Measuring and Modeling Determinants of Fiscal Stress in US Municipalities

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Abstract

The Great Recession produced a wave of fiscal crises in cities and counties throughout the United States. In addition to high-profile bankruptcy filings in Detroit, Michigan, and Harrisburg, Pennsylvania, many local governments declared fiscal emergencies, cut spending, and laid off or furloughed workers. Yet some municipalities weathered the recession without such actions. In this paper, we explore the factors that help predict the likelihood of local fiscal distress. We construct a measure of fiscal distress using annual financial reports, budgets, and media coverage, and we then use this measure as a dependent variable to model fiscal distress as a function of past financial performance, real estate prices, and socioeconomic environment. This work adds to the existing literature in several ways. First, the proposed measure of fiscal distress is based on government actions and therefore has greater external validity than measures based on financial indicators. Second, we add to the literature that goes beyond the measurement of fiscal distress and focuses on its prediction. Finally, we offer policy-relevant conclusions by showing the relative importance of fiscal reserves, revenue composition, and real estate pricing in predicting local fiscal distress.

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Measuring and Modeling Determinants of Fiscal Stress in US Municipalities

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Introduction

In the past decade, a wave of fiscal crises has hit cities and counties throughout the United States. In California, Vallejo, Stockton, and San Bernardino have filed for bankruptcy. Michigan has declared financial emergencies in Detroit, Flint, and several smaller cities (Convery and Imdieke 2015; Scorsone 2014). Like Michigan, Pennsylvania has stepped in to manage financial crises in a number of cities and boroughs, including Scranton, Altoona, and Harrisburg. In addition to these exceptional cases of fiscal distress, the 2007–09 recession negatively affected many other cities and counties (Hoene and Pagano 2009), forcing some of them to declare fiscal emergencies, default on debt, or lay off and furlough workers. In this paper, we propose an evidence-based measure of fiscal distress and examine which of the theoretically relevant factors can be used to effectively predict fiscal distress before it hits crisis stage.

Background

The attention to local government fiscal condition and fiscal distress is not new. Scholars and practitioners have been trying to resolve measurement and prediction questions related to government fiscal condition for decades. Ever since the near-meltdown of New York's finances in the 1970s, public finance researchers, governments, and professional organizations have sought to provide analytical tools for measuring fiscal condition to prevent a repeat. A pioneer in this area was the Advisory Commission on Intergovernmental Relations (ACIR), which produced a series of studies focusing on state and local government fiscal capacity throughout the 1970s and 1980s (ACIR 1971, 1979, 1981, 1988, 1989). In the 1980s, work by Levine,

Rubin, and Wolohojian (1981), Rubin (1982), Berne and Schramm (1986), Groves and Valente (1986), Pammer (1990), and others laid out comprehensive theoretical frameworks for examining local fiscal condition and developed a broad theoretical understanding of various dimensions of government fiscal health. By the 1990s, academic interest in fiscal health slightly waned, as evidenced by the lower number of publications during the decade. Some of these publications, however, became highly influential, including the second edition of "Evaluating Financial Condition: A Handbook for Local Government" by Groves and Valente (1994), also known as the financial trends monitoring system (FTMS). Interest in local government fiscal health recovered after 2000. By 2003, the International City/County Managers Association's (ICMA) FTMS was in its fourth edition (Nollenberger, Groves, and Valente 2003).

Since the 1990s, with the exception of ICMA's FTMS, most innovative empirical research on fiscal condition has appeared in journals or edited volumes (e.g., Brown 1993; Chaney, Mead, and Schermann 2002; Hendrick 2004; Chaney 2005; Kloha, Weissert, and Kleine 2005; Frank 2006; Mead 2006; Kravchuk and Stone 2010; Rivenbark, Roenigk, and Allison 2010; Clark 2015). In 2013, the diversity of approaches to the analysis and management of fiscal condition was reflected in the *Handbook of Local Government Fiscal Health*, edited by Levine, Justice, and Scorsone (2013), which brought together a cohort of leading fiscal health researchers. The edited volume demonstrates that while there is some agreement on fiscal health as a theoretical concept, there is still little consensus on how to measure, predict, and manage a decline in fiscal health (Justice and Scorsone 2013). Importantly, empirically based studies that would test the external validity of the proposed measures of fiscal health are particularly lacking, although some of this work has been started by Clark (2015) and Stone et al. (2015).

Often guided by academic research, a number of states have adopted fiscal condition monitoring systems for their local governments over the past two decades, including New York (Office of the State Comptroller 2015), North Carolina (Coe 2007), Michigan (Kloha, Weissert, and Kleine 2005; Crosby and Robbins 2013), Ohio (Clark 2015), and Pennsylvania (Pennsylvania Department of Community and Economic Development 2011). The fiscal condition monitoring system proposed by Kloha et al. (2005), a blueprint for the Michigan state monitoring system, is an example of a relatively efficient fiscal health assessment for a large number of communities. It is based on the analysis of population changes, trends in real taxable property values, general fund expenditures, general fund operating position, and general long-term debt. Though the system does provide a useful assessment of the relative fiscal health of Michigan communities, the efficiency of the system comes at the expense of its accuracy. Since it uses absolute benchmarks to create binary scores (0 or 1) for various indicators of a government's performance which it then sums into a cumulative score, the system is prone to measurement error (Crosby and Robbins 2013). Besides, like its predecessor, Brown's 10-point test of municipal financial condition (Brown 1993), the Kloha et al. system focuses on municipalities' general fund, excludes enterprise funds, and ignores such long-term liabilities as pension obligations and other post-employment benefits (Crosby and Robbins 2013; Justice and Scorsone 2013; Plerhoples and Scorsone 2011).

