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Designing Formulas for Distributing Reductions in State Aid

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Abstract

This paper develops a framework that distributes reductions in state aid based on underlying local fiscal health. Under this framework, the state gives smaller aid cuts to communities that are in worse underlying fiscal health and receive less existing aid. This framework therefore provides a more rational and equitable method of cutting aid than commonly used ad hoc or across-the-board cuts. The framework can also apply to aid increases, giving policymakers a single tool to accommodate any change in state aid. We use Massachusetts data on unrestricted municipal aid to conduct policy simulations. The framework can also be used to distribute school aid or non-school aid, and is potentially applicable to all states.

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Keywords: fiscal health, fiscal gap, state aid, aid cut, fiscal equalization

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I. Introduction

Local governments depend on state aid to provide residents and businesses with vital public services, such as education, police and fire protection, and safe public roads. According to the U.S. Census Bureau's Survey of State and Local Government Finance, transfers from state government accounted for 33 percent of local government general revenue in the United States in FY 2008. That was the second-largest revenue source for local governments, behind local taxes.

However, because of the fiscal crisis, state aid to local governments has become an increasingly important and contentious budgetary issue across the nation. States tend to cut local aid quickly and deeply during a fiscal crisis (Dye and Reschovsky, 2008; Clemens, 2011). Indeed, the Congressional Budget Office (2010) confirms that 22 states reduced aid to local governments in FY 2010, and notes that 20 states have proposed additional cuts in FY 2011. For example, Michigan cut 9.7 percent of total payments to cities, villages, and townships, and 15.6 percent of aid to 20 counties in FY 2010 (National Association of State Budget Officers, 2009). Oregon cut state aid to K–12 education by 5.7 percent during the 2009–2011 biennium, compared with the previous biennium. In FY 2011, Minnesota cut aid to cities and counties by 35 percent, while New Jersey cut the two major components of state aid to municipalities by a total of 17 percent (National Association of State Budget Officers, 2010).

Cuts in state aid have a negative impact on cities and towns. They increase fiscal stress on local governments, which in turn undermines residents' quality of life and the local business environment. Dye and Reschovsky (2008) and Wu (2009) find that cuts in state aid lead to increases in local property taxes, although those increases only partially offset the loss of state aid. Anderson (2007) and Skidmore and Scorsone (2011) show that local governments respond to declining state aid by cutting public services. Some city governments have even initiated large-scale layoffs. For example, Camden, N.J. laid off half its police force in response to declining state aid in 2011 (Denvir, 2011). San Diego, Calif. adopted a FY 2012 budget that eliminates more than 750 teaching jobs and 600 other positions, to deal with reductions in state education aid (Magee, 2011).

States tend to cut aid either on an *ad hoc* basis or across the board, with every community receiving the same percent aid cut (Fisher and Prasad, 2009). For example, one recently proposed bill in Minnesota planned to eliminate all local government aid for three large cities in FY 2012, while other communities would lose a smaller percentage (Hoglund, 2011).[1] Colorado made an across-the-board cut in school aid of nearly 5 percent in FY 2011 (National Access Network, 2011). The FY 2012–2013 budget in Texas calls for an across-the-board 6 percent reduction in aid funding for all school districts (Torres, 2011).

Ad hoc and across-the-board approaches to aid cuts are widely considered unfair. *Ad hoc* approaches are not based on economic rationale and lack transparency in the decision-making process. Across-the-board cuts ignore differences in underlying fiscal health and levels of existing aid among communities. This often puts more of the aid cut burden on poorer communities (e.g., Murphy, 2011; Norton, 2011). Because poor communities tend to receive a large amount of state aid, across-the-board percentage cuts mean larger per capita aid cuts for these communities. Cuts in state aid also affect total local spending in lower-income communities to a greater degree, because state aid typically accounts for a larger share of total spending in these communities. As a result, local officials have raised concerns that across-the-board aid cuts will widen the gap between wealthier and poorer communities, effectively undoing years of fiscal equalization (Robertson, 2009; Jaklich, 2011; Post-Standard Editorial Board, 2011).

To address these concerns, this paper develops a new aid-reduction framework based on underlying local fiscal health and the distribution of existing aid. Under this framework, communities that are in worse underlying fiscal health and receive less existing aid would see smaller aid cuts. We use a measure of fiscal gap to indicate underlying local fiscal health that is outside the direct control of local officials. Next, we generalize the framework to distribute aid increases, giving policymakers a single tool to accommodate all changes in aid, whether cuts or increases. We use Massachusetts data on unrestricted municipal aid as a case study to conduct simulations and explore policy implications.

This paper provides, for the first time, a framework based on both local fiscal gaps and existing aid distributions that is suitable for allocating aid reductions. Most previous research that focuses on gap-based formulas, such as Bradbury et al. (1984) and Zhao and Bradbury (2009), distributes only aid increases while preserving existing aid distributions or holding them harmless. Those formulas are therefore incompatible with aid-reduction

[1] The final state budget revised this proposal to treat all Minnesota cities and towns the same (Salisbury, 2011).

scenarios. Reschovsky and Schwartz (1990) is the only other paper to our knowledge that has explored designing a gap-based formula for aid reductions. However, their formula ignores the existing aid distribution, which state governments typically use as a starting point for aid cuts. This paper shows that these formulas are special cases of our framework.

Our analysis can be useful for both policy debate and policymaking. First, our framework provides a more rational and equitable approach to cutting local aid than *ad hoc* or across-the-board methods. Second, our framework helps transition the distribution of state aid from non-gap-based to gap-based—even in years of aid cuts. This allows states to accelerate the reform process without having to wait for aid increases to implement a gap-based formula with hold-harmless. Third, this research is practical and timely, because many states are making or plan to make additional local aid cuts in coming fiscal years. Finally, policymakers can apply the framework to any kind of aid used for fiscal equalization, and the framework is potentially applicable to all states.

II. Measuring underlying local fiscal health

States often distribute local aid to address the inequity and inefficiency stemming from disparities in local fiscal health. Yinger (1986) argues that it is inequitable for the same households or firms to pay different amounts of taxes for the same level of local services simply because of their locations. Downes and Pogue (1994) suggest that households and firms may move in response to disparities in local fiscal health, distorting resource allocations and creating economic inefficiency. Many studies therefore deem it appropriate for states to work on reducing fiscal disparities among local communities (Thurow, 1970; Ladd, 1982; Derycke and Gilbert, 1985).

The literature measures underlying local fiscal health in three ways: based on revenue-raising capacity, based on the need for local services or the underlying costs of providing those services, or based on need-capacity gaps. Revenue-raising capacity reflects the underlying ability of local governments to raise revenues from local sources. To avoid using state aid to reward localities for low taxing effort, existing studies do not use actual revenues to represent revenue capacity. This is because actual revenues reflect local tax rates, not necessarily underlying fiscal conditions. Instead, one capacity measure, commonly known as a "representative tax system," relies solely on the size of a community's tax bases

(Advisory Commission on Intergovernmental Relations, 1986). Another capacity measure considers per capita income in each community, while taking into account its ability to export some of the tax burden to non-residents (Ladd and Yinger, 1989).

Cost-based measures of underlying fiscal health incorporate factors that affect spending on local public services, but are outside the direct control of local officials (Bradford, Malt, and Oates, 1969; Chernick, 2004). To avoid rewarding wasteful local spending with state aid, existing analyses do not use actual spending to indicate the underlying costs of providing public services. Instead, researchers use regression analysis to isolate the impact of local economic and social characteristics, such as population density and poverty rate, on local spending (e.g., Bradbury et al., 1984; Ladd, Reschovsky, and Yinger, 1991; Wasylenko and Yinger, 1988; Bradbury and Zhao, 2009). These regressions usually include controls for local preferences and demand for services, available resources, and special institutional factors, which researchers then hold constant across communities for calculating the cost measure for each community.

Need-capacity gap, or fiscal gap, measures the difference between a community's underlying costs and its revenue-raising capacity. Such a gap is a more comprehensive measure of underlying local fiscal health than capacity-only or cost-only measures (Ladd, 1994; Martinez-Vazquez and Boex, 2006; Chernick, 2004).

The actual distribution of intergovernmental aid often bears little relation to the underlying fiscal health of local communities (Reschovsky and Schwartz, 1990). For example, Wasylenko and Yinger (1988) show that municipal aid to each city and town in Nebraska is proportional only to population size. Similarly, Ladd, Reschovsky, and Yinger (1991) find that they "cannot reject the hypothesis that [Local Government Aid] amounts do not vary at all with the need-capacity gap" among Minnesota communities (p. 88). As the following sections show, states can better align aid distribution with local fiscal gaps using our gap-based framework for cutting aid.

