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School Finance Reform: Responses, Equity and Outcomes

Laura D. Ullrich
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Laura D. Ullrich entitled "School Finance Reform: Responses, Equity and Outcomes." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

Matthew N. Murray, Major Professor

We have read this dissertation and recommend its acceptance:

Donald Bruce, William Fox, Daniel Murphy

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

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SCHOOL FINANCE REFORM: RESPONSES, EQUITY AND OUTCOMES

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Laura D. Ullrich
May 2008

DEDICATION

This dissertation is dedicated to my sons Dawson Alexander Ullrich and Reed Anderson Ullrich and my loving husband Brian Andres Ullrich. You are my heart and my strength.

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I would like to dedicate this first acknowledge my loving husband, Brian, and my beautiful boys, Dawson Alexander and Reed Anderson. Brian, without your help and support I could not have accomplished this. You supported me emotionally, physically (through my two grad school pregnancies), spiritually and financially throughout my six year graduate school journey, and I will be forever grateful that you committed yourself fully to my goals and made them *our* goals. Dawson and Reed, although you haven't been aware of what Mommy was doing, you have made me smile in times that I thought I couldn't go further, and have given me the incentive I needed to continue when I thought that quitting would be easier. I hope that by working this hard toward a goal I have taught you to pursue your interests with a passion that will not always be easy. I thank you from the bottom of my heart for being such fabulous boys and allowing me to be a great mommy and student at the same time. I feel blessed beyond words to have you in my life.

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much your support has meant to me throughout this journey. I look forward to the next chapter in my life and in the life of my family.

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ABSTRACT

School finance reform cases have become immensely more common since the *Serrano v. Priest* case in California in 1971. Tennessee's case *Small Schools v. McWherter* led to a significant reform of the Tennessee school finance system during the 1992-1993 school year. This reform created a new system of education funding in Tennessee known as the Basic Education Program (BEP). Essay 1 examines the impact Tennessee's school finance reform had on education spending as well as local and state-provided education revenues from 1989-2006. Results indicate that as state funding for education improved, locally-provided funding decreased, all else constant. In addition, institutional features such as the phase-in of state funds and the nominal maintenance of spending effort requirement decreased locally-provided funding, all else constant.

Essay 2 includes analyses regarding the changes in equity associated with the switch to the BEP during the 1992-1993 school year and the factors that may have impacted changes in equity. The calculation of commonly used equity measures shows an increase in school spending equity during time period analyzed. These equity measures also indicate that locally-provided revenues have become less equitable over time. Further analyses show the relationship between school district level wealth measures and key spending and revenue variables. Results indicate that the relationship between wealth and state spending has grown over time, which shows that from the state perspective, the BEP has continued to equalize over time. However, the relationship between locally-provided funding and wealth has become more positive over time and has led to a considerable gap between education spending in rich and poor districts. In

order to decrease this gap in spending, tighter controls are needed on locally-provided spending via the school finance system.

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Part 1: General Introduction

Upon the subject of education, not presuming to dictate any plan or system respecting it, I can only say that I view it as the most important subject which we as a people can be engaged in.

Abraham Lincoln, 1832

The overall budget for public education in the United States exceeds all other government programs outside of national defense. The National Education Association (NEA) estimates that total primary and secondary school expenditures in the United States totaled more than $519.0 billion during the 2005-2006 school year.[1] Given a national estimate of average daily attendance of 45.9 million, this translates into spending of about $9,576 per student.[2] Tax revenues that support this spending come from all levels of government within the U.S. The NEA estimates that total revenue receipts for public primary and secondary education exceeded $498.0 billion in 2006. This figures breaks down to $45.3 billion, or 9.1 percent, from the federal government, $237.0 billion, or 47.6 percent, from state governments, and $215.7 billion, or 43.3 percent, from local governments. As of 2006, nearly 30 percent of all state and local tax revenues were utilized in the provision of public education.

Since the finding in California's *Serrano v. Priest* in the early 1970s, a great deal of attention has been paid to the way in which state and local governments fund public education. This has led to a swell of school finance reforms that have impacted nearly all 50 states. Many of these states have faced court challenges related to their school finance mechanisms that have led to court mandated alterations to their funding formulas. The

[1] Current expenditures are estimated by NEA to be around $439.5 billion.

[2] All figures from this section can be found in the following source: NEA, *Rankings and Estimates: 2006*, available at www.nea.org

majority of cases over the past thirty years have been brought on the basis of equity amongst school districts. Specifically, many court challenges claim that the system violates the Equal Protection Clause of the Constitution. The general argument is that low wealth school districts do not have the tax base needed to raise school funding to the similar levels that rich districts enjoy.

The general movement has been toward school finance systems that are equalizing to some degree and therefore provide state funding based on some measure of district wealth, with lower wealth districts receiving relatively more money from the state towards K-12 public education. Because of these new equalizing systems, states are now providing larger grants to local governments in support of public education. This is the general result from school finance reform; education spending from state resources increases. Economic theory predicts that local governments will respond to this increase in state funds by decreasing the local funding provided for education if left to their own devices. Because this theoretical result is well known, most states have included regulations like maintenance of effort mechanisms in the school finance system that attempt to prevent this behavior.

Theoretically, any increase in state education grants that accompany a school finance reform should have the same impact on education spending as an equivalent increase in local (school district) income under the median voter hypothesis (Oates, 1979). However, previous empirical results typically indicate that state grants stimulate public expenditures at a rate higher than that associated with income (Gramlich and Galper, 1973; Feldstein, 1975; Fisher, 1982). This anomaly has been dubbed "the

flypaper effect" and has been analyzed in many contexts throughout the literature. The magnitude of the flypaper effect depends at least partially on the median voter's preferences regarding spending on government services, his preferences regarding private goods, the response of bureaucrats, as well as the institutional regulations regarding the provision of the grant. All else equal, more money will "stick" in jurisdictions with a higher taste for spending in the expenditure category for which the grant is provided. The flypaper effect has been shown to exist in numerous empirical studies with results generally ranging from 0.25 to 1.00 (see Hines and Thaler, 1995).

As changes in school finance formulas have evolved, local governments have faced an interesting dilemma related to the flypaper effect. School district bureaucrats, in conjunction with local and/or county governments, have at least partial control over how much of the new grant will "stick". They could choose to take the additional money provided by the state through the school finance formula and pass 100 percent of it through to students via increased spending. Districts may be able to do this in a way in which total education spending would still increase and it would not be readily apparent that they were doing so.

The ability of a school district to decrease local revenues through reductions in tax effort or expenditure diversion is highly dependent on the school finance system in place. Some states have implemented tax effort maintenance requirements or local spending requirements that constrain the districts' control over locally provided spending levels. California's system, for example, disallows local governments from spending more than $300 per student more than the poorest district in California. Other states'

programs contain maintenance of effort requirements which mandate that school districts keep their spending and/or tax effort at levels seen in the previous year. Others have recapture mechanisms in which any local revenue collected above a certain prescribed amount is recaptured by the state and distributed to other districts. The variation in these programs across the country is stark, and is somewhat surprising given the 30 plus years since *Serrano*. A common, most preferred method of school funding has not emerged over this period, and districts continue to struggle with the issues on a state by state basis.

Like many other U.S. states, Tennessee has seen a significant evolution of its school finance system since the early 1990s. State funding was increased significantly, new rules were enacted, and the formula calculating costs and state revenue disbursements was completely changed. The significant alteration in education funding leads to numerous questions regarding the behavioral decisions of local governments that resulted from these changes. The analyses in the first essay that follows examines many of these questions including whether or not local districts decreased their own-source funds for education and whether or not the maintenance of effort requirement in Tennessee impacted the provision of local funds. In addition to these questions, further analyses examine the impact of receiving funds via the Cost Differential Factor (a cost of living adjustment and supplement to the basic grant program), the impact of phasing-in state funds as well as the impact that the increased state funding had on local tax effort. Essay two puts additional focus on the equity issues surrounding school finance reform. Since the intent of the education reform in Tennessee was to reduce inequality, equity measures are employed in order to analyze the change in equity over time. In addition,

empirical analyses investigate the relationship between school district wealth and school funding, and how that relationship has changed over time as the school finance system in Tennessee has evolved.

School Finance Reform in Tennessee

The state of Tennessee has faced three school finance reform cases in the past 15 years known as the *Small Schools* lawsuits. The court has found in favor of the plaintiff in each of the three cases. The first case, Tennessee Small School Systems v. McWherter (*Small Schools I*), challenged the Tennessee Foundation Program (TFP) and was found in favor of the plaintiffs. This led to the passage of the Tennessee Education Improvement Act in 1992. This legislation brought tremendous changes to the education system in Tennessee including the elimination of the TFP (the funding mechanism used from 1975 until 1992) and the creation of a new funding formula (the Basic Education Program, or BEP), the enactment of an accountability system using school and district report cards, and the formation of a new local governance structure for K-12 public education (Smith, 2004). This represented a fundamental change in the way in which education services were funded and delivered to Tennessee children.

Student enrollment, measured as average daily membership, was the driving force for the determination of costs under the BEP. These funds were deemed necessary by the state to provide a basic (though not necessarily *adequate*) level of education for its public school students. The calculated costs included both the state and local shares for classroom and non-classroom costs. The CDF was included in the formula to assist

counties that confronted relatively high labor market wage structures, the presumption being that these counties faced a higher cost of delivering schooling services.[3]

The basic formula for determining costs under the BEP was as follows:

$$E_j = CDF_j * (\sum_{i=1}^{I} \tau_i * ADM_{ij} * c_i) + (\sum_{i=1}^{I} \lambda_i * ADM_{ij} * \gamma_i),$$

$$CDF_j = \frac{\omega_j}{\overline{\omega}},$$

where

E = Total district education cost
CDF = Cost differential factor
τ = Inputs eligible for CDF adjustment (e.g. personnel)
ADM = Average daily membership in district
c = Cost of inputs (τ) used
λ = Inputs ineligible for CDF adjustment (e.g. equipment)
γ = Cost of inputs (λ) used
ω_j = Weighted average wage in county private sector
$\overline{\omega}$ = 95 percent of the state weighted average private sector wage

These costs were then aggregated across all counties to yield total schooling costs. There were 45 cost components in the BEP (corresponding to c_i in the first equation), most of which were determined by average daily membership.

The level of funding support provided to school districts via the BEP was calculated through the use of an equalization formula known as the Fiscal Capacity Index. This formula was calculated yearly using a modified regression-based version of the representative tax system approach. The agency charged with calculating the BEP (TACIR), defines fiscal capacity as "the potential ability of local governments to fund education from their own taxable sources, relative to the cost of their service responsibility" (Green et al., 2004). The Fiscal Capacity Index was based on regression

[3] The CDF is discussed more thoroughly in the first essay.

analysis and was driven primarily by county income levels, property values and sales tax collections.[4] The calculation of the formula provided for some equalization across Tennessee counties, with counties with lower property tax or sales tax revenues receiving relatively more revenue per pupil from the state than counties with high levels of property and sales tax revenues.

Tennessee's switch to the BEP included additional changes including a mandate to reduce class sizes and a requirement for districts with below average teacher salaries to bring those salaries to the 1993 state average. These requirements were not binding until the end of the BEP phase-in, which may have resulted in considerable uncertainty regarding their viability. The BEP also included a nominal maintenance of effort requirement that forbid districts from decreasing overall, nominal spending from local sources from year to year. This number was not adjusted for enrollment growth or inflation, so real per pupil decreases in local funding could be seen if districts chose to have stagnant growth in education spending at the local level.

One of the more controversial aspects of the BEP proved to be its use of county-level equalization calculations rather than equalizing at the district-level. While most Tennessee school districts are coterminous with the county there are a few school districts that are not. These districts are classified as special school districts, city systems and partial county systems. In 2007 there were 67 school districts (out of 136 total school districts) that were coterminous with their county. There were an additional 69 school districts classified as special, city or partial county systems. The BEP calculated

[4] Variables included in the regression analysis include local revenue used for education, ability to pay (based on per capita income), property and sales tax bases, resident taxpayer burden and service responsibility (Green et. al, 2004).

funding of these non-county school districts based on county-level data. This is significant because city districts may have a very different fiscal capacity than the county as a whole. For example, Maryville City School District's funding level per pupil is based on the fiscal data for Blount County as a whole. Maryville City (which is wholly part of Blount County) is significantly more affluent than Blount County, and therefore received more funding per pupil than they would if their funding was calculated separately. On the other hand, Blount County received lower funding per pupil than they would under a district-driven formula because the taxes collected within the Maryville City School District are included in their formula calculation. Therefore, unless the non-county school districts had characteristics identical to the county districts, there were differences in funding compared to a district-specific model.

Until 2007, the BEP was the funding mechanism through which the state attempted to comply with the mandate handed down by the Tennessee Supreme Court in *Small Schools I*. In 2007 a new school finance system was instituted known as BEP 2.0.[5] The BEP 2.0 is similar to the original BEP and did not represent a fundamental reform. Changes include a simplification of the fiscal capacity measure and an elimination of the Cost Differential Factor (CDF). While the switch to BEP 2.0 is an important one, this analysis will examine only those years associated with the BEP. Funds provided to school districts through the BEP were divided between classroom and non-classroom components. For the first fourteen years of the BEP the state provided 75 percent of classroom component funds and 50 percent of the BEP's non-classroom components. In

[5] The switch to BEP 2.0 was not mandated by the Tennessee court system. It was a voluntary change passed via the Tennessee Legislature.

2005, the state lowered the classroom provision percentage to 65 percent. The Local Education Agencies (LEAs) are responsible for the remainder of the funding.

Tennessee in a National Context

As stated previously, nearly all 50 states have faced litigation surrounding their public school financing systems. As of June 2007, only seven states nationwide have not had a court case challenging their education finance systems decided (Delaware, Hawaii, Indiana, Iowa, Mississippi, Nevada, and Utah). Of these seven states, only five have not had cases filed (Delaware, Hawaii, Mississippi, Nevada and Utah).

There are four primary types of systems and formulas that are used across the country to calculate state funding for public school education: Flat Grant Programs, Foundation Programs, Full State Funding and Power Equalization Programs (Verstegen, 2001). Currently all states have programs that fall into one or more of these categories. States can combine methods if desired. For example, the state could provide a flat grant to all districts in addition to the funding provided through the foundation program.

In a 2003 study, Leyden examined how states choose between school finance program types. He concludes that when a court finds a state's funding structure to be unconstitutional due to equal protection arguments, the state legislature is more likely to prefer a power equalizing scheme than a foundation grant program. Conversely, when a state's structure is found to be unconstitutional because it is not "thorough and efficient",

the legislature will be more likely to prefer a foundation grant system over a power equalizing scheme.[6]

It is interesting to note that, although most states have had a court case based on similar equity concerns, the school finance systems still vary significantly across states. The majority of states have some sort of foundation program, many of which have an equalizing feature added in to the traditional foundation system. Several other states have a guaranteed flat grant, typically determined per pupil, which is provided to school districts. As Leyden concluded, the type of program chosen by the state depends on many factors, including the language in the state constitution and the determination of the court.

The behavioral responses associated with a change in the school financing mechanism depend on the specifics related both to the grant calculation and the provision of state funds through the formula. This varies significantly from state to state. The following analysis uses one state's experience to analyze some intriguing questions related to the behavioral responses associated with a significant increase in state funding for public education. This examination specifically relates to the school finance reform implemented in Tennessee during the 1992-1993 school year.

The school finance reform in Tennessee during the early 1990s represented a fundamental reform in public education funding in the state. Not only did it change the way in which local school districts received money from the state, it also changed the

[6] The basis for the lawsuits that states face depends on the structure of their state constitution. Some constitutions contain a clause that states that the level of education provided must be "thorough and efficient." Other states' constitutions contain an equal protection clause through which cases can be filed based on distributive justice arguments.

amount of money that they received. All school districts received more state funds under the BEP than they did under the Tennessee Foundation Program. For low income districts, the new money was a tremendous increase in the funds previously received for schools, and allowed them to increase per pupil school expenditures by a remarkable amount. However, with the new money received from the state also came new rules and regulations that had to be followed by the district. In addition, the matching mechanisms of the BEP required an increased amount of local funds for education spending as well.

There has been a recent movement away from lawsuits and reforms that target spending equity towards reforms and lawsuits regarding the adequacy of state-provided education. This has been amplified by the passage of the No Child Left Behind Act in 2001. Many states have already faced adequacy lawsuits, and many others, including Tennessee, have attempted to prepare themselves for one by participating in an adequacy "costing out" study. These studies examine the cost associated with providing an adequate education to all students in the state. In general, a school finance reform that addresses adequacy issues is much more expensive than a reform focused on equity. While an equity based reform may simply involve reorganizing funds, an adequacy case may require increased provision of funds to all districts. It is important to continue to examine specific school finance programs across the country, as these systems continue to evolve over time, and many changes continue to be made. It is vital to learn what system characteristics are effective and which should be avoided based on the goals of the reform.

This situation in Tennessee allows for a rich analysis of how local school districts responded both to the increased state funds and the new requirements of the BEP. A simple examination of the data shows that school spending increased as the BEP was implemented. However, it is impossible to see in a simple analysis how the precise details of the BEP affected local district behavior during that period. Previous literature demonstrates that as the state increases their granting of education funds to local districts, those districts will decrease their own-source funds committed to education by some degree. This reduction in local funds is accomplished via local tax relief and/or diversion of local education funds to other non-education programs. The degree to which local districts can do this depends on the taste for education in the school district as well as the specifics related to the school finance program itself. The analyses that follow examine many issues surrounding local responses to the BEP while also investigating the program-specific characteristics of the BEP and how they impacted the local response.

Essay 1 examines the impact that the institution of the BEP program had on the level of locally-provided revenues and the tax effort expended by school districts. Analyses are conducted using a constrained bureaucrat framework in which panel data is utilized. Results indicate that local districts decreased own-source funding as the BEP was phased in. It also indicates that existence of a nominal maintenance of spending requirement caused local spending to decrease over time, all else equal. Essay 1 also examines the impact that the CDF had on the school districts that received it and on local expenditures as a whole. Results show that districts who received funds via the CDF each year increased spending in conjunction with the CDF by more than districts who

received the CDF on an inconsistent basis. A further analysis examines the impact of the BEP on local tax effort, in terms of both the sales tax and property tax, and shows that local districts decrease sales tax effort and increased property tax effort during the phase in period of the BEP. Overall effort, when considering both taxes together, was not significantly impacted during the phase in.

Essay 2 breaks down the analysis on spending further with an assessment of the impact of the BEP on spending and revenue equity in Tennessee over the period in question. This analysis is extremely important given that one of the stated goals of school finance reform is to make spending more equitable across school districts. Panel data methods are employed in Essay 2 as well as an examination of the change in coefficients over time using yearly cross-section analyses. The analysis shows that the gap between spending in rich and poor school districts narrowed in the early years of the BEP, but began to widen yet again after 1999. Results indicate that while overall spending equity has improved, both state and local revenue equity have lessened over the same period. This is expected in the case of state revenue since the BEP is equalizing. However, this may not be expected in terms of local revenues. This shows that over time the amount of money being spent from local funds in rich districts is growing at a faster rate than those same own-source funds in poor districts. This is the primary cause for the widening gap in spending between the poorest and richest school districts in Tennessee.

Essay 2 also examines an empirical issue confronted in previous literature. Due to the difficulty in obtaining local property value data, previous studies have used local income (per capita or median) as a proxy of district property wealth (see Card and Payne,

2002, and Baicker and Gordon, 2004). For the analyses that follow, local property wealth data have been collected and Essay 2 examines whether or not per capita income is a reliable proxy for local property wealth. Results indicate that although it performs relatively well in some analyses, it cannot be relied on as an ideal substitute for property wealth.

In addition to these issues, additional nuances of the BEP are explored within the following essays which results in a broad analysis of the implementation of school finance reform in Tennessee. This is especially timely in Tennessee, where they have once again reformed their school finance system (now called BEP 2.0) and where a possible adequacy lawsuit, or another equity lawsuit, still looms in the distance. School finance systems are constantly evolving, and the analyses that follow present important issues that should be considered as states develop the systems that will support statewide funding of public education for years to come.

Part 2: Essay 1:

A Constrained Bureaucratic Model of Behavioral Responses to School Finance Reform: The Case of the BEP

1.A Introduction

Following the Tennessee Supreme Court's decision in favor of the plaintiffs in *Small Schools v. McWherter* in 1992, the BEP was instituted during the 1992-1993 school year. Because of the enormous expense of instituting such a program, Tennessee phased in BEP funding over a five year period beginning in the 1992-1993 school year and ending at the completion of the 1996-1997 school year. In addition to the phase in of funds there were class size restrictions and teacher salary mandates implemented via the Education Improvement Act that became binding after the end of the phase-in period. During the phase-in, districts had considerable flexibility regarding how they could respond to the new mandates and the new funds provided by the state through the BEP. This essay examines the way in which BEP grants affected overall spending and local support for education in Tennessee.

There are several novel features of the BEP that provide for an interesting analysis of behavioral responses. The first is the decision to phase in new state funds and the rules that accompanied the BEP. There may have been considerable uncertainty regarding the BEP and doubt that the rules would ever become binding. This may have led school district bureaucrats to delay changes in funding until the end of the phase in period. In addition, the phasing in of funds may have impacted local school funding differently than would have been seen absent a phase in period.

Secondly, the BEP contains a nominal maintenance of effort requirement which requires local districts to maintain nominal spending from year to year. This prevents a district dropping school expenditures below the nominal level seen in the previous year.

This is an interesting caveat to the increase in state funding since many local school districts in Tennessee previously had a very low revealed taste for education, which was translated into very low levels of school expenditures. The maintenance of effort requirement may have prevented districts from selecting school expenditure levels in line with their residents' taste for education. It may have also impacted school expenditures by constraining school district bureaucratic decision-making and making school districts more hesitant to spend money for fear that they could not maintain it in the coming year.

Thirdly, the Tennessee program provided a relatively unique spending addendum for districts located in areas with high wage structures. This was not designed as a simple cost of living adjustment as is seen in several other states. Instead, the CDF was provided to only a handful of districts each year and receipt was relatively inconsistent for some districts. This allows for an analysis regarding the behavioral decisions of school district bureaucrats based on how confident the bureaucrat was about continued receipt of the CDF. It is reasonable that bureaucrats in districts who consistently received the CDF may behave differently than bureaucrats who were one-time recipients. There is no question that overall per pupil expenditures in Tennessee have increased significantly since the implementation of the BEP. Figure 1.1 shows the average level real per pupil current expenditures in Tennessee between 1989 and 2006. However, on the surface it is impossible to tell if this increase is specifically from the institution of the BEP, or if the growth in expenditures would have existed even without school finance reform. In addition, it is difficult to tell what affect, if any, the phasing in of BEP funds had on school spending in Tennessee. This essay will examine the impact the phase-in

of the BEP had on both local and overall expenditures as well as the levels of local tax effort across the state.

School districts necessarily expend all funds received through the BEP in support of local education. Absent a maintenance of effort requirement, which requires that districts maintain some level of school spending from year to year, it is conceivable that a recipient district might simply reduce own-source commitments toward education by the amount of the BEP grant. Tennessee's BEP does contain a maintenance of effort requirement that ensures that school systems at least maintain their *overall* level of *nominal* spending for education from year to year. Over time, however, school districts might choose to reduce their own-source funding for elementary and secondary education, insofar as they can avoid running afoul of the nominal maintenance of effort requirement. This depends on the district's taste for education, their education tax price and other related factors. In other words, the state grant may free up own-source revenues that could be used to reduce local tax burdens or to support spending in other categorical areas outside education. Indirect evidence of this type of response would be lower levels of local contributions to fund education after passage of the BEP.

The phenomenon described here is one aspect of the now well-known "flypaper effect." According to the flypaper effect, the receipt of a grant will increase overall spending by an amount greater than would be seen with an equivalent increase in income. Empirical results have shown that an intergovernmental grant will increase spending by an amount greater than zero but less than the full amount of the grant. For example, if Tennessee were to give a school system a grant of $5 million, the system would certainly

spend the entire proceeds of the grant. At the same time, the overall increase in spending—including state and local funds—would likely be less than $5 million, especially over time when districts have an opportunity to change their spending commitments. As noted above, Tennessee's maintenance of effort requirement lessens a district's ability to decrease *total nominal* revenue unless enrollment has declined. However, per pupil revenue and/or real revenue could be decreased while staying in accordance with the maintenance requirement. Table 1.1 shows how a nominal maintenance requirement can actually lead to a *decrease* in per pupil, or even total, spending. These figures come from actual examples found in two Tennessee School Districts. In each case total nominal local revenue is not only maintained, it is actually increased. However, given enrollment increases and inflation, real revenues per pupil are decreased.

This is not an isolated phenomenon. Between the school years of 2004-2005 and 2005-2006, 63 of the 136 Tennessee school districts had *decreases* in locally provided *real* revenues per pupil. This may have occurred in three different ways even as districts satisfied the maintenance of effort requirement. First of all, locally provided real revenues may have grown, but at a rate slower than enrollment. Secondly, school districts could have chosen to increase nominal spending by an amount less than inflation. For example, if nominal revenues were increased by 1.5 percent and the consumer price index grew by 2.0 percent, then real revenues would have decreased for that year by 0.5 percent. Thirdly, districts may have been allowed to reduce revenue provision due to falling enrollments.

Figure 1.2 shows the levels of per pupil spending in real terms from 1989 until 2006. The significant increase in state-provided funds is easily seen in Figure 1.2. Local expenditures, however, have not had the same upward trend as state-provided funds. In fact, there has actually been a decrease in locally-provided funds in Tennessee in three of the eighteen years in the analysis (1993, 2003 and 2005). Further analysis is required with the respect to locally-provided funds in order to examine the impact of the BEP and its related policies, including the previously mentioned nominal maintenance of effort requirement.

This study will examine if the BEP, and specifically the phase-in and/or the maintenance of effort requirement, were significant factors in changes in local funding using a constrained bureaucratic model. It will also examine if tax effort was altered in response to the influx of state funds via the BEP. Lastly it will examine a relatively small but important part of the BEP, CDF. The CDF was structured as an add-on to the standard BEP funds for school districts in Tennessee that confronted high market wage structures. Qualification for the CDF was determined by a wage index of all jobs in the county. This additional grant was provided to assist high cost (high wage) school districts with the increased provision costs associated with higher county wages. Receipt of the CDF was not guaranteed from year to year.

The remainder of the study is organized as follows. Section 1.B presents previous literature related to the topics at hand. Section 1.C describes the theoretical basis of the primary analyses. Section 1.D explains the central empirical model utilized. Section 1.E summarizes the data that have been collected for the study and describes the variables in

detail and Section 1.F describes the results obtained. Sections 1.G and 1.H elucidate two additional issues regarding Tennessee's school finance reform: the impact of the Cost Differential Factor and changes in tax effort. Section 1.I contains the conclusion and areas for future research.

1.B Previous Literature

Early research on school finance reform and state school finance systems focused on the sizable inequities seen between education spending in wealthy and poor districts and turned their attention to the rather poor way in which these funding mechanisms were constructed. Bowman's 1974 study examines West Virgina's system in 1969 using a cross-sectional analysis. He concludes that if a matching requirement is not in existence, and the grant is simply a lump-sum transfer, that local school taxes decrease by around $0.50 for every dollar in aid that is granted. He further postulates that if the purpose of school finance reform is for any reason other than taxpayer relief, then a matching requirement should be included. In another early study, Weicher (1972) concludes that local school districts respond to increases in state aid by decreasing their own-source revenues. These decreases are driven by tastes for education and local tax prices associated with public education. While these studies are thought provoking and well developed, new studies are certainly warranted, as econometric methods as well as school finance systems have changed drastically in the past 30 years. Many examinations of school finance reform have followed these early studies and, even with changes in methods and programs, continue to highlight many of the same issues.

Several recent analyses examine the effect of school finance reform on local spending and on local tax effort. Baicker and Gordon (2006) conclude that localities respond to increased state education spending by decreasing their own tax effort and their spending on non-education programs, although total education spending does increase overall. This analysis utilizes state data collected at the county level between 1982 and 1997. This paper, while very thorough, has two significant limitations. Firstly, the analysis aggregates all school distircts to the county level. From a national perspective, most states have multiple school districts in each county (Baicker and Gordon (2006)). Therefore, they cannot differentiate between offsetting effects occuring in multiple school districts in the same county. One can imagine how this may occur, especially in a county that contains a rural county district that is relatively poor and a much more wealthy city school district. For example, in the relatively poor school district, tastes for overall education spending may also be relatively low. Therefore, an increase in state funding may substitute for the local district's use of own-source revenues. A lower amount of the state grant would be expected to "stick" in this district. In the wealthy district, tastes for education may be high, and they will likely pass more of the increase in state funds into overall spending. In other words more money "sticks." If a model is used in which all districts in a county are aggregated for the analysis, the differential effects in these districts would not be seen. The aggregated model would assume that these very different school districts have identical behavior regarding the increase in state funding. This strong assumption lessens the model's ability to examine the true effect of the reform as well as it's ability to understand the behavioral responses associated with it.

