid; $73.5 Million New Aid Pool		(b) Unequal-Weights Approach; $1.13 Minimum New Aid; $73.5 Million New Aid Pool	
		New Aid	Combined Aid	New Aid	Combined Aid
Boston	349.44	1.13	350.57	13.31	362.75
Fall River	294.39	1.13	295.52	21.61	315.99
Lynn	289.23	1.13	290.36	20.07	309.29
New Bedford	282.83	45.99	328.82	24.70	307.53
Springfield	282.30	57.17	339.46	25.63	307.92
Lowell	273.07	9.38	282.45	20.90	293.97
Worcester	266.73	8.60	275.33	20.41	287.15
Brockton	252.88	1.13	254.01	15.89	268.78
Quincy	232.29	1.13	233.42	12.62	244.91
Cambridge	228.53	1.13	229.66	1.66	230.19
Weighted correlation of combined aid with original gap	0.05	--	0.33	--	0.19

(B) Fifth Year of Simulation (FY 2014)

	(a) Equal-Weights Approach; $1.44 Minimum New Aid; $93.5 Million New Aid Pool		(b) Unequal-Weights Approach; $1.44 Minimum New Aid; $93.5 Million New Aid Pool	
	New Aid	Combined Aid	New Aid	Combined Aid
Boston	1.44	355.85	16.71	424.32
Fall River	26.91	411.45	24.79	410.76
Lynn	25.98	388.17	23.29	397.90
New Bedford	28.55	452.19	27.80	414.66
Springfield	29.07	465.17	28.70	418.75
Lowell	26.28	395.62	24.10	385.91
Worcester	25.93	386.94	23.63	377.13
Brockton	23.20	319.09	19.23	340.70
Quincy	21.11	266.98	16.04	303.73
Cambridge	1.44	234.93	5.38	245.22
Weighted correlation of combined aid with original gap	--	0.95***	--	0.63**

(C) Tenth Year of Simulation (FY 2019)

	(a) Equal-Weights Approach; $1.94 Minimum New Aid; $126.3 Million New Aid Pool			(b) Unequal-Weights Approach; $1.94 Minimum New Aid; $126.3 Million New Aid Pool		
	New Aid	Combined Aid	Total Aid Accumulated from FY 10 through FY 19	New Aid	Combined Aid	Total Aid Accumulated from FY 10 through FY 19
Boston	21.78	417.09	3,666.94	22.07	523.48	4,371.50
Fall River	21.35	524.92	4,191.44	29.72	549.59	4,273.97
Lynn	21.45	500.51	3,976.08	28.30	529.36	4,138.24
New Bedford	21.18	567.64	4,592.63	32.57	568.27	4,327.15
Springfield	21.13	581.25	4,720.48	33.42	576.79	4,372.32
Lowell	21.42	508.33	4,035.48	29.07	521.36	4,022.21
Worcester	21.45	499.23	3,950.01	28.62	510.24	3,932.14
Brockton	21.74	428.08	3,322.91	24.45	452.23	3,547.17
Quincy	21.95	373.46	2,870.47	21.43	399.59	3,162.41
Cambridge	1.94	243.58	2,360.64	11.34	288.73	2,527.06
Weighted correlation of combined aid with original gap	--	1.00***	--	--	0.86***	--

Note: Combined aid is existing aid plus new aid. *,**, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. Statewide unrestricted municipal aid is assumed to grow 6.2 percent per year in scenarios (a) and (b). Therefore, the new aid pool is $73.5 million, $93.5 million, and $126.3 million in the first, fifth, and tenth years of simulation in scenarios (a) and (b). In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is $1.13, $1.44, and $1.94 in the first, fifth, and tenth years of simulation in scenarios (a) and (b). In the first year, the baseline gap is set at the 20th percentile of the statewide distribution of the original gap for the equal-weights approach, and of the redefined gap for the unequal-weights approach. The baseline gap is assumed to decrease by one percentile per year in scenarios (a) and (b). For comparable information on scenarios (c) and (d), see Appendix Table 3.