III. A conceptual gap-based aid-cut framework

We develop a framework for distributing aid reductions based on the fiscal gaps of local communities and the existing distribution of local aid. Figure 1 illustrates a simple case of this framework in which communities have different fiscal gaps. For simplicity, we assume that each community received the same $1 per capita aid in the previous year—an extreme case of aid inequity. (We introduce inter-local variation in existing aid in following subsections.)

In reducing state aid under this framework, policymakers need to select a maximum aid cut and a minimum aid cut, which they can define as a percent of the previous year's aid or as a per capita amount. The state may set the maximum cut to protect communities that would otherwise see more dramatic cuts. Setting the minimum cut guarantees that all cities and towns share some burden of the aid reduction, regardless of their underlying fiscal health. Implementing the maximum and minimum aid cuts can help gain support from communities and increase the political feasibility of the gap-based approach.

Policymakers also need to select a baseline gap (G^*), such that cities and towns with a per capita gap lower than the baseline gap will receive the maximum aid cut. In other words, policymakers could consider these communities to be in relatively good underlying fiscal health, and more able to afford the maximum aid cut, than communities with larger gaps. The remaining communities, with gaps greater than the baseline gap, will see aid cuts based on their gaps, subject to the maximum and minimum cuts.

Under this framework, all cities and towns fall into one of three groups. Groups I and K include communities receiving the maximum cut and the minimum cut, respectively. Communities in the middle group, J, receive aid cuts inversely proportional to their gaps. In other words, the aid receipts net of reductions fill the same fraction, r_t, of local fiscal gap above the baseline gap among all group J communities.

3.1 The case of defining aid cuts as a percent of previous aid

Unlike the uniform aid distribution in Figure 1, cities and towns in reality receive different per capita payments of state aid. We assume that a community receives a per capita aid amount of $a_{x,t-1}$ in year $(t-1)$, which varies across communities. To reflect the reality of aid distributions in many states, we further assume that the distribution of $a_{x,t-1}$ is not based on fiscal gaps.[2]

Policymakers can define maximum and minimum cuts as a percent of the previous year's aid. Suppose the percent change in statewide per capita aid in year t compared with

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[2] Our aid-cut framework does not require a non-gap-based distribution to start with. Policymakers can still use the framework to cut a smaller amount of aid from larger-gap communities even if the initial aid distribution is gap-based.

year $(t-1)$ is θ_t. Further suppose that policymakers choose the maximum percent cut, α_t, and minimum percent cut, β_t, such that $-1 \leq \alpha_t \leq \theta_t \leq \beta_t \leq 0$.[3]

In this case, every community j in group J receives per capita aid in year t based on its gap, $G_{j,t}$, such that

$$a_{j,t} = r_t(G_{j,t} - G_t^*), \tag{1}$$

where r_t is the fraction of the gap above the baseline gap filled by aid. The fraction, r_t, is calculated as

$$r_t = \frac{TA_t - \sum_I (1+\alpha_t)(a_{i,t-1}N_{i,t}) - \sum_K (1+\beta_t)(a_{k,t-1}N_{k,t})}{\sum_J (G_{j,t} - G_t^*)N_{j,t}}, \tag{2}$$

where TA_t is the statewide aid pool in year t, and $N_{x,t}$ is the population of community x in year t. The fraction, r_t, can be interpreted as an indicator of the equalizing effect of state aid, because a higher value of r_t indicates that more aid is targeted to larger-gap communities (Zhao and Bradbury, 2009).

Among groups I, J, and K, the percentage change in aid for any community x in year t, $\tau_{x,t}$, is

$$\tau_{x,t} = \begin{cases} \alpha_t & \text{if} \quad G_{x,t} \leq G_t^* \quad \text{or} \quad [\frac{r_t(G_{x,t}-G_t^*)}{a_{x,t-1}} - 1] < \alpha_t \\ \frac{r_t(G_{x,t}-G_t^*)}{a_{x,t-1}} - 1 & \text{if} \quad G_{x,t} > G_t^* \quad \text{and} \quad \alpha_t \leq [\frac{r_t(G_{x,t}-G_t^*)}{a_{x,t-1}} - 1] \leq \beta_t \\ \beta_t & \text{if} \quad G_{x,t} > G_t^* \quad \text{and} \quad [\frac{r_t(G_{x,t}-G_t^*)}{a_{x,t-1}} - 1] > \beta_t. \end{cases} \tag{3}$$

In practice, determining r_t, and which communities fall into each of the three groups, requires several computational iterations.

3.2 The case of defining aid cuts in dollar amounts

Policymakers can also define maximum and minimum aid cuts in dollar amounts as an alternative to defining them as percent cuts. To model this, we redefine α_t and β_t to represent the maximum and minimum per capita dollar cuts in year t. Let θ_t be the statewide per capita dollar change in aid in year t, such that $\alpha_t \leq \theta_t \leq \beta_t \leq 0$.[4]

[3] In a special case, where $\alpha_t = \theta_t = \beta_t$, all communities receive an across-the-board percent aid cut.

[4] Similar to the percent-cut special case referenced in footnote (3), when $\alpha_t = \theta_t = \beta_t$ in the dollar-cut scenario, all communities receive an across-the-board per capita dollar aid cut.

In this case, community x's per capita dollar change in aid in year t, $\triangle_{x,t}$, is defined as

$$\triangle_{x,t}=\begin{cases} max(-a_{x,t-1}+c_t,\alpha_t) & \text{if} \quad G_{x,t}\leq G_t^* \quad \text{or} \quad [r_t(G_{x,t}-G_t^*)-a_{x,t-1}]<\alpha_t \\ r_t\left(G_{x,t}-G_t^*\right)-a_{x,t-1} & \text{if} \quad G_{x,t}>G_t^* \quad \text{and} \quad \alpha_t\leq[r_t(G_{x,t}-G_t^*)-a_{x,t-1}]\leq\beta_t \\ max(-a_{x,t-1}+c_t,\beta_t) & \text{if} \quad G_{x,t}>G_t^* \quad \text{and} \quad r_t(G_{x,t}-G_t^*)-a_{x,t-1}]>\beta_t, \end{cases} \quad (4)$$

where c_t is a small aid amount, such that $0\leq c_t\leq min(a_{1,t-1},a_{2,t-1},\ldots,a_{X,t-1})$, and X is the total number of communities in the state. The per capita dollar aid cut is bounded by $(a_{x,t-1}-c_t)$, because policymakers may want every community to keep at least a small amount of per capita aid (c_t) instead of cutting all the aid. In the dollar-cut case,

$$r_t=\frac{TA_t-\sum_I m\,ax(c_t,a_{i,t-1}+\alpha_t)N_{i,t}-\sum_K m\,ax(c_t,a_{k,t-1}+\beta_t)N_{k,t}}{\sum_J(G_{j,t}-G_t^*)N_{j,t}}. \quad (5)$$

3.3 Comparative analysis and policy choice

The percent of aid cut for a community in group J depends on both its gap and its existing aid (see equations (3) and (4)). Holding all else equal, if the gap ($G_{j,t}$) is larger, community j will experience a smaller percent aid cut, because it will receive more aid in year t. Conversely, if the existing aid ($a_{j,t-1}$) is higher, then community j will experience a larger percent aid cut, because it would receive the same level of aid in year t as another community with the same gap but smaller $a_{j,t-1}$.

Because the aid cut depends on both gap and aid amount received in year $(t-1)$, a larger-gap community may not necessarily receive a smaller percent aid cut in year t than a smaller-gap community, if the former received a rather large amount of aid in the previous year.

The selection of the maximum cut and the minimum cut is a policy choice that affects r_t and the number of communities in the three groups each year. However, the impact is ambiguous in theory, because the iterations determine r_t and the number of communities in the three groups simultaneously. This suggests that data simulations should play an important role in the planning and decision-making process.

In selecting the baseline gap, policymakers could consider increasing it over time in implementing consecutive years of aid cuts. This allows the state to give the maximum aid cut to more smaller-gap communities, leaving more aid to be distributed among the larger-gap communities.

Increasing the baseline gap would also benefit larger-gap communities within group J. Suppose two group J communities, x and y, have different gaps, such that $G_x > G_y$. Because they are in group J in both year t and year $(t+1)$, their aid amounts in both years are distributed based on gaps according to equation (1). If the baseline gap does not change, such that $G_{t+1}^* = G_t^*$, then communities x and y will receive the same $(\frac{r_{t+1}-r_t}{r_t})$ percent cut, where $r_{t+1} < r_t$. But for larger-gap community x to see a smaller percent aid cut than the smaller-gap community y in year $(t+1)$, the baseline gap must increase in year t.

