

SCHOOL DISTRICT CONSOLIDATION
AND ITS ACADEMIC AND FINANCIAL EFFECTS

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Gregory James Collins

This work is dedicated to Emily, Joshua, Clara, my nieces, my nephews, and all children, that they may know a world of freedom, peace, and prosperity.

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ABSTRACT

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Gregory J. Collins

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School district consolidation is a contentious policy debated and implemented in states across the nation. Though consolidation occurred rapidly throughout the 20th century, with the number of districts falling from over 120,000 to approximately 13,000, and several states and communities continue to mandate or incentivize it, little is known about the effects of the policy on student learning or the efficient use of the public's resources. The purpose of this dissertation is to describe recent school district consolidation in the United States and estimate the effects of one mandatory consolidation policy on student and financial outcomes. Using national and state administrative records and media reports of mergers, I counted the number of consolidations between 2000 and 2015 and examined the characteristics of affected districts. I found that one of every nine districts was part of a consolidation during this period. Most of the mergers melded a very low-enrollment rural district into a much larger neighbor, but some consolidations paired multiple high-enrollment urban districts. Consolidating districts were above-average spenders but generally carried little debt. To examine the efficiency effects of consolidation, I studied student and spending outcomes of a 2004 Arkansas law that established minimum district enrollments. From a

differences-in-differences analysis, I found that graduation rates were negatively affected by consolidation while the effect on spending was negligible. Some administrative expense savings, specifically targeted by the legislation, were realized through a reduction in the number of central office personnel, but increases in transportation spending offset half of the small savings. These findings suggest that efficiency improvements should not be expected to automatically follow from school district consolidation. The results of the descriptive analysis, in conjunction with the many mandatory consolidation proposals under consideration in states across the nation, highlight the need for an acceleration of research into the effects of school district consolidation on community resources and student learning and life outcomes.

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Chapter 1. Introduction

School district consolidation is a contentious policy debated and implemented in states across the nation. Due to the vociferous and sometimes violent opposition it can elicit, as local communities resist the loss of their town school, mandating district mergers has been called a political “third rail” for state legislatures (Ledbetter, 2006, p. 45). Faced with demands to maintain both reasonable tax rates and high-quality schools, however, state and local leaders frequently consider school district consolidation as a policy option to improve efficiency.

Some states have recently legislated broad consolidation measures. In 2004, Arkansas school districts with fewer than 350 students, which represented one fifth of districts in the state, were required to merge. In Maine, a minimum enrollment of 2500 students was established in 2009, with a plan of reducing the district count from 290 to 80. Rather than setting a minimum enrollment, Nebraska mandated the closure and reorganization of its 240 elementary-only school districts by the 2006-07 school year.

Other states have chosen incentives as a means of promoting consolidation. Wisconsin provides a small per-student supplement to consolidating districts for seven years following the merger. New York provides a much larger financial incentive – a 40% bonus in state aid – and extends it out for 14 years post-consolidation. The state further provides financial support for new construction required by consolidation. In other states, such as New Jersey,

consolidation is encouraged through state funding for consolidation feasibility studies.

In addition to the states with standing consolidation policies, there are several others that are considering incentivizing or mandating mergers. Indiana, which already funds feasibility studies, has recently debated bills that would provide a \$500 per-student bonus in state aid to consolidating districts. In Kansas, the legislature has frequently considered consolidating to county-level school districts. Pennsylvania's Governor Ed Rendell proposed a similar plan for his state in 2009, which would have reduced the number of school districts in the commonwealth by 80%.

Debates surrounding school district consolidation are not new. A movement to consolidate urban school systems began as early as the mid-19th century, and the idea spread to rural and small-town America by the dawn of the 20th century. School district consolidation occurred rapidly across the nation. Indeed, Guthrie (1979, p. 18) called consolidation "one of the most awesome and least publicized governmental changes to occur in this nation during the twentieth century."

Numerically, the results of school district consolidation have been staggering. In 1933, there were 127,000 school districts operating in the 48 states. Eighty years later, only 13,500 districts remained, marking a 90% decrease at the same time that student enrollment in K-12 schools doubled. Figure 1.1 displays the count of school districts and the student enrollment in the

U.S. by year. Very large decreases in the number of school districts are apparent between 1940 and 1970, particularly during the 1950's.

Although changes in the count of districts after 1970 are not easily observed from Figure 1.1, consolidation continued. In Figure 1.2, the percent change in the count of districts by decade is depicted. This plot confirms that rates of consolidation were indeed slow in the 1980's and 1990's, but the number of districts decreased by 9% during the first decade of the 21st century, a rate comparable to the 1930's.

In addition to rapid rates of school district consolidation and an increase in student enrollment, the 20th century was a period of great increases in financial support of schooling. Figure 1.3 displays spending and school district count data. Between 1930 and 2000, inflation-adjusted current spending per student increased nine-fold.

Improving the efficiency with which this growing dedication of resources is employed has been the prime goal of school district consolidation, but it is not known whether the policy is effective. Despite at least 80 years of rapid consolidation, little research has attempted to estimate the efficiency outcomes of school district consolidation. With local and state policymakers currently considering further sweeping consolidation measures, information about its effectiveness is much needed. The purpose of this dissertation is to explain the theoretical underpinnings of the policy, summarize the research that has been

published, describe the recent state of consolidation in the U.S., and estimate the academic and financial effects of a recent school district consolidation mandate.

Outline of the Dissertation

In Chapter 2, I will explore the historical goals of school district consolidation. Improving the efficiency with which tax dollars are used has been the main stated goal of consolidation since the start of the 20th century. Many other goals, both public and furtive, have also motivated consolidation, and these goals are presented in the chapter.

In Chapter 3, I present theory-based predictions of the effects of school district consolidation. Both economic and sociology of organizations theory are considered, with both fields offer conflicting predictions of the efficiency effects of consolidation.

Chapter 4 includes a review of empirical research related to school district consolidation. Only three studies of consolidation events have made causal claims about the effects of consolidation. Most of the relevant research has examined size and competition effects using school district population data. I review both population and event studies.

In Chapter 5, I briefly introduce the research questions that will be answered in the analytical chapters of the dissertation. These include both descriptive questions about recent consolidation in the U.S. and questions about the efficiency effects of mandatory consolidation.

A national description of recent school district consolidations is the goal of Chapter 6. Having manually reviewed school district census data, I present rates of consolidation across the U.S. I describe the districts that have participated in consolidations, examining student and community demographics and district geography and finances.

In Chapter 7, I estimate the effects of mandatory school district consolidation on academic and financial outcomes. Leveraging a 2004 law in Arkansas that established a minimum school district size, I use differences-in-differences methods to calculate the average effect of mandatory consolidation on both graduation rates and district spending.

Chapter 8 explores changes in the use of specific resources following mandatory consolidation. Again using the 2004 Arkansas mandate, I examine the particular resources that theory predicts would change with consolidation, including administrative, teacher compensation, facilities, and transportation expenses.

In Chapter 9, I present conclusions. I discuss the findings of my analyses and position them in the context of the extant consolidation literature. I also consider the policy implications of my findings.

Several important sections follow Chapter 9. Figures and tables referenced in the body of the text are collected, followed by several appendices, including a glossary of terms, and references.

Chapter 2. “Panacea as Policy”: The Many Goals of Consolidation

In recent campaigns for school district consolidation, efficiency has been the publicly-stated goal of advocates. Arkansas legislators mandated consolidation of low-enrollment districts in 2004 after the state Supreme Court deemed the public school system inefficient. In Maine, Governor John Baldacci signed legislation that forced consolidation of small school districts in 2007, citing administrative inefficiency as the problem he would resolve. Ed Rendell, former governor of Pennsylvania, said in 2009 that his state needed consolidation because they “cannot afford” to have 500 school districts (qtd. in Murphy, 2009).

Improved efficiency has long been a goal of school district consolidation, but the policy has been used for more than one purpose. Reformers have pursued consolidation at some places and times to sustain segregated schools and at other points to integrate. Educational elites have lobbied for consolidation to increase the external power they wielded, while local stalwarts have promoted consolidation to tamp down outside influences. Still others have chosen consolidation to maintain a positive perception of their school system and by extension their community. These and other goals are summarized in Table 2.1.

In this chapter, I outline the goals of school district consolidation. I consider the efficiency, social control, and legitimacy objectives that proponents of more centralized school systems have argued over the past 120 years, revealing that much more than cost savings has been under consideration when it comes to school district consolidation.

Efficiency

The aim of increased efficiency may be best considered as getting more for the money. This can occur through improving outcomes with little or no increase in spending. Alternatively, efficiency gains can come from reductions in cost with little or no loss in product. Efficiency was a goal of many social and policy campaigns throughout the 20th century, including public support for technologies such as telephone and electricity service (Theobald, 1995). Among education reformers, the emphasis on efficiency was particularly acute, leading Callahan (1962) to assign as a moniker for the group “the cult of efficiency.”

Improved Academics

Since the nationwide press for school district consolidation began in the middle 19th century, improved academics has been a commonly-claimed goal. City districts consolidated early, though this consolidation was often limited to the collection and distribution of tax revenue. Local wards or districts retained school boards that controlled school operations with little or no input from the central district board. Reformers in Philadelphia in the 1880's began a push to improve academics by standardizing curriculum across the city through the consolidation of operating authority, not just taxation authority (Issel, 1970). Examining public school reform potential outside of urban areas, the National Education Association appointed a committee in the 1890's to evaluate and make recommendations. The committee identified several curricular needs for town and rural schools, but they argued that such changes could only be implemented

at scale and with increased supervision. To achieve the requisite scale and administrative support, the committee recommended sweeping school district consolidation (Reynolds, 1999).

Age-graded schools were one means through which consolidation was believed to improve student learning. Unlike a teacher in a one-room school, who may have needed to teach 30 subjects to students across eight grades, it was expected that teachers in age-graded schools could offer more complete and age-appropriate education to their students (The National Commission on School District Reorganization, 1948). As increasing numbers of American families relocated for work, there was also greater need for standardization of education across communities. Age-graded schools were believed to foster easier academic transitions for students when they moved from the countryside to industrialized urban areas, thereby improving learning outcomes (Fischel, 2009).

While age-graded schools were an important means to better education, the establishment of effective high schools was seen as absolutely critical. As recently as the mid-20th century, many rural and town communities neither operated a high school nor provided tuition for students to attend nearby high schools, and those that did had such low enrollments that they could not afford to offer a broad curriculum (The National Commission on School District Reorganization, 1948). State bureaucrats viewed these small high schools as educationally ineffective but struggled to garner support for their attempts to consolidate districts (Tyack, 1974).

Recent school district consolidations have also had improved academics as a stated goal. The Arkansas Supreme Court approved school district consolidation as part of the plan to remedy a system that they had deemed inefficient and inequitable, citing low student test scores and lack of access to college preparatory high school classes (Lake View Sch. Dist. No. 25 v. Huckabee, 2004). In Texas, the state ordered the 2006 annexation of Wilmer-Hutchins Independent School District (ISD) to Dallas ISD and the 2013 merger of North Forest ISD with Houston ISD after Wilmer-Hutchins and North Forest each experienced several consecutive years rated “academically unacceptable” (Benton, 2006; Scott, 2011). Voluntary mergers have also proceeded with academics as the stated priority. In Pennsylvania, two school districts consolidated in 2009 in an attempt to expand advanced course offerings despite small and declining enrollments (Prose, 2014).

Lower Costs

Lowering costs without lowering academics is another way in which school district consolidation could increase efficiency. Indeed, Callahan (1962) argued that despite claims of aiming to improve academics, reducing spending on education was long the true goal of consolidation advocates. Urban reformers sought to eliminate waste by consolidating city systems (Issel, 1970), California legislators bemoaned the cost of operating small school organizations (Tyack, 1974), and Iowa politicians advanced significant cost savings as a reason for consolidation in the early 20th century (Reynolds, 1999). Teacher unions pointed

out the large savings that could be realized by increasing class sizes from five students in small districts to 25 students in consolidated districts (The National Commission on School District Reorganization, 1948). Virginia state-level bureaucrats used the same class size argument in their appeals for consolidation and also pointed to the cost reductions possible from the standardization that could result from mergers. Commonizing curriculum and materials would, they believed, lead to further savings (Link, 1986).

Interestingly, many residents of the Midwest were skeptical of the ability of consolidation to reduce costs. By 1913, Iowans had come to the conclusion that consolidation was unlikely to save money (Reynolds, 1999). Within ten years, many living in the Heartland had accepted that, despite the claims of proponents, consolidation would lead to markedly higher school taxes (Theobald, 1995). The result of this realization was a slowdown in the rate of consolidation during the Great Depression, with states such as Arkansas passing laws to make it more difficult for school districts to merge (Ledbetter, 2006).

In current discussions of school district consolidation, claims of potentially large cost savings have resurfaced. Recent academic research using econometrics techniques, discussed in greater detail in Chapter 4, has estimated that some low-enrollment school districts could save over 60% of operating costs through consolidation (Duncombe & Yinger, 2007). Proponents of consolidation in northern New Jersey projected yearly savings of \$9 million if 25 small LEAs were united into one countywide school district in Sussex County (Jennings,

2017). Nationally, savings estimates are quite large, with the progressive advocacy group Center for American Progress arguing in support of consolidation on the grounds that it could save at least \$1 billion annually even if only the smallest districts merge (Boser, 2013).

Social Control

Increased social control has been another goal of school district consolidation. Sometimes advocates have been internal to the community, banding together to promote certain beliefs. At other times, pressure to consolidate has come from outside the community, with external experts seeking greater control of educational systems through school district consolidation.

Internal Social Control

Exerting social control over fellow community members and those in neighboring communities has been an aim of school district consolidation. The political authority required to consolidate school districts varied by state, and in many states local citizens had the power to approve or reject consolidations (Link, 1986). In some cases, a majority vote of all affected citizens was sufficient to force consolidation, enabling a higher-population community to annex smaller neighbors without their consent (Reynolds, 1999).

