IMPLICATIONS OF FINANICAL SHOCKS AND BUDGETARY CONSTRAINTS ON THE PUBLIC EDUCATION SECTOR

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To Alisa

and

In memory of my brother, Andy

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ABSTRACT

This dissertation comprises three separate, stand-alone essays (chapters) that examine the effects of state-imposed binding school district tax and expenditure limitations (TELs) on the public education sector after the implementation of the No Child Left Behind Act of 2001 (NCLB). Previous education finance and policy research finds that NCLB was an underfunded federal mandate on state governments and school districts. However, school districts in states with binding tax and expenditure limitations (TELs) were restricted in their abilities to raise additional revenue to fund the needed investments to comply with NCLB mandates. This dissertation examines whether or not there was negative unintended consequences in states with binding TELs as a result of this underfunded federal mandate.

All three essays empirically address separate research questions. The first chapter examines the differential effect of binding TELs on states' shares of education funding after the implementation of NCLB. Using a state-level panel dataset from 1992 to 2009, I find states that imposed binding school district TELs have 6.9 percentage point higher state shares of total education funding relative to states without binding school district TELs after the implementation of NCLB. This suggests state governments intervened by increasing funding assistance to school districts. As a result, there was an unintended expansion in the role and influence of states in the provision of public education after the passage of NCLB.

The second chapter expands on the first chapter in two ways. First, I test whether the main finding in the first chapter varies across different types of school districts. Second, I test whether or not the increase in states' shares of education funding in states with binding TELs provided adequate funding supplements to local districts. Using a school district-level panel dataset, I find that those state governments with binding TELs did not increase state funding to school districts adequately. Additionally, I find that NCLB had the largest adverse effect on education revenues for low property-wealth school districts in states with binding TELs.

The last chapter changes the outcome of interest from education finances to teacher turnover. Previous public management and organizational theory literature focuses primarily on the employee- and organizational-level characteristics that influence employee turnover. However, other potential determinants of employee turnover, such as factors external to the organization, are understudied. The last chapter addresses this gap in the literature by examining the effect of the interaction between NCLB and binding TELs on teacher turnover. Using a nationally representative teacher-level dataset, this paper tests the hypothesis that, after the implementation of NCLB, teachers in states with binding TELs on school districts become more likely to turnover than their counterparts in other states. This paper presents evidence to support this hypothesis.

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CHAPTER 1

THE DIFFERENTIAL EFFECT OF THE NO CHILD LEFT BEHIND ACT (NCLB) ON STATES' CONTRIBUTIONS TO EDUCATION FUNDING IN STATES WITH BINDING SCHOOL DISTRICT TAX AND EXPENDITURE LIMITATIONS

Introduction

In the last two decades, federal and state governments have increased their influence on U.S. school districts' fiscal decisions. State governments indirectly influence school districts by imposing binding tax and expenditure limitations (TELs), which constrain school districts' abilities to increase revenues and expenditures. Empirical evidence suggests that binding TELs decrease the share of revenue that local governments contribute to government spending (Blankenau and Skidmore, 2004; Mullins and Joyce, 1996; Shadbegian, 2003).

Meanwhile, the federal government has recently taken a larger role in shaping the provision of education, most notably with the passage of the No Child Left Behind Act of 2001 (NCLB). NCLB imposed costly mandates on school districts and state governments, which included increasing the number of "highly qualified teachers" and the creation of new student assessments (Dee et al., 2013; Goertz, 2005; McGuinn, 2005). [1] State governments and school districts faced significant penalties for non-compliance, including the loss of Title I funding and possible principal and staff replacements.[2] However, the federal government did not provide adequate funding for these mandates, which shifted the financial burden of complying with NCLB mandates to state governments and school districts (Dee et al., 2013). Dee et al. (2013) find NCLB increased per-pupil education expenditures by $548, primarily from state and local resources. The financial burden of NCLB was significant, as the Government Accountability

[1] Under NCLB, a highly qualified teacher is fully certified, holds a bachelor's degree, and shows competence in subject knowledge and teaching skills. All Title I classrooms must have a highly qualified teacher by the 2002-2003 school year.

[2] Under NCLB, Title I schools who fail to meet adequate yearly progress (AYP) for two straight years must enter into Program Improvement, which is a five year process of steadily increasing consequences that ends with school restructuring (e.g. staff replacement and state takeover).

Office estimated that the development of new student assessments alone would cost upwards of $7 billion (GAO, 2003).

I use a difference-in-differences approach to examine the differences in states' shares of total education funding between states that had binding school district TELs and states that did not, both before and after the passage of NCLB. The main results suggest that states with binding school district TELs experienced a 6.9 percentage-point greater increase in their shares of total education funding than states without binding school district TELs after the passage of NCLB. This result suggests that states with binding school district TELs contributed a significantly higher amount of funding towards NCLB requirements.

The current paper contributes to the literatures on TELs and intergovernmental fiscal relations by providing evidence that binding school district TELs restricted school districts' abilities to increase their funding after the passage of NCLB. As a result, state governments increased their education funding assistance to school districts in efforts to comply with NCLB mandates. In addition, this research demonstrates the potential unintended consequences of the interaction between underfunded federal mandates and state-imposed constraints on local governments' fiscal autonomy.

This paper is organized into six sections. Section 2 reviews the relevant literature. Section 3 describes the dataset used in this paper and provides the theoretical framework. Sections 4 and 5 present the empirical methodology of the study and the main results, respectively. Section 6 concludes with a discussion of the results and suggestions for future research.

Previous Studies

This study sits at the intersection of three literatures: the financial burden of NCLB, intergovernmental tax competition, and tax and expenditure limitations (TELs). First, recent

studies have suggested that state and local governments bore a nontrivial portion of NCLB's financial burden (Dee et al., 2013). Second, the literature on intergovernmental tax competition suggests a jurisdiction will change its own tax rate in response to a change in the tax rate of a nearby jurisdiction; these changes will affect the total amount of revenue collected by both governments. Third, the TEL literature suggests that TELs restrict school districts' abilities to generate revenue. The relevant studies from each literature are reviewed below.

The Financial Implications of NCLB

The passage of NCLB forced state governments and school districts to make two major investments. First, state governments and school districts were required to design and implement annual assessments of students' math and reading achievement by the 2005-06 school year.[3] Second, schools had to hire an increased number of "highly qualified teachers". See Dee et al. (2013), Goertz (2005), and McGuinn (2005) for a review of the key features and implementation costs of NCLB.

Designing and implementing the student assessments alone was expensive for states and school districts, as they received little funding from the federal government. Prior to the enactment of NCLB, 25 states had developed consequential accountability policies, which required annual reports of student assessments for each school and enforced consequences for low-performing schools (Hanushek and Raymond, 2005). The Government Accountability Office estimated the remaining states would have to design and implement up to eleven new student tests at an estimated total cost of $7 billion (GAO, 2003). However, the federal government authorized only $2.34 billion to fund states in designing and implementing these new student assessments (GAO, 2003).

[3] All grades between 3rd and 8th must assess student math and reading skills every year starting in the 2005-2006 school year, including English Language Learner (ELL) students and students with special needs.

Dee et al. (2013) provide the strongest evidence that NCLB was an underfunded federal mandate. The authors find NCLB increased federal education revenues by $100 per-pupil, while state and local education revenues increased by $448 per-pupil. This finding is consistent with a 2003 survey that found that almost 90% of superintendents and principals characterized NCLB as an underfunded mandate (Olson, 2003).

Both state governments and school districts were incentivized to increase education expenditures, as they faced consequences for failing to comply with NCLB's requirements. For example, state governments risked losing federal Title-I funding if classrooms were not staffed by highly qualified teachers.[4] Similarly, school districts that failed to make adequate yearly progress (AYP) had to develop costly improvement plans, which required schools to provide tutoring services for students and career development opportunities for teachers (Goertz, 2005). [5] States and school districts shared these costs. School districts that consistently failed to meet AYP were at risk of the state restructuring the school, including the replacement of school administrators and other staff members.

To meet NCLB standards, school systems increased teacher compensation and hired more teachers with graduate degrees. Dee et al. (2013) found a $5,000 increase in teachers' average annual compensation and a 14% increase in the number of teachers holding a master's

[4] Title-I Funding is a federal formula grant to state governments and Local Educational Agencies (LEAs). A proportion of all Title I Funding goes to the state government in the form of the Education Finance Incentive Grant (EFIG). The funding level is influenced by state's effort to provide financial support for education and the degree that education expenditures are equalized across (LEAs) in the state. See http://www2.ed.gov/policy/elsec/leg/esea02/pg1.html for more information about Title I funding in the NCLB legislation. The Department of Education defines a highly qualified teacher as a teacher with a bachelor's degree, state license or certification, and proof of knowledge to teach the subject they teach. See http://www2.ed.gov/nclb/methods/teachers/hqtflexibility.html

[5] Under the NCLB, AYP is a state defined measurement of how well schools are educating their students. States set their own standards, but the standards must meet minimum federal standards, which include that the state student assessments were factored into the rating. See Education Week (2011) for more information about AYP.

degree after the passage of NCLB. The largest increases occurred in states without pre-existing school accountability policy.

Higher levels of education expenditures have been associated with both the passage of NCLB and state enacted school accountability policies adopted prior to NCLB. States that adopted accountability policies prior to NCLB spent more on education than states without accountability policies (Hannaway et al., 2002; Hannaway and Stanislawski, 2005). More recently, Dee et al. (2013) found that the passage of NCLB increased total education expenditures by $548 per pupil. The federal government only funded a small portion of this increase. The current study contributes to the NCLB literature by extending the analysis of Dee et al. (2013) to consider whether state governments intervened to assist school districts, particularly those constrained by binding school district TELs, in meeting the fiscal burden caused by the passage of NCLB.

Intergovernmental Tax Competition

The financial burden of NCLB may have affected both state and local fiscal decision-making by increasing competition over tax revenue. The current paper investigates horizontal tax competition, which occurs across independent governments (Wilson, 1999). Competition over property tax revenue between counties, cities, and school districts is an example of horizontal tax competition, as no one local government has authority over another.[6]

Two recent studies have investigated the magnitude of horizontal tax competition between local governments. Using Florida property-tax data, Wu and Hendrick (2009) found that a 10 percentage point increase in a school district's property tax rate resulted in a 1.7 to 4.6 percentage point increase in municipal governments' property tax rates. This evidence suggests

[6] In some cases, non-independent school districts create a hybrid of both horizontal and vertical competition because they depend on the county or municipalities for revenue (e.g., Maryland school districts are dependent on county governments).

that competing local governments change their tax rates in response to other governments' tax rate changes. Johnston et al. (2011) found that Kansas' county and municipality governments increased their own property tax rates in response to school districts lowering their property tax rates after Kansas adopted a school funding equalization policy in the mid-1990s. The passage of this equalization policy allowed school districts to lower their property tax rates, and these decreases allowed county and municipalities to collect more property tax revenue.

These two studies suggest that intergovernmental tax competition creates spillover effects. Johnston et al. (2011) revealed a positive spillover effect because the decrease in school districts' property tax rates benefited county governments and municipalities. The present paper contributes to this literature by examining a possible negative spillover effect created by the interaction of tax competition and the passage of NCLB. State governments and school districts had to increase tax revenue to meet the mandates of NCLB. Counties and municipalities likely increased their own tax rates in response to higher state tax rates. As a result, higher county and municipality tax rates would have negatively impacted states' tax revenue collections.

Tax and Expenditure Limitations

A tax and expenditure limitation (TEL) is a law that restricts governments' abilities to increase the amount of revenue generated and/or funds spent in their jurisdictions. TELs are imposed on various types of governments: state governments, municipalities and county governments, and school districts. Joyce and Mullins distinguished between the various types of TELs (Joyce and Mullins, 1991). Some TELs limit a government's ability to change the property tax rate. In addition, there are general revenue or expenditure limitations that restrict a

government from increasing general revenues or expenditures above a certain amount.[7] Another type of TEL restricts government officials from increasing the assessment values of properties.

The distinction between non-binding and binding TELs is important, as a non-binding TEL is less likely to restrict a government's ability to increase revenue or expenditures. Examples of non-binding TELs include limits on property tax rates and limits on increases in the assessment values of properties. For example, a government constrained by a limit on its property tax rate can still increase revenues by increasing the assessment value of properties in its jurisdiction. These TELs can be binding only if there is both a property tax limit and limits on increasing the assessment value of properties. Limits on general revenue or expenditures are both examples of binding TELs, as they explicitly restrict the amount of revenue collected or money spent by a government.

The current paper's definition of a binding TEL is consistent with the definition provided by Joyce and Mullins (1991). A TEL must meet one of two criteria to be considered a binding TEL. First, a binding TEL can be a limit on general revenue or a limit on general expenditures. Second, a binding TEL can be the combination of a limit on the property tax rate and a limit on increasing the assessment value of properties.

Voters support the enactment of TELs with the goal to decrease government waste and inefficiencies (Mullins and Wallin, 2004). Voters perceive the enactment of a TEL as a "win-win" situation since they expect to receive lower tax burdens, while also keeping the same level of government services (Mullins and Wallin, 2004). Numerous studies examine reasons for voter support of TELs in particular states (Courant et al., 1980; Ladd and Wilson, 198; Stein et al., 1983). Using panel data, Alm and Skidmore (1999) find that income growth is a major

[7] In most cases, an expenditure or revenue ceiling is set, or the growth of revenues or expenditures are indexed by the level of population, inflation, or personal income.

determinate of voter support for TELs. Specifically, they find that a ten percentage point increase in state income corresponds to a ten percentage point increase in the probability of TEL passage. This finding explains the differences in timing of TEL adoptions across states. For example, California experienced substantial economic growth prior to passing Proposition 13 in 1978 (Alm and Skidmore, 1999).

Three studies have examined the relationship between state-imposed TELs on local governments and states' shares of total education expenditures (Blankenau and Skidmore, 2004; Mullins and Joyce, 1996; Shadbegian, 2003). Mullins and Joyce (1996) was the first study to use panel data and controlled for state fixed effects when examining the relationship between binding local TELs and states' education funding. They found that states' education funding was higher in states with binding local TELs. Similarly, using panel data from 1966 to 1992, Shadbegian (2003) found that binding local TELs were associated with a decrease in local governments' shares of education expenditures, while state governments increased their shares of total education funding. Lastly, Blankenau and Skidmore (2004) examined the interaction of education finance reform and local TELs on states' shares of education funding. They found the effect of education finance reform on state education funding depended on whether the state had a binding local TEL.

The present study contributes to the literature on TELs in two ways. First, it provides a more precise measure of the effect of binding school district TELs by estimating the effect of a school district TEL while controlling for all other TELs imposed on other governments in the state. The econometric model in this paper controls for TELs on state governments, county governments, municipality government and schools, while previous studies only controlled for a state and local government TEL. The tax competition literature suggests it is important to control

for county and municipality TELs to factor in the strategic tax competition occurring among the various governments before and after the passage of NCLB.

Second, the present study uses an updated panel dataset, which includes observations on states from 1992 to 2009. This time period contains three major events in education finance: the enactment of school accountability policies prior to the passage of NCLB, court-ordered education finance reforms, and the passage of NCLB.[8] By observing the years after the passage of NCLB, this paper provides the first examination of the interaction between an underfunded federal mandate and state and local TELs on state governments' shares of education funding.

Data and Theory

I use panel data on 49 states for the 19 years between the 1991-92 and 2008-09 school years to test the effects of binding school district TELs on states' shares of total K-12 education funding after NCLB. Hawaii's Department of Education is the sole school district in the state, so it is not included in the sample.[9] The pre-NCLB era includes 11 years of observations between the 1991-92 and 2001-02 school years. The NCLB era includes 8 years of observations between the 2002-03 and 2008-09 school years. The remainder of this section describes the dependent, independent, and control variables.

Dependent Variable

The Public Education Finances Report, which is publicly available through the U.S. Census Bureau, publishes the amount of funding that federal, state, and local governments contribute towards education in each state.[10] The dependent variable, *STATESHARE*, is a continuous measure of states' shares of total education funding. This variable was constructed by

[8] Blankenau and Skidmore (2004) control for education finance reform, but their dataset does not include the years after 1993 when many states' courts ordered for education finance reform.
[9] However, the results are robust to including data on Hawaii.
[10] The first publication year of this report was 1992. See website: http://www.census.gov/govs/school/

dividing the amount that the state government contributed towards education expenditures within a state by the combined amount that federal, state, and local governments contributed towards education expenditures within a state.

Independent Variables

There is an expected positive relationship between the presence of binding school district TELs and states' shares of total education funding. Binding school district TELs restrict school districts from easily increasing revenue or increasing expenditures. Holding all things constant, a state government's share of education funding will be higher in states that imposed binding TELs on their school districts relative to states that did not.

The Mullins and Wallin (2004) collection of state-imposed TELs for all states identifies each type of TEL and the year each was enacted.[11] This list also indicates if the state imposes a binding TEL on the state government, county governments, municipality governments, or school districts. Using this list, I construct *SD_TEL*, which is a dummy variable that equals one if the state imposed a binding school district TEL in a particular year, and zero otherwise.

There is likely a positive relationship between the passage of NCLB and states' shares of total education funding, as state governments and school districts have to meet stronger school accountability standards after NCLB (Goertz, 2005). These higher standards require additional investments for various items including, but not limited to, increased student testing, increased number of highly qualified teachers, supplemental services (e.g., outside student tutoring), and school improvement plans.

Both school districts and state governments have several incentives to meet these higher standards. First, state governments could lose Title I funding if they do not comply with NCLB's

[11] See Tables 1 and 4 in Mullins and Wallin (2004). These tables have been updated over time, see Mullins (2009).

mandates.[12] Previous studies suggest high compliance rates, as state governments, on average, implemented 36.1 of 38 parts of the NCLB law (Center on Education Policy, 2007). Second, school district officials comply due to the threat of losing their administrative positions during state takeovers. State takeovers are rare, but have occurred. For example, four and twenty-six schools have been taken over by the state government in Maryland and Louisiana, respectively (Sheiner, 2005). School takeovers and school choice are very expensive for both school districts and state governments.[13] For example, a state takeover may require higher administrative costs to recruit and hire new school district administrators. The passage of NCLB is captured by $NCLB$, which is a dummy variable that equals one if the time period is during the implementation of the NCLB, and zero otherwise. An interaction variable, $SD\_TEL \times NCLB$, measures the differential effect of the passage of NCLB on states' shares of total education funding for states that imposes binding school district TELs relative to those states that do not.

Control Variables

State governments are able to impose binding TELs on county, municipality, and state governments in addition to school districts. Often the decision to enact a binding school district TEL is correlated with the decision to enact a binding TEL on another type of government in the state. Therefore, the empirical model includes three separate dummy variables that indicate whether the state imposed a binding TEL on the state government, municipal governments, and county governments.

There are two reasons to expect a negative relationship between the presence of a TEL on the state government and states' shares of total education funding. First, TELs on state governments likely restrict state governments' ability to raise revenue, which decreases their

[12] I find no cases where the federal government penalized state government for non-compliance.
[13] School choice gave parents the right to relocate their child to another school district if the current school was failing to meet its AYP.

ability to provide additional funding to their school districts. Second, the passage of NCLB likely places further pressure on state governments' finances, especially states with binding school district TELs. I control for this relationship with $STATE\_TEL$, which is a dummy variable that equals one if the state imposes a TEL on the state government, and zero otherwise. In addition, the empirical model includes an interaction variable, $STATE\_TEL \times NCLB$.

Similarly, binding municipality TELs or binding county TELs likely have negative effects on states' shares of total education funding. This relationship is based on the concept of horizontal tax competition. Counties, municipalities, and school districts compete over property tax revenue and other forms of revenue, including state governments' funding aid. The passage of NCLB likely intensifies this tax competition, which might decrease states' shares of total education funding in two ways. First, research shows that state governments increase state aid to local governments that are fiscally constrained by a state imposed TEL (Mullins and Joyce, 1996). In a zero-sum game, the additional state funding aid to municipalities or counties comes at the expense of additional state funding aid that might otherwise go to school districts.

Second, state governments' revenue collection decreases as a result of tax competition over sales tax revenue between counties, municipalities, and state governments. Binding TELs prevent counties and municipalities from increasing property tax rates, which incentivizes them to raise additional revenue via alternative revenue sources. In this situation, there is a reduction in sales tax revenue collected by state governments and, subsequently, the amount in state funding aid for education. This tax competition likely increases when state governments need to suddenly raise additional revenue, especially in a situation similar to the passage of NCLB.

To try controlling for horizontal tax competition, the empirical model includes four control variables.[14] First, M_TEL is a dummy variable that equals one if the state imposes a binding TEL on municipality governments, and zero otherwise. Second, CO_TEL is a dummy variable that equals one if the state imposes a binding TEL on county governments, and zero otherwise.[15] Third, $M\_TEL \times NCLB$ is an interaction variable that equals one if the state imposed a binding TEL on the municipality in the NCLB era, and zero otherwise. Lastly, $CO\_TEL \times NCLB$ is an interaction variable that equals one if the state imposed a binding TEL on the county in the NCLB era, and zero otherwise.

States might be affected by TELs in adjacent states, even states that do not have TELs. For example, inter-state tax competition will likely occur if neighboring states have different property tax rates, as a result of binding school district TELs. School districts that are adversely affected by inter-state tax competition will require additional state aid assistance. To control for such inter-state spillover effects, the empirical model includes $BORDER$, which is the number of adjacent states that have a binding school district TEL.

The political party of the state governor, court-ordered education finance reform, and the enactment of school consequential accountability policies are also relevant state policy and political changes that occurred between the 1991-92 and 2008-09 school years. The United States Census Statistical Abstracts contain data on the political party of governor for each state by year.[16] The empirical model includes a variable of the political party of state governor,

[14] There is mixed evidence that states that tend to adopt one type of TEL are more likely to adopt other types of TELs. For example, there is a 0.55 correlation coefficient between the binding TEL on school district indicator and the binding TEL on municipality indicator. However, there is only a 0.07 correlation coefficient between the binding TEL on school district indicator and the TEL on state government indicator.

[15] See Tables 1 and 4 in Mullins and Wallin (2004) for a complete list of binding TELs on municipality and county governments.

[16] http://www.census.gov/prod/2/gen/96statab/election.pdf

R_GOV, which is a dummy variable that equals one if there is a republican state governor, and zero otherwise.

In addition to political party of the governor, states differ in their education policies. Various states enact state-level education reforms. Previous research shows that education reform policies have positive effects on state government education funding (Blankenau and Skidmore, 2004). There are two types of reform policies: those that have been ordered by the state supreme court and those that are implemented via state legislative action. Data on court-ordered education finance reform comes from the National Education Access Network (NEAN).[17] The NEAN provides summaries of each state's court history, including whether or not the state courts ruled that the state government's role in funding education was unconstitutional. Using this list of states' court case summaries, I created *EDU_REFORM*, which is a dummy variable that equals one if the state's court ruled the state government's role in education funding was unconstitutional, and zero otherwise. Data on legislative education finance reform comes from the Downes and Shah (2006) collection. I updated the Downes and Shah (2006) collection with a report, Public School Finance Programs of the United States, undertaken by the National Center for Education Statistics.[18] Using both of these sources, I create *LEG_REFORM*, which is a dummy variable that equals one if the state legislature enacted an education finance reform policy, and zero otherwise.

Another set of state-level education policies are school accountability policies enacted prior to the passage of NCLB. The financial shock to states from the passage of NCLB likely varied across states that had enacted accountability policies prior to the passage of NCLB, depending on the strength of such pre-existing accountability policies. For example, states with

[17] http://www.schoolfunding.info/litigation/litigation.php3
[18] See, http://nces.ed.gov/edfin/state_financing.asp

strong accountability policies were more likely to develop and invest in creating student exams prior to the passage of NCLB.

Carnoy and Loeb (2002) categorize states with prior school accountability policies by accountability strength.[19] Using this collection, the model includes four prior school accountability variables. First, the model includes *STRONG_ACCOUNT*, which is a dummy variable that equals one if the state previously had a strong school accountability policy, and zero otherwise. Three more dummy variables are created for moderate, weak, and no prior school accountability policies.[20]

States' shares of education funding are likely affected by financial changes at the federal level. The federal government's contribution to education funding affects subnational governments' contributions to education funding (Bradford and Oates, 1971). The empirical model controls for *FEDSHARE*, which is a continuous measure of the federal share of total education funding in a state. This variable is the share of total education funding provided by the federal government.