Policymakers could consider giving larger-gap communities not only a smaller percent aid cut, but also a smaller per capita dollar aid cut, during consecutive years of aid reductions. To make $(a_{x,t} - a_{x,t+1}) < (a_{y,t} - a_{y,t+1})$ in the previous example, r_{t+1} needs to be greater than r_t. Because r_{t+1} depends on θ_{t+1} in equations (2) and (5), a larger statewide aid cut (θ_{t+1}) requires a larger increase in the baseline gap (G_{t+1}^*) to help raise r_{t+1} above r_t.

3.4 Generalizing the framework for aid increases

This gap-based framework is flexible and can be generalized to accommodate both aid reductions and aid increases. Figure 2 shows a simple case of our gap-based aid-increase framework. Under the aid-increase scenario, policymakers need to choose the minimum and maximum aid increase, defined in either percentage or dollar terms. They also need to choose the baseline gap, so communities with gaps below the baseline gap receive the minimum aid increase. The remaining communities, with gaps above the baseline gap, will see aid increases based on their gaps, subject to the minimum and maximum aid increases.

The formula for aid increases is similar to the formula for aid reductions, with some minor adjustments. For example, we can name the minimum and maximum per capita dollar aid increase in year t as α_t and β_t, respectively. Then, the per capita aid increase of community x in year t is defined as

$$\triangle_{x,t} = \begin{cases} \alpha_t & \text{if} \quad G_{x,t} \leq G_t^* \quad \text{or} \quad [r_t(G_{x,t} - G_t^*) - a_{x,t-1}] < \alpha_t \\ r_t(G_{x,t} - G_t^*) - a_{x,t-1} & \text{if} \quad G_{x,t} > G_t^* \quad \text{and} \quad \alpha_t \leq [r_t(G_{x,t} - G_t^*) - a_{x,t-1}] \leq \beta_t \\ \beta_t & \text{if} \quad G_{x,t} > G_t^* \quad \text{and} \quad r_t(G_{x,t} - G_t^*) - a_{x,t-1}] > \beta_t, \end{cases} \quad (6)$$

in which

$$r_t = \frac{TA_t - \sum_I (a_{i,t-1} + \alpha_t) N_{i,t} - \sum_K (a_{k,t-1} + \beta_t) N_{k,t}}{\sum_J (G_{j,t} - G_t^*) N_{j,t}}. \tag{7}$$

Equations (6) and (7) are the same as equations (4) and (5), except that $\Delta_{x,t}$ is bounded by $(-a_{x,t-1} + c_t)$ under the aid-reduction scenario.

3.5 Comparisons with existing gap-based models

We can link our approach to several existing models. First, the gap-based aid-cut approach in Reschovsky and Schwartz (1990) is a special case of our framework. Assuming that the aid distribution in the previous year was based purely on fiscal gaps, their approach distributes aid cuts inversely proportional to the size of a community's fiscal gap. In particular, the community with the largest fiscal gap receives no aid reduction, while communities whose gaps are at a certain threshold and below lose all their aid.

Assuming a gap-based aid distribution in the previous year, we can create their aid-cut pattern by selecting special parameter values under our framework. We can choose the minimum percent aid cut to be zero, and apply it only to the community with the largest fiscal gap. We then set the maximum percent aid cut as 100 percent, and give it to communities with gaps below the baseline gap. In this case, the baseline gap should be set to be the same as the threshold gap in the model of Reschovsky and Schwartz (1990).

Second, our aid-reduction framework can be viewed as an extension of a gap-based aid-increase model in Zhao and Bradbury (2009), in which the state can hold less than 100 percent of existing aid harmless. In that model, the state distributes the sum of the added new aid and remaining existing aid that is not held harmless through the gap-based formula. The state also guarantees a minimum per capita dollar aid increase to every community, but does not impose a maximum aid increase.

To link our framework to that model, we can consider the state holding $(1 + \alpha_t)$ of every dollar of per capita existing aid harmless, where $-1 \leq \alpha_t \leq 0$. Without any new aid dollars, the "new" aid pool is simply the total aid pool in the current year less $(1 + \alpha_t)$ of the previous year's aid. The state then needs to set the minimum aid "increase" to zero, essentially creating the maximum percent aid cut of α_t. Then, unlike in Zhao and Bradbury's model, we assume that the state imposes a maximum aid "increase" as a percent of the previous year's aid at $(\beta_t - \alpha_t)$, essentially yielding the minimum percent aid cut of β_t, where $\alpha_t \leq \beta_t \leq 0$. Under these circumstances, the aid-increase model with partial hold-harmless can produce a distribution equivalent to one created by our aid-reduction framework.

Third, the aid-increase formula in Zhao and Bradbury (2009) is also a special case of our framework. In an extreme case of our aid-increase approach, where the maximum aid increase, β_t, is so large that it does not cap the aid increase of any community, equation (7) simplifies to

$$r_t = \frac{TA_t - \sum_I (a_{i,t-1} + \alpha_t) N_{i,t}}{\sum_J (G_{j,t} - G_t^*) N_{j,t}}. \quad (8)$$

This equation is identical to the equation of r_3 in Zhao and Bradbury (2009), which has only a minimum aid increase and no maximum aid increase in a gap-based formula with full hold-harmless.

3.6 Drawbacks of the gap-based aid-cut framework

The gap-based framework has some drawbacks. First, it preserves some aid inequity, because it does not take into account differences in the gap and existing aid among communities receiving the maximum aid cut, treating them the same. It does the same for communities receiving the minimum aid cut.

Second, the gap-based framework is more complicated than *ad hoc* or across-the-board approaches, because it requires several policy parameters, and is somewhat less transparent than across-the-board cuts. In practice, policymakers could find it challenging to agree on specific policy parameters.

Third, policymakers may also find it difficult to gather enough votes for the gap-based aid-cut approach among state legislators. Reschovsky and Schwartz (1990) suggest that a majority of legislators could prefer to shift most of the burden of aid reductions to a relatively small number of communities. Therefore, because fewer communities bear the majority of statewide aid reductions under across-the-board cuts than under other approaches, policymakers may be more likely to vote for across-the-board cuts than for a gap-based approach.

IV. Data for simulations

We use Massachusetts data on unrestricted municipal aid as a case study for our policy simulations under the gap-based framework. Massachusetts allocates unrestricted municipal aid to its 351 cities and towns to help equalize their ability to provide non-school municipal services (Municipal Data Management and Technical Assistance Bureau, 2003). Twenty-three other states offered similar unrestricted general government aid to their cities and towns in FY 2007 (Fisher and Prasad, 2009). Unrestricted municipal aid accounted for 6.2 percent of local general revenue in Massachusetts—near the median among all states providing such aid to localities.

4.1 Background on unrestricted municipal aid in Massachusetts

Prior to FY 2010, unrestricted municipal aid in Massachusetts consisted of two programs—Additional Assistance and Lottery Aid—neither of which were distributed based on a measure of local fiscal gap.

At its inception in the early 1980s, the state distributed Additional Assistance to each community as the non-negative difference between an aid category called Resolution Aid and school aid, each calculated based on its own formula. The formula for distributing Resolution Aid was intended to be equalizing in nature (Municipal Data Management and Technical Assistance Bureau, 2003). However, political interference created a bias favoring certain municipalities (Ladd and Kennedy, 1985).

Because school aid grew rapidly throughout the 1980s and early 1990s, some communities found that their Additional Assistance was crowded out and fell to zero. The state also made deep and uneven cuts in Additional Assistance during the severe fiscal crisis of the early 1990s. As a result, less than half of all communities received Additional Assistance in FY 1992. After FY 1992, the state funded Additional Assistance for each community at the nominal level of the previous year, except in FY 2003, 2004, and 2009, when the state made across-the-board percent cuts in Additional Assistance.

Lottery Aid is another source of unrestricted municipal aid, and is distributed through an equalizing formula (Municipal Data Management and Technical Assistance Bureau, 2003). The formula distributes Lottery Aid in proportion to a community's population, and inversely to its property tax base. In the wake of the 2001 recession, the state made across-the-board percent cuts in Lottery Aid in FY 2003 and 2004. It then increased Lottery Aid funding from FY 2005 through FY 2008, but made more across-the-board percent cuts in FY 2009. The sum of Additional Assistance and Lottery Aid reached a peak of $1.31 billion in FY 2008, of which Additional Assistance and Lottery Aid accounted for $379 million and $935 million, respectively.