Maintaining prevailing community values is one form of social control that has been sought by consolidation advocates. Early 20th century Virginians expected consolidation to create “beacon[s] of town values” by promoting long-standing community beliefs while offering a sufficient education to dissuade

migration to urban school districts perceived as academically superior but morally inferior (Link, 1986). The targets of population retention in rural areas and towns were white Protestant families, whose beliefs were aligned with the majority of community residents (Theobald, 1995).

While Protestants represented the values advocates sought to sustain, school district consolidation was used to exert control over Eastern and Southern European Catholic people settling in the Midwest. In rural parts of the nation in the early 20th century, there was general opposition to immigration due to its perceived negative effects on social mores (Rosenfeld & Sher, 1977). Ellwood Cubberley, one-time dean of Stanford's educational school and a national voice on educational administration, wrote in 1914 that immigrants were "devoid of the Anglo-Saxon conceptions" of how to self-govern (Cubberley, 1914, p. 69). Suspicion of Catholic immigrants was especially strong. In districts where Catholics became a majority, schools eschewed the King James Bible that had previously been universal in favor of Catholic versions (Zimmerman, 2009). Forced consolidation by larger neighboring districts provided one path to reinstituting Protestant values. The Ku Klux Klan became actively involved in Iowa consolidation efforts in the 1920's, with cross burnings demonstrating their opposition to Catholic influence and support for school district consolidation (Reynolds, 1999).

In the South, exerting social control through racial segregation of schools was a goal of school district consolidation. Most Southern states allowed county

superintendents to consolidate districts without a community vote, and consolidation occurred more rapidly in the South than in any other region during the first half of the 20th century (Link, 1986). The motivation to maintain segregated schools likely accelerated this rapid rate of consolidation. Following the *Plessy v. Ferguson* ruling in 1896, “separate but equal” became the law of the land, and this applied to public schools along with other public services. In order for sparsely-populated rural and small town communities to afford separate school systems for white and black students that even approached equality, however, large geographies needed to be consolidated into single districts, and thus arose countywide school districts across the former Confederate states (Fischel, 2009).

School district consolidation was also intended to support other forms of social control. Urban leaders used consolidation to redistribute wealth and promote equality within a city as early as 1850 (Rochester Board of Education, 1935). Upper-class city reformers also sought to wrest control of schools away from democratic majorities and place it in the hands of bureaucrats and academics, who the reformers believed were more capable (Issel, 1970; Ravitch, 1974). In more remote areas, transportation to centralized schools, first with school wagons and later with buses, also provided a means of social control. By transporting children to school rather than having them walk, communities could reduce the incidence of foul language and tobacco as students were left unsupervised for less time (Link, 1986). Communities with larger populations

could also exert control over economic activity by forcing consolidation with a smaller district. Consolidation could be used to close schools in these smaller communities, thereby increasing their own property values and enhancing the influence of their own social organizations (Reynolds, 1999). Another social control goal was to force the interaction of people across communities.

Consolidation placed students from different villages and farming communities into the same classroom, exposing them to people with whom they would otherwise not have interacted (Link, 1986). Country Life movement leader Wilbert Anderson wrote in 1906 that consolidation allows students to live “in a larger world,” hence promoting improved relationships and cooperation between communities in the future (qtd. in Reynolds, 1999).

External Social Control

A desire by academics and urban reformers to exert control over town and rural communities and their schools has often been rooted in distrust of the ability of those outside of cities to make prudent governance decisions. Rural school systems of the early 20th century looked very different from the urban ones with which reformers and academics were better acquainted (Rosenfeld & Sher, 1977). This incongruence created doubts among education elites about the decisions being made by rural and townspeople. Cubberley (1914, p. 105) described schools outside of cities as being in a “state of arrested development.” He faulted poor administration and also blamed the electorate for their mismanagement. This was representative of a broader consensus among

academics that local control could not work, because they believed rural people did not know what was good for them (Tyack, 1974).

Following from this distrust of local governance and from widening gaps in income, reformers have also claimed school district consolidation can improve equality of educational opportunity across geographies. Education experts in the early 20th century pointed to great inequality in the quality of schooling between cities and smaller communities. They claimed that poor decisions in rural and town school districts were placing children in these areas at a great disadvantage, but one that could be remedied through consolidation (Reynolds, 1999). To address school funding disparities, proponents have encouraged consolidation of low-wealth districts with high-wealth districts in an attempt to advance equity (Sher & Thompkins, 1977). More recent consolidation efforts have also had improved equity as a stated goal. The 2004 law mandating school district consolidation in Arkansas came in response to a court decision finding schools in the state to be both inefficient and unequal (Lake View Sch. Dist. No. 25 v. Huckabee, 2002). In Pennsylvania in 2009, Governor Rendell similarly argued that school district consolidation would be an effective means of improving both efficiency and equality across school districts (Rendell calls for school mergers to consolidate 500 districts into 100, 2009).

One specific aspect of equality in education that school district consolidation has been used to improve is racial equality. After the *Brown* decision of the U.S. Supreme Court in 1954 declared segregated schools to be

“inherently unequal,” states were responsible for finding solutions that would integrate their schools (Brown v. Board of Education of Topeka, 1954). This frequently required external control of local communities by state and federal actors, who sometimes chose school district consolidation as a means to meeting the objective. Federal courts attempted to force Richmond, Virginia schools and the school districts of surrounding counties to consolidate in 1972, though an appeals court overturned the decision due to a lack of evidence of de jure segregation (Holmes, 1973). In 1974, federal courts were successful in ordering the merger of districts in Louisville, Kentucky and the surrounding county to form Jefferson County Public Schools, which allowed for busing of students between the majority-black city and the majority-white suburbs (Diem, Siegel-Hawley, Frankenberg, & Cleary, 2015). Such consolidations from desegregation orders continued into the 1980’s, with New Castle County, Delaware consolidating its city and suburban districts (Delaware Department of Education, 2002).

Some other goals of external advocates for rural school district consolidation were more related to conditions in American cities. As immigration swelled the urban population in the early 20th century, city leaders looked for ways to battle hunger. Rural school district consolidation, they believed, could be used to improve agricultural education, which in turn would improve production methods and bring down food prices in their cities (Theobald, 1995). They also hoped that consolidated schools would appear more attractive to residents in the

countryside than one-room school districts and stop the movement of rural people to urban areas, where they were viewed as social and economic burdens (The National Commission on School District Reorganization, 1948).

Legitimacy

While increased efficiency and social control have been public goals of consolidation, maintaining legitimacy has been a less overt objective. The subject of legitimacy will be discussed in greater detail in Chapter 3, so the background I present here is brief. Organization scholars Meyer and Scott (1983, p. 201) define legitimacy as “the degree of cultural support for an organization.” This support can come from other organizations of the same type, in this case other school districts. It also comes from groups exerting some formal authority over the organization, such as legislatures and education bureaucrats. The public with which the organization interacts is another source of cultural support. Though efficiency and effective social control may serve some role in this cultural support, legitimacy is rooted in the perception of performance rather than in the results themselves.

Local communities have likely sought to reinforce the legitimacy of their school districts for multiple reasons. One purpose has been to sustain the attractiveness of their schools to prevent out-migration. In the early 20th century, there was concern that, upon graduation, rural and small-town young adults would relocate to start their own families in cities where schools were believed to be better (Link, 1986; Reynolds, 1999). In support of retaining their graduates

through the legitimacy of their schools, school district consolidation and the larger schools that resulted provided “a tangible and effective symbol of the modernization” associated with the perceived success of urban areas (Sher & Thompkins, 1977, p. 45). School districts near urban areas and towns with high schools were more likely to consolidate than similar communities more remotely located (Fischel, 2009). Larger rural and town school districts located near more populous areas continued consolidating in an attempt to match the legitimacy of neighboring school districts and retain their residents (Reynolds, 1999). Related to population loss, legitimacy of schools has also been important to the property values of residents (Fischel, 2009). This was especially true in the elimination of one-room schoolhouses. Graded schools came to be seen as a necessity for economic mobility (Reynolds, 1999), and property values reflected the availability of these larger school organizations (Fischel, 2009).

In addition to community legitimacy, the personal legitimacy of education leaders was also a likely goal of consolidation. Tyack (1974, p. 14) wrote that superintendents, academics, and other leaders in education seek “greater power and status for themselves” through consolidation. There was long a consensus that “bigger is better,” so leaders driving consolidation could expect cultural support from other educators and central government officials if not from local residents (Sher & Thompkins, 1977). In the early 1960’s, a resurgence in the consolidation rate immediately followed a popular report highlighting a key benefit of larger districts. James Bryant Conant, a former president of Harvard

University with experience in international affairs and science education, authored a report in 1959 detailing the qualities of a good high school (Conant, 1959). Among many other characteristics, Conant claimed that high schools needed at least 100 students per graduating class. Though his evidence did not support such a claim, with the smallest schools in his sample offering broader curricula than several of the larger high schools, Conant's reputation was sufficient for education leaders to believe they needed to create larger high schools through school district consolidation (Sher & Thompkins, 1977). Callahan wrote that "any superintendent who could say that he was adopting Conant's recommendations . . . was almost impregnable" (qtd. in Sher & Thompkins, 1977). Consolidation, then, was requisite for education leaders to maintain personal legitimacy and for their schools to be seen as what Metz calls "real schools" (1989).

The Many Goals of School District Consolidation

School district consolidation has been proposed and implemented as a solution to a wide array of educational and social concerns. Rosenfeld and Sher have called consolidation "panacea as policy" because of the many ills it has been sold to cure (1977). Perhaps due to the ambitiousness of the expectations, consolidation was rolled out more rapidly than any other 20th century education reform (Sher & Thompkins, 1977). At the same time, the goals were only vaguely defined (Reynolds, 1999). Cohen and Moffitt (2009) argued that ambitious and ambiguous aims are very difficult to achieve. The lack of clarity and grand scale

of school district consolidation goals makes it hard to assess the attainment of aims, deprioritizing measured outcomes in favor of public perception as the determinant of success.

Chapter 3. Insights from Sociological and Economic Theory

Advocates of consolidating school districts with the goal of improved efficiency frequently root their argument in theories of bureaucratic streamlining and economies of size. These concepts, from the fields of sociology and economics, offer insight into the possible effects of consolidation on school district efficiency. Several other sociological and economic theories, however, are also informative of the likely outcomes of school district consolidation and, in some cases, present the possibility of countervailing forces that may negate or even reverse the effects of consolidation on efficiency. In the sections that follow, I summarize arguments from sociological and economic theory that relate to school district size and environment – two characteristics that are changed by consolidation – and apply these to develop predictions of the likely efficiency outcomes of school district consolidation.

Sociological Theory

School districts are organizations of people, and consolidation changes the attributes of these organizations. As such, scholarship from the sociology of organizations can be informative in predicting the likely effects of consolidation on organizational performance. In this section, I present several ideas from the organizational theory literature that are relevant to school district consolidation, arranging them using the Scott and Davis (2007) classifications of rational, natural, and open systems perspectives.

Rational Systems Perspective

The rational systems perspective views organizations as formalized groups of people with specific goals. Formalization is the degree to which an organization operates through pre-determined rules and pre-defined roles. These procedures and positions are rational, providing a predictability to organizational functions. The goals of an organization, on the other hand, need not be “rational,” but they must be specific in order for technical rationality to be successful (Scott & Davis, 2007).

Weber (2012) introduced some of the early thinking on organizations as rational systems. Through his analysis of German bureaucracies, he identified several indications of formalization that were associated with organizational success. Written rules to guide decision-making were essential. They both fostered standardization across the organization and yet granted some freedom for lower-level workers to diagnose problems and choose the most appropriate of several scripted solutions (Scott & Davis, 2007). Authority to make decisions at all levels was based on credentials, with workers in each position having demonstrated and documented expertise in the work they were required to complete. In the organizations he studied, Weber found that the larger the organizational size, the more evidence of hierarchical expertise and formalized rules, and thus followed his conclusion that with larger size comes “technical superiority” (Weber, 2012, p. 80).

The work of Taylor (1916) paid particular attention to technical expertise arising from division of labor. Rather than rely merely on credentials, however, Taylor's "scientific method" encouraged experimentally determining the most efficient way to complete each organizational task. Required to implement and manage such an organization are relatively large centralized planning departments and the acquisition of task expertise through repetition (Scott & Davis, 2007).

In applying these principles to school districts, rational systems perspectives would generally predict that the larger organizations resulting from school district consolidation should be more efficient organizations. Larger school districts would allow for more division of labor, allowing for more precise credentialing and learned expertise. At the extreme, one-room schoolhouses demand that teachers offer instruction in all subject areas across all grades, which requires great amounts of preparation time and reduces repetition-driven expertise. Larger schools and school systems, on the other hand, can have teachers who specialize in a specific grade level or subject, lessening the preparation work and increasing the amount of practice the teacher accumulates in their given subject. Division of labor would also extend to planning tasks, where large districts can hire curricular experts to identify and negotiate for the best learning resources at the best prices, while in small districts these jobs may fall to teachers who have little experience with textbook selection or software purchasing.

One concern with applying rational systems perspectives to predict the effects of school district consolidation is the assumption of goal specificity. The actual goals of consolidation are broad in scope and scale (see Chapter 2), and the goals of school systems in general are not well-defined (Meyer & Rowan, 1977; Ouchi, 1980). This makes the use of goals to establish written rules and divide labor difficult, and it may reduce the benefits that could be realized from larger organizational size resulting from school district consolidation.

Natural Systems Perspective

The natural systems perspective accepts that formalized rules may exist in organizations but believes that informal actions of organizational members are the ultimate determinants of success. Natural systems theorists argue that, however specifically-written the organizational goals may be, members of the organization have their own personal goals that are at times aligned with and at times opposed to the stated collective mission. The result is goal complexity, a situation with outcomes that are not easily explained by rational systems perspectives. Selznick (1987, p. 119) wrote that rational systems “never succeed in conquering the nonrational dimensions of organizational behavior.” Actions of employees do not necessarily follow the formal rules. Rather, organizational members may work around established hierarchies and ignore procedures in pursuit of their own goals or their personal perception of organizational goals (Scott & Davis, 2007).

