The Great Recession and Public Education

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Abstract

Our goal in this paper is to describe what happened to public education during the Great Recession and to learn what we can about how to shield schools and their students from the worst effects of any future recessions we may face. Five major themes emerge from our work. First, the impact of the Great Recession was unprecedented. Nearly 300,000 teachers and other school personnel lost their jobs. Second, we find that schools that were heavily dependent on funds from state governments were particularly vulnerable to the effects of the recession. Third, unlike state revenues, local revenues from the property tax increased during the recession, primarily because local jurisdictions increased the tax millage rates in response to rapidly-declining property values. Fourth, we find that inequality in school spending rose sharply during the Great Recession. Fifth, we argue that the federal government's efforts to shield education from some of the worst effects of the Great Recession achieved their major goal.

I.   Introduction

The recession that began in December, 2007 was the most severe economic downturn in the United States since the Great Depression. The unemployment rate hit 10 percent in October, 2009. Almost nine million private sector jobs were lost; private employment did not return to pre-recession levels until spring 2014. Even now, there are more than three million long-term unemployed people in the United States.[1] Analysts often call this period the Great Recession, a term that is well-deserved.

In this paper we look at the impact of the recession on public schools. Our goal is to describe what happened to public education during this recession and to learn what we can about how to shield schools and their students from the worst effects of any future recessions we may face. Five major themes emerge from our work. First, the impact of the Great Recession was unprecedented. Nearly 300,000 teachers and other school personnel lost their jobs. All of the gains we made in reducing class sizes during the 13 years before the recession were wiped out. Although it took five years for state and local revenues to return to pre-recession levels, school districts are still losing employees.

Second, the drop in employment is primarily due to the fact that schools that were heavily dependent on funds from state governments were particularly vulnerable to the effects of the Great Recession. As we show, there has been a marked shift toward state-financed public schools over the last 40 years, in part as a result of litigation and legislation to equalize school resources across school districts. We show that revenues from the major state taxes– the income tax and the sales tax – fell sharply over the recession. Our results suggest that an unintended side effect of these efforts has been to make public education more vulnerable to the ups and downs of the economy.

Third, despite the fact that the recession occurs at a time when property values are plummeting, property tax revenue – the mainstay of local school finance – actually rose over the course of the recession. We argue that many school districts were able to offset the shrinking property tax base by raising the property tax rate. As we demonstrate, property tax rates decline little when property values increase and increase markedly when values decline, meaning that the property tax is a very stable source of revenue.

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[1] The U.S. Bureau of Labor Statistics classifies someone as long-term unemployed if they have been unemployed for at least 27 weeks.

Fourth, inequality in school spending rose dramatically during the Great Recession. But we need to be very cautious in our interpretation of this result. School spending inequality has risen steadily since 2000; the trend in inequality we see in the 2008-11 period is very similar to the trend we see in the 2000-08 period. It is clear that the gap in spending between wealthy and poor schools rose during the recession; the role of the recession itself is much less clear.

Fifth, we argue that the federal government's efforts to shield education from some of the worst effects of the Great Recession achieved their major goal. The State Fiscal Stabilization Fund (SFSF), created under the American Recovery and Reinvestment Act of 2009, provided $53.6 billion of funding for public elementary and high schools during the early parts of the recession. We find that as a result of SFSF money, school spending was roughly flat during the 2008-09 and 2009-10 school years.

We use both aggregate national data and school district level data in our analysis. Each has advantages and disadvantages. National data is available quickly and at high frequency. Those data allow us to consider the entire period from the start of the Great Recession in the fourth quarter of 2007 through the 2013-14 school year. But national level data hide many of the essential details of the effect of the recession. As we explain later in the paper, education in the US is primarily the responsibility of the 50 states and 14,000 school districts. There is enormous variation across school districts in the way education is financed and administered and the demographics of the students those schools serve. We therefore make extensive use of a unique school district level panel data set that we have assembled. The drawback here is that district level data on school finances is available just through the 2010-11 school year. While the Great Recession ended officially in the second quarter of 2009, we continue to see the effects of the Great Recession on education five years later.

The rest of the paper has the following organization. In Section II we use aggregate data to focus on the impact of the Great Recession on education at the national level. Initially in that section we present a brief overview of the structure of education finance in the US. We then look at the effect of the recession on state and local government revenue, employment in public schools, and school spending. We compare the impact of the most recent recession to past recessions. In Section III we turn to an analysis of state and school

district level data. Our goal in that section is to better understand how the recession affected different types of schools. So, for example, we ask if the structure of school finance was an important determinant of the impact of the recession. We continue our analysis of school districts in Section IV. In that part of the paper we look at inequality in school spending from 1972 through 2011. An important question here is whether the recession had a particularly severe effect on schools that serve children from low-income families. In Section V we look at the efficacy of the federal government's efforts to offset at least part of the effect of the Great Recession on public education. Section VI includes a brief summary and conclusions.

II.   The Effect of the Great Recession on Education at the National Level

In this section, we present estimates of education finance, spending and employment at the national level over the great recession. As we show later in this section, the impact of the great recession was in part a function of the way education finance has evolved over time. To set the stage for this discussion, we initially present some basic facts about K-12 education finance.

A.   Some Basics of K-12 Education Finance

Figure 1 summarizes the history of per student current expenditures in constant 2013 dollars [2] in the US from the 1970/71 through the 2011/12 school years.[3] Nominal dollars are deflated by the GDP deflator.[4] Two important results emerge from that graph. First, annual real spending per student has nearly tripled over this 43 year period. Second, education spending is sensitive to the business cycle. This is more clearly seen in Figure 2 where we graph the de-trended residuals of real per student current expenditures versus the national unemployment rate.[5] The graph shows a strong negative relationship between these two series with the

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[2] http://nces.ed.gov/programs/digest/d13/tables/dt13_236.65.asp.
[3] Unless otherwise noted, years here are fiscal years. A fiscal year corresponds roughly to an academic year and so, for example, fiscal 1969 is roughly the 1968 – 69 academic year. Current expenditure includes salaries, employee benefits, purchased professional and technical services, purchased property and other services, and supplies. It also includes gross school system expenditure for instruction, support services, and noninstructional functions. It excludes expenditure for debt service, capital outlay, and reimbursement to other governments (including other school systems).
[4] http://research.stlouisfed.org/fred2/series/GDPDEF/.
[5] http://research.stlouisfed.org/fred2/series/UNRATE/.

exception of the mid-1990s.[6] It is therefore no surprise that we see a large drop in real current expenditures at the start of the Great Recession.

There have been some significant changes in the way schools are financed in the US over the last 40 years. In Figure 3 we summarize the distribution of education revenues by source over time.[7] State governments now play a much larger role in education finance than they once did. In the early part of the 20th century, nearly 80 percent of the revenues for public education came from local governments. [8] As Figure 3 demonstrates, in 1970 local governments provided 52.4 percent of K-12 revenues, while the state share was less than 40 percent. By 2008 the local share had fallen to 43.5 while the state share had risen to 48.3 percent.

The growing role of the states in education is in part a response to a long series of court cases that have challenged the constitutionality of an education finance system that has led to wide disparities in education spending across school districts.[9] *Serrano I* in 1971 and subsequent cases led to a requirement of equal spending per student in California. More recent cases have been driven by concerns over the adequacy of funding for public education, in particular the funding of education for students from disadvantaged backgrounds. At last count, litigants had challenged the constitutionality of state school finance systems in 45 states (Corcoran and Evans, forthcoming). In most cases, a decision by a high court to overturn a state education financing system has been accompanied by a direct order to make fundamental changes to school funding formulas. State legislatures have also initiated their own far-reaching reforms to school finance systems in the wake of unsuccessful litigation (e.g., Georgia and Idaho), under the threat of litigation (e.g., Missouri and Oklahoma; see Minorini and Sugarman, 1999), or in response to political pressure (e.g., Michigan).

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[6] In the United States, the unofficial beginning and ending dates of national recessions have been defined by the National Bureau of Economic Research (NBER). The NBER defines a recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real gross domestic product (GDP), real income, employment, industrial production, and wholesale-retail sales."

[7] Data is taken from http://nces.ed.gov/programs/digest/d12/tables/dt12_202.asp and http://nces.ed.gov/programs/digest/d13/tables/dt13_235.10.asp.

[8] http://nces.ed.gov/pubs93/93442.pdf

[9] This literature is captured in a number of papers including, Evans, Murray and Schwab (1997), Murray, Evans and Schwab (1998), Hoxby (2001), Card and Payne (2002), and Figlio, Husted and Kenny (2004),

Historically, the federal government has played a small role in K-12 education finance. The average federal share over the 1970-2008 period was 7.8 percent. The federal government did provide significant additional funding at the start of the Great Recession in response to falling state and local tax revenues. As a consequence, in 2010 the federal share of education spending reached 13.0 percent. We examine the federal government's response to the Great Recession in a subsequent section of the paper.

It is important to look at how state and local governments are funded given their essential role in education finance. In Table 1 we report revenues to state and local governments from broad sources in the third quarter of 2013.[10] In the first two columns we show the tax type and the tax source; in the next two columns we report total revenues by type and the fraction of these total state revenues from this tax. We then present the same information for local governments, then data for these two levels combined in the next four columns.

There is significant variation in state tax structures. Seven states have no income tax (and two others tax only dividend and interest income); five states do not have a sales tax. Despite this heterogeneity, the fact is the income and sales are clearly the key sources of revenue for the states. Averaging across all states, almost half of state government revenues come from individual and corporate income taxes and an additional third comes from various sales taxes. Less than two percent of state revenues come from property taxes. We find a very different picture at the local level. The property tax generates about 72 percent of local government tax revenue while sales and income taxes produce about one fifth of total revenues.

Given these facts, one might expect then that the collapse of the housing markets at the start of the Great Recession might have had a particularly severe impact on schools. We will consider this issue in the next section of the paper where we look at the effects of the Great Recession.

B.   *The Impact of the Great Recession on the Financing of Public K-12 Education*

This section of the paper focuses on the effects of the Great Recession on public education. Figure 4 presents data on state and local government tax revenue for the most recent recession (which began in the fourth quarter of 2007) and the two previous recessions (which began in the third quarter of 1990 and the

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[10] https://www.census.gov/govs/qtax/.

first quarter of 2001). Figure 4 reflects quarterly nominal state and local tax revenue from the U.S. Census Bureau.[11] We convert to constant 2012:Q4 dollars with the GDP implicit price deflator. We present a four-quarter moving average because of very large within fiscal year variation in quarterly revenues. In all cases we set revenues equal to 100 at the start of a particular recession. The horizontal axis shows the number of quarters after the start of the recession, and so, for example, we see that state and local tax revenues were flat for the first four quarters of the 1991 recession but were about 10 percent higher 12 quarters after the start of the recession.

Figure 4 shows that the effect of the Great Recession on state and local tax revenue was unprecedented. State and local revenues were constant for about a year after the start of the recession but then quickly fell by about five percent. Revenues remained roughly flat for five quarters and then rose very slowly. It was not until 18 quarters after the start of the recession that state and local tax revenues returned to pre-recession levels. But of course the demand for state and local government services was far from flat during this period. Between 2007 and 2012, the number of school-age children has risen 0.7 percent,[12] Medicaid roles have grown by 28 percent or by over 11.8 million people,[13] and the unemployment rate has yet to return to pre-recession levels.

We see a very different story when we look at previous recessions. Revenues never fell during the 2001 recession. Real revenues were roughly eight percent higher 11 quarters after the start of the recession and then remained roughly flat for the next four quarters. In the 1990 recession revenues were flat for the first six quarters after the start of the recession and then rose steadily for the next nine quarters. As we will say many times in this paper, the impact of the Great Recession was very different from previous recessions.

Figure 5 looks at the time path of an index of a four-quarter moving average of major sources of state and local tax revenues following the start of the Great Recession. Some of the lessons from Figure 5 are not surprising. Revenues from state and local income taxes, sales taxes, and corporate income taxes all fell very sharply at the start of the recession. Individual income tax collections were down by roughly 16 percent eight quarters after the start of the recession and remained 10 percent below pre-recession levels for 13

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[11] http://www.census.gov/govs/qtax/ .
[12] http://nces.ed.gov/programs/digest/d13/tables/dt13_203.20.asp
[13] http://kff.org/other/state-indicator/monthly-medicaid-enrollment-in-thousands-june/

quarters. Twenty quarters after the start of the recession, income tax revenues were still three percent below levels at the start of the recession. Sales tax revenues declined more slowly than income tax revenues but 15 quarters after the start of the recession, these revenues were 15 percent below levels at the start of the recession. Revenues from corporate income taxes reach a nadir 11 quarters after the start of the recession and were down 28 percent. Twenty quarters after the start of the recession, corporate income and sales taxes were still lower by 25 and 10 percent, respectively, compared to the fourth quarter of 2007.

Property taxes followed a very different pattern. As Figure 5 shows, revenues from property taxes actually grew steadily during the first two years of the recession. They then fell slightly but remained 10 percent above pre-recession levels through then end of 2012.

This is in some ways a surprising result. The housing market collapse was a key element of the Great Recession. The Case-Shiller Home Price Index, a leading measure of housing prices, indicate that the housing bubble began to deflate at least two years before the recession. [14] By the fourth quarter of 2007 the average price of a home was 20 percent below its peak. Prices continued to fall during the first year of the recession and by December 2008 the real price of a home was roughly one-third below its 2005 peak. New home construction fell very dramatically during the recession. New home starts fell from a seasonally adjusted rate of nearly 2.3 million in early 2006 to a low of less than 500,000 units in December 2007. Housing starts remained below one million homes per year even five years after the start of the recession. [15] There is some debate as to what extent the housing market collapse was a cause of the recession and to what extent it was a result of the recession. But what is clear is that the magnitude of the collapse was unprecedented.

We then face a puzzle. The property tax is assessed on the value of residential real property (i.e. personal real estate), commercial, business and farm real property, and in some states personal property (e.g., automobiles). Residential real property accounts for approximately 60 percent of taxable assessments and is the largest component of the tax base by a significant margin; commercial, industrial and farm property account for around 30 percent and personal property accounts for less than 10 percent.[16] It is therefore difficult to square two seemingly inconsistent results: the property tax fared much better than other state and

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[14] http://us.spindices.com/indices/real-estate/sp-case-shiller-us-national-home-price-index
[15] https://www.census.gov/construction/nrc/historical_data/
[16] Statistics are from Lutz, Molloy, and Shan (2011).

local taxes during the Great Recession even though a key part of the property tax base, the housing market, collapsed.