In FY 2010, the state combined Additional Assistance and Lottery Aid to form a new aid category called Unrestricted General Government Aid, and cut 21 percent of its funding, mostly across-the-board. The state made another across-the-board cut in this aid category of 4 percent in FY 2011. In total, unrestricted municipal aid was cut 31.6 percent from FY 2008 to FY 2011. These aid reductions offer an opportunity to use the gap-based approach in simulations to create alternative distributions to the actual aid distribution.

4.2 Fiscal gaps in Massachusetts cities and towns

Following Bradbury and Zhao (2009), we construct a measure of municipal gap in Massachusetts cities and towns as the basis of a formula for distributing unrestricted municipal aid. Bradbury and Zhao (2009) regress local spending and revenues on an extensive list of local economic and social characteristics that are outside the direct control of local officials in Massachusetts, while controlling for local preferences and demand for services, proxies of inefficiency, and various institutional factors.

Bradbury and Zhao (2009) identify four robust local cost factors that determine per capita spending on non-school municipal services: population density, poverty rate, unemployment rate, and number of jobs per capita. For example, higher population density and poverty rates may drive up costs for fire protection, because the fire hazard among housing that is closely packed and poorly maintained is greater than that among housing that is widely spaced and well-maintained.

Using their estimated coefficients and the most recent data in FY 2007, we measure the per capita municipal costs of each community as

$$\text{(per capita municipal costs)} = \begin{array}{lll} 28.0 \times \text{(population density)} & +19.8 \times \text{(poverty rate)} & +81.0 \times \text{(unemployment rate)} \\ +272 \times \text{(jobs per capita)} & +570.2. & \end{array} \quad (9)$$

Using regression analysis of property taxes in Massachusetts, Bradbury and Zhao

(2009) show that a municipality's revenue-raising capacity from property taxes depends on its taxable property values and residents' incomes. Based on their estimated coefficients and the FY 2007 data, we measure per capita property tax capacity for each community as

$$\begin{aligned}(\text{per capita property tax capacity}) = \; & 0.0142 \times (\text{per capita taxable residential property value})^{\frac{2}{3}}(\text{per capita income})^{\frac{1}{3}} \\ & +0.0126 \times (\text{per capita taxable nonresidential property value}).\end{aligned} \tag{10}$$

Considering that cities and towns can collect revenues from other local sources, we add their capacity to raise various local excise taxes to their property tax capacity. These sources include motor vehicle excises and local hotel and motel excises, as well as state payments in lieu of taxes for state-owned land. We also subtract statutorily required reductions from municipal capacity, including state-required minimum local contributions to public schools, county taxes, required local payments to regional planning agencies and regional transit, and state assessments for air pollution control and mosquito control. We remove these required reductions because they are not available to support non-school municipal services.

Massachusetts cities and towns face significant disparities in municipal gap (see Figure 3).[5] However, the distribution of unrestricted municipal aid is not closely correlated with municipal gaps. For example, in FY 2008, when aid reached the pre-recession peak, the adjusted R-squared in a population-weighted linear regression of municipal aid on municipal gap is 0.44. This means that the municipal gap explains less than half of the variation in the municipal aid distribution. The explanatory power of the municipal gap remained unchanged in FY 2011, after three consecutive years of across-the-board aid cuts.

V. Policy simulations

We simulate the changes in aid distribution in Massachusetts under the proposed gap-based framework. We compare those changes with actual aid cuts, to show the equalizing effect of the gap-based framework, and to explore policy implications.

[5] We assume that municipal gaps after FY 2007 are unchanged, owing to data limitations. This assumption is based on the fact that the factors underlying the gap measure are mostly slow-moving. When they do move, communities often change in the same direction, therefore likely maintaining their relative position in municipal gap, at least over a relatively short time period.

5.1 Simulating aid reductions

Instead of the actual across-the-board cuts, we distribute aid reductions between FY 2008 and FY 2011 based on municipal gaps. In the simulations, we set the statewide year-over-year aid cut equal to the actual percent aid cut in each year from FY 2009 to FY 2011—that is, 10 percent, 21 percent, and 4 percent.

We assume that the maximum and minimum aid cut is 2.5 times and one-tenth the statewide aid cut in a given year—defined as either a percent of previous per capita aid or in dollar amounts. To make the dollar-cut scenario comparable to the percent-cut scenario in this exercise, we assume that the aid floor under the dollar-cut scenario (that is, c_t in equation (4)) equals the lowest amount of per capita aid among cities and towns in FY 2011 under the percent-cut scenario.

To better protect higher-gap communities from consecutive aid cuts, we increase the baseline gap over time, with a larger increase corresponding to a deeper aid cut. In this case, we assume that the baseline gap starts at the 10th percentile of the gap distribution in FY 2009, and then increases 1 percentile for every 3 percent of aid cut. Therefore, the baseline gap should rise to the 17th percentile in FY 2010, and to the 18th percentile in FY 2011. For simplicity, we also assume that each community's population is unchanged after FY 2009.[6]

Under the actual aid cuts from FY 2008 to FY 2011, communities in each quintile of the gap distribution lose roughly the same percent of their aid—slightly more than 31 percent (see Table 1).[7] However, if Massachusetts had used the gap-based framework to cut aid, higher-gap communities would have received a smaller total percent aid cut than lower-gap communities from FY 2008 to FY 2011. For example, under the percent-cut scenario, communities in the fifth gap quintile lose 24 percent, on average, compared with an average loss of 66 percent for communities in the first gap quintile.[8]

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[6] The Massachusetts population has been growing rather slowly in the past decade. According to the U.S. Census, the state saw only a 3.1 percent increase in population from 2000 to 2010.

[7] Communities did not receive exactly the same percent aid cut, because Massachusetts had two separate components of unrestricted municipal aid before FY 2010: Additional Assistance and Lottery Aid. More than half of all communities did not receive any Additional Assistance in FY 2008 and 2009. Therefore, even though the state cut Additional Assistance across the board, the percentage cut in combined unrestricted municipal aid (Additional Assistance plus Lottery Aid) was not uniform across cities and towns.

[8] The average percent aid cut of the fifth quintile is slightly larger than that of the fourth quintile, because the fifth quintile includes Boston, which has about 10 percent of the state population and received relatively high per capita aid in FY 2008, and therefore would receive the maximum aid cut in the first two years. If we exclude Boston from the quintile analysis, the population-weighted average aid cut of the fifth quintile drops to 16.2

When the maximum and minimum cuts are defined in dollar amounts, the gap-based framework gives even more favorable treatment to higher-gap communities. Because it cuts almost all the aid from some low-gap communities, communities with higher gaps retain more of their aid. As the right column in Table 1 shows, communities in the first gap quintile lose 97 percent of their aid from FY 2008 to FY 2011 under the dollar-cut scenario. In comparison, the average aid cut is only 21.5 percent for communities in the fifth quintile—even smaller than the average cut for the same communities under the percent-cut scenario.[9]

More than half of all communities—representing about 52 percent of the statewide population—receive smaller aid reductions under the gap-based scenarios than under the actual across-the-board aid cuts from FY 2008 to FY 2011. These communities tended to have relatively large gaps. In practice, policymakers can change the parameters to increase the number of communities or the percent of population that benefits more from the gap-based framework. This could be useful if wider political support is desired or necessary.

Use of the gap-based aid-cut framework would have strengthened the relationship between aid and gap. Figure 4 presents the actual aid distribution and the simulated aid distribution under the percent-cut scenario in FY 2011. Under the gap-based framework, the aid receipts of some communities form an upward-sloping line, because they receive aid in proportion to their municipal gaps. The share of such communities increases from 11 percent in FY 2009 to 38 percent in FY 2011. As a result, municipal gaps gain more power in explaining the distribution of municipal aid over time. The adjusted R-squared increases from 0.44 in FY 2008 to 0.63 in FY 2011.

Furthermore, we compare the percent-cut and dollar-cut scenarios with a hypothetical "high-equalization model" that does not accommodate political considerations. This high-equalization model completely ignores the distribution of aid in the previous year. It allocates aid only in direct proportion to gaps above the baseline gap each year. It does not cap the per capita aid of large-gap communities at an arbitrary level, and does not give aid to

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percent—below the average 20.6 percent aid cut of the fourth quintile under the percent-cut scenario.