Great emphasis in natural systems work is placed on human relationships. Organizational success is expected when human relations are supported by sufficient intimacy (Ouchi, 1980). As organizations get larger, however, they move away from prioritizing human relations and move toward bureaucratic modes of management (Langdale, 1976). Follett (1940) argued that the resulting hierarchies form warring sides, whereas informal power sharing would lead to a more effective organization.

The need for intimate human relations is seemingly especially strong in education organizations (Durkheim, 2018), suggesting that large organizational size may be problematic. Because the technology, a term for the means through which organizational goals are to be attained, is nonroutine in education, writing rules to address each scenario an organizational member may face would be onerous (Ingersoll, 1993). Thus, a reliance on human relations is necessary. Large school organizations, however, are notorious for their weak sense of community (Bryk, Lee, & Smith, 1990). As school district consolidation produces larger schools and districts, it may be expected to reduce the intimacy and therefore the effectiveness of relational organizational management. The smallest schools, however, experience high rates of teacher dissatisfaction and turnover (Ingersoll, 2001). If these outcomes are associated with organizational effectiveness, it suggests that there exists some ideal size for educational organizations. To the extent that school district consolidation moves organizational size toward this hypothetical ideal, the policy should improve

efficiency, but where consolidation makes organizations too large it would be expected to reduce organizational efficiency.

Open Systems Perspective

Open systems perspectives move beyond the internal analysis of rational and natural systems by examining an organization as part of an environment that both affects and is affected by that organization. Open systems are defined as those in which a unit prioritizes “self-maintenance” while managing the flow of resources between it and its environment (Boulding, 1956, p. 203). Survival in different organizational environments requires different degrees of coupling between elements within an organization, the examination of which is a key aspect of the open systems perspective (Scott & Davis, 2007). Loose coupling, for example, may be observed when an organizational rule change does not modify the behavior of organizational members.

Neoinstitutional theory is one open systems perspective that is commonly applied to educational organizations. This theory asserts that legitimacy is required for survival, and organizations make decisions to pursue legitimacy “independent of the immediate efficacy of the acquired practices and procedures” (Meyer & Rowan, 1977, p. 340). Indeed, Meyer and Rowan (1977) argued that pursuing actual efficiency improvements was likely to impede progress toward increased legitimacy. Instead, legitimacy is garnered through institutional isomorphism, which is the process of assuming similar organizational forms to others in the same environment. This can occur through the purposeful mimicry

of leaders in the organizational field or through the establishment of professional norms among decision-makers. Another source of institutional isomorphism is government coercion (DiMaggio & Powell, 1983). Once legitimacy is established, organizations work to obfuscate inspection of internal processes and organizational outcomes to avoid losing legitimacy (Meyer & Rowan, 1977).

An alternative open systems perspective is the ecological theory of organizations. Like neoinstitutionalist theory, ecological theory predicts isomorphism within organizational fields, but the explained cause of isomorphism is competition. One organizational form is perceived to be most efficient in the long-run for a given environment, and organizations that survive are those that have adopted this ideal form. Similar to organismic ecology, organizations that do not have the “fittest” characteristics do not survive (Hannan & Freeman, 1977).

Open systems perspectives do not offer a consistent prediction of the effects of school district consolidation. Ecological theory would suggest that isomorphic movement toward larger consolidated districts would be driven by competition and, thus, by true efficiency gains. Neoinstitutional theory, on the other hand, would suggest that school districts would pursue consolidation regardless of its actual efficiency effects, so long as doing so would increase legitimacy. Even if efficiency improvements were possible with consolidation, the presumed loose coupling of education organizations (Meyer & Rowan, 1977) would suggest that actual efficiency gains would be unlikely as decisions made to optimize the organization go largely unimplemented by faculty and staff.

Neoinstitutionalists would also predict changes in innovation spread following consolidation. Large organizations are less likely to innovate than small ones, but they are more able to adopt proven innovations developed by other organizations (Angst, Agarwal, Sambamurthy, & Kelley, 2010). Widespread consolidation, such as to county-level districts, might then result in less innovation and therefore lower efficiency, while localized consolidation could result in the presence of both large and small districts, promoting both innovation and the spread of best practices.

Economic Theory

School districts are organizations of people, and as organizations that manage resources to produce a service, they are also economic actors. Therefore, economic theory can also inform the likely effects of school district consolidation. Because consolidation increases organizational size and reduces the number of options public education consumers have in a given market, economies of size and competition are the two aspects of economic theory most relevant to school district consolidation.

Economies and Diseconomies of Size

Economies of size are decreases in average unit cost when the number of units produced or served increases. This concept is closely related to the more familiar idea of economies of scale, but the latter requires a clear definition of “output” making it more difficult to apply in educational settings, where social, emotional, and cognitive outputs may be sought, than in manufacturing

operations, where outputs are more clearly defined (Duncombe & Yinger, 2007). Diseconomies of size arise when average unit costs increase with increases in the number of units produced or served.

One source of economies of size is workforce specialization. In his seminal work, *The Wealth of Nations*, Adam Smith (2003) dedicated the opening chapter to this topic, describing in detail the productivity gains in a pin factory. As organizations grew larger, he argued, workers could dedicate their time to a more limited set of tasks. Smith observed that repetition helped workers become more efficient, and the focus on a narrow set of tasks also promoted innovation by the workers in the form of new tools and techniques used to accomplish their tasks more readily.

Another source of economies of size is the sharing of resources over greater quantities of production. Many resources required in manufacturing and service provision are classified as fixed costs, as they are needed regardless of the size of output. A factory may be an example of a fixed cost for a manufacturing firm; a Chief Executive Officer or similar leader is a likely fixed cost for any firm. Semivariable cost resources, also called lumpy cost, are those that vary with size in a step-function fashion. For example, only one assembly line may be required regardless of the quantity produced until the capacity of the line is exceeded. Production in excess of this capacity requires a second line and all the resources it entails. In general, as organizations grow in size, these fixed and lumpy costs can be spread over a larger number of units produced or served

and thereby reduce average unit costs (Mansfield, Allen, Doherty, & Weigelt, 2002).

Countering the sources of economies of size are increasing costs of centralization and coordination that produce diseconomies of size. Achieving labor specialization and sharing of costs frequently requires consolidating operations into a smaller number of locations. This can necessitate the construction of new facilities to house these larger operations. Additional transportation resources may also be needed, as centralization moves good- and service-production further from inputs and consumers (Duncombe & Yinger, 2007). Coordination costs can also increase with size. As division of labor increases, tasks that were previously managed by a single person must now be coordinated among several individuals, requiring additional management resources (Rasmussen, 2013).

Considered together, economies and diseconomies of size predict that the efficiency effects of school district consolidation would depend on pre- and post-consolidation organizational size. Increased specialization of labor would be especially beneficial in the smallest districts, where teachers are required to teach multiple subjects and multiple grades. Consolidation could allow teachers to produce repetitive and innovative gains by teaching fewer subjects more frequently and would also enable districts to hire teachers with more specialized pre-service training (e.g., a chemistry teacher instead of a general science teacher). Sharing of fixed and lumpy costs across more students would also lead

to lower average costs through consolidation. A superintendent, for instance, may be deemed a required resource for a district whether it serves 200 or 2000 students. At an annual salary of \$200,000, the per-unit superintendent cost would be \$900 larger in the 200-student district than in the 2000-student district. Consolidation of physical plant resources would similarly support resource sharing. Countering these economies of size would be likely increases in student transportation costs. As school districts centralize operations into fewer schools, students would need to be transported greater distances at greater cost. The predicted net effect of consolidation on efficiency, then, would be dependent on the degree to which diseconomies offset economies of size.

Competition

It is generally accepted among economists that market competition promotes improved efficiency (Belfield & Levin, 2002). Having multiple options for service provision allows customers to choose the best service/price combination, promoting the success of more efficient firms and the demise of the ineffective. Tiebout (1956) famously applied market principles to public economics in his consideration of allocative efficiency, which is the degree to which citizens are provided with the service/tax burden combination they prefer. Hoxby (1995) argued that the Tiebout effect extends to technical efficiency, which is the relationship between inputs and outputs. Because citizens can “vote with their feet” where several different municipalities serve a region, governments that are more technically efficient, offering more services at a lower tax burden, will tend

to attract residents relocating out of less-efficient municipalities. Where citizens have little choice of government, the government has less incentive for efficient operation.

School district consolidation would negatively affect competitiveness, and thus negatively affect efficiency, by reducing the number of choices of districts citizens have. In some otherwise highly-competitive markets, a single consolidation may have little effect on the market concentration and likely limited competition effect on technical efficiency. Rural areas already served by few districts and states proposing consolidation at the county level, however, may expect meaningful negative efficiency effects from consolidation due to the loss of competitive pressure on school districts.

Predicted Efficiency Effects of School District Consolidation

No unanimity can be found in either sociological or economic theory regarding the predicted efficiency effects of school district consolidation. Each discipline contains concepts that predict positive and negative effects of consolidation on school district efficiency. These ideas are summarized in Table 3.1, categorized by predicted effect. The mechanisms through which benefits are predicted to arise are shown in Figure 3.1, along with moderating forces that oppose efficiency gains.

Though no general prediction about the efficiency effects of school district consolidation can be reached through sociological and economic theory, these concepts may be informative in specific scenarios. Pittsburgh, Pennsylvania, for

instance, is ringed by more than two dozen school districts, several of which have low enrollments. Because of the small size, the efficiency benefits predicted by rational systems and economies of size concepts may be large. At the same time, consolidation with another small district would allow for the maintenance of intimacy demanded by natural systems perspectives, transportation diseconomies would be small because of the dense population, and the effects of a single consolidation on market competitiveness would be minimal. Combined, economic and sociological theory would predict efficiency gains from such a consolidation.

At the other extreme are consolidations of geographically- and enrollment-large districts in noncompetitive regions, where theory would predict negative efficiency effects of consolidation. With these districts, many economies of size would already have been achieved and rational systems implemented before consolidation due to the large enrollments, reducing the potential for additional gains. Intimacy among organizational members would be further hampered with the larger size, and diseconomies of transportation may be exacerbated. Lost competitiveness in an already-noncompetitive region would also result in lower efficiency post-consolidation.

For the many other scenarios where consolidation may be considered, sociological and economic theory offer less clear guidance. In the future, empirical research may provide more insight to inform the relative weight of the

effect of each concept on efficiency and improve the ability of policymakers and researchers to predict the efficiency effects of school district consolidation.

Chapter 4. Review of Empirical Research: School District Size, Competition, Consolidation

Buttressing the theoretical predictions regarding the efficiency effects of school district consolidation is a large corpus of related empirical research. Most of this research has focused on two mechanisms through which consolidation is expected to affect efficiency: school district size and competition. A small number of studies have directly examined consolidation events. In this chapter, I review empirical research on school district size, competition, and consolidation events, summarizing what can be learned from the extant research and identifying a key common weakness among existing studies that limits their generalizability to policymakers considering consolidation.

School District Size

One research approach that has been utilized to inform school district consolidation decisions is the study of district enrollment effects. Since the mechanisms of rational systems and economies of size, through which consolidation is believed to improve efficiency, are all driven by larger enrollments, estimating the effect of enrollments on relevant outcomes could be useful in predicting the effects of consolidation. At the same time, there has been an acknowledgement of the potential for diseconomies of size as school districts grow too large, which has in turn led researchers on a quest to find the optimal school district size that balances these economies and diseconomies.

In this section, I present an overview of older research on optimal size and a more thorough review of recent research. Following a summary of the early research, I describe studies published since 2000, when the most recent review of research on the subject was written. I categorize these studies based on their methodology as production function or cost function studies. Studies that analyzed both inputs and outputs using observed data were included.

Early Research on Optimal Size

Empirical research on cost-optimal school district enrollment began at least as early as the 1960's. Hanson (1964), an official in the state of Washington Department of Education, analyzed the relationship between district size and spending in nine U.S. states. Recognizing that school district spending was a function of more than merely enrollment, he predicted spending based on community characteristics using prior econometric studies and regressed the difference between actual and predicted spending on district size. Hanson concluded from his results that school district enrollments of around 50,000 students were optimal.

In 1981, Fox published the first comprehensive and critical review of research on size effects in education. He identified several methodological shortcomings in the earliest work. One common problem, to which the Hanson (1964) study was an exception, was failure to account for systematic differences in the demand for education across school districts. Another key weakness he identified was that "student number is a poor output surrogate" (Fox, 1981, p.

281). While admitting measurement might be difficult, he argued that educational quality was an essential element of output and must be incorporated into estimating models. Once included, researchers would then need to methodologically manage the simultaneity of student performance and spending. In addition to these and other econometric concerns, Fox found no convergence toward an optimal size in the results of the early studies, with some suggesting an optimal size of fewer than 300 students and others supporting sizes of over 50,000 students. Ultimately, the model shortcomings and mixed findings led him to conclude that economy of district size was “not a settled issue” (Fox, 1981, p. 290).

Two decades later, Andrews, Duncombe, and Yinger (2002) revisited the research on economies of school district size and reported progress in methodology and the establishment of some consensus in results. They found that all nine of the cost function studies they reviewed had incorporated measures of student outcomes and controlled for demographic characteristics, and five of the nine had specifically addressed concerns raised by Fox (1981) regarding the endogeneity of outcomes. At the same time, they noted that less progress had been made on methodology in production function studies that focused on the effects of enrollment. Nonetheless, they observed that results were becoming more consistent as methodology improved and concluded that small school districts would meaningfully benefit from consolidation up to sizes of

2000 to 4000 students, with diseconomies of size occurring with enrollments over 6000 students.

Production Functions

Production functions statistically relate an output to a set of inputs. In educational research, student outcomes, such as graduation rates or standardized test scores, are frequently used as output measures. Independent variables typically include quantity and quality measures of school inputs, such as the relative pay of teachers and the length of the school year. Also included are student and community characteristics, such as student economic disadvantage and educational attainment of district residents, to control for variability in the resources required to educate students with different needs.