We build on the existing body of literature to select indicators of fiscal distress that would effectively capture key measurable dimensions of local fiscal health. In contrast to the dominant empirical literature, we determine the fiscal distress status of a government based on its behavior, which often manifests as politically difficult fiscal decisions to address fiscal distress. In this respect, we offer an alternative approach to conducting empirical research on the

prediction of fiscal distress. The "behavioral" measure of fiscal distress becomes our dependent variable, and the fiscal and socioeconomic indicators work as predictors.

The structure of this paper is as follows. The next section offers an overview of the literature that guided us toward the choice of fiscal health predictors. We then present the *Conceptual Framework* used in this study. The *Data and Method* section describes the dependent variable, the independent variables, and the empirical models. In *Results*, we present and interpret the findings. The *Discussion and Conclusion* section highlights the paper's implications for the theory of fiscal health research and offers two suggestions for the practice of fiscal management.

Literature Overview

What Is Fiscal Condition?

Fiscal condition is typically understood as a position on a spectrum of financial "wellness" commonly referred to as fiscal health. Many local government researchers agree that "[a] host of factors affect local government finances, and no single metric is able to fully account for the various components of financial condition" (Jacob and Hendrick 2013, 11). It is often suggested that fiscal condition is shaped by local decisions and the external environment (Honadle, Costa, and Cigler 2004; Hendrick 2011; Nollenberger, Groves, and Valente 2003). As a result, an analysis of local fiscal condition or fiscal health often involves an analysis of the government's environment, its fiscal structure, and the balance of fiscal structure with the environment (Hendrick 2004, 2011). From this perspective, the key to fiscal health is to adapt fiscal decisions to the environment (Hendrick 2011). The environment may be viewed broadly and may include a variety of factors, from immediate economic resources to political culture (Clark and Ferguson

1983). Conceptually, whenever fiscal decisions and available resources are misaligned, a government experiences fiscal stress (Chapman 2008).

Fiscal Condition Metrics

Perhaps the most comprehensive practitioner-oriented framework for fiscal condition monitoring was developed by the ICMA (Groves and Valente 1983, 1994; Nollenberger, Groves, and Valente 2003). The FTMS framework distinguishes among three types of factors that influence fiscal health: environmental, organizational, and financial. Environmental factors consist of those over which the community has little or no control: the external economy, intergovernmental constraints, community socioeconomic characteristics, disaster risk, and political culture. Organizational factors involve government practices and policies and largely remain a black box in the framework. Financial factors are the outcomes of organizational decisions with regard to available environmental resources and opportunities. Financial factors manifest as measures of revenues, expenditures, operating position, long-term liabilities, and asset maintenance. The environmental factors are predicted to affect government practices and policies, which in turn are predicted to affect the entity's financial condition.

The ICMA framework offers 48 potentially useful indicators of fiscal condition that characterize four dimensions of local fiscal condition: cash solvency, budgetary solvency, long-term solvency, and service solvency. Since local financial arrangements vary, the ICMA framework suggests that governments should choose the metrics they deem important and track them over time. Then, based on the direction of the trends, communities can determine whether their financial condition is improving, declining, or staying the same. There is no benchmarking relative to other entities and—given the complexity and breadth of the measures—no expectation

that a community will be able to monitor each of the identified metrics. This, of course, means

that there is a lack of consistency in the use of metrics across communities.

Figure 1: ICMA Fiscal Condition Monitoring System
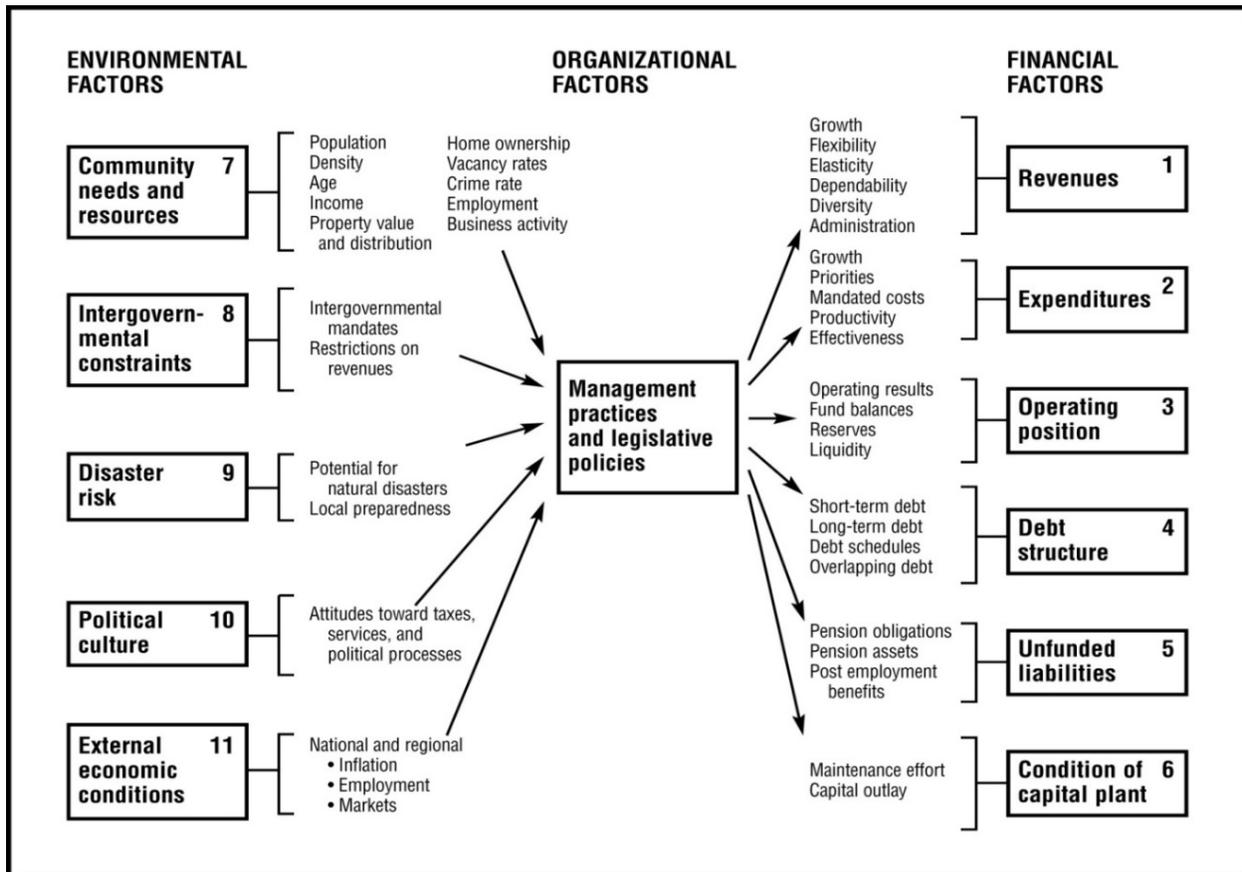
Source: K. Nollenberger, S. M. Groves, and M. G. Valente, *Evaluating Financial Condition: A Handbook for Local Government*, 4th ed. (Washington, DC: International City/County Management Association, 2003), 5. Reproduced with the permission of the ICMA.