Several papers have looked at this puzzle. Lutz, Molloy, and Shan (2011) reach three conclusions from their work. First, there is a significant amount of heterogeneity across states in their experience of the housing cycle, the institutional features of their property tax assessment and collection practice, and their responses to the housing downturn. Second, assessed values lag market values in many states, which helped to support property tax revenues when house prices fall. Third, when assessed values do catch up with market values, local officials appear to be willing to at least partially offset the decreases in assessed values with increases in tax rates.

Alm, Buschman, and Sjoquist (2011) used data from the U.S. Census Bureau Quarterly Summary of State and Local Government Tax Revenue to demonstrate that there is considerable heterogeneity across communities in the impact that housing values have on property tax revenues, but that many local governments avoided any budgetary impact from declining house values. They also provided evidence from school districts in Georgia that supports Lutz et al.'s argument that local governments frequently offset property tax revenue changes that would have occurred from changing house values by changing the millage rate in the opposite direction.

Ihlanfeldt (2011) focuses on the responsiveness of property tax rates to the property tax base. Property tax revenues are the product of assessed valuation and the effective property tax rate.[17] If property tax rates rise at the same rate as assessed valuations fall then property tax revenues will remain constant. So one possible explanation as to why the property tax fared well during the recession is that local governments were able to raise property tax rates enough to offset the effect of a shrinking tax base. Ihlanfeldt's results suggest that tax rates are adjusted in an attempt to stabilize property tax revenues. The tax rate offset is nearly complete for counties, but less than complete for cities. Cities therefore cut selected expenditures to keep total expenditures in line with total revenues.

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[17] Many jurisdictions subject a specified percentage of a property to the property tax; this percentage is called the assessment ratio. The effective tax rate is the product of the nominal tax rate multiplied by the assessment ratio. So, for example, if the nominal tax rate in a town is 1.5 percent (i.e., 15 mils) and the assessment ratio is 60% then the effective property tax rate is .9 percent.

The basics of these arguments are outlined in Figure 6 for two states, Washington and Virginia. These graphs are similar to figures presented by Lutz , Molloy, and Shan (2011) for their eight case studies. Both states have data on the web on the assessed property value and property taxes paid by jurisdiction. Washington reports these numbers by school district. Virginia has dependent school districts that are organized at the county or city level and so each has one property tax for all county or city operations. For Washington we therefore denominate values by students while for Virginia, we denominate values by total population. In these graphs, we present four series for each state. The first is a housing price index for the state from Freddie Mac[18] and measured as of June and deflated by the 3rd quarter GDP deflator.[19] The second is assessed value per capita and the third is property tax revenues per capita. These two are turned into real values using the GDP deflator. Finally, we present an implied aggregate millage rate which is simply tax revenues divided by assessed values.

In both states, we see a rapid rise in housing prices and a severe decline that occurs after the 2007-08 school year in both states. For Washington, assessments/per student continue to increase for a few years after housing prices peak but for Virginia, the decline in this value occurs one year after the housing price peak. Notice that in both cases, movements in the millage rate are inversely related to changes in the assess property in that when assessments per student or per capita start to decline rapidly millage rates increase dramatically. For Washington, the increase in the tax rate is more than enough to offset any decline in housing value and so real revenues/student continued to rise throughout the entire period. For Virginia, revenues per person initially increased as property values fell, but then revenues per capita declined slowly even though the property tax rate continued to rise.

The results for these two states suggest that there is an asymmetric response in tax rates to changing assessed values. When property values are increasing the tax rate falls but not so much that revenues decline. In contrast, when property values are falling, millage rates can be increased to more than offset the decline in values. This basic argument is illustrated in Figure 7, again for Washington and Virginia. In these graphs, we plot on the X axis the percentage change in assessed values per student (for Washington) or per capita (for

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Virginia) from the peak to trough in property values per capita over the Great Recession. On the Y axis we plot the percentage change in millage rates for the local jurisdiction. The size of the bubble represents enrollment per population within the district at the beginning of the period. We fit an OLS line through the bubbles that varies based on whether over this time per capita assessed property values increased or decreased.

For both states, we see an asymmetric response to changing per capita property values. When this change is positive there is a small negative or zero gradient suggesting that tax revenues will continue to rise in this regime. However, there is a very large negative value for the same gradient when property values are declining.

To put some magnitudes on these numbers we have collected data on assessed valuations and property tax rates for several years for all school districts in five states: Illinois (2008-11), Washington (2009-12), Virginia (2006-11), Texas (2009-13), and Washington (2008-12).[20] In all cases, we took the data from peak to trough in per student assessed property values. Note that the peak varies across states, a reflection of how frequently properties are assessed. In all cases we have real assessed values per student and property tax millage rate at the school district level. We use these data to estimate the econometric model

(1) $\%\Delta MR_i = \alpha_0 + \alpha_1 D_i + \alpha_2 \%\Delta PVPC_i \cdot D_i + \alpha_3 \%\Delta PVPC_i \cdot (1 - D_i) + \varepsilon_i$

where the dependent variable $\%\Delta MR$ is the percentage change from peak to trough in district i's property tax millage rate. We define $\%\Delta PVPC$ as the percentage change from peak to trough in property values per capita in a school district and we define D_i as a dummy variable that has a value of 1 if $\%\Delta PVPC$ is positive (i.e., D is 1 in those districts where the per student property values rose). We suspect that government response to changing property tax base may be asymmetric. The elasticity of the tax rate is then α_2 in districts where the

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[20] Data on local tax rates for Virginia can be found at http://www.tax.virginia.gov/site.cfm?alias=LocalTaxRates, whereas tax collections are found at http://www.tax.virginia.gov/site.cfm?alias=SalesRatioStudies. Financial data for Washington is provided on an annual basis and the data for 2012-13 school year is found here http://www.k12.wa.us/safs/PUB/FIN/1213/fs.asp. Data for Texas is available here http://www.tea.state.tx.us/index2.aspx?id=2147504614&menu_id=645&menu_id2=789. Illinois data is available here http://webprod1.isbe.net/ilearn/ASP/index.asp. The data for Ohio for tax year 2012 is available here http://www.tax.ohio.gov/tax_analysis/tax_data_series/school_district_data/publications_tds_school/SD1CY12.aspx.

tax base is rising and α_3 in districts where the tax base is falling. We are interested in three hypotheses. First, is α_2 equal to α_3? If so, then local government response to changing property base is symmetric. Second, is α_2 or α_3 equal to 0? If so, then the millage rate is unaffected by changes in the tax base. In this case property tax collections would fall at the same rate as the tax base; government would offset none of the change in the property tax base by changing the millage rate. Third, is α_2 or α_3 equal to -1? If so, then changes in the millage rate completely offset changes in the tax base. In this case property tax collections would remain constant when the base changes.

Table 2 sets out our OLS estimates of (1). We can reject the hypothesis that government response is symmetric in all five states at the five percent level. School districts are much more likely to respond to a falling tax base by raising the tax rate than they are to lower the tax rate in response to rising property values. Moreover, we cannot reject the hypothesis that the effect of a rising base is 0 but we can reject the hypothesis the effect of a falling tax base is zero in all five states. Finally, we cannot reject the hypothesis that changes in the property tax rate fully offset changes in the tax base for Illinois, Virginia, and Ohio. For Washington, our estimate of α_3 is statistically greater than 1; for Texas our estimate of α_3 is statistically less than 1.

In all, our results strongly suggest that school districts were able to offset a declining tax base during the recession by raising the tax rate. This result has at least two important policy implications. First, all taxes are unpopular, but the property tax is often seen as one of the most unpopular of all.[21] It is a highly visible tax to taxpayers because they typically pay it directly. Property tax administration is often arbitrary and idiosyncratic. The tax is particularly unpopular among the elderly who often face significant tax bills but have relatively modest incomes. The tax base is typically distributed across local governments in very uneven ways, which contributes to extreme fiscal disparities across jurisdictions. But one advantage of the property tax is that it has proven to be a quite stable source of revenue. Property tax revenues in the past have been relatively insensitive to the business cycles; they do not rise quickly when the economy is robust and do not fall much during recessions. But until the Great Recession, virtually all of the evidence on the stability of the property tax came from episodes when the real estate market was fairly stable despite ups and downs of the economy

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[21] See, for example, James Alm (2013).

as a hole. The experience during the Great Recession tells us that the stability of the property tax is a more a general result than we might have imagined. Property tax revenues continued to rise even during one of the greatest upheavals in the real estate market we have ever seen or are likely to see in the future.

Second, as we noted above, states have assumed a larger role in education finance over the last 40 years, in part as a result equalize education resources across school districts. As we saw, states make little use of property tax but they are a mainstay of local government revenue. And so this shift toward state funding may have an unintended side effect. It could make public education funding much more sensitive to the ups and downs of the economy. We will present some further evidence on this point in section III of the paper.

C.   Employment in Public K-12 Education

We now turn to the effect of the Great Recession on the employment of teachers and other school personnel. Our primary data source here is the monthly US Bureau of Labor Statistics (BLS) Current Employment Statistics which is a monthly survey of roughly 550,000 worksites and are available back to 1939. Those data allow us to track all public sector school personnel but do not allow us to consider the impact of the recession on jobs for teachers separately.

Figure 8 looks at full-time-equivalent employment in public K-12 education, the private sector, state government, and local government outside of K-12 education for the 36 months before and 64 months after the start of the recession. We scale all four time series so that each equals 100 at the start of the recession in December, 2007. Several points are of interest in that figure. First, Figure 8 shows that employment in education followed a very different time path than employment in the private sector. Private sector employment fell sharply at the start of the recession; two years after the start of the recession private employment was seven percent lower than at the start. But private employment then recovered and by March 2014 had returned to its pre-recession level. Employment in public K-12 education followed a very different pattern. Jobs for teachers and other school personnel increased slightly or were flat during the first two years of the recession but then fell dramatically. Employment in public schools has yet to return to pre-recession level, more than six years after the start of the Great Recession. We strongly suspect the time path of

employment in schools reflects the federal government's stimulus program. We look at the stimulus in section V of the paper.

Second, the recession took a substantial toll on public education. Employment in public schools fell by 294,700 from the start of the recession until January 2013. This represents a 3.7 percent decrease in employment. Employment in K-12 schools has increased slightly in calendar year 2013, adding back only 10,000 jobs. From fall 2007 through fall 2013, public school enrollment rose by an estimated 1.6 percent,[22] and so the drop in public school employment meant that the ratio of employees (largely teachers) to student fell by 5.1 percent over this period. Pupil/teacher ratios fell from 17.4 to 16.3 between the 1989/1990 and 2003/04 school year which was a 4.5 percent decline. The recession's impact on pupil/teacher ratios wiped out 13 years of gains in this metric about three years.[23]

A second data source allows us to take an initial look at the distribution of lost jobs within public schools. From the American Community Survey (ACS), we extract all respondents who report they are currently working in primary and secondary education for 2008 through 2012 ACS.[24] For this group we define as part-time those who work less than 30 hours per week and let two part-time workers equal one full-time equivalent. We then use the occupation codes to identify teachers and compare changes in total K-12 employment for teachers and non-teachers in this sector. Between 2008 and 2012, teacher employment in the ACS fell from 4.53 million to 4.39 million, a loss of 140,000. Over the same period, non-teacher full-time equivalent employment dropped from 3.58 million to 3.52 million, a decrease of only 60,000. These results suggest that employment losses were more heavily concentrated in classroom instruction than in other jobs in K-12 education. We return to this issue in section III.

Figure 9 looks at the impact of the recession on education from a different perspective. That figure compares the effects of the most recent recession on public school employment to the effects of three previous recessions. Here we scale each time series so that employment equals 100 at the start of each recession; the horizontal axis measure months since the start of each recession. Figure 9 shows that the impact of the Great Recession on teachers and other personnel was unprecedented. In the 1990 and 2001

[22] http://nces.ed.gov/programs/projections/projections2021/tables/table_01.asp
[23] http://nces.ed.gov/programs/digest/d13/tables/dt13_208.10.asp
[24] The ACS includes both public and private schools.

recessions, public school employment continued to rise steadily despite the economic downturn. In the 1981 recession, which was much more severe than the 1990 and 2001 recessions, public school employment fell for two years but then recovered fairly quickly. Five years after the 1981 recession began, public education employment was about three percent higher than at the start of the recession. But as we showed above, in the 2007 recession public education employment remained five percent below the December 2007 level.

III.   The Effect of the Great Recession on Education at the State and Local Level

We now shift gears and look at the effect of the Great Recession on public education at the state and local level. As we explained in the introduction, looking at states and school districts allows us to address questions we cannot answer with national data. For example, how did the structure of school finance in a state or school district affect the impact of the recession on schools? How did inequality in school spending change during the recession? But as we also noted in the introduction, most school district data is available just through the 2010-11 school year and so we cannot look at the full effect of the recession from this perspective.

A.   School District Data

We have developed a balanced panel school district data set for this analysis. We describe the construction of our data set in the appendix to this paper. As we explain in the appendix, our sample consists of annual observations for 9,692 regular school districts for the 1994-95 school year through the 2011-12 school year.[25] The final data set excludes many small districts. As a consequence, while the data set contains only about 71 percent of all regular districts, those districts account for 88 percent of all public school students.

B. Education Spending

We initially focus on one question: which schools were affected most severely by the Great

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[25] According to NCES, regular districts include local education agencies that operate primary and secondary schools but excludes such districts as regional education service agencies, supervisory union administrative centers, state or federally operated agencies, and independent charter schools.

Recession? The results from the last section suggest a few observed characteristics that may be more

predictive than others. The ability of school districts to raise local property tax rates may have shielded local

revenues during the recession. At the same time, two trends may have worked to make state support

particularly vulnerable to the effects of the recession. There has been a growing dependence on state

revenues in K-12 education and the recession was particularly devastating for two key sources of state

revenues: income and sales taxes. This second point suggests that state support for education may have been

particularly vulnerable to the recession.