Similarly, states' shares of education funding are likely to depend on local governments' abilities to shift revenue collection from property tax revenues to non-property tax revenues, especially if TELs are imposed on property tax rates (Mullins and Joyce, 1996). I take data from the National Public Education Financial Survey (NPEFS) to construct *N_PROP_REV*, which is the ratio of non-property tax revenue for education purposes collected by all local governments in the state to the total tax revenue collected by all local governments for education purposes.[21]

[19] See Appendix A in Carnoy and Loeb (2002).
[20] The no prior school accountability indicator serves as the omitted group in the empirical model.
[21] The National Center for Education Statistics (NCES) collects this data for this survey annually. See http://nces.ed.gov/ccd/ccddata.asp.

At the same, the amount that state governments contribute to education depends on the demand for education services (Bergstrom and Goodman, 1973; Borcherding and Deacon, 1972). One demand variable is the number of public school students. I take data on average daily student attendance from the NPEFS. The average daily student attendance, *ADA*, is calculated by adding the total amount of students attending school for the entire year and dividing it by the total number of school days in the year. A second demand variable is economic growth. To control for economic growth, the empirical model includes state real personal income per capita, *INCOME*, and the annual average state unemployment rate, *UNEMPLOY*.[22] A third set of demand variables are socioeconomic characteristics. I take data from various sources to control for the proportion of states' populations that are 65 years or older, *ELDERLY*, and the proportion of individuals who are white, *WHITE*.[23]

Descriptive Statistics

Figure 1.1 illustrates the changes, before and after the passage of NCLB, in average education funding by source separately by states that imposed a binding school district TEL and those that did not. Figure 1.1 demonstrates that the shares of education funding for local governments with binding school district TELs decreased slightly from the 2002-03 to the 2003-04 school year, while non-TEL local governments' shares of education funding increased slightly during the same period. Meanwhile, state governments' shares of education funding decreased slightly in states with no binding school district TELs and increased slightly in states

[22] For state personal income statistics, see the Bureau of Labor Statistics estimates this measurement annually. See the State Annual Personal Income report, http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1. For unemployment statistics, see the Bureau of Labor Statistics, See http://www.bls.gov/schedule/archives/all_nr.htm#SRGUNE. State personal per capita was converted to 1982-1984 dollars using the CPI Index from the Bureau of Labor Statistics, ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt.

[23] The data sources for these two variables are the American Community Survey, U.S. Statistical Abstracts, and the Decennial Census. For the years that the Decennial Census or the American Community Survey is not available, I use the U.S. Statistical Abstracts to create Elderly and White. See, https://www.census.gov/compendia/statab/past_years.html

that imposed binding school district TELs. After the 2003-04 school-year, figure 1.1 shows little change in state governments' or local governments' shares of education funding between states with or without binding school district TELs. One possible explanation for the slight changes observed between the 2002-03 and 2003-04 school years is that local governments in states with no binding school district TELs have the ability to raise additional revenue, while state governments with binding school district TELs have to increase their share of funding for school districts who were fiscally constrained by binding school district TELs.

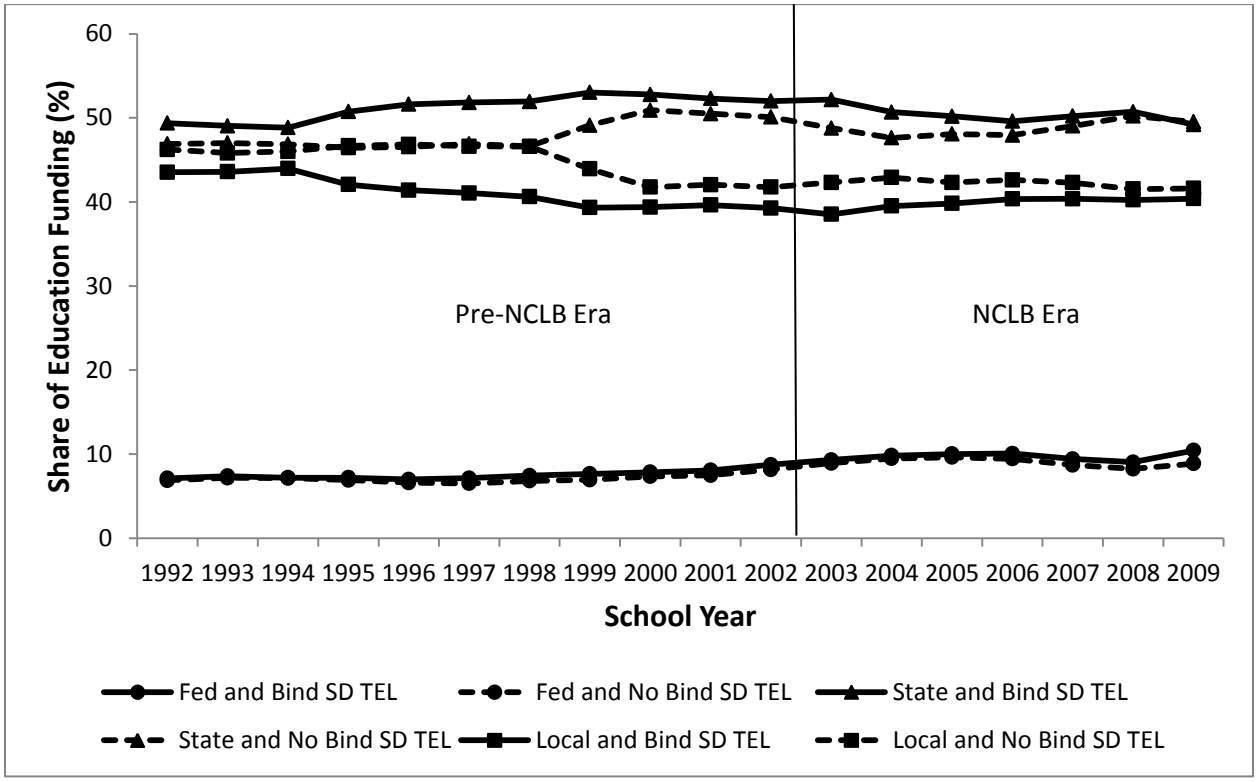

Figure 1.1: Share of Education Funding By Government and School District TEL Indicator

Table 1.1 shows descriptive statistics for all variables before and after the passage of NCLB. There are no substantial differences in the proportion of states with binding TELs in the pre-NCLB era relative to the post-NCLB era. For example, the proportion of states with binding school district TELs increases by less than three percentage points in the post-NCLB era. This

increase was the result of Wisconsin, Florida, and Oklahoma enacting binding school district TELs in 1994, 1995, and 1996, respectively.

Table 1.1 shows substantial variation in states' political and education policies before and after the passage of NCLB. In the pre-NCLB era, only 37% of states' courts had ruled that the state's role in education finance in the state was unconstitutional. In the post-NCLB era, this proportion increased by 14 percentage points. In addition, 27% of states adopted a consequential school accountability policy before the passage of NCLB. Lastly, political power shifted in the favor of the Democratic Party for many states after the passage of NCLB. The percentage of states with a republican governor decreases from 62% to 51% after the passage of NCLB.

Table 1.1 Average State Characteristics by Time Period

Variable	Pre-NCLB (1992-2002)	Post-NCLB (2003-2009)	Difference
State Share of Education Funding in State	0.498	0.497	-0.001
	(0.121)	(0.114)	[0.010]
Federal Share of Education Funding in State	0.073	0.097	0.021***
	(0.027)	(0.032)	[0.001]
Local Share of Education Funding in State	0.429	0.409	-0.020*
	(0.098)	(0.121)	[0.010]
Prop. Of Local Edu. Rev. from Non-property Tax Sources	0.098	0.088	-0.009
	(0.181)	(0.146)	[0.008]
Imposed Binding School District TEL Indicator	0.555	0.583	0.028*
	-	-	[0.015]
Imposed Binding Municipality TEL Indicator	0.579	0.609	0.031*
	-	-	[0.016]
Imposed Binding County TEL Indicator	0.538	0.569	0.031*
	-	-	[0.016]
Imposed TEL on State Government Indicator	0.616	0.665	0.049
	-	-	[0.034]
# of border states with a binding school district TEL	2.42	2.50	0.082***
	(1.71)	(1.75)	[0.021]
Court-Ordered Edu Finance Reform Indicator	0.377	0.516	0.139***
	-	-	[0.038]
Legislative Education Finance Reform Indicator	0.822	0.878	0.056**
	-	-	[0.022]
Previous School Accountability Policy: Strong	0.096	0.184	0.087***
	-	-	[0.029]
Previous School Accountability Policy: Moderate	0.083	0.143	0.059**
	-	-	[0.026]
Previous School Accountability Policy: Weak	0.091	0.184	0.093***
	-	-	[0.029]
Previous School Accountability Policy: None	0.729	0.489	-0.239***
	-	-	[0.039]
Republican Governor Indicator	0.614	0.513	-0.101
	-	-	[0.085]
Real Personal Income per capita ($)	15,641.73	17,881.23	2,239.50***
	(2,465.39)	(2,615.68)	[117.98]
Percent of 65 year old or older individuals (%)	12.9	12.7	-0.211***
	(2.2)	(1.7)	[0.078]
State Annual Average Unemployment Rate (%)	5.2	5.0	-0.152
	(1.5)	(1.1)	[0.124]
Percent of White Individuals (%)	81.0	81.7	0.735
	(11.5)	(10.6)	[0.649]
Average Daily Attendance (in thousands)	851.5	929.4	77.8***
	(954.7)	(1,095.4)	[23.4]
Observations	539	343	882

Notes: All states are included expect Hawaii. Standard deviations are in parentheses and brackets include standard errors that are robust to state-level clustering.

Methodology

Main Analysis

I test for the presence of a differential effect of the passage of NCLB on states' shares of total education funding between states that imposed binding school district TELs and states that did not. I estimate the following baseline regression by OLS:

$$(1)\quad STATESHARE_{st} = \beta_0 + \beta_1 SD_{TEL_{st}} + \beta_2 SD\_TEL_{st} \times NCLB_t + \beta_3 X_{st} + \beta_4 X_{st} \times NCLB_t + c_s + \tau_t + e_{st},$$

where s indexes states, t indexes years, X is a vector of the controls described in the data section, c is a state fixed effect, τ is a year fixed effect, and e is an error term. Shown in equation (1), all variables are interacted with the NCLB indicator variable.[24]

The empirical model includes state fixed effects that control for time-invariant unobserved and observed heterogeneity across states. State fixed effects control for long-term economic and political preferences of the state. For example, the state fixed effects will control for some state resistance to the implementation of NCLB. Shelly reported that some states passed resolutions declaring their formal opposition to NCLB (Shelly, 2008). Additionally, the state fixed effects control for time-invariant heterogeneity across states in how property tax revenues contribute to the state general fund for education. The year fixed effects control for national trends in the economy and political preferences. Standard errors are made robust to state-level clustering, which makes inference robust to arbitrary forms of both serial correlation within states over time and heteroskedasticity.

[24] The inclusion of year dummies in the model prevents the model from including the NCLB indicator variable due to perfect collinearity. The results are robust when dropping the year dummies and adding the NCLB indicator. In addition to the theoretical justifications for interacting all variables with the NCLB indicator, a Chow Test was conducted to test the joint significance of all of the interactions in the model and it supported this model specification. The main result, however, is robust to not including the $X_{st} \times NCLB_t$.

The parameter of interest is the coefficient β_2, which captures the differential effect of the passage of NCLB in states' shares of total education funding between states that imposed binding school district TELs and states that did not. Recall from the previous section that the current study's main hypothesis is that the combination of the passage of NCLB and binding school district TELs placed a higher financial burden on state governments to comply with NCLB standards. Therefore, β_2 is hypothesized to be positive and statistically significant.

Whether or not β_2 can be given a causal interpretation depends primarily on two assumptions. First, that there is no pre-existing trend in state share specific to states with binding TELs prior to the 2002-03 school year. Second, that no other federal policies were enacted at the same time that only impacted states with binding TELs. I test these two assumptions by conducting the event study analysis described in the next section. Nonetheless, it is worth remembering that regardless of whether this estimate is given a causal interpretation, a contribution of the current study is an accurate description of the differences in states' shares of education between states with binding TELs on school districts and stats without binding TELs on school districts after the passage of NCLB.

Sensitivity Analyses

Two aspects of equation (1) warrant further discussion. I conduct two separate sensitivity analyses. First, the parameter of interest, β_2, may be positive due to a pre-existing trend in states' share of education funding in states with a binding TEL on school districts. To verify that there is no pre-existing trend, I estimate the following regression by OLS:

(2) $STATESHARE_{st} = \beta_0 + \beta_1 SD_{TEL_{st}} + \beta_2 SD\_TEL_{st} \times \tau_t + \beta_3 X_{st} + \beta_4 X_{st} \times \tau_t + c_s + \tau_t + e_{st}$.

Comparing equation (2) to equation (1), the NCLB indicator is replaced with a set of year indicators. The year interactions provide an estimate of how the effect of a binding school district TEL on states' shares of education funding varied by year. If the main result is due to the passage of NCLB, there should be a difference in the effect of binding school district TELs on states' shares of education funding in the years prior to the passage of NCLB (1992-93 to 2001-02 school year) and the years post of the NCLB implementation (2002-03 to 2008-09 school years). This is method is known as an event study analysis in the finance literature (Ferri and Maber, 2013).

Second, one limitation of linear estimators is they do not restrict the predicted values of the fractional dependent variable to be between zero and one. As a result, linear estimators may provide poor estimates of the average partial effect (Papke and Wooldridge, 1996). Papke and Wooldridge (1996) recommend fractional logit or probit models. To demonstrate that the results are robust across different estimators, equation (1) is estimated with a fractional probit and logit model.

Results

Table 1.2 reports the estimated coefficients of equation (1). The coefficient for the NCLB and School District Binding TEL interaction term indicates that a state that imposed a binding TEL on a school district had a 6.9 percentage point higher share of total education funding compared to a state without a binding school district TEL after the passage of NCLB. This point estimate is both statistically and practically significant.

Many of the estimated coefficients on the controls are not statistically significant. This is not surprising, given the empirical model includes state fixed effects and a large number of controls. There are, however, a few exemptions. The variable that captures the intergovernmental

tax competition in the NCLB era has the expected negative sign, which indicates that a binding TEL on the municipality government had a negative effect on states' shares of total education funding after the passage of NCLB. Surprisingly, the effect of a state-imposed binding TEL on either the state or county government did not have statistically significant, negative impacts on states' shares of total education revenue after the passage of NCLB.

The results of Table 1.2 are consistent with previous education finance reform studies' findings. Similar to Blankenau and Skidmore (2004), the impact of court-ordered education reform has a positive impact on states' shares of total education funding. States with court-ordered education reform have a 7.7 percentage point higher state share of education funding relative to other states. Surprisingly, the impact of legislative education finance reform on states' shares of total education funding is not statistically different from zero. These two finding are consistent with Downes and Shaw (2006) who found that court-ordered education finance reforms have a relatively larger impact on state education funding, compared to finance reforms enacted via state legislatures.

The point estimate for the number of bordering states with a binding school district TEL is 0.028, which suggests that a one state increase in the number of adjacent states with a binding school district TEL corresponds to a 2.8 percentage point increase in states' shares of total education funding. However, this coefficient is not statistically significant. This finding suggests there is no clear relationship between state governments' decision on education funding and the number of adjacent states with binding TELs on school districts.

Table 1.2: Linear Fixed Effects Estimates on State Share of Education Funding

	State Share
Binding TEL on School District	-0.001
	(0.051)
Binding TEL on School District × No Child Left Behind Indicator (NCLB)	0.069**
	(0.027)
Binding TEL on Municipality	-0.033
	(0.053)
Binding TEL on Municipality × NCLB	-0.063*
	(0.032)
Binding TEL on County × NCLB	0.022
	(0.027)
TEL on State Government	0.004
	(0.015)
TEL on State Government × NCLB	-0.026
	(0.018)
Number of border states with a binding school district TEL	0.028
	(0.018)
Number of border states with a binding school district TEL × NCLB	-0.007
	(0.006)
Fed Share of Education Funding	-0.513
	(0.339)
Fed Share of Education Funding × NCLB	-0.407
	(0.377)
Court-Ordered Education Reform Indicator	0.077***
	(0.027)
Court-Ordered Education Reform Indicator × NCLB	0.010
	(0.018)
Legislative Education Finance Reform Indicator	0.012
	(0.033)
Legislative Education Finance Reform Indicator × NCLB	0.004
	(0.023)
Prior Strong School Accountability	-0.011
	(0.017)
Prior Strong School Accountability × NCLB	-0.025
	(0.020)
Prior Moderate School Accountability	0.014
	(0.021)
Prior Moderate School Accountability × NCLB	0.013
	(0.024)
Prior Weak School Accountability	0.067
	(0.046)
Prior Weak School Accountability × NCLB	0.011
	(0.025)

Table 1.2 (Cont.): Linear Fixed Effects Estimates on State Share of Education Funding

	State Share
Republican Governor Indicator	-0.000
	(0.009)
Republican Governor Indicator × NCLB	0.018
	(0.016)
Log of Real Personal Income per Capita	0.326
	(0.209)
Log of Real Personal Income per Capita × NCLB	-0.011
	(0.091)
Log of Percent of 65 years old or older	0.109
	(0.193)
Log of Percent of 65 years old or older × NCLB	-0.047
	(0.052)
State Annual Average Unemployment Rate	-0.001
	(0.006)
State Annual Average Unemployment Rate × NCLB	-0.004
	(0.009)
Prop. of Local Education Revenue from non-property tax sources	0.027
	(0.057)
Prop. of Local Education Revenue from non-property tax sources × NCLB	-0.036
	(0.041)
Log of Average Daily Student Attendance	0.034
	(0.096)
Log of Average Daily Student Attendance × NCLB	-0.007
	(0.008)
Percent of White Individuals	-0.001
	(0.001)
Percent of White Individuals × NCLB	0.002
	(0.001)
Constant	-3.304
	(2.811)
Observations	882
R-squared	0.289

Notes: Cluster-robust standard errors (state level) in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The model includes state fixed effects and year dummies. The omitted prior accountability policy indicator is no prior school accountability indicator. The binding TEL on county government is omitted due to collinearity.

Table 1. 3 reports estimates of equation (2). From the 1992-93 to 2001-02 school years, the coefficients, ranging from negative six percentage points to positive five percentage points,

are not statistically different than zero. In the first year of the implementation of NCLB (2002-03 school year), the effect of a binding school district TEL on states' shares of education funding increases by ten percentage points, which coincided with the NCLB mandate that required all Title I classrooms to be taught by highly qualified teachers. This trend continues for the next several school years as more NCLB provisions were implemented, including the requirement that all public schools' core classes be taught by highly qualified teachers and all 3rd through 8th grade students be tested in math and reading annually by the start of the 2005-06 school year.[25] Overall, this finding provides support for the two assumptions mentioned above, and a causal interpretation of β_2 in equation (1). Specifically, the event study analysis shows that the relative increase in state share in states with binding TELs began precisely in the first year of the implementation of NCLB (2002-03 school year).

Table 1.4 reports the estimated coefficients and average partial effects from the fractional probit and logit estimates of equation (1).[26] The estimated average partial effect of 6.9 percentage points from the fractional probit is identical to the linear estimate of 6.9 shown in column 2 of Table 1.2. Not surprisingly, the average partial effect of a fractional logit model is identical to the fractional probit model. The fractional probit estimates demonstrate that the main results are robust to the choice of a linear estimator.

[25] There are two reasons why the estimated standard errors in this model are conservative. First, the estimates are from the use of a two-tail instead of a one-tail t-test. Second, the degrees of freedom decrease substantially as the event history analysis includes year interaction variables instead of NCLB interaction variables.

[26] The average partial effect for a difference-in-difference interaction variable in a non-linear model is computed consistent with Puhani (2008).

Table 1.3: Event Study Analysis

	State Share
Pre-NCLB Era	
Binding School District TEL	-0.058
	(0.075)
Binding School District TEL × Year 1993	-0.006
	(0.039)
Binding School District TEL × Year 1994	0.008
	(0.038)
Binding School District TEL × Year 1995	0.012
	(0.044)
Binding School District TEL × Year 1996	0.036
	(0.046)
Binding School District TEL × Year 1997	0.026
	(0.053)
Binding School District TEL × Year 1998	0.028
	(0.051)
Binding School District TEL × Year 1999	0.057
	(0.049)
Binding School District TEL × Year 2000	0.039
	(0.060)
Binding School District TEL × Year 2001	0.037
	(0.060)
Binding School District TEL × Year 2002	0.026
	(0.058)
NCLB Era	
Binding School District TEL × Year 2003	0.102*
	(0.053)
Binding School District TEL × Year 2004	0.096*
	(0.050)
Binding School District TEL × Year 2005	0.129*
	(0.067)
Binding School District TEL × Year 2006	0.136**
	(0.063)
Binding School District TEL × Year 2007	0.101
	(0.062)
Binding School District TEL × Year 2008	0.090
	(0.072)
Binding School District TEL × Year 2009	0.093
	(0.071)
Observations	882
R-squared	0.797

Notes: Cluster-robust standard errors at the state level are in parentheses, *** p<0.01, ** p<0.05, * p<0.10. This table does not report all coefficients in the model. The Year 1993 represents the 1992-93 school year. The 1991-92 school year is the omitted year.

Table 1.4: Fractional Logit and Probit Estimates on State Share

	Logit		Probit	
	Coefficients	APE	Coefficients	APE
Binding TEL on School District	0.001	0.000	0.000	0.000
	(0.198)	(0.047)	(0.124)	(0.048)
Binding TEL on School District ×	0.291**	0.069**	0.179**	0.069**
No Child Left Behind Indicator (NCLB)	(0.115)	(0.029)	(0.071)	(0.027)
Observations	882			
Pseudo R-squared	0.30		0.30	
Log likelihood	-388.72		-388.68	

Notes: Cluster-robust standard errors (state level) in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All models include state fixed effects and year dummies. This table does not report the coefficients for all the other variables.

Conclusions

This paper tested the hypothesis that states' shares of total education funding increased more after the passage of NCLB in states with binding school district TELs than in states without binding school district TELs. The previous education finance literature demonstrated that NCLB placed a significant financial burden on state governments and school districts by requiring new investments in both teachers and student assessments. Binding school district TELs restricted school districts' abilities to collect the revenue necessary to pay for these new investments. As a result, state governments that imposed binding school district TELs intervened by increasing their education funding assistance to school districts. I provide empirical support for this claim. After the passage NCLB, states that had imposed binding school district TELs had 6.9 percentage point higher shares of total education funding relative to states without binding school district TELs.

This result has implications for education policy makers and intergovernmental fiscal relations. It demonstrates the unintended consequences of federal government policies that do not consider the consequences of the interaction between underfunded federal mandates and

local institutional factors (e.g., binding TELs). However, the federal government is not solely to blame. States' use of TELs to restrict the fiscal autonomy of local governments was a contributing factor to the financial burden placed on states by NCLB. An important unintended consequence of this interaction was the expansion of state governments' role and influence in the provision of public education. Although binding school district TELs were already leading to a more centralized education system, this study shows that the combination of the passage of NCLB and school district binding TELs substantially increased states' roles in the provision of public education.

The unintended expansion of states' roles in education can be viewed as either a positive or negative outcome. Some policymakers would argue that centralizing education finance at the state level increased equity in public education across school districts.[27] This argument, however, assumes that states provide a disproportionally higher amount of education assistance to low-performing school districts. This may not have been the case, however, and should be a topic for future research. In addition, it assumes that states provided the necessary additional revenue to comply with NCLB's mandates. If the state government did not increase education funding assistance to meet the extra cost, school districts, due to restrictions by a binding TEL, would have had insufficient funding for important expenditures (e.g., increasing the number of highly qualified teachers). Therefore, as a result of the passage of NCLB, school districts without binding TELs may have fared better than school districts with binding TELs.