Academic approaches to measuring fiscal condition are extensive—there are as many

empirical fiscal condition metrics as there are studies. That being said, fiscal condition seems to

be generally accepted as the ability of a government to meet its obligations. This conceptual

definition is consistent with the definitions of fiscal health by Hendrick (2004) as the "ability of

government to meet its financial and service obligations" (79), and by Berne and Schramm

(1986) as "the probability that a government will meet its financial obligations" (71). This study uses the notions of fiscal health and fiscal condition synonymously.

The empirical frameworks of fiscal condition tend to incorporate measures of revenues and expenditures, operating position, and fiscal flexibility (Berne and Schramm 1986; Hendrick 2004; Kloha, Weissert, and Kleine 2005). Measures of revenue and expenditure capacity have also received attention. For example, some scholars have combined revenue capacity and spending needs to create a measure of "need-capacity gap" (Ladd and Yinger 1989) or "standardized fiscal health" (Chernick and Reschovsky 2006; Skidmore and Scorsone 2010). Hendrick (2004) measured revenue capacity as own-source revenues relative to city wealth (tax base, personal income, and sales receipts). Maher and Nollenberger (2009) created a proxy for revenue capacity using general-fund revenues per capita, intergovernmental revenues as a percentage of total revenues, and own-source tax revenues as a percentage of general-fund revenues.

Financial Reporting Effects

As the measurement of fiscal condition has evolved, so has financial reporting. The most important change in financial reporting was GASB 34, which was adopted in 1999 and required governments to produce accrual-based government-wide financial statements. Chaney (2005) and Chaney, Mead, and Schermann (2002) offered some of the first fiscal condition metrics based on government-wide statements. This work was followed by Wang, Dennis, and Tu (2007), who assessed the validity of government-wide ratios; Rivenbark, Roenigk, and Allison (2010), who offered a practical approach for local officials to collect data and explain financial condition using government-wide ratios; and Arnett (2012), whose dissertation focused on state-level financial condition analysis using government-wide statements. The purpose of the

measures using government-wide statements remained the same—to capture changes in four commonly identified dimensions of fiscal health: cash solvency, budgetary solvency, long-run solvency, and service-level solvency. The benefits of government-wide statements over fund statements include an opportunity to capture long-term liabilities such as pension obligations and an opportunity to uniformly report on government assets and liabilities beyond the general fund (Mead 2013). More recent fiscal condition ratios include a combination of fund and government-wide statements (Mead 2013; Maher 2013). Despite efforts to demonstrate the validity of the ratios based on government-wide statements (particularly by Wang, Dennis, and Tu 2007), government-wide measures have recently been challenged by Clark (2015).

Evaluating Fiscal Condition

In addition to a variety of possible indicators of fiscal condition, several approaches have been developed to combine the indicators into a single measure of fiscal condition. Brown (1993) offered a cumulative score of fiscal condition based on a community's quartile ranking on each of the 10 indicators. Kloha, Weissert, and Kleine (2005) came up with relative benchmarks for each indicator, assigned the score of 1 to governments that met a benchmark and 0 otherwise, and then summed the scores for each indicator into a single aggregate score. Mead (2006) revised Brown's test to include indicators of pension funding. Yet Hendrick (2004) asserted that fiscal health is too complicated to combine into one single score and that "measures of [different] dimensions should be constructed separately and assessed in relation to one another to produce a complete and more accurate picture of fiscal conditions" (85). In this respect, rating agency credit ratings offer a compromise between a single score and a vast variety of indictors. A credit rating consolidates all relevant information about a government into a single metric, while

allowing for a categorical differentiation of fiscal conditions through rating grades. Importantly, when credit rating agency analysts construct a rating, they analyze both quantitative and qualitative information. However, since the investor community takes changes in government credit ratings seriously, changes in rating tend to be made conservatively (when a critical mass of evidence is collected) and may lag behind an actual change in fiscal condition.