Secondly, similar to many other school finance reform studies, Baicker and Gordon utilize U.S. Census of Governments data that is only collected every five years. So, while their research spans a time period of 15 years, they only utilize a total of four observations for each county. Not being able to observe what occurs in those "in between" years is very limiting. For example, Tennessee's school finance reform took place beginning in the 1992-1993 school year. Baicker and Gordon's data would not have picked up these impacts until 1997. But, by 1997 the BEP had been fully phased-in, and many of the impacts had already occurred. Limiting the data in Tennessee to Census of Goverments years would eliminate the ability to analyze the impact of the phase-in period as a whole. Data regarding district spending is extremely tedious to collect, and therefore, nearly all studies use Census of Governments data.

Gordon (2004) examines whether federal grants for education via the Title I program boost school spending. The Title I program is a special education program and is now responsible for distributing funds for the costs associated with No Child Left Behind. The Title I program is interesting to examine because it contains a maintenance of effort requirement in which local and/or state funding per pupil cannot drop below 90 percent of its nominal level in the previous year for a district to receive Title I funds. Gordon is able to conduct her analysis using yearly district level data to examine what impact the increase in Title I funds in 1992 and 1993 had on spending variables in years 1992 through 1995. She concludes that the increase in Title I funds has no significant impact on state revenues per pupil, either in the short run or over time. In the case of

local revenues, however, new Title I revenues are crowded out by a decrease in the level of per pupil local revenues by the third year following receipt.

Romer and Rosenthal (1982) conclude that a school district whose share of state aid is close to the statewide average before and after the increase in state aid would increase total spending by the increased amount of state aid that they receive. This explains a perfect flypaper effect in which all of the grant "sticks." This provides an explanation for the flypaper effect outside of the common explanation of fiscal illusion (See Fisher, 1982). In this case, Romer and Rosenthal are able to explain the flypaper effect as a misperception of grant size. While district residents may have a firm idea of their property tax price, they likely have very little idea related to the amount of funding provided to the school district by the state. The model predicts a flypaper effect for all levels of state aid, but a perfect flypaper effect is only seen when state aid is close to the state average.

Very few analyses examine the impact of school finance reform in a specific state. This is likely due to the difficulty in obtaining reliable district-level data. However, a few district-level examinations have been completed in recent years. In an analysis regarding Wisconsin's reform, Maher, Skidmore and Statz (2006) conclude that the most recent adjustments to the school finance formula in Wisconsin have not decreased disparities in tax effort, which was a stated goal of the Wisconsin reform. In fact tax effort disparities have widened since the reform. Their results further demonstrate that school finance reform had a lesser effect on spending in districts who spent a relatively high amount on education prior to the reforms. Their empirical analysis is a cross-

sectional analysis using the change in variables between 1995 and 2002. Their model additionally shows that a change in tax price is a weak determinant of changes in school spending. Other factors, such as the change in per pupil property tax base and changes in state aid are better predictors of changes in spending.

In another state-specific examination, Olmsted et al. (1993) investigate the impact institutional factors, such as voter approval of education spending, played on school spending levels in Missouri during the 1970s. The cross-sectional analysis, using a tobit specification, concludes that giving local governements more control over spending levels (through the relaxation of a voting requirement for all spending increases) led to substantial increases in local spending. This study lends credence to the idea that school district bureaucrats desire to increase their budgets as much as possible within the contraints set by the state and/or the county in which they reside. They conclude that more constraints lead to a decrease in local spending. This occurs because constraints limit the local school district bureaucrat's ability to manipulate school spending via agenda control.

While these state-specific analyses have thought provoking results, it is difficult to compare studies conducted on data related to specific states, as state laws regarding school finance differ significantly across the country. This is highlighted in Hoxby (2001), as she concludes that different school finance reforms should not be treated as equals. Many previous studies examine results across states in which a dummy variable is utilized that shows whether or not a state has undergone school finance reform. These programs differ so drastically from state to state that Hoxby asserts that lumping them

together is inappropriate. Therefore, the current analyses presented examine the impact of Tennessee's statewide reform on specific school districts. In addition, the ability to examine issues at the school district level allows for a rich analysis of the behavioral effects of such reforms. While Tennessee's system may not be identical to others across the country, an analysis of its components allows for general lessons regarding school finance reform and how institutional features impact education expenditures.

The differences between school finance programs across the country is quite stark. These differences go far beyond the type of program that the states employ. Stark differences occur even in states that have the same "type" of school finance systems. For instance, states that have foundation programs can have distinctive program characteristics that make the provision of state funds to local districts very different. For example, some states have programs that mandate that local governments maintain their level of tax effort regardless of state support levels. In these cases, local funding cannot decrease as the state increases financial support. In states that do not require spending maintenance, local districts are able to reduce spending as much as will be supported by local residents. Other states, including Wisconsin, have revenue limits in which wealthy districts are limited to a certain level of local school funding before the state begins to recapture local funds. The nuances of these programs are very important to both the level of spending that results and the behavioral reaction to an increase in state funds.

The current analysis improves on previous work in several ways. This analysis provides evidence regarding the response of local school districts to numerous institutional factors such as the phase in of education funds, the existence of a

maintenance of effort requirement, and a cost differential grant for high wage districts. The ability to incorporate all of these institutional factors allows for a unique context in which to analyze education expenditures over time. The dataset used in this essay is much more extensive than others seen in the literature. A yearly panel of 136 school districts has been collected including several years prior to the school finance reform. Most national studies use aggregated data based on a sporadic time period (for example, the Census of Governments). All previous state level studies found use school-district level information, but limit the analysis to a cross-sectional examination due to the difficulty in collecting school-district level data. The essay is also valuable in that Tennessee's reforms have not been studied previously, and given the wide distribution of incomes and other demographic characteristics in Tennessee, there is a great deal of variation in many of the explanatory variables which can lead to a rich analysis of school finance reform impacts.

1.C Theoretical Analysis

The majority of school finance reform evaluations have utilized the median voter model (See Chang, 1981; Addonizio 1991; Murray, 1997; Card and Payne, 2006). The median voter model has also been used frequently to examine other granting programs. Another line of inquiry utilizes Romer and Rosenthal's bureaucratic voting model (Romer and Rosenthal 1979a, 1979b, 1982) which recognizes the ability of local government to take part in agenda control and yields outcomes that deviate from the median voter's preferred outcome. Some believe that this model better explains the flypaper effect which says that a one dollar governmental grant normally increases

spending more than an equivalent increase in the income of the median voter. The bureaucratic voting model suggests that bureaucrats will seek to increase the budget of their bureaus through the use of grants and the setting of relatively unattractive reversion spending levels.

The median voter and bureaucratic models lead to similar predictions with regard to changes in local spending levels in response to the BEP. The existence of the nominal maintenance of effort requirement, as well as the required levels of spending on classroom and non-classroom expenditures via the BEP, led to a significant increase in local funds during the phase-in period for districts with relatively low education tastes. These districts had to increase local expenditures to higher levels in order to comply with the new regulations of the BEP. After BEP implementation, the median voter in these districts was unable to select the level of local education expenditures associated with their particular level of education tastes (assuming it was below the required amount). Figure 1.3 presents this case graphically.

Assume a district consumes at point A in Figure 1.3 prior to the implementation of the BEP. BEP funds are then introduced to Tennessee school districts via the use of matching grants. Districts are required to match a portion of both classroom and non-classroom costs. Given the district's taste for education and other goods (considering the relative prices for those goods), the district's median voter would prefer to consume at point B after BEP implementation. However, the matching scheme of the BEP and the existence of the maintenance of effort requirement prevent the district from spending below M. The portion of the budget constraint below M has been removed from the

median voter's potential choice set. Therefore, the median voter will select the lowest level of local spending possible given the matching requirements, point C. If income remained constant, all districts who consumed local education expenditures below M prior to BEP implementation would choose to remain at the nominally required level from year to year. Consuming local education expenditures equal to M, the required level, leaves these districts on a lower indifference curve than was seen prior to the institution of the BEP.

Over time, since this required level is based on nominal numbers rather than real and is not adjusted for enrollment increases, remaining at the nominal requirement results in a *real, per-pupil* decrease in locally-provided expenditures. These districts would be expected to remain at point C until their education tastes, or other related factors, adjusted to a point in which an increase in local education expenditures above point C would put the median voter on a higher indifference curve. This may or may not occur, but would be less likely in districts with especially low tastes for education spending.

The five year phase-in of BEP funds would also have an impact on the model shown in Figure 1.3. BEP funds were phased in from the 1992-1993 school year until the 1996-1997 school year. While state funds were phased in, the matching requirements via the BEP program were also phased in. Therefore, M increased on a yearly basis from the beginning of the phase-in until the phase-in was complete. This increase would mean that a larger percentage of districts would choose to remain at M each year as the required spending level surpassed their desired level of local education spending.

What if there was an increase in income in a district consuming force to consume at point C? If district income increases, the entire budget constraint shifts to the right. After this shift, the preference of the district shown would lead to a preferred consumption point equal to point D in Figure 1.3. This point is not possible, however, because the maintenance of effort requirement forces them to spend a minimum of M. Therefore, given the options available to the median voter, the district consumes at point E. Education consumption remains at M while the consumption of non-education goods increases. Once again, since the nominal maintenance requirement does not adjust for inflation and enrollment, maintaining spending of M would result in a real per-pupil decrease in local funding.

This model does not restrict districts that prefer education spending above M from spending at a level that corresponds with their tastes for education, given relative costs. The behavior in those districts may not be affected by the existence of the nominal maintenance of effort requirement if they desire to increase education spending from year to year and desire to remain above the state required matching levels. Therefore, the theoretical prediction of the model regarding the impact of the nominal maintenance of effort requirement is ambiguous. The impact depends on the number of districts whose preferred level of spending falls below M compared to the number of districts who prefer to maintain spending greater than the matching levels required.

While the overall predictions of behavior are similar, there are notable differences in the median voter and bureaucratic models. First of all, in the median voter model, matching grants result in a larger increase in public spending than do lump-sum grants of

the same amount. Under the bureaucratic model the two types of grants would have identical expenditure effects because the bureaucrat ensures that the money sticks since the bureaucrat's primary goal is the maximization of the bureau's budget. Secondly, the median voter model predicts that a lump-sum grant will increase spending by an amount equivalent to the increase seen with an equivalent increase in income. The bureaucratic voting model forecasts that a lump-sum grant increases spending by a larger amount than an increase in income. This difference is especially significant because of the notable flypaper effect. The bureaucratic model can explain this phenomenon while the basic median voter model cannot (Romer and Rosenthal, 1979a). Thirdly, in the bureaucratic model the increase in public expenditures is always larger than the amount of the grant. Under the median voter model the rise in public spending depends on the price elasticity of demand.

Romer and Rosenthal use the bureaucratic model in their analyses (1979a, 1979b, 1982) to examine the level of public school expenditures in Oklahoma during the 1970s. Their results indicate that school district bureaucrats utilize agenda control by setting reversion levels of spending very low so that the median voter prefers the higher level of expenditure. They deduce, using a logarithm cross-sectional model, that the reversion level was a significant determinant of spending in school districts. Moreover, they find a negative relationship between the reversion level of spending and the actual level of spending instituted. In other words, the lower the reversion level set by district bureaucrats, the higher the level of spending accepted by the median voter.

Two noteworthy analyses compare the median voter model and the bureaucratic model in the context of public education expenditures. In an early application Wyckoff (1988) concluded that the bureaucratic model performed better in the case of analyzing capital expenditures while the median voter model was preferred when examining current expenditures. He compares the median voter and bureaucratic models via a double log model that estimates education spending in Michigan. In a more recent analysis, Chandler (2005) expands this analysis using more sophisticated statistical techniques and utilizing data from Connecticut's school finance reforms. He finds that both models predict education spending in Connecticut consistently, and cannot separate out which model is preferred over the other.

In their cross-sectional examination of school funding in Missouri, Olmsted et al. (1993) postulated that "tax rates in [these] districts do not appear to simply reflect voter demands…Institutional factors, not changes in demand, apparently cause these increases." This strengthens the argument that the bureaucratic model is the most appropriate when analyzing local school finance expenditures. School district bureaucrats desire to maximize their budgets in order to maximize the level of funds provided for their bureau. Therefore, we should expect them to spend as much as residents and the structure of the granting mechanism will allow.

There are statutes related to the BEP in Tennessee that may assist in model selection. The BEP contains a "maintenance of effort" requirement for local spending. The requirement to maintain a level of spending restricts the median voter's ability to fully control local spending levels. This requirement is a *nominal* spending requirement,

which differs significantly from a maintenance of real per pupil spending or a tax effort maintenance requirement. When only nominal spending must be maintained, inflation and/or enrollment growth may lead to a decrease in real per pupil spending. In addition, this level of spending is partially determined by the match required for classroom and non-classroom spending via the BEP. This also restricts the choices available to the median voter. These constraints would not be considered in a typical median voter model although they may play a significant role in the determination of school funding across the state. Because the median voter model assumes that the voter can choose any level of spending along the continuum, which is not the situation faced in Tennessee, the traditional median voter model is expected to underperform when compared to the bureaucratic model. In addition, the way in which school expenditures are funded at the local level must also be considered. There is no required open referendum process in Tennessee in which voters approve the budget each year. Instead, local school district budgets are proposed by school district bureaucrats who then must obtain approval from the school board and the county (city) government. Under this scenario it seems likely that the school district bureaucrat may have influence beyond what would be seen in a case, such as Oregon, where voters consider school district budgets in elections each year. Due to these considerations and previous literature related to this topic, the bureaucratic voting model will be utilized in the spirit of Romer and Rosenthal with adjustments made for the current analysis.

Romer and Rosenthal present a bureaucratic model in which a bureaucrat is interested in maximizing spending for their particular bureau. In order to accomplish this

they set a reversion level of spending that is less attractive to the median voter than the higher proposed level of spending. They then allow voters to select only from their proposed level of spending and the lower reversion level of spending. Figure 1.4 presents this situation. The slope of the median voter's budget constraint is determined based on the relative prices of local education expenditures and all other goods and services. The 'price' of education expenditures is measured as the tax price of the median voter. Given the budget constraint, the median voter would prefer a level of local education expenditures of μ^v. According to the median voter model, this is the level of education expenditures that would be expected absent bureaucratic influences. Under the bureaucratic model, however, the bureaucrat has agenda control, and can determine which levels of funding are proposed for the coming year. In addition, the bureaucrat that proposes the budget (the school district bureaucrat) may have access to information that the bureaucrat approving the budget (the county/city bureaucrat) does not have. These information asymmetries can assist in the district bureaucrat's aim to maximize their district's budget. In the case of the model in Figure 1.4 the bureaucrat is assumed to prefer a spending level of ξ^p. The bureaucrat knows that local education spending equal to ξ^p lies on an indifference curve below that of μ^v. Therefore, the bureaucrat utilizes his agenda control ability and sets a reversion level of spending of ξ^r. In other words, the median voter can only choose between two levels of school spending, ξ^p and ξ^r. Spending level ξ^p is located on a higher indifference curve, and is therefore the level of spending chosen by the median voter. By taking advantage of agenda control, the

bureaucrat is able to obtain a level of spending that is higher than the preferred level of the median voter.

There is a significant difference between Romer and Rosenthal's model and the current analysis that should be noted. Romer and Rosenthal's model assumes that the bureaucrat can set any reversion level necessary to maximize their bureau's funding. They therefore set a reversion level that is less preferred than their higher level of spending that the bureaucrat desires. This ensures that their preferred level of spending will be accepted. Tennessee's situation is a bit different since the bureaucrat cannot suggest a funding level lower than the maintenance of effort requirement. Therefore, the model utilized in this analysis is better described as a constrained bureaucratic model. This will lead to different theoretical results than those seen in Romer and Rosenthal's studies. Where the setting of a reversion level in Romer and Rosenthal increases the level of spending in school districts, the existence of a nominal maintenance of effort requirement may decrease spending in Tennessee's school districts since the bureaucrat cannot set the reversion level that they would choose in the absence of the maintenance of effort requirement.

The existence of the maintenance of effort requirement and the BEP matching requirement have similar effects on the level of education expenditures in Tennessee as seen in the Romer and Rosenthal model shown in Figure 1.4. The median voter does not have full control over the level of local spending due to these constraints. The median voter can choose increased spending, as proposed by the school district bureaucrat

(analogous to ξ^p), or they can choose to revert to nominal spending in the previous year (the reversion level).

In addition to this constraint, the school district bureaucrat does not have the ability to set a low reversion level. Their choice is limited by the maintenance of effort requirement. They do not have the option of choosing to decrease nominal spending on public education or to set a reversion spending level of zero dollars. Romer and Rosenthal's theory shows that the bureaucrat has an incentive to set the reversion level as low as possible in order to increase the level of spending that will be approved by the median voter. Due to the constraint of the maintenance of effort requirement, the bureaucrat cannot set a reversion level below that amount. The bureaucrat will therefore choose the nominal maintenance of effort as its reversion level of spending, and that amount essentially becomes the constrained reversion, ξ^r. Because of these institutional details, both the median voter and the bureaucrat's options regarding public education financing are constrained.

The constrained bureaucrat model is based on four assumptions. First of all, the school budget process is viewed as a negotiation between the school district bureaucrat and the local (county) government. The preferences of the county government are assumed to be equal to that of the median voter in the district. Secondly, the school district bureaucrats are assumed to be concerned with maximizing the budget of their school district. Thirdly, it is assumed that the school district bureaucrat has additional knowledge regarding the school district and their budgeting needs that the county government does not have. Lastly, it is assumed that there is no open referendum process

in which the median voter can choose their preferred level of spending. Using the constrained bureaucratic model leads to several propositions regarding local education expenditures as they relate to the BEP in Tennessee. [7]

Proposition 1: If the required level of local education spending exceeds the median voter's preferred level of spending ($\xi^r > \mu^v$), the level of spending will not increase above the required level.

In Figure 1.5 μ^v represents the preferred level of spending by the median voter and ξ^r and ξ^p represent the level of spending required by the maintenance of effort and the desired level of spending proposed by the school district, respectively. The median voter does not have the option to choose their preferred level of spending because $\xi^r > \mu^v$. The median voter may only choose between the required level and the level proposed by the school district in their budget request. The median voter would choose to remain at the required level of spending, as increasing spending by any further amount would put them on a lower indifference curve.

A different situation may occur in cases in which the minimum required level of education spending through the maintenance of effort requirement is below the level preferred by the median voter ($\xi^r < \mu^v$). This may occur in districts with high tastes for education expenditures.

[7] All theoretical specifications included in this analysis assume that preferences over local education spending are single-peaked.

Proposition 2: If the required level of local education spending via the maintenance of effort requirement is less than the median voter's preferred level of spending ($\xi^r < \mu^v$), the level of spending chosen by the median voter depends both on the required level of spending and the level of spending proposed.

There are several potential results that may follow Proposition 2. First of all, we may have a situation where education spending level ξ^r lies on an indifference curve above that of education spending level ξ^p. In the case depicted in Figure 1.6, the median voter will choose to revert to the required level of spending if confronted with a choice between ξ^r and ξ^p. The required level of spending is lower than that preferred by the median voter, but it lies on an indifference curve below that associated with the proposed level of spending. In this case an increase in spending above the required maintenance level would not be expected.

A well-informed bureaucrat would never choose to propose ξ^p as presented in Figure 1.6 due to the voter's preference for the reversion level over ξ^p. Instead, the bureaucrat would propose a level of spending that lies on an indifference curve higher than ξ^r. Figure 1.7 shows this potential result. This case is similar to the one presented in Figure 1.6, but now the median voter prefers the increased proposed level of spending to the level required under the maintenance of effort requirement. In this case, we expect the local level of school expenditures to increase above that required by the state.

A third prospect exists in which $\xi^p = \mu^v$. In this case the proposed level of school spending exactly equals that of the median voter, and therefore the proposed level is

selected. This is unlikely, however, because the bureaucrat (the school district) cannot directly observe the precise level of expenditures preferred by the median voter.

These results lead to a proposition regarding the relationship between the reversion level (the maintenance of effort requirement) and the highest level of spending that would be approved by the median voter.

Proposition 3: When $\xi^r < \mu^v$, there is a negative relationship between the level of nominal spending required by the maintenance of effort requirement (the reversion level) and the highest level of school expenditures above μ^v that will be preferred by the median voter.

The implementation of the BEP was phased in over a five year time period (from 1992-1992 until 1997-1998). Local school districts were responsible for providing 25 percent of classroom expenditures and 50 percent of non-classroom expenditures as calculated by the BEP.[8] Therefore, with the implementation of the BEP and the increase in state expenditures, an increase in local expenditures was also required. This essentially increased the reversion level of local spending at a higher rate than would have been seen absent the BEP phase in. Since districts could not decrease spending below the previous year's nominal level, the reversion level of spending increased significantly during the phase in period as state and local spending grew. The increase in

[8] This amount was changed to 35 percent of instruction ala classroom expenditures and 50 percent of non-classroom expenditures during the 2005-2006 school year.

the reversion level impacts the potential levels of spending that may be approved by the median voter if $\xi^r < \mu^v$. Figure 1.8 depicts this situation.

Suppose the initial state is represented by a proposed level of spending of ξ^p_0 and a reversion level, per the maintenance of effort requirement. Under this scenario, the median voter would select the proposed level of spending, ξ^p_0, as it lies on a higher indifference curve than ξ^r_0. Now suppose that the reversion level is increased from ξ^r_0 to ξ^r_1 due to the phasing in of the BEP. At reversion level ξ^r_1 the median voter will no longer select the proposed level of spending, ξ^p_0. Instead, the median voter will prefer the newly increased reversion level. This illustrates that as the reversion level increases, the highest level of education spending that will be approved by the median voter decreases.

The reversion level increased at a much faster rate during the phase in period than was seen after the five year phase in. Therefore, it is likely that local education spending increased at a slower rate during the phase in, after controlling for required spending, than was seen outside of the phase in years. A real decrease in spending may even be observed if the median voter consistently chose to remain at the reversion level (which is based on a nominal measurement). In addition, it is possible that the nominal maintenance of effort requirement was consistently above the median voter's preferred level of spending and spending would never be increased above the required amount. This is possible, and even likely, in districts with low tastes for education spending.

When the bureaucrat has considerable control of the reversion level set, as seen in Romer and Rosenthal (1979, 1982), the existence of the reversion level causes spending to increase. This is because they are able to set the reversion level low enough to where

the median voter will always select the bureaucrat's preferred spending level over the proposed reversion. However, with the maintenance of effort requirement, bureaucrats do not have free choice over the reversion, so the existence of the reversion may actually cause spending to remain at the nominal reversion, which amounts to a *decrease* in real funds (see Figures 1.5 and 1.6). Over time, the nominal requirement will necessarily increase, even if districts do not prefer higher spending, as the required matches for classroom and non-classroom costs increase. This results in the case shown in Figure 1.8, where an increase in the nominal effort requirement decreases the highest approvable level of local spending.

If the bureaucrat is constrained, the reversion may decrease spending to a level lower than that seen in the basic median voter model. If the bureaucrat is not constrained (as in Romer and Rosenthal), the reversion will increase spending when compared to the median voter result, as the bureaucrat can always set a reversion level low enough to get their preferred level of spending approved. Although this differential result exists, the relationship between the level of the reversion in both the constrained and non-constrained case is the same: as the reversion level increases, the spending level that will be approved decreases. Therefore, a negative relationship is expected between the reversion level and local spending levels in the analyses that follow.

1.D Empirical Model

Due to the bureaucratic nature of the school district budgeting process, the empirical analysis will investigate both the effect of the nominal maintenance of effort requirement and the phase-in aspect of the BEP by utilizing a bureaucratic model in the

spirit of Romer and Rosenthal (1982). Between the 1992-1993 school year and the 1996-1997 school year, school districts received BEP funds that increased yearly at a much faster rate than was seen during the pre-BEP period or after the phase-in was complete. Other than the maintenance of effort requirement, the new rules accompanying the institution of the BEP were not binding until the program reached full funding. These rules included increases in teacher salaries and significant decreases in class size. School districts could use the BEP funding during the phase-in period to implement the new regulations immediately, or they could have used the funds from 1992 to 1997 to offset local spending, while maintaining the required level of nominal effort, choosing to delay compliance with the new rules.

An additional issue existed surrounding the confidence Tennessee school districts had in the new school finance program. Districts may not have been overly confident in the full phase-in of the BEP. In addition, the rules associated with the implementation of the BEP, such as smaller class sizes and higher teacher salaries, were announced in 1992, but were not put into effect until the completion of the BEP phase-in. If districts had relatively low tastes for education, they would be expected to delay expenditures related to these regulations until they became binding. Moreover, districts may not have had much confidence that these rules would ever be enforced. Districts that did not have faith that the BEP would be fully implemented as originally proposed may have chosen to delay investing in new capital needed to comply with the class size restrictions. In some districts the new rules required building new schools or adding on to existing structures in order to adequately reduce class sizes. A decrease in local funds, or a slow-down in local

fund growth, during the phase-in may have occurred if districts chose to delay these expenses or if they were not confident in the stability of the BEP.

The first statistical analysis was conducted to further analyze effects of the BEP and its components using locally-provided education revenues as the dependent variable. This analysis will differ from many previously performed in the literature since it involves a balanced panel of data rather than a cross-sectional analysis or an examination of changes in variables between two time periods. Since full population data are available for analysis, sample selection issues are not problematic, and a simple linear examination can be employed as the baseline analysis. This follows previous education expenditure literature that utilizes linear models (Romer and Rosenthal, 1982, Murray et al, 1997, Card and Payne, 2002). The linear model follows a fixed effect specification and contains both year and district fixed effects,

$$\Gamma_{it} = \alpha_{it} + \omega_1 \mathrm{N}_{it} + \omega_2 \sigma_t + \lambda_{it} \hat{Z}_{it} + \delta_{it} \hat{X}_{it} + f_i + y_t + \xi_{it}$$

where Γ_{it} (LOCALFUNDS) represents locally-provided, per-pupil revenues. The variable N_{it} (NOMINALMOE) controls for the reversion level of spending in each district. The variable σ_t is a dummy variable (PHASEIN) that takes a value of 0 during non phase-in years and a value of 1 for the school years from 1992-1993 until 1996-1997. Vectors of education variables that are available at the district level (property tax base, sales tax base, classroom and non-classroom requirements, funding from all levels of government, percentage of special education students, etc.) and community variables available only at the county level (unemployment rate, per capita income, median home

value, etc.) are represented by $\hat{Z}_{it}$ and $\hat{X}_{it}$ respectively. The variables f_i and y_t represent district and year fixed effects which are included in all models. Including fixed effects allows for control of unobservable characteristics of the school districts and helps to correct for any omitted variable bias that may result otherwise.[9]

1.E Data

The lack of data availability has severely constrained the ability of researchers to effectively analyze issues related to school finance reform. Nearly all previous studies utilize data from the United States Census of Governments which is only conducted every five years. This leads to obvious difficulties in examining the immediate and ongoing effects of school finance reform. To further complicate analysis, in many states school districts are not coterminous with counties, and therefore, the collection of data is especially daunting. In Tennessee, the majority of school districts are coterminous with the county in which they reside. For the current analysis a balanced panel of 18 years has been collected for a total of 135 school districts.

As stated previously, the Basic Education Program was instituted in Tennessee during the 1992-1993 school year, with full funding reached at the end of the 1996-1997 school year. In order to examine the effects of the BEP data covering a significant period *before* the reform must also be collected. In order to account for this, data have been collected at the district/county level data for each of the school years from 1988 to

[9] This follows Holtz-Eakin (1986) in which he finds that models without fixed effects are misspecified.

2006.[10] Data on both school district and county characteristics have been collected. Variables were collected at the district level whenever possible. In addition, all variables measured in dollars have been inflation-adjusted using 2006 dollars.[11]

Table 1.2 presents the spending variables collected at the school district level. The variables CURSPENDING (current per pupil spending) and LOCALFUNDING (local per pupil school expenditures) are used as the key dependent variables in the analyses that follow. Current spending is utilized rather than total spending because expenditures outside of current spending, such as construction and debt service, do not impact students in an equal manner. For example, only students who attend a new school are impacted by the funds used in the construction of that school. Because of this it is standard in the literature to consider current spending alone. As discussed previously, local funding varies widely across Tennessee school districts. In 2006, local per pupil expenditures ranged from a low of $701.05 per pupil (Alamo City School District in Crockett County) to a high of $8,225.47 per pupil (Franklin City Special School District in Williamson County). The wide range in local spending gives rise to the potential for a rich analysis regarding how these expenditures vary as other variables change.

In addition, STATEFUNDING (per pupil spending from state sources) and FEDFUDING (per pupil spending from federal sources) are also included in Table 1.2. The summary statistics for these variables are presented for the entire time period, 1989 through 2006, as well as for three snapshot years (1989, 1998 and 2006). All variables

[10] This is the case with all but a few variables, such as per capita income, that are currently not available up to 2006. All data is available at least through 2004.
[11] In addition to the models presented, additional models were conducted using non-inflation adjusted data. All results were consistent with those shown herein.

presented in the analysis, including the maintenance of effort, have been adjusted for inflation and are presented in 2006 dollars.

STATEFUNDING is measured on a real per-pupil basis, and includes all funds provided to the local school district by the state. The majority of this funding is provided via the state sales tax. Due to the equalizing nature of the BEP, the amount of per-pupil state support granted to each school district varies quite a bit as well. As of 2006, this figure ranged from $2,395.80 (Hamilton County) to $6,049.36 (Hancock County). Hancock County had the lowest per capita income in Tennessee in 2006. Therefore, it is no surprise that they were the largest recipient of state funds during that year. The variable FEDFUNDING represents the per-pupil funding amount provided by the federal government. This number represents an average of 12 percent of total school spending in Tennessee. Federal funding for K-12 education is primarily reserved for support of special education programs, including the No Child Left Behind Act passed in 2001.