NCLB did not consider how states would fund the expenditures needed to comply with the law. States had at least four possible mechanisms with which to increase education funding:

[27] Alternatively, there is a tradeoff between equality and efficiency. A more decentralized structure of education provision with many jurisdictions with different packages of level of education and tax prices would allow individuals to choose a jurisdiction with the best level of education at the lowest price (Tiebout, 1956). A more centralization system limits the number of options available to individuals; therefore, individuals will have to choose a less optimal package.

borrowing, raising taxes, extracting revenue from local governments' tax bases (e.g., counties and municipalities), and moving funding from a non-educational to educational programs. It is possible that these actions conflicted with other priorities and goals of federal government, as well as affected state and local policy goals.

One possible solution is to design federal grants that encourage states to exempt school districts from binding TELs if school districts need to raise additional funding to meet federal mandates. Specifically, states should exempt low property wealth school districts from binding TELs for two reasons. First, a state-wide exempt would potentially increase education expenditure inequalities between high and low property wealth school districts. Second, previous research suggests binding TELs restrict low property wealth jurisdictions relative more than high property wealth school jurisdictions.

Accordingly, the results of the current study suggest two areas for future research. First, it is important to know how state governments were obtaining the resources necessary to increase funding assistance to school districts. As mentioned above, there were at least four mechanisms that states could have used to raise additional state education funding. Policymakers would likely be interested if the mechanisms that states used to increase education spending had any unintended consequences. For example, federal governments should be aware whether or not an underfunded mandate may result in states taking funding away from other high-priority policies, federal or otherwise.

Second, future research might evaluate how changes in state and local education finances impacted student and teacher outcomes. A change in education finances could have had an impact on teacher retention or quality across school districts with a binding TEL relative to states without a binding TEL.

CHAPTER 2

THE NO CHILD LEFT BEHIND ACT (NCLB) AND TAX AND EXPENDITURE LIMITATIONS (TELs): EXAMINING THE IMPACTS ON DISPARITIES IN LOCAL SCHOOL FUNDING

Introduction

The No Child Left Behind Act of 2001 dramatically increased the role of the federal government in shaping the provision of public education (Dee et al., 2011). The primary goal of NCLB was to incentivize schools to improve student achievement, particularly for disadvantaged students. Unfortunately, previous studies find mixed evidence on the effectiveness of NCLB on improving student performance (Center on Education Policy, 2008; Dee and Jacob, 2011; Dee et al., 2013; Fuller et al., 2007; Krieg, 2008; Neal and Schanzenbach, 2010). In fact, research indicates that NCLB has generated negative unintended consequences (Jacob and Levitt, 2003; Neal and Schanzenbach, 2010).

One possible explanation for the mixed findings mentioned above is that NCLB was an underfunded federal mandate (Dee et al., 2013; Hayes, 2014). NCLB imposed costly mandates on school districts and state governments, which included increasing the number of "highly qualified teachers" and the creation of new student assessments (Dee et al., 2013; Goertz, 2005; Hayes, 2014; McGuinn, 2005). However, the federal government did not provide adequate funding for these mandates, which shifted the financial burden of complying with NCLB mandates to state governments and school districts (Dee et al., 2013). For example, Dee et al. (2013) find NCLB increased per-pupil education revenues by $548, primarily from state and local resources.

One possible way school districts may have funded NCLB mandates was by increasing tax revenue from local sources. However, not all school districts could raise additional local revenue. For example, some states impose binding tax and expenditure limitations on school

districts, which restrict districts' abilities to raise additional local revenue. Therefore, school districts in states with binding TELs were less likely to respond to NCLB by raising additional revenue (Hayes, 2014). As a result, school districts restricted by binding TELs may have been especially reliant on state funding support to implement NCLB. Hayes (2014) finds evidence of an increase in states' share of education funding in states with binding TELs on school districts compared to all other states after NCLB took effect.

However, it is unclear whether or not the increase in states' education funding shares in states with binding TELs provided adequate funding supplements to local districts. This supplemental funding may not have eliminated the revenue disparities between school districts with and without binding TELs, as the latter group was not restricted from raising additional local revenue. The current study addresses this gap in the education finance and policy literature. Specifically, this study addresses two broad research questions. First, *did local revenue per pupil* increase more in school districts without binding TELs compared to school districts with binding TELs? Second, *did state revenue per pupil* increase more in school districts with binding TELs compared to all other school districts?

Using a school district-level panel dataset, I use a difference-in-difference type strategy to examine whether binding TELs affected school district per pupil revenue, before and after NCLB took effect. I also examine whether the results vary by school districts' fiscal capacities. A common measure of fiscal capacity is property values per pupil (Odden and Picus, 2008). This is a potentially important difference because school districts with low fiscal capacities in states with binding TELs are more likely to be restricted from raising additional revenue relative to all other school districts (Mullins, 2004).

The current study's empirical results yield five main findings. First, states' shares of education funding increased 4.3 percentage points more in school districts with binding TELs relative to all other school districts after NCLB was implemented. This estimate reinforces previous state-level analyses (Hayes, 2014). Second, I find that school districts without binding TELs were able to raise $400 per pupil more local revenue relative to school districts with binding TELs after enactment of NCLB. Third, this gap in local revenue between school districts without and with binding TELs is even larger when restricting the analysis to only school districts in the lowest quartile of fiscal capacity.

Fourth, the presence of a binding TEL had no statistically significant impact on state revenue per pupil after NCLB took effect. Surprisingly, this result holds true even when restricting the analysis to only school districts in the lowest quartile of fiscal capacity. In addition, there is evidence that additional state aid was targeted to school districts with the highest fiscal capacity in states with binding TELs. The 4.3 percentage point increase in states' shares of education between school districts with binding TELs and all other school districts is not the result of significant increases in state education funding to school districts; instead, this state share increase is due to lower local revenues in non-TEL districts. Fifth, for the lowest fiscal capacity districts, those without binding TELs had $528 per pupil more total education revenue compared to school districts with binding TEL, primarily because the non-TEL districts were able to increase more revenue from local sources. Taken together, these five findings suggest that NCLB had the largest adverse effect on education revenues for low fiscal capacity school districts in states with binding TELs.

The current study makes three contributions to the field of education finance and policy. First, this study adds to the growing literature on the potential unintended consequences of

NCLB. Specifically, this study suggests that the financial burden of NCLB adversely affected school districts with binding TELs and with low fiscal capacity. Second, this study adds to previous TEL studies by providing evidence that binding TELs restrict the abilities of low fiscal capacity governments to raise additional revenue compared to all other governments, especially after a financial shock. Lastly, this study provides a potential explanation for why TELs reduce student performance in public schools (Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000; Downes and Figlio, 2008; Figlio, 1997).

The remainder of this paper is organized into five sections. Section 2 reviews the relevant literature and presents four testable hypotheses. Sections 3 and 4 describe the dataset and the empirical strategy. Section 5 presents the main results and section 6 concludes with a discussion of the implications of these results.

Literature Review and Theory

This study sits at the intersection of two literatures: the financial burden of NCLB and tax and expenditure limitations (TELs). First, recent studies have suggested that state and local governments bore a notable portion of NCLB's financial burden (Dee et al., 2013; Hayes, 2014). Second, the TEL literature suggests that TELs restrict school districts' abilities to generate revenue (Dye, McGuire, and McMillen, 2005; Hayes, 2014; Mullins and Joyce, 1996; Shadbegian, 2003). In this section, I use the key findings from these literatures to develop four testable hypotheses, which I then test empirically.

The Financial Burden of NCLB

NCLB required state governments and school districts to make two major investments. First, state governments and school districts had to design and implement annual assessments of

students' math and reading achievement by the 2005-06 academic year.[28] Second, schools had to increase the hiring of "highly qualified teachers."[29] See Goertz (2005), Dee et al. (2013), and McGuinn (2004) for a review of the key features and implementation costs of NCLB. Previous studies find the federal government did not provide an adequate level of funding to states and school districts to implement the investments mandated by NCLB. For example, the Government Accountability Office (2003) estimated that states designed and implemented up to eleven new student tests at an estimated total cost of $7 billion. However, the federal government authorized only $2.34 billion to fund state governments and school districts in designing and implementing these new student assessments. Similarly, Dee et al. (2013) find that, in the years following the implementation of NCLB, federal education revenues increased by $100 per-pupil, while state and local education revenues increased by $448 per-pupil.

Dee et al. (2013) combine state and local revenues together in their analysis. As a result, it is difficult to know which level of government, state governments or local school districts, are responsible for the increase in education revenues after the NCLB took effect. It is important to know which level of government is contributing more to education revenues for three reasons. First, there are important implications for state and local tax policy, since state governments rely on different tax sources than school districts. Second, there are implications for the relative budgetary autonomy between state governments and their school districts. For example, if state governments are contributing more revenue than school districts, states increase their control over local education budgets. Lastly, not all school districts had the same abilities to raise revenue to comply with NCLB because some states place budgetary constraints on school

[28] NCLB required that all grades between 3rd and 8th assess student math and reading skills every year, including English Language Learner (ELL) students and students with special needs.
[29] Under NCLB, a highly qualified teacher is fully certified, holds a bachelor's degree, and shows competence in subject knowledge and teaching skills. All Title I classrooms must have a highly qualified teacher by the 2002-2003 school year.

districts. It is important to determine whether or not state governments provided additional funding to financially constrained school districts with the implementation of NCLB.

The current study contributes these bodies of scholarship by disaggregating total state-local revenues after the implementation of NCLB. Specifically, this study hypothesizes and tests for a differential effect of NCLB on both state and local revenues between states that place budgetary constraints on school districts and those states that do not. One of the most common budgetary constraints on school districts is a state imposed binding tax and expenditure limitations (TELs).

Binding Tax and Expenditure Limitations on School Districts (TELs)

A TEL is a law that restricts governments' abilities to increase the amount of revenue generated and/or funds spent in their jurisdictions. Voters support the enactment of TELs with the goal to decrease government waste and inefficiencies (Mullins and Wallin, 2004). Voters perceive the enactment of a TEL as a "win-win" situation since they expect to receive lower tax burdens, while also keeping the same level of government services (Mullins and Wallin, 2004). The enactment of a TEL, however, creates a host of economic distortions because governments affected by TELs are less likely to meet the service needs of their citizens (Mullins and Joyce, 1996; Mullins, 2004).

State governments impose TELs on various types of governments: state governments, municipalities, county governments, and school districts. The current study focuses on TELs placed on school districts. Joyce and Mullins (1991) distinguished between five different types of TELs, including limits on changes to the property tax rate, limits on changes to property tax levies, limits on changes to general expenditures, limits on changes to general revenue collection, and limits on changes to property value assessments.

The distinction between non-binding and binding TELs is important, as non-binding TELs are less likely to restrict governments' abilities to increase revenues or expenditures. Examples of non-binding TELs include limits on property tax rates and limits on increases in the assessment values of properties. For example, a government constrained by a limit on its property tax rate can still increase revenues by increasing the assessment value of properties in its jurisdiction. These TELs can be binding only if there is both a property tax limit and limits on increasing the assessment value of properties.

More generally, a TEL must meet one of three criteria to be considered binding. First, a TEL is binding if there are direct limits on either general revenues or general expenditures. Limits on general revenues or expenditures are both examples of binding TELs, as they explicitly restrict the amount of revenue collected or funds spent by a government. Second, a limit on the property tax levy is a binding TEL because it explicitly restricts the growth in property tax collection. Lastly, a binding TEL can arise from the combination of a limit on the property tax rate and a limit on increasing the assessment value of properties.

Four previous studies examine the relationship between the enactment of TELs and the financing of public education. First, Mullins and Joyce (1996) find TELs reduce the amount of education revenue collected from the local property tax base. Second, Dye, McGuire, and McMillen (2005) find TELs increasingly restrict growth in education revenue collection over time. They find school districts, shortly after the enactment of a TEL, have the ability to protect instructional expenditures by reducing administrative expenditures. In the long-run, however, school districts are forced to reduce instructional expenditures. Third, Shadbegian (2003) finds school districts are forced to rely on non-property tax revenue sources, which are less stable

forms of revenue relative to property tax revenue sources. One form of non-property tax revenue for school districts is state aid (Mullins and Joyce, 1996; Shadbegian, 2003).

Lastly, Hayes (2014) finds that following NCLB implementation, states' share of education funding increased relatively more in states with binding TELs on school districts compared to all other states. This finding suggests that the increase in state and local education revenues post- NCLB enactment was primarily the result of state governments increasing state aid to school districts, especially in states with binding TELs.

The current study expands on previous research in this area. Specifically, I test whether the main finding in Hayes (2014) varies across different types of school districts. The effects of TELs on school districts, even in the same state, are likely to co- vary with school districts' fiscal capacities (Mullins, 2004). For example, communities with low property values per pupil, a common measure of fiscal capacity, are more likely to be restricted by TELs because these school districts need a higher than average tax rate to collect adequate levels of revenue.[30] This paper explicitly tests whether or not the effect of binding TELs on public education funding varies by school districts' fiscal capacity.

Four Testable Hypotheses

As mentioned above, the financial burden of NCLB was borne in no small measure by state governments and school districts (Dee et al., 2013). One possible way for school districts to fund NCLB mandates was to raise additional revenue. However, school districts in a state with binding TELs have relatively less abilities to raise additional revenue to fund NCLB mandates. This assertion leads to the first testable hypothesis.

[30] Odden and Picus (2008) define property values per pupil as a measure of fiscal capacity.

Hypothesis 1: After the implementation of NCLB, local revenue per pupil increased less in school districts in states with binding TELs on school districts compared to all other school districts.

If school districts in states with binding TELs were less likely to increase local funding, these school districts likely relied on their state governments to increase state funding. State governments had several incentives to fund NCLB mandates. First, state governments could lose Title I funding if they do not comply with NCLB's mandates. Previous studies suggest high compliance rates, as state governments, on average, implemented 36.1 of 38 parts of the NCLB law (Center on Education Policy, 2007). Second, failing schools were subject to state takeovers. State takeovers are rare, but have occurred. For example, Maryland and Louisiana have assumed control over 4 and 26 local school districts, respectively (Steiner, 2005). School takeovers are very expensive for both school districts and state governments. For example, a state takeover may require higher administrative costs to recruit and hire new school district administrators. This assertion leads to the second testable hypothesis.

Hypothesis 2: After the implementation of NCLB, state revenue per pupil increased more in school districts in states with binding TELs on school districts compared to all other school districts.

There is likely a heterogeneous effect of binding TELs on local revenue collection across school districts in the same state. As mentioned above, Mullins (2004) suggests the effectiveness of TELs on revenue collection will vary depending on the governments' fiscal capacities. This assertion leads to the third and fourth testable hypothesis.

Hypothesis 3: The largest gap in local revenue per pupil between school districts with binding TELs and school districts without binding TELs occurred in the lowest fiscal capacity school districts.

Hypothesis 4: The largest gap in state revenue per pupil between school districts with binding TELs and school districts without binding TELs occurred in the lowest fiscal capacity school districts.

Testing these four hypotheses makes three contributions to the field of education finance and policy. First, this study adds to the growing literature on the potential unintended consequences of NCLB. Specifically, this study tests whether or not the financial burden of NCLB adversely affected school districts with binding TELs. Second, this study tests whether or not binding TELs restrict the abilities of low fiscal capacity governments to raise additional revenue relative more than other governments, especially during a fiscal shock. Lastly, this study provides a potential explanation for why TELs reduce student performance in public schools (Figlio, 1997; Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000).

Data

District-years are the unit of analysis in the current study. The main source of data is the Common Core of Data's Local Education Agency (School District) Finance Survey, also known as the F-33 survey.[31] The National Center for Education Statistics (NCES) has administrated this survey annually starting in the 1994-95 school year. The F-33 includes detailed financial data for all school districts in the United States. I use all surveys from 1994-95 and 2008-09. The 2008-09 school year is the latest available year of data.

Consistent with Dee et al. (2013), I make four adjustments to the data and analytical sample. First, I convert all financial data to 1982-84 constant dollars using the Consumer Price Index.[32] Second, I restrict the analytical sample to all regular, operational, unified (K-12) school districts. This restriction allows for more analogous units of observations by excluding school districts that operate only elementary or secondary schools, districts that are purely administrative in nature, and agencies that operate only charter schools. Third, the analytical

[31] See, http://nces.ed.gov/ccd/ccddata.asp for access to this data.
[32] See, http://www.bls.gov/cpi/ for more information about the Consumer Price Index.

sample excludes Hawaii and the District of Columbia because there is only one school district in both jurisdictions. This exclusion is also consistent with previous TEL studies (Hayes, 2014; Mullins and Joyce, 1996; Shadbegian, 2003). Lastly, the analytical sample excludes extreme outliers by dropping observations where the real revenues per pupil were greater than 150% of the state-specific 95th percentile value or less than 50% of the state-specific 5th percentile (Dee et al., 2013; Murray, Evans, and Schwab, 1998). However, the main results are robust to including extreme outliers.

This data is augmented with other district-, county- and state-level variables from various sources including the Common Core of Data's Public Elementary/Secondary School Universe Survey Data, U.S. Census Statistical Abstracts, Bureau of Economic Analysis, Bureau of Labor Statistics, 2000 Decennial Census, and others. The final analytical sample consists of 134,331 district-years, representing 10,825 unique school districts observed over 15 school years. Descriptive statistics for all variables are reported in Table 2.1. The remainder of this section describes the dependent, independent, and control variables.

Dependent Variable

There are five outcomes of interest: states' shares of education funding, local education revenue per pupil, state education revenue per pupil, federal education revenue per pupil, and total education revenue per pupil. The five outcome variables are created using the F-33 survey. First, the state share of education funding variable was constructed by dividing the amount of education revenue received from state sources by the total amount of revenue from all sources (Hayes, 2014). Second, local education revenue per pupil is the amount of education revenue that a school district receives from local sources divided by the total number of K-12 students in the district.

Third, state education revenue per pupil is the amount of education revenue that a school district receives from state sources divided by the total number of K-12 students in the district. Fourth, federal education revenue per pupil is the amount of education revenue that a school district receives from federal sources divided by the total number of K-12 students in the district. Lastly, total education revenue per pupil is the amount of education revenue that a school district receives from all sources divided by the total number of K-12 students in the district.

Independent Variables

There are three variables of primary interest in this study: the presence of binding TELs on school districts indicator, the No Child Left Behind Act implementation year indicator, and the districts' levels of fiscal capacity. First, the data source for state-imposed TELs is Mullins and Wallin (2004), which identifies the year each type of TEL was enacted. Using this collection, I construct the binding TEL on school districts indicator, which is a dummy variable that equals one if the state imposes a binding TEL on school districts in a particular year, and zero otherwise.[33] Second, there is an indicator for the No Child Left Behind Act implementation year, which equals one if the time period is during the implementation of the NCLB, and zero otherwise. The implementation of NCLB started in the 2002-03 school-year. All observations during or after the 2002-03 school-year are coded with a one.

Third, I use county and state median home values to create the fiscal capacity variable. The fiscal capacity variable is the ratio of county to state median home values (Mullins, 2004). Unfortunately, there is no data source that contains county median home values for all years between 1995 and 2009. Therefore, for the observations between 1995 and 1997, I use the

[33] There are some school districts in the United States that dependent on another government to raise revenue on their behalf (i.e. Rhode Island school district depend on municipalities). The binding TEL on school districts indicator is coded one for states with school districts that dependent on government that is constrained by a binding TEL.

median home value estimates from the 1990 Decennial Census.[34] For the survey years between 1998 and 2003, I use the 2000 Decennial Census. For the survey years between 2004 and 2009, I use the 2005-2009 five year estimate from American Community Survey. There is little variation in median home values from year to year. Dividing the county median home value by the state median home value is appropriate because there is variation in median home values across states (Mullins, 2004). Without adjusting for this variation, it is difficult to know whether a county in one state has a high or low median home value relative to a county in another state.

Figure 2.1 illustrates the changes, before and after the implementation of NCLB, in average education funding by source separately by states that imposed binding TELs on school districts and those that did not. As expected, there is no difference in the average federal revenue per pupil between states with binding TELs and all other states, before or after NCLB took effect. Surprisingly, there is no evidence to support the expected changes in state revenue per pupil or local revenue per pupil after NCLB implementation. One possible explanation is the averages in Figure 1 do not control for important factors. For example, it is important to control for whether or not the state had a school accountability policy prior to the passage of NCLB. This motivates the need to use a multivariate regression, which includes important control variables. Below, I describe the control variables used in the current study.

[34] See, http://censtats.census.gov/usa/usa.shtml for the USA Counties website, which includes median home value data for all counties and states.

Table 2.1: Descriptive Statistics for Analytical Sample of U.S. School Districts

Variable	Mean	SD	Min	Max
Dependent Variables				
State Share of Education Funding	0.51	0.17	0.01	0.98
Real Local Revenue Per Pupil ($)	2,152.17	1,503.75	7.83	14,949.47
Real State Revenue Per Pupil ($)	2,471.30	1,051.05	0.51	9,981.34
Real Federal Revenue Per Pupil ($)	352.26	332.71	0	4,998.39
Real Total Revenue Per Pupil ($)	4,975.73	1,520.22	457.90	20,0567.03
Independent Variables				
Binding TEL on School District	0.75		0	1
NCLB Implementation Year	0.48		0	1
Ratio of County to State Median Home Value	0.73	0.30	0	6.72
Quartile 1 (Lowest)	0.20		0	1
Quartile 2	0.23		0	1
Quartile 3	0.26		0	1
Quartile 4	0.32		0	1
District-Level Controls				
% Black Students	0.08	0.17	0	1
% Hispanic Students	0.08	0.08	0	1
% Free and Reduced Lunch Students	0.29	0.19	0	1
% Individualized Education Program Students	0.13	0.05	0	1
Log of Total Student Enrollment	7.32	1.29	3.30	13.81
Located in Urban Area	0.06		0	1
Located in Suburban Area	0.41		0	1
Located in Rural Area	0.53		0	1
Prop of non-property tax revenue	0.28		0	1
% Secondary Students (9^{th}-12^{th} grade)	0.31	0.04	0.01	1
Log of Total FTE Teachers	4.65	1.17	0	11.09
County-Level Controls				
Annual Unemployment Rate	0.05	0.02	0.01	0.38
State-Level Controls				
Binding TEL on municipality or county	0.76		0	1
TEL on state government	0.61		0	1
Strong Prior School Accountability Policy	0.22		0	1
Moderate Prior School Accountability Policy	0.13		0	1
Weak Prior School Accountability Policy	0.14		0	1
No Prior School Accountability Policy	0.51		0	1
Real Personal Income per Capita	17,034.05	2,343.25	11,412.63	27,462.64
Proportion of Residents 65 years or older	0.13	0.02	0.05	0.22
Ratio of Average Daily Attendance and Pop	0.16	0.01	0.13	0.22
% Employment in Manufacturing Sector	0.10	0.04	0.02	0.19
Republican Governor	0.63		0	1
Court-Ordered Education Finance Reform	0.51		0	1
Legislature Enacted Education Finance Reform	0.88		0	1

Table 2.1 (Cont.): Descriptive Statistics for Analytical Sample of U.S. School Districts

Variable	Mean	SD	Min	Max
State-Level Controls (Cont.)				
Log of Real GDP	12.32	1.03	9.56	14.38
# Adjacent states with binding TELs	3.29	1.71	0	7
Number of States		49		
Number of Districts		134,331		
Number of Unique Districts		10,825		
Number of Years		15		

Notes: The analytical sample includes all school districts that operate both elementary and secondary school. The sample excludes school districts that operate only charter schools, or that are purely administrative in nature. Lastly, the sample excludes Hawaii and DC.