Where Are We Now?

Despite the extent of the academic and professional literature and the increasingly widespread use of metrics of fiscal condition in modern management practices (for a review, see Stone et al. 2015), fiscal condition measurement issues are yet to be resolved, and empirical methodologies for predicting fiscal distress are yet to be perfected. Importantly, there is a growing understanding that indicators of fiscal condition need to be validated against some objective reality of whether a government is experiencing fiscal prosperity or distress (Clark 2015; Stone et al. 2015). Clark offers a full-fledged criticism of research that relies on a single composite indicator or arbitrarily picks indicators as measures of fiscal condition. Following Rivenbark, Roenigk, and Allison (2010), Clark (2015) recognizes that "aggregate scores may hide a particular area of weakness shown by an individual indicator" (73) and that some indicators may not be valid measures of fiscal condition when compared against actual government performance. Echoing Clark's concerns, Stone et al. (2015) attempt to validate existing metrics of financial condition by focusing on a single case study of Detroit. They offer a descriptive analysis of a variety of Detroit's fiscal indicators over a decade, including the indicators proposed by Kloha, Weissert, and Kleine (2005). The authors view the city's bankruptcy as an unequivocal expression of a poor fiscal condition and show that asset and liability ratios,

operating solvency, and business-type activity ratios are the most useful predictors of its distress. Because a single case study cannot be generalized, more empirical work is needed to validate existing indicators of financial condition against actual government performance and to identify indicators that can be used as predictors of fiscal crises.

Conceptual Framework

This study scales up and further develops the empirically based approach to the analysis of predictors of fiscal distress pioneered by Stone et al. (2015). We work with a sample of close to 300 city and county governments over the period from 2007 to 2012. First, we propose a new measure of fiscal distress based on the information from Comprehensive Annual Financial Reports (CAFRs), local budgets, and news media. We then explore which of the theoretically plausible fiscal and socioeconomic indicators act as statistically significant predictors of fiscal distress.

This paper defines fiscal distress as the condition of local finances in which the government cannot provide public services and meet its own operating needs to the extent that it previously did. To create the dependent variable, we draw from the literature on strategies that governments use to address fiscal distress. Building on the works by Levine, Rubin, and Wolohojian (1981) and Hendrick (2011), who propose typologies of such strategies, we compiled a list of actions that we view as indicators of fiscal distress. Then, if a CAFR, budget, or news source revealed that a government took one of the listed actions in a given fiscal year, we designated that government as fiscally distressed. Though many governments provide meaningful insight into what happened during the fiscal year in their CAFRs and budgets, some governments provide only a pro forma "Management and Discussion" section in their CAFRs and sketchy descriptions in their budgets. For example, a city or county may lay off or furlough

workers without it being mentioned in the CAFR or the budget. Therefore, we supplemented the analysis of CAFRs and budgets with web news content analysis, and we ran Google queries on each city and county for each year of analysis where we included the name of the government and keywords for actions associated with fiscal distress. Based on the query results, we examined the news media coverage to determine if a government was fiscally distressed. As a result, a city or county that (for example) did not mention layoffs or furloughs in its CAFR or budget is coded as fiscally distressed if it received media coverage that any of these actions did, in fact, occur.[1] A comprehensive listing of the actions that signal fiscal distress is provided in the *Data and Method* section and includes personnel layoffs, furloughs, and failures to make full pension contributions or payments to vendors. Just like Detroit's bankruptcy, used as a measure of distress by Stone et al. (2015), our measure of fiscal distress is characterized by high external validity because it reflects actual government behavior that attempts to address fiscal distress.

To select independent variables that would gauge key dimensions of government fiscal health, we build on the ICMA analytical framework (Nollenberger, Groves, and Valente 2003). In defining financial condition, the ICMA distinguishes among four dimensions of fiscal health: cash solvency, budgetary solvency, long-term solvency, and service-level solvency. Cash solvency suggests that a government has enough liquidity to meet its short-term obligations. Budgetary solvency means that a government can draw on sufficient revenues to cover its expenses on an annual basis and maintain a balance between its revenues and expenditures. Long-term solvency is present when a government can successfully meet its obligations over the long term. And service-level solvency suggests that a government is able to provide the level and quality of services desired by the local community. Our models include measures of cash

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[1] See Hendrick (2011) for another example of using local media sources to capture local fiscal actions during periods of distress.

solvency, budgetary solvency, and long-term solvency, which are detailed in the *Data and Method* section. We exclude service-level solvency because it tends to be compromised every time the government experiences fiscal distress, as we define it. In addition, service-level solvency would be particularly difficult to measure empirically (Ladd and Yinger 1989).

Besides solvency, our models include measures of revenue structure, government type, size, and local economic indicators. Revenue structure may be an important determinant of fiscal health because of its effects on revenue collections. Governments with diversified revenues may have higher revenue collections in times of economic growth but also higher revenue volatility in economic recessions (Carroll 2009; Oates 1988; Yan 2011). Though the net effect of revenue diversification on fiscal distress is difficult to predict, we posit that an increase in revenue volatility that is associated with diversification is likely to affect fiscal health negatively. Revenue volatility increases uncertainty of revenue collections and increases the probability of misalignment between fiscal decisions and available resources.