[9] As with the percent-cut scenario, the average percent cut of the fifth quintile is slightly larger than that of the fourth quintile, because of Boston. Excluding Boston from the quintile analysis reveals that the population-weighted average cut of the fifth quintile is 15.3 percent—smaller than the 20.0 percent average aid cut of the fourth quintile.

communities with a gap lower than the baseline gap. We set the baseline gap in the high-equalization model at the 18th percentile of the gap distribution in FY 2011, the same as under the two aid-cut scenarios.

The aid distribution under the dollar-cut scenario is closer to the distribution in the high-equalization model than the distribution under the percent-cut scenario is (see Figure 5). We use the population-weighted average absolute deviation of per capita aid from the aid in the high-equalization model in FY 2011 to determine how close each of the alternative distributions is to the high-equalization model.

For the dollar-cut scenario, the average absolute deviation from the high-equalization model is $6.01, with a standard deviation of $11.43. In comparison, the average absolute deviation for the percent-cut scenario is $9.17, with a standard deviation of $11.67.[10] The dollar-cut scenario outperforms the percent-cut scenario, mostly because it cuts more aid from low-gap communities than the percent-cut scenario. While this treatment under the dollar-cut scenario improves the equalization, it creates discontent among low-gap communities that could impair the political feasibility of the gap-based approach.

5.2 Simulating aid increases

We use the generalized gap-based approach to simulate the distribution of future aid increases. In FY 2012, Massachusetts preserved the same aid distribution as in the previous year, ending a series of consecutive reductions (Norton and Murphy, 2011). As revenues continue to grow, the state may be able to increase the municipal aid pool in the near future (Massachusetts Department of Revenue, 2011).

In this simulation, we assume that the municipal aid pool will gradually return to the pre-recession peak of $1.31 billion (i.e., the nominal FY 2008 level) in 10 years. To accomplish that, the aid pool would need to grow 3.9 percent in each year from FY 2013 (Year 1) through FY 2022 (Year 10).

We set the minimum and maximum percent aid increase in each year to be one-tenth of and 10 times the annual statewide percent increase, respectively. The baseline gap starts at the 20th percentile of the gap distribution in FY 2013. Because the aid pool is increasing each

[10] Both aid-cut scenarios are more closely related to the high-equalization model than the actual distribution under across-the-board cuts. The actual FY 2011 aid distribution deviates from the high-equalization model by an average of $43.36, with a standard deviation of $27.96.

year, we decrease the baseline gap by one half of one percentile per year, to "share the wealth" across more communities and gain political support.[11] Figure 6 shows the simulated aid distributions for years 5 and 10 of the simulation, as well as the starting point—the actual FY 2012 aid distribution.

The gap-based framework provides greater aid increases to larger-gap communities and steadily strengthens the relationship between aid and gap. In FY 2022, communities in the first quintile of the gap distribution receive aid that is, on average, 4 percent higher than their FY 2012 aid, while communities in the fifth quintile receive an aid amount 57 percent higher, on average. As a result, the share of communities receiving aid in proportion to their gaps rises from 20 percent in FY 2013 to 72 percent in FY 2022. Municipal gaps also explain 65 percent of the variation in municipal aid in FY 2022, compared with 44 percent in FY 2012.

Some local officials and advocacy groups argue that the state should use aid increases to return to the pre-recession FY 2008 levels for each city and town (Davis, 2010). However, in doing so, the state would restore the inequity of the previous aid distribution. To show this, we compare the aid distribution simulated under the percent-increase gap-based framework in FY 2022 with the actual FY 2008 aid distribution (see Figure 7). The simulated aid distribution is more closely related to municipal gaps than the actual FY 2008 distribution. Under the gap-based approach, 54 percent of cities and towns receive more aid in FY 2022 than under the actual FY 2008 aid distribution.

VI. Conclusion

In the wake of the Great Recession, local governments in the United States have faced deep cuts in state aid, losing revenues essential to maintaining local services. Some states plan to continue cutting local aid in the coming fiscal years. For instance, New York has cut funding for school aid in FY 2012 by 6.1 percent (New York Governor's Press Office, 2011), while Wisconsin has cut general school aid by 8.3 percent in FY 2012 and 7.7 percent in FY 2013, compared with FY 2011 (Wisconsin Budget Project, 2011).

States traditionally cut aid on an *ad hoc* or across-the-board basis. Those approaches often ignore differences in the underlying fiscal health and existing aid level of local

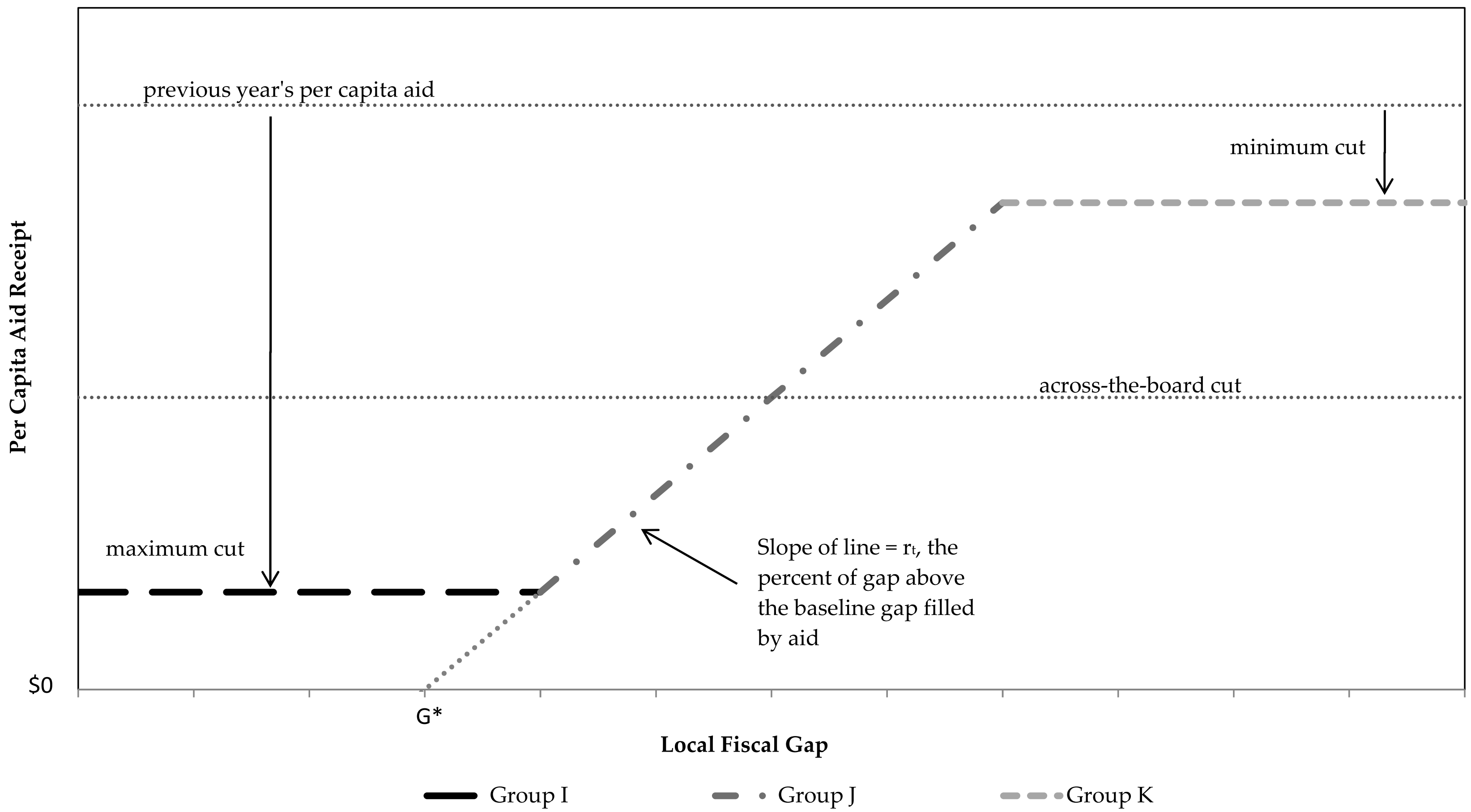
[11] If the baseline gap decreases by more than one half of a percentile per year, the slope of the lines in Figure 6 could decline, meaning that larger-gap communities would gain less per capita aid dollars than smaller-gap communities.

communities. Those approaches therefore put more burden on communities that are already fiscally stressed, and work against the equalization goals of aid programs (Reschovsky and Schwartz, 1990).

This paper offers new approaches to cutting aid that help with fiscal equalization. We show that a gap-based framework can help allocate smaller aid cuts to communities with larger fiscal gaps and lower levels of existing aid. We also use the gap-based framework to distribute aid increases. Policymakers will find this increasingly relevant, as more states expect revenue growth and possible increases in local aid as the economy improves (Dadayan and Boyd, 2011).