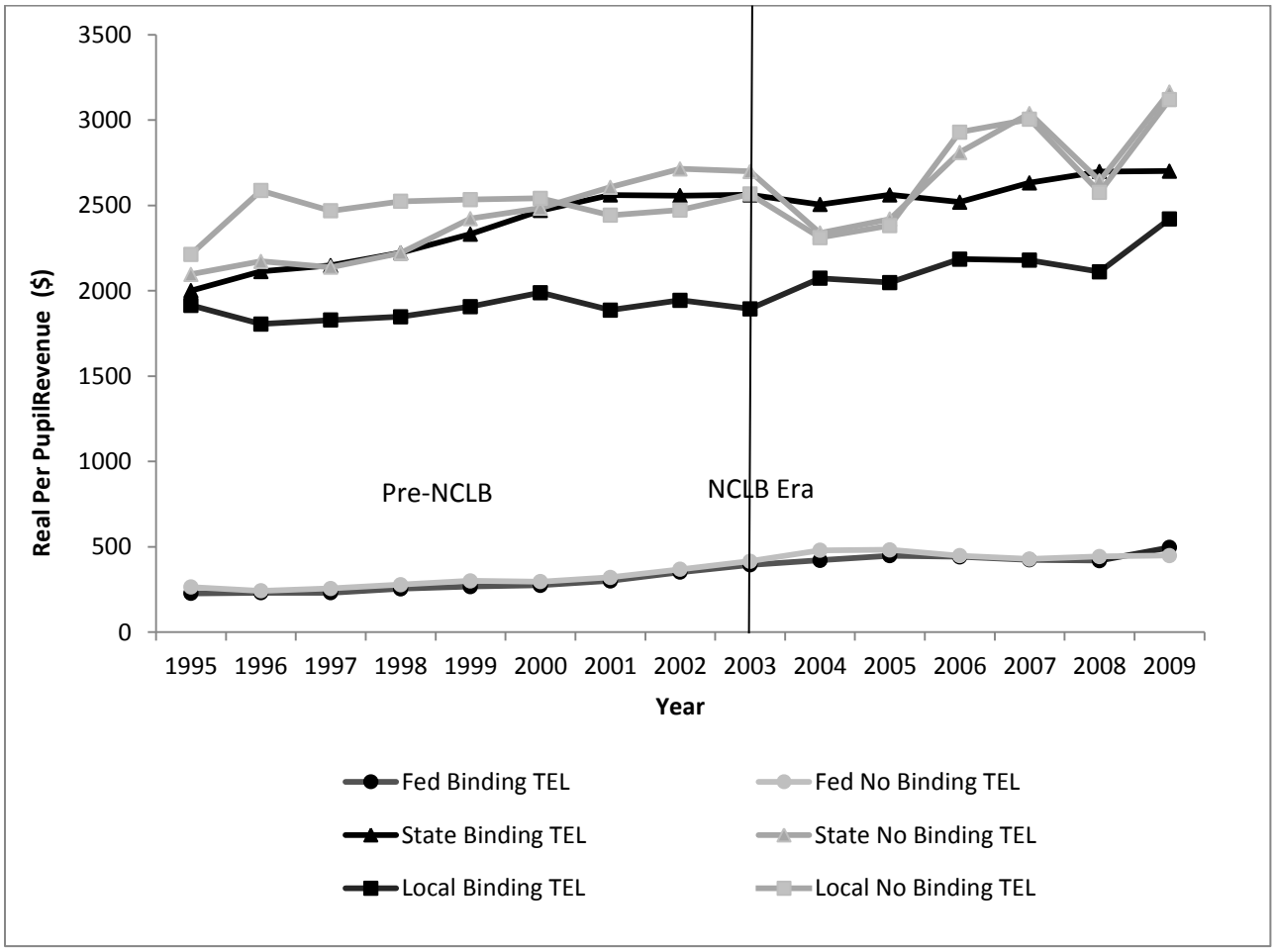

Figure 2.1: Revenue per Pupil by Revenue Source Type and Binding TEL Status

District-level Controls

I use the Common Core of Data's Public Elementary/Secondary School Universe Survey Data to create a set of student demographic variables and a set of district demographic variables.

First, drawing on the literature on education costs, the student demographic variables include the proportion of black students, the proportion of Hispanic students, the proportion of free and reduced lunch students, the proportion of individualized education program (IEP) students, the proportion of secondary students, and the total student enrollment. IEP students are those who have written instructional plans for a disability.[35] Secondary students include students who are in 9th, 10th, 11th, or 12th grades. Shadbegian (2003) argues the cost of educating secondary students is relatively higher than all other students.

Second, the district demographic variables include whether or not the district is located in an urban area, suburban area, or rural area, the proportion of revenue from non-property tax sources, and the total number of full-time equivalent (FTE) teachers. The cost of education will vary depending on the location of the school district, as well as the number of staff members (Shadbegian, 2003). The proportion of revenue from non-property tax sources is the ratio of the total amount of revenue from non-property tax sources to the total amount of revenue from all local sources. This is an important variable because previous research finds governments can generate revenue from non-property tax sources in response to the enactment of binding TELs (Mullins and Joyce, 1996; Nguyen-Hoang, 2013; Shadbegian, 2003).

County- and State-level Controls

I use various sources to create county- and state-level controls. From these data sources, I create a set of socioeconomic variables and a set of state-level policy variables. Consistent with Shadbegian (2003) and Mullins (2004), I include socioeconomic variables to control for economic factors that likely affect the abilities of governments to collect revenue. First, I take data from the Bureau of Labor Statistics to create the annual county unemployment rate.[36]

[35] For more information about IEP, see http://www2.ed.gov/parents/needs/speced/iepguide/index.html?exp=3
[36] See, http://www.bls.gov.lau for county employment data.

Second, the state-level socioeconomic variables include real personal income per capita, ratio of average daily attendance to state population, proportion of employment in the manufacturing sector, real state gross domestic product, and the proportion of residents who are 65 years or older. Average daily attendance is the total number of student attendance divided by the total number of days in the regular school year.[37] I take data from the Bureau of Economic Analysis to construct the first four variables, and data from the U.S. Statistical Abstracts to construct the variable for the proportion of residents who are 65 years or older.[38]

There are ten state-level policy variables. The inclusion of these variables is consistent with previous TELs studies (Hayes, 2014; Mullins, 2004; Shadbegian, 2003). First, there is an indicator for whether the states' governor is a republican. The data source for the political party of governor variable comes from the United States Census Statistical Abstracts.[39] Second, I use Mullins and Wallin (2004) to create an indicator for whether the state imposed a TEL on the state government, and an indicator for whether the state imposed a TEL on either the county or municipality governments. A TEL on the state government will restrict the amount of education revenue collected from state sources (Mullins, 2004; Shadbegian, 2003). Third, I include a continuous variable that equals the number of the adjacent states with binding TELs. Fourth, I use data on court-ordered education finance reform from the National Education Access Network (NEAN) to create an indicator for whether or not the state's court ruled the education finance system in the state was unconstitutional.[40] Additionally, I use data on statutory education reform policies from Downes and Shah's (2006) collection of state legislative education finance reform policies to create a dummy variable that equals one if the state's legislature enacted an education

[37] For more information, see http://www.ncpublicschools.org/fbs/accounting/data/
[38] See, http://www.bea.gov/regional/index.htm for the Bureau of Economic Analysis data and http://www.census.gov/compendia/statab/past_years.html for the U.S. Statistical Abstracts data.
[39] http://www.census.gov/prod/2/gen/96statab/election.pdf
[40] http://www.schoolfunding.info/litigation/litigation.php3

finance reform policies and zero otherwise. I updated Downes and Shah (2006) using state profiles from the Education Finance Statistics Center website.[41] Both types of education finance reform will likely increase amount of revenue from state sources (Downes and Shah, 2006).

Lastly, I use Carnoy and Loeb (2002) to categorize states with prior school accountability policies by accountability strength.[42] Using this collection, the model includes four prior school accountability variables. First, the model includes an indicator for whether or not the state had a strong school accountability policy prior the passage of NCLB, and zero otherwise. Three more dummy variables are created for moderate, weak, and no prior school accountability policies.[43] It is important to control for whether or not a state had a prior school accountability policy because states with prior school accountability policies did not need the same amount of funding compared to all other states to comply with NCLB mandates (Carnoy and Loeb, 2002).

Empirical Strategy

Main Analysis

The main empirical analysis proceeds in two steps. First, I test for the presence of a differential effect of NCLB on each separate dependent variable between states that imposed binding TELs on school districts and states that did not. I estimate the following baseline regression by OLS:

$$(1) \qquad y_{dst} = \beta_0 + \beta_1 TEL_{st} + \beta_2 TEL_{st} \times NCLB_t + \beta_3 X_{dst} + \beta_4 X_{dst} \times NCLB_t + c_d + \tau_t + e_{dst}$$

where y is an continuous outcome for district d, in state s, in year t; TEL is a school district binding TEL indicator; $NCLB$ is a NCLB implementation year indicator; X is a vector of

[41] See, http://nces.ed.gov/edfin/ and http://nces.ed.gov/edfin/pdf/StFinance/Alabama.pdf. Please contact the author for documentation and a complete list of states' legislative education finance reforms.
[42] See Appendix A in Carnoy and Loeb (2002).
[43] The no prior school accountability indicator serves as the omitted group in the empirical model.

controls variables; c is a district fixed effect; τ is a year fixed effect; and e is an error term.[44] As mentioned in the data section, y takes on five separate outcomes: state share of education funding; real local revenue per pupil; real state revenue per pupil; real federal revenue per pupil; and real total revenue per pupil.

The coefficient of interest in equation (1) is β_2, which is expected to be positive and statistically significant when the dependent variable is state share of education funding and state revenue per pupil. At the same time, the coefficient of interest is expected to be negative and statistically significant when the dependent variable is local revenue per pupil. Otherwise, there is no clear prediction for the sign of the coefficient when the dependent variable is federal revenue per pupil and total revenue per pupil.

Second, I investigate whether the relationship described above varies further depending on school districts' fiscal capacities, measured by the ratio of county to state median home values. Specifically, I estimate equation (1) separately for each quartile of fiscal capacity. This approach of estimating the regressions separately for each quartile is consistent with Dee et al. (2013). As a sensitivity check, I estimated the regression using five quintiles and the results are qualitatively the same. As described in the theory section, the magnitude of the differential effect of NCLB between states with and without binding TEL is expected to be higher for school districts in the lowest quartile of fiscal capacity.

All empirical models include district fixed effects to control for all time invariant unobserved heterogeneity across districts. District fixed effects control for long-term economic and political preferences of the district and state that do not vary over time. For example, these

[44] $NCLB$ is not included by itself in equation (1). Instead, this variable is absorbed in the year fixed effect. The results are robust if equation (1) is estimated with $NCLB$ and without the year fixed effect. In addition to the theoretical justifications for interacting all variables with the NCLB indicator, a Chow test was conducted to test the joint significance of all of the interactions in the model and it supported this model specification.

effects will control for state resistance to the implementation of NCLB. Shelly (2008) reported that some states passed resolutions declaring their formal opposition to NCLB. Standard errors are robust to state-level clustering, which makes inference robust to serial correlation within states over time and heteroskedasticity.

Sensitivity Analyses

Whether or not β_2 of equation (1) can be given a causal interpretation depends primarily on two assumptions. First, there is no pre-existing trend in the dependent variable specific to states with binding TELs prior to the 2002-03 school year. Second, no other federal policies were enacted at the same time that affected only states with binding TELs. I test the first assumption by estimating a generalization of equation (1):

$$(2) \qquad y_{dst} = \beta_0 + \beta_1 TEL_{st} + \beta_2 TEL_{st} \times \tau_t + \beta_3 X_{dst} + \beta_4 X_{dst} \times \tau_t + c_d + \tau_t + e_{dst}$$

Comparing equation (2) to equation (1), the NCLB indicator is replaced with a set of year indicators. The year interactions provide an estimate of how the effect of a binding school district TEL on the respective dependent variable varied by year. If there was no pre-existing trend, there should be a difference in the effect of binding school district TELs on the dependent variable between the years prior to the passage of NCLB (1992-93 to 2001-02 school year) and the years post of the NCLB implementation (2002-03 to 2008-09 school years). This is method is referred to as an event study analysis in the finance literature.[45]

I test the second assumption by estimating equation (1) using outcomes that should not be affected by binding TELs on school districts after the passage of NCLB. Specifically, I estimate equation (1) on six outcomes: county median home values; state median home values; state unemployment rates; percent of black students in district, percent of Hispanic students; and the

[45] See Ferr and Maber (2013) for a more detailed explanation of event study analyses.

ratio of state average daily attendance and state population. These six outcomes are similar to the outcomes used in the falsification exercises in Dee et al. (2013). I expect β_2 to be statistically insignificant on all six of these outcome variables. If there were a statistically significant effect, this would be evidence of another federal policy affecting only states with binding TELs on school districts.

Results

Main Analysis

The first panel in Table 2.2 reports the coefficient of interest in equation (1) when the dependent variable is state share of education funding. As expected, the coefficient of interest in Column 1 is positive. This coefficient suggests that states' shares of education funding increased 4.3 percentage points more in school districts with binding TELs relative to all other school districts after the implementation of NCLB.

This estimate is only marginally significant, and it is slightly smaller than Hayes' (2014) estimate of 6.9. One possible reason for this slightly smaller estimate is Hayes (2014) relies on a state-level dataset. The estimate of the differential effect likely varies further depending on school districts' fiscal capacities. Columns 2 through 5 investigate heterogeneity in state share results by fiscal capacity quartiles. For example, shown in Column 2, the coefficient of interest is 0.077 when equation (1) is estimated with only school districts in the lowest quartile of fiscal capacity. This suggests that lowest fiscal capacity school districts in states with binding TELs were more dependent on state education funding relative to all other low fiscal capacity school districts after the enactment of NCLB.

The second panel of Table 2.2 reports the coefficient of interest in equation (1) when the dependent variable is local revenue per pupil. As expected, the coefficient of interest in Column

1 is negative and statistically significant. This coefficient suggests that local revenue increased $400 per pupil more in school districts without binding TELs relative to school districts with binding TELs after NCLB took effect. This is a practical difference since this gap between school districts with and without binding TELs represents 20% of the average local revenue per pupil.

As expected, there are differences in this estimate by quartile of fiscal capacity. For example, the gap widens when comparing school districts in the lowest quartile of fiscal capacity. Shown in Column 2, the coefficient, -501.757, suggests that in the lowest quartile, local revenue per pupil revenue collection was $502 lower in school districts with binding TELs than non-binding TELS after NCLB was implemented. Interestingly, the gap is *largest when comparing school* districts with the highest fiscal capacities. One possible explanation for this result is that residents in high property-wealth school districts may have a strong preference for increasing education revenue after the implementation of NCLB. For example, school expenditures are associated with property values. However, high property-wealth school districts in states with binding TELs were relatively less able to raise additional revenue compared to high property-wealth districts in states without binding TELs on school districts.

Taken together, the results in the second panel provide evidence for hypothesis 1 and 3. After NCLB took effect, local revenue per pupil increased less in school districts in states with binding TELs on school districts compared to all other school districts. Additionally, this gap widens when comparing the lowest fiscal capacity school districts.

The third panel of Table 2.2 presents the coefficient of interest in equation (1) when the dependent variable is state revenue per pupil. As expected, the coefficient of interest in Column 1 is positive. This coefficient suggests state revenue increased by $177 per pupil more in school

districts with binding TELs relative to all other school districts after the NCLB took effect. However, this coefficient is not statistically significant.

Most of the differences estimates by fiscal capacity are not significant. One exception is found in Column 5, where the coefficient is statistically significant. This coefficient suggests that state revenue increased by $333 per pupil more in the highest fiscal capacity school districts with binding TELs relative to all other school districts in the highest fiscal capacity quartile. This result suggests that state governments in states with binding TELs were targeting additional state aid to school districts with the highest fiscal capacity. One possible explanation for this result is that residents and local government officials in high property-wealth districts have relatively more political influence on state-level politicians compared to all other residents and local officials in the state.

Taken together, the results in the third panel do not support hypothesis 2 and 4. After the NCLB was implemented, there is no statistically significant difference in state revenue per pupil between school districts in states with binding TELs on school districts and all other school districts. This finding holds true even when comparing school districts in the lowest quartile of fiscal capacity.

Table 2.2: Differential Effect of NCLB between States with and without TELs by Fiscal Capacity

	Full Sample	FC Quartile 1 (Lowest FC)	FC Quartile 2	FC Quartile 3	FC Quartile 4 (Highest FC)
	(1)	(2)	(3)	(4)	(5)
Panel 1: State share					
Differential Effect	0.043*	0.077***	0.047*	0.033	0.057**
	(0.025)	(0.026)	(0.027)	(0.033)	(0.028)
Mean for 2001-02 school year	0.53	0.57	0.57	0.55	0.45
SD for 2001-02 school year	0.17	0.16	0.15	0.15	0.18
Panel 2: Local revenue per pupil					
Differential Effect	-398.919**	-501.757**	-349.117**	-345.022	-504.163**
	(167.852)	(196.249)	(171.096)	(226.995)	(213.288)
Mean for 2001-02 school year	2,086.08	1.908.68	1,745.70	1,835.41	2,658.80
SD for 2001-02 school year	1,422.06	1,344.56	1,179.32	1,091.54	1,678.36
Panel 3: State revenue per pupil					
Differential Effect	176.156	213.044	167.194	132.208	332.583**
	(126.489)	(177.467)	(125.661)	(147.487)	(134.704)
Mean for 2001-02 school year	2,599.24	3,077.15	2,716.80	2,586.95	2,197.03
SD for 2001-02 school year	1,090.94	1,306.54	953.68	976.94	952.60
Panel 4: Fed revenue per pupil					
Differential Effect	26.914	-108.376*	13.235	69.211**	70.107***
	(33.162)	(55.639)	(42.456)	(30.866)	(24.439)
Mean for 2001-02 school year	356.05	447.64	414.24	345.33	259.45
SD for 2001-02 school year	313.61	384.19	342.10	280.78	221.79
Panel 5: Total Revenue Per Pupil					
Differential Effect	-204.030	-528.812**	-208.396	-183.323	-166.354
	(146.064)	(225.085)	(192.684)	(207.838)	(159.341)
Mean for 2001-02 school year	5,041.38	5,433.47	4,876.73	4,767.69	5,115.27
SD for 2001-02 school year	1,419.76	1,594.32	1,267.33	1,187.42	1,502.33
Number of states	49	49	49	49	49
Number of district-years	134,331	26,747	30,646	34,366	42,572
Number of unique districts	10,825	2,916	3,883	4,260	4,172
Number of years	15	15	15	15	15

Notes: FC is the abbreviation for fiscal capacity. The first quartile of FC includes school district below the 25th percentile in the ratio of county to state median home values. Each estimate of the differential effect is the coefficient of interest from a separate regression of equation (1). All models include district fixed effects and all of the controls variables. The coefficients for the control variables are reported in Appendix A. Standard errors are clustered at the state-level, *** p<0.01, ** p<0.05, * p<0.1.

These findings presented in the first three panels suggest two ideas. First, the relative increase in states' shares of education in school districts with binding TELs does not stem from increases in state education funding. Instead, the relative increase in states' shares of education funding is the result of a lower amount of revenue raised at the local level for school districts with binding TELs compared to all other school districts. Second, any increases in state funding to school districts with binding TELs were not targeted at low fiscal capacity districts. Instead, high fiscal capacity districts in TEL states received more state aid, relative to their "poorer" counterparts.

The fourth panel of Table 2.2 presents the coefficient of interest in equation (1) when the dependent variable is federal revenue per pupil. Shown in Column 1, the coefficient of interest is small and not statistically significant. Surprisingly, there are differences in this estimate by fiscal capacity. Restricting the analysis to the school districts with the lowest fiscal capacities, the coefficient of interest suggest that federal revenue decreased by $108 per pupil more in school districts with binding TELs relative to all other school districts. When the sample is restricted to school districts with the highest fiscal capacity, the coefficient of interest suggest that federal revenue increased by $70 per pupil more in school districts in binding TELs relative to all other school districts. One possible explanation for these puzzling results is that high fiscal capacity school districts have more resources compared to low fiscal capacity school districts to invest in federal grant writers and therefore better able to raise federal funds after the passage of NCLB.

The final panel of Table 2.2 presents the coefficient of interest in equation (1) when the dependent variable is total revenue per pupil. The coefficient of interest is -204.03. This coefficient is neither practically or statistically significant. This suggests that there is no

difference in total revenue per pupil between school districts with binding TELs and all other school districts after NCLB was implemented.

Not surprisingly, the estimate of this coefficient does vary by fiscal capacity. In particular, the coefficient, -528.813, is large and statistically significant in Column 2. This coefficient suggests that total revenue was $528 per pupil lower in the lowest fiscal capacity school districts with binding TELs compared to all other school districts in the lowest fiscal capacity quartile. The $528 per pupil estimate represents almost 10% of the average amount total education revenue for a school district. Overall, the findings in panel 5 of Table 2.2 suggest that NCLB had the largest adverse effect on total revenue per pupil for low fiscal capacity school districts in states with binding TELs.

Sensitivity Analyses

As mentioned above, the empirical strategy relies on two key assumptions. An event study analysis is conducted to relax the first assumption that there is no pre-existing trend in the dependent variable specific to states with binding TELs prior to the 2002-03 school year. In other words, there should be a significant change in the effect of a binding TEL on the dependent between the 2001-02 and 2002-03 school years.

Table 2.3: Event Study Analyses

	State Share	Local Revenue Per Pupil	State Revenue Per Pupil	Federal Revenue Per Pupil	Total Revenue Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)	(6)
Pre-NCLB Era						
Binding TEL	-0.137***	980.732***	-574.098***	106.929**	731.902***	845.998***
	(0.028)	(175.111)	(172.767)	(43.174)	(194.669)	(131.070)
Binding TEL × 1996	0.024	-25.013	197.463**	-44.804**	41.098	-172.002
	(0.015)	(96.051)	(84.218)	(21.667)	(108.707)	(147.623)
Binding TEL × 1997	0.058**	-360.884***	199.158*	-10.599	-293.668***	-188.661
	(0.023)	(118.290)	(111.127)	(13.262)	(73.008)	(133.113)
Binding TEL × 1998	0.104***	-601.581***	383.638***	-10.135	-457.255***	-371.115*
	(0.021)	(94.231)	(111.522)	(21.435)	(104.782)	(212.333)
Binding TEL × 1999	0.077**	-510.166***	265.883	27.011	-437.658***	-224.183
	(0.033)	(154.328)	(171.025)	(23.707)	(127.651)	(156.329)
Binding TEL × 2000	0.078**	-560.598***	158.807	4.116	-604.302***	-180.975
	(0.030)	(140.922)	(150.915)	(23.790)	(131.192)	(178.218)
Binding TEL × 2001	0.076***	-585.624***	185.461	-2.258	-630.605***	-558.038***
	(0.026)	(144.363)	(140.620)	(27.358)	(143.351)	(143.421)
Binding TEL × 2002	0.085***	-678.129***	230.232	10.540	-653.025***	-668.757***
	(0.029)	(139.140)	(185.199)	(30.408)	(137.726)	(117.843)
NCLB Era						
Binding TEL × 2003	0.137***	-918.845***	531.544***	-1.123	-688.392***	-942.333***
	(0.025)	(174.756)	(132.763)	(34.481)	(177.942)	(117.271)
Binding TEL × 2004	0.134***	-906.852***	514.925***	-20.430	-648.696***	-1,002.21***
	(0.025)	(154.371)	(133.843)	(40.387)	(146.517)	(167.835)
Binding TEL × 2005	0.123***	-867.040***	394.161***	25.499	-626.631***	-809.779***
	(0.022)	(140.172)	(130.764)	(51.063)	(151.207)	(161.619)
Binding TEL × 2006	0.122***	-868.900***	440.209***	-8.275	-614.928***	-820.319***
	(0.024)	(158.977)	(136.060)	(37.694)	(162.732)	(187.366)
Binding TEL × 2007	0.097***	-694.273***	374.359***	-34.161	-498.513**	-834.426***
	(0.025)	(206.962)	(133.359)	(37.180)	(246.235)	(182.863)
Binding TEL × 2008	0.069***	-477.319***	304.253*	21.237	-242.808	-765.688***
	(0.023)	(132.812)	(161.522)	(42.096)	(146.881)	(174.026)
Binding TEL × 2009	0.047*	-467.280***	98.762	107.129**	-226.633	-634.339***
	(0.026)	(149.125)	(185.961)	(53.039)	(145.612)	(176.058)
Total Districts			134,331			26,747
Adjusted R-squared	0.28	0.33	0.41	0.40	0.64	0.70

Notes: The year 1996 represents the 1995-96 school year. The 1994-95 is the omitted school year. This table does not report all of the coefficients from equation (2). The difference between Columns 5 and 6 is the results from Column 6 are generated from estimating equation (2) with only the lowest fiscal capacity school districts. Standard errors are clustered at the state-level, *** p<0.01, ** p<0.05, * p<0.1.