The variables collected for this analysis fall into two broad categories: school related variables and community variables. These variables may influence both the school district bureaucrat's decisions as well as the median voter's preferences. They may also help to identify the school district's overall taste for education expenditures. School related variables are generally collected at the school district level and include revenue collected from all sources, number of students, average teacher salary, percentage of students qualifying for special education, and district level school expenditures. Community variables are also collected at the school district level when available, but are more commonly presented at the county level. Community variables

available at the school district level include property and sales tax rates and bases. Community variables that must be collected at the county level include per capita income, percentage of the population between 5 and 17 years of age and over 65 years of age, and unemployment rates. Table 1.3 presents summary statistics for the variables utilized in the before mentioned empirical model.

The dataset utilized in the current analysis includes variables that have been collected for 135 school districts for 18 years. This amounts to an immense dataset that represents the entire population during the period of analysis. The variables selected in this analysis were chosen to give further depth to the spending equation. Each of these variables accounts for an important aspect of the BEP, the school district, or the county in which the district resides.

The first variable relates specifically the bureaucratic specification. NOMINALMOE represents one of the key variables, the nominal maintenance of effort requirement. It is equal to the nominal level of spending in the previous year.[12] According to the model presented a higher value of NOMINALMOE, all else equal, should decrease locally provided school spending. PROPTAXBASE represents the real property tax base in each school district. This includes all classes of taxable property within the school district. It is measured as the assessed property values in the school district. MEDIANHOME represents the median home value in the county in which the district arises. After controlling for property tax base, a higher value of MEDIANHOME

[12] This variable was calculated using the nominal numbers from each year. The nominal values were then adjusted for inflation.

would lead to a higher tax price of education in the district. Therefore, a negative relationship is anticipated between MEDIANHOME and LOCALFUNDING.

The measurement of SALESTAXBASE is a bit more complicated because local taxable sales are not available at the school district level. However, this data has been imputed using data available at the county level. Data on total taxable local sales at the county level were collected for each year in the analysis. For school districts coterminous with the county, this is equal to taxable sales within the school district.. However, for those that are non-coterminous with counties, the amount is weighted by the percentage of pupils in each district in order to retrieve a district-level value of taxable sales. Although this method is not perfect, it allows a school district level analysis that is much richer than a county only examination. The ability of a school district to collect revenues using the sales tax is limited significantly by the 2.75 percent cap on the local sales tax rate in Tennessee. Therefore, LRATECAP is included in the analyses. This variable is a dummy variable that is equal to one if the district is at the 2.75 percent tax cap and a zero if the district is not.

Several variables utilized are unavailable at the school district level. This is not a problem for the majority of Tennessee school districts, which are coterminous with the counties in which they reside. However, in the case of the city and special school districts, the county-level variable is used both for the county and city/special school district. These variables include UNEMPRATE (unemployment rate), PCT517 (percent of county residents between the ages of 5 and 17), PCT65 (percent of county residents over the age of 65), and PCI (per capita income).

UMEMPRATE is used to measure the economic conditions within the county for each time period. Economic conditions within a county may impact the decisions made by the median voter education spending relative to spending on all other goods and services. PCT517 and PCT65 are important variables as they allow for an analysis of how age effects education spending. Considering the fact that over 90 percent of children in Tennessee attend public schools, it seems likely that a county with a higher percentage of students between the ages of 5 and 17 has a larger population of residents attending schools. This may increase the financial burden of school districts. PCT65 may also be an important determinant of education expenditures. Previous literature asserts that having a larger percentage of elderly residents is associated with a decrease in education spending, all else equal (see Poterba, 1995, and Harris et al., 2001).

The final variable collected at the county level is PCI. Per capita income varies greatly in Tennessee. In 2006, per capita income in Tennessee ranged from just over $16,000 (Hancock County) to nearly $50,000 (Williamson County). This wide range of incomes leads to a wide margin of local school expenditures, even under an equalization system. In general, we would expect there to be a positive relationship between PCI and overall school expenditures. As income increases, the median voter's ability to consume both education and all other goods and services increases. The median voter's budget constraint shifts outward and their consumption of all goods, including education, are expected to increase. This increased ability to consume leads districts with higher incomes tend to have higher tastes for education spending, and they tend, therefore, to have higher overall expenditures (See Card and Payne, 2002 and Baicker and Gordon,

2006). While the relationship between PCI and total expenditures is expected to be positive, a negative relationship between PCI and STATEFUNDING is anticipated under an equalization scheme.

All other variables in the analysis are provided at the school district level. The variable STUDENTS accounts for the number of students in each district and is measured using average daily membership. This is a common measurement of school enrollment used across the nation that measures the number of students who attend school each day rather than the number of enrolled students. This variable is used to control for the impact of the size of the district beyond what is used in the BEP calculation. It allows for control of potential economies (or diseconomies) of scale related to education in Tennessee. The BEP calculation required for most years in the analysis that school districts provide 25 percent of classroom costs as determined by the BEP and 50 percent of non-classroom costs. In the last two years of the analysis, the classroom cost requirement for local districts increased to 35 percent. These amounts are controlled for on a per-pupil basis via the variable REQSPENDINGPP.

RETENTION and SUSPENSION are utilized to control for student type. RETENTION is measured as the percentage of students that are retained in each year. This provides a basic measure of student outcomes. SUSPENSION measures student behavior and is equal to the percentage of district students that are suspended in each year. These districts are used to control for environmental factors associated with education that may otherwise be unobservable, including student achievement and behavior. Students with low educational outcomes and/or behavioral issues may be more

expensive to educate and may require additional expenditures by the school district. The bureaucrat may have to increase the budget of the school district further in order to account for the existence of these students. PCTSPED also controls for student type and is calculated as the percentage of district students that qualify for special education services. Special education students are more expensive, on average, to educate than non-special education students. A district with a high percentage of special education students may have additional financial burdens that districts with very few special education students do not have. A school district bureaucrat may have to adjust spending on special education as the percentage of special education students in the school district changes since the federal government does not fully fund special education programs.

1.F Empirical Results

Table 1.4 presents three empirical models utilized to estimate local school district expenditures throughout the period of analysis. Each of the three models utilizes panel data fixed effect estimation.[13] Hausman tests were conducted to ensure that the fixed effect model was appropriate in each case. All results generally concur with the relevant literature with results that conform to expectations. Model I presented in Table 1.4 represents the baseline empirical analysis introduced in Section IV. Several interesting results emerge from the analysis. As expected, the results indicate that local funding decreased during the phase-in period. Specifically, the findings show that local per pupil

[13] The coefficients associated with the year fixed effects are eliminated from all results tables in the analysis due to space considerations. In nearly all cases the year fixed effects were significant and became more positive, or went from negative to positive, over the time period in question. Year fixed effects that show a different pattern will be discussed in the text.

spending decreased by $376.99 on average during the phase-in years. This is as expected in accordance with theory, as the phase-in period was associated with a tremendous increase in state funding, and with it, local funding and the nominal maintenance requirement. In addition, the decrease in locally-provided revenues during the phase-in period may have been exacerbated by low tastes for education and the fact that the BEP-associated rules were not binding until after the phase-in period. Local districts had the freedom to reduce the growth in locally-provided revenues early on in the BEP implementation process, knowing that the class size rule and teacher's salary mandates would not be enforced for five years.

The coefficient for NOMINALMOE is negative and highly significant. This shows that the existence of the nominal maintenance requirement decreased local funding, all else held constant. Specifically, it shows that a $100,000 increase in the nominal maintenance of effort decreases local spending by $93.51 per pupil. Operating from the means of these variables, the coefficient shows that a 0.7 percent increase in the nominal spending requirement would decrease local spending by over4 percent. This fact that the NOMINALMOE is a significant determinant of local spending provides considerable credence to the use of a bureaucratic model. If the median voter model was appropriate, the nominal spending requirement would not be a significant determinant of spending.

The coefficient related to income (PCI) is positive and significant, showing that although the BEP has improved equity considerably (see Essay 2), income still played a significant role in the level of funds provided by the local government during the period

of analysis. According to the results, a $1,000 increase in per capita income would result in a real increase of $28 per pupil from local funds. This is expected with the BEP, since the program did not limit the amount of money a local government could raise and did not contain a 'recapture' mechanism. Therefore, wealthier districts are expected to spend more on education at the local level than poorer districts.

The coefficients for PROPTAXBASE as well as HOMEVALUES are positive and significant. This is expected as these variables impact the tax price the median voter faces in terms of education expenditures. An increase in both PROPTAXBASE and HOMEVALUES increases local per-pupil education spending. SALESTAXBASE is insignificant in the model, but a related variable, LRATECAP, is positive and significant. This variable represents whether or not the school district is at sales tax rate cap of 2.75 percent. The positive coefficient shows that districts at the cap spend more per pupil than those who are not at the cap, all else constant.

The independent effect of an increase in state funds (STATEFUNDING) is a significant decrease in locally-provided funds. More specifically, a $1.00 increase in state funds, all else constant, results in a $0.37 decrease in locally-provided funds. In other words, $0.63 of the grant from the state "sticks." According to the model, the positive impact of the state grant on spending is larger than the impact of an equivalent increase in PCI. This shows that, all else constant, a $1.00 increase in PCI during the time period would result in an increase in per pupil local spending of $0.03 while a $1.00 increase in state funding would result in a $0.63 increase.

The coefficient related to STATEFUNDING is in line with the flypaper effect literature and is expected with the receipt of an intergovernmental grant. Empirical evidence shows a general range of the flypaper effect from $0.25 to nearly $1.00 (See Hines and Thaler (1995)). This result shows that local school districts decreased local spending, or the growth of local spending, when state expenditures increased. Local bureaucrats may have failed to increase local spending as they would have without the implementation of the BEP and the influx of state funds. They could not decrease nominal funds due to the nominal maintenance of effort requirement, but they could choose to freeze nominal spending, which would certainly result in a decrease in real per pupil spending as enrollment increased and prices rose via inflation. This decrease in local funds reflects several potential aspects of bureaucratic behavior. First of all, districts may have shifted local funds that would have been spent on education prior to the increased state grant to other expenditure needs. Secondly, districts may have decreased (or failed to increase) local tax effort with regard to the property of or sales tax. According to Maher, et al. (2006), this was the result seen after the implementation of school finance reform in Wisconsin, even though the program stated that tax effort would be increased. They conclude that effort actually decreased with the implementation of the new program.

The crowding out of funds is not an issue that is isolated to school expenditures. Similar results have been found in other empirical analyses. Knight (2002) concludes that federal highway grants crowd out state spending on highways. He also concludes that the net result is little to no increase in overall highway spending. His analysis

indicates that this result could be easily changed by altering the structure of the granting program. Baicker and Jacobson (2007) examine police policy regarding the seizure of drug-related funds. Many states have now passed laws in which local police can keep a significant portion of the funds that they seize in drug related busts. They conclude that the revenue from the state-level policy is offset by a decrease in local funding for police. Their results suggest "that the ability to influence public agents through federal and state laws is limited by the ability of local governments to divert funds to other uses" (Baicker and Jacobson, 2007). Given the previous literature found both within and outside of the education realm, the crowding out of local funds is expected within the boundaries set by school finance policy.

The independent effect of federally-provided school spending is positive and significant. Specifically, a $1.00 increase in federal education funding results in a $0.31 increase in local funding. This is likely related to the programs that receive federal funding. The vast majority of federally provided education expenditures are related to special education programs. The federal government, however, does not provide full funding for these programs. Therefore, when the federal government gives $1 towards a special education program, this typically necessitates an increase in local expenditures to reach full program funding. Related to this is the variable PCTSPED, which measures the percentage of students in each district that qualify for special education. As expected, as the percentage of special education students increases, local funding increases as well. Specifically, a one percentage point increase in the percentage of special education students is associated with a $40.39 increase in local per pupil expenditures.

The second model presented in Table1.4, Model II, is the same model as Model I with the variables related to the sales tax base and price eliminated. This was done in order to be more consistent with previous literature, which generally only considers funding provided via the property tax even though local governments elsewhere typically supplement local funding with non-property tax revenue. Even though a significant portion of school districts throughout the country receive part of their funding via local sales tax revenue, previous literature fails to control for the sales tax influence in most cases (see Romer and Rosenthal, 1982 and Card and Payne, 2002). This is likely due to two issues. Data on local sales tax revenues is difficult to collect and the information regarding school district sales tax rates can be even more difficult to obtain. Secondly, property tax revenue is still the primary funding mechanism for schools in most all states. While state programs differ in structure, school districts in all states receive at least some level of education funds via the property tax. Therefore, if the analysis is a national examination of school funding, the property tax is the most consistent measure of local tax burden for education.

The deletion of the sales tax variables does not lead to many significant differences in the models. The coefficient of PHASEIN increases by a significant amount, indicating that local funds decreased by $400.00 per pupil during the phase-in. The variable PROPTAXBASEPP is positive and significant. The result indicates that a $1,000 per pupil increase in property tax base results in a $3.00 increase in per pupil local funding. Operating from the means, this shows that an increase in PROPTAXBASEPP of approximately one percent increases LOCALFUNDING by approximately 0.1 percent.

This may reflect the fact that districts with a higher *per pupil* property tax base can raise equivalent education revenues with reduced effort when compared to districts with lower per pupil tax bases. The coefficient related to our key variables of NOMINALMOE and STATEFUNDING are not significantly different in Models I and II.

Model I is the most preferred of the two because of the importance of including variables related to both the sales tax and the property tax, as well as increased statistical strength. As of 2006, nearly 40 percent of all local education funds came from local sales tax revenues. Leaving sales tax figures out of the regression would not be appropriate since the sales tax plays such an important role in local school finance in Tennessee.

An additional specification similar to Model I in Table 1.4 was run using the standard median voter model and eliminating the control for the maintenance of effort since this should have no impact under the traditional median voter model. Surprisingly, these models performed almost identically to one another in the prediction of local spending levels. Similarly to Chandler (2005) neither model can be shown statistically to be preferred. The R-squared related to the bureaucratic model was slightly higher, and predicted values were slightly more robust, but not at a level that was statistically significant. However, from a policy standpoint, the statistical significance of NOMINALMOE when included leads to the conclusion that the bureaucratic model remains slightly preferred.

For a check of robustness, a log-log model was also investigated using log forms of the same variables shown in the linear model. This was the model of choice in Romer and Rosenthal's models, although substantial model differences do not allow for a

specific comparison of results. The log-log specification results in coefficients that can be interpreted as elasticities. Because of the log transformation, any variables with a zero value during the period of analysis were eliminated. In most cases the significance and the sign of the variables is consistent, including NOMINALMOE and STATEFUNDS. One interesting variable of note is SALESTAXBASE. When the log-log model is estimated without the salestax base included, this elasticity is positive and significant.. The coefficient of PCT65 is negative and significant in Model III, but is not significant in the other two models. This is consistent with much of the previous literature which shows that an increase in the percentage of elderly residents decreases school expenditures.

The presentation of the three models in Table 1.4 shows a great deal of consistency with regard to the key variables in the analysis: PHASEIN, NOMINALMOE, STATEFUNDING, and FEDFUNDING. These results are consistent with the theoretical predictions and propositions presented previously. In addition, the results show that the implementation of the BEP and the structure of the BEP led to changes in local government behavior during the period of analysis. Based on the previous flypaper effect literature this is expected, insofar as the local school district is able to reduce local expenditures within the confines of the BEP regulations.

The existence of endogeneity was examined and tested for in each analysis, and it was not found to be an issue. This is in line with recent literature regarding this issue. Several recent studies have concluded that court-mandated school finance reform is exogenous to current economic conditions within the state (see Baicker and Gordon

(2006), Figlio et al. (2004), and Card and Payne (2002)). Each of these studies conclude that the court mandate to reform the school finance system was exogenous to the prior state economic conditions. Therefore, an endogeneity issue should not exist between variables regarding education spending and variables controlling for the local economic environment when spending variables are utilized as the dependent variable.

Alternate Specifications

The vast majority of the prior literature regarding the impact of school finance reform on financial outcomes relies on Census of Governments data which limits the analysis to an observation every fifth year (see Card and Payne, 2006 and Murray et al., 1997). In addition, other examinations use even sparser data including decennial census data or a one year cross section (see Maher, et al., 2006 and Romer and Rosenthal, 1982). Using a sporadic panel of data is less than optimal for reasons discussed previously in the literature review. In order to test the robustness of using Census of Governments data, the Model I presented in Table 1.4 was repeated using only data from the years in which the Census of Governments were conducted. For the dataset in question, this results in a sporadic panel with data for the years 1992, 1997 and 2002. Results from the Census of Governments specification are presented in Table 1.5. The variable PHASEIN was excluded because this variable only takes a value in years 1993-1997, and would be inappropriate when looking at a three year panel since the dummy variable would only have a value of one in 1997.[14]

[14] Year fixed effects were included in the analysis, any unusual variation seen in 1997 would be picked up by the 1997 fixed effect coefficient. No such result was found.

The results presented in Table 1.5 are mixed when compared to the model run using the full panel of data. Many of the variables that were found to be significant when examining the full panel lose their statistical significance when a sporadic panel is utilized. These variables include NOMINALMOE, PROPTAXBASE, STUDENTS, TEACHSALREAL, REQSPENDINGPP, PCT517, UNEMPRATE and SUSPENSION. The results for this model are statistically different from the Model I.[15] For a couple of variables, including our key variable STATEFUNDS, the coefficient is very similar to that found when using the entire panel, -0.379 for the sporadic panel compared to -0.371 for the complete panel. That is where the similarities end. More significantly, NOMINALMOE is not significant, which might lead one to incorrectly reject the use of the bureaucratic model.

These results show that caution should be used when a full panel of data is unavailable. This is not surprising, since many policy and expenditure decisions can be made at the local, state or federal level in between the five year intervals covered by the Census of Governments. In the example of Tennessee, the time period between the 1992 Census of Governments and the 1997 Census of Governments encompassed nearly the entire phase-in period of the BEP. Therefore, an analysis using Census of Governments data would not pick up changes in local or state government behavior between those years.[16]

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[15] This was determined via use of the F-test.

[16] In addition an analysis was conducted that separated county-coterminous districts from city and special school districts. Results were very similar to the results seen in the baseline empirical model. There were no significant differences between the majority of the variables in the two models. There are two exceptions. The variable PHASEIN was not significant in the county district model but is highly significant in the city/special district model. The other difference lies in the STATEFUNDING coefficient.

1.G The Cost Differential Factor

The models previously presented do not include a breakdown of state level expenditures. Specifically, it does not differentiate between state funds provided through the standard BEP and those provided via the CDF. The CDF was implemented along with the BEP in order to account for local cost differentials that might affect the costs of delivering elementary and secondary education services. There are several reasons why school districts may have responded differently to the standard BEP grant and the CDF. First, different districts faced varied costs, from salary costs to the cost of locally-purchased supplies and services. Salaries in particular vary greatly in Tennessee, and it is not surprising that teachers, janitors, and other school staff are paid more in high income districts than they are in low income districts because schools confront a higher wage structure. The CDF was intended to account for these cost differentials using a straight-forward county wage index. Counties in which average weighted wages were greater than 95 percent of the state's average wage rate in Tennessee received additional funding via the CDF.

Second, CDF funds were included as an add-on to the BEP formula for qualifying school districts. These funds were not guaranteed from year to year to these school districts; districts had to continue to qualify on a yearly basis. In addition, any CDF funds spent were subject to the overall maintenance of effort requirement. This may have led to behavioral effects that differed based on the continued receipt of CDF funds. The choices made by local governments pertaining to locally provided school funds may have

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The county districts decrease local funds per pupil by a statistically larger amount when state funds increase than city/special school districts do (coefficients of -0.466 for county districts and -0.236 for city/special school districts).

also differed based on the confidence school districts had that their receipt of CDF funds would continue. If school districts were relatively confident that they would receive money via the CDF on a continuing basis and that the Tennessee legislature would continue CDF funding, they may have been more likely to establish programs that would be required to utilize CDF funds in future years. Districts who barely qualified for the CDF in one year may have been much less likely to pass the entire CDF grant on to education expenditures for fear that they could not maintain that level of spending if they did not receive CDF funds in the following year.

CDF Funding Patterns

The CDF adjustment amounted to a considerable increase in state-provided education resources for some systems. The Memphis School District received the largest amount of funds from the CDF in each year included in this analysis, totaling $60.9 million in 2006. To put this figure into perspective, this is roughly enough money to fund food services and the Board of Education budget for the Memphis school district for the 2005-2006 school year.

During the 2005-06 school year, 10 states including Tennessee had mechanisms in their school finance funding formulas to account for cost differences across districts. These states include Alaska, California, Colorado, Florida, Massachusetts, Ohio, Tennessee, Texas, Virginia and Wyoming. Some of the formulas provided cost-adjusted

funds for all districts, while others—including Tennessee—only rewarded a subset of all systems. The basic premise of each state's program is discussed below.[17]

Alaska: Uses an index known as the Area Cost Differential (ACD). The ACD is only applied to non-teacher personnel costs and administrative costs. (Teacher salaries do not vary significantly between school districts in Alaska.) The district cost factor is calculated by comparing the cost of running an identical school (same type of students, same teachers, etc.) in Anchorage. Schools located in Anchorage are assigned a base value of 1.00. Other school districts are assigned higher figures to account for their increasingly rural locations. The state then adjusts basic need by the district cost factor. Rural schools in Alaska generally face increased costs due to transportation and climate considerations.

California: The state uses cost of living information published on U.S. metropolitan areas by the U.S. Department of Commerce to adjust the annual revenue limits used in the district funding formulas. The funding amount given to all California districts is adjusted to reflect the cost of living.

Colorado: The Cost of Living Factor (CLF) is calculated every two years by comparing the differences in the cost of housing, goods and services in each of Colorado's school districts. This factor is then incorporated into the Personnel Costs Factor (PCF) which uses historical information along with the CLF. The PCF is applied to the portion of state funding that is allocated towards personnel.

Florida: The District Cost Differential (DCD) is calculated using a two-step method. The Florida Price Level Index (FPLI) is calculated in the first step. It is a county-level index that is based on a standard basket of consumer goods, similar to the consumer price index. After the FPLI is determined, the DCD is calculated by taking the average FPLI for each district for the past three years. The DCD is then applied (via the funding formula) to the basic per student funding.

Massachusetts: The state uses a wage adjustment factor that accounts for cost of living and salary expectation differences across school districts. Districts located in geographic areas associated with higher than average wages receive additional funding. The wage adjustment factor is calculated using average wage data collected by the Massachusetts Department of Employment. The calculation is based on the labor market area rather than the county or city where the district is located.

[17] Generally see Thompson and Silvernail (2001), National Center for Education Statistics (2001) and State of New York (2000). For Florida see Bureau of Economics and Business Research (2007) and for Texas see Alexander et al. (2001).

Ohio: The cost adjustment factor in Ohio is known as the Cost-of-Doing-Business Factor. It is based on an index of all hourly wages for the county in which the school district is located as well as the school district's contiguous counties. The range of index values is limited by state law, which creates an Adjusted Cost-of-Doing-Business Factor. This factor is multiplied by district membership and the formula funding amount.

Texas: The Cost of Education Index is used to account for varying costs beyond the control of Texas school districts. The index takes into account district size, county population, the percentage of low-income students and teacher salaries.

Virginia: The state adjusts their funding formula for nine high-cost school districts in northern Virginia near Washington, D.C. As of 2006, a 9.83 percent add-on was given for instructional salaries and a 19.07 percent add-on was given for support salaries. These percentages are adjusted by the Virginia Legislature as they see fit. This factor is known as the "Cost of Competing Factor."

Wyoming: The funding formula is adjusted to account for differences in costs across school districts. The adjustment is based on an index calculated by comparing consumer prices. Prices of 140 different consumer goods including housing, food and transportation are considered.

On average, ten counties qualified for the CDF each year between 1992 and 2006. As shown in Figure 1.9, six of these counties (10 districts) in Tennessee received the CDF in each of the fourteen years, while eleven additional counties (20 districts) received the CDF at least once during that period.

As a part of the BEP, the CDF was calculated at the county level. Therefore, in counties that qualified for CDF funds and contained more than one school district, all districts within the county received the CDF. For example, if Anderson County received CDF funds, then the Clinton and Oak Ridge city school systems also received CDF funds. The CDF determined the percentage of funds to be provided to school districts above and beyond the base funding of salaries and benefits identified by the BEP funding formula. Therefore, if Anderson County received an additional 14 percent of funds via

the CDF, the Clinton and Oak Ridge schools also received a 14 percent increase in funding.

Figure 1.10 shows the geographical pattern of the counties receiving additional money via the CDF. As revealed by the figure, most school districts receiving CDF funds were located in or around one of Tennessee's largest cities: Chattanooga, Knoxville, Memphis and Nashville. This is not surprising considering that the CDF is calculated using a wage index. Average wages, as well as overall per capita personal income, tend to be higher in these metropolitan areas.

Figure 1.11 shows the current spending levels of districts broken down by whether or not they received CDF funds. Districts that received CDF funds generally spent more on education per student even prior to the implementation of the BEP. On average, districts that received extra funds via the CDF spent 19 percent more per pupil than districts that did not receive CDF funds between 1992-1993 and 2005-2006. Districts that received CDF funds in all fifteen years spent an average of 6.0 percent more than districts that receive CDF funds in some, but not all, of the years since BEP implementation. In the four years prior to the institution of the CDF (and the BEP) these same districts spent an average of only 1.9 percent more. The average increase in funding via the CDF was 4.8 percent per student across all years of our analysis. Not surprisingly, districts that consistently received CDF funds qualified for a larger percentage increase in revenues. Districts that received the CDF funding in each year saw an average increase of 5.4 percent per student while districts that received CDF funds in only some years received an average increase of 2.7 percent per student. A wide

array of factors may explain these spending differentials other than receipt of the CDF as is discussed more fully below.

Counties were not guaranteed CDF funds from year to year, which created some uncertainty for the school districts. While some counties, such as Williamson County, could reasonably expect to receive CDF funds on a year-to-year basis, other counties could not make such an assumption. The actual and potential variability of the CDF may have affected the spending decisions of school district bureaucrats. For example, Shelby County, which qualified for CDF funds in all years, could reasonably make budget decisions assuming that they would continue to receive some additional funds through the CDF.[18] Other counties that received CDF funds on an irregular basis, on the other hand, might have chosen to avoid any long-term funding commitments, such as hiring new employees or instituting ongoing programs, which would have been supported by the CDF because of funding uncertainties. Therefore, if funding is uncertain, local bureaucrats may not want to make a commitment to spending the same amount the following year regardless of CDF receipt.

All districts receiving CDF funds would have spent their complete CDF allocation provided by the state. But like the basic BEP grant discussed above, CDF funding would allow a local district to reduce its tax effort or reallocate its own funds to other spending programs as long as the nominal maintenance of effort requirement was satisfied. Because it is part of BEP funding and not a separate grant, the CDF also required the local matching of classroom and non-classroom funds previously discussed. The

[18] While Williamson and Shelby Counties could count on *qualifying* for CDF funds, even these counties were subject to the vagaries of the legislative cycle which determined the level of CDF funding.

majority of the money, $1.8 billion provided via the BEP, was provided to the districts that received CDF funds in all years. The remainder was paid to the 20 school districts who inconsistently received revenue through the CDF.

Figure 1.12 shows both the average amount of real CDF funds measured on a per pupil basis as well as the number of school districts receiving funds via the CDF between 1993 and 2006. The number of school districts qualifying for the CDF (measured on the right axis) decreased slightly after reaching its peak in 1996. In the first year of the BEP, 19 Tennessee school districts received CDF funds with an average grant of $256.71 per pupil. The peak of CDF funding was 1999, with an average CDF amount of $343.36 per student. By 2006, this number fell to an average of $281.32 a student.

While some Tennessee school districts lost CDF funding, or saw significant decreases, there were also some Tennessee school districts that had significant increases in CDF funds over time. In 1993, Williamson County received $266.42 per pupil via the CDF adjustment. In 2006, Williamson County received $524.19 per pupil. In 1993, CDF funds accounted for 5.1 percent of current per pupil spending in Williamson County. In 2006, this had risen to 7.8 percent.

The Impact of the CDF on Current Spending

An important policy question that remains is how the receipt of CDF funds affected current education spending. All districts receiving the CDF could account for the complete disbursement of their grant allocation. However, it is possible that CDF funds simply supplanted, in part or in whole, local funds that *would* have been provided beyond the maintenance of effort requirement. Because money is fungible, grant

proceeds might have been used to support spending in other programmatic areas of the local government budget or to lower local tax rates. This would be consistent with the flypaper effect discussed above in the context of the BEP phase-in, where governments in receipt of a grant from a higher level of government increase overall spending by less than the amount of the grant. While this response on the part of local governments may not have been the intent of the policy, it is nonetheless a possible outcome.

The variation in funding levels and districts receiving CDF funds may also affect local government spending. In particular, one would expect to see a smaller increment in spending in districts where the presence or absence of CDF funding was inconsistent from year to year. This is due to the fact that school districts might have been hesitant to increase spending in one year when they had a good reason to believe that funding might disappear or be reduced in the subsequent year. On the other hand, districts who consistently received CDF funds each year would be less fearful of the loss of funds and thus more likely to spend a greater share of their state grant.