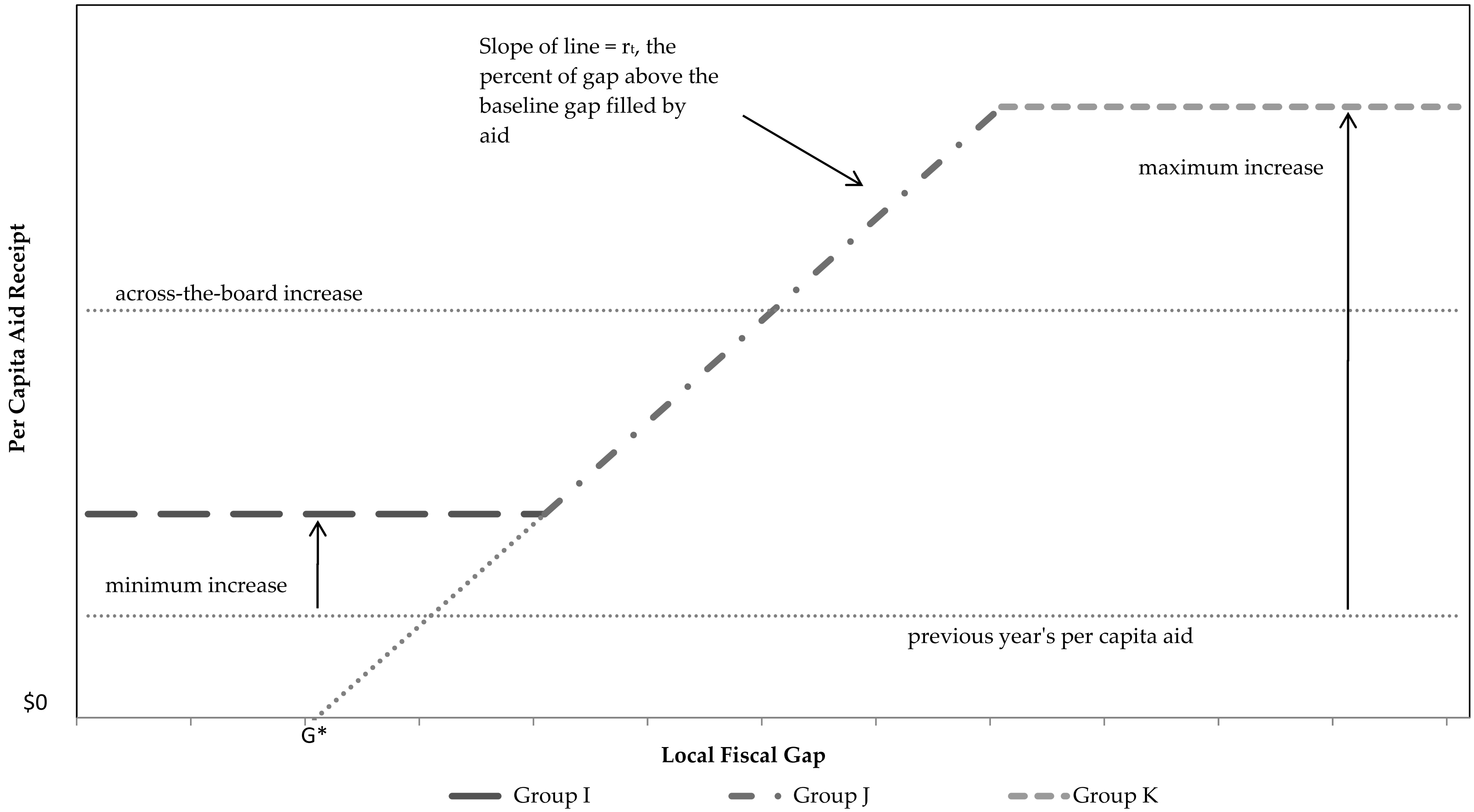
While we use Massachusetts as a case study, the gap-based framework is potentially applicable to all states. In principle, researchers can measure underlying local fiscal health in other states using regression analysis similar to that in Bradbury et al. (1984) and Bradbury and Zhao (2009), while controlling for state-specific institutions. Our gap-based framework is also general enough for use with any school or non-school aid program that aims for fiscal equalization.

Figure 1. Aid cuts under the gap-based framework



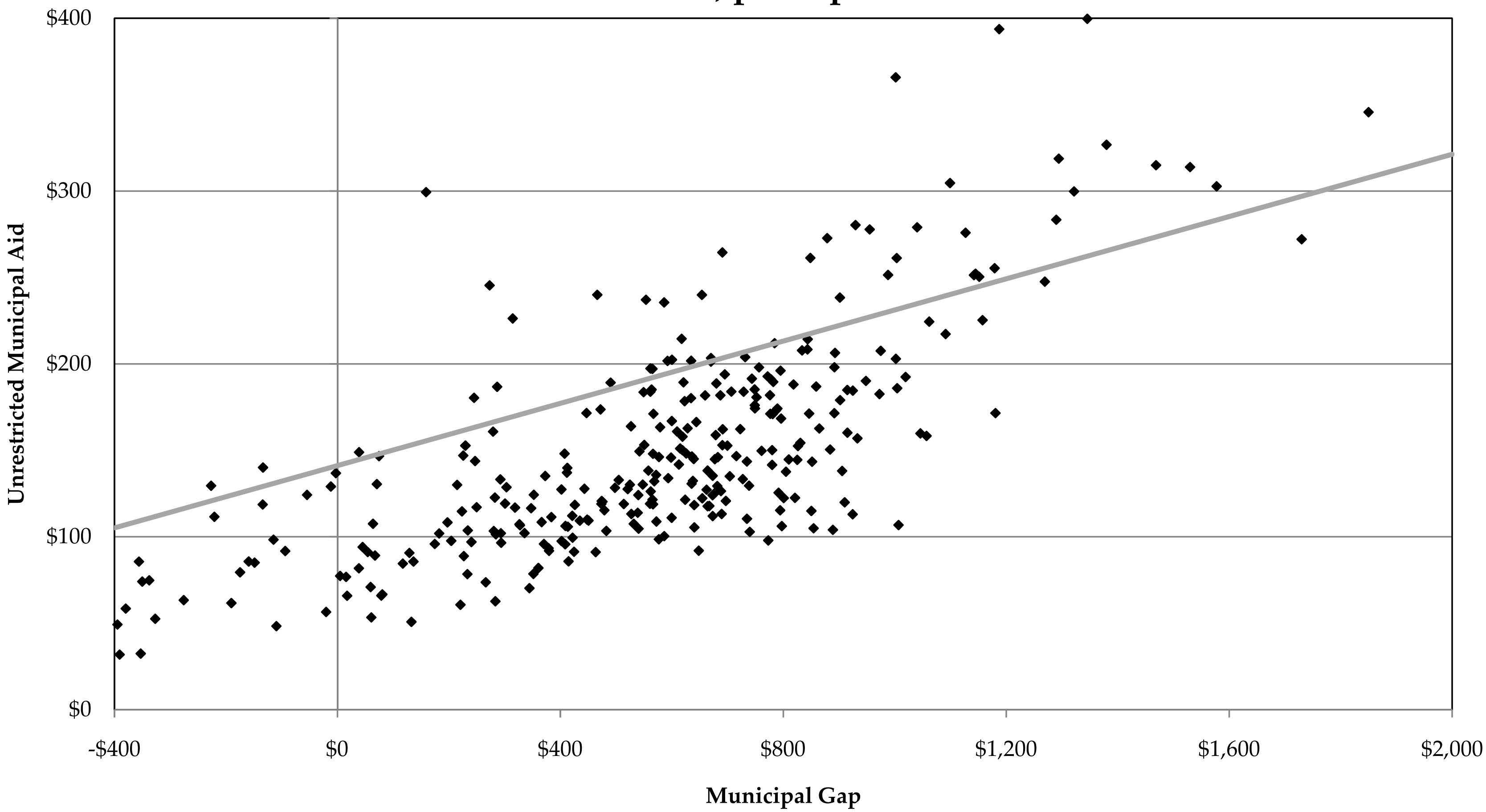
Note: For simplicity, we assume that each community in this example receives a $1 per capita aid payment in the previous year. The baseline gap is represented by G*.