There were four production function studies examining returns to school district size published in peer-reviewed journals since 2000. These studies are listed in Table 4.1.

Jacques, Brorsen, and Richter (2000) analyzed Oklahoma school districts using 1994-95 academic year standardized test data across multiple grade levels. As independent variables, they included expenditures as inputs and several demographic control covariates. They displayed results from a model that included the multiplicative inverse of enrollment as an independent variable and concluded that there were decreasing returns to size over all enrollment levels. In a footnote, they also reported that a model featuring linear and square root enrollment terms revealed decreasing returns to size only through enrollments of

8100 students, above which test scores increased. Because few Oklahoma school districts are that large, the authors did not consider this finding to merit discussion and omitted detailed regression analyses for the model from their report.

Driscoll, Halcoussis, and Svorny (2003) similarly studied school districts within one state in their production function study of California school districts. They estimated relationships by grade band – elementary, middle, and high school – and concluded from their model that there are decreasing returns to district size across all enrollment levels for elementary and middle school students. Constant returns to size were estimated for high school students. Tests of a quadratic enrollment term were not statistically significant. Notably, the independent variables they included in their model complicate interpretation in a consolidation context. Both school and class size were incorporated as control variables, and given that these variables are both predicted to increase with consolidation, the joint effect should be considered. In this model output, all size coefficient estimates were negative or not statistically significantly different from zero. As a result, their findings would predict a negative effect of consolidation on student outcomes.

Attempting to produce a more generalizable finding through a national sample, Robertson (2007) used SAT data from the highest-enrollment districts in the U.S. to estimate returns to size. Under the assumption of a linear relationship between SAT score and district enrollment, he found constant returns to size

across these large districts. No attempt at estimating a non-linear relationship was reported.

Another study using a nationwide approach was a production function study by Berry and West (2010). They used 1980 U.S. Census education and wage data to examine three different outcomes: educational attainment, income returns to education, and wages as adults. Changes in average district size by state from 1920 through 1949 proxied for school district size. They found positive effects of average district enrollment on returns to education but no significant relationship between district enrollment and educational attainment or income after controlling for other inputs. Additionally, they found significant negative effects of larger school sizes and argued that these negative effects would more than offset any potential positive effect of larger district enrollments on wage and educational attainment.

Contrary to the prediction of the existence of an optimal district size, none of the four recent production function studies found evidence of an ideal district enrollment. The methodology used by Robertson (2007) and the model preferred and reported on by Jacques, Brorsen, and Richter (2000) could produce only increasing or decreasing functions, precluding them from finding an optimal size. Driscoll, Halcoussis, and Svorny (2003) and Berry and West (2010), however, tested for quadratic enrollment terms that would have allowed for the location of an ideal enrollment but did not find these functional forms to be statistically significant. In total, three studies found decreasing returns to size and one, Berry

and West (2010), found constant returns to size on the ultimate outcomes of interest. Collard-Wexler (2012) reported that production function studies across industries generally suggest the presence of decreasing returns to size, meaning the school district results are not unusual. Griliches (1957) anticipated this and offered an explanation, arguing that production functions are particularly sensitive to the omission of labor and management quantity and quality variables, with the result being a downward bias in the estimation of returns to size. Thus, results from these studies suggesting decreasing returns to school district size may be more indicative of methodological bias than of actual decreases in efficiency with district size.

Cost Functions

An alternative econometric approach to estimating the effect of organizational size on efficiency is the cost function. Cost functions relate per-unit expenditures to output quantities, while controlling for environmental factors that may affect cost. In school district organization studies, per-pupil current expenditures are usually the dependent variable. In addition to district enrollment, independent variables include academic quality indicators, frequently in the form of test scores, and a measure of regional price variation. Student and community characteristics, such as student economic disadvantage and educational attainment of district residents, are also included as controls for environmental factors affecting the cost of production.

There were ten cost function studies of school district size published since 2000. These studies are listed in Table 4.2. An additional four recent cost function studies were released in the grey literature and are listed in Table A2.1 in Appendix Two.

Chakraborty, Biswas, and Lewis (2000) applied a cost function model to estimate the relationship between cost and district size in Utah. Using panel data from 1982-83, 1987-88, and 1992-93 with district fixed effects, they found that costs decreased as enrollments grew larger. The quadratic enrollment term in their estimated model was not statistically different from zero, leading them to conclude that economies of size existed for districts of all enrollment levels in Utah.

In an analysis of Arkansas school districts, Dodson and Garrett (2004) used a cost function and cross-sectional data from 1999-2000 to estimate the optimal district enrollment. Their model attempted to better isolate the effect of size on cost by managing other sources of technical inefficiency through stochastic frontier analysis (SFA). In their estimation, the quadratic enrollment term was statistically significant, leading to the conclusion that an optimal size of 3500 students existed in Arkansas. They also independently examined three categories of expenditures, finding that most economies were achieved for teacher compensation by enrollments of 1850 and for supplies by enrollments of 525 students, with no economies of size observed for transportation costs.

Imazeki and Reschovsky (2006) used a 2001-02 cross section of K-12 districts to estimate a cost function for Texas school district. From their two-staged least squares (2SLS) estimation, which instrumented for student outcomes, they found an optimal district enrollment of over 85,000 students. They addressed concerns about inefficiency by including a proxy, market concentration as measured by the Herfindahl–Hirschman Index (HHI).

In their cost function study of rural New York school districts, Duncombe and Yinger (2007) separately examined operating and capital expenditures. They used panel data from 1985 through 1997 in a 2SLS framework and found economies of size for operating expenditures across all relevant enrollment ranges and no economies or diseconomies of size for capital expenditures. They included a quadratic enrollment term in their model, which had a statistically significant relationship with operating costs, but the optimal size estimated from this result was many times larger than the largest district in their sample. Nonetheless, this non-linear relationship suggested the potential for much greater savings in small districts that consolidated than for larger merging districts.

Among Indiana school districts, Zimmer, DeBoer, and Hirth (2009) found economies of size only though enrollments of about 1900 students, above which diseconomies existed. The study used panel data from 2004 through 2006 in a 2SLS model with district fixed effects. Interpretation of their model in a consolidation context is complicated by the inclusion of school size and percent

of expenditures used on teacher salaries as controls, since these variables are expected to be affected by consolidation.

In response to the Imazeki and Reschovsky (2006) study of Texas school districts and concerns raised by Costrell, Hanushek and Loeb (2008) about the efficiency assumptions of cost functions, Gronberg and colleagues published a series of cost-function analyses of Texas districts. One of these studies (Gronberg, Jansen, & Taylor, 2011a) used similar data to Imazeki and Reschovsky but estimated the size-spending relationship with a more flexible translog function in an SFA. By using SFA, they aimed to better manage school district efficiency. Their results suggested economies of size existed over all school district sizes, with the largest districts exceeding 200,000 students. Results of a second study (Gronberg, Jansen, & Taylor, 2011b) in which the price of capital was included in the model and a third study (Gronberg, Jansen, Karakaplan, & Taylor, 2015) in which market concentration was included generally supported this conclusion. A study that compared traditional public school districts to charter school systems in Texas metropolitan areas produced markedly different findings, with costs minimized at enrollments of only 1200 students (Gronberg, Jansen, & Taylor, 2012). The methodology for this study differed notably from their other three studies, as data was school-level rather than district-level and the model included school enrollment, which had a negative relationship with cost.

Using a similar methodology to the district-level studies of Gronberg and colleagues, Karakaplan and Kutlu (2017) examined California school district size. Their estimate suggested that costs were minimized for districts with about 6700 students. From their regression results, they simulated savings for a proposed mandatory consolidation of districts with fewer than 100 students and estimated that savings may be as large as 25%.

Summarizing Optimal Size Research

Results from recent research on optimal school district size have been mixed, with some studies finding negative associations between enrollments and efficiency and other studies finding positive relationships. While there are substantial differences among studies within each methodology, the contrasting conclusions drawn from production function and cost function estimation are stark.

Recent production functions studies would predict negative effects on efficiency from school district consolidation. Two of the four production function studies found student outcomes worsened with increasing district size, even for the smallest districts, while controlling for other inputs and environmental characteristics. The one production function study that found a positive relationship also controlled for school size and noted the negative effect of school size, which is correlated with district size, more than offset any positive effect of larger district size.

Cost function studies unanimously predict improved efficiency with increasing district size over at least some range of enrollments. Five of the ten cost function studies found economies of size over all enrollment levels. The remaining studies identified an optimal school district size, ranging from 1200 to 85,000 students, below which additional savings were possible and above which diseconomies existed.

Competition in Education

Like research on optimal size, empirical investigations into the effects of competition in education are not new. Belfield and Levin (2002) conducted a thorough review of this research, beginning with studies from the 1970's. They concluded that the preponderance of the evidence supports a positive relationship between competition and both student outcomes and efficiency, while describing the size of these effects as "modest" (p. 296) in general but stronger for low-income students.

More recent evidence on the effects of competition on efficiency comes from several of the cost function studies cited in the previous section. Imazeki and Reschovsky (2006) directly included HHI in their model and found no significant relationship between market concentration and cost in their study of Texas school districts. Gronberg and colleagues, using market concentration in modeling the SFA efficiency error term, showed competition to be positively predictive of efficiency (Gronberg, Jansen, Karakaplan, & Taylor, 2015). They used their results to simulate a county-level consolidation proposal and projected

that the lost efficiency due to decreased competition would produce a \$2 billion annual loss compared to only a \$0.4 billion savings from economies of size. Similar to Gronberg and colleagues, Karakaplan and Kutlu (2017) found competition to be significant and meaningful in size for districts in California. They also performed a simulation, but only on the smallest districts, where they predicted that size economies would exceed efficiency losses.

School District Consolidation

Despite a rich body of research on the potential size and competition effects of school district consolidation, only three published studies have examined the financial effects of actual consolidation events. Studies of actual events may be more pertinent to policymakers looking to improve the efficiency of their school systems, as they provide evidence of what has actually resulted from consolidation rather than what is theoretically possible. All three studies of consolidation events contrasted pre- and post-consolidation outcomes for merging districts with a comparison group, with each using a different methodology, and none found significant cost savings or efficiency gains from consolidation.

Streifel, Foldes, and Holman (1991) examined 19 consolidation events that occurred in several U.S. states in the early 1980's. They only studied financial measures with no academic outcomes considered, thus precluding conclusions about changes in efficiency. Methodologically they used an approach akin to a differences-in-differences design, comparing the percentage

change in expenditures for consolidating districts to the corresponding change in the state average expenditures. They reported no significant difference in total expenditures. An analysis by spending category similarly showed no difference in most types of expenditure, with the exception of administrative expenses, for which consolidating districts grew at a much slower rate than the corresponding state averages.

Attempting to move closer to estimating efficiency effects of school district consolidation, Duncombe and Yinger (2007) merged their cost function approach, discussed in the previous section, with a differences-in-differences-style estimator. Twelve consolidations occurred in New York State between 1985 and 1997, and these districts were compared to approximately 190 non-consolidating rural New York districts. Both district fixed effects and district-specific time trends were included in the model, and the results showed average increases of 67% in operating expenditures immediately with a slow 1.4% decrease each year following consolidation. Capital expenditures showed no significant intercept shift but rose at 8.5% per year following consolidation. Because these effects were estimated in a model that also included enrollment, Duncombe and Yinger used the size effect coefficients to calculate the predicted savings associated with the larger enrollments post-consolidation. They projected that within ten years after consolidation two hypothetical 1500-student districts would save 14% annually by merging, with smaller merging districts expecting larger savings. By including both enrollment and an indicator for consolidation in

their model, however, the actual causal impact of consolidation on the efficiency of the twelve districts cannot be directly inferred.

In their study of Texas consolidations, Cooley and Floyd (2013) used simple differences to estimate effect. They examined academic and financial outcomes for ten rural district consolidations. One set of statistical tests compared consolidated district results pre- and post-consolidation. Another set of tests compared outcomes from the post-consolidation time period for consolidated districts and a matched comparison group. They found that the absorbing districts in consolidations had higher expenditures and lower standardized test pass rates after consolidating than before it but no significant change in expenditures or pass rates for the joining districts. Between consolidating and non-consolidating matched districts, they found no significant differences. Due to the simple difference methodology, the results of this study do not provide causal evidence of the effects of school district consolidation.

Empirical Predictions of Efficiency Effects from School District Consolidation

The large number of empirical studies that have sought to inform school district consolidation decisions offer conflicting predictions of what results policymakers may expect. Production function studies suggest decreasing returns to size, which would predict negative efficiency effects from consolidation. Cost function studies all suggest economies of size exist for at least small school districts, predicting that efficiency gains are likely from consolidation of low-

enrollment districts. The three studies that examined actual consolidation events provide no evidence of direct efficiency improvements from consolidation, though Duncombe and Yinger (2007) interpret their results to suggest that savings may be possible in the long run.

One methodological shortcoming – selection bias – plagues all of the reviewed studies on consolidation, which prevents true causal interpretation of the effects of school district consolidation. Where consolidation is a voluntary decision, it may be expected that districts likely to benefit from consolidation would more probably choose to consolidate. If this is true, the consolidation effects estimated from production function, cost function, and event studies would all be affected, with the projected benefits of consolidation overestimated when applied to other districts that have not yet opted to consolidate.

Exogenous assignment to consolidate, a necessary characteristic to gain a causal estimate, has not been a feature of any previous consolidation study. Such exogeneity would likely come from an externally-applied policy that mandated the consolidation of one group of districts but not another. From an effect estimation standpoint, this would ideally be done through random assignment or random timing of assignment to consolidation. Where randomization is politically infeasible, arbitrary cut points, such as an enrollment threshold below which consolidation much occur, could also introduce exogeneity around that threshold. Though minimum-enrollment consolidation mandates have

been common over the past century, no studies have leveraged these thresholds to improve estimation of the efficiency effects of school district consolidation.