Table 2.3 represents the results from equation (2). Shown in Column 1, the results of the event study analysis support the assumption that there was no pre-existing trend in state share of education funding prior to the 2002-03 school year. The coefficient on the binding TEL indicator remained constant in the four years prior to the implementation of NCLB. In the first year of the implementation of NCLB, the coefficient increased from 0.085 to 0.137. This was both a practical and statistical significant increase.

Shown in Columns 2 and 3, the results also support the assumption that there was no pre-existing trend in local and state revenue per pupil prior to the 2002-03 school year. In both columns, there was a statistically significant difference between the coefficient in the year before and after the implementation of NCLB. For example, in Column 2, the coefficient in the 2001-02 school year was 678 and the coefficient in the 2002-03 school year was 918. This $240 per pupil increase between these two years was a practical and statistical significant increase.

Shown in Column 4, the results of the event study analysis do not support the assumption that there was no pre-existing trend in federal revenue per pupil prior to the 2002-03 school year. Likewise, Column 5 shows there is a preexisting trend in total revenue per pupil prior to the implementation of NCLB, when equation (2) is estimated with the full analytical sample of school districts. However, Column 6 shows that there is no preexisting trend in total revenue per pupil prior to the implementation of NCLB, when equation (2) is estimated with the school districts in the lowest fiscal capacity quartile.

Similar to Dee et al. (2013), I conducted falsification exercises to relax the second assumption, that no other federal policies were enacted at the same time as NCLB that affected only states with binding TELs. Table 2.4 presents the results of six falsification exercises. Specifically, Table 2.4 shows the estimated “differential effects” of NCLB on several observable

district and state characteristics. As shown in Columns 1 through 6, there are no statistically significant effects on any of the six outcomes. This suggests there is no evidence of confounding factors, and allows me to relax assumption two. Overall, these two sensitivity analyses indicate that the estimated effects in Table 2.2 reliably identify the differential effect of NCLB on the outcomes of interest between school districts with binding TELs and all other school districts.

Table 2.4: Falsification Exercises

	County Median Home Value	State Median Home Value	State Unemploy Rate	% Black Students in District	% Hispanic Students in District	Ratio of ADA to State Pop
	(1)	(2)	(3)	(4)	(5)	(6)
Binding SD TEL × NCLB	17,476.171	13,889.255	0.137	-0.000	0.004	0.000
	(10,680.685)	(11,486.213)	(0.210)	(0.003)	(0.003)	(0.002)
Mean for 2001-02 year	92,562.39	109,374.80	4.58	0.08	0.08	0.16
SD for 2001-02 year	49,287.18	34,136.03	0.78	0.18	0.17	0.01
N (district-years)			134,331			

Notes: Each cell is a separate regression from estimating equation (1) on one of the six dependent variables. All models include district fixed effects and all of the controls variables. Standard errors are clustered at the state-level. *** p<0.01, ** p<0.05, * p<0.1.

Discussion

Previous education finance and policy literature concludes that NCLB placed a significant financial burden on state governments and school districts (Dee et al., 2013). Additionally, school districts in states with binding TELs were restricted in their abilities to raise additional revenue (Hayes, 2014) to fund compliance with the law. Expanding on previous education finance and policy literatures, the current study tests the general hypothesis that the impact of NCLB on education revenues varied between states with and without binding TELs. This study provides some evidence supporting this claim.

Specifically, the current study's empirical results report five main findings. First, states' shares of education funding increased 4.3 percentage points more in school districts with binding

TELs relative to all other school districts after NCLB took effect. This estimate reinforces previous state-level analyses (Hayes, 2014) and implies that in aggregate, states helped local districts fund compliance efforts . Second, I find that school districts without binding TELs were able to raise $400 per pupil more local revenue relative to school districts with binding TELs after NCLB was implemented. Third, this gap in local revenue between school districts without and with binding TELs is even larger when restricting the analysis to only school districts in the lowest quartile of fiscal capacity.

Fourth, the presence of a binding TEL had no statistically significant impact on state revenue per pupil after enactment of NCLB. Surprisingly, this result holds true even when restricting the analysis to only school districts in the lowest quartile of fiscal capacity. In addition, there is evidence that additional post-NCLB state aid was targeted to school districts with the highest fiscal capacity in states with binding TELs. The 4.3 percentage point increase in states' shares of education between school districts with binding TELs and all other school districts is not the result of significant increases in state education funding to school districts; instead, this state share increase is due to lower local revenues in non-TEL districts. Fifth, for the lowest fiscal capacity districts, those without binding TELs had $528 per pupil more total education revenue compared to school districts with binding TEL, primarily because the non-TEL districts were able to increase more revenue from local sources. Taken together, these five findings suggest that NCLB had the largest adverse effect on education revenues for low fiscal capacity school districts in states with binding TELs.

The fact that total revenue was $528 per pupil lower in school districts with binding TELs compared to school districts without binding TEL after NCLB took effect implies a number of implications for education policy. First, previous research shows that per pupil district

expenditures exert positive impacts on student test scores, especially for students in the lowest quantile of student test scores (Eide and Showalter, 1998). Second, the $529 gap estimate in this study flies in the face of education finance reforms designed to provide an equitable level of education resources across school districts (Murray, Evans, and Schwab, 1998).

The current study makes three contributions to the fields of intergovernmental finance, TEL policies, and education finance and policy. First, it adds to the growing literature on the potential unintended consequences of NCLB. Specifically, this study suggests that the financial burden of NCLB adversely affected school districts with binding TELs and with low fiscal capacities. Second, this study add to the TEL literature by providing evidence that binding TELs more tightly restrict the abilities of low fiscal capacity governments to raise additional revenue, especially after a fiscal or policy shock. Lastly, this study provides a potential explanation for why TELs reduce student performance in public schools (Figlio, 1997; Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000).

The findings in this study also provide three implications for education policymakers. First, the findings highlight the potential unintended consequence of federal policies that are implemented without full consideration of how the policy will interact with existing state and local policy. Specifically, federal policymakers did not consider the consequences of the interaction of underfunded federal mandates and state-level budgetary constraints on school districts. The main goal of NCLB was to reduce the achievement gap between disadvantaged and non-disadvantaged students. However, these results suggest that the interactive effects of NCLB and TELs in fact exacerbated school district resource disparities, with particularly high TEL/non-TEL disparities in the lowest fiscal capacity school districts.

Second, the findings also reinforce the notion that local governments are adversely affected by binding TELs. In particular, school districts with the lowest level of fiscal capacity are most adversely impacted by TELs. One possible solution is to provide additional state funding to these school districts. While this study does find additional state responsibility for local district funding post-NCLB, there is an absence of state targeting to offset disparities in local funding for compliance with the law. Thus, federal education policymakers could consider the targeting of federal education aid to school districts with low fiscal capacities and in states with binding TELs on school districts.[46]

Lastly, education policymakers may want to evaluate changes in educational outcomes between states with and without binding TELs. For example, it would be interesting to know whether the relative increase in education revenue for school districts without binding TELs resulted in comparatively higher gains in student performances.

[46] This additional federal aid would have to be appropriately calibrated to account for this.

CHAPTER 3

DO ENVIRONMENTAL SHOCKS AND BUDGETARY CONSTRAINTS ON PUBLIC ORGANIZATIONS INCREASE EMPLOYEE TURNOVER?

Introduction

Understanding the factors that influence employee turnover is important because personnel decisions affect organizational performance (Kim, 2002; Meier & Hicklin, 2007; Pitts, 2005; Ronfeldt et al., 2013; Shaw et al., 2005). Employee turnover also imposes a financial burden on organizations. For example, estimates of the cost of teacher turnover range between $12,000 to $52,500 per teacher (Alliance for Excellent Education, 2005; Texas Center for Educational Research, 2000).

The literature on employee turnover in public management and organizational theory focuses primarily on employee- and organizational-level characteristics that influence employee turnover. However, other determinants of employee turnover, such as factors external to the organization, are understudied (Meier and O'Toole, 2009). The current study addresses this gap in the literature by focusing on the interaction of two external factors: environmental shocks to organizations and budgetary constraints on organizations.

Specifically, the current study examines how the passage of the No Child Left Behind Act of 2001 (NCLB) and state-imposed binding tax and expenditure limitations (TELs) on school districts interact to affect the likelihood of teacher turnover. Previous education finance research demonstrates that NCLB created an environmental shock by placing a significant financial burden on school districts by requiring them to invest in "highly qualified teachers" and designing and implementing new student assessments (Dee et al., 2013; Goertz, 2005; Hayes,

2014; McGuinn, 2005).[47] At the same time, the passage of NCLB had non-financial effects on teachers, such as diminishing teachers' classroom autonomy, reducing teachers' perceived job security, and increasing teachers' stress levels (Daly and Chrispeels, 2005; Figlio and Loeb, 2011; Luna and Turner, 2001; Reback et al., 2011). This environmental shock potentially affected teachers who taught in tested grades relatively more than teachers in non-tested grades and subjects, as tested-grade teachers were subject to significantly more accountability pressure than their counterparts in non-tested grades and subjects (Gershenson, 2013). A tested grade is a grade-level in which students are required to take state exams in reading, writing, or math.[48]

One possible mechanism through which school systems might buffer teachers from the environmental shock associated with NCLB was to raise additional revenue. Some states, however, impose budgetary constraints on school districts. Common state-imposed budgetary constraints on school districts are binding TELs, which restrict districts' abilities to raise additional revenue. School districts in states with binding TELs were unable to respond to the environmental shock of NCLB by raising additional revenue (Hayes, 2014).

Using a nationally-representative teacher-level dataset, I use a difference-in-difference type strategy to examine the differences in the likelihood of teacher turnover between teachers in states with and without binding TELs on school districts, before and after the passage of NCLB. I also examine whether the results differ between teachers who taught in tested and non-tested grades. Lastly, I examine whether the results vary by school districts' fiscal capacities. A common measure of fiscal capacity is property values per pupil (Odden and Picus, 2008). This is a potentially important difference because school districts with low fiscal capacity in states with

[47] School systems needed to increase the number of "highly qualified teachers" in classrooms. Under NCLB, a highly qualified teacher is fully certified, holds a bachelor's degree, and shows competence in subject knowledge and teaching skills. All Title I classrooms must have a highly qualified teacher by the 2002-2003 school year.
[48] After the passage of NCLB, at a minimum, 3rd through 8th grade students were assessed in math, writing, and reading. Some states were testing students in these grades and subjects prior to the passage of NCLB.

a binding TEL are more likely to be restricted from raising additional revenue relative to all other school districts in the same state (Mullins, 2004).

The current study's empirical results suggest there is no evidence of a differential effect of NCLB in TEL states. However, I do find statistically significant effects of NCLB on teachers in TEL states who were most affected by NCLB: those in tested grades. Similarly, I find a statistically significant difference in NCLB's effect on the school districts in TEL states that are most affected by TELs: those with low fiscal capacity. Lastly, I find teachers who taught in low fiscal capacity districts, taught in tested grades, and in states with binding TELs are less likely to remain in the same school compared to all other teachers after the passage of NCLB.

The current study makes three contributions to the fields of public management, TELs, and education finance and policy. First, this study adds to the growing public management literature on the determinants of employee turnover. By focusing on how environmental shocks and budgetary constraints influence employee turnover, this study demonstrates that external factors are also potentially important determinants of employee turnover. Second, this study provides the first evidence on how TELs affect public managers and employees. By doing so, this study demonstrates how fiscal and budgetary factors can affect public organizations, managers, employees. Lastly, this study contributes to the literature on education finance and policy by testing whether there are differences in teacher turnover rates between TEL and non-TEL states. If teachers in states with TELs are relatively more likely to leave their school, this study provides a potential explanation for why TELs reduce student performance in public schools (Figlio, 1997; Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000).

The remainder of this paper is organized into five sections. Section 2 reviews the relevant literature and presents four testable hypotheses. Sections 3 and 4 describe the dataset and the

empirical methodology. Section 5 presents the main results and section 6 concludes with a discussion of the implications of these results.

Literature Review and Theory

The current study sits at the intersection of three literatures: the determinants of employee turnover, the fiscal and non-fiscal shocks caused by NCLB, and tax and expenditure limitations (TELs). In this section, I use the key findings from these literatures to develop four testable hypotheses, which I test empirically later in the paper.

Determinants of Public-Sector Employee Turnover

Extensive literatures in public management, organizational theory, and education finance and policy find numerous predictors of employee turnover. For thorough reviews of these literatures, see Guarino et al (2006), Moynihan and Pandey (2008), and Pitts et al. (2011). Generally, these studies find that employee- and organizational-level characteristics strongly influence the likelihood of employee turnover. These previous findings are important for the development of the current study's empirical model. Below, I summarize the various employee- and organizational-level predictors of employee turnover, both generally and in the context of public schools.

The decision to leave an organization is influenced by various employee demographics including age, years of work experience, race, gender, and worker qualifications. First, older and more experienced employees are more likely to remain in the same organization relative to younger and less experienced employees (Guarino et al. 2006; Lambert et al., 2001; Moynihan and Landuyt, 2008; Pitt et al. 2011; and Stark, 2007). Second, there are mixed findings on whether turnover is related to employee race/ethnicity (Blau and Kahn, 1981; Choi, 2009; Grissom et al., 2012; Ingersoll, 2001; Kellough and Osuna, 1995; Kirby et al., 1999). Third,

recent research suggest female employees are less likely to leave their organization (Guarino et al. 2006; Moynihan and Landuyt, 2008) Lastly, in the context of public school teachers, turnover decisions also vary by teacher qualifications. For example, the likelihood of a teacher leaving their school is higher if the teacher has a graduate degree, higher standardized test scores, and less teaching experience (Borman and Dowling, 2008).

Organizational characteristics also influence the likelihood of employee turnover. First, employee satisfaction with pay, benefits, and career advancement are strong predictors of turnover. Research finds higher salaries and more generous benefits decrease the likelihood of employee turnover (Blau and Kahn, 1981; Borman and Dowling, 2008; Kim, 1999; Shaw et al., 1998). Organizations with more opportunities for career advancement and promotion have lower employee turnover rates (Cotton and Tuttle, 1986; Lee and Whitford, 2008; Selden and Moynihan, 2000). One possible explanation for this negative relationship between opportunities for career advancement and turnover intention is that access to more opportunities for career advancement promotes higher levels of job satisfaction and organizational commitment (Johnston et al., 1993; Pitts et al., 2011).

Second, the employee's relationship with his or her supervisor is another important factor. More effective public managers tend to lower the likelihood of employee turnover. For example, public managers can decrease rates of employee turnover through better communication, providing more role clarity, and creating a sense of trust (Kim, 2002; Kim, 2005; Pitts et al. 2011).

In the context of public schools, a teacher's decision to leave his or her school is also influenced by several school-level characteristics. First, schools with more experienced principals have relatively lower teacher turnover rates (Grissom, 2011). Second, schools with

more minority and economically disadvantaged students have relatively higher turnover rates (Ingersoll, 2001; Hanushek, Kain, & Rivkin, 2004). Third, schools located in an urban area have higher teacher turnover rates relative to schools located in suburban areas (Ingersoll, 2001; Lankford et al., 2002). Fourth, schools with higher levels of administrative support have relatively lower teacher turnover rates (Mintzberg, 1979; O'Toole and Meier, 1999; Ingersoll, 2001; Boyd et al., 2010). Lastly, teachers with smaller class sizes and more instructional support are more likely to remain teaching in their school (Loeb, Darling-Hammond, Luczak, 2013).

Overall, previous research demonstrates that various employee- and organizational-level factors influence employee turnover. However, other determinants of employee turnover, such as factors external to the organization, are understudied. The current study contributes to this literature by examining how factors external to the organization influence the likelihood of employee turnover. Specifically, the current study hypothesizes and tests whether environmental shocks and budgetary constraints affect public employees' decision to move to another organization or leave the profession altogether.

The Fiscal and Non-Fiscal Shocks Associated with the Passage of NCLB

While there are numerous studies in public management focusing on individual and organizational factors that impact the likelihood of employee turnover, there is surprisingly little research on external factors that impact employee turnover (Meier and O'Toole, 2009). Meier and O'Toole (2009) find environmental shocks on organizations, defined in their study as budgetary shocks, have negative effects on organizational performance. If environmental shocks negatively affect organizational performance, it is possible that these shocks also impact organizations' personnel decisions and employee morale. A recent major environmental shock

on public school systems and their teachers was the passage of NCLB, which included both fiscal and non-fiscal shocks.

The fiscal shock of the passage of NCLB was the financial burden that this law put on state governments and school districts. The passage of NCLB required state governments and school districts to make two major investments. First, state governments and school districts had to design and implement annual assessments of students' math and reading achievement by the 2005-06 academic year.[49] Second, schools had to increase the hiring of "highly qualified teachers."[50] See Goertz (2005), Dee et al. (2013), and McGuinn (2004) for reviews of the key features and implementation costs of NCLB.

Previous research suggests that NCLB was an underfunded federal mandate. Indeed, a 2003 survey found that almost 90% of superintendents and principals characterized NCLB as an underfunded mandate (Olson, 2013). For example, the Government Accountability Office (2003) estimated that states designed and implemented up to eleven new student tests at an estimated total cost of $7 billion. However, the federal government authorized only $2.34 billion to fund public school systems in designing and implementing these new student assessments. Similarly, Dee et al. (2013) find that, in the years following the passage of NCLB, federal education revenues increased by $100 per-pupil, while state and local education revenues increased by $448 per-pupil.

In addition to the fiscal shock created by the passage of NCLB, there was also a non-fiscal shock to teachers. NCLB and similar state-level test-based accountability policies incentivized teachers, schools, and administrators to increase student performance on

[49] All grades between 3rd and 8th must assess student math and reading skills every year after the passage of NCLB, including English Language Learner (ELL) students and students with special needs.
[50] Under NCLB, a highly qualified teacher is fully certified, holds a bachelor's degree, and shows competence in subject knowledge and teaching skills. All Title I classrooms must have a highly qualified teacher by the 2002-2003 school year.

standardized tests while simultaneously placing a tremendous amount of pressure on teachers. Recent studies find that accountability policies negatively affect teachers through diminished classroom autonomy, reductions in job security, and increases stress levels (Luna and Turner, 2001; Reback et al., 2011; Daly and Chrispeels, 2005). These negative effects likely vary between teachers in tested and non-tested grades (Gershenson, 2013).

There are potentially both direct and indirect effects of the environmental shock caused by NCLB on teacher turnover. An example of the former is that teachers who have less job security, less classroom autonomy, or higher levels of stress are more likely to relocate to another school or leave the teaching profession altogether. An example of the latter is that, after the passage of NCLB, there were fewer resources available to improve current teacher's working conditions, such as reducing class sizes, hiring more teacher aides, increasing salaries/benefits, and improving opportunities for career advancement. Fewer resources also exacerbated the effect of the non-fiscal shocks on teacher turnover. For example, fewer resources likely increased teachers' stress levels. As a result, the effect of NCLB may have been stronger in financially constrained states and school districts.

It is unclear how different school systems were able to buffer the environmental shock of NCLB on employee turnover. One possible buffer was the ability of school systems to raise additional revenue to pay for the required NCLB investments. By increasing tax revenue, a school district can fund the required NCLB investments, while also keeping resources available to buffer teachers from the non-fiscal shocks of NCLB. The ability to raise additional revenue, however, is a function of the budgetary constraints imposed on school districts by states. One common budgetary constraint on school districts is a TEL.

Budgetary Constraints on School Districts: Tax and Expenditure Limitations (TELs)

A TEL is a law that restricts governments' abilities to increase the amount of revenue generated and/or funds spent in their jurisdictions. Voters support the enactment of TELs with the goal to decrease government waste and inefficiencies (Mullins and Wallin, 2004). Voters perceive the enactment of a TEL as a "win-win" situation since they expect to receive lower tax burdens, while also keeping the same level of government services (Mullins and Wallin, 2004). The enactment of a TEL, however, creates a host of economic distortions because the governments affected by TELs are less likely to meet the service needs of their citizens (Mullins and Joyce, 1996; Mullins, 2004).

State governments impose TELs on various types of governments: state governments, municipalities, county governments, and school districts. The current study focuses on TELs placed on school districts. Joyce and Mullins (1991) distinguished between six different types of TELs, including limits on changes to the property tax rate, limits on changes to property tax levy, limits on changes to general expenditures, limits on changes to general revenue collection, and limits on changes to property value assessments.

The distinction between non-binding and binding TELs is important, as non-binding TELs are less likely to restrict governments' abilities to increase revenues or expenditures. Examples of non-binding TELs include limits on property tax rates and limits on increases in the assessment values of properties. For example, a government constrained by a limit on its property tax rate can still increase revenues by increasing the assessment value of properties in its jurisdiction. These TELs can be binding only if there is both a property tax limit and limits on increasing the assessment value of properties.

More generally, a TEL must meet one of three criteria to be considered binding. First, a TEL is binding if there are limits on either general revenue or general expenditures. Limits on

general revenue or expenditures are both examples of binding TELs, as they explicitly restrict the amount of revenue collected or money spent by a government. Second, a limit on the property tax levy is a binding TEL because it explicitly restricts the growth in property tax collection. Lastly, a binding TEL can arise from the combination of a limit on the property tax rate and a limit on increasing the assessment value of properties.

Four previous studies examine the relationship between the enactment of TELs and the financing of public education. First, Mullins and Joyce (1996) find TELs reduce the amount of education revenue collected from the local property tax base. Second, Dye, McGuire, and McMillen (2005) find TELs increasingly restrict growth in education revenue collection over time. They find school districts, shortly after the enactment of a TEL, have the ability to protect instructional expenditures by reducing administrative expenditures. In the long-run, however, school districts are forced to reduce instructional expenditures. Third, Shadbegian (2003) finds school districts are forced to rely on non-property tax revenue sources, which are less stable forms of revenue relative to property tax revenue sources. One form of non-property tax revenue for school districts is state aid (Mullins and Joyce, 1996; Shadbegian, 2003).

Lastly, Hayes (2014) finds, after the passage of NCLB, states' shares of education funding increased relatively more in states with binding TELs on school districts compared to all other states. This finding suggests that school districts in states with binding TELs were restricted in their abilities to raise the additional revenue necessary to comply with NCLB from local sources. As a result, state governments provided additional funding to school districts in these states. It is unclear whether the additional funding from state governments in states with binding TELs on school districts was adequate. The current study contributes to literature by

testing whether or not school districts in states with binding TELs were able to buffer teachers from the environmental shock of NCLB.

Four Testable Hypotheses

As mentioned above, the environmental shock of NCLB likely had both direct and indirect negative effects on the likelihood of teacher turnover.[51] One possible way for school districts to buffer the environmental shock of NCLB on teachers is to raise additional revenue. A school district in a state with binding TELs have relatively less ability to raise additional revenue to buffer the environmental shock of NCLB on their teachers (Hayes, 2014). This assertion leads to the first testable hypothesis.

> Hypothesis 1: After the passage of NCLB, teachers in states with binding TELs became less likely to remain in the same school, and more likely to exit the teaching profession.

The effects of the environmental shock of NCLB on teachers will likely vary between teachers in tested and non-tested grades (Gershenson, 2013). A teacher is considered a tested teacher if they teach students who are assessed by some state exam.[52] A teacher in a tested grade is more likely to be affected by the environmental shock of the passage of NCLB. See Figure 3.1 for an illustration of all four hypotheses.

> Hypothesis 2: The expected outcome of Hypothesis 1 is stronger for tested teachers compared to non-tested teachers.

[51] I formally define turnover in the data section.
[52] After the passage of NCLB, at a minimum, 3rd through 8th grade students were assessed in math, writing, and reading. Some states were testing students in these grades and subjects prior to the passage of NCLB.