Figure 2. Aid increases under the gap-based framework



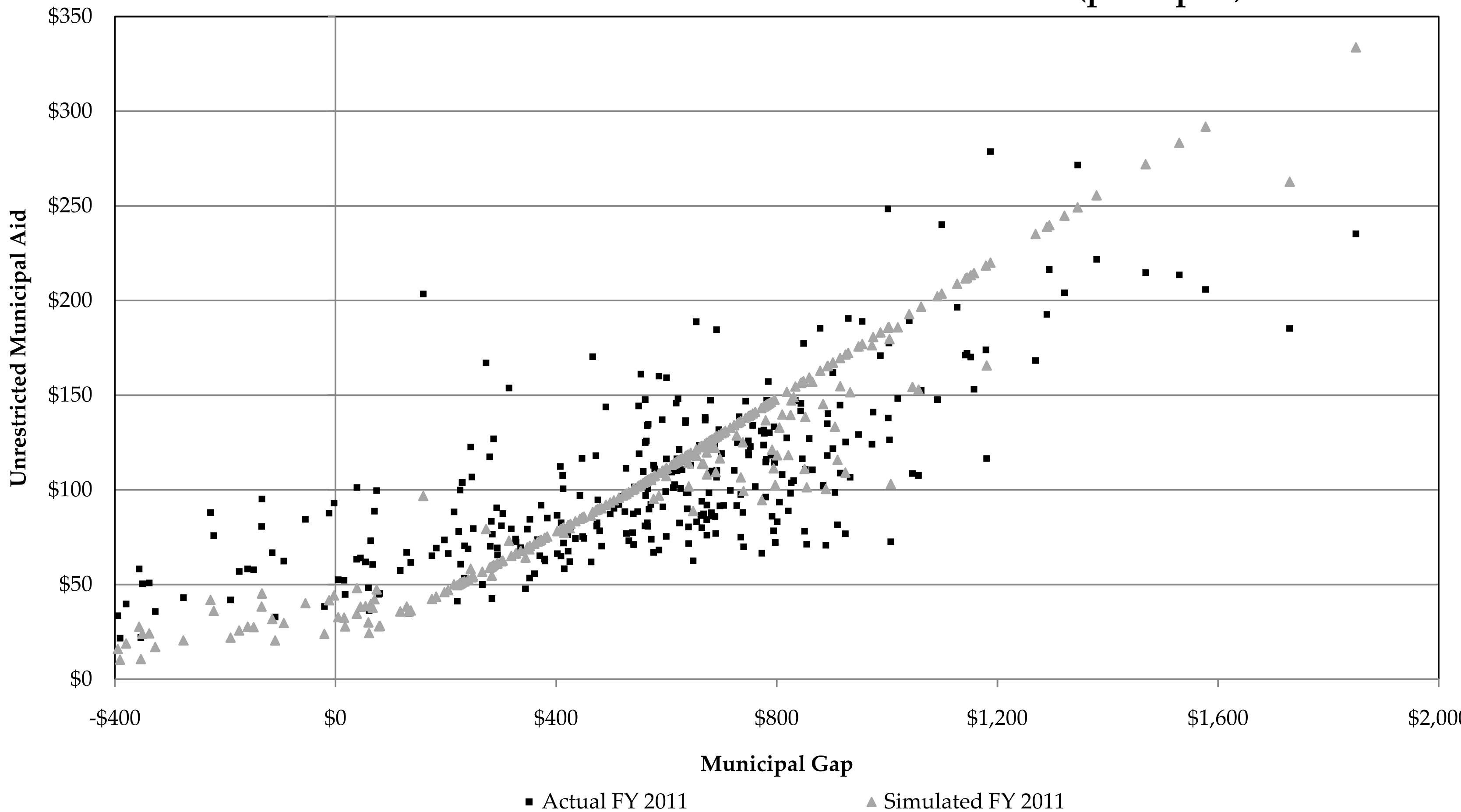
Note: For simplicity, we assume that each community in this example receives a $1 per capita aid payment in the previous year. The baseline gap is represented by G*.

Figure 3. Comparing municipal aid with municipal gaps in Massachusetts (FY 2008, per capita)



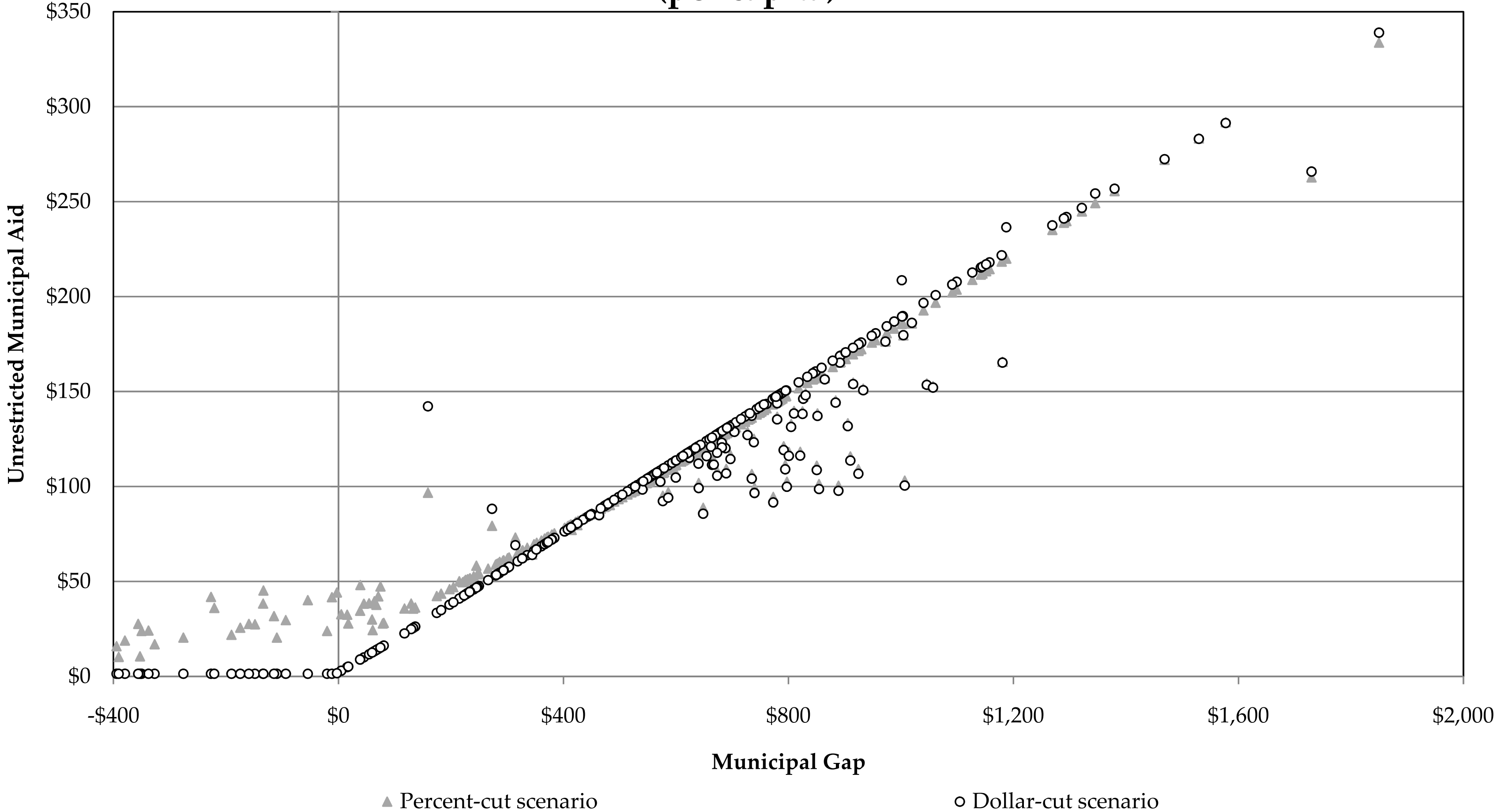
Note: To show the general pattern more clearly, 40 communities with a per capita gap below -$400 have been omitted. The gray line is created from the population-weighted regression of unrestricted municipal aid on the municipal gap over all 351 cities and towns.