Based on the above conceptualizations, our empirical model is as follows:

$$Fiscal\ Distress_{it} = \beta_0 + \beta_{1-2}Cash\ Solvency_{it} + \beta_{3-4}Budgetary\ Solvency_{it} +$$
$$\beta_{4-5}Long-term\ Solvency_{it} + \beta_6 Revenue\ Structure_{it} + \beta_{7-9}Local\ Economy_{it} +$$
$$\beta_{10-11}Government\ type\ and\ size_{it} + \beta_{12-14}\ State\ effects_s + \beta_{15-20}Year\ effects_t + \varepsilon_{it},$$

where *Fiscal Distress* is a dichotomous measure. To capture *Cash Solvency,* we use the quick ratio and general fund balance. For *Budgetary Solvency,* we use the operating ratio and total local revenues per capita. We do not include a measure of solvency for business-type activities because many governments in the sample do not run business-type activities. In addition, these

operations are typically self-funding and are unlikely to cause fiscal distress for a general government. *Long-term Solvency* is measured as the level of debt and annual contributions to the pension plans. *Revenue Structure* captures a share of own-source revenues coming from the property tax. The models also control for government type and size and for local economic factors such as the change in income, the change in housing prices, and the change in population. To study the determinants of fiscal distress, we run binary logistic regression models with state and year fixed effects. Since the observation period is only six years and the sample of governments is relatively small, we focus on the models with heteroscedasticity-robust standard errors clustered by city or county. We prefer these models to government fixed-effect models that would involve the loss of multiple degrees of freedom and statistical power.

Data and Method

The variables for the analysis come from the following data sources: Comprehensive Annual Financial Reports, budgets, news coverage, the US Census Bureau Annual Survey of Government Finances, and Zillow, an online real-estate database company. Initially, we collected CAFR data for 300 city and county governments from California, Pennsylvania, and Michigan over the years 2007–2012, producing a panel of 1,800 observations. The sample decreased to 1,767 observations after it was merged with the data from the US Census Bureau Annual Survey of Government Finances. Our concern at the beginning of the project was that we might not find enough cases of fiscal distress to run statistical models. We therefore selected three states known for having high-profile cases of municipal fiscal distress (Stockton, California; San Bernardino, California; Detroit, Michigan; Flint, Michigan; Harrisburg, Pennsylvania; and Scranton, Pennsylvania).

As mentioned previously, we created the dependent variable through the analysis of comprehensive annual financial reports, budgets, and news coverage. We operationalized fiscal distress as actions, often disruptive and politically unpopular, that a government takes because it is unable to meet its fundamental operating needs and service requirements. We coded a government as fiscally distressed in a given year if its financial management was characterized by at least one of the following: a blanket prohibition of overtime, a blanket reduction of employee salaries, personnel furloughs or layoffs, deferral of payments to vendors and other payees, large across-the-board budget cuts or cuts in key services, budget enactment later than two months after the beginning of the fiscal year, pension contributions less than 75 percent of annual required contributions, unusually large interfund transfers, unusual tax rate or fee increases, declaration of fiscal emergency, default on municipal debt, credit rating downgrade, bankruptcy, auditor doubts that the entity may continue to be a "going concern," or a takeover by the state or significant state financial assistance (bailout). Table 1 provides frequencies of the episodes of fiscal distress by state.

The explanatory variables are measured and scaled as follows:

- *Cash solvency*. The quick ratio consists of cash and cash equivalents divided by current liabilities. The general fund balance is measured as a percentage of total general fund expenditures.

- *Budgetary solvency.* The operating ratio is the ratio of total governmental funds revenues to total governmental funds expenditures, expressed as a percentage. Total revenues per capita are measured in thousands of dollars and adjusted for inflation using the Consumer Price Index with 2012 as the base year.

- *Long-term solvency.* To measure local debt burden, we use total debt as a percentage of total revenues and annual required pension contributions as a percentage of total revenues.

- *Revenue structure.* We measure revenue structure as a percentage of total own-source revenue coming from the property tax.

Table 1. Frequency of Fiscal Distress Episodes by State in the 2007–2012 Period

Episode type	CA	MI	PA	Total
Blanket prohibition of overtime	1	0	0	1
Blanket reduction in employee salaries	79	3	2	84
Considerable layoffs or furloughs	7	13	4	24
Deferred capital projects	9	1	0	10
Deferred payments to vendors and other payees	2	0	4	6
Large across-the-board budget cuts, cuts in services	256	50	6	312
Late budget enactment (> 2 months after FY began)	2	3	0	5
Pension contributions less than 75% of annual required contributions	0	5	9	14
Unusually large interfund transfers	15	2	5	22
Unusual tax rate or fee increases	21	14	33	68
Declaration of fiscal emergency	7	0	2	9
Default on municipal debt, credit rating downgrade	2	2	2	6
Bankruptcy or auditor "going concern" doubts	1	0	1	2
Takeover by the state or state financial bailout	0	1	0	0
Number of episodes	402	94	68	564
Total number of government-years	1,198	281	288	1,767

Note: Data were collected by the authors from CAFRs, budgets, and news media.

The control variables were measured as follows. Changes in population, income, and home prices are expressed as annual percent change. Besides modeling the effects of population changes, the study also controls for the effects of government type and size. Counties are coded to be different from cities. Governments with population less than 50,000 are coded as small; governments with population between 50,000 and 150,000 are coded as medium; and governments with population over 150,000 are coded as large.

Results

Descriptive Statistics

Table 2 presents the descriptive statistics and data sources for each variable. The dependent

variable suggests that 32 percent of the sample experienced fiscal distress between 2007 and 2012.