In Figure 10, we present data from the Center on Budget and Policy Priorities that shows the change

in state support for education between the 2007-08 school year and the 2012-13 school year.[26] Although

there are 11 states that experienced increases in state support, the numbers show steep drops in state support

over this five year period. Real per pupil revenues fell in 38 states; in 18 of those states the decrease in per

student revenues was 18 percent or more. What is interesting is that the states with the greatest drop in

funding are mostly states with particularly high levels of state support for education. In Figure 11 we plot on

the y axis the numbers from Figure 10 and on the x axis, the fraction of revenues for all districts in a state in

2007-08 school year that came from state sources. The line through these points is clearly negative, indicating

that states that supported K-12 education with more dollars were more vulnerable to the recession and hence

experienced a greater decline in state support.

We can use our balanced panel of school districts described above to shed further light on this issue.

The dependent variable in this econometric work is the percent change in per student revenues between the

2006-07 and the 2010-11 school years. We use the county where these districts reside and merge our school

district-level data with the percentage change in county-level per capita income from 2007-11 constructed

from the Bureau of Economic Analysis's Local Area and Personal Income and Employment Regional Data.[27]

We also merge this with the change in the county unemployment rate over the 2007-11 period taken from the

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[26] http://www.cbpp.org/cms/?fa=view&id=4011

[27] Per capita income information can be downloaded from the Bureau of Economic Analysis at
http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=5#reqid=70&step=25&isuri=1&7022=49&7023=7&70
24=non-industry&7001=749&7029=49&7090=70.

Bureau of Labor Statistics Local Area Unemployment Statistics.[28] In column 1 of Table 3 we regress the outcome on these two variables plus the fraction of district revenues that came from state sources. In this column, we report OLS standard errors in square brackets and in parentheses we report standard errors that allow for within-state correlation in the errors.

Looking at the parameter estimates and the OLS standard errors, we find what we think most people would predict: expenditures/pupil fell sharply in school districts where the unemployment rate rose or per capita income fell. The results also suggest that districts with greater support from the state in 2006-07 experienced significantly lower growth over the next five years.   It is not clear, however, if the numbers in the column are capturing district-level characteristics at all. One piece of evidence is that when we allow an arbitrary correlation in errors within a state, the standard errors increase by a factor of five, suggesting that there is some shock that is common to districts within states. In the next column, we add state effects to the model and cluster the standard errors at the state level. Note that the coefficients on change in income and state share are now no longer statistically significant and the coefficient on the unemployment rate is actually the wrong sign. This suggests that the results in column 1 were capturing events at the state level rather than what is happening at the district level. In the third column we get some sense of the variables that are driving this result where we take out the state effects and add in four variables measured at the state level: the percentage change in real per capita income from 2007-11,[29] the change in the state unemployment rate,[30] the share of K-12 revenues provided by the state, and the change in house prices from June of 2007 to June of 2011 as measured by the state housing price index from Freddie Mac.[31] In this model, the only two variables that are statistically significant are the change in the state unemployment rate and the state share of education for all districts in the state. Nationwide the unemployment rate went from 4.6 in June of 2007 to 9.1 percent in June of 2011. From the results in column 3, a change this large at the state level is estimated to reduce

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[28] State unemployment rates are from the Bureau of Labor Statistics Local Area Unemployment Statistics and were downloaded from the Department of Agriculture's Economic Research Service at http://www.ers.usda.gov/data-products/county-level-data-sets/download-data.aspx#.U8_727FvLkg

[29] Per capita income information at the state level can be downloaded from the Bureau of Economic Analysis at http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=5#reqid=70&step=25&isuri=1&7022=49&7023=7&7024=non-industry&7001=749&7029=49&7090=70.

[30] State unemployment rates are from the Bureau of Labor Statistics Local Area Unemployment Statistics and were downloaded from the Department of Agriculture's Economic Research Service at http://www.ers.usda.gov/data-products/county-level-data-sets/download-data.aspx#.U8_727FvLkg.

[31] This data is available for download at http://www.freddiemac.com/finance/fmhpi/.

spending/student by (0.045)(-2.64)= -0.119 or almost 12 percent. It is not uncommon to see a 20 percentage point difference in the state share in K-12 revenues across states, and a change this big is estimated to reduce spending during the recession by 4 percent.

The results in the first three columns can be criticized because we do not include a measure of changes in property value at the local level, a variable that we do not have for all districts. However, the Freddie Mac housing price index is calculated at the level of the Core Based Statistical Area (CBSA).[32] In the final three columns of Table 3 we reduced the sample to the 3,692 districts that are located in CBSA's which allows us to add a local housing price index as a covariate. The basic results in this case are qualitatively the same as the full sample. We find that there are large effects of local economic conditions on spending that seem to capture state level results.

Table 4 summarizes our econometric estimates of some of the determinants of the impact of the recession on the district-level pupil/teacher ratio. The dependent variable in those three models is the percent change in the district pupil/teacher ratio between 2007 and 2011. The models in columns (1) – (3) mirror the structure of the estimates in Table 3 where numbers in brackets represent regular OLS standard errors and the numbers in parentheses represent the standard errors that cluster at the state level. As above, we do not have school district level measures of unemployment and income, and so we use county-level aggregates for these variables.

In column (1) where we add in covariates at the county level, we see that rising income and falling unemployment rates reduce the pupil/teacher ratio and these results are statistically significant at conventional levels when regular OLS standard errors are used but these standard errors increase appreciably when we cluster at the state level. With either standard error, the fracytion od revenues from the state is positive and statistically significant suggesting that districts more dependent on the state saw an increase in the pupil/teacher level. In column (2), none of these results remain statistically significant when we add state fixed effects and when we take out the state effects and add in state variables, the ONLY statistically significant variable is the fraction of K-12 revenues from the state across all districts. The results are

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[32] A CBSA includes an urban center and its suburbs. CBSA are defined by the Office of Management and Budget (OMB) and replaced the old OMB concept of a metropolitan area.

essentially unchanged when we reduce the sample to districts in metro areas but not, the percentage change in the state-level housing price index is a statistically significant and positive coefficient.

Finally, an important question is how school districts adjusted their workforce in response to the changing economic climate. Here we must sacrifice the timeliness of the BLS data above for data from the Common Core of Data which is an annual census of public schools and school districts. Data on employment in broad job categories for all public schools is available in the Department of Education's *Digest of Education Statistics*.[33]

In Figure 12 we present graphs of fall employment from 1998 through 2011 for four broad groups of employees in schools: teachers, teacher aids, support staff and other employees which includes district administrators, principals, librarians and guidance counselors. We set each series equal to 100 in 1998. As Figure 12 shows, the number of teachers rose at the slowest rate among the four groups in the education sector between 1998 and 2008: teachers increased 14 percent, support staff 17 percent, administrators, librarians principals, and librarians 26 percent, and aids 25 percent over that year period. During 2008-11, however, the number of teachers fell 3.7 percent compared to a decrease of just 1.4 percent for administrators. Over this period the number of teacher employment fell by 118,891 and the number of teacher aids employment fell by another 23,675. Over the same period, support staff employment fell by 38,794 and other employees fell by only 6,452. Teachers represented 51 percent of employment in 2008 but were responsible for 63 percent of job loss over the first three years of the Great Recession.

IV.   The Impact of the Recession on School Spending Inequality

In the previous sections we have focused largely on how the Great Recession altered average outcomes. Here we turn to the impact of the recession on inequality in education spending. Unlike most sectors of the economy at the end of the 20th century, which became more unequal, between-district measures of resources devoted to K-12 education actually was becoming more equal (Corcoran and Evans forthcoming; Murray, Evans and Schwab, 1998). We examine whether this trend continued during the Great Recession.

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[33] http://nces.ed.gov/programs/digest/d13/tables/dt13_213.10.asp.

A.   *Data and the Measurement of Inequality*

Our data for this analysis utilizes the panel of school districts from 1993 to 2011 that we outlined

above. For data prior to 1993, we use measures of inequality reported by Evans and Schwab and their

various coauthors in the past. In all, we have data for five year intervals starting in 1972 until 1992, 1990 data,

and annual data from 1993 and on. As we noted above, this data set includes current expenditures per pupil

from the F33 data for unified districts.

We look at four measures of inequality. [34] The Gini coefficient ranges from 0 (perfect equality) to 1

(perfect inequality) and is based on the Lorenz curve. The 95/5 ratio is the ratio of spending for the student

at the 95th percentile in district spending divided by the student at the 5th percentile in spending. The

coefficient of variation equals the ratio of the standard deviation of school spending to the mean of spending.

The final measure is the Theil index, which for state k equals

$$(2) \qquad T_k = \frac{\sum_{j=1}^{J_k} P_{jk} X_{jk} \ln(X_{jk} / \bar{X}_k)}{\sum_{j=1}^{J_k} P_{jk} X_{jk}}$$

where X_{jk} is per-pupil revenue in district j, J_k is the number of districts in state k, P_{jk} is the fall enrollment in

district j in state k, and $\bar{X}_k$ is the pupil-weighted mean revenue per pupil for the state. The Theil index falls

whenever revenues in a wealthy district fall by $1 but rise by $1 in a poor district. Thus, lower values of the

index are associated with less inequality. At one extreme, the Theil reaches a minimum of zero when

resources are the same in all districts throughout a state, since in that case X_{jk} equals $\bar{X}_k$ and the natural log

of one is zero. At the other extreme, the index reaches the natural log of the number of students in the state

in the case where one district receives all of the revenue in the state and the rest of the districts receive none.

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[34] See Berne and Stiefel (1984) for a thorough discussion of the properties of measures of equity in public school funding.

A convenient property of the Theil index is that the coefficient for the United States can be decomposed to show the disparity in per-pupil revenues between and within states. Across all states and districts in our sample, the decomposition can be written

$$(3) \qquad T = \frac{\sum_{k=1}^{K} P_k (\bar{X}_k / \bar{X}) \ln(\bar{X}_k / \bar{X})}{\sum_{k=1}^{K} P_k} + \frac{\sum_{k=1}^{K} P_k (\bar{X}_k / \bar{X}) T_k}{\sum_{k=1}^{K} P_k}$$

where $\bar{X}$ is a pupil-weighted mean revenue per pupil for the country, and P_k is the number of students in state k. The first term on the right side of this expression measures between-state inequality. The second term measures the degree of within-state inequality and can be interpreted as a weighted average of the within-state Theil index numbers.

The four national estimates of between-district inequality are presented in Table 5. Looking at the entire 40 year period between 1972 and 2011, we see very little change overall in inequality school spending. This is true regardless of which measure of inequality we rely on. This overall trend, however, masks enormous differences within the 40 year period. There are two distinct sub-periods. From 1972 to 2000 inequality fell sharply. Depending on which measure we use, inequality in school spending fell between 20 and 38 percent during that period. The US did make significant progress in an effort to reduce the disparities between rich and poor school districts.

But the trend changed dramatically in 2000. All four of our measures reversed course and rose steadily from 2000 to 2011. The increase in inequality during this 12-year period essentially undid all of the progress that was made during the preceding 29 years. And so it is somewhat misleading to say that there has been little change in inequality in school spending. We were able to reduce inequality, but the success was fleeting and fairly fragile.

Table 5 exploits the unique properties of the Theil index of inequality and looks at the national, between-state and within-state measures of current expenditures per pupil. Both measures fell sharply from 1972 to 2000. Within-state inequality fell by 43 percent and between-state inequality fell by 36 percent in this period. There is a fair amount of evidence that the decline in inequality in school spending was at least in part

the result of successful court-ordered state efforts to reduce inequality. As we argued above, there has now been litigation over school finance in virtually every state. Murray, Evans, and Schwab (1996), for example, found that:

- Court-ordered education finance reform did significantly decrease within-state inequality in spending. Depending on the way they measured inequality, their results imply that reform in the wake of a court decision reduced spending inequality within a state by anywhere from 16 to 38 percent.

- Court-ordered reform reduced inequality by raising spending at the bottom of the distribution while leaving spending at the top unchanged. As a result of court-ordered reform, spending rose by 11 percent in the poorest school districts, by 7 percent in the median district, and remained roughly constant in the wealthiest districts.

- Finance reform led states to increase spending for education and left spending in other areas unchanged. Thus, by implication, states funded the additional spending on education through higher taxes. As a consequence, the state's share of total spending rose as a result of court-ordered reform.

Rising between-state and within-state inequality both contributed to the overall increase in inequality in education spending starting in 2000. But clearly the main factor here is growing differences between the states in school spending. Between-state inequality rose by over 80 percent between 2000 and 2011; within-state inequality in spending rose by 21 percent during that period.

It is not clear that the Great Recession played a major role in the increase in inequality in school spending. All of our inequality measures rose at roughly the same rate between 2000 and 2008 and between 2008 and 2011. The data suggest that some combination of factors led to a continual rise in inequality in education expenditures over the 12 year period. We have not explored those factors here, but growing inequality in income and wealth are obvious candidates.

Given the significant increase in inequality in school spending since 2000, we would expect to find that spending in initially high-spending districts increased faster than spending in initially low-spending

districts. Figure 13 presents some evidence consistent with this hypothesis. In that figure, we present a scatter plot of the growth in real current expenditures per pupil at the state level from 2000-2011 on the y axis versus current expenditures per pupil in 2000 on the x axis. There is a clear upward sloping line through these points – each $2000 increase in 2000 expenditures per pupil is associated with 4.5 percent greater growth over the next 12 school years.

Why did school spending rise faster in initially high-spending states? Almost certainly the continuing increase in income and wealth inequality in the US played a key role. The results from Table 2 suggest an additional answer. When housing prices are increasing, the elasticity of response on the millage rate is negative but much less than 1 in absolute value. This suggests that as property values increase, tax revenues increase as well. Hence, in an era of rising property values, we would expect faster growth in per student spending in areas with faster growth in per student assessments. If the high spending states in the early 2000s were also those states with the fastest growth in property value, then this would help explain why spending in these states grew so much. We do not have per student assessments for all states over the past 14 years but we have a reasonable proxy which is the change in housing prices over that period. In Figure 14, we graph on the vertical axis the percentage change in the Freddie Mac state-level house price index between 2000 and 2011 versus the real state-level per pupil current expenditures in 2000. Note that this graph has a steep positive slope, implying that high spending states in 2000 had the greatest increase in house prices over the next 11 years. If there is an automatic growth in revenues because the elasticity between tax rates and assessed valuations is less than 1 in absolute value, this would explain the growth in the between-state inequality in expenditures.