Figure 4. Comparing simulated aid distribution under the percent-cut scenario with actual aid distribution in Massachusetts in FY 2011 (per capita)



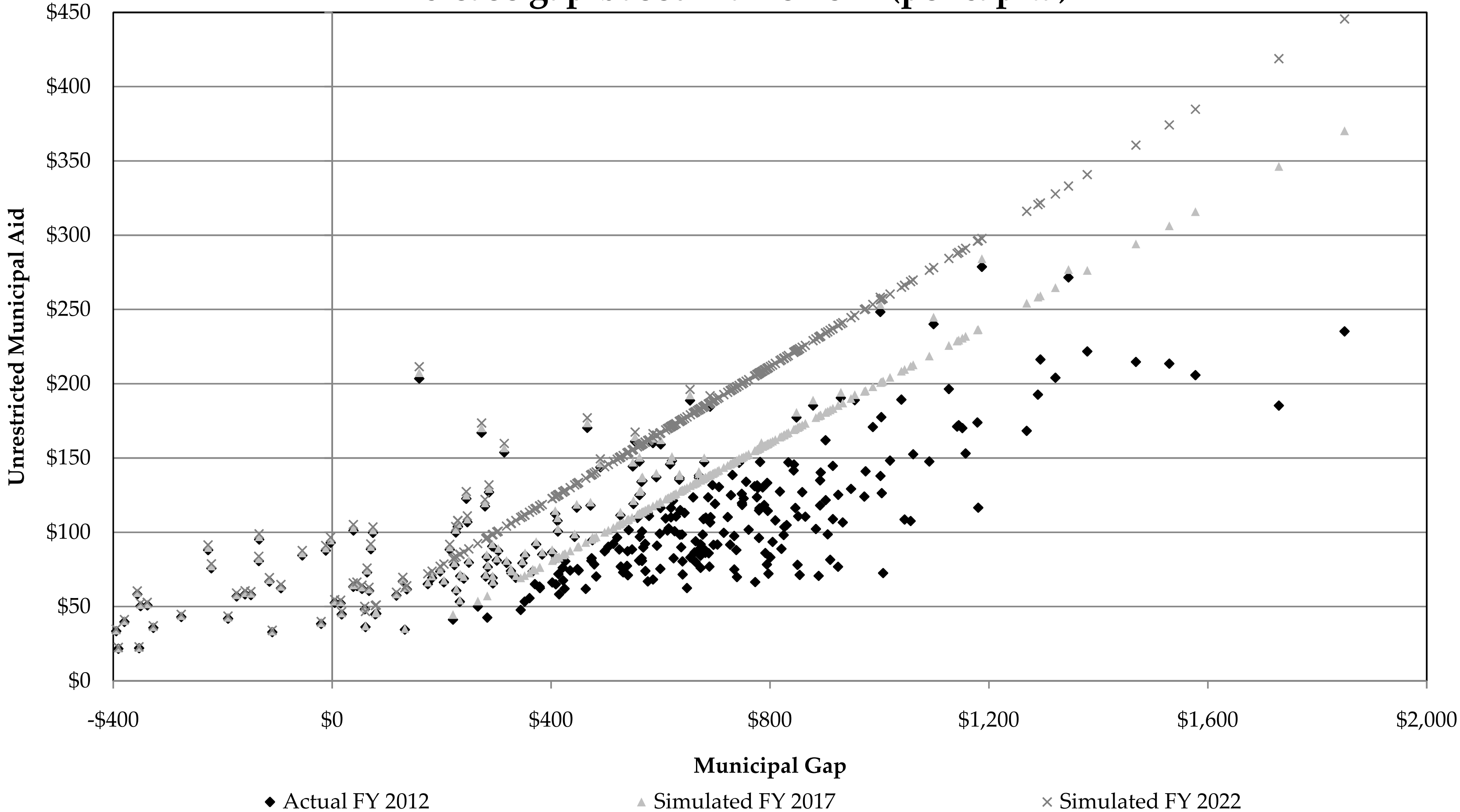
Note: To show the general pattern more clearly, 40 communities with a per capita gap below -$400 have been omitted.

Figure 5. Comparing simulated FY 2011 aid distributions in Massachusetts (per capita)



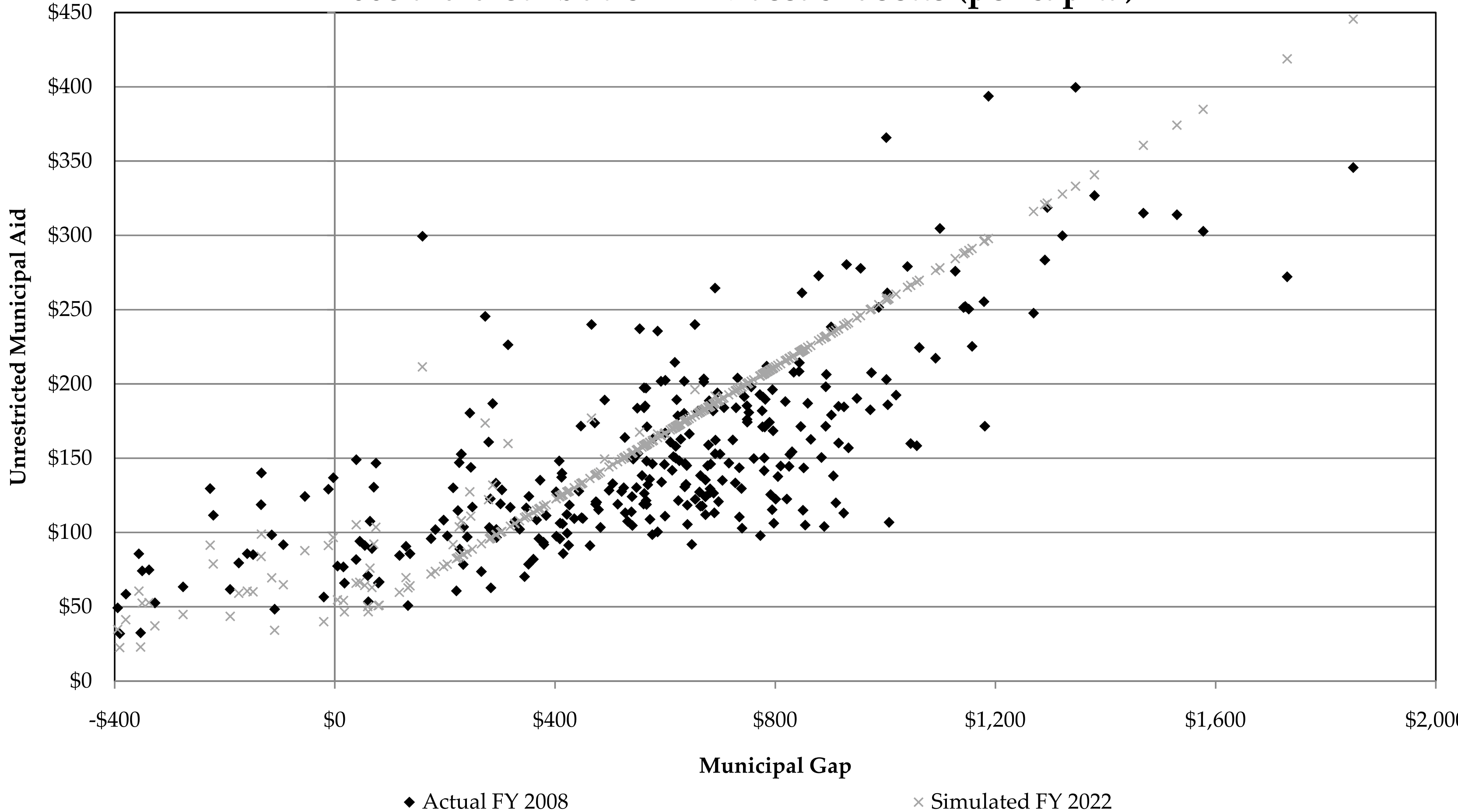
Note: To show the general pattern more clearly, 40 communities with a per capita gap below -$400 have been omitted. The percent-cut and dollar-cut scenarios display the aid distribution after corresponding gap-based aid cuts in FY 2009 through FY 2011.

Figure 6. Simulating aid increases in Massachusetts using the percent-increase gap-based framework (per capita)



Note: To show the general pattern more clearly, 40 communities with a per capita gap below -$400 have been omitted.

Figure 7. Comparing simulated FY 2022 aid distribution with actual FY 2008 aid distribution in Massachusetts (per capita)



Note: To show the general pattern more clearly, 40 communities with a per capita gap below -$400 have been omitted.

Table 1. Average percentage of aid cut in Massachusetts
from FY 2008 to FY 2011 by quintile of the gap distribution
(quintile 5 = largest gaps)

	Actual cuts	Percent-cut scenario	Dollar-cut scenario
Statewide	31.6	31.6	31.6
Quintile 1	31.9	66.1	97.0
Quintile 2	31.5	46.7	52.0
Quintile 3	30.5	30.6	29.9
Quintile 4	31.1	20.6	20.0
Quintile 5	31.8	23.6	21.5

Note: Averages are population-weighted.

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