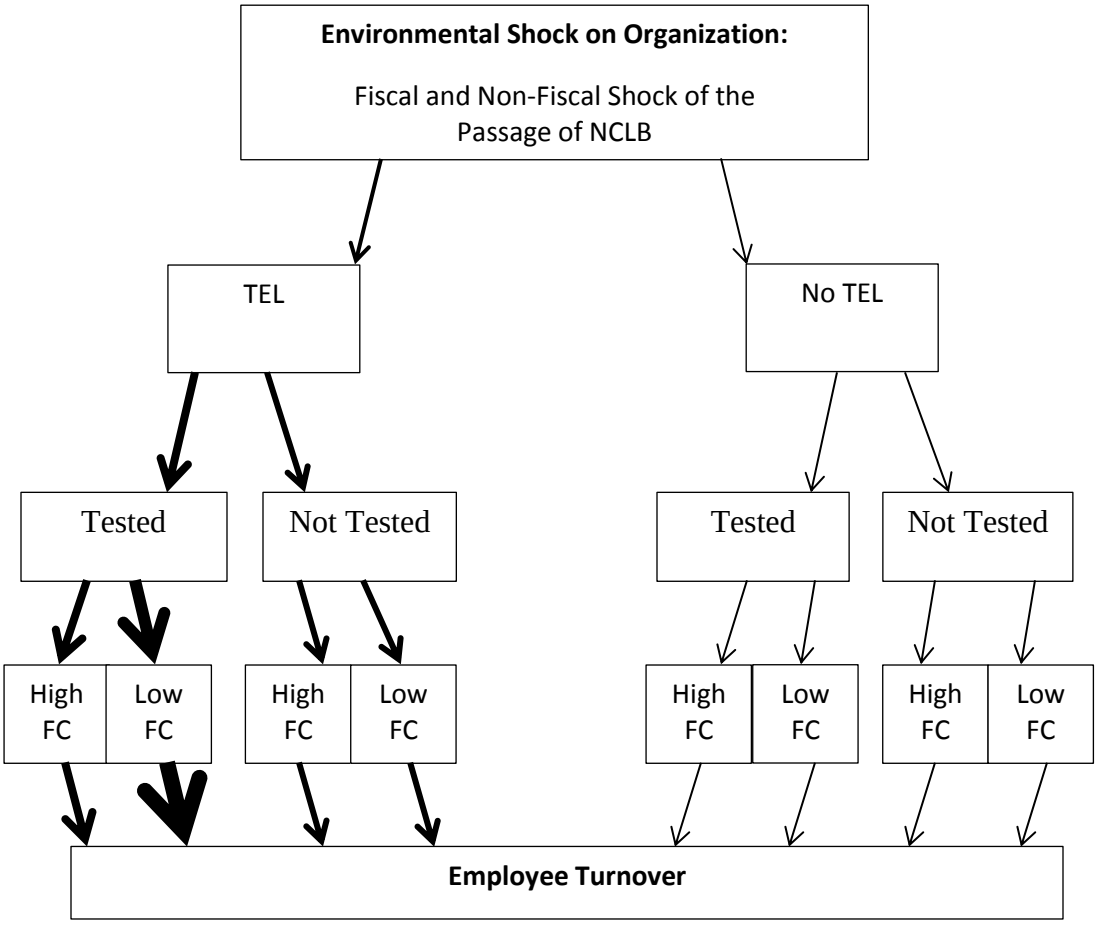

Figure 3.1*:* Expected Relationship between Environmental Shock, Budgetary Constraints, and Employee Turnover. The bolded lines represent the strength of hypothesized relationships between environmental shocks, budgetary constraints, and employee turnover. TEL is the abbreviation for a binding TEL on school district. FC is the abbreviation for fiscal capacity.

There is likely a heterogeneous effect of binding TELs on revenue collection across school districts in the same state. By law, binding TELs are imposed on all school districts within the state. In reality, the effects of TELs on school districts, even in the same state, will vary (Mullins, 2004). Mullins (2004) suggests the effectiveness of TELs on revenue collection will vary depending on the governments' fiscal capacities. For example, communities with low property values per pupil, a common measure of fiscal capacity, are more likely to be restricted by TELs because these school districts need a higher than average tax rate to collect adequate

levels of revenue (Odden and Picus, 2008). Mullins (2004) finds evidence to support this claim. This assertion leads to the third and fourth hypotheses.

> Hypothesis 3: The expected outcome of Hypothesis 1 is stronger for teachers in school districts with low fiscal capacity.
>
> Hypothesis 4: The expected outcome of Hypothesis 1 is strongest for tested teachers in school districts with low fiscal capacity.

Testing these four hypotheses adds to the public management, TEL, and education finance and policy literatures in at least three ways. First, this study adds to the growing public management literature on determinants of employee turnover. By focusing on how environmental shocks and budgetary constraints influence employee turnover, this study demonstrates that external factors are also important determinants of employee turnover. Second, this study provides the first examination of how TELs affect public managers and their employees. By doing so, this study demonstrates how fiscal and budgetary factors affect public organizations, managers, and employees. Lastly, this study contributes to the literature on education finance and policy by testing whether there are differences in teacher turnover rates between TEL and non-TEL states. If teachers in states with TELs are relatively more likely to turnover, this study provides a potential explanation for why TELs reduce student performance in public schools (Figlio, 1997; Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000).

Data

Individual teachers are the unit of analysis in the current study. Data on teachers comes from the restricted-use versions of the 1999-00 and 2003-04 Schools and Staffing Surveys (SASS) and the 2000-01 and 2004-05 Teacher Follow-up Surveys (TFS). All four surveys are

conducted by the National Center for Education Statistics (NCES).[53] The SASS is a nationally-representative random sample of approximately 43,000 elementary and secondary public school teachers in each survey year. The TFS follows up with approximately 5,300 randomly sampled SASS respondents the following year to see if and where they are still teaching.[54] Specifically, I use the teacher, principal, school, and school district questionnaires from SASS and TFS to collect information on the teacher's mobility and demographics. Teacher mobility across schools, and attrition from the teaching profession will be created by comparing each SASS to its corresponding TFS, the latter of which asks a random subsample of the previous year's SASS teachers if they are still teaching, if they are still teaching in the same school, if they are still teaching in the same district, and if they are still teaching in the same state. Because the TFS only surveys a subsample of the SASS sample, the current analysis will be restricted to teachers surveyed in both the SASS and TFS.

The SASS and TFS data are then augmented with district- and state-level data from various sources including the U.S. Census Statistical Abstracts, Bureau of Economic Analysis, Bureau of Labor Statistics, 2000 Decennial Census, Local Education Agency Finance Survey (LEAFS), and a TEL inventory collected by Mullins and Wallin (2004). Descriptive statistics for all variables are reported in Table 3.1. The remainder of this section describes the analytic sample and the dependent, independent, and control variables.

[53] See http://nces.ed.gov/surveys/sass/index.asp for additional information.
[54] Numerous studies have used the SASS and TFS to examine teacher mobility on a national scale (e.g. Ingersoll, 2001; Shen, 1997; Grissom, 2011; Grissom, 2012; Grissom et al., 2012).

Table 3.1: Descriptive Statistics for Analytical Sample

Variable	Mean	SD
Teacher Mobility		
Stayer	0.87	-
Mover	0.07	-
Leaver	0.06	-
Independent Variables		
After the Implementation of NCLB Indicator (NCLB)	0.52	-
Binding District TEL (TEL)	0.72	-
Below the 25 Percentile in District to State Median Home Value Indicator (LOW_FC)	0.12	-
Teacher in Tested Grade Indicator (TESTED)	0.39	-
Teacher Controls		
Black	0.08	-
Hispanic	0.07	-
Female	0.90	-
Age	42.02	11.08
Total Teaching Experience	12.97	9.67
Teaching Experience in Current School	8.53	7.90
Earned Master's Degree	0.41	-
Log of Real Base Salary	10.12	0.27
School Controls		
Title I School	0.66	-
% Limited English Proficiency	0.10	0.19
% Black Student	0.17	0.26
% Hispanic Students	0.18	0.27
% Free and Reduced Lunch	0.48	0.30
Log of Total School Enrollment	6.29	0.50
School in Urban Area	0.25	-
School in Suburban Area	0.55	-
School in Rural Area	0.20	-
Teacher to Administrator Ratio	26.45	9.30
Teacher Aid to Teacher Ratio	0.19	0.18
Principal Characteristics		
Total Experience	8.71	7.73
Experience in Current School	5.05	5.18

Table 3.1 (Cont.): Descriptive Statistics by Sample Restriction

Variable	Mean	SD
District Controls		
Compensation Incentive: Less Desirable Location	0.11	-
Compensation Incentive: Pay for Shortages	0.23	-
Ratio of State to District Education Funding	1.64	1.41
Proportion of Funding from Non-property tax base	0.40	0.32
Union Status: Collective Bargaining	0.63	-
Union Status: Meet and Confer	0.07	-
Union Status: None	0.30	-
State Characteristics		
Republican Governor Indicator	0.61	-
% Elderly	0.12	0.02
Real Personal Income per Capita ($)	9.86	0.12
Annual Unemployment Rate (%)	5.15	1.11
Court-Ordered Education Finance Reform	0.54	-
Legislative Education Finance Reform	0.91	-
Consequential Accountability Policy	0.59	-
TEL imposed on State Government	0.71	-
Ratio of Average Daily Attendance to Population	0.16	0.02
Number of Teachers	1,500	
Number of States	49	
Number of Survey Years	2	

Notes: The overall sample includes all SASS and TFS surveyed, full-time, regular, self-contained, and non-charter public elementary teachers who have an observation for all variables. Any teacher located in DC or Hawaii are eliminated from the sample. All estimates are weighted to account for the unequal probabilities of sample selection by NCES-provided sampling weights.

Analytical Sample

The SASS surveyed approximately 85,300 teachers between 1999-00 and 2003-04.[55] I construct the analytical sample in four steps. First, I drop any SASS teachers not surveyed in the TFS, leaving 9,450 teachers. Second, an additional 2,400 teachers are removed from the sample because these teachers could not be linked to the SASS school, principal, or district questionnaires. Third, teachers from the District of Columbia and Hawaii are eliminated from the sample, as DC and Hawaii both only contain one school district. This is consistent with previous

[55] In accordance with NCES regulations, sample sizes are rounded to the nearest 10 observations.

TEL studies (e.g. Mullins and Joyce, 1996; Shadbegian, 2003). The results are robust to including DC and Hawaii in the sample. Fourth, teachers who retired between the SASS and TFS survey years are eliminated from the sample because it is unclear whether or not these teachers retired for reasons other than the expected relationship described in the previous section. Lastly, the sample is restricted to full-time, regular, self-contained, and non-charter public elementary school teachers who have an observation for all variables.[56] These restrictions yield an analytical sample of approximately 1,500 teachers.

Dependent Variable

The outcome of interest is teacher turnover, which is coded as a categorical variable that takes 3 values: stayers, movers, and leavers. Three dependent variables are created using the TFS, which asks the SASS sampled teacher one year later to describe their teaching status and location. Stayers are teachers who reported in the TFS survey that they remained in the same school. Movers are teachers who reported that they remained a public school teacher, but relocated to another school, district, or state.[57] Lastly, leavers are teachers who reported that they were no longer a full-time, public teacher.[58]

Independent Variable

Four variables and their interactions are of primary interest in this study: presence of a binding TEL on school districts indicator, the No Child Left Behind Act implementation year indicator, a tested teacher indicator, and the low fiscal capacity school district indicator. First, the

[56] Regular teachers are any teachers not considered substitutes or student teachers. Self-contained teachers teach multiple subjects to the same class of students for the entire day. Non-charter teachers teach in public schools that are not considered a charter school.

[57] As a robustness check, the analysis was run with two mover variables: school mover and district/state mover. There is no practical or statistical difference between the main coefficients for the school mover and district/state mover models. Therefore, the main analysis combines school, district, and state movers in one mover category.

[58] The weighted average of stayers is 87% for the analytical sample. The non-weighted average of stayers is 66%. As a sensitivity check, the main results are estimated with and without sampling weights. The sampling weights account for the unequal probabilities of sample selection by NCES-provided sampling weights. The main results yield qualitatively similar results with or without the sampling weights.

data source for state-imposed TELs is Mullins and Wallin (2004), a collection for all states identifying the year each type of TEL was enacted. Using this collection, I construct the binding TEL on school districts indicator, which is a dummy variable that equals one if the state imposes a binding TEL on school districts in a particular year, and zero otherwise.[59] Second, there is an indicator for the No Child Left Behind Act implementation year, which equals one if the time period is during the implementation of the NCLB, and zero otherwise. The implementation of NCLB started in the 2002-03 school-year. All observations during or after the 2002-03 school-year are coded with a one.

Third, I use tables from a NCES report to create the tested teacher indicator, which equals one if the teacher taught in a tested grade and zero otherwise.[60] This NCES report provides the tested grades for all states and all years between 1999 and 2007. A tested teacher is a teacher who taught in a grade in which the state required math, writing, or reading assessments.

Lastly, I use district and state median home values from the 2000 Decennial Census to create the low fiscal capacity district indicator, which equals one if the school district is below the 25th percentile in the ratio of district to state median home values and zero otherwise (Mullins, 2004).[61] Dividing the district median home value by the state median home value is appropriate because there is variation in median home values across states (Mullins, 2004). Without adjusting for this variation, it is difficult to know whether a district in one state has a high or low median home value relative to a district in another state. The 2000 Decennial Census

[59] There are some school districts in the United States that dependent on another government to raise revenue on their behalf (i.e. Rhode Island school district depend on municipalities). The binding TEL on school districts indicator is coded one for states with school districts that dependent on government that is constrained by a binding TEL.
[60] See the Department of Education and NCES report, http://ies.ed.gov/ncee/pdf/2009013.pdf.
[61] The source for this data comes from http://nces.ed.gov/ccd/bat/.

is the appropriate dataset for this analysis because it is the only data source that has district-level median home values during the time period between 1999 and 2003.

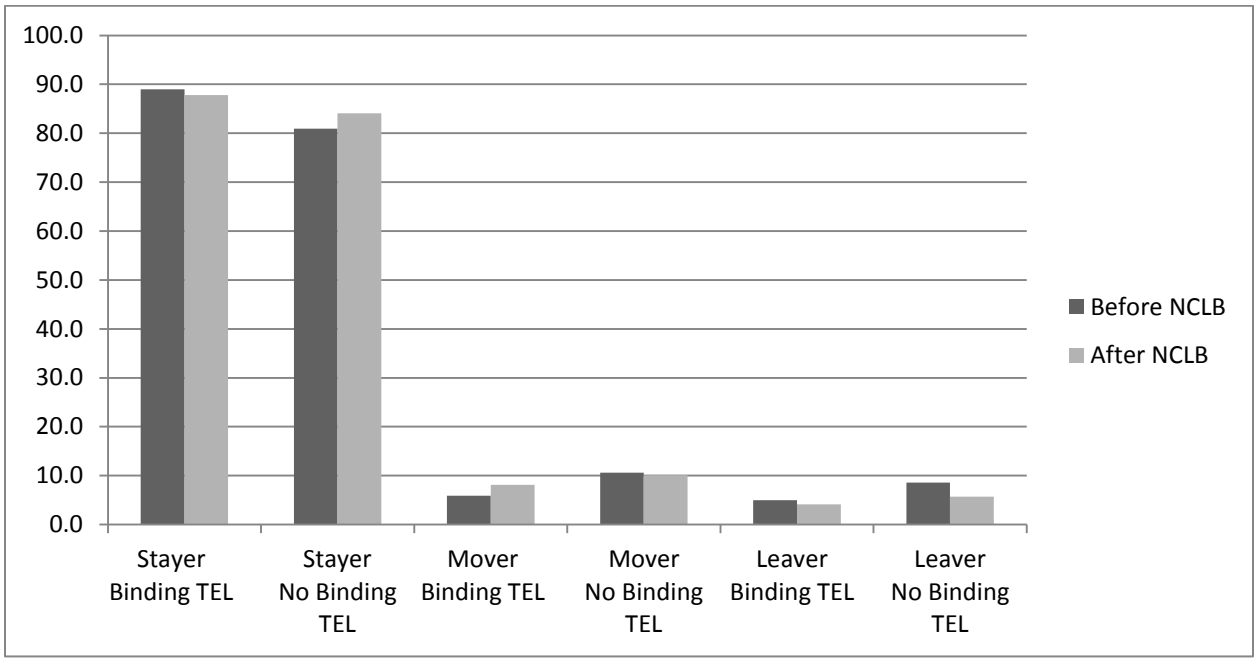

Figure 3.2: Percent of Sampled Teachers who are Stayers, Movers, or Leavers. A stayer is a teacher who remained in the same school. A mover is a teacher who left their school, but remained a full-time teacher. A leaver is a teacher who left full-time teaching or the teaching profession entirely. There are no statistically significant differences in this figure. All estimates are weighted to account for the unequal probabilities of sample selection by NCES-provided sampling weights.

Figure 3.2 compares the percent of teachers who turnover in states with and without a TEL on school districts, before and after the passage of NCLB. As expected, Figure 3.2 shows the percent of stayers decreased relatively more in states with a binding TEL on school districts after the passage of NCLB. Similarly, Figure 3.2 shows that there was a relatively greater increase in the percent of movers in states with a binding TEL on school districts after the passage of NCLB. Surprisingly, Figure 3.2 shows a small relative decrease in the percent of teachers who were leavers in states with binding TELs on school districts after the passage of NCLB. These differences are not statistically significant, which is surprising because the likelihood of teacher turnover is expected to vary depending on the presence of a binding TEL on

school districts. One possible explanation of this counterintuitive finding is the presence of confounding factors that jointly predict teacher turnover and the presence of a binding TEL on school districts. In addition, the inclusion of relevant statistical controls can improve the estimates' precision. This motivates the use of multivariate regressions to test the hypotheses proposed in the previous section.

Statistical Controls

Previous studies illustrate the importance of teacher- and school-level characteristics in predicting teachers' decisions to leave a school (Ingersoll, 2001; Guarino et al., 2006; Grissom et al., 2012). Accordingly, the regression models control for relevant teacher, school, school district, and state characteristics. I take data from the SASS teacher, principal, school, and district questionnaires to create these control variables. Teacher characteristics include indicators for race, gender, and whether the teacher holds a Master's Degree. Teacher covariates also include age, years of full-time teaching experience, years of experience in current school, and academic base salary.[62] To be consistent with previous teacher turnover studies, quadratic variables are created for age and experience (Ingersoll, 2001; Kirby et al., 1999).

School characteristics include indicators for principal experience, whether the school is a Title I school, and whether the school resides in an urban, suburban, or rural area. A school is considered a Title I school if the school receives any Title I funding from the federal government. Title I funding is given to schools with a large proportion of students who come from households that are below the poverty level.[63] School covariates also include student demographics, total student enrollment, teacher to administrator ratio, and teacher aide to teacher

[62] The main results are robust when not including teachers' academic base salary in the analysis.
[63] For more information about Title I funding, see http://www2.ed.gov/programs/titleiparta/index.html

ratio. The teacher to administrator ratio is equal to the number of full-time equivalent teachers divided by the number of principals or vice principals.

District characteristics include five school district policy indicators. First, there is a "less desirable location incentive policy indicator," which is a dummy variable that equals one if the district provides additional compensation to recruit or retain teachers in less desirable locations and zero otherwise. For example, "less desirable location" schools are those located in low income areas. Second, there is a pay-for-shortage policy indicator, which is a dummy variable that equals one if the district provides extra compensation to attract teachers in fields that currently are currently experiencing shortages of teachers and zero otherwise. Third, there is a dummy variable for whether or not a district has a collective-bargaining agreement with union. Fourth, there is a dummy variable for whether or not a district has a meet-and-confer agreement with union.[64] Fifth, there is a dummy variable for whether or not a district has no union agreement.

There are also two district-level finance variables including the ratio of education funding from state to local sources, and the total amount of local revenue from non-property tax revenue. These variables come from the Local Education Agency Finance Survey (LEAFS). Controlling for these variables is important for two reasons. First, Hayes (2014) finds states' shares of education funding increased relatively more in states with binding TELs on school districts relative to states without binding TELs on school districts. Second, previous studies find local governments increase revenue from non-property tax revenue sources after an enactment of

[64] The meet and confer agreement is a more informal union agreement relative to a collective-bargaining agreement. For example, a meet and confer agreement does not legally bound the employer to the agreement. For more information, see http://www.aft.org/about/union101/

TELs (Mullins and Joyce, 1996; Shadbegian, 2003). LEAFS publishes detailed revenue and expenditure data on all school districts in the United States.[65]

State-level socioeconomic and policy characteristics will influence the likelihood of teacher turnover. There are five socioeconomic variables, including real state personal income per capita, state population, average daily attendance, annual unemployment rate, and the proportion of 65 year or older individuals in the state. Average daily attendance is calculated by adding the total number of students attending school for each day of the school year, and dividing that number by the total number of days in the school year.[66] Lastly, state-level policy variables include a republican governor indicator, state education finance reform indicator, and a consequential school accountability policy indicator.

Various data sources are used to create the five socioeconomic variables. The inclusion of socioeconomic variables is based on previous theoretical frameworks (Borcherding and Deacon, 1972; Bergstrom and Goodman, 1973; Shadbegian, 2003). First, data from Bureau of Economic Analysis is used to construct state real personal income per capita and total state population variables.[67] Assuming that education is a normal good, a higher level of state income should be positively associated with higher citizen preferences to fund government services like public education. Consistent with Shadbegian (2003), a higher state population should have a negative effect on state aid to school districts because of economies of scale which reduce the per-pupil cost of educating students.

[65] The first year of published data on all school districts was for the 1990-91 school year. See, http://nces.ed.gov/ccd/f33agency.asp
[66] For more information, see http://www.ncpublicschools.org/fbs/accounting/data/
[67] See, the Bureau of Economic Analysis website for data, http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=4#reqid=70&step=1&isuri=1.

Second, data from the Bureau of Labor Statistics is used to create the annual state unemployment rate.[68] A higher unemployment rate should have a negative impact on state aid per pupil because higher unemployment rates should reduce state income and sales tax revenue collection. Lastly, data from the National Public Education Financial Survey is used to create the state average daily attendance variable.[69] Similar to state population, a higher level of average daily attendance should have a negative impact on state aid per pupil due to economies of scale in the production of education.

There are three state-level policy variables. First, the data source for the political party of the governor variable comes from the United States Census Statistical Abstracts.[70] The data-set includes a variable of the political party of state governor, which is a dummy variable that equals one if there is a republican state governor, and zero otherwise.

In addition to political party of the governor, states differ in their education policies. Various states enacted court-ordered and/or statutory education finance reform policies during the time period covered by the current study. Previous research shows that these education finance reform policies have positive effects on state government education funding (Blankenau and Skidmore, 2004). Data on court-ordered education finance reform comes from the National Education Access Network (NEAN).[71] NEAN provides summaries of each state's court history, including whether or not the state courts ruled that state government's role in funding education was unconstitutional. Using this list of states' court case summaries, I create a dummy variable that equals one if the state's court ruled the state government's role in education funding was

[68] See, the Bureau of Labor Statistics' website for data, http://www.bls.gov/lau/
[69] The definition of average daily attendance is the same as definition mentioned above expect that this variable is aggregated to the state-level instead of the school district level. See, the National Center for Education Statistics and the Common Core of Data for data source, http://nces.ed.gov/ccd/stfis.asp
[70] http://www.census.gov/prod/2/gen/96statab/election.pdf
[71] http://www.schoolfunding.info/litigation/litigation.php3

unconstitutional, and zero otherwise. Data on statutory education reform policies comes from Downes and Shah (2006) collection of state legislative education finance reform policies, which I updated using state profiles from the Education Finance Statistics Center website.[72] I create a dummy variable that equals one if the state's legislature enacted an education finance reform policies and zero otherwise.

Another set of state-level education policies are school accountability policies enacted prior to the passage of NCLB. The financial shock to states from the passage of NCLB is likely less severe in states that enact school consequential accountability policies prior to the passage of NCLB. For example, states with state-imposed school consequential accountability policies developed and invested in creating student exams prior to the passage of NCLB (See, Dee and Jacob, 2011).

Generally, consequential school accountability policy consists of two components: a public report of schools' education outcomes and the attachment of consequences to schools' education outcomes. Hanushek and Raymond (2005) provided a complete list of states with consequential school accountability policies by year of enactment.[73] The consequential school accountability policy indicator is a dummy variable that equals one if the state enacts a consequential school accountability policy prior to the passage of NCLB, and zero otherwise.