The empirical model shown previously was augmented in order to examine the potential impact CDF funding had on state and local education funding. This analysis includes four years of data before the implementation of the BEP, with data ranging from 1989 until 2006. The estimated equations used real per pupil current education expenditures across school districts, inclusive of CDF funds, as the dependent variable. A number of control variables were utilized, many of which have been described in previous sections. Newly introduced control variables include CDFFUNDS which measures real, per-pupil CDF funds provided by the state, and

NONCDFSTATEFUNDING, which measures state provided funds (STATEFUNDING) minus CDFUNDS received from the state.[19]

Two additional variables SOMETIMES and ALWAYS are dummy variables which reflect a district's propensity to receive CDF funds. SOMETIMES measures the amount of CDF funds received by districts who received CDF funds in some years of the analysis, on an inconsistent basis. ALWAYS measures the amount of CDF funds received by school districts who received funds via the CDF consistently during the period of analysis[20] These variables are employed in order to investigate whether these districts behaved differently when receiving CDF funds. More specifically, this allows for an analysis regarding the impact uncertainty may have had in the expenditure of CDF funds. If CDF funds were fully expended with no reduction in spending from local sources, the coefficient of the variable CDFFUNDS should be 1 since the dependent variable is inclusive of the CDF funds: every CDF dollar received should be directly reflected in spending. If the flypaper effect is present, then this coefficient should be greater than that associated with PCI, and is expected to be greater than zero but less than 1. This would mean that for every dollar of state aid received, current spending increased by less than a dollar. The coefficient for the interaction term ALWAYSINT should also be 1 if funds are fully passed on to spending. This is not expected, however, due to the flypaper effect literature and the results found in previous sections showing local fund

[19] The preceding analyses in this essay measured state funding in sum (STATEFUNDING) and did not differentiate between the types of state funding. This portion breaks down STATEFUNDING into two categories: general BEP funds (NONCDFSTATEFUNDING) and CDF funds (CDFFUNDS).

[20] . If a district received funds via the CDF in only one or two years consecutively, they are given a value of one for the dummy variable SOMETIMES. In addition, if a district lost the CDF during the time period analyzed, after a significant time of receipt, they are given a value of one for SOMETIMES in subsequent years. Districts who received CDF funds in all years or in more than two years consecutively are given a value of one for the variable ALWAYS during that period.

depreciation when state funds increase. Based on the discussion above, the coefficient related to SOMETIMESINT should be smaller than the coefficient on ALWAYSINT. In other words, it is expected that current spending will be stimulated more in districts with ongoing CDF funding than in districts with sporadic CDF funding.

Table 1.6 presents a model measuring the impact of CDF funds on current per pupil expenditures. Model I utilizes the variable CDFFUNDS as well as SOMETIMES and ALWAYS to examine this relationship. Based on the empirical flypaper effect literature, and prior studies regarding state grants for public education, there is an expectation that overall current spending will rise by an amount that is less than the value of the CDF but is greater than a current spending increase associated with an equivalent rise in income. The results confirm this hypothesis. Specifically, the estimates show that holding all else constant districts that received the CDF add approximately 9.0 percent of CDF funds to their current per pupil expenditures (see Model I in Table 1.6). This is a much larger increase in spending than that associated with PCI, which has a coefficient of 0.014 in the model. The coefficient related to CDFFUNDS funds means that the remaining 11.0 cents of every grant dollar received is used to support spending in other areas of the local government budget, support tax relief for local taxpayers or some combination of these responses. As with the BEP discussed above, insofar as the overall maintenance of effort requirement was satisfied, this would free up funds from one year to the next to accommodate lower tax effort or greater spending elsewhere in the local budget. Interestingly, by comparing the coefficients for CDFFUNDS and NONCDFSTATEFUNDING in Model I we can see that a $1 increase in CDF funds led

to a larger increase in per pupil spending than did a $1 increase in other state funds (a $0.89 increase versus a $0.70 increase). Figure 1.11 previously showed that districts that received the CDF spent more per pupil than districts that never received the CDF funds even in the years preceding the implementation of the BEP, and with it the CDF. This indicates that these districts may have higher tastes for public education than non-CDF recipient districts. It is also conceivable that they faced higher costs since controlling this occurrence was the intent of including the CDF as a part of the BEP. Therefore, it is not surprising that CDF receiving school districts passed a higher percentage of BEP funds into per pupil expenditures, all else constant.

The analysis also shows that the two groups—those districts that always received CDF funds and those that received CDF funds in only some years—did not have statistically different levels of per-pupil current spending. The results in Model I indicate that the consistency of CDF fund receipt did not have a statistically significant impact on per-pupil spending. Per pupil expenditures are expected to increase with the receipt of a grant from the state via the flypaper effect. However, there is no theoretical certainty regarding what will happen to local spending as the grant is provided. In order to investigate this further, an additional analysis was conducted examining the impact of CDF fund receipt on locally provided revenues. Once again, it is hypothesized that districts receiving funds in all years may have a different behavioral response to districts that receive CDF funds on an inconsistent basis. Table 1.7 presents these results.

Model II presents the model utilizing per pupil CDF revenues as a control variable to explain locally provided per pupil revenues. The model shows that an

increase in the CDF does not produce a statistically positive impact on locally provided revenues. The variable representing state funds in Model II excludes those funds provided via the CDF (NONCDFSTATEFUNDS). The coefficient related to this variable is negative and significant, and shows that a $1.00 increase in non-CDF related state funds (after controlling for other variables, including the maintenance of effort requirement) leads to a $0.42 decrease in local funds. Therefore, approximately $0.58 of the $1.00 grant "sticks" a la the Flypaper Effect.

As in previous models, the existence of the maintenance of effort requirement, all else equal, decreases locally provided revenues. The coefficient of NOMINALMOE in Model II is larger, in absolute terms, than in the models in previous sections that did not control for CDFFUNDS. Once again, this follows the theory presented in the beginning of this analysis, in which a higher reversion level decreases the maximum amount of funding that will be approved by the median voter. So, why would controlling for the CDF increase the impact of NOMINALMOE? This is likely because districts who receive the CDF are in high wage areas and likely have higher tastes for education than many non-CDF recipient districts. This can be seen by analyzing the spending patterns of CDF recipient districts before the institution of the BEP (See Figure 1.11). Therefore, districts who receive CDF funding are less likely to have spending levels at or near the reversion level than low wage districts. If those districts with higher wages are less likely to decrease the growth in spending due to the nominal maintenance of effort, then the coefficient of NOMINALMOE may have been biased upward when the CDF was not specifically controlled for in previous models.

According to Model II, both districts who always receive CDF funds and sometimes receive CDF funds statistically alter local spending due to the CDF grant. Districts who receive CDF funds on an inconsistent basis decrease local funding by a statistically larger margin than do districts who consistently receive CDF funds. This result conforms to expectations described previously. Districts who receive these funds in all years may take their receipt of the CDF as given, and may not change spending allocations due to CDF receipt. Conversely, districts who receive the CDF on an inconsistent basis, may doubt future receipt, and will likely be more hesitant to increase spending to a level that cannot be supported without CDF receipt. How one reacts to these findings on the CDF will depend on what view is held regarding the intent of CDF program itself. Consider first those districts that received CDF funds for all fourteen years. If the intent was to stimulate funding in high-cost jurisdictions above the level that would have otherwise prevailed, then the CDF was modestly successful since each grant dollar increased current spending by slightly less than $0.50. Similarly, if the grant was intended to compensate local districts for the high costs they incur in providing education services, then the CDF was also effective since it freed up about 50 cents of every grant dollar to support spending elsewhere or to support tax relief.

1.H Tax Effort Analysis

Tax rates in Tennessee vary considerably from county to county and district to district. Two taxes primarily fund K-12 education in Tennessee: the sales tax and the property tax. As of 2006, around 60 percent of local school funding was provided via the property tax. In order to increase local education spending (without the aid of an

enrollment increase or an increase in tax base), districts must increase their tax effort, the extent to which they tax the available base.

Not surprisingly, districts with relatively higher per pupil education expenditures typically have relatively high levels of tax effort. In theory, these levels of tax efforts could be affected due to the implementation of school finance reform. In a study specifically analyzing Wisconsin's most recent school finance reform, Maher et al. (2006) find that the reform did not alter the disparities in tax effort across the state. Tax effort was not significantly altered even though this was a stated goal of Wisconsin's reform. Wisconsin's school finance system incorporates a recapture mechanism in which revenues collected above a set amount are 'recaptured' by the state. This discourages districts with high level of expenditures from increasing their tax effort since some of those funds may be recaptured. Tennessee's program lacks a recapture mechanism, so the impact on tax effort may be quite different than the result found in Wisconsin. The analyses that follow examine whether or not the increase in state funds over the time period, and specifically during the BEP phase in, was a significant determinant of district level tax effort.

School district and county government bureaucrats have some degree of flexibility when determining the tax liability that their residents will confront. This flexibility varies based on the residents' toleration of tax increases and tax statute limits. For example, some areas may have such a high taste for education that voting residents would prefer a local sales tax rate of 3.0 percent. However, since the law caps local tax rates at 2.75 percent, the local government cannot levy a 3.0 percent tax. This locality

will have to look to the property tax in order to increase the tax rate. Currently there is no statute limit on property taxation; however there has historically been considerable aversion to higher tax burdens. Tennessee has one of the lowest average tax burdens in the United States, and its residents have historically been relatively tax averse.

An interesting question is how local tax effort responded to school finance reform. Results in the previous section showed that local school spending decreases as state school funding increases. In addition, results showed that local spending decreased during the phase-in period, relative to other years in the analysis. The question remains as to how districts decreased the funds. Did they divert money otherwise reserved for schools to other programs or did they actually decrease tax rates faced by residents in the district? They may have also chosen to increase property or sales tax rates at a slower rate than they would have without the institution of the BEP. Examining the pattern of tax effort during the period of analysis will help to explain what may have happened throughout the existence of the BEP, and in the years leading up to the program.

Tax effort is always difficult to measure, and it is especially difficult when more than one tax is used to fund the expenditure category. Such is the case with education expenditures in Tennessee since both the sales and property tax are used to generate local education funds. Tax effort for this examination has been calculated as sales tax effort alone, property tax effort alone, and combined tax effort. The method used follows Chervin (2007). His method is especially developed to accommodate the measurement of tax effort in Tennessee. He uses the representative tax system method in which, the average tax rate in the state is applied to the relevant base in order to obtain potential

revenues raised at the average tax rate. These potential revenues are then compared to the actual revenues collected by the jurisdiction. Tax effort is measured as the ratio of actual revenues to potential revenues under a relative tax system (see also Tannenwald, 1999).

Property tax rates in Tennessee are specific to the school district in which the resident resides. Each county sets a property tax rate, and city and special school districts are able to levy a tax above and beyond the county level. The property tax base in each school district is measured as the total assessed value of all property in the district. This includes all classes of property. The rate used in all calculations is the effective property tax rate. This rate can be interpreted as the amount of tax collected per $100 of assessed property value. Therefore, a rate of 2.6 would mean that $2.60 would be collected for each $100 of assessed value. To take it a bit further, $100,000 worth of assessed property value in a county would result in $2,600 worth of property tax revenues.

The variables PROPRATE and LSALESRATE represent the property tax rate and local sales tax rate respectively. Local school districts are able to set their own property tax rates. Districts that are not coterminous with the county receive property tax revenue from both the county levied tax rate and the school district specific rate. This rate is not capped in Tennessee, and can be raised as high as local residents allow via the political process. The local sales tax is set quite differently. The state sales tax rate on non-food purchases in Tennessee is 7.0 percent. County governments are able to levy an additional tax up to 2.75 percent. Therefore, the highest rate a jurisdiction can have in total is 9.75 percent. If a county chooses to levy less than the allowed 2.75 percent, school districts

that are not county-coterminous can levy up to the 2.75 percent mark. As of 2006, 50 out of 135 school districts were at the 2.75 percent cap. Only three districts had local sales tax rates below 2.0 percent. Local school expenditures come from both property and sales tax revenues. Although the percentages vary from district to district, approximately 60 percent of locally provided education revenues come from property tax levies and 40 percent come from sales tax revenues. This analysis improves on previous studies as many of them neglect the importance of local sales taxes in the funding of schools.

The previous models in this essay have confirmed the hypothesis that local funding for schools decreased as a result of the increase in state provided education funds, all else constant. Local governments could have used the funds otherwise reserved for education spending in a number of ways. They may have diverted local funds for education to other local government expenditures needs. They also may have decreased local tax effort in response to the increase in state funding. Maher et al. (2006) conclude that this was the local response to school finance reform in Wisconsin. The increase in state funds allows districts to decrease local tax effort (or to fail to increase tax effort) while still increasing overall education spending in the district. The Wisconsin reform expressly stated that local tax effort would be improved and would not be decreased, yet the evident shows that local tax effort was not maintained as desired. Since the Tennessee reform did not require a maintenance of tax effort, Tennessee school districts may have had a similar response.

The following empirical examination investigates the changes in tax effort across Tennessee in response to the BEP. The models utilize three measures of effort as the

dependent variable: property tax effort, sales tax effort and combined tax effort. Control variables include many of the variables utilized previously. The measure used for combined tax effort is calculated by adding the potential levels of sales and property tax revenue and dividing it by the amount of property and sales tax revenue collected by the district. This shows the level of effort expended by each school district across school-specific taxes.

Table 1.8 presents the results of each of the three tax effort models. All three dependent variables are examined using a panel data, fixed effect model using both year and district fixed effects.[21] The levels of PROPRATE and SALESRATE have been lagged when included in the models in order to deal with the endogeneity associated with tax rates and tax effort.[22] In order to make the results shown more manageable, the tax effort figures have been multiplied by 1,000.

The results presented in Table 1.8 differ considerably based on the measure of tax effort employed. This shows the importance of examining effort in all taxes used to fund the expenditure in question. The property tax effort model presented in Table 1.8 uses property tax effort as the dependent variable. In this model a negative and significant relationship can be seen between property tax effort and the phase-in period. In addition, a negative relationship exists between real per capita income and property tax effort as well as property tax effort and property tax base. This is not surprising as a wealthier district with a larger property tax base would have higher property values, and would not need to tax residents at a high rate to earn average revenues. This highlights one of the

[21] Hausman tests confirmed in each case that the fixed effects model was the preferred approach.
[22] A Hausman test showed that the issue of endogeneity was eliminated via lagging the property and sales tax rate.

main differences between sales tax and property tax at the local level. Some districts, especially those in urban areas, are able to export a large percentage of their sales tax burden to residents of other school districts. A large percentage of retail sales in urban or tourist areas come from those who reside outside of the county. Therefore, it is not surprising that a strong relationship is not found between sales tax effort and income (see the sales tax effort model that follows). The property tax burden is much more difficult for most districts to export (except maybe those in areas with a significant percentage of second homes). Therefore, we expect districts with wealthier residents to have a much easier time raising money via the property tax than districts with poorer residents. It would be surprising to see an insignificant relationship between income and property tax effort because of this relationship.

The property tax model shows a negative relationship between state-provided education funds and property tax effort. Previously presented expenditure models showed a negative relationship between state-provided funds and locally-provided funds. This adds depth to that analysis by demonstrating that an increase in state funds for education allows school districts to decrease their property tax effort. The coefficients associated with the year fixed effects were consistently positive and significant in the property tax effort model from 1998 until 2006. Prior to 1998 year fixed effects are only significant in two years, 1993 and 1994, and both coefficients are negative.

Another interesting result remains in this model. Having a higher percentage of both young residents (5 -17 years old) and older residents (65 plus years old) increases the district's property tax effort. After closer examination, these results are as would be

expected. Younger residents do not own homes, and therefore, cannot pay property taxes. Further, having a higher percentage of school age children in a district may force school districts to tax their base more heavily in order to raise ample *per pupil* revenues. In addition, older residents tend to live in homes with lower assessed values than non-elderly residents. Therefore, having a high percentage of both of these age groups will likely lower the district's ability to raise revenue via the property tax.

The second model presented uses sales tax effort as the dependent variable. The results show that, after controlling for other factors, school district sales tax effort decreased during the phase in period, from 1992-93 until 1996-97. This may partially explain the results found in the expenditure analyses previously presented. Previous results showed that locally provided spending, all else equal, decreased during the phase in period. However, the previous model could not explain the manner in which this took place. It was not possible to tell if it was due simply to the shifting of funds, or if funds were reduced via a reduction in tax effort.

Results in Table 1.8 also show that sales tax effort is not statistically impacted by an increase in state funds. This shows that any decrease in overall tax effort during the period of analysis was generally driven by a decrease in tax effort with respect to the property tax. The level of federal funds is also insignificant. This is expected, as federal fund provision is exogenous to most influences and is primarily provided for special education funding. According to the sales tax effort model, having a higher percentage of young residents lowers the district's sales tax effort. After controlling for per capita income and the other control variables utilized, more school age children means lower

school district sales tax effort. This may seem surprising since having a higher percentage of younger residents puts greater pressure on the local school district. However, families with young children tend to spend a high percentage of their income, which may lessen the districts need for increased sales tax effort. Because of this, a community with a large percentage of families may not have to maintain as high of a level of effort as a community without a large percentage of school age residents.

The third model in Table 1.8 presents the combined measure of tax effort that unites both property and sales tax effort into a single measure. This measure is the strongest of the three, and gives the best overall picture of the true impact of the BEP on tax effort in Tennessee. However, there is a tradeoff, as using the combined measure forces both effects (sales and property) into a single coefficient, which limits the models ability to examine specific tax effort impacts. The combined measure shows a negative and significant relationship between the phase-in period and overall tax effort. This is not surprising given the results found in the first two models. This finding also corresponds well with previous models in which the phase in alone was shown above to have a negative effect on local education expenditures. Together the tax effort and local revenue collection results indicate that overall tax effort decreased during the BEP phase-in period. In addition to a decrease in local tax effort, local revenues may have been diverted to other spending categories within local government during the phase-in window.[23]

[23] These results are partially confirmed by an analysis using data for a subsample of counties obtained from the U.S. Census Bureau. Results are not shown due to the lack of information regarding sampling techniques and the incomplete nature of the dataset. The regressions examined local spending categories controlling for a variety of different factors, including the introduction of the BEP grant. The coefficient

In the combined tax effort model in Table 1.8 it is shown that the nominal maintenance of effort requirement and tax effort are significantly and negatively related. This follows the expenditure models previously presented, which showed a negative relationship between the maintenance of effort (the reversion level) and local spending. In addition, a negative relationship between overall district tax effort and state funds, per capita income and teacher salaries is shown. Positive coefficients are shown for other significant variables including the percentage of residents in both age groups, the number of students, and the unemployment rate.

The results for the combined effort model mirror the property tax effort model much more than they do the sales tax effort model. This is likely due to the fact that the majority of local education revenues continue to come from the levy of the local property tax. However, the differences in the property tax and sales tax effort models emphasize the importance of including all important taxes in the effort calculation. Results from models not fully utilizing data from all tax sources must be considered less than optimal, since a significant amount of local education funding comes from multiple tax sources.

1.I Conclusion

The analyses contained in this essay reinforce previous studies regarding the impact of intergovernmental grants on school expenditures. Consistent with the empirical flypaper effect literature, a grant received from a higher level of government results in an overall increase in spending that is greater than what would be seen with an equivalent

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of the BEP grant variable had a positive sign indicating the BEP was associated with higher spending on highways and public buildings at the local level. The Census public buildings category does not include school buildings.

increase in income. Empirical research has shown that the amount of the spending increase is greater than zero but less than the full amount of the grant. While the state instituted the nominal maintenance of effort requirement in order to prevent districts from decreasing locally-provided spending, a nominally based requirement does not prevent the decrease of real spending, especially when it fails to account for enrollment growth. Further, as shown by both the theoretical and empirical models, the nominal maintenance of effort requirement may actually cause an independent decrease in education spending as district bureaucrats are unable to set a reversion level of spending low enough to induce the median voter to increase spending to the bureaucratically desired level. Indeed each statistical analysis shows the negative relationship between spending and the maintenance of effort requirement. A negative relationship between the phase-in period and spending (or effort) is also commonly observed. This is likely due to two factors: the delayed enforcement of class size and teacher salary mandates and the sharp increase in the maintenance of effort requirement during the phase-in years (due to the increased classroom and non-classroom match calculated under the BEP).

There are numerous policy implications that accompany this analysis. First of all, the institution of a *nominal* maintenance of effort requirement does not maintain spending levels in real terms and actually causes a *decrease* in locally-provided real per pupil expenditures over the time period analyzed. A *real, per-pupil* maintenance of effort requirement would likely do a much better job of maintaining school spending levels across the state. Secondly, education expenditures from local sources decreased during the phase-in period of the BEP, from 1993-1997, all else constant. The state of

Tennessee had little choice but to phase in BEP funding because of the sudden policy change and the Supreme Court decision. However, having such a long period of phase-in, especially for the new class size and teacher salary rules, may have led to greater uncertainty regarding these policies and bureaucratic hesitancy in spending money to comply with the new regulations.

In addition to these policy inferences, the existence of the CDF and the lack of a regulation regarding district tax effort also led to changes in local spending that may or may not have been desired or expected. It is hard to imagine that the state of Tennessee desired for districts who consistently received the CDF to behave differently than those who didn't, especially if wage costs really differed related to those who did not receive the CDF. However, the CDF may have been instituted for political gain in order to please the large counties who were by and large seen as the losers in the move to the BEP. These districts generally received the CDF, and therefore had less uncertainty regarding receipt. So, by making these districts content they may have achieved their political goal. Similarly, while controlling tax effort may have led to a more equitable distribution of spending, it may have limited wealthy districts' ability to spend on education in accordance with their tastes for education. These analyses point out the importance of close examination of all institutional factors, as they each play a significant role in the bureaucrat's and median voter's determination of education spending at the local level.

It is impossible to accurately predict what the outcomes would have been if the BEP was not phased in or if class size and teacher salary mandates were immediately

enforced. In addition, one cannot tell what difference it would have made if the state of Tennessee had instituted a real per pupil maintenance of effort requirement or a true tax effort requirement as is seen in many other states' programs. Given the evidence presented, it is likely that either of these maintenance of effort programs would perform better than Tennessee's nominal maintenance requirement as long as the goal of that requirement is to prevent districts from decreasing local spending as state funds increase. While Tennessee's nominal maintenance of effort requirement may prop up spending levels in districts with low tastes for education, it may have also decreased the ability of bureaucrats in wealthy districts to take part in agenda control (a la Romer and Rosenthal) which may have increased spending further.

School finance reform is a constantly evolving phenomenon. New reforms continue to be proposed and instituted across the country each year. While the first court cases had equity underpinnings, the newest court challenges are adequacy based. It is highly unlikely that Tennessee has seen the last of their school finance court challenges, especially since Tennessee has avoided an adequacy case up to this point. Other states are dealing with very similar issues and can potentially learn a great deal from Tennessee's experience.

The General Assembly in Tennessee introduced the BEP 2.0 in the 2007 legislative session and instituted it in Tennessee school districts during the 2007-2008 school year. The new program has a simplified formula that is no longer based on a regression analysis. Additionally, the CDF has been eliminated and teacher salaries are being improved further under the BEP 2.0. For now the nominal maintenance of effort

requirement remains. As time goes on, and data becomes available for the years under the BEP 2.0, new analyses will be necessitated in order to examine the change from the BEP to the BEP 2.0 and to investigate whether this change led to a more efficient and equitable school financing system in Tennessee. However, since the BEP 2.0 is relatively similar to the original BEP, it is somewhat doubtful that significant changes will be seen.

APPENDIX

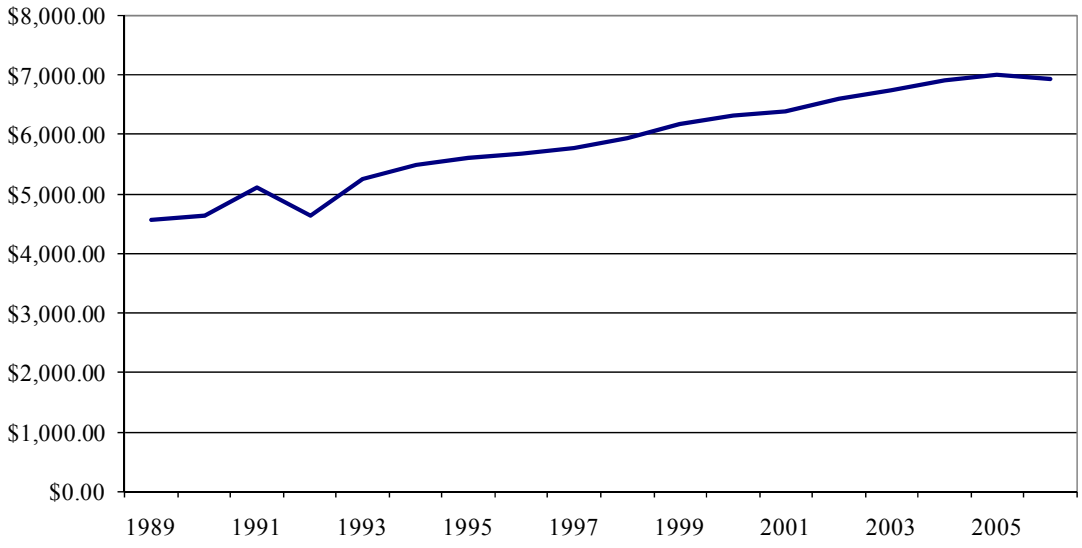


Figure 1.1
Average Per Pupil Current Expenditures in Tennessee

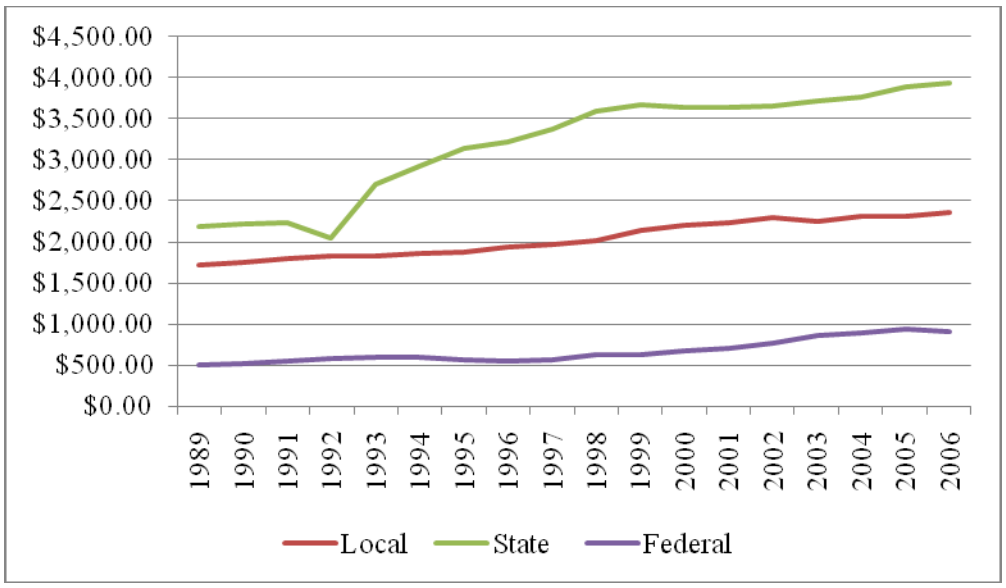
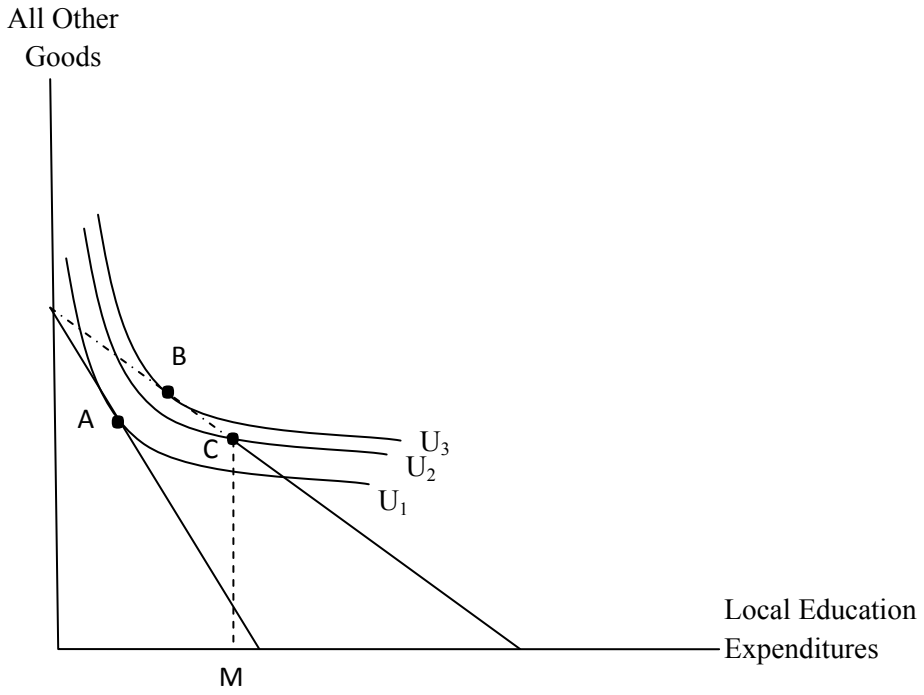