The average general fund balance was 46 percent of the general fund expenditures, and it ranged

from a negative 126 percent to a positive 219 percent, with a standard deviation of 41 percent.

The average operating ratio was 96 percent, with a range of 55–134 percent and with a

standard deviation of 9.94 percent. The proximity of the average operating ratio to 100

percent during a period of economic slowdown may reflect the effectiveness of local

balanced-budget requirements.

The average total revenue per capita was $1,665, with a wide variation from $171 to

$6,685 and a standard deviation of $994. The average debt burden of a government was 96

percent of its total revenues, ranging from 0.48 percent to 484 percent with a standard deviation

of 66 percent. The average annual required contribution to pension plans amounted to 6.63

percent of total revenues, ranging from zero to 28 percent with a standard deviation of 3.99

percent. Property tax as a share of total revenue averaged 25 percent, ranging from 2.54 percent

to 58 percent with a standard deviation of 9.20 percent. The average population change in a

given year was less than one percent but ranged from -6.92 percent to +9.49 percent, with a

standard deviation of 1.46 percent. Changes in housing prices for the period of analysis averaged

−6.55 percent, ranging from –41.5 to + 32.4 percent, with a standard deviation of 8.2 percent.

Table 2. Descriptive Statistics and Data Sources

Variable	Mean	SD	Min.	Max.	Source
Fiscal distress (dichotomous)	31.91	—	0	1	CAFR
Year					
2007 (%)	16.85	—	0	1	—
2008 (%)	16.79	—	0	1	—
2009 (%)	16.62	—	0	1	—
2010 (%)	16.09	—	0	1	—
2011 (%)	16.85	—	0	1	—
2012 (%)	16.79	—	0	1	—
Cash solvency					
Quick ratio (cash/current liabilities)	3.24	4.33	−0.70	54.22	CAFR
General fund balance (% of total expenditures)	45.82	40.81	−126.16	219.46	CAFR
Budgetary solvency					
Operating balance (total revenues/total expenditures as %)	95.65	9.94	55.44	133.79	Census
Total revenues per capita (in $ thousands)	1,665	994.97	171.31	6,685.27	Census
Long-term solvency					
Total debt (% of total revenues)	95.87	66.63	0.48	484.19	CAFR
ARC (% of total revenues)	6.64	3.99	0.00	28.05	CAFR
Revenue structure					
Property tax (% of own-source revenues)	25.05	9.21	2.54	58.21	Census
Socioeconomic environment					
Change in income (%)	0.02	0.03	−0.13	0.09	Census
Change in house prices (%)	−6.55	8.22	−41.52	32.37	Zillow
Change in population (%)	0.77	1.46	−6.92	9.49	Census
Government type and size					
County government	30.02	—	0	1	CAFR
Big city/county (> 150,000)	31.49	—	0	1	Census
Medium city/county (> 50,000 and < 150,000)	55.56	—	0	1	Census
Small city/county (< 50,000)	12.94	—	0	1	Census
California	67.87	—	0	1	—
Michigan	14.34	—	0	1	—
Pennsylvania	16.79	—	0	1	—
Number of governments	295				
Number of government-year observations	1,767				

Sources: US Census Bureau (2007–2012), Annual Surveys of Government Finances, http://www.census.gov/govs /local/; Zillow (2006–2012), "Zillow Home Value Data," http://www.zillow.com/research/data/; aggregate data from 300 CAFRs.

Governments with population less than 50,000 made up 12.9 percent of the sample; governments with population over 50,000 but less than 150,000 made up 55.5 percent of the sample; and the remaining 31.4 percent were governments with population over 150,000. Thirty

percent of the sample were counties. Over two-thirds of the cities and counties were in California, roughly 14 percent were in Michigan, and the remaining 16 percent were in Pennsylvania.

We considered using municipal-level fixed-effect models, but those models result in the loss of a third of the sample due to the lack of variation within a city or county in some variables. These models also involve the loss of multiple degrees of freedom and statistical power. Instead of giving up statistical power, we run models with standard errors clustered by city or county. Similar to fixed-effect models, these models address the issue of observational nonindependence across time.

Multivariate Results

Tables 3 and 4 present the parameter estimates for the odds of fiscal distress. In table 3, Model 1 includes solvency variables of interest, plus year fixed effects and state fixed effects. Model 2 of table 3 adds socioeconomic controls and measures of government type and size. Table 4 presents two models that have the same predictors as in table 3 but that lag all the time-varying predictors by one year.

As expected, all the models demonstrate the negative effects of the Great Recession on local fiscal conditions. The likelihood of a fiscal distress event is highest in 2009 and 2010. In addition to the year effects, three other strong and statistically significant predictors of fiscal distress are the general fund balance, debt obligations, and property taxes. In Model 2 of table 3, after controlling for the effects of the economic cycle, every percentage point increase in the general fund balance as a percentage of general expenditures is associated with a 1.3 percent decrease in the odds of fiscal distress. The effect is robust following the inclusion of socioeconomic controls and government type and size.