V. The Federal Government's Response to the Great Recession

A. The Stimulus Bill and Education Finance

President Obama signed the American Recovery and Reinvestment Act of 2009 (ARRA) into law on February 17, 2009. ARRA was a key element of the government's effort to fight the recession that began in December 2007 and accelerated with the Lehman Brothers bankruptcy in September of 2008. The estimated

cost of the bill when it was passed was $787 billion. [35] ARRA included $237 billion in tax relief for individuals and $51 billion of tax cuts for business. The bill provided $155.1 billion for health care (largely additional spending on Medicaid, Medicare, and subsides for private insurance for people who were laid off from their jobs), $105.3 billion for infrastructure investment, and $82.2 billion for extended unemployment benefits and other aid to low income workers, the unemployed, and the elderly.

ARRA provided nearly $100 billion for education including $15.6 billion for increases in Pell Grants, $13.0 billion in Title I funds, and $12.2 billion for special education. The single largest component of the aid to education was the State Fiscal Stabilization Fund (SFSF). SFSF was a new one-time appropriation of $53.6 billion. Of the amount appropriated, the U.S. Department of Education awarded governors approximately $48.6 billion by formula in exchange for a commitment to advance essential education reforms to benefit students from early learning through post-secondary education.

The purpose of these funds was to help stabilize state and local government budgets in order to minimize and avoid reductions in education and other essential public services. Program funds could also be used to help support the modernization, renovation, and repair of school and college facilities. The Department of Education awarded the remaining $5 billion competitively under the "Race to the Top" and "Investing in What Works and Innovation" programs.

Four principles guided the design of the education component of ARRA:

- **Spend funds quickly to save and create jobs.** ARRA funds were to be distributed quickly to states and districts in order to avoid layoffs. States and districts in turn were urged to move quickly to develop plans for using funds, consistent with the law's reporting and accountability requirements, and to promptly begin spending funds to help drive the nation's economic recovery.

- **Improve student achievement through school improvement and reform.** ARRA funds were to be used to improve student achievement, and help close the achievement gap.

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[35] This section draws heavily on http://www2.ed.gov/policy/gen/leg/recovery/factsheet/stabilization-fund.html

- **Ensure transparency, reporting and accountability.** Recipients were required to publicly report on how funds were used.

- **Invest one-time ARRA funds to minimize the "funding cliff."** States and districts were encouraged to use SFSA funds in ways that did not result in unsustainable continuing commitments after the funding expired.

ARRA specified the way the funds were to be allocated to the states. Sixty-one percent of a state's allocations were based on a state's relative population of individuals aged 5 to 24, and 39 percent was based on its relative share of total population. The Department of Education awarded SFSF funds to governors in two phases. To receive its initial SFSF allocation, a state had to submit to the Department of Education an application that included three key elements. First, it was to include assurances that the state is committed to advancing education reform in the four specific areas discussed above. Second, the application included baseline data that demonstrated the state's current status in each of the four education reform areas outlined above. Third, it included a description of how the state intended to use its stabilization allocation. Within two weeks of receipt of an SFSF application, the Department was to provide a state with 67 percent of its SFSF allocation. A state was to receive the remaining portion of its SFSF allocation after the Department of Education approved the state's plan detailing its strategies for addressing the education reform objectives described in the assurances.[36]

States were required to use 81.8 percent of SFSF funds for the support of public elementary, secondary, higher education, and (as applicable) early childhood education programs and services. The states had to use their allocations to help restore FY 2009, 2010, and 2011 support for public elementary, secondary, and postsecondary education to the greater of the FY 2008 or FY 2009 level. The funds needed to restore support for elementary and secondary education had to be run through the state's primary elementary and secondary education funding formulae. If any SFSF funds remained after the state had restored state support for elementary and secondary education and higher education, the state was required to award the

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[36] If a state could demonstrate that the amount of funds it was to receive in the first phase (67 percent of its total stabilization allocation) was insufficient to prevent the immediate layoff of personnel by LEA, state educational agencies, or public institutions of higher education, the Department of Education could award the state up to 90 percent of its SFSF allocation in phase one. In such cases, the remaining portion of the state's allocation was provided after the Department approved the state's plan.

funds to school districts on the basis of the relative Title I shares (but not subject to Title I program requirements). States were to use the remaining 18.2 percent of their SFSF funds for education, public safety, and other government services. This could include assistance for early learning, elementary and secondary education, and to support public colleges and universities. In addition, states could use these funds for modernization, renovation, or repair of public school and public or private college facilities.

Governors were strongly encouraged to award program funds as soon as possible after receipt of their grant awards. However, funds were not available for obligation at the state and local levels until Sept. 30, 2011. As part of a state's application, each governor was required to include an assurance that the state will maintain the same level of support for elementary, secondary, and postsecondary education in FY 2009 through FY 2011 as it did in FY 2006. States and school districts that received SFSF were expected to report on how those funds were spent and the results of those expenditures. The administration posted reports on ARRA expenditures on the www.Recovery.gov Web site. The SFSF authorization also contained specific reporting requirements to help ensure transparency and accountability for program funds. For example, states were required to report to the Department of Education (1) the use of funds provided under the SFSF program, (2) the estimated number of jobs created or saved with program funds, (3) estimated tax increases that were averted as a result of program funds, and (4) the state's progress in the areas covered by the application assurances.

The Department of Education was to use at least $4.35 billion of ARRA funding to make competitive grants under the "Race to the Top" fund. These grants were designed to help states make significant improvement in student achievement. The Department of Education was also authorized to spend up to $650 million to make competitive awards under the "Invest in What Works and Innovation" fund. These awards were to serve as rewards to districts and nonprofit organizations that had made significant gains in closing achievement gaps to serve as models for best practices.

The Education Job Funds program was the second major federal effort to offset some of the effects of the Great Recession on public education.[37] The Job Funds bill was signed into law on August 10, 2010. It provided $10 billion in assistance to save or create education jobs for the 2010-2011 school year. A district that had funds remaining after the 2010-2011 school year was allowed to use those remaining funds through September 30, 2012. The Department determined the allocation for each State by formula on the basis of (1) its relative population of individuals who are aged 5 to 24, and (2) its relative total population.[38] The amount of funding available to each State under the program is provided on the program website at http://www2.ed.gov/programs/educationjobsfund/index.html.

States were required to distribute Education Job Funds to school districts *either* through the State's primary elementary and secondary education funding formula(e) as identified in its application for funding under the SFSF program, *or* on the basis of the districts' relative shares of funds under Part A of Title I of the Elementary and Secondary Education Act of 1965 (ESEA) for the most recent fiscal year for which data are available.

Under the Education Job Funds program, a State was required to maintain fiscal effort for education for FY 2011 (which is roughly equivalent to the 2010-11 academic year) in one of four ways. Under each method, the State must separately meet the maintenance of effort requirements for both elementary and secondary education and for public colleges and universities. Two methods were available to all states. First, a state would be required to maintain state support for elementary and high school education for FY 2011 at least at the level of support for FY 2009. Alternatively, for fiscal year 2011, the State will maintain State support for elementary and secondary education at a percentage of the total revenues available to the State that is equal to or greater than the percentage for State fiscal year 2010. The remaining two methods were available only to states state tax collections for calendar year 2009 that were less than state tax collections for calendar year 2006.

There have been several efforts to evaluate the impact of SFSF and the Education Job Funds. A 2009 analysis by the Obama administration looked at state funding for K-12 and higher education for the two

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[37] This section draws heavily on "Initial Guidance for the States on the Education Jobs Fund Program," U.S. Department of Education, April 15, 2011.

[38] For purposes of this program, the District of Columbia and Puerto Rico are defined as States.

previous and current school years.[39] It concluded that SFSF funds were able to restore nearly 100 percent of the 2008-09 budget gaps and a significant portion of the 2009-10 shortfalls. Based on an analysis of states' initial and preliminary submission of the first ARRA quarterly reports the study argued that over 250,000 education jobs have been retained or created through ARRA.

The Center on Education Policy (CEP) has tracked the use of ARRA and Education Jobs funds and the implementation of ARRA-related reforms since these laws were enacted.[40] These six reports were based on survey responses of state and local officials charged with implementing the ARRA and Education Jobs programs. In particular, CEP surveyed state education agency officials and governors' staff and conducted nationally representative surveys of school district officials, including superintendents, chief financial officers, and program directors. CEP came to five conclusions:

- The stimulus programs largely met their goal of stabilizing school finances. In just over half of the districts surveys, SFSF money offset all of the loss of state funding in FY 2010. Virtually all of the remaining districts said the funds offset at least part of the lost state funds.

- 69 percent of the districts reported that they used SFSF funding to save or create jobs for teachers and other school personnel.

- To make up for funding shortfalls not covered by ARRA funds, 85 percent of the districts that lost funds responded by cutting jobs for teachers and other school personnel.

- Two-thirds of the administrators said their spending choices were influenced to a great extent by the one-time nature of the resources.

- To comply with the ARRA reform assurances, the vast majority of states surveyed undertook a variety of strategies to implement rigorous standards and assessments and statewide longitudinal data systems. A majority of survey states also took steps to tie teacher and principal evaluations to student achievement and provide various supports to low-performing schools. Fewer states, however, undertook other reforms related to teacher

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[39] See http://www.whitehouse.gov/assets/documents/DPC_Education_Report.pdf
[40] See Center for Education Policy (2012).

effectiveness or low-performing schools, such as adopting incentives to attract highly

qualified teachers and principals to struggling schools.

The William and Flora Hewitt Foundation provided support for ten organizations to analyze the

impact of ARRA and the Jobs Fund on education. Mead, Vaishnav, Porter, Rotherham (2010) reviewed the

work of Hewitt organizations and came to a number of interesting conclusions.[41] They argued that that

ARRA and the Jobs Program had two virtually irreconcilable goals. Their main goal was to provide

immediate short term aid to state and local governments to save teachers' jobs. But on the other hand, they

sought to provide incentives for the four long term education reforms: implementing college- and career-

ready standards and high-quality assessments, creating pre-K-20 longitudinal data systems, increasing teacher

effectiveness, and turning around chronically low-performing schools. Mead et al. argued that this tension

between the competing goals of short-term stimulus shaped how ARRA played out in practice.

B.   *The Distribution of Stimulus Funds*

To begin an analysis of how the stimulus impacted schools, we first merged data on stimulus

payments to schools from the recovery.gov data base to data from the Common Core and F33 outlined

above. Unfortunately, this was a difficult exercise because the primary identification used in the

Recovery.gov data set was the Duns number which is not reported in NCES data sets. To match the data, we

first selected grants for K-12 education based on the Catalog of Federal Domestic Assistance (CDFA)

number and then matched specific grants to recipients based on the zip code of the recipient and then

visually identified whether the name of the recipient matched the name of the district. In many cases, we had

to match grants to districts by hand. We matched grants to the SY 2008-2009 F33 data.

A similar exercise was conducted by the Institute for Education Studies (IES) of the Department of

Education (2012). This IES paper reports two versions of total stimulus awards: one for all LEA's and

another for Districts. All LEA's includes supervisory unions, regional vocational school districts, etc. while

districts are only regular schools and charter schools, which is closer to what we use in the F33 above so we

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[41] See http://bellwethereducation.org/sites/default/files/legacy/2010/11/Bellwether_Conflicting-Missions-Unclear-Results.pdf.

use their numbers for districts, except for Title 1 totals which are for all LEA's. The IES funding analysis ends in the fourth quarter of 2010 while ours continues to the third quarter of 2013. Our results come from stimulus funds that matched with districts in the F33 while IES results are stimulus funds that matched to SY 2008-2009 CCD.

In Table 6, we report aggregate information about the amount of grants we could match to school districts by grant type and we compare this to the grant amounts reported by the IES. In general, our estimates of dollar amounts are slightly larger than the values in the IES report mainly because we used a more recent version of the Recovery.gov data. In aggregate, our numbers for the SFSF grants differ by less than 1 percent and across all grants by only 2.7 percent. We do however have a smaller number of districts because we match our data to the F33 instead of the Common Core. Our numbers for funds differ most for pre-school grants where we find fewer districts but we record more grant dollars. This is most likely due to the fact that our data from the recovery web page was drawn much later than the original IES document.[42]

C.   SFSF Funds and School Finance: Some Econometric Evidence

To date, there has been limited analysis of the impact of the stimulus. The most detailed work has examined where the money has gone, such as the analysis by the Department of Education (2012). In contrast, Dee (2012) examined the impact of School Improvement Grants (SIGs) on test scores in California. Only persistently low-achieving schools or schools demonstrating lack of progress were eligible for these funds and Dee uses a regression discontinuity framework to examine the receipt of funds on subsequent test scores. He finds that grant funds are associated with higher test scores for schools that qualify under the lowest-achieving margin but finds no impact of grant funds for districts that qualify due to lack of progress.

In this section, we examine whether SFSF operated as intended. If the SFSF program achieved its major goal, then an additional dollar of ARRA funding should have should have been associated with a one dollar decrease in state funds for schools. In general, there are two problems with estimating such a model. First, the recovery.gov website records when grants were first awarded but it does not indicate when they

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[42] Our table does not include some more minor stimulus categories such as Title II technology grants, grants for school lunch equipment, Title I school improvement funds and funds for longitudinal data.

were spent. In the case of SFSF, there is tremendous variation across states in when these funds were distributed to districts. Some states such as California and Illinois spent the vast majority of funds in FY08 while other states such as Virginia reserved a significant portion of funds for distribution in FY09 and FY10. Unfortunately, we do not have a comprehensive source of data that indicates when states distributed funds to the districts. Starting in FY09, districts reported three variables in the F-33 associated with ARRA funding. One measured new Title 1 funds, the second measured capital outlays, and the third measured all funds that went to current expenditures. This third variable would include SFSF funds, but it would also other funds such as support for special education. We use this third measure as a proxy for SFSF funds, but since this category represented roughly 81 percent of non-capital, non-Title 1 funds, it is a quite sensible proxy.

Second, there is potential endogeneity problem in the econometric estimation. If states distributed more funds to districts with lower local revenues, then the size of SFSF awards may signal something about the underlying financial health of the local area. We believe that the way in which SFSF funds were distributed at both the state and local level means that this endogeneity problem can be addressed in a straightforward two-stage least-square (2SLS) procedure.