Chapter 5. School District Consolidation Research Questions

Much of the research that has sought to inform school district consolidation policy has relied on existing populations of school districts. Production function studies have examined the relationship between changes in average school district size by state and changes in financial and academic outcomes over long periods of time. Cost function studies have utilized cross-sectional data within a state to estimate optimal enrollment size. Studies of actual consolidations, meanwhile, have been very rare, though the need for such studies has been identified in several key papers on the subject (e.g., see Andrews, Duncombe, & Yinger, 2002). In this dissertation, I will focus on filling this void by describing and estimating the effects of actual school district consolidations.

Describing School District Consolidation in the United States

Chapter 6 will describe school district consolidation in the U.S. from 2000 through 2015. The frequency of consolidation and variation by geography will be explored. I will also describe the school districts that participated in consolidations, including enrollment, demographic, geographic, and financial characteristics.

The research questions to be answered include:

RQ6.1. How many school district consolidations occurred between 2000 and 2015?

RQ6.2. How have rates of consolidation varied by state?

RQ6.3. What are the enrollment characteristics of consolidating districts?

RQ6.4. What are the demographic characteristics of consolidating districts?

RQ6.5. What are the geographic characteristics of consolidating districts?

RQ6.6. What are the financial characteristics of consolidating districts?

Academic and Financial Effects of Mandatory School District Consolidation

In Chapter 7, I will investigate the effects of mandatory consolidation on academic outcomes and school district spending. Improved efficiency is often the stated goal of school district consolidation. Examining the effects of a 2004 change in Arkansas law that required low-enrollment districts to consolidate will provide a gauge of its effectiveness at improving cost-effectiveness.

The research questions to be answered include:

RQ7.1. What is the effect of school district consolidation on student academic outcomes?

RQ7.2. What is the effect of school district consolidation on school district spending?

School District Consolidation and Economies of Size

Chapter 8 will provide a detailed look at the effect of consolidation on school district expenditures by category. Several types of expenditures are hypothesized to exhibit economies of size, including administrative, instructional salary, and facility expenses. Transportation, on the other hand, is predicted to exhibit diseconomies. I will explore whether the predicted economies and

diseconomies were realized in the 2004 Arkansas mandatory consolidation by examining spending by category.

The research questions to be answered include:

RQ8.1. What is the effect of school district consolidation on resources hypothesized to exhibit economies of size?

RQ8.2. What is the effect of school district consolidation on resources hypothesized to exhibit diseconomies of size?

Chapter 6. School District Consolidation in the U.S.: 2000 – 2015

A dearth of research attention to consolidation has left unanswered questions of how many districts consolidate each year and the characteristics of those consolidating districts. This chapter answers these questions, providing a description of school district consolidation in the U.S. between the years 2000 and 2015. Data and Methods are explicated in the opening sections. The Results section details the counts of consolidations, the size and demographics of participating districts, and the geographical and financial characteristics of consolidating school districts. Finally, some Limitations of this analysis are presented and Conclusions are discussed.

Data

In this analysis, I used administrative data from federal and state sources. Lists of active school districts in each year were obtained from the National Center for Education Statistics' (NCES) Common Core of Data (CCD) school district universe surveys to identify all consolidation events. For several states,¹ CCD data was supplemented by lists of changes in school district organizations available on state websites or provided in reply to my requests. In some instances, local newspaper coverage of consolidations provided confirmatory evidence where other sources were unclear.

Data describing the consolidating districts came from a variety of sources. The CCD school district universe files contained much of the information about

¹ States with school district reorganization lists included: AR, AZ, CA, IA, IL, KS, MA, ME, MN, MS, MT, ND, NE, OK, SD, VT.

each school district, including enrollment, locale, grade ranges, counts of schools and teachers, and beginning in 2010-11 the proportion of students who identified as racioethnic minority. Prior to 2010-11, race and ethnicity data were reported at the school level in CCD school universe files. Financial data on expenditures and debt were extracted from the CCD school district finance files. Geographic data on land area, contiguity, and coterminosity came from NCES Education Demographic and Geographic Estimates (EDGE) School District Boundary files.

To complement the description of the school district organization, I included community characteristics in this analysis. The 2000 U.S. Census was used as a measure of population, income, education, and share of households with children within each school district.

Methods

Definitions

Several definitions are important to this analysis. First, I limited the scope of this analysis to districts meeting the NCES “regular LEA” criteria. This includes traditional school districts with a defined geographic area of authority. Also included are school districts with defined boundaries that are part of a larger supervisory union of multiple districts. Charter districts and special districts for vocational education or juvenile justice are not considered “regular LEAs” and are excluded from this analysis.

I define a consolidation event by its resulting school district in a given year. That is, when two or more districts join at the same time to form a larger

district, I count this as one event. In some cases school districts split, with part of the former district merging with one district and part joining with another district. Under the definition I have opted to use, such a scenario would be counted as two consolidations, since two resulting districts have been changed.

A final definition of import is that of non-operating districts. Some school districts in the U.S. exist as a political entity but do not directly educate students. Instead, they may have a sending-receiving relationship with a nearby district or may provide tuition payments to schools of parental choice. These non-operating districts are not easily identified in school district lists. To proxy for this categorization, I define non-operating school districts as those with zero students or with zero schools.

Identifying Consolidation Events

Identifying consolidation events was the first step in this analysis. Consolidations were identified by screening for changes in the CCD list of school districts from year to year. School districts that were not present in the CCD in every school year from 1999-00 through 2015-16 were retained for further inspection. This included nearly 3000 school districts.

A second level of screening attempted to remove districts that had been coded incorrectly. During the early years of charter schools, some states coded charter school districts as regular LEAs. Michigan, for instance, had 183 charter school districts on their master list before recoding them in 2001. Using the name

of the school district, I removed those that contained the word “charter” from the list of possible consolidating districts.

The next step in the identification process was to verify whether districts deleted from or added to the CCD were results of consolidation events. State records were the primary means of verification. These records were manually compared to the CCD additions and deletions, with details of the districts participating in each consolidation recorded. For states that did not have available lists of school district changes, local news reports of consolidation events were used to confirm the participating districts. In the few cases where no state records or media reports could be found, geographic information system (GIS) data from EDGE was used to determine where changes in school district boundaries had occurred. Ultimately, all but four² of the nearly 3000 school district additions and deletions were verified.

This manual approach to identifying school district consolidations offers more precision than past estimations of consolidation activity. Researchers have often used the change in the total count of school districts as an indicator of consolidation activity (Duncombe & Yinger, 2007; Gordon & Knight, 2008). Such an approach returns a rough estimate of the number of school districts that have been eliminated through consolidation. Since exact counts and descriptions of consolidating districts were not the aims of these past reports, the “change in districts” approach served the authors’ purpose. Achieving precise consolidation

² One school district in Arizona and three districts in New York were unable to be verified.

counts and detailing those districts participating in consolidations, however, required this more intense case-by-case inspection.

Describing Consolidating Districts

Results of this analysis are presented mainly in counts, proportions, and percentile values. Percentile values, particularly median values, are preferred to mean values in this analysis because of the presence of several extreme values. The highest-enrollment consolidating district, for instance, inflates the mean enrollment of consolidating districts by over 20%. As such, the mean does not well represent the central tendency of school district characteristics in this analysis.

Since some states are much more represented in the set of consolidating districts than others, several characteristics are presented as both raw values and as multiples of the corresponding state median value of that characteristic. Where state median measures are used, these are medians of regular school districts. National median values are also presented for some measures, and these also include only regular LEAs.

Most school district characteristics included in this analysis are presented using common metrics. Annual student memberships reported to NCES were used for district enrollment. Racioethnic minority representation included those students not identifying as white non-Hispanic. Geographic contiguity was categorized based on the presence or absence of any shared border between joining districts. School market competitiveness was measured using the

Herfindahl-Hirschman Index (HHI), calculated as the sum of the squared market shares of each district in a market. Following Imazeki and Reschovsky (2006), the market boundary for the HHI calculation was defined as the metropolitan statistical area (MSA) for those districts within a defined MSA and the county for those not within an MSA. District finance measures were adjusted to 2014 U.S. dollars using the Bureau of Labor Statistics' Consumer Price Index - U.S. City Average. Finally, debt was calculated as the sum of short term and long term debt.

Results

Counts

Between 2000 and 2015, there were 909 school district consolidation events in the United States. About one in every nine districts that existed in the 1999-2000 school year was part of a consolidation in the fifteen years that followed. The isolation of a time trend in consolidation activity over this period is complicated by the presence of state-specific actions that mandated or incentivized consolidations. As is shown in Figure 6.1, most years in this period had between 40 and 60 consolidation events. Spikes in 2004, 2006, and 2009 resulted directly from policy actions in Arkansas, Nebraska, and Maine, respectively.

Consolidation events between 2000 and 2015 were highly concentrated in a small number of states. A national map of consolidating LEAs is displayed in Figure 6.2. Though consolidations occurred in 32 of the 50 states, nearly one-

third of all events took place in Nebraska and another third occurred in the next five most-active states. Table 6.1 displays the states with the most consolidation events. Counts of consolidations by state are also mapped in Figure 6.3.

Relative levels of consolidation activity by state were also compared using the percentage of a state's districts that participated in a consolidation. These values are displayed in Figure 6.4. The states with the highest shares of districts involved in consolidations between 2000 and 2015 are displayed in Table 6.2. South Dakota and Maine had high rates of consolidation activity under this measure and ranked ahead of Illinois and Iowa, both of which had more total consolidations but also had many more districts as of 1999-2000.

Consolidation Participants

Most consolidations united two school districts, but some brought together many more. Table 6.3 shows the share of consolidations by number of districts joined. About five of every six consolidations featured only two school districts, with another 8.7% uniting part or all of three districts. A small number of consolidations included ten or more joining districts. A consolidation in Maine united ten complete school districts, while a district in Nebraska was formed from the merging of parts or all of 19 districts.

The splitting of districts during the consolidation and reorganization process was common. Of the 909 consolidation events that occurred between 2000 and 2015, 394 involved at least one district that had been divided into

multiple parts. This was particularly common in Nebraska, where 71% of consolidations included one or more partial districts.

Consolidations that included non-operating districts were also common. Nearly one-fourth of all consolidations between 2000 and 2015 involved at least one non-operating district. In some states, eliminating non-operating districts was a particular policy focus. New Jersey, for instance, mandated the consolidation of its non-operating districts with operating districts in 2009.

Enrollment in Consolidating Districts

Nationally, around 1.7 million students were enrolled in consolidating school districts between 2000 and 2015. The majority of these students were from large districts, with enrollments above 5000 students, but most of the school districts involved in consolidation were small. Excluding non-operating districts, the median enrollment of consolidating districts was approximately 200 students. Nearly 90% of operating consolidating districts had student enrollments below the national median of 1100 students. Compared to state median enrollments, consolidating districts were not as relatively small. One third of operating consolidating districts had enrollments above their corresponding state median.

Considering a typical set of districts involved in a consolidation event, the largest district of the set was often a typical size district within its state and the other was usually much smaller. The median size of the largest district in each consolidation event was about 500 students, with 55% of consolidations including a district greater than the state median enrollment. The median size of the

smallest district was approximately 90 students. Around 75% of consolidations involved at least one district with an enrollment less than a third of the state median.

Wide differences in enrollment between districts involved in consolidation events were common. Approximately 80% of consolidations included one district that was two or more times larger in enrollment than the smallest district involved. The median difference between the highest and lowest enrollment in consolidating sets was 565%, meaning over half of all consolidations involved a district with six or more times the enrollment of a smaller district participating in the union.

While most consolidations events between 2000 and 2015 united a state-typical-enrollment district with a low-enrollment district, several exceptions existed. Table 6.4 displays the largest total-enrollment consolidations featuring multiple large school districts, and Table 6.5 presents the smallest total-enrollment consolidations. The consolidation of Memphis (TN) City School District into Shelby County School District brought together two districts with enrollments in the top 1% nationally. Even larger in terms of total enrollment was the uniting of North Forest (TX) Independent School District with Houston Independent School District. Houston had the nation's eighth-highest enrollment with over 200,000 students when it joined with North Forest, which itself had an enrollment in the top 10% nationally and was seven times the Texas median district enrollment. At the other extreme were consolidations of very small

districts, such as Twin Buttes and Rock Spring in Montana, which were single-teacher schools serving three and two students respectively at the time of consolidation.

In addition to generally having low levels of enrollment, school districts involved in consolidations also often had decreasing enrollments. At least one participating district had a negative five-year enrollment trend in 95% of consolidation events. In 55% of consolidations, all districts involved had decreased in enrollment from five years prior to the union.

Demographics

Demographically, consolidating school districts were similar to the national population of districts on several measures but very different on racioethnic representation.

Over 900,000 students – more than half – enrolled in consolidating districts identified as racioethnic minorities. The largest consolidations by total enrollment involved districts where more than half of the student body identified as racioethnic minorities. Of the ten largest-enrollment consolidations between 2000 and 2015, only the 2006 reorganization in Lincoln, Nebraska and the 2004 Cleveland County (NC) merger included mostly white students.

Though a majority of students in consolidating districts identified as racioethnic minorities, most consolidation events involved districts that were predominantly white. Indeed, the median consolidating district had an enrollment

that was 96% white. In the national distribution of all school districts, only one-fourth of all districts had so high a share of white students.

Between the districts involved in each consolidation, differences in minority representation were typically small, with a few notable exceptions. The median difference in minority representation between consolidating districts was approximately four percentage points. In a few consolidations, however, the differences were very large. Eight consolidation events in Michigan and Arkansas had differences of 60 percentage points or more, most of which involved the merger of a smaller district with high racioethnic minority representation into a larger district with a majority of white students. The consolidation events with the largest differences in racioethnic minority representation are shown in Table 6.6.

While consolidating districts differ from the national population of districts on racioethnic representation, they are comparable on several other demographic characteristics. Figures 6.5 and 6.6 compare consolidating district medians to national medians on the share of households with a child and the percent of adults with a Bachelor's degree. On both measures, consolidating districts are slightly lower than the national median, but the differences are relatively small.