Appendix Table 1. Municipal Cost Factors of the 10 Largest Cities in Massachusetts (FY 2007)

	Share of Total State Population (%)	Cost Factors				Municipal Costs ($ per Capita)
		Population Density (thousands per square mile)	Poverty Rate (%)	Unemployment Rate (%)	Jobs per Capita	
Quincy	1.42	5.46	8.99	4.40	0.51	1,396.42
Brockton	1.44	4.34	13.11	6.10	0.41	1,556.43
Worcester	2.71	4.67	17.62	5.50	0.56	1,648.26
Lynn	1.35	8.05	19.28	5.70	0.26	1,710.98
Lowell	1.60	7.52	18.29	6.00	0.32	1,716.36
Cambridge	1.57	15.77	15.08	2.60	1.06	1,809.83
Boston	9.40	12.56	19.83	4.30	0.92	1,914.46
Fall River	1.40	2.93	18.65	10.10	0.40	1,947.91
Springfield	2.34	4.71	28.40	7.00	0.50	1,967.88
New Bedford	1.42	4.57	24.52	9.40	0.40	2,054.49
Average Community	-	4.02	9.93	4.90	0.49	1,410.86

Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors. Based on the approach developed by Bradbury and Zhao (2009), per capita municipal costs = 28.0 * population density + 19.8 * poverty rate + 81.0 * unemployment rate + 272 * jobs per capita + 570.2.

Appendix Table 2. Municipal Capacity Factors of the 10 Largest Cities in Massachusetts (dollars per capita, FY 2007)

	Property Tax Capacity Factors			Property Tax Capacity	Other Local Revenue Capacity	Required Reductions in Capacity	Municipal Revenue Capacity
	Taxable Residential Property Value	Taxable Nonresidential Property Value	Income				
Worcester	58,753.32	12,822.46	18,227.50	726.78	85.20	-453.36	358.62
Springfield	38,171.59	10,946.64	13,117.66	517.93	86.87	-214.28	390.53
Lowell	59,813.34	9,144.71	17,324.75	677.53	73.30	-356.04	394.80
Lynn	71,666.16	9,027.27	16,915.41	743.01	66.21	-392.39	416.84
Brockton	74,006.75	14,403.07	16,754.64	822.45	69.63	-375.73	516.35
New Bedford	61,216.83	11,484.44	14,867.03	687.44	67.25	-229.82	524.88
Quincy	110,749.60	19,687.77	25,465.37	1,212.21	104.62	-768.86	547.96
Fall River	58,303.08	13,845.57	14,429.62	694.69	72.73	-199.28	568.15
Boston	97,465.73	44,748.16	34,282.61	1,542.06	181.60	-810.72	912.94
Cambridge	139,419.80	79,216.88	44,087.85	2,349.07	142.41	-954.64	1,536.84
Average Community	128,549.00	23,314.87	33,240.16	1,457.51	124.64	-784.32	797.84

Note: The average community is defined as a hypothetical community experiencing the weighted average among 351 Massachusetts cities and towns (weighted by population size) for municipal cost and revenue capacity factors. Based on the approach developed by Bradbury and Zhao (2009), property tax capacity = 0.0142 * (taxable residential property value)$^{2/3}$ * (income)$^{1/3}$ + 0.0126 * taxable nonresidential property value (all in per capita terms). The sources for other local revenue capacity include motor vehicle excise, hotel/motel excise, urban redevelopment excise, local share of racing taxes, and state government payments in lieu of taxes for state-owned land. Required reductions in capacity include net minimum required local contribution for schools; county taxes; charges for MBTA, regional transit, Boston metro transit, and regional planning authorities; and state assessments for air pollution control and mosquito control. Municipal revenue capacity = property tax capacity + other local revenue capacity + required reductions in capacity.