As we noted above, the allocation of SFSF funds had two distinct steps. First, states received funds from the federal government. State allocations were determined by formula and states received a specific amount based on the size of the student population and the size of the state. Second, districts had to apply for SFSF funds. Because receipt of funds required districts to agree to some specific reforms and enhanced reporting, some districts chose not to participate in the SFSF program. Our data indicates that two percent of all school districts did not receive SFSF funds. Non-participating schools tended to be smaller than average (the average size of schools not receiving funds was 2,106 students while the corresponding number for participating school is 4,245), have fewer poor students (78 versus 86 percent receiving Title 1) and are in rural areas (58 versus 55 percent).[43] Overall, schools NOT receiving SFSF funds only represent 1.1 percent of all students and 2.1 percent of the districts in Table 6.

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[43] These numbers are based on data from the FY08 F-33 data.

In general, states distributed SFSF money in a way similar to the way they distributed other state funds. In Figure 15, we graph on the x-axis the fraction of state revenues in FY08 that went to a particular district.[44] On the y-axis, we report the fraction of a state's SFSF funds in total that went to that district. We also include the regression line that best fits these points. That line is essentially the 45 degree line. In a regression of the SFSF share from the state on the state share of total revenues in FY08, the coefficient (standard error) on this variable is 1.007 (0.013) and we cannot reject the null that this coefficient equals 1. The fact that states distributed SFSF funds in a similar way to other state revenues will be exploited in a 2SLS procedure below.

The model we would like to estimate is one that examines the impact of the SFSF funding on state funds. Consider a panel data set where we have state revenues per pupil over time for a sample of districts. Let $S_{ij}^t / Pupil_{ij}^t$ be the state funding per pupil in district i, in state j in year t. Let $SFSF_{ij}^t / Pupil_{ij}^t$ be the corresponding values distributed through the SFSF program. Consider a simple regression of *State/Pupil* on *SFSF/Pupil* of the form

$$(4) \qquad S_{ij}^t / Pupil_{ij}^t = \beta_0 + SFSF_{ij}^t / Pupil_{ij}^t \beta_1 + u_{ij} + v_j^t + \varepsilon_{ij}^t$$

where u_{ij} is a district fixed effect, v_j^t is a state-specific year effect and ε_{ij}^t is a random error. If the SFSF program is working as intended, then the coefficient on β_1 should be -1; that is, an additional dollar from the federal government through this program allowed states to reduce spending by exactly a dollar. The primary concern is that $SFSF_{ij}^t / Pupil_{ij}^t$ is correlated with ε_{ij}^t. If the factors that lead a state to give a district more funds than expected is persistent over the six years in our panel, then that concern would be captured by the district effect u_{ij}.

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[44] In this graph, we only include a 10% random sample of districts that received SFSF funds. For ease of exposition, we excluded any district that received greater than 1 percent of a state's allocation of revenues in FY08, which is a small number of districts.

The instrument we use exploits the results in Figure 16 which suggest that once the total size of the state's SFSF grant was announced, districts had a good sense of how much they would receive from the state. Let $SFSF_j^t$ be the total SFSF funds distributed by state j in year t, let θ_{ij}^{08} be the share of state j's funds distributed to district i in FY08, and $Pupils_{ij}^t$ be the number of students from district i in year t. Our instrument for $SFSF/Pupil_{ij}^t$ is then

$$(5) \qquad INST_{ij}^t / Pupil_{ij}^t = \frac{\theta_{ij}^{08} SFSF_j^t}{Pupils_{ij}^t}.$$

In year t, district i could expect to receive $\theta_{ij}^{08} * 100$ percent of total funds $SFSF_j^t$ distributed under this program in year t and dividing this by district size turns it into a per pupil amount. In this case we will use data from FY06 through FY11 which gives us three years before SFSF and three years when all SFSF funds were supposed to be distributed. In years prior to the ARRA, $SFSF_j^t = 0$ so $INST_{ij}^t / Pupil_{ij}^t = 0$. Because the instrument only makes sense for districts that received SFSF funds, we delete districts that did not participate in that program. In all, our data set has information for 9,450 districts over six years. In our 2SLS models we weight the regressions by number of pupils and we cluster standard errors at the state level.

In the first column of Table 7, we report the first-stage estimate where we regress $SFSF_{ij}^t / Pupil_{ij}^t$ on $INST_{ij}^t / Pupil_{ij}^t$, plus district effects and state-specific year effects. The coefficient on the instrument is 0.88 and we can easily reject the null that the parameter equals 0. The first-stage F-test is 66.8 so there are no concerns of finite sample bias in this case. The 2SLS estimate of equation (4) is reported in the second column of Table 7. The estimated coefficient on $SFSF_{ij}^t / Pupil_{ij}^t$ is -0.94 with a standard error of 0.256. We can easily reject the null that the coefficient is zero but the p-value on the null that the coefficient is -1 is 0.80. In general, the results in Table 7 suggest the SFSF program was working as intended; for every dollar

distributed to the districts through this program, the states reduced spending by a dollar and there was no tax relief offered to local taxpayers from these grants.

VI.   Summary and Conclusions

When we began this project we had a simple task: how did the Great Recession affect public schools? Our research has led to some interesting answers to this question, but it has generated some important further questions as well.

Our results strongly suggest that the growing role of the states in public education magnified the impact of the Great Recession. Over the last 40 years, states have assumed more and more responsibility for funding public schools. This shift in the way schools are financed is in part a result of legislative and judicial efforts to reduce the wedge between resources in rich and poor schools. As previous work has shown, the increase in state funding successfully reduced between-district inequality from 1972 through 2000. But this growing reliance on the states has, however, proved costly. States rely on taxes that are particularly sensitive to the ups and downs of the business cycle. The Great Recession led to a steep decrease in state tax revenues and consequently state support for schools. As we note in Figure 10, state funding for education fell sharply as a result of the recession; in roughly one-third of the states, state funding fell by 10 percent or more. An important question we do not address is whether it is possible to have a more redistributive state system of support that does not subject districts to these large systemic shocks. Given that states will continue to rely on income and sales taxes, these goals seem incompatible.

We also found that the Great Recession had a much smaller impact on local support for education. As we argued above, this is a somewhat surprising result. The recession began with a sharp fall in housing prices. Given that most local school districts rely heavily on the property tax, one would expect that local tax revenues would have fallen at least as far as state tax revenues. This turned out not to be the case. As we showed in some of our state case studies, school districts seem to be able to raise tax millage rates to compensate for any loss in property values. In four of five states we studied, we cannot reject the null that when property values were falling, the elasticity of the millage rate with respect to per capita property values

was -1. This raises an additional question: why do property tax rates rise when the tax base falls but remain roughly unchanged when the tax base rises? The ease with which local governments can change the property tax stands in stark contrast to voter sentiment about the property tax. The American Enterprise Institute has compiled survey results from 1937 about what taxes respondents consider fair and onerous and they conclude that "surveys suggest that the local property tax is now considered more onerous than the federal income tax" (p.3). They note that the property tax is usually mentioned as the worst or least fair tax. As one example, Gallop/CNN/USA Today in April 2005 found that 42% of respondents listed the property tax as the "worst or least fair" way to tax, twice the rate of the federal tax and at least three times the rate for state sales, Social Security or state income taxes (p.18).[45] As Cabral and Hoxby (2012) note, the property tax is one of the most salient taxes and at the same time one of the most hated and they conclude that the high salience of the property tax explains why voters despise it so much.

Our results suggest that one reason voters hate the property tax is that local government spending always rises. The results in Table 2 point to an interesting dynamic with respect to property values. When property values per capita are increasing the elasticity of interest is much less than 1 in absolute value, indicating that total revenues/pupil will increase in those situations. Similarly, property value declines do not generate reductions in expenditures given the plasticity of the millage rate. Local revenues/pupil are almost immune from reductions.

Starting in the early 2000s, the long-term secular decline in between-district inequality described above reversed and now, inequality is about the same as it was in 1972. In a span of 10 short years, 30-years of reductions in inequality were eliminated. This occurred well before the start of the Great Recession and hence, this trend had little to do with the recession. In fact, the available evidence suggests that Great Recession may have reduced inequality slightly.

However, it does leave open an important question: why did things change so dramatically in the early 2000s? Corcoran and Evans (2010) argue that in a simple median-voter model, rising inequality due to changes in the top of the income distribution should increase public spending. With an income or wealth tax,

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[45] http://www.aei.org/files/2012/04/09/-aei-public-opinion-study-on-taxes-2012_082833686158.pdf

rising inequality at the top of the distribution reduces the cost to the median voter of raising an extra dollar of revenues and hence increases spending. This is one possible mechanism but prior to this paper, no one has documented the rising inequality in between-district spending over the past decade let alone identified a possible mechanism.

Finally, the Great Recession led to the largest expansion of federal support for public education. Through ARRA, the federal government doubled their share of school district revenues, albeit for a short period of time. The largest component of ARRA support for education came through the State Fiscal Stabilization Funds which made up 82 percent of non-Title I stimulus spending on education and were designed to offset dwindling state support for education. Our results suggest that the program worked as intended: a dollar in ARRA support offset a dollar of state funding for education. Unfortunately, our results do not answer a more difficult question which is what states would have done had they not received stimulus funds. At what level would states have supported K-12 education had there been no stimulus over the 2009-2011 period?

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Appendix

We have developed a balanced panel school district data set for this analysis. The key source of data here is the Common Core of Data (CCD) from the National Center for Education Statistics (NCES) which is available at the Local Education Agency (LEA) (district) level. The Universe Surveys in the Common Core are available annually for the 1986-87 to 2011-12 academic years and include data on enrollment, staff counts, and basic school demographics recorded in the Fall of the school year.

The Universe Surveys of the Common Core do not contain any financial information, however. We take data at the LEA level and merge the Universe Surveys to the Finance Survey (F-33) data from the Common Core. The F-33 data provides information on revenues, expenditures, and capital outlays for districts and is available annually for the 1991-92 to the 2010-11 school years. As we constructed the data set for this part of our work, we found that the financial data in the F-33 contained some extremely large and small values. These values could be valid, but it is more likely that some districts incorrectly reported enrollments or expenditures. We therefore developed an algorithm to delete extreme values. First, we calculated the (unweighted) 95th and 5th percentile district in total per-pupil current expenditures for each state and year. We then deleted districts with per-pupil expenditures greater than 150 per-cent of the 95th percentile of per-pupil revenues or less than 50 percent of the 5th percentile.

Along with eliminating extreme values, we further restrict our sample by only keeping school districts that had similar operating procedures and organization/level. Given that schools with different operating procedures and organizations often experience different costs (secondary schools are typically more expensive than elementary schools), we focus on districts that are unified across elementary and secondary schools. All schools in our sample are also regular districts.

The Universe Survey of the CCD contains staff counts broken down by position type. Certain position types, however, are more consistently reported than others (e.g. most districts will report the number of teachers, but not as many keep track of the number of library support staff). To account for this, we create a balanced panel by excluding districts that failed to report information for multiple years and districts

that were only in operation for a limited number of years during our study period. [46] We use five key variables to balance the districts in our dataset: teachers, guidance counselors, school administrators, school district administrators, and student enrollment. Teacher employment and student enrollment were the most consistently reported variables across districts. In order to remain in the balanced sample, a school district had to report these variables in at least 17 years of our 19 year study period (School Years 1993-94 to 2011-12). For the remaining staff count variables – guidance counselors, school administrators, and school district administrators -- districts needed to report at least 12 years.

Once we exclude these districts, we then develop a procedure to fill in the missing information of the remaining districts in the balanced sample. Missing teacher employment and student enrollment are linearly interpolated using data reported by a district in the year before and the year after the missing year of data. Given this strategy, we eliminate all districts that failed to report teacher or student information in the first or last years of our study period (1994-95, 2011-12, respectively). Missing information for guidance counselors, school administrators, and district administrators is generated by calculating the average ratios of these employment types to teachers by district over the entire study period. We then multiply this ratio by the teacher count for the corresponding missing year to estimate the number of employees. The final data set excludes many small districts. As a consequence, while the data set contains only about 71 percent of all regular districts, those districts account for 88 percent of all public school students.

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[46] In some years of our sample, New York City Public Schools did not report information as a single district, but instead as 33 distinct geographic districts. We aggregated the components of these 33 districts to form one aggregate measure for New York City Public Schools in the dataset.