Differences in personal income between consolidating districts and the national population of districts are somewhat larger than differences in education and child rearing, though they may be explained by regional differences in income. Figure 6.7 shows the median personal income median for consolidating

districts and for all districts nationally. The median consolidating district had a median income about 13% less than that of the median district nationally. When income was considered as a percent of the state median income, however, the median income of consolidating districts was only 4% less.

Geography

School district consolidation was most common among rural and small town districts. As is displayed in Figure 6.8, 93% of consolidating LEAs were rural or town districts. This is a much larger share than the 64% of districts in the national population identified as rural or town districts. Considering consolidation events, 89% included exclusively rural and town districts. Only sixteen of the 909 total consolidation events included an urban district.

Parallel with the prevalence of rural districts, population density in consolidating LEAs was lower than both state and national norms. The median population density for consolidating districts was 9.5 people per square mile, and 85% of consolidating districts had densities below the national median of 57.5 pp/mi². Consolidations were more common in states with lower population densities; nonetheless, two-thirds of consolidating districts had population densities below state median values.

The land area of consolidating districts was slightly smaller than state-typical sizes and slightly larger than national norms. The consolidating district median area of 108 square miles was about 10% larger than the national median of 98 mi². Compared to state median values, the median consolidating LEA was

about 6% smaller in area. Consolidating districts ranged in size from less than 0.25 mi² for several districts in New Jersey to nearly 10,000 mi² for a district in Arizona.

As with enrollment size, land area differences were common between districts involved in each consolidation. Nearly 60% of consolidation events included one district with twice the land area of the smaller district. In 30% of consolidation events, the larger district had an area four times that of the smaller district.

The boundaries of consolidating districts are another geographical characteristic of note. Twenty-eight of the consolidation events were coterminous consolidations, unifying districts that shared all boundaries but taught different grade levels. Most of the remaining consolidations were contiguous, though 4% of consolidation events included districts that shared no boundaries. In one event in Arkansas, the resulting district included three disjoint areas. All consolidations save one occurred within a single state, with the exception being the Rivendell Interstate School District in Vermont and New Hampshire.

A final geographic characteristic related to district boundaries and size is school market concentration. Figure 6.9 shows the median concentration, measured using HHI, for consolidating districts and the national population of school districts. Market concentration was notably greater in markets where consolidations occurred than in the national population. Compared to state

medians, however, the median market concentration for consolidating districts was only about 5% greater.

Resources

At the median, spending in consolidating districts was slightly higher than state and national medians. The median current expenditure per student was about \$10,750 in 2014 dollars among consolidating districts. The median was about 5% greater than both the national and respective state medians.

Differences in per-student spending among districts involved in a consolidation were typical. Over two thirds of consolidations included one district with current expenditures per student 20% or more greater than the lowest-spending district in the merger. In one fifth of consolidations, a district spent twice as much per student as its partnering district.

Like expenditures, the number of teachers per student was also greater in consolidating districts, and more markedly so. Measured by its inverse – the student-to-teacher ratio – consolidating districts had as a median 10.7 students per teacher. Over 80% of consolidating LEAs had fewer students per teacher than the national median of 14.1. Figure 6.10 graphically displays the national and consolidating district medians. Despite the large proportion of consolidating districts below the national median, approximately 60% of consolidation events included at least one district with a student-to-teacher ratio above the state median. At the same time, more than 90% of events had a district with below state-typical student-to-teacher ratios. It follows that differences between districts

in each consolidation were common, with a majority of events having differences of 50% or more in student-to-teacher ratio.

Turning next to the number of schools per district, consolidating districts were small in relation to national norms. As shown in Figure 6.11, half of all consolidating districts had a single school, compared to only 15% of all districts nationally. In Nebraska, where a concerted policy effort was made to eliminate elementary-only districts, two thirds of consolidating LEAs were single-school districts.

Another resource-related characteristic of interest was debt, where consolidating districts held debt less frequently than the population of all districts. Figure 6.12 displays the percent of districts with zero total debt, revealing that debt was much less common among consolidating districts. Compared to state norms, 70% of consolidating districts had debt levels at or below state medians. A quarter of consolidation events included only districts with zero debt, and another one third included at least one district with zero debt.

Limitations

One limitation to this study is a lack of access to state administrative records for school district consolidations in some states. In the states with the largest numbers of consolidations, such records were either publicly available on websites or were made available for this study. For states with smaller numbers of consolidations, such records were not always available. Most consolidations identified through CCD changes, as detailed in the Methods section, were

confirmed through GIS data or local news reports. The inconsistency of state coding in their CCD submissions, however, leaves open the possibility that consolidations occurred without the addition or deletion of districts in CCD. These events would not have been identified in this study for states that did not have district consolidation records.

Another limitation to this study is the age of data used for income, education, and child-rearing measures. Federal data from the 2000 U.S. Census were used for these characteristics, regardless of the year of consolidation. While Census American Community Survey (ACS) data was available for most districts, the relatively small populations in most consolidating districts resulted in estimates with large margins of error often exceeding 40%. Due to the presence of the ACS beginning in 2005, the 2010 Census did not include questions about educational attainment and income, thus limiting the source for precise demographic data to the 2000 Census. To the extent that these measures are stable over time, the age of the data could be expected to proxy well for the measures at the time of consolidation. If some trend in income or education systematically precedes consolidation, however, any differences between consolidating districts and the broader national population of all districts may be understated.

Conclusions

School district consolidation affected many school districts and many students between 2000 and 2015. Most of the 909 consolidations involved two

rural districts with small and declining enrollments. They were concentrated in the Great Plains states, along with Arkansas and Maine – two states that passed consolidation mandates during this period. They also occurred in regions with low levels of competition between districts.

Consolidating districts looked a lot like the typical school district in many ways but differed in some important characteristics. Incomes were lower in consolidating districts than national median incomes, but they were comparable to the median incomes in their corresponding states. On educational attainment and the percent of households with children, they were also similar. School district resources, on the other hand, were an area of difference. Consolidating districts had much lower student-to-teacher ratios than national and state medians and were much more likely to have only a single school. District debt was below national and state medians for most consolidating districts, with nearly half carrying no debt the year prior to consolidation.

The lack of debt in consolidating districts may provide an important clue to policymakers looking to encourage consolidation. This study offers no causal evidence on the drivers of consolidation, but the large number of consolidating districts with no debt stands out. In Maine, a qualitative study of the consolidation process found that districts considering a merger with another district struggled to reconcile differences in debt (Fairman & Donis-Keller, 2012). If indeed such differences in district debt are obstacles to otherwise-prudent consolidations,

states may consider offering one-time debt forgiveness to consolidating districts in lieu of other financial incentives as a way of overcoming this sticking point.

Policymakers should also consider market concentration while debating consolidation mandates and incentives. Some evidence has shown that competitiveness is related to improving student learning outcomes cost-effectively (Gronberg, Jansen, & Taylor, 2011; Hoxby, 2000). In industrial markets, the U.S. Department of Justice Antitrust Division uses a 0.25 HHI threshold to identify “highly concentrated” markets. Over 70% of consolidating districts were in markets exceeding this threshold, and this value necessarily rises when consolidation occurs and markets become even less competitive. As policymakers look to improve student learning and fiscal efficiency through consolidation, they should consider the countering effects that a loss of competition will have on districts in markets that are already highly concentrated.

A racial matter of importance for policymakers to consider when mandating consolidation is lost voice for racioethnic minority people. Consolidation offers an opportunity for integration when neighboring districts differ in racioethnic representation (Frankenberg, Siegel-Hawley, & Diem, 2017). With integration, however, can come fewer opportunities for minority people to lead and to control the schools their children attend through their vote (Jimerson, 2005). Subduing ethnic and religious minorities was in fact a goal of some school district consolidation proponents of the early 20th century (Reynolds, 1999). As policymakers debate the merits of consolidation, careful consideration of the

details of a proposed policy is essential to ensure that racioethnic and other minority people retain control of their schools.

Finally, a large share of school districts – one out of every nine – have been involved in a consolidation in the past fifteen years and several states are considering broad consolidation policies, suggesting that much more research attention should be dedicated to school district consolidation. Future studies on the effects of consolidation on student learning, school finance, racial integration, and other outcomes would be beneficial. Of additional use would be research into how educational leaders can best manage consolidations to produce prime outcomes for the students and communities affected.

Chapter 7. The Academic and Financial Effects of Arkansas Act 60

In the most recent review of research on school district size, Andrews, Duncombe, and Yinger (2002) noted the lack of studies of school district consolidation events. Predicted effects of school district consolidation have come primarily from cost function estimates of the relationship between expenditures and student enrollment, a method that provides insight into the possible outcomes of consolidation but does not account for selection bias of districts choosing to consolidate and the consolidation process itself. Two analyses of the effects of consolidation events have been published since the 2002 review (Andrews, Duncombe, & Yinger, 2002), one finding pronounced economies of size with consolidation using cost function methodology on twelve consolidations in New York State (Duncombe & Yinger, 2007) and the other finding no efficiency gains from a simple differences analysis of 10 consolidations in Texas (Cooley & Floyd, 2013). In estimating effects, both studies used small samples of districts that had consolidated voluntarily. The purpose of this study is to examine the academic and spending effects of school district consolidation using a larger sample of consolidations stemming from a policy mandate in Arkansas in 2004.

Policy Context

During the 2003-04 school year, Arkansas's 450,000 public school students were served by 308 school districts, which ranged in size from 89 students to over 25,000. Among southern states, this number of districts ranked behind only Texas, though Arkansas was the least populous.

Control of school districts had remained mainly a local matter in the state through the beginning of the 21st century. Unlike other southern states which allowed county administrators to consolidate districts without local approval (Fischel, 2009), Arkansas allowed voters to decide the fate of their own school districts (Ledbetter, 2006). One statewide consolidation measure was adopted in 1948, forcing all districts with 350 or fewer students at that time to merge. A similar policy proposal in 1966, however, was rejected by nearly three fourths of Arkansas voters, and mandatory consolidation remained the “third rail of Arkansas politics” until the early 2000’s (Ledbetter, 2006, p. 45).

In 2002, a state Supreme Court ruling reignited discussion about school district consolidation and ultimately led to a legislated mandate. The Constitution of the State of Arkansas stipulates that a “general, suitable and efficient system” of public education must be provided (State of Arkansas, 2017, p. Art. 14). The *Lake View v. Huckabee* ruling, however, determined that this was not occurring. To support its decision, the Court cited poor academic outcomes, including low graduation rates, and inadequate resources, such as insufficient indoor plumbing and the state’s last-place ranking in per-pupil spending (Lake View Sch. Dist. No. 25 v. Huckabee, 2002). The decision was stayed for one and a half years to allow the state legislature to remedy the situation, during which time laws were enacted to increase funding to all public schools, to implement a need-based school funding formula, and to mandate school district consolidation.

Act 60 of the Second Extraordinary Session of 2003 went into law in January 2004, and it mandated the consolidation of districts with fewer than 350 students by July 1, 2004. Earlier post-Lake View proposals would have established a minimum school district size of 1500 students, but these were met with strong public opposition (Ledbetter, 2006). To compensate districts for the costs of consolidation and encourage neighboring districts to merge, Act 60 included a one-time consolidation bonus payment. For small districts that could not find a voluntary consolidation partner, the act empowered the state board to assign one.

Research Questions

In the context of the Act 60 mandatory consolidation policy in Arkansas, I aim to answer two research questions about the effects of school district consolidation.

RQ7.1. What is the effect of school district consolidation on student academic outcomes?

RQ7.2. What is the effect of school district consolidation on school district spending?

Methods

The research questions were answered quantitatively using a differences-in-differences methodology.

The Differences-in-Differences Approach

The differences-in-differences (DD) methodology compares the changes in outcomes for a treatment group to changes for a control group over the same time period. This comparison of changes in both groups accounts for both time- and group-specific effects, allowing for a causal estimate of the effects of treatment (Wooldridge, 2010). Figure 7.1 graphically displays the intuition behind this approach, with δ representing the estimated effect of treatment.

The key assumption underlying the DD methodology is that of parallel pre-treatment trends (Angrist & Pischke, 2009). Under stricter standards of baseline equivalence, such as those used by the What Works Clearinghouse (Institute of Education Sciences, 2018), treatment and control groups would need to be equal on the outcome *level*. The DD approach assumes that equality on the *change* in outcome level is sufficient to estimate a causal effect. If both treatment and control groups were changing at the same rates pre-treatment, a change in the difference between groups post-treatment could be interpreted as an effect of the treatment.

To test the parallel trends assumption, the slopes of the outcome variables over time for both groups were compared pre-treatment. Both parametric and non-parametric time variables were used, as shown in Equations 7.1 and 7.2, respectively.

$$(7.1) \quad y_{lt} = \lambda_l + \tau \text{year}_t + \varphi(d_l \cdot \text{year}_t) + \varepsilon_{lt}$$

$$(7.2) \quad y_{lt} = \lambda_l + \gamma_t + \varphi_t(d_l \cdot \gamma_t) + \varepsilon_{lt}$$

In the above equations, y represents the outcome variables, graduation rate or current expenditures per student, indexed on school district, l , and year, t . A district fixed effect, λ , was included in each model. The parametric form estimated a continuous time trend, τ , while the non-parametric form used a set of year dummy variables, γ . This non-parametric method facilitates detection of a non-linear pre-treatment trend (Lafortune, Rothstein, & Schanzenbach, 2016). The coefficient of interest when testing for parallel trends is ϕ , which estimates the interaction effect of time and treatment group status. This represents the difference in outcome trends. A statistically non-zero coefficient on the parametric ϕ or unequal, non-zero coefficients on ϕ in the non-parametric model would be evidence of different trends between control and treatment groups pre-treatment. Such a difference would raise concerns about the ability to assign cause from DD estimation.