Figure 1.2
School Expenditures from Government Sources



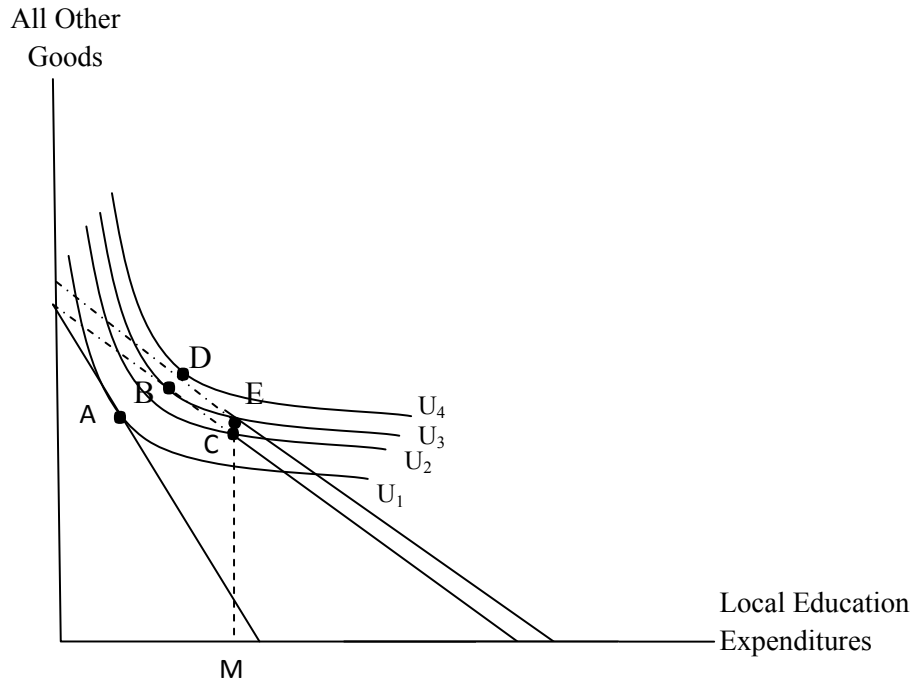


Figure 1.3: Median Voter Framework

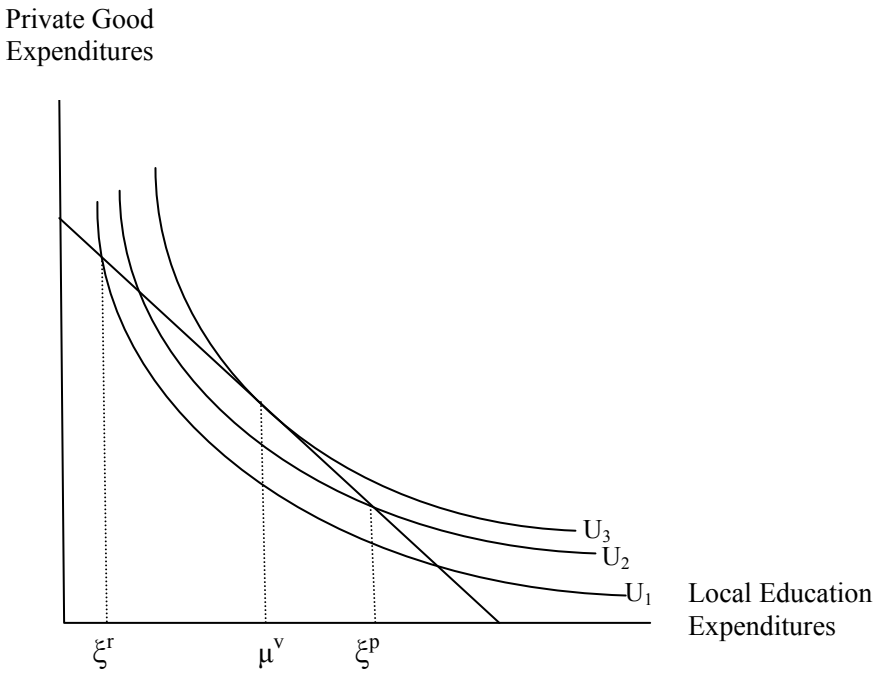


Figure 1.4
Romer and Rosenthal Model

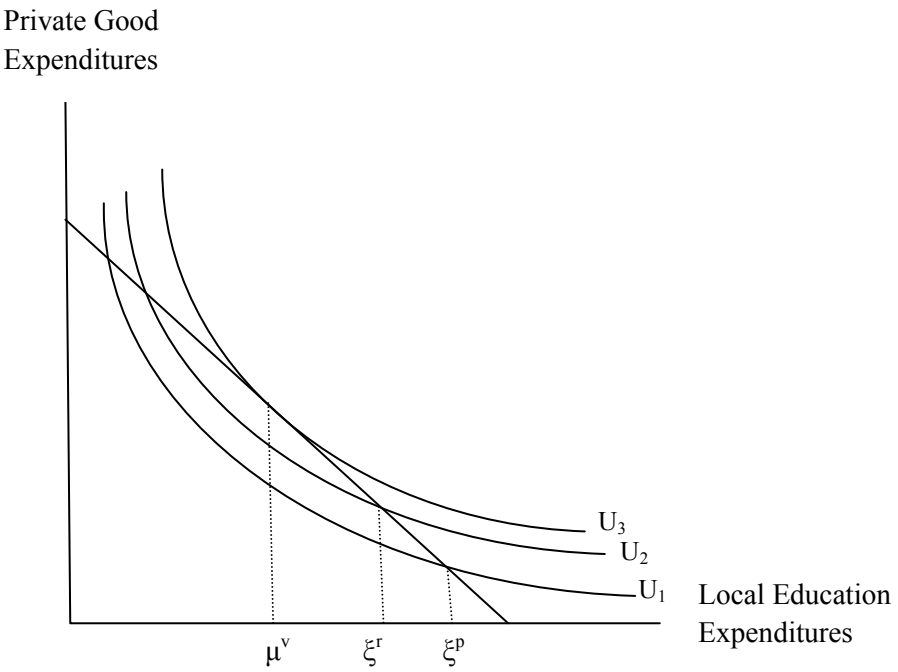


Figure 1.5
Theoretical Proposition 1

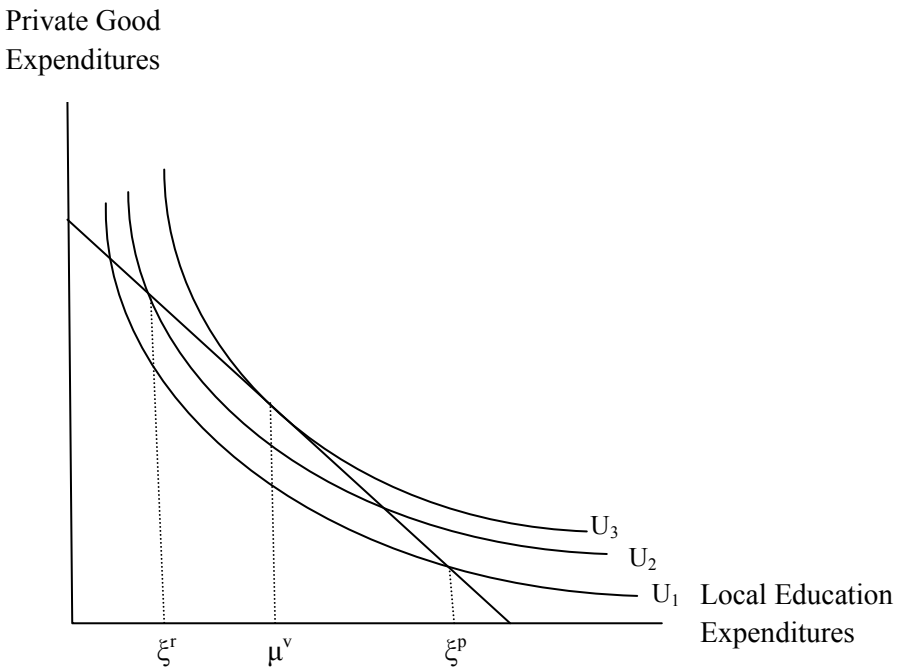


Figure 1.6
Theoretical Proposition 2(a)

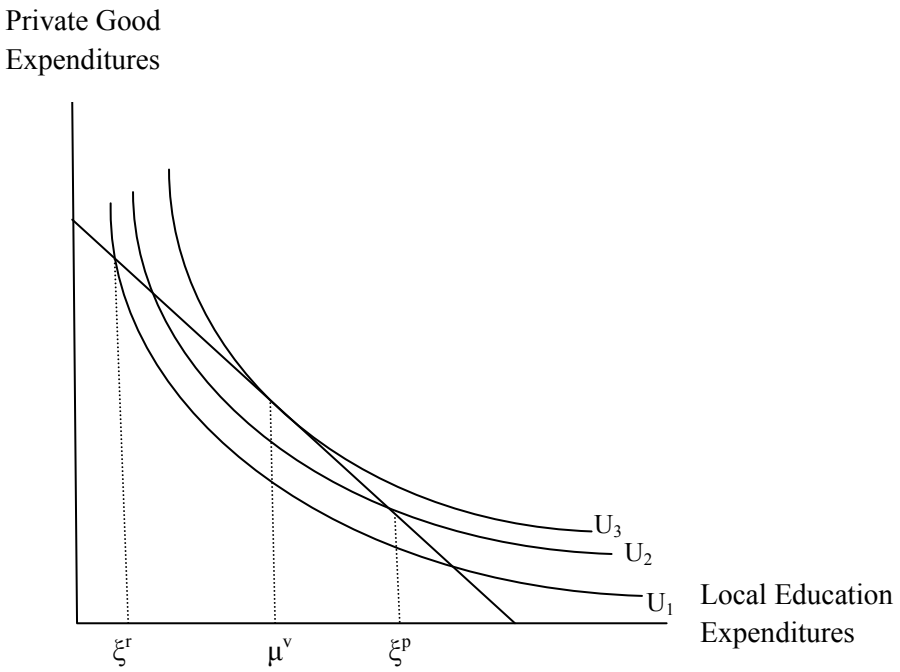


Figure 1.7
Theoretical Proposition 2(b)

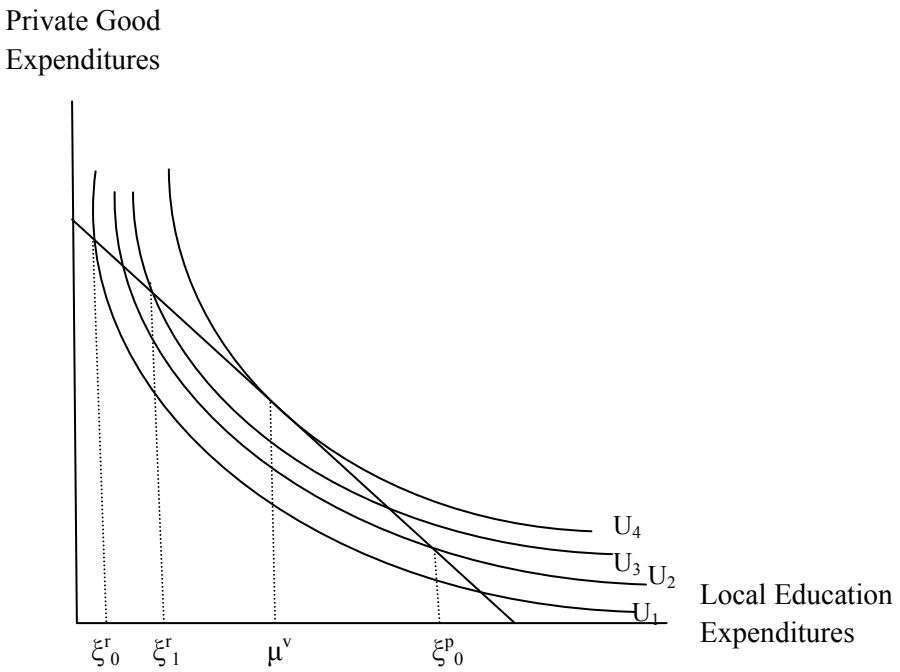


Figure 1.8
Theoretical Proposition 3

Received CDF from 1992-2006	Received CDF for Some (but not all) Years	
Anderson County	**Blount County**	**Roane County**
Clinton City	Alcoa City	Harriman City
Oak Ridge City	Maryville City	**Rutherford County**
Davidson County	**Coffee County**	Murfreesboro City
Knox County	Manchester City	**Sullivan County**
Maury County	Tullahoma City	Bristol City
Shelby County	**Hamilton County**	Kingsport City
Memphis City	**Humphreys County**	**Van Buren County**
Williamson County	**Madison County**	**Wilson County**
Franklin Special SD	**Moore County**	Lebanon Special SD

Figure 1.9
Counties Receiving CDF Funds

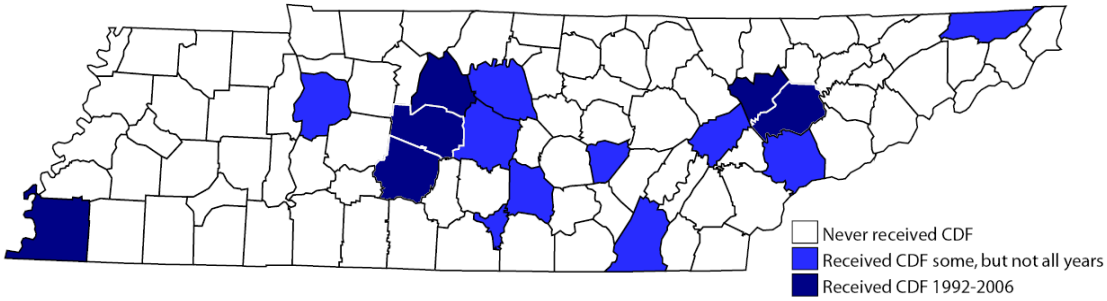


Figure 1.10
CDF Receipt Across Tennessee

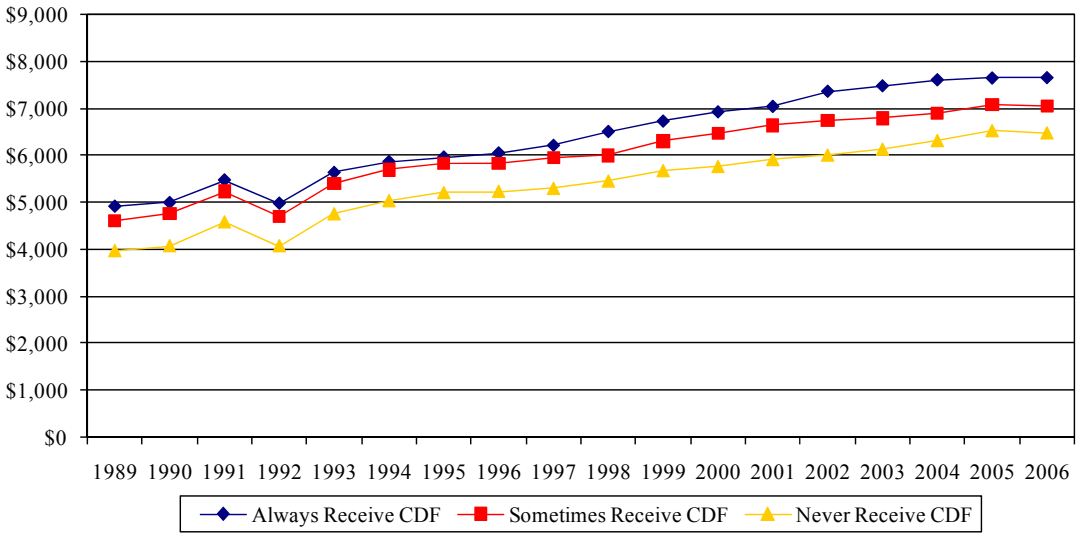


Figure 1.11
Per Pupil Current Expenditures by CDF Receipt History

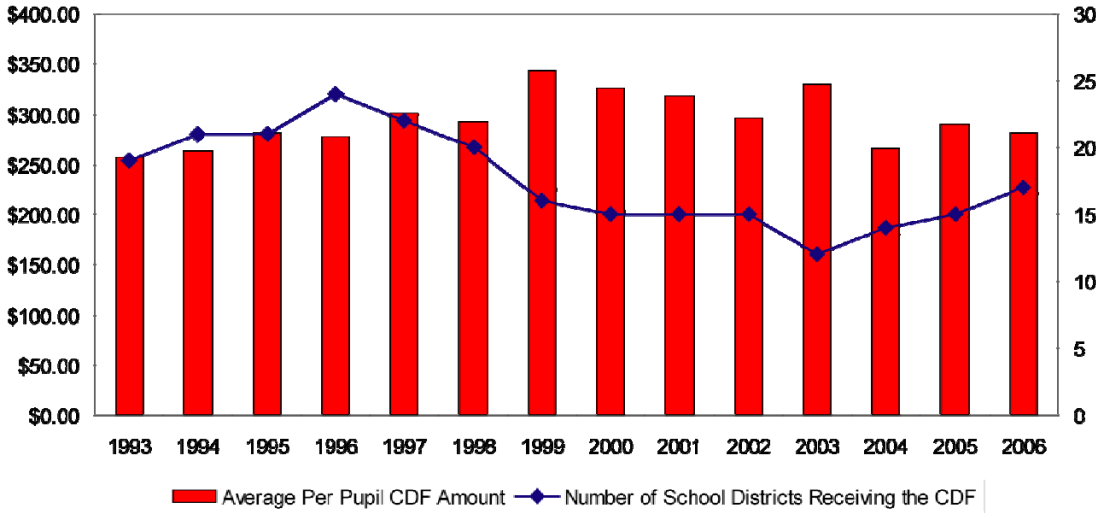


Figure 1.12
CDF Funding Per Pupil

Table 1.1
Nominal vs. Real Revenue

		Nominal	Real		Nominal Local	Real Local
	Year	Local Revenue	Local Revenue	Enrollment	Revenue Per Pupil	Revenue per Pupil
District 1	2000	$9,406,581	$11,013,478	6,122	$1,537	$1,799
	2001	$9,596,326	$10,923,594	6,182	$1,552	$1,767
District 2	2005	$19,828,529	$20,469,440	6,805	$2,914	$3,008
	2006	$20,011,345	$20,005,974	6,882	$2,908	$2,907

Table 1.2
Summary Statistics of Revenue Measures

Variable	1989-2006	1989	1998	2006
CURSPENDING	$5,557.37 ($1096.16)	$4,161.88 ($718.41)	$5,643.49 ($738.94)	$6,670.72 ($770.72)
LOCALFUNDING	$2,035.82 ($1027.26)	$1,720.84 ($792.26)	$2,015.76 ($991.23)	$2,351.82 ($1260.64)
STATEFUNDING	$3,188.91 ($764.80)	$2,192.20 ($197.33)	$3,582.10 ($488.17)	$3,924.97 ($685.31)
FEDFUNDING	$663.81 ($267.81)	$501.78 ($188.32)	$621.56 ($196.94)	$904.47 ($265.96)

*The mean of the variable is shown with standard deviation in parentheses.

Table 1.3
Summary Statistics

Variable	1989-2006	1989	1998	2006
NOMINALMOE [1]	$13,844.07 ($27,077.02)	-	$15,427.72 ($27,492.02)	$21,840.05 ($38,214.85)
PCI	$24,472.91 ($4,749.74)	$21,882.08 ($3,981.68)	$24,956.11 ($4,601.94)	$26,948.92 ($5,073.92)
STUDENTS	6,396.108 (12,807.042)	5,960.015 (12,089.832)	6,502.146 (12,940.86)	6,916.140 (13,663.32)
TEACHSALREAL	$39,485.65 ($4,026.16)	$39,045.78 ($4,028.00)	$39,738.61 ($3,946.83)	$39,977.12 ($3,161.95)
REQSPENDINGPP	$655.17 ($447.19)	-	$805.50 ($291.67)	$936.08 ($379.11)
PCT517	17.640 (1.294)	18.308 (1.097)	17.852 (1.217)	16.689 (1.271)
PCT65	13.870 (2.023)	13.957 (1.812)	13.593 (1.789)	14.599 (2.513)
RETENTION	3.691 (2.131)	4.670 (1.996)	3.752 (2.257)	2.758 (1.628)
SUSPENSION	6.575 (6.253)	4.734 (4.498)	5.470 (3.954)	5.150 (2.884)
PCTSPED	1.492 (0.917)	1.628 (0.882)	1.397 (0.927)	1.294 (0.862)
UNEMPRATE	6.583 (2.305)	6.243 (1.904)	7.312 (3.114)	6.012 (1.403)
PROPTAXBASEPP	$92,208.84 ($49,796.28)	$70,366.61 ($37,692.32)	$92,825.11 ($46,785.79)	$120,611.20 ($62,555.22)
SALESTAXBASEPP	$47,055.39 ($26,905.26)	$42,264.19 ($22,883.91)	$50,707.24 ($28,880.92)	$45,869.77 ($26,944.99)

*The mean of the variable is shown with standard deviation in parentheses.

[1] The values of these variables have been divided by 1,000 in order to allow for manageable numbers.

Table 1.4: Baseline Results

Dependent Variable : LOCALFUNDING

	Model I	Model II	Model III
PHASEIN	**-376.992*** (53.138)**	**-400.760*** (72.044)**	-
NOMINALMOE	**-0.935*** (0.348)**	**-1.036*** (0.340)**	**-0.687* (0.003)**
PROPTAXBASE	**0.352** (0.170)**	**0.301* (0.168)**	-0.004 (0.012)
SALESTAXBASE	-0.740 (0.500)	- -	**0.144*** (0.021)**
PCI	**0.028*** (0.007)**	**0.027*** (0.007)**	**0.176*** (0.071)**
STATEFUNDING	**-0.371*** (0.039)**	**-0.363*** (0.039)**	**-0.415*** (0.042)**
FEDFUNDING	**0.313*** (0.061)**	**0.314*** (0.061)**	**0.135*** (0.018)**
STUDENTS	**-0.031*** (0.009)**	**-0.033*** (0.009)**	-
TEACHSALREAL	**0.037*** (0.007)**	**0.036*** (0.007)**	**0.465*** (0.092)**
REQSPNDINGPP	**0.518*** (0.064)**	**0.492*** (0.062)**	-
PCTSPED	**40.390*** (11.501)**	**41.089*** (11.503)**	-
PCT517	**34.722*** (11.267)**	**32.034*** (11.213)**	0.034 (0.073)
PCT65	-8.037 (6.748)	-8.467 (6.749)	**-0.054* (0.033)**
UNEMPRATE	7.842 (4.785)	**9.789** (4.717)**	0.018 (0.014)
RETENTION	-2.843 (4.891)	-2.435 (4.893)	-
SUSPENSION	**5.026*** (1.476)**	**5.058*** (1.477)**	-
LRATECAP	**58.986** (27.003)**	- -	-
HOMEVALUES	**0.003*** (0.001)**	**0.002*** (0.001)**	-
CONSTANT	182.028 (398.267)	321.431 (394.902)	**5.352*** (1.167)**

Standard errors shown in parentheses.

*, **, and *** represent significance at the 10%, 5%, and 1% levels respectively.

Table 1.5: Results Using Census of Governments Data

Dependent Variable : LOCALFUNDING

	Census Years Only
PHASEIN	-
NOMINALMOE	-1.965 (6.255)
PROPTAXBASE	0.377 (0.421)
SALESTAXBASE	-0.268 (0.219)
PCI	**0.066**** **(0.026)**
STATEFUNDING	**-0.379**** **(0.156)**
FEDFUNDING	**0.584**** **(0.262)**
STUDENTS	-0.032 (0.049)
TEACHSALREAL	0.030 (0.024)
REQSPNDINGPP	**0.482*** **(0.251)**
PCTSPED	**73.982*** **(38.955)**
PCT517	26.180 (31.878)
PCT65	-7.262 (19.895)
UNEMPRATE	-1.413 (15.241)
RETENTION	2.292 (17.324)
SUSPENSION	10.635 (6.594)
HOMEVALUES	-0.253 (2.760)
CONSTANT	-653.284 (1281.574)

Standard errors shown in parentheses.
*, **, and *** represent significance at the 10%, 5%, and 1% levels respectively.

Table 1.6: CDF Model I Results

Dependent Variable : CURSPENDING

	Model I
CDFFUNDS	**0.885*** (0.103)**
ALWAYS	10.877 (38.852)
SOMETIMES	16.737 (32.719)
PHASEIN	**-362.925*** (37.456)**
NOMINALMOE	**-0..549** (0.232)**
PROPTAXBASE	**0.235** (0.113)**
SALESTAXBASE	**0.892*** (0.334)**
PCI	**0.014*** (0.004)**
NONCDFSTATEFUNDING	**0.697*** (0.028)**
LOCALFUNDING	**0.281*** (0.014)**
FEDFUNDING	**0.740*** (0.041)**
STUDENTS	**-0.024*** (0.006)**
TEACHSALREAL	**0.037*** (0.004)**
REQSPNDINGPP	**0.319*** (0.050)**
PCTSPED	8.998 (7.692)
PCT517	7.130 (7.512)
PCT65	**-19.399*** (4.511)**
UNEMPRATE	-4.338 (3.184)
RETENTION	**-5.630* (3.261)**
SUSPENSION	1.317 (0.984)
HOMEVALUES	**0.002*** (0.001)**
LRATECAP	-15.361 (18.002)
CONSTANT	485.773 (273.617)

Standard errors shown in parentheses.

*, **, and *** represent significance at the 10%, 5%, and 1% levels respectively.

Table 1.7: CDF Model II Results

Dependent Variable : LOCALFUNDING

	Model II
CDFFUNDS	-0.139 (0.155)
ALWAYS	**-139.455**** **(58.274)**
SOMETIMES	**-353.146*** **(49.101)**
PHASEIN	**-429.398***** **(55.530)**
NOMINALMOE	**-0.943***** **(0.348)**
PROPTAXBASE	**0.303*** **(0.170)**
SALESTAXBASE	-0.642 (0.501)
PCI	**0.026***** **(0.007)**
NONCDFSTATEFUNDING	**-0.416***** **(0.041)**
FEDFUNDING	**0.313***** **(0.061)**
STUDENTS	**-0.035***** **(0.009)**
TEACHSALREAL	**0.037***** **(0.007)**
REQSPNDINGPP	**0.452***** **(0.074)**
PCTSPED	**43.949***** **(11.514)**
PCT517	**35.435***** **(11.257)**
PCT65	-6.447 (6.773)
UNEMPRATE	7.527 (4.780)
RETENTION	-3.361 (4.897)
SUSPENSION	**5.130***** **(1.474)**
HOMEVALUES	**-0.002***** **(0.001)**
LRATECAP	**56.871**** **(27.009)**
CONSTANT	488.504 (410.784)

Standard errors shown in parentheses.

*, **, and *** represent significance at the 10%, 5%, and 1% levels respectively.

Table 1.8: Tax Effort Model Results

	Property Tax Effort	Sales Tax Effort	Combined Model
PHASEIN	**-12.092*** (3.474)**	**-5.705*** (1.452)**	**-10.823*** (2.144)**
NOMINALMOE	0.006 (0.022)	-0.002 (0.009)	**-0.027** (0.013)**
PCI	**-0.966** (0.413)**	0.148 (0.172)	-0.345 (0.255)
STATEFUNDING	**-19.427*** (2.505)**	1.017 (1.047)	**-8.077*** (1.257)**
FEDFUNDING	**11.980*** (3.899)**	-2.447 (1.630)	**4.100* (2.461)**
STUDENTS	**1.483*** (0.499)**	**-0.337* (0.209)**	**0.717** (0.345)**
TEACHSALREAL	**-0.777* (0.417)**	**0.413** (0.174)**	**-0.514* (0.263)**
REQSPNDINGPP	**8.931** (4.118)**	0.147 (0.197)	3.223 (2.542)
PROPTAXBASEPP	**-0.114*** (0.030)**	0.013 (0.012)	**-0.039** (0.018)**
SALESTAXBASEPP	**-0.825*** (0.085)**	**-0.252*** (0.036)**	**-0.574*** (0.052)**
PCT517	**2714.066*** (705.020)**	**-1853.179*** (294.719)**	**1313.121*** (435.144)**
PCT65	**2373.480*** (431.700)**	-275.665 (180.463)	**1126.045*** (266.449)**
SPECED	**-1246.009* (735.373)**	31.873 (307.408)	**-896.635** (453.879)**
UNRATE	**1034.291*** (305.270)**	**837.065*** (127.612)**	**936.970*** (188.415)**
RETENTION	**1081.302*** (313.595)**	**460.668*** (131.092)**	**864.081*** (193.554)**
SUSPENSION	**411.176*** (94.511)**	-14.195 (39.508)	**288.814*** (58.333)**

Standard errors shown in parentheses.
*, **, and *** represent significance at the 10%, 5%, and 1% levels respectively.

Part 3: Essay 2:

Differing Responses to School Finance Reform:

The Haves vs. the Have-Nots*

*Thanks to Daphne Kenyon, Kristy Piccinini, and Yesim Yilmaz for helpful comments and insights.