Figure 1
Real Current Expenditures per Pupil, Public K-12 Schools, 1970/71 to 2010/11 (in 2013$)
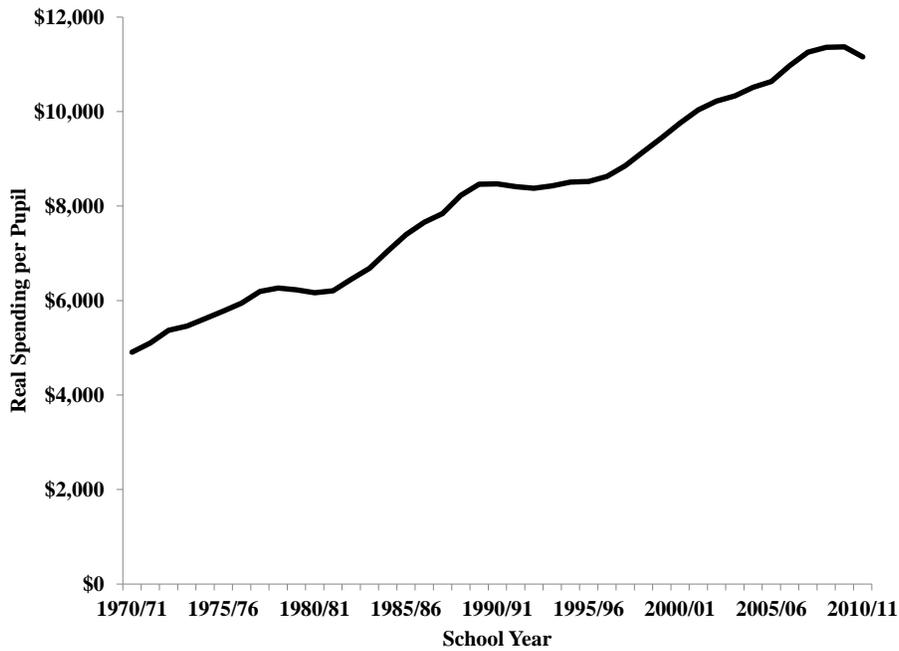
Figure 2
Time Series Plot of National Unemployment Rate and De-Trended Real Current Expenditures per Pupil
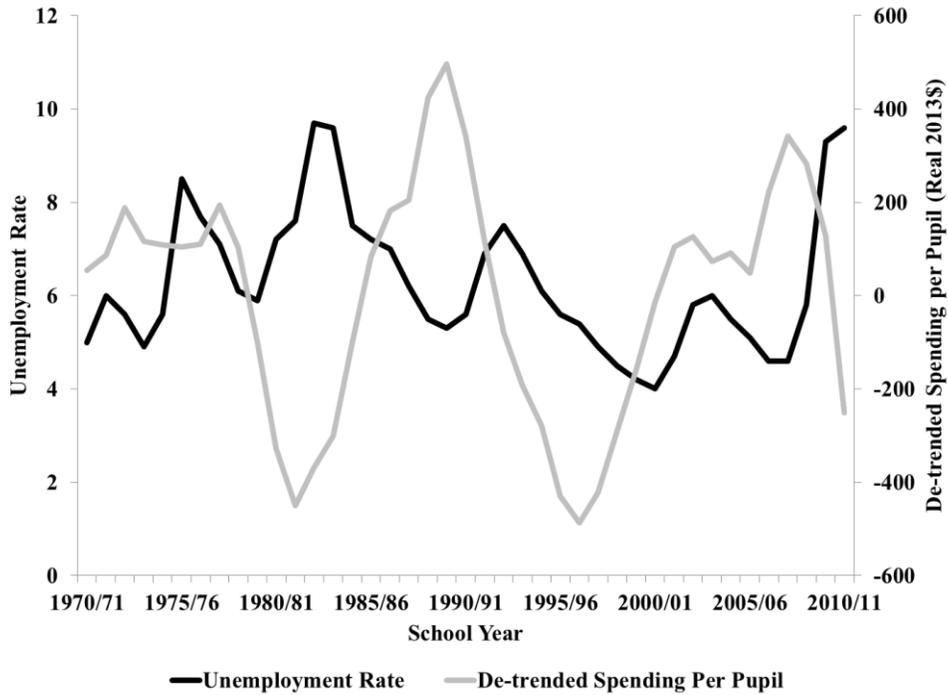
Figure 3
Source of Revenues for K-12 Education, 1970/71 – 2010/11 School Years
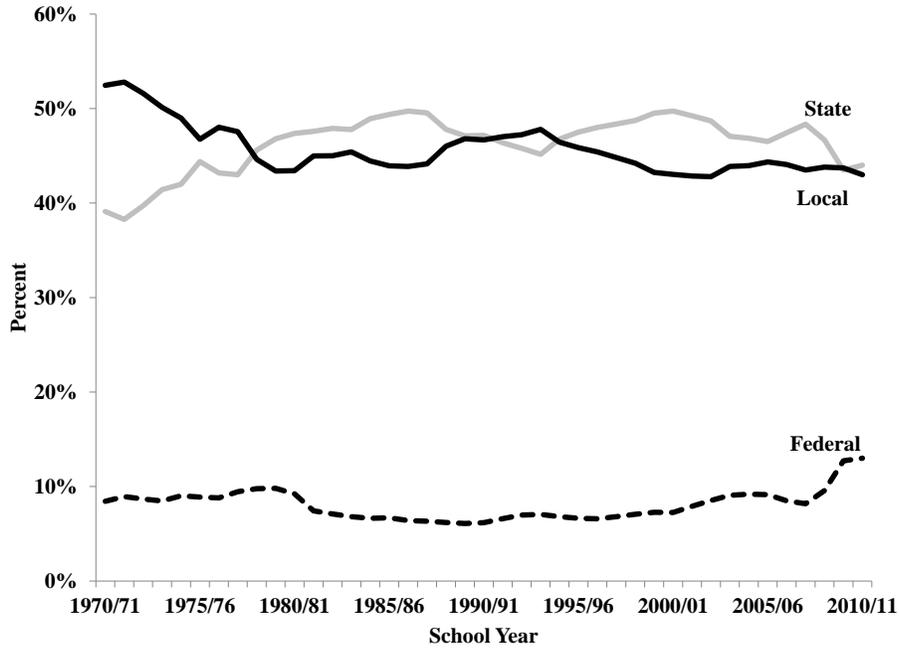

Figure 4
Index of Four-Quarter Moving Average of Quarterly State and Local Tax Revenues
Over the Last Three Recessions (Start of Recession=100)
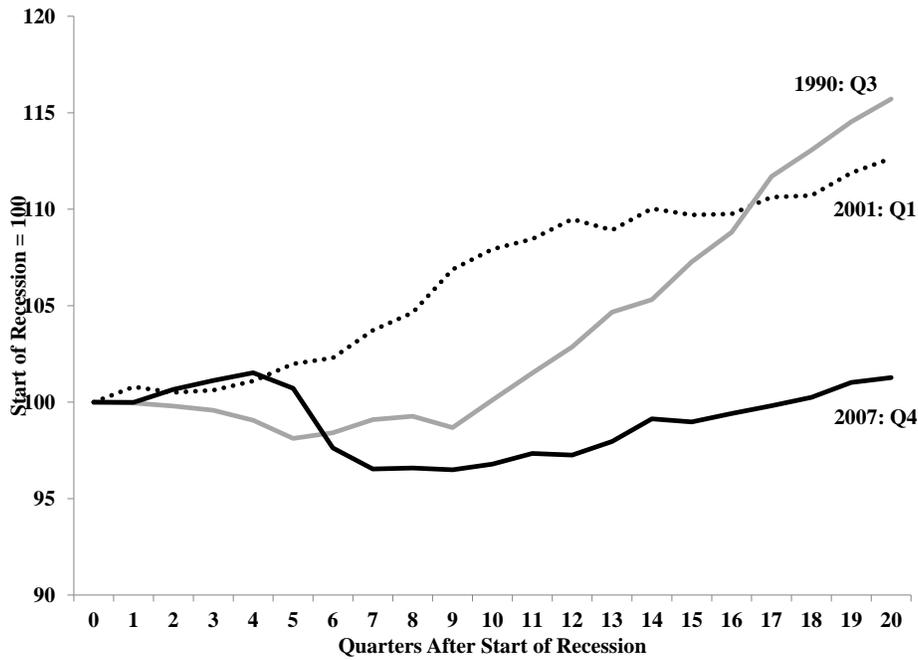
Figure 5
Index Four Quarter Moving Average of Sources of State and Local
Tax Revenues Over the Great Recession (Start of the Recession=100)
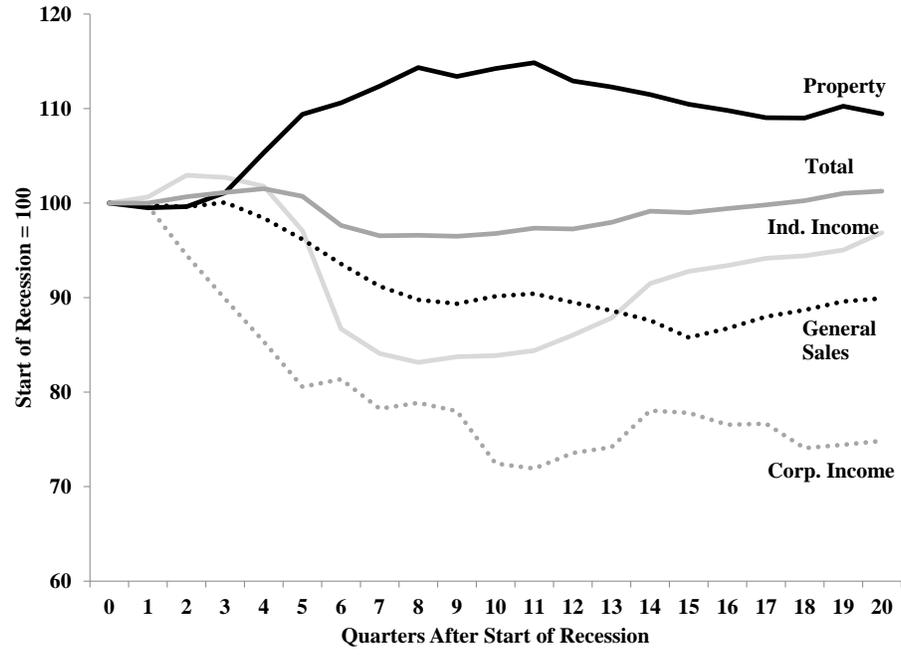
Figure 6
House Price Index and Property Tax Outcomes in Virginia and Washington

A: Washington
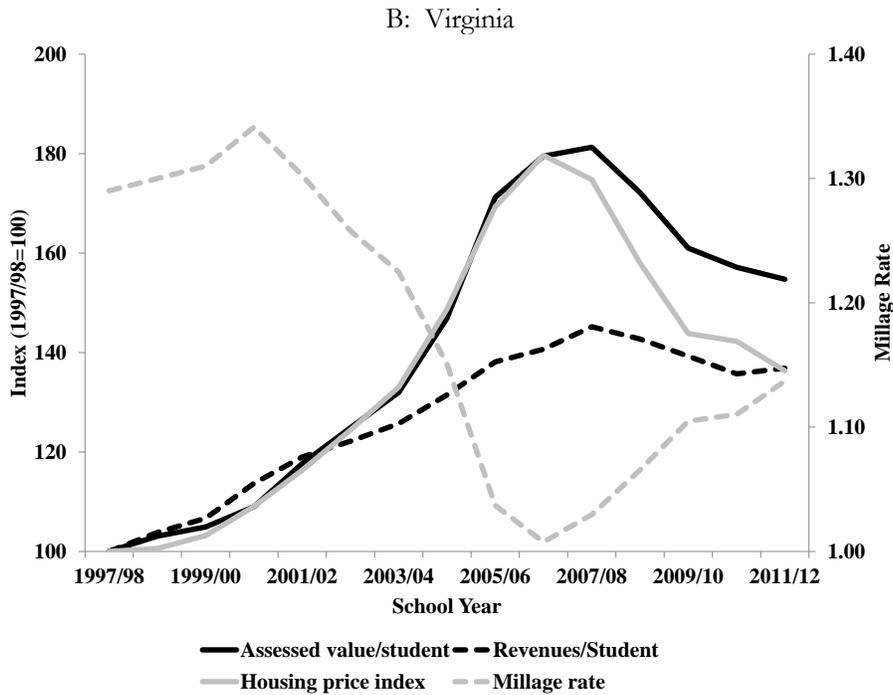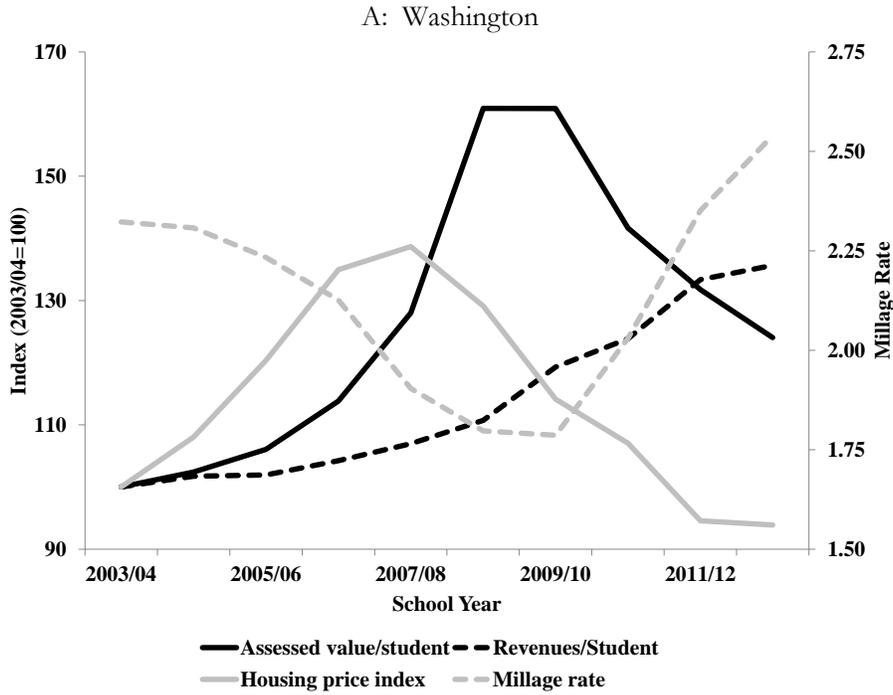
B: Virginia

Figure 7
Scatter Plot of the Change in Percentage Change in Property Tax Rates and the
Percentage Change in Property Tax Values for Virginia and Washington
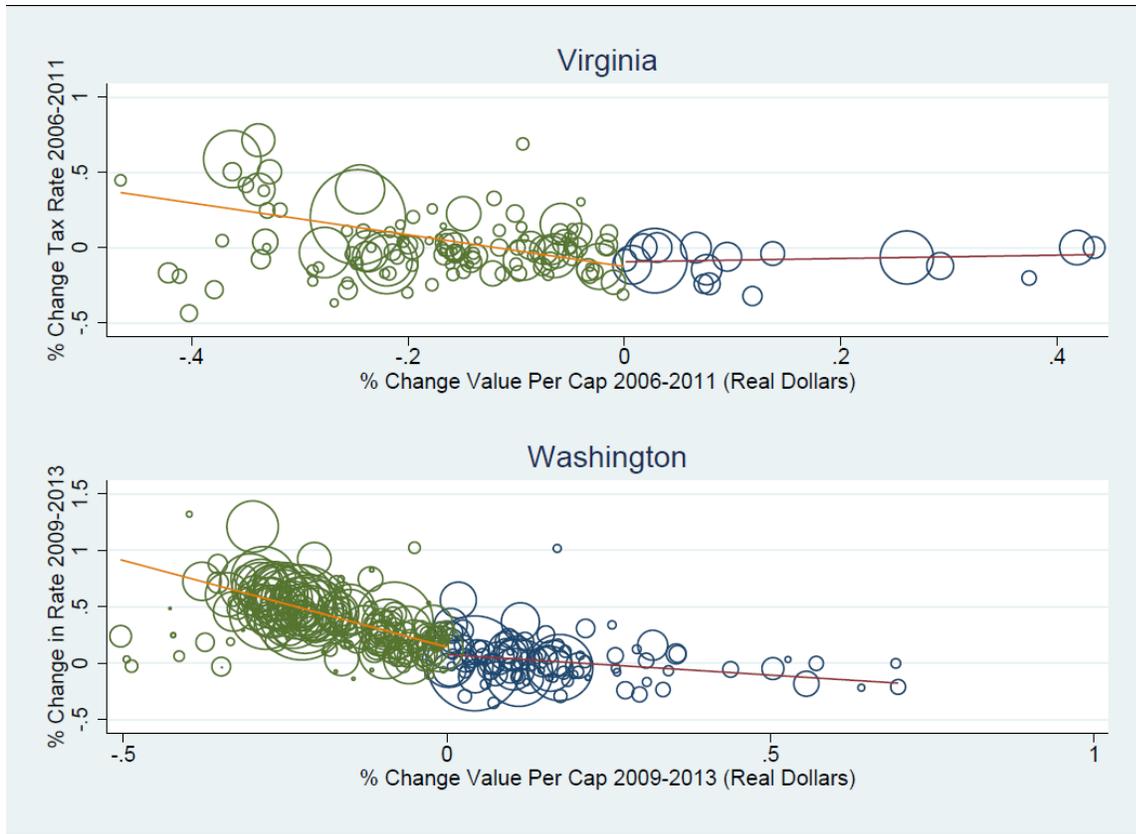
Note: Data is at the county level for Virginia and at the school district level for Washington. The size of the bubble is determined by county population in Virginia and students in the district in Washington. Red circles are areas with declining property values and blue circles are areas with increasing property values.