Table 3. Logistic Regression Parameter Estimates with State and Year Fixed Effects, Predicted Log Odds of Fiscal Distress

Covariate	Model 1			Model 2		
	Estimate	SE		Estimate	SE	
Intercept	−0.232	0.841		0.134	0.895	
Fiscal year						
[2007]						
2008	1.375	0.180	**	1.261	0.218	**
2009	1.804	0.198	**	1.629	0.325	**
2010	1.667	0.200	**	1.723	0.221	**
2011	1.559	0.199	**	1.660	0.214	**
2012	1.141	0.196	**	1.263	0.210	**
Cash solvency						
Quick ratio (cash/current liabilities)	−0.031	0.028		−0.044	0.029	
General fund balance (% of total expenditures)	−0.011	0.002	**	−0.013	0.002	**
Budgetary solvency						
Operating balance (total revenues/total expenditures as %)	−0.006	0.007		0.005	0.007	
Total revenues per capita (in $ thousands)	−0.164	0.000	*	−0.160	0.000	*
Long-term solvency						
Total debt (% of total revenues)	0.005	0.001	**	0.004	0.002	**
ARC (% of total revenues)	0.001	0.025		−0.022	0.027	
Revenue structure						
Property tax (% of own-source revenues)	−0.024	0.010	*	−0.032	0.010	**
Socioeconomic environment						
Change in income (%)				−0.019	0.330	
Change in housing prices (%)				−0.010	0.011	
Change in population (%)				−0.004	0.027	
Government type and size						
County				−0.396	0.272	
[Big city/county (> 150,000)]						
Medium city/county (> 50,000 and < 150,000)				0.409	0.336	
Small city/county (< 50,000)				0.567	0.325	*
California	0.123	0.224		0.083	0.228	
[Michigan]						
Pennsylvania	−0.289	0.259		−0.153	0.261	
Number of government-years	1,767			1,767		
Model chi-square | −2 log likelihood	156 | −1,053			159 | −1,043		

Notes: Reference categories are in brackets. Robust standard errors are clustered by city or county. Significance levels are as follows: ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

Source: Calculations are by the authors.

In contrast, one percentage point increase in debt-to-revenue ratio increases the odds of distress by 0.4 percent. Model 2 also suggests that a percentage point increase in the government

reliance on property tax is associated with a 3.2 percent decrease in the odds of fiscal distress, controlling for the effects of time and other predictors. In addition, the models in table 3 show a statistically significant negative effect of total revenue per capita on fiscal distress. The effect, however, is significant only at the 0.05 level and is substantively small: a thousand-dollar increase in total revenue per capita reduces the odds of fiscal distress by only 16 percent.

Table 4 offers models with predictors lagged by one year. The key predictor variables remain statistically significant, and the magnitudes change only slightly. In addition to these effects, the models show a statistically significant effect of changes in home prices on the likelihood of fiscal distress. A percentage point increase in home prices decreases the odds of fiscal distress by 3.5 percent in the following year.

The effects of most other predictor variables are noteworthy even though they do not reach the level of statistical significance. As expected, the quick ratio and the operating ratio reduce the odds of distress. Increases in population and income affect fiscal distress negatively. Controlling for other factors, counties and large governments are less likely to experience fiscal distress than cities and smaller governments.

Table 4. Logistic Regression Parameter Estimates with State and Year Fixed Effects, Predicted Log Odds of Fiscal Distress, with Explanatory Variables Lagged by One Year

Covariate	Model 1			Model 2		
	Estimate	SE		Estimate	SE	
Intercept	−0.921	0.978		−0.711	1.072	
Fiscal year						
[2008]						
2009	0.654	0.168	**	0.652	0.173	**
2010	0.429	0.182	*	0.320	0.188	+
2011	0.319	0.194		0.245	0.198	
Cash solvency						
Quick ratio (cash/current liabilities)	−0.028	0.028		−0.041	0.029	
General fund balance (% of total expenditure)	−0.008	0.003	**	-0.010	0.003	**
Budgetary solvency						
Operating balance (total revenues/total expenditures as %)	0.014	0.009	+	0.012	0.009	
Total revenues per capita (in $ thousands)	−0.204	0.095	*	−0.186	0.101	+
Long-term solvency						
Total debt (% of total revenues)	0.007	0.001	**	0.005	0.002	**
ARC (% of total revenues)	0.016	0.028		0.004	0.030	
Revenue structure						
Property tax (% of own-source revenues)	−0.031	0.013	**	−0.036	0.013	**
Socioeconomic environment						
Change in income (%)				−0.694	1.877	
Change in housing prices (%)				−0.033	0.011	**
Change in population (%)				−0.069	0.044	
Government type and size						
County				−0.333	0.314	
[Big city/county (> 150,000)]						
Medium city/county (> 50,000 and < 150,000)				0.240	0.247	
Small city/county (< 50,000)				0.513	0.386	
California	0.029	0.252		0.076	0.259	
[Michigan]						
Pennsylvania	−0.518	0.293	+	−0.164	0.311	
Number of government-years	883			883		
Model chi-square	−2 log likelihood	59	−563			73	−551		

Notes: Reference categories are in brackets. Robust standard errors are clustered by city or county. Significance levels are as follows: ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

Source: Calculations are by the authors.

Discussion and Conclusion

As stated earlier, 32 percent of the communities across the three states in our sample experienced fiscal distress, which, on its own, sheds light on the magnitude of the 2007–2009 recession. Understanding the determinants of those incidents has been the focus of a number of scholars for more than 40 years. This study has taken a novel approach to the measurement and prediction of fiscal condition. Rather than trying to define fiscal stress through a set of fiscal and environmental indicators (e.g., Brown 1993; Kloha, Weissert, and Kleine 2005; Mead 2006), we identified local fiscal distress based on the analysis of governmental actions that indicated difficulties in maintaining a healthy fiscal path. We then tested theoretically grounded parsimonious models to best predict the incidents of fiscal distress.