2.A Introduction

In the landmark *Serrano v. Priest* decision, the California Supreme Court declared that California's school finance system was unconstitutional because "it makes the quality of a child's education a function of the wealth of his parents and neighbors." Therein began a school finance revolution in which nearly all states faced claims based on similar foundations. Over 30 years of legislation, this litigation has moved the typical school finance program from a simple foundation grant to programs that contain some form of equalization between wealthy and poor districts.

Feldstein's seminal 1975 work on wealth neutrality and local choice in public education imparted a theoretical construct in which a state can achieve any level of wealth neutrality desired with respect to public school expenditures by using a matching grant structure in which the net price of educational services varies with wealth in an *appropriate way*. The success of these programs depends highly on the institutions and regulations surrounding the school finance system. He finds that Massachusetts's school finance program in the 1970s was set up in a way that he predicted would overcorrect for wealth inequities and would result in an inverse relationship between local wealth and local educational spending.

Complete wealth neutrality, where district wealth has no impact on overall education expenditures is not a stated goal of most school finance systems. While the vast majority of programs desire to make spending more equal to some degree, it is likely that in most cases complete neutrality is neither expected nor desired. This can be seen based on the institutional rules that govern school finance systems. The degree to which

the state controls local spending on education varies from total control to little to no control at all. This varies considerably from state to state.

Hawaii funds all schools at the state level and has no local school districts. This system could quite easily result in complete wealth neutrality since no revenues are distributed at the local level. This is possible in Hawaii because of its limited population and small number of schools. Hawaii represents the extreme in state school financing. Other states have programs with a lesser degree of state control. A good number of school finance systems currently in practice (Kansas, Montana, Texas, Vermont and Wyoming for example) contain what are commonly known as recapture mechanisms in which funds raised by local governments over a certain prescribed level must be returned to the state. The state can then distribute the funds as they so desire. This allows the state the ability to limit spending at the local level, and thus controlling the upper limit of overall spending on education.

Additional states' programs contain a regulation that sets a maximum level of funding that may be undertaken at the local level. Some other programs contain maintenance of tax effort requirements in which local governments cannot decrease tax effort from year to year and must therefore maintain a prescribed level of revenue collection. Others have spending maintenance requirements or contain no effort requirements at all. These varying school finance regulations play a significant role in the ability of the state to obtain a high degree of wealth neutrality. The more control the state has over the amount of education spending that occurs at the local level, the more likely they are to achieve a high degree of neutrality.

Many equity based school finance lawsuits have been filed with the charge that the existence of varying levels of school spending across a state, high spending in relatively wealthy districts and low spending in relatively poor districts, violates the Equal Protection Clause of the Constitution. Tennessee's first equity based lawsuit, *Small Schools v. McWherter,* was based on these claims and was initiated by several superintendents from small school systems in Tennessee. These superintendents argued that they were receiving unfair treatment with regard to school funding because their small property and sales tax bases could not support a very high level of local spending. As of 1992, the year of the *McWherter v. Small Schools* decision, the 10th percentile of current per pupil expenditures was $3,465 while the 90th percentile level of expenditures was $5,182.[24] This is a gap in spending of over $1,700 per pupil. At the same time, the gap in property tax base per pupil was over $95,000 per pupil. The Tennessee Supreme Court agreed with the plaintiffs and charged the Tennessee Legislature to "develop and adopt policies, formulas, and guidelines for the fair and equitable distribution and use of public funds among public schools and for the funding of all requirements of state laws, rules, regulations, and other required expenses" (Tennessee Code Annotated, 1992).

The BEP was the Tennessee Legislature's answer to the Supreme Court's order. It is clear, because of the language used, that improving spending equity was a primary goal of the institution of the BEP. Although this was a stated goal of the BEP, no regulations were contained within the confines of the BEP to ensure that a high level of overall spending equity was achieved. Tennessee's program is structured slightly different than many other programs across the country in that it includes a *nominal*

[24] All figures have been adjusted for inflation and are stated in 2006 dollars.

maintenance of effort requirement rather than a maintenance of tax effort requirement. Tennessee's maintenance of effort requirement mandates the maintenance of local revenues in aggregate nominal terms from year to year. School districts are free to raise any level of funds above that amount that are desired to support public education spending. Tennessee's BEP regulations contain no recapture mechanism and no cap on local spending. Therefore, since the state cannot control the amount invested in education at the local level, complete wealth neutrality would not be expected under the confines of the BEP. In fact, from a pure economics point of view, wealthy districts with a high taste for education would be expected to continue to increase spending at a rate higher than relatively poorer districts that may have a lower taste for education services.

The state of Tennessee equalized BEP funds via the Fiscal Capacity Index developed by the Tennessee Advisory Commission on Intergovernmental Relations (TACIR). The TACIR capacity measure estimated the level of funding that each county could afford to raise in order to fund education within the county. They calculate the county's fiscal capacity by using a multiple linear regression in which fiscal capacity was the dependent variable. Several independent variables were included in the regression to control for the factors that contributed to a county's capacity. These variables included own-source revenue, the property tax base, the sales tax base, per capita income, the county assessment ratio of farm and residential property to all property and the percentage of the population that were public school students. The regression was performed using three-year moving averages for all variables. The three-year averages were used in an attempt to avoid the volatility in aid associated with planning and

budgeting issues. The capacity number for all 95 counties in Tennessee was summed and the amount for each county was divided by the statewide total. That amount represented the Fiscal Capacity Index. This number was essentially the share each Tennessee county had of total statewide capacity to raise local education funds (Green et al., 2004).

A notable issue arises from the use of three-year moving averages of each variable. The most recent data used in the calculation was never less than 12 months old. In fact, it was often 24 months old due to delays in data collection. Therefore, the earliest year in the three-year average may have been as much as five years old. The TACIR method, therefore, was slow to adjust for growth that increased capacity quickly over a short period of time. It may have taken up to five years for the Fiscal Capacity Index to fully recognize the true change in capacity. Because of this lag, an inconsistent link could be seen between an increase or decrease in observed variables and a resulting change in county capacity. Performing a statistical analysis using panel data will allow for a richer exploration between the relationship between district wealth and education spending in Tennessee.

The level of per pupil public education expenditures in Tennessee is ultimately determined at the district level. School districts, and the counties in which they reside, can decide how much to spend in excess of the BEP grant. These decisions are based on several factors including district needs, local education tastes, district wealth and the institutional factors of the BEP formula. The decisions made by school district bureaucrats and the district median voters determine the level of overall school spending

equity across the state. As the factors used in their decision-making process change, it is anticipated that spending equity may change as well.

The following essay examines both spending and revenue equity since the implementation of the BEP. Multiple measures of equity are calculated and examined at the district level. This is an improvement over TACIR's county-level approach. The capacity (and therefore spending levels) of a city school district may be very different than the capacity in the county in which the city resides. In addition, multiple econometric models are included that investigate the gap in spending between rich and poor school districts in Tennessee as well as examinations regarding the existence of a relationship between district incomes and school spending.

The remainder of the essay is organized as follows. Section 2.B presents previous literature related to the topic at hand. Section 2.C examines the equity of school spending and revenues by examining commonly used measures of equity. Section 2.D presents the theoretical model under consideration. Section 2.E summarizes the baseline empirical model utilized and Section 2.F describes the data that has been collected for the analyses. Section 2.G presents the empirical results from the baseline model and additional alternative models, and section 2.H wraps up the analysis with a conclusion.

2.B Previous Literature

Several studies have examined the effect of modern school finance reforms on the distribution of school spending and specifically on the distribution across income groups. This is an important topic to analyze because it is generally the basis of school finance reform itself. Most of the court cases across the nation have begun because of perceived

inequalities between districts. The concern over inequality may not be based solely on the amount spent on students in the district. Rather, it may also be due to concerns about one district's ability to raise revenues more easily than other districts. This ability to raise revenue in wealthy districts may then lead to a disparity in the real spending levels seen in wealthy and poor districts.

Earlier studies tended to look at the absolute effect of education reform on educational expenditures. More recent studies examine these reforms further, including the effect on variables such as tax effort, spending equity, and income differentials. Murray, et al. (1998) examined the effect of nationwide school finance reforms on the distribution of school resources from 1972 until 1992 (all before Tennessee's reform). They find that school finance reforms across the country had significant impacts on equality. Depending on which measure of inequality they use, they find that school finance reforms have led to 16 to 35 percent more equitable school financing. They also conclude that school finance reforms across the country significantly increased per pupil expenditures.

Hill and Kiewiet (2005) update the Murray, et al. analysis to 2002 and find that school finance reform has indeed increased education spending equity. They also conclude, however, that overall per pupil expenditures have not statistically increased as a result of the reforms. Both of these studies, while thorough, base their empirical investigations on a limited dataset, the U.S. Census of Governments. Because the Census of Governments is only conducted every 5 years, Murray et al.'s 1972-1992 time period only includes five years of data: 1972, 1977, 1982, 1987, and 1992. This is a significant

limitation, as nothing can be observed during the years in between the Census. An additional weakness of these analyses is their grouping together of school finance reforms across states and time. They create a simple dummy variable to represent the existence of a reform. Hoxby (2001) warns of this simplification and assumption that all school finance reforms are "created equal." Their analyses do not differentiate between small reforms and comprehensive reforms mandated due to severe inequities. Their analyses also assume that a change to an equalization scheme would have the same impact as a change to a guaranteed tax base system. This essay will be a tremendous improvement over these methods as yearly data are utilized for a significant period of time at the school district level. In addition, this essay will focus on the full time period encompassed by the BEP in Tennessee, so there are no missing periods of time to contend with.

Most school finance reforms are geared toward lessening the gap in spending between property rich districts and property poor districts. However, as stated previously, local districts in Tennessee are able to spend as much as they can raise on education, so school finance reform does not guarantee that the spending gap will be closed, or even narrowed. Card and Payne (2002) study the impact of school finance reforms on the distribution of school spending across richer and poorer districts. They use Census of Governments data similar to other school finance reform studies and utilize a difference-in-difference framework. They find that a court decision in favor of the plaintiff tends to increase the relative funding available to poor districts. In other words, the gap between spending in wealthy districts and spending in poor districts is narrowed significantly. Their results suggest that every additional dollar of state funding results in

an increase in overall education spending of 30 to 65 cents. This finding is consistent with previous flypaper effect estimates in education and other expenditure literature (See Hines and Thaler, 1995). Card and Payne face data limitations as due to their use of Census of Governments data, and only examine two points in time to investigate the improvement in school spending equity.

In a national study, Baicker and Gordon (2004) conclude that school finance reforms increase both state school spending and the progressivity of that spending. In other words, state spending increases, but so does the propensity of high income districts to spend more than poor districts. Therefore, while overall spending increases, the gap between rich and poor districts does not narrow. The different findings seen in Baicker and Gordon when compared to Card and Payne are primarily driven by the level of analysis used and the data employed. Baicker and Gordon utilize a multi-year panel, while Card and Payne rely on cross-sectional analysis of two years.[25]

Because these studies do not have access to district level data, most (including Card and Payne, 2002 and Baicker and Gordon, 2004) use state level numbers or aggregate all school districts to the county level. In most states, the typical county has more than one school district. Therefore, these studies are commonly aggregating the behavior of several school districts into one observation. This process can be extremely limiting, especially in a state like Texas that has around 1,100 independent school districts but only 254 counties.[26] In Texas, and many other states, these independent

[25] Card and Payne's 2002 analysis utilizes data from two years, 1979 and 1992.
[26] This is not a limited phenomenon. The state of New Jersey has 604 school districts and only 21 counties. The state of Arkansas has 75 counties and 310 school districts. In fact, Tennessee has one of the smallest school district to county ratios in the country, so county aggregation is much more reasonable in Tennessee

school districts have independent taxing authority and may cross county boundaries and exist within more than one county. By aggregating the data to the county level you negate the fact that the decision making process regarding local education spending and taxing often originates at the district level. The school district bureaucrat proposes the initial school budget and, in independent school districts, determines the school district tax rates. Aggregating this decision making process severely limits the ability to examine the impact school finance reform may have on actual school district behavior.

Few studies have been conducted utilizing school district level data due to the collection difficulties (especially in states where school districts and counties are rarely, if ever, coterminous). However, several recent district-level studies have been conducted and generally conclude that spending is increased by education reforms and that equity is improved at the state level. Dee and Levine (2004) find that reforms in the state of Massachusetts increased state aid to and spending in the districts that spent the least prior to the reforms. In addition they find that the increased spending was put towards instructional and capital expenditures. Maher, Skidmore and Statz (2006) find a similar result for the state of Wisconsin using a cross-sectional district level analysis. In a report prepared for the Kentucky Department of Education, Picus, et al. conclude that the equity of revenues provided to Kentucky school districts improved between 1990 and 2000. They also conclude that the link between property wealth and overall revenue per pupil has essentially vanished.

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than it is in most states. This is a significant benefit to analyzing Tennessee data. Data not available at the district level, including income, can be collected at the county level without fear of significant error since the majority of Tennessee school districts are coterminous with the county in which they reside.

Eliminating the link between property values and education expenditures or revenues via school finance reform is significant in that it eliminates the potential for the Tiebout outcome in which residents sort into homogeneous communities based on their taste for public goods (including education). The Tiebout model results in the efficient provision of public goods at the local level. If this outcome is no longer possible due to the legislation regarding school financing, a less efficient level of education provision would be anticipated. Rather than dealing with residents with very similar tastes for education, school district bureaucrats may have to attempt to accommodate residents with very different education tastes. This embodies the economic principle of the efficiency/equity tradeoff in which an increase in equity is generally associated with a decrease in efficiency.

The following essay will greatly improve on the prior literature regarding the impact of school finance reform on spending and revenue equity. First of all, the analyses are performed at the school district level rather than an aggregated analysis at the county or state level. This allows for a much more precise analysis of how districts respond to the equalization of state aid since many spending related decisions are made at the district level. Secondly, the case of Tennessee represents an interesting examination given the structure of the BEP. Since local districts are able to control local funding (above a relatively low prescribed level), school districts have considerable control over the level of funding that exists in their schools. Tennessee districts have a great deal more control than many other states in which the local school district bureaucrats confront recapture mechanisms, tax effort requirements or revenue caps (such as in

California, Texas, and many other states). As previously mentioned, the dataset used is a tremendous improvement over any other known study done to this point. The time period covered is longer than other studies and a full population, balanced panel is utilized.[27]

2.C Equity Measurement and Descriptive Analysis

The desire to improve equity within the state was the primary rationale behind the school finance reforms in Tennessee and in many other states in the past thirty years. Whether or not the switch from the foundation grant program to the BEP was truly effective in achieving greater equity across districts is yet to be determined. It is expected that state revenue provided to local school districts has become more equalized since the 1992 implementation of the BEP since state revenues were equalized via the Fiscal Capacity Index. However, without further analysis the impact on current spending and local revenue equity is unknown. Since there were no caps placed on local revenue collection and no recapture mechanism was utilized in Tennessee, a decrease in local revenue equity may be expected. If this is the case, what is the overall impact of the BEP on overall education spending equity? Employing frequently used equity measurements can aid in the ability to examine this question further.

There are multiple measures of equity commonly used to examine education spending equity within states (See Murray, et al., 1998; and Berne and Stiefel, 1999). Four of these measures will be calculated and considered in this analysis. The benefit of

[27] In subsequent sections the dataset will be limited to the years included in the Census of Governments to analyze whether or not different results would have been obtained if only those years were included. As was seen in Essay 1, using only Census of Government years leads to tremendous differences in the results.

using these four measures is that none is affected by the unit of measurement selected for education spending. Additionally all four decrease when a dollar is redistributed from a wealthy district to a poorer district. All of the measures have potential limitations, so it is helpful to compare the results across multiple equity measures. Each of these measures is limited by the fact that they only include the differences seen in education revenues and spending. These measures are not able to control for additional factors that may impact equity amongst school districts. Further empirical analyses will be conducted in subsequent sections to accomplish this task.

The Gini coefficient measures inequality of a distribution and is commonly used within the economics literature to measure income inequality. Within the education finance literature it is used to measure the average difference in resources between any pair of school districts relative to the average resources for all districts in the state. The coefficient is a measure of income dispersion calculated as a ratio in which the numerator is the area between the Lorenz curve of the income distribution and the uniform distribution line and the denominator is measured as the area under the uniform distribution, or the 45 degree, line. The coefficient is a number between 0 and 1, where 0 corresponds to perfect equality and 1 corresponds to perfect inequality. Perfect equality occurs when every district has equal resources. Perfect inequality would result if one district had all the resources and all other districts had zero resources. The Gini coefficient for district j can be written as follows:

$$(1) \qquad \Gamma_j = \frac{\sum_{i=1}^{I} \left| x_i - x_j \right| \eta_i \eta_j}{2\bar{x}(\sum_{j=1}^{J} \eta_j)^2},$$

where x is district per pupil expenditure, $\bar{x}$ is average per pupil expenditure for the state, and η is district enrollment.[28] This measure is beneficial since it is a ratio measure that takes a significant portion of the data into consideration. There are, however, disadvantages to using the Gini Coefficient, including the fact that the coefficient may understate inequality if wealthier school districts are able to use their income more efficiently than lower income school districts.

The second measure of inequality that will be utilized is the Theil index first proposed by economist Henri Theil in 1967. For district j the Theil index can be stated as

$$(2) \qquad T_j = \frac{\eta_j x_j \ln(x_j / \bar{x})}{\eta_j x_j}.$$

Similarly to the Gini coefficient, a value of zero for the Theil index represents perfect equality among districts. A value of one would occur if one district has all state expenditures and the remaining districts have no state expenditures. Arguably the most attractive property of the Theil index is that the coefficient for the state as a whole can be decomposed into a within district effect and a between district effect. The decomposition can be represented by the following:

$$(3) \qquad T = \sum_{j=1}^{J} (\eta_j \bar{x}_j / \bar{x}) \ln(\bar{x}_k / \bar{x}) + \sum_{j=1}^{J} (\eta_j \bar{x}_j / \bar{x}) T_j,$$

where the first term on the right hand side represents between-district inequality and the second term represents within-district inequality.

[28] District enrollment is measured as average daily attendance within the district during the relevant school year.

The third measure of inequality is known as the *coefficient of variation* (CV), which is a measure of dispersion of a probability distribution. In the current analysis of education expenditures, the CV measures the dispersion around mean per pupil expenditures. By definition, it is defined as the ratio of the standard deviation to the mean. One drawback of this method is that it treats transfers of funds between all districts the same. In other words, the CV measure sees a transfer between a very rich district and a poor district as identical to a transfer between two relatively poor districts. The CV can be decomposed in a similar manner to that seen with the Theil index. The variation in spending in the state of Tennessee can be decomposed into between-district variation and within-district variation.

The fourth and final measure of inequality is the ratio of per-pupil education expenditures between the 90^{th} and 10^{th} percentiles of per-pupil district wealth. The wealth level of the school districts will be measured by property wealth per student since property taxation is the primary method of local public school funding. This measure is less sensitive than the previous three to extremely large or small values within the dataset. Contrary to the previous three measures, a value of one indicates perfect equality between the 90^{th} percentile district and the 10^{th} percentile district. The drawback of using this method, as with the Gini coefficient, is that it cannot be decomposed into between-district and within-district effects. In addition it only examines two specific points in the data. It does not take a large part of the data into account. Two districts with identical 90^{th} and 10^{th} percentile property wealth figures result in the same value regardless of the distribution of property wealth in the district. Therefore, this method cannot differentiate

between a district with property wealth that is normally distributed and a district with a bimodal distribution of property wealth.

Some previous examinations have used the 95th and 5th percentiles as the comparison units (Murray et. al, 1998). In the case of Tennessee, however, it may be more appropriate to use the 90th and 10th percentiles. This is due to the extreme variation in property values and per capita income in Tennessee counties. Tennessee has counties on both extremes of the wealth spectrum. Williamson County is the 15th richest county in the country, with 2004 per capita income of $44,298 (U.S. Census Bureau, 2005). On the opposite end of the spectrum, Hancock County is one of the poorest counties in the United States, with 2004 per capita income of only $14,885. Due to the wide range of income and property wealth in Tennessee counties, it is believed to be more appropriate to use the 90th and 10th percentiles as comparison units, therefore lessening the effect that the outlier counties have on the analysis. Examining the 5th and 95th percentiles may give a less accurate picture of overall equity since the school districts below the 5th percentile and above the 95th percentile may be considered to be outliers when compared to all other Tennessee school districts.

Calculations of these equity measures show that per pupil spending and overall revenue equity have been improved significantly since the implementation of the BEP. However, if local and state revenue equity is examined, it appears that local revenue equity as well as state revenue equity has become less equitable over the same time period. State revenue allotments for education have been shifted towards poorer districts (the have-nots). This is a direct result of the way in which the BEP is calculated and the

equalization method it employs. The Fiscal Capacity Index directly adjusts BEP allotments based on the revenue capacity of local school districts. Therefore, districts with a lower ability to pay for public schools receive a relatively larger amount of state support. Because of this, a decrease in state revenue equity is expected in an education finance system that incorporates an equalizing scheme as wealthy districts receive less from the state and poor districts receive more.

Local revenues have become more unequal as well, with rich districts increasing per pupil local revenues at a faster rate than is seen in poorer districts. This is not necessarily expected based on the structure of the BEP, but since local districts in Tennessee are allowed to raise as much local funds for education as the community will support, this conclusion is not surprising. The results of these calculations are shown in Tables 2.1 through 2.4 and show a tremendous amount of consistency across the multiple equity measures.

Simply examining the change in equity measurements is not enough to determine what is changing the distribution of spending and revenues in Tennessee school districts over time. Is it because poor districts are taxed with more non-traditional students (e.g. special education students)? Is it because rich districts have increased their dependence on their large property and sales tax bases? Have wealthy districts increased spending at a faster rate than less wealthy districts because of their residents' higher taste for education? Without additional analysis the reason behind the improved spending equity remains unknown. In addition, it is impossible to tell why local revenues have become less equitable in recent years without further analysis.

2.D Theoretical Considerations

The level of overall spending employed at local schools is a function of both aid and behavior. Aid to schools via the state is formula driven. However, the amount of local revenue contributed to education spending (above and beyond that mandated by the BEP) is based on local behavior and tastes. The analysis that follows considers the factors that impact this behavior and how the choices made by school districts and the counties in which they reside impact overall equity in terms of both spending and revenues.

The analysis will begin with the theoretical model proposed by Card and Payne (2002).[29] This model has been selected due to its explicit focus on spending equity. In addition, data are available on a yearly basis in Tennessee at the district level for the model proposed which allows for an analysis of how the findings change over time. Substantial changes have been made as Card and Payne perform a cross-sectional model rather than a panel model. This model is fashioned off of the median voter model presented by Bergstrom and Goodman (1973).

Suppose that ζ_{it} represents the amount of state aid received by district i in year t. Let ρ_{it} represent the total amount of current per pupil spending in district i in year t, where all per pupil variables are calculated using average daily membership of the district. Let γ_{it} represent the mean level of per capita income in district i in year t, and let

[29] The objective of the initial analysis is to compare and improve on the Card and Payne examination. All models for state and local expenditures were also analyzed using the theoretical model employed in Essay 1 (the constrained bureaucrat model). The two methods resulted in similar findings and will be utilized for a future research project. As stated in Essay 1, the results from the bureaucratic model are not generally preferred (on a statistical basis) to the median voter model, however, the significance of the nominal maintenance of effort variable lends credence to the use of the bureaucratic model over the median voter model.

μ_{it} represent a vector of observable factors (excluding revenue related variables) that affect school spending such as the number of special education students in the school district and whether the district is in a high wage area. Projections can then be made based on these variables related to the level of state funding per capita and expenditures per capita on both γ and μ.

(4) $$\zeta_{it} = \alpha_{1t} + \beta_{1t}\gamma_{it} + \delta_{1t}\mu_{it} + \varepsilon_{it}$$

(5) $$\rho_{it} = \alpha_{2t} + \beta_{2t}\gamma_{it} + \delta_{2t}\mu_{it} + v_{it}$$

According to the Card and Payne model the coefficient β_{1t} represents the redistributive nature of the Tennessee school finance reform system in a given district in a given year. The more negative β_{1t} is the more equalizing the state funding formula is.[30] Due to the school finance reform history in Tennessee, a more equalized pattern of state aid is expected after implementation of the BEP, although the effect may be delayed some do the phase-in of funding and regulations. The coefficient β_{2t} in equation (5) shows the level of spending inequality across higher and lower income districts by investigating the impact of district wealth on overall per pupil expenditures.

Card and Payne assert that equations (4) and (5) are linked via the budget constraint of the district and by the way in which voters and local governments react to changes in the level of revenue provided by the other levels of government. This is represented by the following

[30] Equation (4) is essentially a reduced form version of the BEP formula in Tennessee. The focus of this essay is on the impact of district wealth and the degree of revenue and expenditure equalization all else equal. This specification has been chosen because it can investigate the impact of current levels of these variables on current year spending. Interestingly, the cost aspect of the BEP is calculated using current figures, while the Fiscal Capacity Index, which equalizes state revenue, is based on the delayed three-year averages previously discussed.

(6) $\rho_{it} = \zeta_{it} + \lambda_{it} + \varphi_{it}$

where λ_{it} represents the revenues that are provided to district *i* in year *t* by the local government, and φ_{it} represents federal funds received by district *i* in year *t*.

Finally, assume that the desired level of per pupil spending in a district is determined by a function

(7) $\rho^{*}_{it}(Y_{it}, \Gamma_{it}, \tau_{it}; \pi_{it})$,

where Y_{it} represents total available resources per pupil in the district and Γ_{it} represents the total amount of outside aid per pupil in the district where $\Gamma_{it} = \zeta_{it} + \varphi_{it}$. Any flypaper effect present in the granting of state and federal funds would be measured as $\partial\rho_{it} / \partial\Gamma_{it}$. In the context of the BEP calculation, Y_{it} would include property and sales tax revenues. The tax price associated with an additional dollar of district level school spending per capita is represented by τ_{it} and π_{it} is a set of district and community characteristics. This aligns well with the BEP in which local spending depends on the amount of funds designated from state and federal sources as well as the level of expenditures determined by local school district bureaucrats and district voters. The level of local spending is primarily determined by school district characteristics such as tax base, special education population, and percentage of school age residents.

The basic premise of Card and Payne's theoretical analysis is that when observing the level of overall spending equity, it doesn't matter which level of government is providing the funding. Increases in overall equity can come from more equitable

spending from local sources, state sources, or a combination of the two.[31] Therefore, it would be inappropriate to include state aid in equation (5). The focus of this essay rests in the relationship between district wealth and total spending without holding the source of revenue constant. State revenue receipts are expected to be negatively related to district wealth due to the fiscal capacity adjustment of the BEP. At the same time, a positive relationship is expected between locally provided funds and district wealth. Since these effects offset, it is important to investigate the *overall* impact of district wealth on total spending on education in Tennessee. This can be accomplished by examining the coefficient β_{2t} in equation (5).

The baseline empirical application analyzes whether or not the BEP reforms in Tennessee have had disproportionate effects on poor and wealthy school districts. In order to accomplish this, an empirical strategy that is modified from that used by Card and Payne (2002) is utilized which directly follows the theoretical model presented above. The procedure must be modified substantially because Card and Payne used cross-sectional analysis and the current analysis utilizes panel data methods. In addition, Card and Payne use state and county level data while the analysis at hand focuses on school district level data.

The variables of particular interest to this analysis are PCI, which measures real per capita income, and PROPTAXBASEPP, which is calculated as the per pupil real assessed property value in each school district. The calculation of property tax base takes both the appraisal and the assessment ratios into account. Therefore, the number

[31] It is highly unlikely that federal government spending would have an effect on overall equity since federal government spending on education is almost entirely based on the number of special education students in a school district.

presented as PROPTAXBASEPP represents the per pupil *taxable* amount of property in each district. Both variables will be used in the analyses that follow as a measure of district wealth. Tennessee is a very diverse state with a wide range of represented incomes. This can be seen in the range of both per capita income and taxable property values in Tennessee school districts and enriches the following analyses of education spending in poor districts relative to spending in wealthy districts.

2.E Empirical Model

The baseline analysis follows Card and Payne by using per-capita income as the local wealth measure rather than property wealth. Card and Payne state that they prefer this option for two reasons. First of all, property wealth tends to be highly correlated with family income and therefore would result in similar results. Between 1989 and 2006 in Tennessee, PCI and PROPTAXBASEPP have a correlation coefficient of 0.65. Secondly, per capita income data are widely available at the county level while property wealth data are more difficult to obtain at the county level. In a subsequent analysis in this essay assessed property value per student will be utilized as the wealth measure as property assessment data for all years and all school districts during the period of analysis has been collected in order to compare these measures of district wealth.

The empirical application introduced by Card and Payne relies on the Bergstrom and Goodman median voter model (1973). Under that model, Bergstrom and Goodman assert that ρ_{it}^{*} is the demand function for education spending at the district level by the median-income voter in the district. ρ_{it}^{*} is independent of Γ_{it}. In other words, in their

median voter model, the median voter's demand function is not dependent on the amount of outside aid received by the district in each year. Instead, it depends on the price of school spending and the district resources that are available. Based on Bergstrom and Goodman's theory, districts all have a taste for education spending given the property tax price and the available resources. After their level of educational demand has been determined, it is not affected by who pays what. It doesn't matter to them by whom it is funded. Local demand for education is not altered if the federal share of spending goes from 9 to 10 percent as long as their tax price remains constant. Bergstrom and Goodman measure tax price as the individual tax share of the median resident. In general, ρ_{it}^{*} represents the process of district-level determination of school spending (Card and Payne, 2002).