Figure 8
Employment Index for Four Sectors over the Great Recession,
BLS Current Employment Statistics (100 = Start of the Recession)
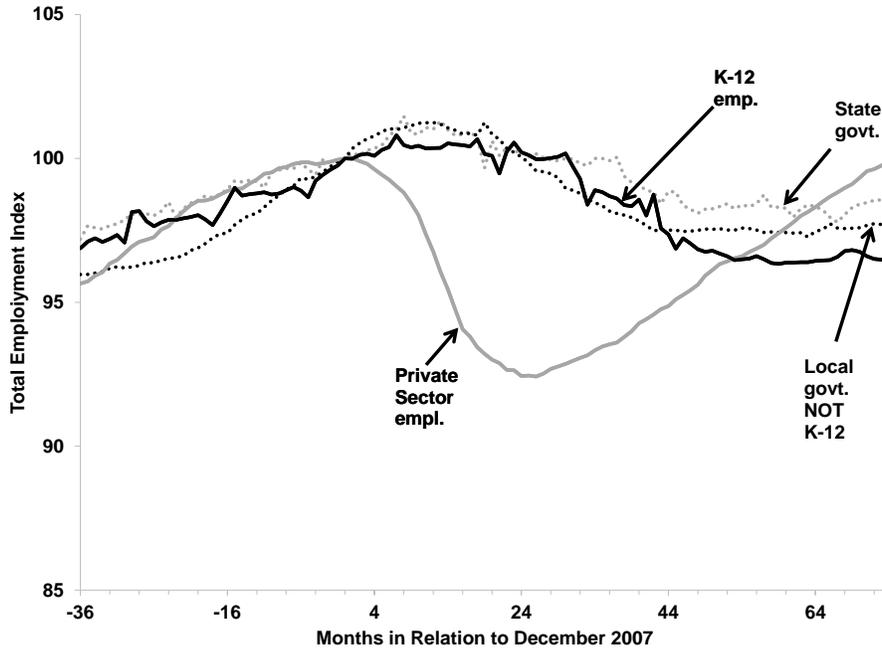
Figure 9
Employment Index for K-12 Education over Last Four Recessions,
BLS Current Employment Statistics (100 = Start of the Recession)
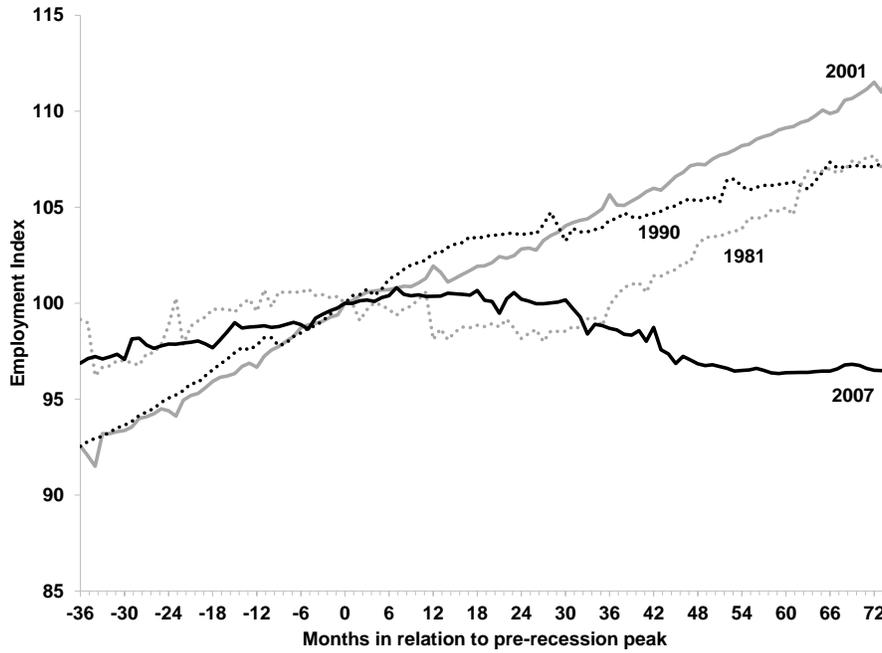
Figure 10
Percentage Change in State K-12 Revenues/Student 07/08 to 12/13
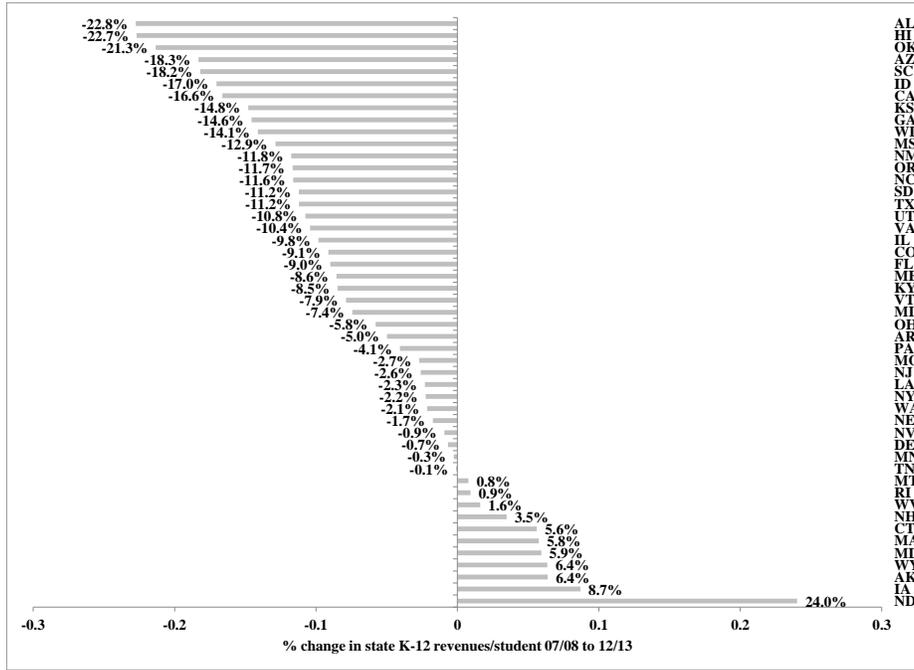
Source: Center for Budget Priorities and Policies

Figure 11
Scatter Plot of State Share of K-12 Revenues in 2007/08 versus
Change in Real State Revenues/Student, 2007/08 to 2012/13
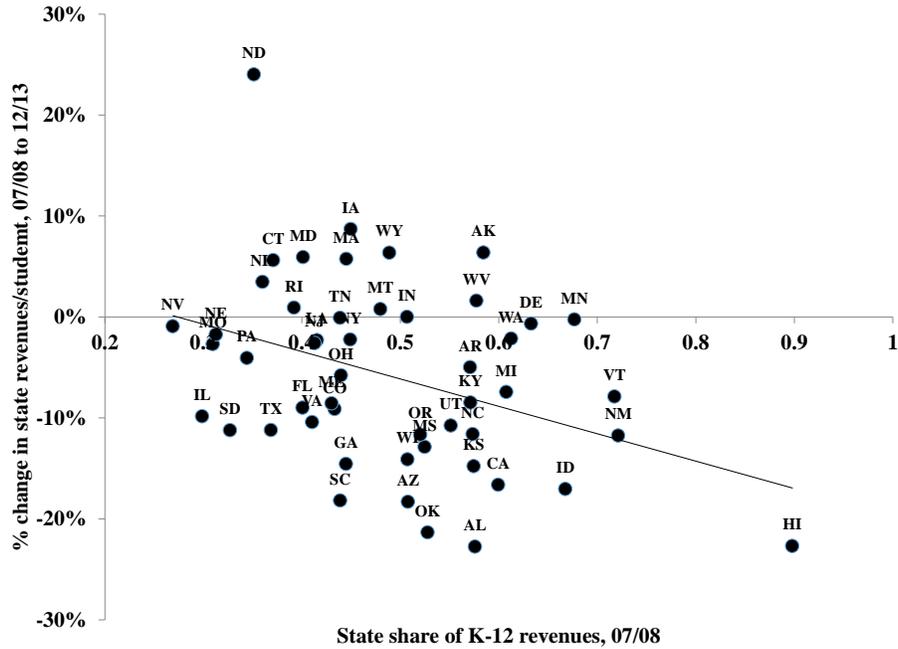
Figure 12
Teachers, Aides, Support, and Other Education Employees
1998-2011 (1998 = 100)
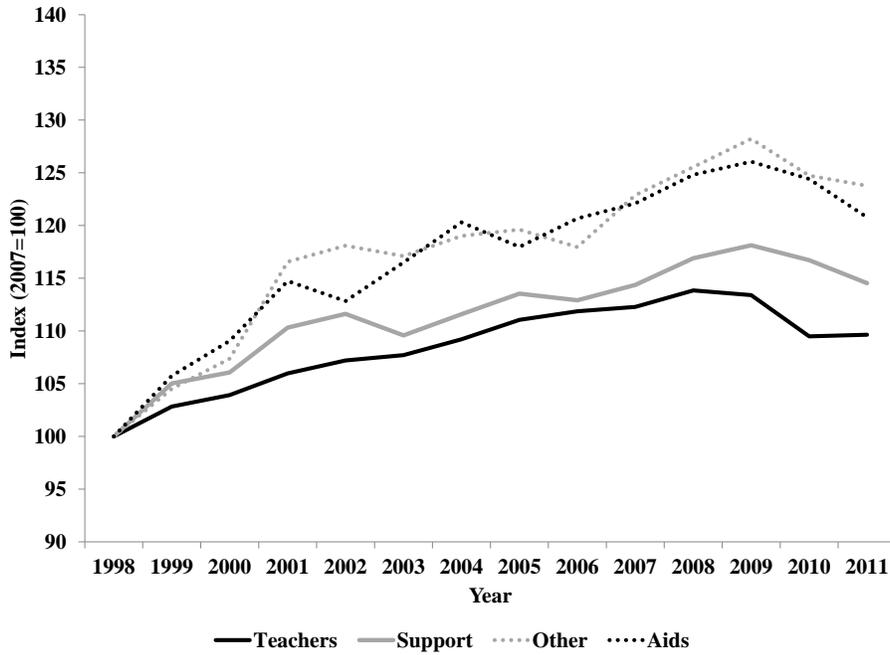
Figure 13
Percentage Change in Current Expenditures/Student
vs. Current Expenditures per Student in 2000
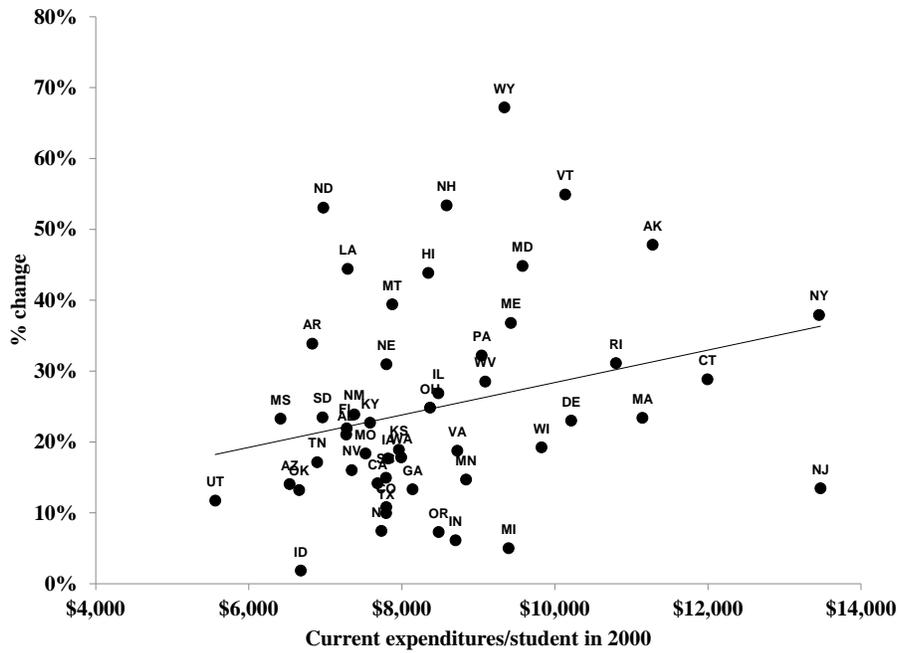
Figure 14
Percentage Change in State Housing Price Index 2000-2011 vs. Current Expenditures per Student in 2000
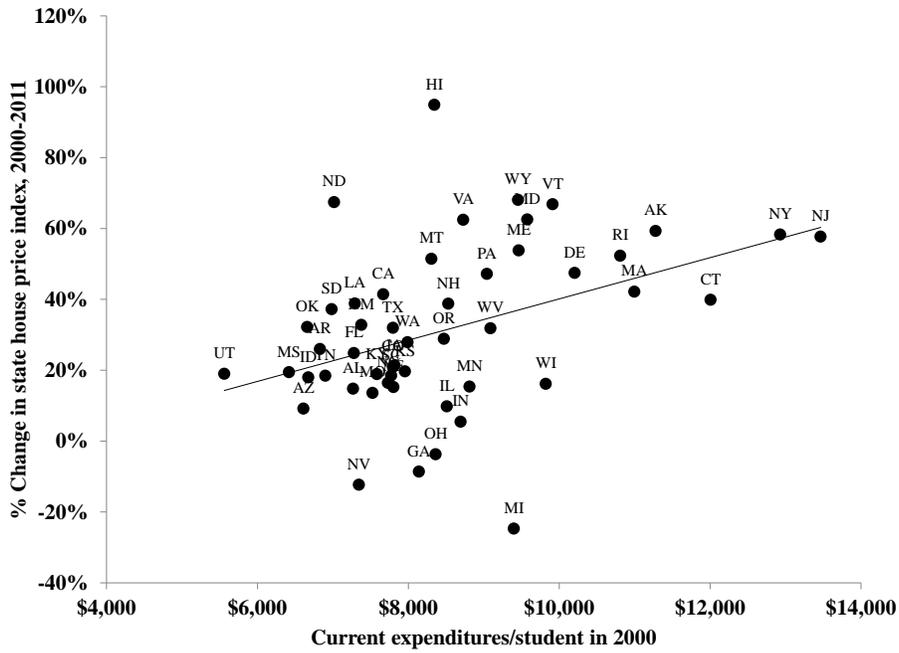
Figure 15
Scatter Plot of State Share of Revenues in FY08 Going to Districts vs. Share of State SFSF Revenues Going to District
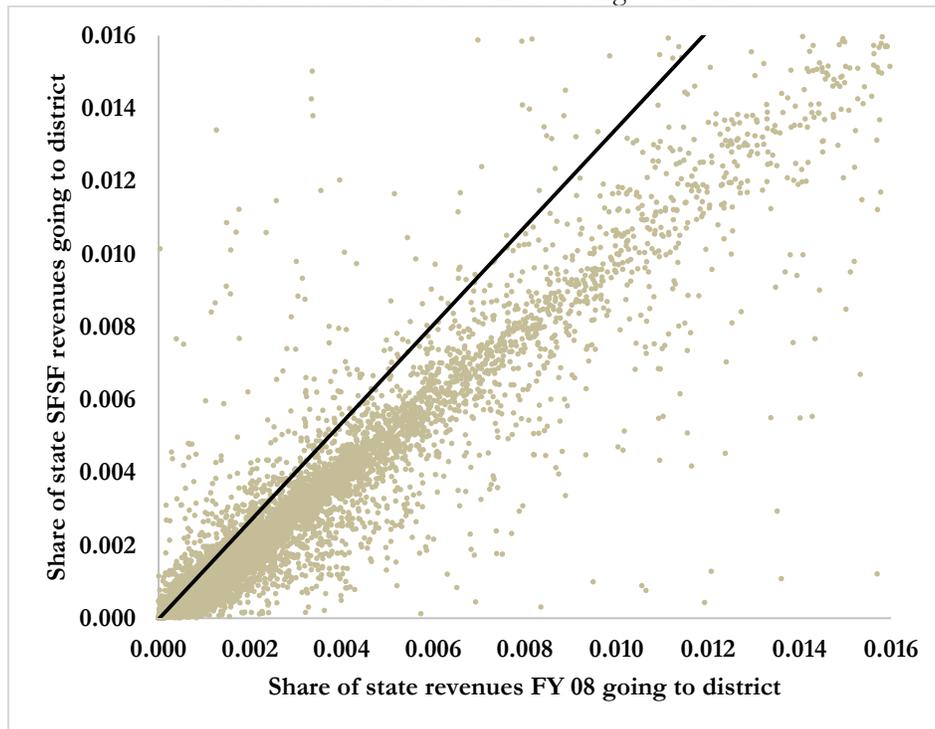
Table 1
State and Local Tax Revenues by Source, 2nd Quarter 2013
(in Millions of dollars)