The Differences-in-Differences Model

Following the examination of parallel trends, the DD models were fit to estimate the effect of school district consolidation on graduation rate and current expenditures per student. The main models, shown in Equation 7.3, relate the outcome variables, y , to an indicator for the post-treatment period, p , and the DD estimator, δ , which is the coefficient on the interaction of indicators for treatment group, d , and post-treatment. Also included were district fixed effects, λ .

$$(7.3) \quad y_{lt} = \lambda_l + \beta p_t + \delta(d_l \cdot p_t) + \varepsilon_{lt}$$

Standard errors for the model estimates were heteroskedastic robust and adjusted for clustering by district.

Consolidated Districts

Pre-treatment data for consolidated districts were collapsed into one record for each post-treatment district. Enrollments, diplomas issued, and expenditures were summed across the districts that merged to form each consolidated district post-treatment, with per-student outcomes calculated after aggregating. District fixed effects and the indexing by LEA shown in Equation 7.3 relate to these post-treatment districts for all time periods before and after consolidation.

Sample Selection

The study sample included 235 of the 245 school districts in Arkansas that remained as of 2008-09. In the study sample were 45 treatment districts that consolidated in 2004-05 and 190 districts that had not consolidated in the five years before or after Act 60's passage. Ten districts were excluded from this analysis, including one 2004 consolidation, because they consolidated shortly before or shortly after 2004-05 and, as such, may have been expected to exhibit different changes in student outcomes and district spending than either treatment districts that consolidated only in 2004-05 or control districts that did not consolidate.

School years 2000-01 through 2008-09 were used in this analysis. This represents four school years before mandatory consolidation, the year of

consolidation itself, and the four years that follow. While economies of size may continue to be realized later than five years post-treatment, assigning the cause of savings to a policy event becomes more difficult with the passage of time as other intervening events can threaten the assumption that parallel trends would have continued.

Sensitivity Tests

Several sensitivity tests were performed to strengthen the validity of the findings. These included estimation on a subsample that omitted large school districts, the use of district-specific time trends, and, for the expenditure outcome, logged spending, regionally-adjusted costs, and exclusion of the 2004-05 school year.

Omitting large districts. Cost function studies have predicted that the largest economies of size exist for the smallest school districts (e.g., Duncombe & Yinger, 2007; Imazeki & Reschovsky, 2006). From this, it would be expected that consolidation would produce a larger cost savings for smaller districts than for larger ones. A cost function study of Arkansas school districts by Dodson and Garrett (2004) estimated savings of about \$800 per pupil if a district of 250 students were to double enrollment through consolidation and about \$400 per pupil for a doubling of a 1000-student district. By enrollments of 3500 students, Dodson and Garrett estimated that all size economies would be achieved, with further increases reducing district efficiency.

Several of the districts involved as merging partners in Act 60 consolidations were relatively large and therefore might have expected minimal or no savings. These districts could then potentially obscure savings realized by the smaller consolidations. To explore this possibility, the graduation rate and expenditure models were estimated on a subsample of districts with total enrollments of less than 2000 students.

This subsample offered an additional benefit of a control group that was more comparable in size to the treatment group. The average enrollment with the full sample was 1500 students for the treatment group and 1943 students for the control group. In the sub-2000 subsample, the treatment group mean was 1014 students compared to 886 in the control group. This increased equivalence on size might be expected to correlate with other determinants of academic and financial outcomes and thereby result in a more comparable control group.

District-specific time trends. Models with district-specific time trends were also estimated. Angrist and Pischke (2009, p. 238) called this approach an “alternative check” on the underlying assumption of parallel trends. By including a trend for each school district, the DD estimator could be interpreted as a common step increase or decrease in outcome for treated districts, regardless of whether the control group and treatment group had parallel trends pre-treatment.

Equation 7.4 displays the district-specific time trend model.

$$(7.4) \quad y_{lt} = \lambda_{0l} + \beta p_t + \tau year_t + \lambda_{1l} year_t + \delta(d_l \cdot p_t) + \varepsilon_{lt}$$

Logged expenditures. If education costs tend to change on a percentage basis from year to year rather than a dollar basis, parallel trends might more likely exist on logged expenditures per pupil than on the non-transformed value. Treatment districts were spending more per student than control districts at the time of consolidation, so their expenditures may have been increasing at a greater dollar rate per year but an equal percentage rate. To test this, the parallel trends test models shown in Equations 7.1 and 7.2 were estimated using the natural logarithm of current expenditures per student as the outcome variable. After testing for parallel trends, the model represented in Equation 7.3 was fit, again with logged expenditures as the outcome variable.

Regionally-adjusted costs. The cost of labor varied by region across Arkansas at the time of Act 60, and if changes in this variation over time were associated with treatment status, regression estimates could be biased. The Comparable Wage Index (CWI) (Taylor, 2016) provides estimates of local cost of labor by district and over time. CWI data revealed that, in 2004, labor cost levels in some regions were as much as 40% higher than in other areas. To manage this potential source of bias, the model in Equation 7.3 was estimated using current expenditure data adjusted by the CWI factor.

Changes in state funding. Coincident with the implementation of Act 60 were policy changes affecting state funding of schools. A new formula was implemented to allocate state revenues to school districts, and a one-time “administrative consolidation assistance” bonus was distributed to consolidating

districts. Such changes in revenue could be expected to result in changes in school district spending. To the extent that these changes are correlated with treatment status, the estimated effect of consolidation on spending may be biased.

An examination of financial data suggests that differences in state revenues between treatment and control groups did not change appreciably over time except in 2004-05. Figure 7.2 shows state revenue per student for both treatment and control groups. Treatment districts received about \$300 per student more in each year both before and after consolidation other than in the year of consolidation, when they received nearly \$1000 more. This corresponds with the one-time bonus paid to consolidating districts. A DD analysis of revenue changes, results of which are shown in Appendix Three, supports the graphical conclusion that 2004-05 was the only year in which the funding difference changed between groups.

Since the change in state revenue was only correlated with treatment status in the year of consolidation, a final sensitivity test attempted to account for this difference. The model in Equation 7.3 was re-estimated with the omission of the 2004-05 school year, allowing for an estimate of the effect of consolidation on current expenditures during periods when the state revenue difference was constant.

Data and Measures

For this analysis, I used administrative data from federal and state sources. The Arkansas Department of Education provided a list of school district consolidations from 1983 through 2017, which I used to identify those districts that consolidated during the sample period. I used National Center for Education Statistics' (NCES) Common Core of Data (CCD) data on total student enrollment, student enrollment by grade, diplomas issued, and current expenditures by district. These data were used to calculate the academic and financial outcomes of interest.

The Averaged Freshman Graduation Rate (AFGR) was used as the academic outcome in this study. In the absence of cohort graduation rate data, NCES has identified AFGR as the best graduation indicator (Seastrom, et al., 2006). It is calculated by dividing the number of diplomas issued by a smoothed estimate of the number of ninth graders three school years earlier. The smoothed estimate is an average of the actual number of ninth graders, the number of eighth graders the previous year, and the number of tenth graders the following year. For example, the 2003-04 AFGR would equal the number of diplomas issued at the end of the 2003-04 school year divided by the average enrollment of eighth graders in 1999-2000, ninth graders in 2000-01, and tenth graders in 2001-02.

The financial outcome selected for this study was current expenditures per student. This was calculated by dividing the district current expenditures by

student enrollment. Current expenditures include most of the operational costs of school districts, such as teacher salaries and student transportation, but exclude capital and debt financing expenditures. Current expenditures per student for each year were expressed in 2009 U.S. dollars, inflated using the Consumer Price Index (CPI) (U.S. Bureau of Labor Statistics, 2018).

Limitations

Conclusions drawn from this study are tempered by some data limitations. The main shortcoming lies in the scope of academic outcome data. Graduation rates were the only reliable measure available for this study, and such rates provide only information about completion of district graduation requirements. Other outcomes, such as exam performance and advanced course completion, are not included yet may have been academic goals for districts in Arkansas. If consolidation resulted in improvements of these outcomes, this could provide some evidence countering the negative effect of consolidation on graduation rates.

Similar to academic outcomes, the financial outcomes used in this study were not as comprehensive as may be desired. Current expenditures account for the majority of school district expenditures, but if capital or debt financing expenditures present opportunities for economies of scale, their omission from this study may understate the benefits of consolidation. The high variability in capital expenditures from year to year makes their inclusion challenging. Access to detailed data about district property could allow for estimation of annual capital

economic costs and facilitate estimation of the effect of consolidation on capital costs.

The reliance on district-level data in this study represents another limitation. Though the district level is the policy target, school-level expenditure data could broaden the conclusions drawn from study findings. This study provides estimates of spending and graduation rate effects of consolidation as experienced by sets of districts, but it does not estimate the effect on each participating district. With school-level data, estimating the effect of Act 60 on expenditures for the low-enrollment districts would be possible. This could reveal real savings for the small districts that, under the aggregated data used in this study, are hidden by an absence of savings in the larger districts with which they are merging.

Two possible selection bias concerns also warrant consideration. First, using district-level academic outcome data leaves open the potential for selective student migration. If, for example, high-achieving students relocated out of newly-consolidated districts, this would tend to overstate the negative effect of consolidation on graduation rate. This bias could be avoided with access to student-level data. Second, unlike all past studies of consolidation effects which examined voluntary consolidation, this study leveraged the enactment of a mandatory merger policy – all districts with fewer than 350 students were required to consolidate whether they believed it to be advantageous or not. This effectively removed a source of selection bias common to prior studies. Still, the

partnering districts with which small districts merged were mostly voluntary participants³. To the extent that partnering districts opted to consolidate based on likely cost savings or academic improvement, the quasi-voluntary nature of this policy would tend to overstate academic gains and expenditure savings.

Results

This section of the paper presents descriptive statistics about Arkansas school districts at the time of consolidation, followed by results of the DD analyses.

Descriptive Statistics

A total of 46 school district consolidations occurred in Arkansas in the summer between the 2003-04 and 2004-05 school years. The consolidations included 100 school districts, 60 of which had enrollments below the new state minimum of 350 students. These consolidations are shown in the map of Figure 7.3. One consolidation united four districts, six mergers united three districts, and 39 consolidations (85%) united two districts. All of the districts involved were operating districts (i.e., operating one or more schools). More details on district characteristics before consolidation are displayed in Appendix Four.

Table 7.1 shows summary statistics on graduation rate and current expenditures for control and treatment districts collapsed to their post-treatment district. Average graduation rates differ by about 1.3 percentage points pre-treatment, with treatment districts having a larger mean value. Treatment districts

³ Act 60 allowed the state to assign a partner district with which a sub-350 student district would consolidate in the event that no voluntary agreement could be reached.

also had a larger pre-treatment mean current expenditure per student, with consolidating districts spending on average 8.2% more than control districts.

Academic Effects

The parallel trends assumption upon which DD methods rest appears to be satisfied for graduation rates. The pre-treatment data on graduation rate do not indicate the presence of non-parallel trends. Figure 7.4 graphs the mean values for each pre-treatment period. The graph reveals a slight upward slope for graduation rates over time for both control and treatment groups, with the control group appearing to have a somewhat larger increase between 2000-01 and 2001-02 but otherwise generally parallel trends. Results from estimation of the parametric and non-parametric models shown in Equations 7.1 and 7.2 fail to reject the parallel trends hypothesis. These regression results are displayed in Appendix Five.

Results of the differences-in-differences model estimation imply that consolidation had a negative effect on graduation rates. These results are summarized in Table 7.2. The coefficient on the interaction term, $(d_l \cdot p_t)$, is the DD estimator of the effect of school district consolidation on graduation rate. On average, treatment districts had post-treatment graduation rates that were 3.12 percentage points lower than would have been expected if the districts had not consolidated. Control districts experienced graduation rates 1.89 percentage points higher after 2004 than they did prior to the passage of Act 60.

Financial Effects

As with the graduation rate, the parallel trends test on current expenditures per student was satisfied. Graphically, Figure 7.5 shows generally parallel trends with slight separation occurring between treatment and control groups. Statistical tests failed to reject a non-parallel hypothesis, though the p-value of 0.058 was near to customary levels of significance, further commending the sensitivity tests reported in the following section.

The DD estimate of the effect of consolidation on spending showed no significant difference from zero. Results of the regression are displayed in Table 7.3. The coefficient on the interaction term, $(d_l \cdot p_t)$, is the DD estimator of the effect of school district consolidation on spending. The point estimate conveys that on average consolidation tended to increase spending by an additional \$24 per student in treatment districts, though the wide confidence interval shows that the effect could have ranged from an increase of nearly \$200 per student down to a savings of \$150 per student.

Sensitivity Tests

Several sensitivity tests were performed to reinforce or refute the findings from the main DD estimation. Two alternative estimations were completed for graduation rate and five for current expenditures. Parallel trends assumptions for all sub-samples and transformed variables used in these sensitivity tests were satisfied.

Results of the graduation rate sensitivity tests are shown in Table 7.4. Both the restricted sample of districts with enrollments under 2000 students and the district-specific time trends model provided confirmatory evidence of the finding from the main DD estimation. The sample of smaller LEAs returned a point estimate of -3.74 percentage points for the effect of consolidation on graduation rates, and the district-specific time trends model had -4.48 percentage points as the point estimate. The latter estimate, however, had a p-value of 0.051 and a larger confidence interval, implying the presence of some district-by-district variation in time trends. Nonetheless, the sensitivity tests support the main finding that school district consolidation may have had a meaningful negative effect on graduation rates or, at best, had no effect.

Table 7.5 shows the results of sensitivity tests on the DD-estimated effect of consolidation on current expenditures. The model estimated with school districts of 2000 students or fewer returned a point estimate larger than that for the full sample but still not statistically significantly different from zero effect. The sample omitting the year of consolidation (2004-05) resulted in an estimated treatment effect of a \$6 savings per student, again statistically indistinguishable from zero. From the district-specific time trends model, the point estimate was nearly the same as in the main model but with a larger confidence band. This model implies the effect of consolidation on spending may have ranged from a \$210 savings per student to a \$250 increase.