Equations (4) and (5) were estimated for the 18 year time period ranging from 1989 to 2006. This allows for an examination of how school district wealth (as measured by real per capita income) impacted both state-provided revenues and overall per pupil expenditures over time. These models will serve as the baseline, with multiple alternate models to follow including a breakdown of the pre-BEP and post-BEP periods and yearly analyses of school aid and spending. In addition to these models, further examinations will investigate the use of per capita income as the primary wealth measure.

2.F Data

The availability of data has severly constrained the ability of researchers to effectively analyze issues related to the consequences of school finance reform. The

usage of Census of Governments or other sporadic data leads to obvious difficulties in examining the immediate and ongoing effects of school finance reform since the datapoints are only observed every fifth year. Because of this, the data could ignore a significant impact whose impact was seen for a period of time less than five years. In addition, in many states, school districts are not conterminous with counties, and therefore, the collection of school district level data is especially daunting. For the current study on Tennessee, a balanced panel spanning 18 years has been collected, much of which had to be collected by hand from Tennessee Department of Education documents. This data represents a tremendous improvement over data used in previous studies analyzing similar topics.

As stated previously, the Basic Education Program was instituted in Tennessee during the 1992-1993 school year, with full funding reached during the 1996-1997 school year. In order to examine the effects of the BEP, data covering a significant period *before* the reform must also be collected. In order to account for this district/county level data for each of the school years has been collected from 1989 to 2006. Data on both school district and county characteristics have been collected. Variables were collected at the district level whenever possible. If data were not available at the school district level, county level data are utilized. The majority of Tennesee school districts are coterminous with the county, so for those districts, county and district data are one in the same.

In order to estimate equations (4) and (5) variables must be collected that may impact the median voter's choice of education expenditures and the state's level of

educational aid. These variables fall into two broad categories: school related variables and community variables. School related variables are generally collected at the school district level and include revenue collected from all sources, number of students, percentage of special education students, and district level school expenditures. Most community variables must be collected at the county level since school district level data are available. One exception is collection of the property tax base data, which were collected at the school district level. Community variables that must be collected at the county level include per capita income, percentage of the population between 5 and 17 years of age and percentage of the population over 65 years of age.

Table 2.5 shows summary statistics for funding-related variables utilized.[32] Local revenues per pupil, LOCALFUNDING, as well as state revenues per pupil, STATEFUNDING, and federal funding per pupil, FEDFUNDING, are presented in Table 2.5. The mean of each variable is shown for selected years. The years chosen are the first year in the analysis, 1989, the first year after the completion of the BEP phase-in, 1998, and the final year of the analysis, 2006. These numbers are calculated on a per pupil basis using average daily membership. All variables utilized in the analyses that follow have been transformed into real values using the yearly consumer price index. All variables are shown in 2006 dollars.

Table 2.6 presents the additional variables utilized in this analysis. The variables PCTSPED, RETENTION, SUSPEND and STUDENTS are used to control for school district characteristics. Additional variables are included to control for community characteristics and demographics including PCT517, PCT65, and UNEMPRATE (which

[32] These variables are defined identically to the same variables presented in Essay 1.

controls for local economic conditions during the period of analysis). One variable is added to the analysis that was not described in Essay 1. This variable, CDFDUMMY, is a variable that has a value of one if the district receives CDF funds in that year and zero if they do not. This variable is included in order to control for the existance of high wages in a district and the fact that these districts spend more per pupil, on average, than non-CDF districts (See Essay 1). Summary statistics are broken down into four time periods. Column 1 presents the mean and standard deviation of the variables for the entire time period, 1989 to 2006. The last three columns show the summary statistics for three specific years: 1989, 1998, and 2006. 1998 was chosen because this is the first year after the completion of the BEP phase-in.

2.G Empirical Results

Panel data ordinary least squares fixed effects models were run in order to estimate both β_1 and β_2 presented in the theoretical model in equations 4 and 5. This estimator was chosen given the availability of a balanced yearly panel with full population data. Both district and year effects are used in the panel data analyses.[33] Results are presented below in Table 2.7. [34]

As expected, the coefficient estimate β_1 (the coefficient of PCIREAL in the STATEFUNDING model) is negative and significant. This demonstrates that the higher

[33] The specific results related to the year fixed effects are not included in the results tables throughout the paper due to space limitations. These results are available by request from the author.

[34] All analyses included in this essay using the 18 year panel were also conducted using only those years available in the Census of Governments in order to compare this analysis to Card and Payne (2002) in which they use Census of Governments as the primary data source. In this case, the years analyzed were 1992, 1997 and 2002. Results were tremendously different in all cases with inconsistencies seen in the significance and signs of the variables included. Further analysis is being conducted on this topic for a future project.

county per capita income is in a district, the less state funds they will receive. Since the BEP formula equalizes state funds based on local wealth, which is highly correlated with per capita incomes, this is the anticipated result. Specifically, a $1,000 increase in per capita income results in a decrease in per pupil state revenue of just over $62. The variable PHASEIN is positive and highly significant in both models showing that both state revenues and overall education spending increased significantly during the phase-in period. The coefficient of PHASEIN in the STATEFUNDING model is larger than that in the CURSPENDING model which indicates that overall current spending did not reflect the total increase in STATEFUNDING during that period. This is consistent with the findings in Essay 1 which show a decrease in local funding during the phase-in period.

The coefficients of PCT65 and PCTSPED are both negative and significant in the STATEFUNDING model. PCT65 is likely negative because the higher the percentage of elderly residents in a district, the lower the percentage of school-age children. An increase in the percentage of elderly residents may therefore decrease the state's burden of education provision in that district. It may also reflect the lower sales tax revenues associated with a higher percentage of elderly residents. The coefficient of PCTSPED is likely driven by the availability of federal funds for special education programs. The majority of special education funds are provided by the federal government, and these funds may offset programs that the state government would otherwise choose to partially fund (for example, reading and extracurricular programs).

The fact that the coefficient of STUDENTS is negative and significant in both models, given the controls for other variables in per pupil terms, may relate to the lower number of students per school in smaller districts. For instance, some Tennessee school districts are so small that they contain only one school. Even though the school is small, they are still allotted a principal and at least one teacher per grade via the BEP. Therefore, the BEP may provide a higher level of instructional expenditures per pupil in small schools than is seen in schools in larger districts (e.g. one principal per 354 elementary students in the Richard City School District compared to one principal per 820 elementary students in the Memphis City School District.)

The coefficient estimate β_2 (the coefficient of PCI in the CURSPENDING model) is positive and significant, revealing that an increase in per capita income during the period of analysis increases per pupil current expenditures. The results show that a $1,000 increase in per capita income results in a $34.12 increase in per pupil current education expenditures. These results correspond well with the results found in Card and Payne (2002) which also show a negative relationship between wealth and state funding and a positive relationship (in most cases) between district wealth and per pupil spending.

In the CURSPENDING model the coefficients of PCT517 and PCT65 are both negative and significant. The negative coefficient of PCT517 likely reflects the burden school districts face when a large percentage of residents are enrolled in the public school system. The sign of the coefficient for PCT65 may reflect the lower tax revenues associated with a higher percentage of elderly residents. This result is commonly seen in the education finance literature (See Poterba, 1997). SUSPENSION is also highly

significant and has a positive coefficient, showing that districts with more behavioral issues spend more per pupil. In the CURSPENDING model CDFDUMMY is also positive and significant as expected. This indicates that districts who received the CDF, and had relatively high wage structures, spent more per pupil than those who did not. This may be due to several factors including the existence of higher costs and/or higher tastes for education.

These results illustrate that state funding in Tennessee, primarily driven by the BEP during the time period analyzed, was equalized between poor and local districts on the basis of per capita incomes. However, the results of the per pupil spending equation show that a gap in school spending based on income remains between Tennessee school districts. Mean per capita income in Tennessee counties was $26,949 in 2006. The range however was from $16,176 to $49,990. This is nearly a $34,000 gap in per capita income. Based on these results, school spending in these two counties would be expected to differ by $1,160. In actuality these two districts had a gap in per pupil expenditures of just over $2,200 ($7,547 compared to $9,825). This is obviously a significant difference, especially considering that mean per pupil current spending in Tennessee was only slightly above $6,670 in 2006.

While the panel analysis gives some insight into the redistributive nature of the BEP, it does not allow us to observe how these effects evolved over time. For instance, have state revenues per pupil become more or less redistributive since BEP implementation? An examination of the per pupil spending data show a widening of the gap between rich and poor district spending beginning after 1999. This is shown in

Figure 2.1 which examines the difference (gap) in spending between school districts in the top 10 percent of PCI (the rich) and the bottom 10 percent of PCI (the poor).

Figure 2.1 shows that the gap between district spending in the years leading up to the BEP was quite large, maximizing at nearly $1,500 in 1991. This gap decreased significantly throughout the phase-in period of the BEP, reaching a minimum of $60 in 1999. Nothing significant changed regarding the BEP in 1999. However, this was the first year following the full funding of the BEP, so the changes may reflect the end of the phase-in and a return to the education tastes and district behavior seen prior to BEP implementation. From 2000 until 2004 the gap in spending between rich and poor districts widened yet again. In the last two years of the analysis the gap appears to have narrowed. The narrowing of the spending gap at the end of the analysis may be due to a change to the BEP implemented in 2005. Between 1993 and 2004 school districts were required to supply 25 percent of instructional classroom costs calculated via the BEP. In 2005 the required provision was increased to 35 percent (in other words, the state decreased their provision of instructional classroom costs from 75 percent to 65 percent). This may have forced school districts that chose to maintain low levels of spending at or near the state requirement to expand their spending at an increased rate.

In a 2008 analysis, Arroyo examines the funding gap in states across the country between 1999 and 2005. She uses the districts with the highest levels of poverty (top 25 percent) to represent the poor districts and districts with the lowest levels of poverty (bottom 25 percent) to represent the rich districts. She finds that Tennessee is one of 16 states in the United States in which the funding gap between high-poverty and low-

poverty districts increased by more than $200 a student between 1999 and 2005.[35] This finding is supported by the data presented in Figure 2.1. In addition, she concludes that Tennessee has one of the largest funding gaps in the nation. While the gap in spending can be seen by simply glimpsing at the data, further statistical analysis is needed, that examines all districts, in order to tell if state supported spending has become less sensitive to changes in per capita income in recent years, or if the observed inequities are coming from differences in local spending.

Pre- and Post-BEP Analyses

In order to examine the possibility of differential effects after BEP implementation, further analyses were conducted. The first splits the previous period of analysis (1989 to 2006) into two time periods: pre-BEP and post-BEP. The pre-BEP time period runs from 1989 to 1992. The post-BEP period is from 1993 until 2006. Fixed effects panel regressions were conducted using both dependent variables shown previously, state revenues per pupil and per pupil current spending, as well as local revenues per pupil.[36] Both district and year fixed effects were included in the regressions.[37] Tables2.8 and2.9 present the results from these analyses.

When only those years prior to the BEP are analyzed, per capita income surprisingly does not have a significant impact on any of the three dependent variables utilized. This result implies that, when controlling for year and district fixed effects, per

[35] Other states whose funding gap increased include: Florida, Idaho, Illinois, Kansas, Maine, Missouri, Nebraska, Nevada, New Hampshire, North Carolina, South Carolina, Texas, Vermont, Virginia, and Wisconsin.
[36] Hausman tests were conducted in order to test the appropriateness of fixed vs. random effects for all models.
[37] These results are not shown in the following tables. The same is true for all remaining analyses. Fixed effect results are available by request from the author.

capita income was not the driving force of the spending gap between rich and poor districts. The only variable that is consistently significant is the percentage of special education students in a district which has a positive and significant impact on each of the three dependent variables. The positive impact of percentage of special education students on STATEFUNDING during the pre-BEP period is opposite of what is seen in the analysis of the full time period. This is likely due to the significant special education legislation that occurred during the 1990s and early 2000s including the Individual with Disabilities Act of 1990 and the No Child Left Behind Act of 2001. These laws reduced the burden of local and state governments with regard to special education provision and increased federal funds for the purpose of educating those students with special needs.

The post-BEP analysis, shown in Figure 2.5, results in very different coefficients than those seen previously. Hausman tests confirm that the results are statistically different in all three cases. Of particular interest is the significance of the per capita income variable in the post-BEP period. As was previously discussed, the BEP adjusted state funding based on fiscal capacity, which is a statistical measure of district wealth. The Fiscal Capacity Index used to equalize state aid in Tennessee included per capita income as part of the calculation of district capacity. Therefore, it would be surprising if these coefficients were insignificant. As anticipated, an increase in per capita income leads to a decrease in state revenues.

The relationship between PCI and LOCALFUNDING is positive and significant, which is expected given the structure of the BEP, under which local governments can raise as much revenue for local education funding as they prefer. Districts of higher

wealth can collect education revenues at a relatively lower price and will therefore be expected to collect a larger amount of per pupil local funds than districts of lower wealth. In addition, it is possible that districts with higher levels of wealth have a higher taste for education, on average, and would therefore expend more for education at the local level. The post-BEP model also shows a positive and significant relationship between PCI and CURSPENDING. Given the fact that PCI has a negative impact on state funding and a positive impact on local funding, the coefficient of PCI in the CURSPENDING model depends on which effect is larger. Examining the magnitudes of the PCI coefficient in each model shows that the increase in per pupil expenditures associated with an increase in per capita income is primarily driven by the increase in locally provided revenues.

The coefficient of PHASEIN is negative and significant in each of the three analyses. The negative coefficient in the STATEFUNDING model may seem surprising at first glance, especially since it was positive in the full panel analysis, but it is important to remember that only those years *after* BEP implementation are included in this model. Since state funding was ramped up during the phase-in period, it makes sense for state funding to have been lower during the initial phase-in years than it was once full-funding was achieved. The story is the same for PHASEIN in the CURSPENDING model. Overall current spending was lower during the phase-in, all else equal, than it was after full-funding was complete.

The variable CDFDUMMY is also worth further examination. The coefficient of CDFDUMMY in the STATEFUNDING model and the CURSPENDING model is positive and highly significant. Those districts who qualified for the CDF received

significantly more funds per pupil, all else equal. In addition the coefficient in the CURSPENDING model shows that this increase in state funds via the BEP was translated into a significant increase in per pupil expenditures. The coefficient of CDFDUMMY in the LOCALFUNDING model is negative and significant at the 10 percent level. This shows that districts receiving CDF funds spent less money per pupil from local sources than those who did not. These findings correspond well with the findings previously presented in Essay 1.

These results are important because they show that examining school revenues over a long time period, and across multiple school finance systems, can be a bit misleading. The coefficient related to per capita income's impact on state revenues for 1989 to 2006 was -0.062. However, when we limit the time period of analysis to those years after school finance reform, the value of the same coefficient is only -0.024. Similarly, the primary regression overestimated the impact of per capita income on current per pupil expenditures because of the equalizing nature of the school finance system post-BEP. In order to deepen the analysis to examine the path of these impacts over time, yearly analyses should be considered.

Yearly Analyses

In an attempt to break the results down even further, yearly analyses were conducted using OLS regression analysis. This allows a year-by-year examination of the time period included in the full panel analysis previously presented. In addition, special attention can be paid to the time period since 1999 when the gap in school spending

appears to have widened between the richest and poorest school districts in Tennessee. The fact that spending patterns of rich and poor schools changed around 1999 may not be surprising since the BEP was fully phased-in the year before. Previous examinations in Essay 1 showed a negative relationship between spending at the local level during the BEP phase-in period. Once this period was over, districts may have altered their behavior. Table 2.10 presents the results for the yearly regression analyses using real current per pupil expenditures as the dependent variable. Only significant coefficients are presented. Coefficients shown in italics are significant only at the ten percent confident level. All others are significant at the five percent level or above.

The coefficient related to per capita income, β_1, is positive in all years that the coefficient is significant. This shows that higher per capita income is generally associated with a higher level of per pupil spending. There is an interesting pattern that emerges over time. Prior to BEP implementation (1989-1992) β_1 is positive, significant, and larger than is seen in the majority of the later years.[38] This is expected, as the BEP provided greater equalization than the foundation program that existed prior to the BEP. Interestingly, per capita income is not a significant determinant of per pupil current spending during any of the years in which the BEP was phased in. In the phase-in years per capita income had no distinguishable effect on per pupil current spending in Tennessee. This may indicate a great deal of equalization on the basis of income in school spending during that period and may reinforce the previously calculated equity

[38] This is a particularly interesting result when compared to the pre-BEP panel analysis which found PCI to be an insignificant determinant of per pupil expenditures. It is not clear exactly what leads to the difference seen in the two analyses, but it is likely due to the inclusion of school district fixed effects in the panel data model.

measures that show a significant improvement in spending equity during the phase-in period. It is also possible that the tremendous growth in state funds during this period reduced the impact that taste for education (which worked through income) had on per pupil spending. The analysis shows that a year before BEP implementation, in 1992, a $1,000 increase in per capita income was expected to coincide with $62 more in per pupil spending, all other things equal. At the end of the BEP phase-in, in 1998, this had dropped to only $20 more in per pupil spending. The relationship between per capita income and per pupil spending was cut by more 65 percent during the BEP phase-in.

After that period, beginning in 1999, the coefficient relating per capita income and per pupil current spending once again becomes positive and significant, representing a strengthening of that relationship when compared to the phase-in years. This at least partially explains the widening of the spending gap between rich and poor districts since 1999 as shown in Figure 2.1. This likely reflects a return to the district behavior seen prior to the implementation of the BEP. School districts with a higher ability to raise local revenues increased their own source funds at a rate significantly higher than those districts with a lower ability to pay. Since there is no cap on the amount of revenue raised at the local level, the gap between wealthy and poor districts began to widen again. It is also likely that these wealthy districts had a relatively higher taste for education than poor districts and that these tastes were reflected in the widening of the spending gap. Towards the end of the period of analysis, the relationship between PCI and CURSPENDING was similar to levels seen prior to the BEP.

In addition to the per capita income variable there are other variables of note in this analysis. One key variable, CDFDUMMY, is positive and significant in each year since BEP implementation. This variable represents whether or not the district has been distinguished as a high wage area and has received CDF funds. This result shows that districts in high wage areas spend more money per pupil than those not in high wage counties. This result appears to have lessened after the phase-in period, only to strengthen again after 1999. By 2004, being designated as high wage, all else constant, was associated with an increase in spending of over $1,000 per pupil.

The coefficient related to the percentage of school age children in the county, PCT517, is negative and significant in most years. This may be attributed to two things. First of all, a county with a higher population of school age children may very well have a lower working age population. A jurisdiction with fewer workers is likely to have a lower level of assessed property and taxable sales, all else constant. Secondly, a county with a high share of school age children would have to collect more revenue than a county with a lower population of school age children in order to maintain the same level of per pupil expenditures. Having a larger population of school aged children is a burden to a school district. The coefficient related to PCTSPED is positive and significant in all years of the analysis. This is expected since special education students have special needs which require expenditures above and beyond those spent on traditional students.

Yearly analyses examining the path of β_2 (the relationship between PCI and STATEFUNDING) were also conducted. These regressions, which use state revenues per pupil as the dependent variable, give greater insight into the equalization of revenue

provided by the BEP. In 1989, the first year of the analysis, an increase in $1,000 of per capita income only led to a decrease of $14 in per pupil state revenues. However, by the end of the analysis in 2006 this number had grown to $83. This is a tremendous change, and is one that occurred gradually over time throughout the analysis. There are two years in which the yearly change in β_2 is highly significant: 1993 and 1997.[39] This result is not overly surprising since they represent the beginning and end of the phase-in period. The yearly results from these regressions are presented in Table 2.11.

As with the previous table, only significant results are shown. The relationship between per capita income and per pupil state revenues is negative throughout the analysis period. In nearly all cases, the coefficient (β_2) becomes more negative each year. This shows that the provision of state revenues in Tennessee has become much more equalized over time with respect to per capita income levels. This is an interesting outcome given the stability of the Fiscal Capacity Index used to distribute BEP funds. There were no major changes to this formula after BEP implementation. So why would the BEP have become more equalizing over time? Since there was no change to the formula itself, it must be due to changes in the factors included in the formula. As described previously, the Fiscal Capacity Index used per capita income as well as property and sales tax bases in order to calculate district capacity. The capacity numbers were then translated into the Fiscal Capacity Index which represented each school district's capacity as a percentage of the state's total capacity. Therefore, if the wealthy districts' relative capacity increased over time and the poor districts' relative capacity decreased over time, the BEP would become more equalizing. This aligns well with the

[39] This was determined via an F-test.

equity measures presented previously which show an increase in per pupil state revenue equity over time.

The analysis of state revenues per pupil shows a consistently positive relationship between CDF recipients and state revenues. This is expected since CDF funds were provided by the state to high wage districts. For the first few years of the analysis the percentage of special education students in a district was a positive and significant determinant of state funding.[40] In the later years of the analysis it is no longer significant. This change may be due to the federal government's increased commitment to special education funding through the passage of several recent legislative acts regarding special education. The majority of federal funding for K-12 education is provided for the imparting of special education services. This commitment was accelerated most recently with the passage of the No Child Left Behind Act in 2001.

The yearly regressions related to β_1 and β_2 leave an additional question unanswered. If state revenues are becoming *more* equalized over time and the coefficient of β_2 remains strongly negative and significant, why has β_1 remained positive and significant? In addition why has β_1 increased since the phase-in period when it was insignificant? In other words, if the state provision of revenues continues to be more equalizing on the basis of district wealth, why has the gap between spending based on per capita income widened since the completion of the BEP phase-in?

[40] The percentage of special education students in each district is included as a component of the BEP calculation. Specifically, having a larger number of special education students leads to a larger number of allotted teaching positions and a higher level of other classroom allocations such as classroom materials and instructional equipment.

In order to analyze this further an additional yearly analysis was conducted using *local* per pupil revenues as the dependent variable.[41] Based on the previous analyses, the relationship between PCI and LOCALFUNDING is expected to lessen after the implementation of the BEP and then strengthen again after the phase-in period. This is due to the ability of local governments to raise local funds for education over and above that provided by the state. Local governments with a high taste for education tend to have higher levels of educational attainment, and therefore have higher levels of per capita income. Over time, as the BEP implementation was phased-in, districts with high tastes for education, and those for which raising local funds is relatively less expensive, would be expected to continue to raise a great deal of funds at the local level. On the contrary, districts with a lower taste for education expenditures, and those for which raising local funds is relatively more expensive, may have backed off of local revenue raising due to the increased state funding provided by the BEP.

Table 2.12 presents the results of the yearly regression using LOCALFUNDING as the dependent variable. The results show that the coefficient on per capita income is positive as would be expected. It also confirms the expected behavioral effects related to income and changes in local spending. The specification of the model is identical to the model used to estimate yearly estimates of β_1 and β_2 except for the change in dependent variable.

As anticipated, the coefficient related to per capita income is positive and significant throughout the analysis. It is much more interesting, however, to note the

[41] A panel model using local revenues as the dependent variable was also analyzed and results were in line with the yearly results currently presented as well as the results seen in Essay 1.

changes in the coefficient over time. In the first year of the BEP (during the 1992-1993 school year) the coefficient is 0.094. This illustrates that a $1,000 increase in per capita income would lead to a $94 increase in per pupil local education revenues. In the final year of the analysis, 2006, the coefficient is 0.167, meaning that a $1,000 increase in per capita income results in a $167 increase in per pupil local revenues. This is nearly a 76 percent increase from the first year of the BEP. And, more importantly, by 2006 it is significantly higher than the levels seen prior to the BEP. More specifically, beginning in 2000, the coefficient of PCI is higher than those seen prior to BEP implementation. Since the BEP has caused greater equalization of state revenues, districts in high income counties may have needed to collect a larger amount of local revenues in order to maintain relative spending levels.

These coefficients are very revealing because we can now compare the impact of an increase in per capita income on both state and local revenues over time. We can do this by examining the sum of the coefficients presented in Tables 2.11 and 2.12. The first two years after BEP implementation actually resulted in a relationship between combined per capita income and state and local revenues that was much lower than that seen prior to the BEP. According to the results, in 1992, a $1,000 increase in per capita income would have resulted in an increase in overall state and local school revenues of $98. A $1,000 increase in per capita income in 1993, the year of BEP implementation, would have resulted in an increase in revenues of only $65. The effect on overall state and local revenues rebounded in 1994, but fell steadily past that point throughout the remaining years of the phase-in. In 2000 the combined impact on state and local revenues jumped

over 100 percent to 0.58 and climbed to 0.75 in 2001. This number continued to climb until 2004. This provides an explanation for the gap between spending in the richest and poorest school districts that began to widen after 1999 and then began to narrow again after 2004.

Property Tax Base vs. Per Capita Income

Thus far, this analysis has been consistent with that of Card and Payne (2002) in which they used per capita income as a measure of local wealth even though most states, including Tennessee, use property wealth as the basis for equalization. Card and Payne state that they chose to use per capita income due to data limitations and the close relationship between income and property wealth. While per capita income and per pupil property tax base are correlated in Tennessee, they are far from being perfectly correlated with a correlation coefficient of 0.65. Therefore, per capita income may not be the most appropriate measure of school district wealth in the case of Tennessee.

For the current analysis, property assessment data were collected for all school districts in Tennessee for all 18 years. Thus, similar models can be conducted in which district wealth is measured as assessed property values per pupil. As was previously stated, the assessed property value amount takes appraisal and assessment ratios into consideration, and therefore represents the total *taxable* value of all district property. This amount was divided by the number of pupils in each district in order to calculate the

per pupil taxable property in each district. Table 2.13 presents the results of a panel data fixed effects model in which property base per pupil is utilized.[42]

These results are very similar to those in which per capita income served as a proxy for school district wealth. The same variables are significant in both sets of analyses and have comparable magnitudes. The PROPTAXBASEPP coefficient can be interpreted as follows. A $1,000 increase in per pupil assessed property value is expected to result in a decrease in state revenues of $26 per pupil. Put in alternative terms, operating from the mean, a one percent increase in the property tax base per pupil is associated with a 0.08 percent decrease in state revenues.

Additional yearly analyses, identical to those previously performed, were run in order to compare the use of per capita income versus assessed property value. The results for the regressions using real current expenditures as the dependent variable are shown in Table 2.14. The results are similar in magnitude and scope to those seen when per capita income was used rather than property wealth. The coefficient estimate related to per pupil assessed property is positive and significant in all years analyzed. The coefficients range from 0.033 to 0.076. For the year 2000, the coefficient related to per pupil assessed property value for 2000 is 0.044. This means that a $1,000 increase in per pupil assessed property would increase per pupil expenditures by $44. Mean per pupil assessed property value in 2000 is $101,120and mean per pupil current expenditure is $5,974. This reveals that, moving from the mean, an increase in per pupil assessed property to $102,120, a 0.99 percent increase in per pupil assessment, would result in an increase in per pupil

[42] This model is identical to that shown in Table 2.7 with the exception of the replacement of per capita income by per pupil property tax base.

expenditures to $6,018, an increase of 0.07 percent. The remaining coefficients show a very similar pattern to that seen when per capita income was used as the wealth measure. Per capita income appears to be a good proxy for property value when examining the impact of district wealth on per pupil expenditures over the entire time period studied.

Using property wealth rather than per capita income as a measure of district wealth leads to more significant differences in the case of the state and local revenue regressions. Table 2.15 presents the results of the regression analysis using state revenues per pupil as the dependent variable. The most significant difference comes in the significance of the primary wealth measure. While PCI was a significant determinant of state funding in all years, PROPTAXBASEPP is only significant after the implementation of the BEP. This may reflect the inclusion of property tax base as a part of the Fiscal Capacity Index used to equalize BEP funds.

It is important to remember, given the fact that the Fiscal Capacity Index was calculated using regression analysis, that PCI and PROPTAXBASEPP would not have been given equal weight in the fiscal capacity calculation. In fact, the weights assigned to each Fiscal Capacity Index component changed on a yearly basis. Remember, too, that these weights were based on a three-year average of variables in which the data collection may have been significantly delayed. This can lead to significant differences based on the wealth measure utilized. Because most school finance systems equalize based at least partially on property tax base, it may be inappropriate to utilize PCI as the primary wealth measure given the varied results.

When per capita income was used as the measure of district wealth, the existence of high wages in a county (CDFDUMMY) was always positive and highly significant in the state revenue equation. However, when property values are used instead, the existence of high wages is rarely significant. This is likely due to a positive relationship between high wage districts and property values. An area with high wages is likely to have higher values of both residential and commercial properties. When PCI is used as the sole wealth measure, the coefficient of CDFDUMMY may be picking up some additional district wealth effects due to high tax bases in those districts. Although the existence of high wages is not significant in the state revenue regression, it is significant in half of the years analyzed in the local revenue regression.

In the state revenue per pupil regression, presented in Table 2.15, a higher level of per pupil assessed property is generally associated with lower amounts of state education funding. As expected, this number increases post-BEP. An additional analysis was conducted considering the impact of PROPTAXBASEPP on LOCALFUNDING. As in previous analyses, an increase in district wealth leads to an increase in per pupil local revenues when assessed property is used as the district wealth measure. Table 2.16 below presents these results.

Using property values as the measure of district wealth shows relatively similar coefficients to those seen when per capita income was used, however some coefficients do differ between the models in both sign and significance. Therefore, while it cannot be said that per capita incomes are an inappropriate proxy for district wealth when

examining local expenditures, they certainly do not appear to be a perfect substitute for the use of that data.