| Tax type	Tax source	State Total	State Share	Local Total	Local Share	State+ Local Total	State+ Local Share
Income	Individual	$106,170	40.9%	$7,862	6.4%	$114,032	29.8%
	Corporate	$17,549	6.8%	$2,614	2.1%	$20,163	5.3%
Property		$3,396	1.3%	$88,493	72.1%	$91,889	24.0%
Sales	General	$68,820	26.5%	$13,392	10.9%	$82,212	21.5%
	Motor fuels	$10,965	4.2%	$289	0.2%	$11,254	2.9%
	Tobacco	$4,489	1.7%	$45	0.0%	$4,534	1.2%
	Alcohol	$1,707	0.7%	$120	0.1%	$1,827	0.5%
MV operator's license		$6,975	2.7%	$970	0.8%	$7,945	2.1%
Other taxes		$39,480	15.2%	$8,902	7.3%	$48,382	12.7%
Total		$259,550		$122,688		$382,238	

Table 2
OLS Estimates, Percentage Change in District Property Tax Millage Rates, Peak to Trough
as a Function of the Change in Property Values Per Capita

	State and Fiscal Years Included				
	IL	WA	VA	TX	OH
	'08 to '11	'09 to '12	'06 to '11	'09 to '13	'08 to '12
(a) %$\Delta PVPC_i$ * D_i	-0.034	-0.308	0.111	0.004	-0.181
	(0.042)	(0.210)	(0.436)	(0.041)	(0.159)
(b) %$\Delta PVPC_i$ * (1-D_i)	-1.190	-1.536	-1.056	-0.097	-0.927
	(0.130)	(0.106)	(0.166)	(0.025)	(0.086)
D_i	-0.017	-0.073	0.031	-0.000	-0.019
	(0.013)	(0.0437)	(0.090)	(0.007)	(0.265)
Constant	0.048	0.143	-0.126	0.020	0.058
	(0.010)	(0.023)	(0.036)	(0.003)	(0.015)
P-value on test: (a)=(b)	<0.0001	<0.0001	0.014	0.037	<0.0001
N	552	279	134	1021	612
R^2	0.335	0.601	0.267	0.018	0.265
Sample means (unweighted):					
% Δ tax rates	4.32%	23.6%	-0.24%	3.02%	9.60%
% $\Delta PVPC_i$	8.50%	-4.14%	-13.4%	-3.39%	-3.94%
I(% $\Delta PVPC_i$ >0)	67.2%	36.6%	12.7%	47.2%	34.9%

Regressions are weighted by size of the district in the earlier year.

Table 3
OLS Estimates of Equation Explaining % Change in Current Expenditures/pupil from 07/08 to 10/11

Covariates	All districts in sample (9,619 observations)			Districts in a CBSA (3,692 observations)		
% Δ County per capita income, 07-11	0.195 (0.068) [0.014]	0.040 (0.030)	0.069 (0.040)	0.213 (0.099) [0.025]	0.027 (0.050)	0.122 (0.079)
Δ County unemployment rate, 07-11	-1.267 (0.313) [0.060]	0.546 (0.216)	0.249 (0.225)	-1.076 (0.301) [0.106]	0.759 (0.234)	0.379 (0.317)
% district revenues from state sources, 07	-0.090 (0.027) [0.005]	-0.026 (0.036)	-0.017 (0.036)	-0.085 (0.027) [0.009]	-0.024 (0.029)	-0.019 (0.029)
% Δ CBSA housing price index, 07-11				0.033 (0.045) [0.011]	-0.011 (0.037)	0.039 (0.065)
% Δ State per capita income, 07-11			0.048 (0.308)			-0.018 (0.328)
Δ State unemployment rate, 07-11			-2.637 (0.792)			-3.106 (0.818)
Share of state K-12 revenues from state sources '07			-0.197 (0.095)			-0.217 (0.079)
% Δ State housing price index, 07-11			-0.029 (0.074)			-0.114 (0.119)
Include state effects?	No	Yes	No	No	Yes	No
R^2	0.1339	0.4701	0.2067	0.1607	0.4857	0.2432

There are 9,616 observations in the each regression. The numbers in parentheses are standard errors allowing for arbitrary correlation in errors across districts within a state. The numbers in square brackets are OLS standard errors.

Table 4

OLS Estimates of Equation Explaining % Change in Pupil-Teacher Ratio from 07/08 to 11/12

Covariates	All districts in sample (9,619 observations)			Districts in a CBSA (3,692 observations)		
% Δ County per capita income, 07-11	-0.071 (0.075) [0.016]	-0.005 (0.029)	-0.031 (0.036)	-0.143 (0.158) [0.032]	0.046 (0.046)	-0.029 (0.097)
Δ County unemployment rate, 07-11	0.639 (0.717) [0.083]	-0.288 (0.165)	0.419 (0.219)	1.229 (0.613) [0.151]	-0.351 (0.390)	0.956 (0.583)
% district revenues from state sources, 07	0.107 (0.050) [0.007]	0.013 (0.017)	0.015 (0.023)	0.083 (0.054) [0.012]	-0.013 (0.022)	-0.017 (0.031)
% Δ CBSA housing price index, 07-11				0.069 (0.112) [0.013]	-0.012 (0.049)	-0.037 (0.087)
% Δ State per capita income, 07-11			-0.212 (0.438)			-0.411 (0.390)
Δ State unemployment rate, 07-11			1.491 (1.250)			1.050 (1.580)
Share of state K-12 revenues from state sources '07			0.275 (0.118)			0.286 (0.137)
% Δ State housing price index, 07-11			0.203 (0.151)			0.328 (0.122)
Include state effects?	No	Yes	No	No	Yes	No
R²	0.0413	0.4455	0.0925	0.0411	0.4758	0.0813

There are 9,755 observations in the each regression. The numbers in parentheses are standard errors allowing for arbitrary correlation in errors across districts within a state. The numbers in square brackets are OLS standard errors.

Table 5

Inequality in District-Level Per Pupil Current Expenditures on K-12 Education, 1972-2011

Year	Gini (x100)	95-to-5 ratio	Coefficient of Var. (x100)	Theil Index (x 1000)	Between- and Within-state Theil Index			
					Within States	Between States	% Within	% Between
1972	16.2	2.73	30.57	43.1	14.0	29.2	32.4	67.6
1982	13.7	2.21	25.53	30.7	13.8	16.9	45.0	55.0
1990	15.7	2.53	30.02	41.1	12.9	28.2	31.3	68.7
1992	15.1	2.47	29.44	39.0	11.9	27.1	30.4	69.6
1993	14.4	2.39	28.19	35.8	11.3	24.5	31.5	68.5
1994	13.9	2.34	27.61	34.0	10.0	24.0	29.5	70.5
1995	13.6	2.26	27.15	32.8	9.6	23.3	29.1	70.9
1996	13.2	2.19	26.32	30.9	9.0	21.9	29.1	70.9
1997	12.7	2.15	25.37	28.8	8.4	20.4	29.1	70.9
1998	12.1	2.10	24.27	26.4	8.2	18.2	31.2	68.8
1999	12.0	2.08	24.13	26.1	8.1	18.0	31.2	68.8
2000	11.9	2.08	23.98	25.7	8.0	17.7	31.2	68.8
2001	11.9	2.08	24.06	25.9	8.2	17.6	31.8	68.2
2002	12.2	2.09	24.61	27.1	8.5	18.5	31.5	68.5
2003	12.4	2.11	25.11	28.1	8.7	19.5	30.8	69.2
2004	12.9	2.16	26.38	30.7	9.3	21.5	30.1	69.9
2005	13.2	2.16	27.35	32.6	9.5	23.2	29.1	70.9
2006	13.4	2.20	27.94	33.8	10.0	23.9	29.5	70.5
2007	13.4	2.24	28.16	34.3	9.9	24.4	29.0	71.0
2008	13.7	2.27	28.53	35.3	10.4	24.9	29.6	70.4
2009	13.4	2.26	27.62	33.4	9.6	23.8	28.6	71.4
2010	13.8	2.29	28.30	35.0	9.6	25.5	27.3	72.7
2011	14.2	2.37	28.98	36.8	9.7	27.1	26.4	73.6

Data for 1972-1992 are from Corcoran and Evans (2009). All other calculations are by authors.

Table 6
Total Stimulus Funds Received by School Districts

CFDA #	Program Name	Total amount awarded (in millions of $)		% diff.	# districts with awards		% diff.
		IES Estimate	Our sample		IES Estimate	Our sample	
84.394	SFSF – Education	$28,895	$29,115	0.8%	13607	13341	-2.0%
84.389	Title 1, Part A	$8,835	$9,090	2.9%	12682	10876	-14.2%
84.391	Special Education	$8,844	$9,594	8.5%	9180	8716	-5.1%
84.386	Education Technology	$484	$517	6.8%	4710	4554	-3.3%
84.387	Education Homeless	$55	$52	-6.0%	1342	1230	-8.3%
84.392	Special Ed. -- Preschool	$285	$320	12.8%	5427	5237	-3.5%
	Total	$47,399	$48,690	2.7%	14493	15382	6.1%

Table 7
2SLS Results of Impact of Stimulus Spending on School District Outcomes,
Balanced Panel of Districts, FY0506 – FY1011

Estimation Method:	OLS	2SLS			
Dependent Variable: Covariates	$SFSF_{ij}^t / Pupil_{ij}^t$	$S_{ij}^t / Pupil_{ij}^t$	Local rev./Pupil	Total rev./Pupil	Employment/ Pupil
$INST_{ij}^t / Pupil_{ij}^t$	0.881 (0.102)				
$SFSF_{ij}^t / Pupil_{ij}^t$		-0.936 (0.256)	0.103 (0.206)	0.239 (0.258)	-0.000 (0.000)
1st stage F (P-value)	66.8 (<0.0001)				
P-value, $\beta=-1$		0.802	0.000	0.000	0.000
R^2	0.887	0.429	0.2668	0.3668	0.1851

Standard errors in parentheses allow for arbitrary correlation in errors within a state. There are 6 observations per district for 9,450 districts for 56,700 observations. Other covariates in the model are state-specific year effects and district fixed-effects. We cluster the standard errors at the state level. Results are weighted by annual student enrollment.