While not offering the explanatory power we would have preferred (pseudo R^2 range from 0.05 to 0.12), our models do offer insights into factors that are associated with fiscal distress in communities. We conclude that a reduction in the level of local fiscal reserves is a strong predictor of fiscal trouble and that an increase in debt as a share of total revenue increases the odds of fiscal distress. The findings, while not novel, highlight the importance of basic budgeting principles and should generate policy conversations at the local level about the appropriate size of fund balance and appropriate debt levels.

Importantly, local reliance on property tax revenues is negatively associated with fiscal distress. This finding suggests that communities that are relatively more reliant on non–property tax revenues expose themselves to a higher likelihood of fiscal distress in a recession than governments that are more reliant on the property tax. Interestingly, due to its unique nature—the housing bubble and burst—the 2007–2009 recession had dramatic effects on property taxes. The models show that local governments reliant on property taxes managed to weather the recession

better than governments reliant on other revenue sources. Importantly, given the lagged effects of the recession on property assessment values, decreases in property tax collection happened only after the recession had passed. By the time property assessments caught up with the declines in home market values, local sales taxes as well as fees and charges, which had been hit hard by economic contraction, had already begun to rebound. Even though the regression results caution governments against a heavy reliance on income-elastic revenue sources, governments need not necessarily scale down their revenue diversification strategies. Instead, after recognizing the risk that diversification poses to local fiscal health over the economic cycle, local officials could look for ways to guard against this additional risk—for example, by holding higher fiscal reserves or by arranging with other governments or the private sector for quick access to cash in a recessionary period.

We present additional models in table 5. Before running the models, we conducted diagnostics of all independent variables to make sure that their distributions were appropriate for running the models. We tried removing outliers and using logarithms for all the variables with non-normal distributions as part of the robustness testing. The results did not change much, and we decided to keep the independent variables consistent. All of them are expressed as percentages.

Table 5. Robustness Checks of the Models Presented in Table 3: Logistic Regression Parameter Estimates with State and Year Fixed Effects, Predicted Log Odds of Fiscal Distress

Covariate	Model 1 Estimate	SE		Model 2 Estimate	SE		Model 3 Estimate	SE		Model 4 Estimate	SE	
Intercept	−1.257	0.248	**	0.692	0.740		−0.878	0.780		−0.232	0.841	
Fiscal year												
[2007]												
2008	1.388	0.177	**	1.327	0.178	**	1.364	0.180	**	1.379	0.181	**
2009	1.850	0.191	**	1.734	0.195	**	1.773	0.197	**	1.803	0.198	**
2010	1.745	0.191	**	1.607	0.195	**	1.631	0.198	**	1.664	0.200	***
2011	1.642	0.192	**	1.564	0.194	**	1.532	0.197	**	1.563	0.199	**
2012	1.134	0.178	**	1.063	0.177	**	1.106	0.191	**	1.151	0.195	**
Cash solvency												
Quick ratio (cash/current liabilities)	−0.045	0.030		−0.044	0.030		−0.038	0.028		−0.031	0.028	
General fund balance (% of total expenditures)	−0.011	0.003	**	−0.012	0.003	**	−0.011	0.003	**	−0.101	0.003	**
Budgetary solvency												
Operating balance (total revenues/total expenditures as %)				−0.018	0.007	*	0.006	0.007		−0.006	0.007	
Total revenues per capita (in $ thousands)				−0.067	0.065		−0.115	0.062	*	−0.180	0.074	*
Long-term solvency												
Total debt (% of total revenues)							0.005	0.001	**	0.005	0.001	**
ARC (% of total revenues)							0.011	0.025		0.002	0.024	
Revenue structure												
Property tax (% of own-source revenues)										−0.022	0.011	*
Socioeconomic environment												
Change in income (%)												
Change in housing prices (%)												
Change in population (%)												
Government type and size												
County												
[Big city/county (> 150,000)]												

Medium city/county (> 50,000 and < 150,000)								
Small city/county (< 50,000)								
California	0.288	0.210	0.298	0.216	0.177	0.222	0.145	0.226
[Michigan]								
Pennsylvania	−0.116	0.256	−0.182	0.259	−0.249	0.257	−0.309	0.258
Number of government-years	1767		1767		1767		1767	
Model chi-square | −2 log likelihood	143 | −1079		146 | −1073		158 | −1057		160 | −1051	

Notes: Reference categories are in brackets. Robust standard errors are clustered by city or county. Significance levels are as follows: ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

Source: Calculations are by the authors.

In summary, our models show a relatively pronounced role of fiscal reserves, debt, and revenue structure in the prediction of local fiscal distress. This study highlights the importance of local fiscal policy that focuses on building and using adequate fiscal reserves to weather fiscal shocks. This policy is even more salient today than in previous decades because of the state-level initiatives to limit local taxing authority, especially property taxes in the vein of California's Proposition 13 and efforts to impose limits on revenue growth in the vein of Colorado's Taxpayer Bill of Rights, which by definition limit a community's ability to grow reserves. In addition, revenue diversification also calls for a responsible fiscal reserves policy because, while generally positive, it also means that governments need to be better prepared for fiscal shocks as their revenue structures become more vulnerable.

Lastly, these findings may be generalized only with caution. As previously stated, the Great Recession was unlike any other recession seen in the recent past. The housing bubble-burst resulted in a unique level of fiscal distress. Similarly, many local governments, especially in California and Michigan, were hit particularly hard during the recession for different reasons—housing bubble-burst in California and long-term fiscal distress in Michigan—meaning that the generalizability of the results to local governments throughout the United States is limited until the research can be expanded beyond these two states. Since the predictive power of individual measures of solvency and revenue structure is relatively modest, future research should consider exploring interactions between these individual measures of solvency as predictors of fiscal distress.

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