In order to examine the overall effect on state and local revenues both sets of coefficients must be examined. In all 18 years of the analysis the increase in per pupil local revenues associated with a property wealth increase outweighs the decrease associated with per pupil state revenues. The combined effect of an increase in property wealth on state and local revenues decreases between 1997 and 2000. Between 2000 and 2002 the effect begins to increase. Once again, this is able to partially explain the widening gap in spending between rich and poor schools that appears beginning in 1999.

These results as a whole show that while state revenues have become more equalizing with poorer districts receiving relatively more revenue from the state over time, local revenues have become less equal with relatively wealthy districts collecting significantly more revenue per pupil than their less wealthy counterparts. This is not surprising considering the lack of controls on local level funding in the BEP discussed in Essay 1. The nominal maintenance of effort requirement is certainly not sufficient to eliminate the gap in spending between rich and poor districts. If the state of Tennessee desired to lessen this gap considerably, or eliminate it altogether, much more stringent regulations on local funding would be required, such as a revenue cap (as seen in California) or a recapture mechanism (as seen in Texas). Why might this be very important? Tennessee has now faced three reincarnations of the initial *Small Schools v. McWherter* case. While the most recent case was dismissed, this certainly does not mean that another equity case could not be brought upon Tennessee based on the claim of

continued inequities in Tennessee school funding. The state of California's Supreme Court has now mandated that the gap between the highest level of per pupil expenditures and the lowest level of per pupil expenditures can be no more than $300 per pupil. In 2006, the same gap in Tennessee remained at over $4,400. California led the way with the *Serrano* case in the 1970s. If California continues to lead the school finance reform trend, Tennessee may have to eliminate this differentiation in spending at some point. Adding to this concern is the fact that Tennessee has not yet faced an adequacy suit, which has become the new wave of school finance litigation. Therefore, Tennessee may face an adequacy challenge in the future as well.

In their 1992 finding, the Tennessee Supreme Court found that the Tennessee General Assembly must "maintain and support a system of free public schools that affords equal educational opportunities to students in small counties as well as large, and rural counties as well as urban" (TN Code Ann.). In the General Assembly's legislation related to the court finding later that year, The Education Improvement Act of 1992 directed the Tennessee State Board of Education to "develop and adopt policies, formulas, and guidelines for the fair and equitable distribution and use of public funds among public schools and for the funding of all requirements of state laws, rules, regulations and other required expenses" (Tenn. Code Ann. § 49-3-351 et seq.). It will be up to the courts to decide, but it seems well within reason for a $4,400 gap to be considered inequitable. Allowing the gap in spending to remain leaves Tennessee open for further challenges and the potential for another round of fundamental education finance reform.

Tennessee's switch to the BEP 2.0 in 2007 may lessen this gap somewhat due to its change in fiscal capacity formula. The BEP 2.0 includes a much simplified formula in which tax rates are calculated for each county as the average use of property and sales tax base by local governments. However, the BEP 2.0 is vastly similar to the BEP and does not include additional mechanisms to deal with the funding gap. It is highly unlikely that the BEP 2.0 will eliminate the gap, but it is wholly possible that it could decrease significantly.

2.H Conclusion

Currently there is no limit to the amount of revenue that can be raised and spent locally in Tennessee. There is no property tax cap and there is no spending limit set by the Tennessee Department of Education. Therefore, rich districts can continue to increase spending by taxing their large property and sales tax bases. Poor districts, which have much smaller tax bases, may be much more constrained in regard to the raising of local school revenues. In addition, differing tastes for education between rich districts and poor districts may also lead to a gap in local spending between these districts. If the goal is true equalization, or total equity, with regards to school spending, then the state would have to ensure that rich districts could not increase their spending past some fixed level. Hawaii has accomplished this by collecting all school revenues at the state level and dividing it up equally per student. Without an extreme measure such as this, it would be relatively difficult to prevent the rich/poor school spending gap.

Arroyo (2008) comments that states that have been successful in narrowing the funding gap between rich and poor school districts have generally employed two tactics.

First of all, they have taken more responsibility for overall education funding at the state level. This can be done like in Hawaii, where all funding goes through the state, or it can be accomplished via strict regulations of local spending. Introducing a recapture mechanism or a cap on local spending gives states a great deal of control over the amount of money spent on education at the local level. Secondly, states that have been successful in narrowing the gap have used state money to target student needs and have compensated districts based on the district's ability to pay for education. Tennessee's program does a relatively good job of equalizing based on ability to pay. The BEP formula, as well as the new BEP 2.0, calculate the fiscal capacity of each district and distribute state funds accordingly. Therefore, it appears that a substantial narrowing of Tennessee's gap would likely take increased state control over local spending since they are already employing an ability to pay system.

It is important to remember that states may not desire to completely eliminate the rich/poor gap. The previous analyses showed that overall spending equity has been improved in Tennessee since before BEP implementation. That may have been the only desired outcome with regard to equity. If Tennessee lawmakers desired to entirely eliminate the differential in funding between poor and rich districts they could have easily incorporated a local spending cap or a recapture mechanism that would have aided in the accomplishment of that goal. The fact that those mechanisms were not included, lends credence to the idea that an elimination of the gap was not of top priority.

Choosing a school finance system that is not totally wealth neutralizing may be good policy. The improvement of education spending equity between school districts

that has resulted from many school finance equity-based court challenges comes with considerable costs beyond the increased state dollars provided. By making spending equal across school districts, and therefore reducing the choices available to the local school district, a decrease in education provision efficiency should be expected. This comes about through the breakdown of the well-known Tiebout model in which citizens can sort themselves into homogenous communities that align with their taste for public goods. If all school districts in Tennessee were forced to provide the same level of education, there would be little incentive for citizens to vote with their feet and sort into new communities based on education provision. This would result in school districts with identical spending levels in which residents with very different tastes for education would reside.

From an equity viewpoint, this is fine. However, this is certainly less than desirable from an efficiency standpoint. The provision of public education would likely be much less efficient under a school finance system that aimed for complete wealth neutrality (equity). Why is the reduction of efficiency so important in today's education market? The answer lies in the importance of adequacy. While the efficiency argument would not likely play a significant role in an equity-based court challenge, efficiency of education provision would be very important in the provision of an adequate education. A less efficient system may mean lower student attainment, and therefore more difficulty in providing students with what would be considered adequate.[43] As stated earlier, the majority of new school finance system challenges today are adequacy based. Therefore,

[43] Student attainment may be lessened by a decrease in education efficiency because of the difficulty of educating students from different backgrounds and with dramatically different tastes for education.

states may be forced to confront issues related to both equity and adequacy within school districts. In the end having an equitable system while maintaining an adequate system may not be wholly possible because of the tradeoff between equity and efficiency.

Tennessee is a unique state due to the wide amount of variation seen in both per capita incomes and property values across the state. Therefore an examination of Tennessee provides interesting insight into the anticipated effect of school finance equalization reform in states with diverse economic populations. Nearly all school finance studies conducted on the subject of poor vs. rich responses have been conducted at the state level. Using district-level data allows for a distinctive analysis of the intra-state responses to school finance equalization. In addition, the dataset collected allows a much more thorough analysis to be conducted of the impact of increased school aid than has been conducted previously. Lastly, the data collected allow for a thorough analysis of the pre-BEP and post-BEP effects. Much of the existing literature does not utilize a full panel of data and cannot accurately examine the pre-reform and post-reform impacts. Most commonly studies utilize cross-sectional data or a non-yearly panel, such as the Census of Governments which allow for very few years of analysis.[44]

Results included in this analysis highlight the importance of not only examining all years of a reform when at all possible, but also the importance of using an appropriate measure of district wealth. Although this variable may be difficult to obtain in many cases, the difference seen with regards to locally-provided revenues in models using income versus models using property wealth as an explanatory variable shows that per

[44] For example, the Card and Payne (2002) study uses data from only the 1977 and 1992 Census of Governments.

capita income cannot be substituted freely as a measure of district wealth as it has been in many previous studies.[45]

As previously mentioned, the state of Tennessee transitioned from the BEP to the BEP 2.0 during the 2007-2008 school year. While the BEP 2.0 contains a new fiscal capacity measure, and has eliminated the use of the CDF, it does not contain any limits on local funding. It also continues the use of a nominal maintenance of effort rather than a maintenance of tax effort requirement. It will be very interesting in coming years to analyze whether this switch to the BEP 2.0 will again narrow the gap in spending between rich and poor districts as was seen in the early years of the BEP. In addition, if the BEP 2.0 remains in place for several years it will be interesting to see if it can sustain a narrowing of the gap between those districts. However, because of the constantly evolving nature of school finance reform, chances are great that the BEP 2.0 will not remain in its current form for long before it is challenged by some group striving for greater equity or adequacy in Tennessee schools.

[45] For a future research project, data will hopefully be obtained that provides the exact measure of fiscal capacity used by TACIR in their calculation of the Fiscal Capacity Index. This amount will then be analyzed as a more appropriate measure of district wealth.

APPENDIX

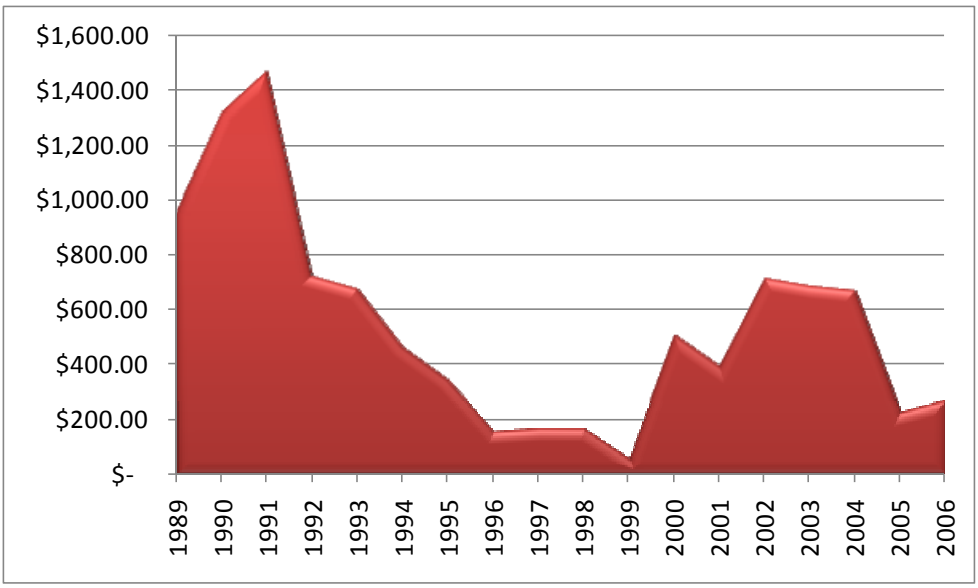

Figure 2.1
Gap in Spending Between Rich and Poor School Districts

Table 2.1
Current Spending Equity Measures

	Federal Range Ratio	90/10 Ratio	Coefficient of Variation	Gini Coefficient	Theil's T-Statistic
1989	0.418	1.468	0.173	0.088	0.014
1990	0.424	1.449	0.165	0.085	0.013
1991	0.404	1.420	0.154	0.082	0.011
1992	0.406	1.496	0.170	0.088	0.014
1993	0.363	1.424	0.146	0.076	0.010
1994	0.355	1.403	0.144	0.074	0.010
1995	0.374	1.401	0.139	0.073	0.009
1996	0.354	1.414	0.137	0.073	0.009
1997	0.359	1.362	0.141	0.073	0.009
1998	0.347	1.339	0.131	0.069	0.008
1999	0.356	1.355	0.130	0.069	0.008
2000	0.334	1.358	0.122	0.065	0.007
2001	0.324	1.334	0.123	0.065	0.007
2002	0.339	1.321	0.125	0.066	0.007
2003	0.324	1.305	0.123	0.065	0.007
2004	0.317	1.332	0.123	0.064	0.007
2005	0.301	1.311	0.114	0.060	0.006
2006	0.306	1.308	0.116	0.062	0.006

Table 2.2
Local Revenue Equity Measures

	Federal Range Ratio	90/10 Ratio	Coefficient of Variation	Gini Coefficient	Theil's T-Statistic
1989	0.743	2.672	0.461	0.232	0.091
1990	0.737	2.928	0.447	0.230	0.087
1991	0.719	2.782	0.428	0.221	0.081
1992	0.743	2.872	0.462	0.235	0.092
1993	0.763	2.948	0.469	0.238	0.095
1994	0.761	3.144	0.468	0.240	0.095
1995	0.755	3.006	0.464	0.238	0.094
1996	0.757	2.840	0.475	0.243	0.098
1997	0.783	3.105	0.488	0.251	0.104
1998	0.779	3.082	0.492	0.252	0.105
1999	0.767	3.358	0.489	0.253	0.104
2000	0.768	3.349	0.496	0.254	0.106
2001	0.794	3.362	0.519	0.262	0.114
2002	0.789	3.360	0.541	0.267	0.121
2003	0.766	3.440	0.498	0.258	0.108
2004	0.781	3.572	0.515	0.265	0.115
2005	0.778	3.422	0.506	0.260	0.111
2006	0.774	3.647	0.536	0.271	0.122

Table 2.3
State Revenue Equity Measures

	Federal Range Ratio	90/10 Ratio	Coefficient of Variation	Gini Coefficient	Theil's T-Statistic
1989	0.234	1.223	0.091	0.047	0.004
1990	0.249	1.247	0.092	0.047	0.004
1991	0.255	1.231	0.095	0.048	0.004
1992	0.262	1.243	0.097	0.051	0.005
1993	0.233	1.228	0.089	0.046	0.004
1994	0.271	1.254	0.097	0.051	0.005
1995	0.296	1.310	0.105	0.058	0.005
1996	0.340	1.318	0.117	0.064	0.007
1997	0.356	1.378	0.126	0.070	0.008
1998	0.352	1.430	0.136	0.076	0.009
1999	0.368	1.441	0.136	0.076	0.009
2000	0.373	1.439	0.139	0.078	0.010
2001	0.368	1.460	0.138	0.077	0.009
2002	0.362	1.448	0.141	0.079	0.010
2003	0.364	1.512	0.142	0.080	0.010
2004	0.412	1.538	0.161	0.090	0.013
2005	0.428	1.544	0.165	0.092	0.013
2006	0.457	1.585	0.175	0.097	0.015

Table 2.4
Total Revenue Equity Measures

	Federal Range Ratio	90/10 Ratio	Coefficient of Variation	Gini Coefficient	Theil's T-Statistic
1989	0.451	1.502	0.185	0.094	0.016
1990	0.426	1.510	0.178	0.093	0.015
1991	0.418	1.449	0.167	0.088	0.013
1992	0.461	1.526	0.186	0.096	0.016
1993	0.424	1.476	0.162	0.083	0.012
1994	0.401	1.423	0.154	0.079	0.011
1995	0.390	1.375	0.144	0.075	0.010
1996	0.370	1.359	0.142	0.073	0.009
1997	0.343	1.343	0.137	0.070	0.009
1998	0.320	1.334	0.126	0.065	0.007
1999	0.334	1.341	0.135	0.070	0.009
2000	0.376	1.324	0.138	0.070	0.009
2001	0.384	1.358	0.146	0.071	0.010
2002	0.337	1.351	0.156	0.076	0.011
2003	0.302	1.336	0.130	0.068	0.008
2004	0.349	1.320	0.134	0.068	0.008
2005	0.302	1.311	0.126	0.065	0.007
2006	0.328	1.330	0.134	0.069	0.008

Table 2.5
Summary Statistics of Revenue Measures

Variable	1989-2006	1989	1998	2006
CURSPENDING	$5,557.37 ($1096.16)	$4,161.88 ($718.41)	$5,643.49 ($738.94)	$6,670.72 ($770.72)
LOCALFUNDING	$2,035.82 ($1027.26)	$1,720.84 ($792.26)	$2,015.76 ($991.23)	$2,351.82 ($1260.64)
STATEFUNDING	$3,188.91 ($764.80)	$2,192.20 ($197.33)	$3,582.10 ($488.17)	$3,924.97 ($685.31)
FEDFUNDING	$663.81 ($267.81)	$501.78 ($188.32)	$621.56 ($196.94)	$904.47 ($265.96)

*The mean of the variable is shown with standard deviation in parentheses.

Table 2.6
Summary Statistics – Control Variables

Variable	1989-2006	1989	1998	2006
PCI	$24,472.91 ($4,749.74)	$21,882.08 ($3,981.68)	$24,956.11 ($4,601.94)	$26,948.92 ($5,073.92)
PROPTAXBASEPP	$92,208.84 ($49,796.28)	$70,366.61 ($37,692.32)	$92,825.11 ($46,785.79)	$120,611.20 ($62,555.22)
STUDENTS	6,396.108 (12,807.042)	5,960.015 (12,089.832)	6,502.146 (12,940.86)	6,916.140 (13,663.32)
PCT517	17.640 (1.294)	18.308 (1.097)	17.852 (1.217)	16.689 (1.271)
PCT65	13.870 (2.023)	13.957 (1.812)	13.593 (1.789)	14.599 (2.513)
RETENTION	3.691 (2.131)	4.670 (1.996)	3.752 (2.257)	2.758 (1.628)
SUSPEND	6.575 (6.253)	4.734 (4.498)	5.470 (3.954)	5.150 (2.884)
UNEMPRATE	6.583 (2.305)	6.243 (1.904)	7.312 (3.114)	6.012 (1.403)
CDFDUMMY	0.100 (0.301)	-	0.146 (0.354)	0.126 (0.333)

*The mean of the variable is shown with standard deviation in parentheses.

Table 2.7
Fixed Effects Panel Regression
Full Time Period: 1989 - 2006

	STATEFUNDING	CURRSPENDING
PCI	**-0.062** **(0.005)**	**0.034** **(0.006)**
PHASEIN	**1562.599** **(38.515)**	**1102.701** **(47.132)**
PCT517	-11.629 (8.264)	**-30.803** **(10.113)**
PCT65	**-10.840** **(5.016)**	**-38.095** **(6.138)**
RETENTION	-0.501 (3.656)	-6.095 (4.474)
SUSPENSION	1.439 (1.105)	**3.069** **(1.353)**
STUDENTS	**-0.037** **(0.006)**	**-0.052** **(0.007)**
PCTSPED	**-33.969** **(8.523)**	-1.062 (10.429)
UMEMPRATE	-7.956 (3.476)	*-7.854* *(4.254)*
CDFDUMMY	-33.709 (25.470)	**148.677** **(31.168)**

Significant variables at the 5% or higher level are shown in bold type.
Significant variables at the 10% level are shown in italics.

Table 2.8
Panel Analysis of the Pre-BEP Period

	STATEFUNIDNG	LOCALFUNDING	CURSPENDING
PCI	-0.001 (0.007)	-0.018 (0.025)	-0.003 (0.015)
PHASEIN	-	-	-
PCT517	**-200.401** **(63.199)**	151.761 (220.782)	-124.378 (131.733)
PCT65	*87.118* *(47.170)*	148.498 (164.787)	-5.431 (98.322)
RETENTION	1.474 (3.380)	3.610 (11.808)	-2.663 (7.045)
SUSPENSION	-0.984 (1.218)	1.352 (4.256)	0.902 (2.539)
STUDENTS	**-0.045** **(0.013)**	-0.014 (0.045)	**-0.069** **(0.027)**
PCTSPED	**25.048** **(9.849)**	**80.516** **(34.408)**	**53.016** **(20.530)**
UMEMPRATE	**-8.028** **(3.290)**	17.968 (11.493)	-10.126 (6.857)
CDFDUMMY	-	-	-

Significant variables at the 5% or higher level are shown in bold type.
Significant variables at the 10% level are shown in italics.

Table2.9
Panel Analysis of the Post-BEP Period

	STATEFUNDING	LOCALFUNDING	CURSPENDING
PCI	**-0.024** **(0.005)**	**0.056** **(0.008)**	**0.026** **(0.007)**
PHASEIN	**-1300.501** **(30.821)**	**-393.595** **(51.477)**	**-1626.127** **(42.014)**
PCT517	**-28.588** **(7.236)**	**27.353** **(12.085)**	**-22.764** **(9.863)**
PCT65	**-12.779** **(4.405)**	-3.669 (7.358)	**-25.211** **(6.005)**
RETENTION	-0.827 (3.576)	-3.711 (5.973)	-7.451 (4.875)
SUSPENSION	0.515 (1.051)	**4.458** **(1.755)**	-0.196 (1.433)
STUDENTS	**-0.040** **(0.007)**	0.015 (0.011)	**-0.027** **(0.009)**
PCTSPED	**-38.497** **(8.694)**	**61.764** **(14.520)**	2.568 (11.851)
UMEMPRATE	**-15.467** **(3.385)**	**17.698** **(5.654)**	-5.758 (4.615)
CDFDUMMY	**251.571** **(28.674)**	*-80.540* *(47.891)*	**152.747** **(39.086)**

Significant variables at the 5% or higher level are shown in bold type.
Significant variables at the 10% level are shown in italics.

Table 2.10
Yearly OLS Regression Results: CURSPENDING

	PCI	PCT517	PCT65	PCTSPED	RETENTION	SUSPEND	STUDENTS	UNEMPRATE	CDFDUMMY
1989	0.058	-150.701		232.373					
1990	0.065	-228.565		196.421					
1991	0.070	-222.048		230.789					
1992	0.062	-234.420		162.956		-18.992			
1993		-144.128		150.289					910.226
1994		*-96.243*	*59.332*	*101.894*					1003.364
1995			*60.248*	155.088					946.682
1996				117.003					1119.657
1997				*131.556*					967.753
1998		*-101.135*		264.490					675.238
1999	*0.020*			264.594					*450.444*
2000	*0.034*	*-94.976*		232.369					568.949
2001	0.043			203.824				*-50.655*	646.567
2002	0.072	*-105.025*		161.925	*-61.950*	*38.864*			605.297
2003	0.047	*-102.546*		125.455		*32.760*			870.048
2004	0.062	-180.823	*-57.678*	*138.601*				*95.284*	1049.118
2005	0.055	-248.421	-75.943	125.455		128.038		102.487	908.566
2006	0.052	-237.408	*-64.191*	*120.375*	*68.591*				700.147

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

Table 2.11
Yearly OLS Regression Results: STATEFUNDING

	PCI	PCT517	PCT65	PCTSPED	RETENTION	SUSPEND	STUDENTS	UNEMPRATE	CDFDUMMY
1989	-0.014			78.874	-18.746			*-17.592*	
1990	-0.017			64.252					
1991	-0.021		21.207	77.248					
1992	-0.016	-29.214		53.223					
1993	-0.030			61.435					170.284
1994	-0.036	*35.606*	*23.016*	*41.438*					204.250
1995	-0.044			*41.569*			-0.008		192.670
1996	-0.048			*50.984*			*-0.008*		
1997	-0.061	63.469		67.538			*-0.009*		
1998	-0.067	*50.892*	-42.264	68.830			*-0.009*		
1999	-0.071	62.306	*-41.121*				*-0.010*		441.421
2000	-0.071	*56.795*	*-39.656*				-0.010		413.061
2001	-0.070	77.862					*-0.009*		427.962
2002	-0.083	101.363					*-0.008*		405.265
2003	-0.086	93.829			44.495	*-18.794*	*-0.009*		518.424
2004	-0.079	*62.853*							*285.778*
2005	-0.072		*-28.658*					135.370	344.749
2006	-0.083							107.890	321.590

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

Table 2.12
Yearly OLS Regression Results: LOCALFUNDING

	PCI	PCT517	PCT65	PCTSPED	RETENTION	SUSPEND	STUDENTS	UNEMPRATE	CDFDUMMY
1989	0.094	-223.981		*114.758*	*59.439*				
1990	0.117	-214.399		*91.577*		-22.943			
1991	0.124	-213.670		119.861		*-14.560*			
1992	0.114	-246.885				*-16.376*			
1993	0.095	-179.147							772.387
1994	0.075	-199.599							773.033
1995	0.102	-185.051							629.059
1996	0.093	-152.935	*71.383*						846.815
1997	0.097	-175.860	*71.078*						587.529
1998	0.100	-195.331							538.609
1999	0.099	*-127.366*		211.071		*-33.354*		*-87.222*	
2000	0.129	-212.316		273.941					
2001	0.145	-196.071		226.597					
2002	0.195	-265.924		197.140	-145.135				
2003	0.147	-225.240			-123.485				
2004	0.179	-253.585		173.600	-93.401				786.227
2005	0.162	-268.866		*122.945*					707.191
2006	0.167	-262.194							535.233

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

Table 2.13
Panel Model Using Property Tax Base

	STATEFUNDING	CURRSPENDING
PROPTAXBASEPP	**-0.026** **(0.003)**	**0.029** **(0.003)**
PHASEIN	**1323.457** **(28.167)**	**1256.050** **(34.447)**
PCT517	**-24.795** **(7.933)**	**-23.163** **(9.881)**
PCT65	**-22.608** **(4.903)**	**-35.230** **(9.881)**
RETENTION	-0.064 (3.581)	*-7.494* *(4.461)*
SUSPENSION	1.210 (1.082)	**2.865** **(1.348)**
STUDENTS	**-0.062** **(0.005)**	**-0.038** **(0.007)**
PCTSPED	**-27.173** **(8.353)**	-2.465 (10.400)
UMEMPRATE	**-13.695** **(3.440)**	**-8.327** **(4.327)**
CDFDUMMY	-32.201 (24.881)	**156.212** **(30.936)**

Significant variables at the 5% or higher level are shown in bold type.
Significant variables at the 10% level are shown in italics.

Table 2.14
Yearly Results Using Property Tax Base: CURSPENDING

	PROPTAXBASEPP	PCT517	PCT65	PCTSPED	RETENTION	SUSPENSION	STUDENTS	UNEMPRATE	CDFDUMMY
1989	0.049	-153.169		242.565					
1990	0.075	-210.160		216.142					
1991	0.063	-226.525		257.251				*-45.706*	
1992	0.076	-204.050		190.069		-18.370	0.023		
1993	0.044	-128.336		160.365					781.200
1994	0.045		-16.454	*114.857*					839.192
1995	0.050		*65.690*	65.690					808.579
1996	0.034			131.475					982.779
1997	*0.033*			145.862					828.452
1998	0.047			266.181					579.182
1999	0.042			262.109					417.363
2000	0.044			236.813					553.195
2001	0.046	*-93.531*		206.043					727.278
2002	0.061		*50.748*	186.214	-68.948	51.991			681.477
2003	0.055			134.457		*37.339*			1002.491
2004	0.030			*138.009*		*37.511*			1138.823
2005	0.035	-165.025		*127.230*		40.990			925.568
2006	0.040	-140.548							623.026

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

Table 2.15
Yearly Results Using Property Tax Base: STATEFUNDING

	PROPTAXBASEPP	PCT517	PCT65	PCTSPED	RETENTION	SUSPENSION	STUDENTS	UNEMPRATE	CDFDUMMY
1989				76.675	*-17.335*				
1990				61.819					
1991			25.259	72.189					
1992			18.522	12.703					
1993	-0.017		*20.060*	60.725			-0.009		*142.297*
1994	-0.020		28.872	47.693			-0.010	*18.958*	
1995	-0.031						-0.014	41.021	*172.655*
1996	-0.037			*51.286*			-0.014	41.786	
1997	-0.047			*60.760*			-0.016	*23.708*	
1998	-0.043			86.499			-0.018	31.131	
1999	-0.040						-0.018	57.389	279.608
2000	-0.039						-0.019		259.192
2001	-0.030	82.479					-0.020		
2002	-0.034				*38.387*		-0.019	75.870	
2003	-0.039				55.373	*-21.214*	-0.020	61.843	
2004	-0.046		-50.318		47.891		-0.020	126.764	
2005	-0.040	*-73.651*	-65.006				-0.020	180.126	293.175
2006	-0.046	*-89.638*	-63.825					162.606	290.112

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

Table 2.16
Yearly Results Using Property Tax Base: LOCALFUNDING

	PROPTAXBASEPP	PCT517	PCT65	PCTSPED	RETENTION	SUSPENSION	STUDENTS	UNEMPRATE	CDFDUMMY
1989	0.065	-243.296		*130.804*				*-57.479*	
1990	0.095	-216.664		119.113	53.788	-21.254		-83.306	
1991	0.072	-244.974		157.541		-17.489	0.021	-64.150	
1992	0.085	-232.233		*116.367*		*-15.847*	0.024		
1993	0.053	-162.269							865.778
1994	0.062	-152.506					*0.018*		805.441
1995	0.082	-145.968						*-55.498*	633.697
1996	0.079	*-104.450*						-58.895	826.292
1997	0.083							-54.194	595.755
1998	0.080	-150.794						*-60.265*	603.697
1999	0.077			175.690		*-34.232*		-122.022	
2000	0.090	-179.097		263.741				*-73.905*	
2001	0.084	*-174.262*		215.972			*0.022*		
2002	0.100			220.775	-173.164		*0.021*	-130.119	
2003	0.081				-139.419			-122.006	804.178
2004	0.083			*171.232*	-179.460			-133.304	1055.773
2005	0.080				*-94.605*			-175.412	877.658
2006	0.080							-199.033	687.643

All variables shown in italics are significant at the 10% level. All other coefficients are significant at the 5% level or higher.

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