Methodology

The empirical analysis proceeds in four steps. First, I examine whether the probability of teacher turnover varies between teachers in binding TEL and non-binding TEL states after the

[72] See, http://nces.ed.gov/edfin/ and http://nces.ed.gov/edfin/pdf/StFinance/Alabama.pdf. Please contact the author for documentation and a complete list of states' legislative education finance reforms.
[73] See Table 1 in Hanushek and Raymond (2005).

passage of NCLB. To test for this, I estimate the following baseline linear probability model (LPM) for each category of teacher turnover by Ordinary Least Squares (OLS):

$$(1) \qquad Pr\,(y_{ist} = 1) = NCLB_t\alpha_1 + TEL_{st}NCLB_t\,\alpha_2 + X'_{ist}\beta_1 + c_s + e_{ist}$$

where y is a binary indicator of teacher i, in state s, in year t, experiencing a type of teacher turnover; TEL is a school district binding TEL indicator; $NCLB$ is a NCLB year indicator; X is a vector of control variables; c is a state fixed effect; and e is an error term.[74] The coefficient of interest in equation (1) is α_2, which is expected to be negative and statistically significant when the dependent variable is the stayer category of turnover. Otherwise, this coefficient is expected to be positive and statistically significant when the dependent variable is the mover or leaver category of turnover.

Second, I investigate whether the relationship described above varies between teachers in tested and non-tested grades. To test for this relationship, I estimate the following extension of equation (1):

$$(2) \qquad Pr\,(y_{ist} = 1) = NCLB_t\delta_1 + TEL_{st}NCLB_t\,\delta_2 + TEST_{ist}\delta_3 + TEST_{ist}NCLB_t\delta_4 + TEST_{ist}TEL_{st}\delta_5 + TEST_{ist}NCLB_tTEL_{st}\delta_6 + X'_{ist}\gamma_1 + c_s + e_{ist}$$

where $TEST$ is an indicator equal to one if the teacher taught in a tested grade and zero otherwise. The parameter of interest of equation (2) is δ_6, which is expected to be negative when the dependent variable is the stayer category of turnover. Otherwise, the coefficient is expected to be positive when the dependent variable is the mover or leaver category of turnover.

Third, I investigate whether the relationship described in the first part of the analysis varies further depending on whether or not the school district is a low fiscal capacity district. To test for this relationship, I estimate the following extension of equation (1):

[74] Note that *TEL* is not included by itself in equation (1). This is because *TEL* is subsumed by the state fixed effects, as this variable is time invariant during the sample time period (1999-00 to 2003-04 school years).

(3) $$Pr\,(y_{ist}=1) = NCLB_t\theta_1 + TEL_{st}NCLB_t\,\theta_2 + LOW\_FC_{st}\theta_3 + LOW\_FC_{st}NCLB_t\theta_4 + LOW\_FC_{st}TEL_{st}\theta_5 + \text{LOW\_FC}_{st}NCLB_tTEL_{st}\theta_6 + X'_{ist}\omega_1 + c_s + e_{ist}$$

where LOW_FC is an indicator for whether or not the school district is a low fiscal capacity district. The parameter of interest of equation (3) is θ_6, which is expected to be negative when the dependent variable is the stayer category of turnover. Otherwise, the coefficient is expected to be positive when the dependent variable is the mover or leaver category of turnover. To check whether or not the coefficient is statistically significant, a joint significance test is conducted for all relevant variables in the model.

Fourth, I investigate whether the relationship described in the second part of the analysis varies further by whether or not the school district is a low fiscal capacity district. To test for this relationship, I estimate a regression model that extends equations (2) and (3) to include a full set of TEL, tested, low FC, and NCLB interactions. Additionally, I include an indicator for whether or not the teacher taught in a tested grade and the school district is a low fiscal capacity district, and an indicator for whether or not the teacher taught in a tested grade, the school district is a low fiscal capacity district, in the NCLB implementation era, and in a state with binding TELs on school districts. This latter indicator is a four-way interaction variable. The coefficient for this four-way interaction variable is expected to be negative when the dependent variable is the stayer category of turnover. Otherwise, the coefficient is expected to be positive when the dependent variable is the mover or leaver category of turnover.

The empirical model conditions on state fixed effects, which control for all time invariant unobserved heterogeneity across states. State fixed effects control for long-term economic and political preferences of the state that do not vary over time. For example, the state fixed effects will control for state resistance to the implementation of NCLB. Shelly (2008) reported that some states passed resolutions declaring their formal opposition to NCLB. The state fixed effects

also control for whether or not the state had a binding TEL on school districts since this variable does not vary over time during the time period between 1999 and 2003. Standard errors are robust to state-level clustering, which makes inference robust to serial correlation within states over time and heteroskedasticity.

There are two reasons for preferring OLS over a non-linear model such as a multinomial logit model (MNL). First, the calculation of average partial effects (APE) of interaction variables is significantly more complicated in the MNL model than in a linear regression model.[75] Specifically, the OLS coefficients are the APE estimates, whereas the MNL coefficients do not have a direct interpretation. Second, the consistency of MNL coefficient estimates relies on the independence of irrelevant alternatives assumption (IIA). The IIA restriction assumes outcome categories are not nested. The turnover categories are likely nested because, for example, the probability of leaving the school is correlated with the probability of leaving the teaching profession.[76] Nonetheless, MNL analogues of equations (1), (2), and (3) are estimated in a sensitivity analysis, and yield qualitatively similar results.

Results

In Table 3.2, columns 1 through 3 report estimates of equation (1) to test for a differential effect of the passage of NCLB on the likelihood of teacher turnover between teachers in states with binding TELs on school districts and all other teachers. The main variable of interest is the interaction of the NCLB implementation year indicator and the binding TELs on school districts indicator.

[75] See Ai and Norton (2003) and Puhani (2008) for a full explanation of the issues with calculating APEs in non-linear models.
[76] See, on p. 501, Wooldridge (2010) for their illustration of the IIA problem using the "red bus/blue bus" example.

Shown in column 1, the coefficient of interest,-0.044, is the expected sign. This coefficient suggests teachers in states with binding TELs on school districts are 4.4 percentage points less likely to be stayers relative to all other teachers after the passage of NCLB. Unexpectedly, this coefficient is not statistically significant. Similarly, the coefficient of interest in Columns 2 and 3 is not statistically significant. Taken together, the results from columns 1 through 3 provide no evidence to support the first hypothesis. However, perhaps this is because the passage of NCLB affected different types of teachers differently.

Table 3.2: Baseline Estimates of Teacher Turnover (OLS)

Variables	(1) Stayer	(2) Mover	(3) Leaver	(4) Stayer	(5) Mover	(6) Leaver	(7) Stayer	(8) Mover	(9) Leaver	(10) Stayer	(11) Mover	(12) Leaver
NCLB	0.045	0.112*	-0.157**	0.069	0.150**	-0.219**	0.056	0.099	-0.155**	0.080	0.136*	-0.216**
	(0.082)	(0.065)	(0.074)	(0.092)	(0.072)	(0.092)	(0.085)	(0.065)	(0.077)	(0.095)	(0.072)	(0.096)
NCLB × TEL	**-0.044**	**-0.049**	**0.093**	-0.022	-0.142**	0.164*	-0.041	-0.085	0.126*	-0.031	-0.171***	0.203**
	(0.083)	**(0.060)**	**(0.067)**	(0.096)	(0.059)	(0.092)	(0.087)	(0.060)	(0.071)	(0.101)	(0.061)	(0.101)
Tested				0.008	0.140**	-0.148**				0.005	0.138**	-0.142**
				(0.058)	(0.054)	(0.059)				(0.058)	(0.053)	(0.057)
Tested × NCLB				-0.064	-0.083	0.147				-0.063	-0.078	0.141
				(0.070)	(0.078)	(0.097)				(0.069)	(0.077)	(0.094)
Tested × TEL				0.028	-0.145**	0.117				0.030	-0.142**	0.112
				(0.080)	(0.065)	(0.075)				(0.079)	(0.064)	(0.075)
Tested × NCLB × TEL				**-0.028**	**0.216****	**-0.188**				0.001	0.203**	-0.204*
				(0.102)	**(0.088)**	**(0.118)**				(0.103)	(0.089)	(0.121)
LOW_FC							0.073	0.042	-0.115	0.066	0.031	-0.097
							(0.081)	(0.050)	(0.084)	(0.090)	(0.066)	(0.107)
LOW_FC × NCLB							-0.034	-0.060	0.095	-0.036	-0.046	0.082
							(0.111)	(0.088)	(0.115)	(0.112)	(0.089)	(0.125)
LOW_FC × TEL							-0.151	-0.031	0.182*	-0.155	-0.020	0.175
							(0.103)	(0.106)	(0.106)	(0.103)	(0.108)	(0.107)
LOW_FC × NCLB × TEL							**-0.013**	**0.247***	**-0.234***	0.083	0.211	-0.294**
							(0.128)	**(0.131)**	**(0.133)**	(0.135)	(0.137)	(0.139)
LOW_FC × Tested										0.008	0.018	-0.026
										(0.101)	(0.076)	(0.088)
LOW_FC × Tested × NCLB × TEL										**-0.228***	**0.056**	**0.172**
										(0.128)	**(0.125)**	**(0.106)**
Adjusted R-squared	0.12	0.06	0.06	0.12	0.07	0.06	0.12	0.07	0.06	0.12	0.08	0.07

Notes: NCLB is an indicator for the passage of NCLB, *TEL* is an indicator for states with a binding TEL on school districts, *Tested* is an indicator for whether or not the teacher taught in a tested grade, *LOW_FC* is an indicator for whether or not the school district was below the 25 percentile in district to state median home value. There are 1,500 teacher and 49 state observations in the sample. All models include state fixed effects and all of the control variables. Please contact author for the coefficients for the control variables. The coefficients for court-ordered and legislative passed education finance reform both drop out of the model due to collinearity. Standard errors are clustered at the state-level. *** p<0.01, ** p<0.05, * p<0.1.

In Table 3.2, columns 4 through 6 report the estimates of equation (2) to test whether the differential effect of the passage of NCLB on teacher turnover between states with binding TELs on school districts and all other states varies further by whether the teacher taught in a tested grade. The main variable of interest in columns 4 through 6 is the three-way interaction variable of the tested teacher indicator, the NCLB implementation year indicator, and the binding TELs on school districts indicator.

Shown in columns 4 and 5, the coefficient of interest is -0.028 and 0.216, respectively. Both coefficients have the expected sign. However, only the effect on changing schools, 0.216, is statistically significant. This coefficient suggests that teachers who taught in tested grades and in states with binding TELs are 21.6 percentage points more likely to move to another school compared to all other teachers after the passage of NCLB. This is a practically significant coefficient as 21.6 percentage points is three times the size of the average percent of movers in the sample, 7 percentage points. Unexpectedly, the coefficient of interest in column 6 is negative and not statistically significant. Altogether, the results from columns 4 through 6 provide partial support for the second hypothesis. After the passage of NCLB, teachers who taught in tested grades and in states with binding TELs are more likely to move to another school compared to all other teachers. However, there is no evidence that similar teachers are more likely to leave the teaching profession.

In Table 3.2, columns 7 through 9 report the estimates of equation (3) to test whether the differential effect of the passage of NCLB on teacher turnover between states with binding TELs on school districts and all other states varies further by whether the school district is a low fiscal capacity district. The main variable of interest in columns 7 through 9 is the three-way

interaction variable of the school district is a low fiscal capacity district indicator, the NCLB implementation year indicator, and the binding TELs on school districts indicator.
Shown in columns 7 and 8, the coefficient of interest is -0.013 and 0.247, respectively. Both coefficients have the expected sign. However, only the coefficient, 0.247, is statistically significant. This coefficient suggests that teachers who taught in low fiscal capacity districts and in states with binding TELs are 24.7 percentage points more likely to move to another school compared to all other teachers after the passage of NCLB. This is a practically significant coefficient as 24.7 percentage points is more than three times the size of the average percent of movers in the sample.

Surprisingly, the sign of the coefficient of interest in column 9 is negative. This coefficient suggests that teachers who taught in low fiscal capacity districts and in states with binding TELs are 23.4 percentage points less likely to be leaver compared to all other teachers after the passage of NCLB. While only marginally statistically significant, this coefficient is practically significant.

The results from columns 7 through 9 provide partial support for the third hypothesis. First, the results support the third hypothesis that, after the passage of NCLB, teachers who taught in low fiscal capacity districts and in states with binding TELs are more likely to move to another school compared to all other teachers. Second, the results do not support the hypothesis that, after the passage of NCLB, teachers how taught in low fiscal capacity districts and in states with binding TELs are more likely to not being a full-time teacher compared to all other teachers.

In Table 3.2, columns 10 through 12 present the estimates of the current study's final analysis. The regressions in these three columns include all of the variables included in the

previous columns. Additionally, the regressions in these columns include an indicator for whether or not the teacher taught in a tested grade and the school district is a low fiscal capacity district, and an indicator for whether or not the teacher taught in a tested grade, the school district is a low fiscal capacity district, in the NCLB implementation era, and in a state with binding TELs on school districts. This latter indicator is the main variable of interest in these columns.

Shown in columns 10 through 12, the coefficient of interest is -0.228, 0.056, and 0.172 respectively. All three coefficients have the expected sign. However, only the coefficient in column 10, -0.228, is statistically significant. This coefficient suggests that teachers who taught in low fiscal capacity districts, taught in tested grades, and in states with binding TELs are 22.8 percentage points less likely to remain in the same school compared to all other teachers after the passage of NCLB.

It is important to point out that the coefficients of interest in columns 11 and 12 are practically significant. For example, the coefficient of interest in column 12, 0.172, is almost three times the size of the average number of leavers in the sample. Additionally, all of the main variables reported for both columns 11 and 12 are jointly significant at the 0.01 significance level. It is possible that a relatively small sample size might contribute to the imprecision of these estimates.

The results in columns 10 through 12 provide support for the fourth hypothesis. First, teachers who taught in low fiscal capacity districts, who taught in tested grades, and located in states with binding TELs are less likely to remain in the same school compared to all other teachers after the passage of NCLB. This difference between these two groups of teachers is practically and significantly significant. Second, there is some evidence that these teachers are choosing to move to another school, as well as, stopping full-time teaching.

Table 3.3: Baseline Estimates of Teacher Turnover (MNL APE)

Variables	(1) Stayer	(2) Mover	(3) Leaver	(4) Stayer	(5) Mover	(6) Leaver	(7) Stayer	(8) Mover	(9) Leaver	(10) Stayer	(11) Mover	(12) Leaver
NCLB	0.050	0.100	-0.150***	0.068	0.138*	-0.207***	0.063	0.084	-0.147**	0.081	0.123*	-0.204***
	(0.084)	(0.066)	(0.058)	(0.094)	(0.073)	(0.067)	(0.086)	(0.066)	(0.059)	(0.095)	(0.071)	(0.070)
NCLB × TEL	-0.049	-0.055	0.103*	-0.021	-0.156**	0.177**	-0.048	-0.088	0.136**	-0.028	-0.186***	0.214**
	(0.077)	(0.062)	(0.059)	(0.087)	(0.063)	(0.076)	(0.080)	(0.062)	(0.063)	(0.090)	(0.064)	(0.084)
Tested				-0.005	0.139***	-0.134***				-0.007	0.140***	-0.133***
				(0.057)	(0.050)	(0.045)				(0.055)	(0.049)	(0.042)
Tested × NCLB				-0.047	-0.089	0.137				-0.046	-0.086	0.133
				(0.069)	(0.066)	(0.088)				(0.066)	(0.066)	(0.084)
Tested × TEL				0.035	-0.148**	0.113*				0.038	-0.149**	0.111*
				(0.075)	(0.063)	(0.061)				(0.074)	(0.063)	(0.062)
Tested × NCLB × TEL				-0.034	0.224***	-0.190*				-0.010	0.220***	-0.210*
				(0.097)	(0.078)	(0.111)				(0.098)	(0.081)	(0.114)
LOW_FC							0.082	0.053	-0.135*	0.086	0.051	-0.137
							(0.078)	(0.051)	(0.081)	(0.088)	(0.071)	(0.101)
LOW_FC × NCLB							-0.050	-0.047	0.098	-0.060	-0.039	0.099
							(0.125)	(0.087)	(0.148)	(0.128)	(0.087)	(0.152)
LOW_FC × TEL							-0.149	-0.037	0.185*	-0.162	-0.025	0.188*
							(0.103)	(0.111)	(0.098)	(0.104)	(0.112)	(0.102)
LOW_FC × NCLB × TEL							0.005	0.230*	-0.235	0.102	0.213	-0.314*
							(0.140)	(0.130)	(0.162)	(0.146)	(0.130)	(0.166)
LOW_FC × Tested										0.000	0.008	-0.008
										(0.095)	(0.076)	(0.078)
LOW_FC × Tested × NCLB × TEL										-0.234*	0.024	0.210**
										(0.123)	(0.119)	(0.098)

Notes: NCLB is an indicator for the passage of NCLB, *TEL* is an indicator for states with a binding TEL on school districts, *Tested* is an indicator for whether or not the teacher taught in a tested grade, *LOW_FC* is an indicator for whether or not the school district was below the 25 percentile in district to state median home value. There are 1,500 teacher and 49 state observations in the sample. All models include state fixed effects and all of the control variables. Please contact author for the coefficients for all these variables in the model. The coefficients for court-ordered and legislative passed education finance reform both drop out of the model due to collinearity. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

Table 3.3 presents estimates of MNL analogues to the regressions reported in Table 3.2. To ensure the results of Table 3.3 are comparable to Table 3.2, Table 3.3 presents the estimated average partial effect for each variable.[77] Table 3.3 provides two general contributions to the study's analysis. First, the point estimates in Table 3.3 are very similar to the point estimates in Table 3.2. This is reassuring and suggests that the main results are robust across linear and non-linear models. Second, the average partial effects in Table 3.3 are consistently more statistically significant than in Table 3.2. For example, the coefficient of interest in column 12 of Table 3.3 is more statistically significant relative to the same coefficient of interest in column 12 of Table 3.2. This is not surprising because a multinomial logit produces more efficient estimates relative to OLS estimates.[78]

Discussion and Conclusion

Previous education finance literature finds the passage of NCLB imposed significant fiscal and non-fiscal shocks on school districts (Dee et al., 2013; Hayes, 2014). Additionally, the environmental shock of NCLB was strongest in states with binding TELs on school districts (Hayes, 2014). Expanding on previous employee turnover studies in public management and organizational theory, this paper tests the hypothesis that, after the passage of NCLB, the likelihood of teacher turnover increased more for tested teachers in states with binding TELs and in districts with low fiscal capacity. This study provides empirical support for this claim. After the passage of NCLB, tested-grade teachers in states with binding TELs on school districts and in low fiscal capacity school districts were less likely to remain in the same school than all other teachers. In general, this finding suggests that environmental shocks and budgetary constraints increase the likelihood of employee turnover in the public sector.

[77] Please contact the author for the coefficients from the multinomial logit.
[78] See, Wooldridge (2010) for a more comprehensive discussion of the benefits of a multinomial logit.

This study makes three contributions to the fields of public management, TELs, and education finance and policy. First, this study adds to the growing public management literature on the determinants of employee turnover. By focusing on how environmental shocks and budgetary constraints influence employee turnover, this study demonstrates that external factors are potentially important determinants of public-sector employee turnover. Second, this study provides the first examination of how TELs affect public managers and employees. By doing so, this study demonstrates how fiscal and budgetary factors can affect public organizations, managers, employees. Lastly, this study contributes to the literature on education finance and policy by testing whether there are differences in teacher turnover rates between TEL and non-TEL states. If teachers in states with TELs are relatively more likely to leave their school, this study provides a potential explanation for why TELs reduce student performance in public schools (Figlio, 1997; Downes, Dye, and McGuire, 1998; Downes and Figlio, 2000).

The findings in this study also provide three policy implications for education policymakers and public managers. First, the findings highlight the potential unintended consequences of federal policies that are implemented without consideration of how the policy will interact with existing state and local policy. Specifically, federal policymakers did not consider the consequences of the interaction of unfunded federal mandates and state-level budgetary constraints on public organizations. The main goal of NCLB was to reduce the achievement gap between disadvantaged and non-disadvantaged students. However, these results show that there was an increase in teacher turnover rates in school districts with low fiscal capacity that predominantly serve low-income students. While it is unclear whether these exiting

teachers were more or less effective, teacher turnover is nonetheless costly given the financial burden of replacing teachers, especially in districts that have fewer resources available.[79]

Second, these findings suggest policymakers might want to design compensation and transfer policies that encourage teachers to remain in disadvantaged schools (Fullbeck and Farley, 2012). For example, Denver's teacher compensation policy, Teacher ProComp, allows the district to attract and retain the most effective teachers by offering teacher bonuses.[80] For example, the district can provide a 6.4% bonus to teachers in schools with a high percentage of students on free and reduced lunch.

Lastly, public managers, particularly school principals, need to be aware of the how the interaction of environmental shocks and budgetary constraints may negatively impact their employees. It is impossible for principals to change federal or state policy, but principals can try shielding their employees from non-fiscal shocks. Being aware and creating a line of communication with teachers, principals can mitigate some of these negative effects on teachers. One state-level mechanism to help principals is to provide them with more autonomy over the school budget. Specifically, principals can be given more control over reallocating resources within the school so the principal can transfer more resources to teachers in the most need, such as tested teacher.

[79] Previous research shows effective teachers are more likely to leave low-performing schools (See, Boyd et al. 2005; Guarino et al., 2011; Horng, 2009).
[80] For more information, see http://denverprocomp.dpsk12.org/about/overview.