Appendix Table 3. Distributions of per Capita Aid Dollars among the 10 Largest Massachusetts Cities, Scenarios (c) and (d)

(A) First Year of Simulation (FY 2010)

	Existing Aid (FY 2009 Aid)	(c) Equal-Weights Approach; $0.18 Minimum New Aid; $11.9 Million New Aid Pool		(d) Unequal-Weights Approach; $0.18 Minimum New Aid; $11.9 Million New Aid Pool	
		New Aid	Combined Aid	New Aid	Combined Aid
Boston	349.44	0.18	349.63	2.15	351.59
Fall River	294.39	0.18	294.57	3.49	297.87
Lynn	289.23	0.18	289.41	3.24	292.46
New Bedford	282.83	0.18	283.01	3.98	286.81
Springfield	282.30	0.18	282.48	4.13	286.43
Lowell	273.07	0.18	273.25	3.37	276.44
Worcester	266.73	0.18	266.92	3.29	270.03
Brockton	252.88	0.18	253.07	2.56	255.45
Quincy	232.29	0.18	232.47	2.04	234.32
Cambridge	228.53	0.18	228.71	0.27	228.80
Weighted correlation of combined aid with original gap	0.05	--	0.05	--	0.08

(B) Fifth Year of Simulation (FY 2014)

	(c) Equal-Weights Approach; $0.19 Minimum New Aid; $12.3 Million New Aid Pool		(d) Unequal-Weights Approach; $0.19 Minimum New Aid; $12.3 Million New Aid Pool	
	New Aid	Combined Aid	New Aid	Combined Aid
Boston	0.19	350.37	2.23	360.38
Fall River	0.19	295.32	3.58	312.04
Lynn	0.19	290.16	3.33	305.63
New Bedford	7.93	316.24	4.08	302.98
Springfield	8.04	326.23	4.23	303.20
Lowell	0.19	274.00	3.46	290.15
Worcester	0.19	267.67	3.38	283.42
Brockton	0.19	253.81	2.65	265.92
Quincy	0.19	233.22	2.12	242.67
Cambridge	0.19	229.46	0.34	230.06
Weighted correlation of combined aid with original gap	--	0.25	--	0.17

(C) Tenth Year of Simulation (FY 2019)

	(c) Equal-Weights Approach; $0.20 Minimum New Aid; $13.0 Million New Aid Pool			(d) Unequal-Weights Approach; $0.20 Minimum New Aid; $13.0 Million New Aid Pool		
	New Aid	Combined Aid	Total Aid Accumulated from FY 10 through FY 19	New Aid	Combined Aid	Total Aid Accumulated from FY 10 through FY 19
Boston	0.20	351.35	3,504.77	2.34	371.85	3,615.94
Fall River	5.28	315.57	2,998.77	3.63	330.08	3,138.89
Lynn	5.08	296.15	2,907.75	3.39	322.45	3,073.63
New Bedford	5.63	349.55	3,173.18	4.11	323.46	3,050.69
Springfield	5.75	360.38	3,263.67	4.25	324.41	3,053.58
Lowell	5.14	302.37	2,824.60	3.52	307.62	2,919.43
Worcester	5.07	295.13	2,757.72	3.44	300.51	2,851.78
Brockton	0.20	254.79	2,539.17	2.74	279.43	2,673.27
Quincy	0.20	234.20	2,333.23	2.23	253.60	2,438.30
Cambridge	0.20	230.44	2,295.64	0.53	232.31	2,303.70
Weighted correlation of combined aid with original gap	--	0.49	--	--	0.27	--

Note: Combined aid is existing aid plus new aid. *,**, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. Statewide unrestricted municipal aid is assumed to grow 1 percent per year in scenarios (c) and (d). Therefore, the new aid pool is $11.9 million, $12.3 million, and $13.0 million in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In all scenarios, the minimum amount of new per capita aid is set to equal 10 percent of the statewide per capita amount of new unrestricted municipal aid each year. Therefore, the minimum amount of new per capita aid is $0.18, $0.19, and $0.20 in the first, fifth, and tenth years of simulation in scenarios (c) and (d). In the first year, the baseline gap is set at the 20th percentile of the statewide distribution of the original gap for the equal-weights approach, and of the redefined gap for the unequal-weights approach. The baseline gap is assumed to decrease by one-quarter percentile per year in scenarios (c) and (d).