APPENDIX A

FULL RESULTS FROM EQUATION 1 BY DEPENDENT VARIABLE

	State Share	Local Revenue Per Pupil	State Revenue Per Pupil	Federal Revenue Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)
Independent Variable					
Binding SD TEL	-0.031	469.279***	-124.977	66.002***	387.674***
	(0.020)	(121.529)	(106.240)	(18.504)	(118.457)
Binding SD TEL × NCLB Indicator	0.043*	-398.919**	176.156	26.914	-204.030
	(0.025)	(167.852)	(126.489)	(33.162)	(146.064)
District-Level Controls					
% Black Students	0.101***	-641.431**	423.323	186.334**	-305.151
	(0.037)	(273.977)	(318.619)	(77.049)	(379.227)
% Black Students × NCLB	-0.003	293.405***	56.498	-54.747	275.773***
	(0.012)	(88.209)	(93.276)	(49.243)	(99.473)
% Hispanic Students	0.002	178.135	-316.657*	132.885**	145.483
	(0.025)	(237.828)	(158.570)	(62.594)	(310.019)
% Hispanic Students × NCLB	0.052***	-15.136	312.023***	-19.542	90.347
	(0.010)	(97.365)	(72.781)	(48.048)	(115.490)
% Free and Reduced Lunch Students	0.017	31.667	12.877	40.864	93.656
	(0.013)	(92.549)	(114.946)	(39.951)	(125.024)
% FR Lunch Students × NCLB	0.030**	-703.44***	433.568***	271.983***	-276.051**
	(0.013)	(126.370)	(153.732)	(69.684)	(118.021)
% Individualized Education Program	0.015	359.181	687.550*	84.650*	1,133.956***
	(0.045)	(257.572)	(361.511)	(45.881)	(310.674)
% IEP × NCLB	-0.010	-90.119	-187.736	142.072*	-229.562
	(0.047)	(256.105)	(317.341)	(81.442)	(331.189)
Log of Student Enrollment	0.063***	-1,038.0***	-993.3***	-252.04***	-2,999.16***
	(0.010)	(122.916)	(148.964)	(29.186)	(237.713)
Log of Student Enrollment × NCLB	0.011	-423.29***	58.524	-83.841***	-613.912***
	(0.009)	(86.585)	(84.305)	(22.601)	(171.660)
Urban Area	-0.001	22.091	-4.066	-9.960*	4.508
	(0.004)	(23.933)	(20.992)	(5.165)	(21.406)
Urban Area × NCLB	0.011***	-85.559**	-4.284	31.988***	-53.492
	(0.004)	(31.906)	(37.761)	(6.806)	(35.187)
Rural Area	0.001	-4.518	-1.168	1.600	-0.336
	(0.002)	(15.024)	(9.082)	(2.826)	(17.619)
Rural Area × NCLB	-0.006**	13.784	13.193	-4.225	23.658
	(0.002)	(15.899)	(17.329)	(3.407)	(21.278)
Log of Federal Revenue	-0.026***	46.047**	50.017***		
	(0.004)	(19.909)	(16.688)		
Log of Federal Revenue × NCLB	-0.016***	-19.833	-80.874***		
	(0.004)	(32.963)	(29.796)		
% Secondary	0.076**	403.237	827.714**	146.518*	893.050**
	(0.029)	(327.759)	(312.353)	(74.811)	(399.427)
% Secondary × NCLB	-0.015	-98.174	-916.04***	-233.619**	-792.235***
	(0.027)	(219.909)	(264.266)	(96.292)	(289.523)
Log of FTE Teachers	-0.004	169.566	409.246***	58.241***	465.675***
	(0.009)	(103.526)	(101.255)	(21.221)	(159.412)
Log of FTE Teachers × NCLB	0.002	472.894***	32.730	90.343***	593.916***
	(0.011)	(101.604)	(92.143)	(23.032)	(110.780)

	State Share	Local Revenue Per Pupil	State Revenue Per Pupil	Federal Revenue Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)
District-Level Controls (Cont.)					
Prop of non-property tax revenue	-0.018	768.998***	409.943*	-4.352	1,011.691***
	(0.037)	(270.065)	(216.401)	(18.429)	(252.268)
Prop of non-property tax rev. × NCLB	0.019	-472.96***	259.129**	18.888	-266.728**
	(0.011)	(140.559)	(101.325)	(31.262)	(126.380)
County-Level Controls					
Annual Unemployment Rate	-0.105	933.791	-829.845	-502.346***	298.479
	(0.098)	(557.019)	(553.783)	(173.697)	(644.535)
Annual Unemployment Rate × NCLB	0.003	-812.988	-439.407	1,140.033***	15.804
	(0.075)	(678.815)	(646.794)	(238.507)	(698.097)
State-Level Controls					
Binding TEL on municipality or county	0.027**	-440.54***	100.366	-59.224***	-402.079***
	(0.011)	(74.284)	(82.354)	(16.897)	(89.540)
Binding TEL on M or C × NCLB	-0.033	346.412**	-137.443	-23.328	194.542
	(0.020)	(143.872)	(99.467)	(25.995)	(129.958)
TEL on state government	0.025*	-31.077	265.499***	24.731**	156.154*
	(0.013)	(72.345)	(90.830)	(11.412)	(79.692)
TEL on state government × NCLB	-0.023***	94.071	-220.09***	12.190	-15.763
	(0.009)	(58.354)	(56.986)	(16.053)	(60.739)
Strong Prior Accountability Policy	0.019	-104.217	211.752***	21.498***	90.892
	(0.012)	(86.412)	(71.251)	(7.907)	(75.185)
Strong Policy × NCLB	-0.045***	215.767**	-220.52***	0.076	132.216
	(0.015)	(105.169)	(73.667)	(24.635)	(104.134)
Moderate Prior Accountability Policy	0.035*	-57.331	264.147***	0.172	84.618
	(0.018)	(115.045)	(91.751)	(15.291)	(72.985)
Moderate Policy × NCLB	-0.021	-21.335	-153.383	37.019*	-41.574
	(0.016)	(113.874)	(97.373)	(20.554)	(104.525)
Weak Prior Accountability Policy	-0.001	-23.252	-24.435	1.008	20.232
	(0.024)	(122.799)	(115.023)	(10.031)	(91.075)
Weak Policy × NCLB	-0.020**	18.530	-77.676	-6.402	-9.178
	(0.009)	(56.454)	(63.977)	(10.798)	(56.752)
Real Personal Income per Capita	0.000**	0.048	0.083**	-0.001	0.076**
	(0.000)	(0.038)	(0.034)	(0.007)	(0.036)
Real Personal Income × NCLB	0.000**	-0.003	0.064***	0.004	0.033**
	(0.000)	(0.019)	(0.013)	(0.004)	(0.016)
Prop. Of Residents 65 years or older	0.954	-562.341	6,442.912	935.058	1,543.201
	(0.993)	(6,206.557)	(5,812.270)	(784.116)	(4,703.046)
Prop. 65 years or older × NCLB	0.132	-2,476.047	-1,326.493	739.580	-2,332.995
	(0.360)	(2,568.136)	(2,082.327)	(537.080)	(2,656.893)
Average Daily Attendance / Pop	-0.284	4,601.863	-1,725.542	-288.434	1,462.783
	(0.633)	(4,392.970)	(3,688.295)	(940.420)	(5,494.764)
ADA/Pop × NCLB	-0.311	-2,680.826	-3,314.651	1,488.193**	-3,113.564
	(0.429)	(3,295.294)	(2,961.123)	(724.954)	(3,438.817)
% Employ in Manufacturing Sector	-0.226	-2,414.230	-1,609.116	-567.621	-1,834.641
	(0.372)	(2,173.356)	(2,474.001)	(541.862)	(2,486.465)
% Employ in Manu Sector × NCLB	0.024	101.191	-34.356	-708.926**	-869.039
	(0.170)	(1,111.481)	(1,209.637)	(286.451)	(1,174.917)

	State Share	Local Revenue Per Pupil	State Revenue Per Pupil	Federal Revenue Per Pupil	Total Revenue Per Pupil
	(1)	(2)	(3)	(4)	(5)
State-Level Controls (Cont.)					
Republican Governor	-0.000	-38.523	-44.194	-4.679	-60.513*
	(0.006)	(34.955)	(31.452)	(8.745)	(32.134)
Republican Governor × NCLB	0.005	21.400	22.469	33.332**	60.749
	(0.008)	(62.242)	(45.659)	(13.579)	(80.684)
Court-Ordered Educ Finance Reform	0.012	7.192	157.104***	-9.945	43.504
	(0.011)	(62.534)	(55.752)	(9.933)	(66.277)
Court-Ordered Reform × NCLB	0.013	-65.442	146.946***	-27.111*	-12.165
	(0.009)	(66.387)	(52.142)	(14.450)	(72.627)
Legislature Enact Educ Finance Reform	-0.004	37.560	156.355**	1.794	195.268
	(0.012)	(98.846)	(60.307)	(11.088)	(121.846)
Legislature Enacted Reform × NCLB	-0.027	289.020**	-202.445	-53.378**	30.631
	(0.022)	(131.886)	(133.450)	(23.610)	(122.363)
Log of Real GDP	0.067*	-333.834	906.280***	101.510	240.190
	(0.037)	(245.353)	(301.445)	(65.973)	(280.508)
Log of Real GDP × NCLB	-0.006	25.449	-55.184	-23.692**	-6.360
	(0.008)	(51.986)	(41.798)	(10.016)	(48.017)
# Adjacent states with binding TELs	-0.005	48.501	13.893	-4.845	38.751
	(0.010)	(50.178)	(42.294)	(9.730)	(61.928)
# Adjacent states × NCLB	-0.003	18.289	-14.190	-1.439	11.724
	(0.003)	(17.983)	(17.159)	(3.571)	(21.283)
Adjusted R-squared			0.33		
Number of states			49		
Number of district-years			134,331		
Number of unique districts			10,825		
Number of years			15		

Notes: All models include district fixed effects and all of the controls variables. Standard errors are clustered at the state-level, *** p<0.01, ** p<0.05, * p<0.1.

REFERENCES

Ai, Chunrong and Norton, Edward C. 2003. Interaction terms in logit and probit models. Economic Letters 80:123-129.

Alliance for Excellent Education. 2005. Teacher Attrition: A costly loss to the nation and to the states.

Alm, James and Skidmore, Mark. 1999. Why do Tax and Expenditure Limitations Pass in State Elections? Public Finance Review 27.

Bergstrom, Theodore C. and Goodman, Robert P. 1973. Private Demands for Public Goods. The American Economic Review 63:280.

Blankenau, William F. and Skidmore, Mark. 2004. School finance litigation, tax and expenditure limitations, and education spending Contemporary Economic Policy 22:127-143.

Blau, Francine D. and Kahn, Lawrence. 1981. Race and Sex Differences in Quits by Young Workers. Industrial and Labor Relations Review 34:563-577.

Borcherding, Thomas E. and Deacon, Robert T. 1972. The Demand for the Services of Non-Federal Governments. The American Economic Review 62:891.

Borman, Geoffrey D. and Dowling, N. Maritza. 2008. Teacher Attrition and Retention: A Meta-Analytic and Narrative Review of the Research. Review of Educational Research 78:367-409.

Boyd, Donald, Lankford, Hamilton, Loeb, Susanna, Ronfeldt, M. and Wyckoff, James. 2010. The Role of Teacher Quality in Retention and Hiring: Using Applications to Transfer to Uncover Preferences of Teachers and Schools. Journal of Policy Analysis and Management 30:88-110.

Boyd, Donald, Lankford, Hamilton, Loeb, Susanna and Wyckoff, James. 2005. Explaining the short careers of high-achieving teachers in schools with low-performing students. The American Economic Review 95:166-171.

Bradford, David F. and Oates, Wallace E. 1971. Towards a Predictive Theory of Intergovernmental Grants. American Economic Review 61:440-48.

Carnoy, Martin and Loeb, Susanna. 2002. Does External Accountability Affect Student Outcomes? A Cross-State Analysis. Educational Evaluation and Policy Analysis 24.

Center on Education Policy, 2008. Instructional time in elementary schools: A closer look at changes for specific subjects. From the capital to the classroom: Year 5 of the No Child Left Behind Act. Washington DC: Jennifer McMurrer.

Center on Education Policy. 2007.State Implementation of supplemental education services under the No Child Left Behind Act. In From the capital to the classroom: Year 5 of the No Child Left Behind Act. Washington, DC: Center on Education Policy.

Choi, Sungjoo. 2009. Diversity in U.S. Federal Government: Diversity Management and Employee Turnover in Federal Agencies. Journal of Public Administration Research and Theory 19:603-630.

Cotton, John L. and Tuttle, Jeffrey M. 1986. Employee Turnover: A Meta-Analysis and Review With Implications for Research. Academy of Management Review 11:55-70.

Courant, Paul N., Gramlich, Edward and Rubinfeld, Daniel L. 1980. Why Voters Support Tax Limitation Amendments: The Michigan Case. National Tax Journal 33.

Daly, A.J. and Chrispeels, J. 2005. From problem to possibility: Leadership for implementing and deepening the process of effective schools. Journal of Effective Schools 4:7-25.

Dee, Thomas S. and Jacob, Brian A. 2011. The impact of no Child Left Behind on student achievement. Journal of Policy Analysis and Management 30:418-446.

Dee, Thomas S., Jacob, Brian A. and Schwartz, Nathaniel L. 2013. The Effects of NCLB on School Resources and Practices. Educational Evaluation and Policy Analysis 20:1-28.

Downes, Thomas A., Dye, Richard F. and McGuire, Therese J. 1998. Do Limits Matter? Evidence on the Effects of Tax Limitations on Student Performance. Journal of Urban Economics 43:401-417.

Downes, Thomas A. and Figlio, David N. 2000. School Finance Reforms, Tax Limits, and Student Performance: Do Reforms Level-Up or Dumb Down?

Downes, Thomas A. and Figlio, David N. 2008. Tax and Expenditure Limits, School Finance and School Quality. In Handbook of Research in Education Finance and Policy, eds. Helen F. Ladd and Edward B. Fiske, 373-388. New York: Routledge.

Downes, Thomas A. and Shah, Mona P. 2006. The Effect of School Finance Reforms on the Level and Growth of Per-Pupil Expenditures. Peabody Journal of Education 81.

Dye, Richard F., McGuire, Therese J. and McMillen, Daniel P. 2005. Are property tax limitations more binding over time? National Tax Journal 58:215-225.

Education Commission of the States. 2006. NCLB Database. (2006). Retrieved from http://nclb2.ecs.org/nclbsurvey/nclb.aspx?Target=SS.

Educational Week. 2011. Adequate Yearly Progress. http://www.edweek.org/ew/issues/adequate-yearly-progress/

Eide, Eric and Showalter, Mark H. 1998. The Effect of School Quality on Student Performance: A Quantile Regression Approach. Economic Letters 58:215-225.

Ferri, Fabrizio and Maber, David A. 2013. Say on Pay Votes and CEO Compensation: Evidence from the UK. Review of Finance 17:527-563.

Figlio, David N. 1997. Did the 'Tax Revolt' Reduce Student Performance? Journal of Public Economics 65:245-269.

Figlio, David N. and Loeb, Susanna 2011. School Accountability In Handbook of the Economics of Education, eds. Eric A. Hanushek, Stephen Machin and Ludger Woessman. Amsterdam, The Netherlands: North-Holland.

Figlio, David N. and Rueben, Kim. 2001. Tax Limitations and the Qualifications of New Teachers. Journal of Public Economics 80:49-71.

Fullbeck, Eleanor S. and Farley, Amy N. 2012. Denver ProComp: Teachers' Attitudes and Behaviors.

Fuller, Bruce, Wright, Joseph, Gesicki, Kathryn and Kang, Erin. 2007. Gauging Growth: How to Judge No Child Left Behind? Educational Researcher 36:268-278.

Gershenson, Seth 2013. Grade-Specific Effects of Strengthening Consequential Accountability Policy on Teacher Qualifications: Evidence from California. American University.

Goertz, Margaret E. 2005. Implementing the No Child Left Behind Act: Challenges for the states. Peabody Journal of Education 80:73-89.

Grissom, Jason A. 2011. Can Good Principals Keep Teachers in Disadvantaged Schools? Linking Principal Effectiveness to Teacher Satisfaction and Turnover in Hard-to-Staff Environments. Teachers College Record 113:2552-2585.

Grissom, Jason A. 2012. Revisiting the Impact of Participative Decision Making on Public Employee Retention: The Moderating Influence of Effective Managers. The American Review of Public Administration 42:400-418.

Grissom, Jason A. 2012. Revisiting the Impact of Participative Decision Making on Public Employee Retention: The Moderating Influence of Effective Managers. The American Review of Public Administration 42:400-418.

Grissom, Jason A., Nicholson-Crotty, Jill and Keiser, Lael. 2012. Does My Boss's Gender Matter? Explaining Job Satisfaction and Employee Turnover in the Public Sector. Journal of Public Administration Research and Theory 22:649-673.

Guarino, Cassandra M., Brown, A.B. and Wyse, A.E. 2011. Can districts keep good teachers in the schools that need them most? Economics of Education Review.

Guarino, Cassandra M., Santibañez, Lucrecia and Daley, Glenn A. 2006. Teacher Recruitment and Retention: A Review of the Recent Empirical Literature. Review of Educational Research 76:173-208.

Hannaway, Jane, McKay, Shannon and Nakib, Yasser. 2002. Reform and Resource Allocation: National trends and state policies. Developments in School Finance 1999-2000: Fiscal Proceedings from Annual State Data Conference July 1999 and July 2000.

Hannaway, Jane and Stanislawski, Maggie 2005. Responding to Reform: Florida School Expenditures in the 1990s. CALDER Researchers.

Hanushek, Eric A., Kain, E.J. and Rivkin, Steven G. 2004. Why public schools lose teachers? Journal of Human Resources 39:326-354.

Hanushek, Eric A. and Raymond, Margaret E. 2005. Does school accountability lead to improved student performance. Journal of Policy Analysis and Management 24:297-327.

Hayes, Michael S. 2014. Are State-Local Budgetary Responses Affected by Fiscal Shocks and Tax and Expenditure Limitations? American University.

Horng, Eileen Lai. 2009. Teacher tradeoffs: disentangling teachers' preferences for working conditions and student demographics. American Educational Research Journal 46:690-717.

Ingersoll, Richard M. 2001. Teacher Turnover and Teacher Shortages: An Organizational Analysis. American Educational Research Journal 38:499-534.

Jacob, Brian A. and Levitt, Steven. 2003. Rotten apples: An investigation of the prevalence and predictors of teacher cheating. Quarterly Journal of Economics 118:843-877.

Johnston, Jocelyn M., Marlowe, Justin, Matkin, David S. T. and Hayes, Michael S. 2011. The impact of local school property tax reductions on city and county revenue decisions: A natural experiment in Kansas. Public Finance and Management 11.

Johnston, Mark W., Griffeth, Rodger W., Burton, Scot and Carson, Paula P. 1993. An Exploratory Investigation into the Relationship Between Promotion and Turnover: A Quasi-Experimental Longitudinal Survey. Journal of Management 19:33-49.

Joyce, Philip G. and Mullins, Daniel R. 1991. The Changing Fiscal Structure of the State and Local Public Sector: The Impact of Tax and Expenditure Limitations. Public Administration Review 51:240.

Kellough, J. Edward and Osuna, Will. 1995. Cross-Agency Comparisons of Quit Rates in the Federal Service: Another Look at the Evidence. Review of Public Personnel Administration 15:58-68.

Kim, Marlene. 1999. Where the Grass is Greener: Voluntary Turnover and Wage Premiums. Human Relations 52:584-92.

Kim, Soonhee. 2002. Participative management and job satisfaction: Lessons for management leadership. Public Administration Review 62:231-241.

Kim, Soonhee. 2005. Factors affecting state government information technology employee turnover intentions. American Review of Public Administration 35:137-156.

Kirby, Sheila, Berends, Mark and Naftel, Scott. 1999. Supply and Demand of Minority Teachers in Texas: Problems and Prospects. Educational Evaluation and Policy Analysis 21:47-66.

Krieg, John M. . 2008. Are students left behind? The distributional effects of No Child Left Behind Act. Education Finance and Policy 3:250-281.

Ladd, Helen and Wilson, Julie B. 1983. Who supports tax limitations: Evidence from Massachusetts's Proposition 2 ½. Journal of Policy Analysis and Management 2.

Lambert, Eric G., Hogan, Nancy L. and Barton, Shannon M. 2001. The Impact of Job Satisfaction on Turnover Intent: A Test of a Structural Measurement Model Using a National Sample of Workers. Social Science Journal 38:233-250.

Lankford, Hamilton, Loeb, Susanna and Wyckoff, James. 2002. Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis. Educational Evaluation and Policy Analysis 24:37-62.

Lee, Soo-Young and Whitford, Andrew B. 2008. Commitment, voice, and the intent to leave: Evidence from the public workforce. Journal of Public Administration Research and Theory 18:647-71.

Loeb, Susanna, Darling-Hammond, Linda and Luczak, John. 2013. How Teaching Conditions Predict Teacher Turnover in California Schools. Peabody Journal of Education 80:44-70.

Luna, C. and Turner, C.L. 2001. The impact of the MCAS: Teachers talk about high-stakes testing. The English Journal 91:79-87.

McGuinn, Patrick J. 2005. The National Schoolmarn: No Child Left Behind and the New Educational Federalism. Publius 35:41-68.

Meier, Kenneth J. and Hicklin, Alisa. 2008. Employee Turnover and Organizational Performance: A Theoretical Extension and Test with Public Sector Data. Journal of Public Administration Research and Theory 18:573-590.

Meier, Kenneth J. and O'Toole, Laurence J. 2009. The Dog that Didn't Bark: How Public Managers Handle Environmental Shocks. Public Administration 87:485-502.

Mintzberg, H. 1979. The Structuring of Organizations Englewood Cliffs, NJ: Prentice-Hall.

Moynihan, Donald P. and Landuyt, Noel. 2008. Explaining Turnover Intention in State Government. Review of Public Personnel Administration 28:120-143.

Mullins, Daniel R. 2004. Tax and Expenditure Limitations and the Fiscal Response of Local Governments: Asymmetric Intra-Local Fiscal Effects. Public Budgeting and Finance 24:111-147.

Mullins, Daniel R. 2009. Fiscal limitations on local choice: the imposition and effects of local government tax and expenditure limitations. In State and Local Fiscal Policy: Thinking Outside of the Box?, ed. Sally Wallace. Northampton, MA: Edward Elgar.

Mullins, Daniel R. and Joyce, Philip G. 1996. Tax and Expenditure Limitations and State and Local Fiscal Structure: an Empirical Assessment. Public Budgeting and Finance 16:75-101.

Mullins, Daniel R. and Wallin, Bruce A. 2004. Tax and Expenditure Limitations: Introduction and Overview. Public Budgeting and Finance 24:2-15.

Murray, Sheila E., Evan, William N. and Schwab, Robert M. 1998. Education-finance reform and the distribution of education revenues. The American Economic Review 88:789-812.

Neal, Derek and Schanzenbach, Diane W. 2010. Left behind by design: Proficiency counts and test-based accountability. Review of Economics and Statistics 92:263-283.

Nguyen-Hoang, Phuong. 2013. Tax Limit Repeal and School Spending. National Tax Journal 66:117-148.

Odden, Allan R. and Picus, Lawrence O. 2008. School Finance: A Policy Perspective New York: McGraw-Hill.

Olson, Lynn. 2003. In ESEA wake, school data flowing forth. Education Week. Retrieved from http://www.edweek.org/ew/articles/2003/12/10/15nclb.h23.html

O'Toole, L.J. and Meier, K.J. 1999. Modeling the Impact of Public Management: Implications of Structural Context. Journal of Public Administration Research and Theory 9:505-526.

Papke, Leslie E. and Wooldridge, Jeffrey M. 1996. Econometric methods for fractional response variables with an application to 401(k) plan participation rates. Journal of Applied Econometrics 11:619-632.

Pitts, David W. 2005. Leadership, empowerment, and public organizations. Review of Public Personnel Administration 25:5-28.

Pitts, David W., Marvel, John and Fernandez, Sergio. 2011. So Hard to Say Goodbye? Turnover Intention among U.S. Federal Employees. Public Administration Review 71:751-760.

Puhani, Patrick A. 2008. The Treatment Effect, the Cross Difference, and the Interaction Term in Nonlinear 'Difference-in-difference' Models.

Reback, R., Rockoff, Jonah E. and Schwartz, H.L. 2011. Under pressure: Job security, resource allocation, and productivity in schools under NCLB. NBER Working Paper No. 16745.

Ronfeldt, Matthew , Loeb, Susanna and Wyckoff, James. 2013. How Teacher Turnover Harms Student Achievement. American Educational Research Journal 50:4-36.

Selden, Sally C. and Moynihan, Donald P. 2000. A Model of Voluntary Turnover in State Government. Review of Public Personnel Administration 20:63-70.

Shadbegian, Ronald J. 2003. Did the property tax revolt affect local public education? evidence from panel data. Public Finance Review 31:91-121.

Shaw, Jason D., Delery, John E., Jenkins, G. Douglas and Gupta, Nina. 1998. An Organization-Level Analysis of Voluntary and Involuntary Turnover. Academy of Management 41:511-525.

Shaw, Jason D., Gupta, Nina and Delery, John E. 2005. Alternative Conceptualizations of the Relationship Between Voluntary Turnover and Organizational Performance. Academy of Management 48:50-68.

Shelly, Brian. 2008. Rebels and their causes: state resistance to no child left behind. The Journal of Federalism 38:444-468.

Shen, Jianping. 1997. Teacher retention and attrition in public schools: Evidence from SASS91. Journal of Educational Research 91:81-88.

Stark, Glenn L. 2007. The Effect of Person-Job Fit on Retention of Top College Graduates in Federal Agencies. Review of Public Personnel Administration 27:59-70.

Stein, Robert M., Hamm, Keith E. and Freeman, Patricia K. 1983. An analysis of support for tax limitation referenda. Public Choice 40.

Steiner, Lucy M. 2005. School Restructuring Options Under No Child Left Behind: What Works When? State Takeovers of Individual Schools.

Texas Center for Educational Research. 2000. The cost of teacher turnover.

Tiebout, Charles M. 1956. A Pure Theory of Local Expenditures. Journal of Political Economy 64:416-424.

U.S. Government Accountability Office. 2003. Title I: Characteristics of tests will influence expenses; information sharing may help state realize efficiencies. GAO-03-389. Washington, DC: Author.

Wilson, John D. 1999. Theories of tax competition. National Tax Journal 52:269-30.

Wooldridge, Jeffrey M. 2010. Econometric Analysis of Cross Section and Panel Data. 2nd ed. Cambridge, MA: MIT Press.

Wu, Yonghong and Hendrick, Rebecca. 2009. Horizontal and vertical competition in Florida local governments. Public Finance Review 37:289-311.