Presented in Table 7.6 are sensitivity test estimates using adjusted expenditure outcome variables, the results of which support earlier findings. Regional adjustments of spending using the CWI did not produce markedly different results. The logged expenditure model, where evidence of parallel pre-treatment trends is stronger, showed an estimated consolidation effect of a 0.7% savings post-treatment, which is about \$55 per student for the average district. The confidence interval suggests the spending effect may have ranged from a \$215 savings to a \$105 increase per student.

Conclusions

From these analyses, I do not find evidence that Act 60 mandatory consolidation resulted in the more “efficient system” of schooling required by the Arkansas courts. The effect of consolidation on graduation rates was negative, while current expenditure effect estimates were near zero. Confidence intervals on expenditure effect estimates were large, but even at the lower bound the maximum savings effect could have been \$200 per student. While this is not a meaningless sum, it would represent a best-case savings of only 0.4% of current expenditures in the state, a small percentage for a statewide policy that reorganized one-third of school districts in Arkansas. Additionally, the maximum savings effect is far less than the savings of \$500 or more per student predicted by cost function estimates.

Act 60 was passed in direct response to an Arkansas Supreme Court ruling which deemed the state system of education funding unconstitutional both

due to efficiency and equality, making equity another goal worthy of evaluation. With access to student- and school-level data, future research could explore changes in access to resources in consolidated districts. Changes in local tax rates could also indicate improvements in taxpayer equity if small districts were able to lower previously high tax rates.

Because this study examined state-mandated school district consolidation, its findings may be generalizable to similar policy proposals. Legislatures considering a minimum school district size may rightly infer from these results that merely mandating consolidation does not guarantee expenditure savings or improved academic outcomes. Indeed the effects of mandatory consolidation may be undesirable, as the point estimates on expenditures and graduation rate in this study both suggest. The results of this analysis, however, do not provide information about the benefits of consolidation for a specific pair of districts. Synergies may allow some districts to capture economies of size through consolidation while other districts are unable to reap such rewards. Future research should examine which types of district sets tend to experience improvement in academics and efficiency upon merging to inform case-by-case consolidation decisions.

Finally, as Arkansas and other states consider broad consolidation measures in the future, they can increase what can be learned about such policies by incorporating random elements in their design. The use of mandatory consolidations in this study provides the first estimates of the effects of

involuntary mergers, eliminating the selection bias inherent in studies of voluntary consolidations, but because all small districts were treated, the control group used was not ideal. Random assignment to or timing of treatment would produce a better comparison group, and while this idea may seem far-fetched, Pennsylvania recently debated a bill that would have piloted county-level consolidation in municipalities chosen by the state department of education (House Bill 1381, 2015). If, instead of purposeful selection, random assignment from among the pool of districts under consideration were used, it would facilitate a more scientific study of the effects of school district consolidation.

Chapter 8. Achieving Economies in Consolidated Districts

Economies of size are an expected result of school district consolidation. These economies arise when the per-student cost of education decreases as enrollments grow larger. Hypothesized sources of economies of size in school district operation include improved utilization of administration, teachers, and school facilities. Most school districts operate with discrete numbers of superintendents, teachers, and school buildings. A district with 150 students, for instance, likely has one superintendent, one first grade teacher, and one elementary school. A school district with twice the enrollment – 300 students – may similarly only need one superintendent, one first grade teacher, and one elementary school. Using the same quantity of inputs to educate twice as many students is an example of economies of size.

Not all types of school district expenditures are expected to result in economies of size. Transportation is a category that may have diseconomies in the context of consolidation, as the closure of school buildings could lead to increased busing distances.

The purpose of this study is to describe the changes in expenditures for those types of spending believed to exhibit economies or diseconomies of size. In Chapter 7, I found that the effect of consolidation on total current expenditures per student was nearly zero. In this chapter, I will examine changes in administration, teaching, school facility, and transportation resources following

mandatory school district consolidation in Arkansas in 2004, to determine which categories of spending changed following consolidation.

Policy Context

Following a court ruling that declared school funding in Arkansas unconstitutional, legislation was passed that forced small districts in the state to consolidate. The Arkansas Supreme Court held in *Lake View Sch. Dist. No. 25 v. Huckabee* (2002) that the public school system was neither equitable nor efficient. The state legislature responded with several changes to the law, including Act 60 (State of Arkansas, 2004), which mandated the consolidation of school districts with fewer than 350 students. Included in Act 60 was a one-time consolidation assistance bonus to financially assist districts with the merger process. Believing duplicate administrative costs to be a prime source of inefficiency, Act 60 also stipulated that consolidated school districts could have only one superintendent.

A total of 100 Arkansas school districts consolidated in 2004. Sixty of these had been below the minimum enrollment threshold and were required to merge, while the other 40 were larger districts that consolidated with a small partner district. In all, 46 consolidations occurred in 2004.

Research Questions

In the context of the Act 60 mandatory consolidations in Arkansas, I aim to answer two research questions about the effects of school district consolidation

on the utilization of resources expected to be source of economies or diseconomies of size.

RQ8.1. What is the effect of school district consolidation on resources hypothesized to exhibit economies of size?

RQ8.2. What is the effect of school district consolidation on resources hypothesized to exhibit diseconomies of size?

Methods

I answered the research questions using descriptive statistics and differences-in-differences estimation.

Descriptive Analysis

Summary statistics were calculated for Arkansas school districts before and after consolidation. Three comparisons were made. Before consolidation, expenditures by category for those districts required to merge (i.e., enrollment less than 350 students), those larger districts that consolidated with a small district, and those that did not consolidate in 2004 were compared. A similar comparison of pre-consolidation expenditures by category was made using data aggregated to the post-2004 school district level. Finally, post-consolidation expenditures were compared in 2008-09, five school years after consolidation.

Count data were also used to describe changes in resources. The number of districts that reduced their administrative and teacher workforces and the number of school closures were counted.

Differences-in-Differences Analysis

To move toward a causal estimate of the effect of mandatory consolidation on specific categories of expenditure, I used a differences-in-differences (DD) approach. This methodology compares changes in outcomes for one group following some event to changes in a comparison group. Details on the DD approach and its underlying assumptions are discussed in Chapter 7. I used DD to estimate the effect of consolidation on per-student administration, instructional pay, facility operations, and transportation expenditures.

The DD model fit is shown in Equation 8.1. This model was estimated separately for each expenditure category. Indexed on local education agency (LEA), l , and year, t , these expenditure outcomes, y , were related to an indicator for the post-treatment period, p , and the DD estimator, δ , which is the coefficient on the interaction of indicators for treatment group, d , and post-treatment. District fixed effects, λ , were also included. Heteroskedastic-robust standard errors were adjusted for clustering by district.

$$(8.1) \quad y_{lt} = \lambda_l + \beta p_t + \delta(d_l \cdot p_t) + \varepsilon_{lt}$$

Sample Selection

Two samples of districts were used in these analyses. For the initial pre-consolidation descriptive comparison, all 308 Arkansas school districts in existence as of 2004 were included and considered as independent cases. In the remaining descriptive analyses and all DD estimates, districts that were part of a consolidation between 2000 and 2009 other than in 2004 were excluded. This

restricted sample was used to create a group of districts that did not consolidate (the control group of 190 districts) to compare with the group that consolidated due to Act 60 in 2004 (the treatment group of 45 districts). Where control and treatment groups were compared, data for the treatment districts were collapsed into a single record for each post-consolidation district. Expenditures and enrollments were summed across merging districts prior to calculating per-student expenditures. District fixed effects in the DD models are similarly based on the post-consolidation LEAs.

School years 2000-01 through 2008-09 were included in the sample. This date range allowed for four years prior to consolidation, the year of consolidation, and four years after. In each of the DD analyses, a subsample of dates that excluded 2004-05, the year of consolidation, was tested but revealed no meaningful deviation from the main analyses using all years and so is not presented in this chapter.

Data and Measures

For this analysis, I used administrative data from federal and state sources. The Arkansas Department of Education provided a list of school district consolidations from 1983 through 2017, which I used to identify those districts that consolidated during the sample period. National Center for Education Statistics (NCES) Common Core of Data (CCD) LEA Universe files were used for data on total student enrollment and counts of schools, administrators, and

teachers per district. Data on expenditures by category were obtained from CCD LEA Finance files.

Four expenditure categories were of specific interest in this study. I summed general and school administration to create an administration expense per student measure. This included school board, central office, and school office spending, such as leadership compensation and office expenditures. For instruction, I used the sum of instructional salaries and benefits, since a reduction in the number of teachers per student was the hypothesized economy of size. Facility, or plant, operations and student transportation expenditures were used directly from CCD data. All financial measures were adjusted to 2008-09 U.S. dollars using the Bureau of Labor Statistics Consumer Price Index (U.S. Bureau of Labor Statistics, 2018).

Limitations

This study is intended to estimate the overall expenditure effects of mandatory consolidation in Arkansas from a state perspective and as such does not attempt to inform individual school district effects. The methods I use provide an estimate of aggregate effects, which are useful for state policymakers who seek to improve the educational efficiency of their school system. Results can indicate whether consolidation led to increases or decreases in total administrative spending or transportation. They do not inform the question of whether individual small districts may have benefited. It is possible that small districts did become more or less efficient, but changes to their consolidation

partners could amplify or offset the changes experienced by small districts. As such, the findings of this study should not be interpreted as increasing or decreasing the expenditure in a given category for an individual district that merged but rather for the group of districts that united in each consolidation.

Results

This section of the paper presents summary statistics of school district spending before and after consolidation, counts of economy-pursuant activities, and results of the DD analyses.

Summary Statistics

School districts required to consolidate had higher per-student expenditures on average in all spending categories prior to consolidation than those with enrollments over 350 students. Figure 8.1 shows per-student spending in each category. Total current spending per student was about \$2000 greater in districts with fewer than 350 students than in those above the threshold. By category, absolute differences in instructional compensation and administration expenditures were particularly pronounced, with each exceeding \$500 per student.

Proportions of spending by category also differed notably between small districts and their larger counterparts. In Figure 8.2, the fraction of current spending by category is displayed. As was the case with absolute spending per student, non-consolidating districts and larger consolidation partners appear to

have been similar in spending by category. Districts with fewer than 350 students, however, had some marked differences. Small districts allocated over 13% of current spending to administration, compared to around 9% for larger districts. At the same time, spending on instructional pay accounted for only 48.7% of current spending in small districts, while in larger districts it exceeded 53%.

When 2003-04 data for consolidated districts were aggregated to the post-consolidation LEA, differences between non-consolidating districts and those that merged were much smaller. Figures 8.3 and 8.4 show similar analyses as those presented above but use aggregated data for treatment and control districts. The absolute difference in total current spending was about \$600 per student, and per-student differences in instructional compensation and administration expenses were \$250 and \$150 respectively. In proportional spending by category, administration was about one percentage point greater in consolidating districts than control districts, while instructional compensation was one percentage point less in treatment districts than in control districts.

By 2008-09, five school years after consolidation, the difference in per-student spending between treatment and control districts remained the same, though spending by category changed. Figures 8.5 and 8.6 show absolute and proportional spending by category in 2008-09. Treatment districts continued to spend approximately \$600 more per student in total current expenditures after consolidation. Spending on administration decreased in both treatment and

control districts, though the drop in consolidated districts was much greater and left them spending only slightly more than control districts. The change in administrative spending was also apparent in the proportional spending by category data. As a percentage of current spending, administrative expenditures fell from 10.6% to 8.1% in treatment districts. The percent of spending dedicated to instruction also fell, while the share of spending on plant operations and transportation expenditures increased in consolidated districts.

Economies-Producing Activities

Three activities hypothesized to produce economies of size – administration reduction, teacher cuts, and school closures – were counted among treatment districts. Evidence of all three activities was present, but reductions in administration and school closures were much more common than reductions in the teacher force.

Nearly two-thirds of consolidated districts decreased the number of district administrators by 2008-09. Most of these districts reduced the count by one administrator, with 11 districts reducing their counts by two or more. One consolidation – the merger of Gillett and Humphrey with DeWitt School District – resulted in a reduction from 6 to 2 district administrators.

Reductions in the number of teachers, on a per-student basis, were much less common among consolidated districts. Only 14 of the 45 consolidated districts in the sample had an increase in the number of students per teacher, despite many treatment districts having very low student-to-teacher ratios pre-

treatment. Only three districts increased their student-to-teacher ratio by as much as 1.0, while eleven districts decreased their ratios by more than 1.0 students per teacher.

School closure counts are more comparable to administration reductions, with nearly two-thirds of consolidated districts reducing the number of schools by 2008-09. Seventeen districts closed two or more schools, including the three-district mergers of McGehee-Arkansas City-Delta Special and Clinton-Alread-Scotland which each closed four schools.

Nearly all consolidated districts undertook some economy-pursuant activities, and some showed evidence of all three actions. Only four consolidated districts made no reductions in the number of administrators, teachers, or schools. Three of these consolidated districts were formed from two low-enrollment districts each. The fourth united Ozark, which enrolled 1500 students in 2003-04, and Altus-Denning, with 250 students, both of which had administrative and instructional spending below typical for their given sizes prior to consolidation. Of the districts that made reductions in all three areas, most paired a small district with one enrolling a larger number of students. All had at least one district with high per-student administrative spending before consolidation.

Differences-in-Differences Estimated Effects by Category

The underlying assumption of DD estimation, that of parallel trends pre-treatment, was verified for all outcomes of interest. Results of parallel trends test regressions are displayed in Table A6.1 of Appendix Six.

Differences-in-differences estimates suggest that consolidation caused both positive and negative effects on spending by category. As predicted by theory, administration expenditures per student decreased in treatment districts and transportation spending increased. Effects of consolidation on instructional compensation and plant operations were not statistically significantly different from zero.

DD regression results are shown in Table 8.1. The point estimate on administrative expenditures per student suggests that consolidation reduced spending in this category by more than \$70, or slightly less than 10%. Transportation spending, on the other hand, was estimated to increase by about \$35 per student due to consolidation, an increase in this category of more than 10%. Point estimates on the effects of consolidation on instructional compensation and plant operations were both positive, indicating possible increases in these spending categories, but neither was statistically different from zero.

Conclusions

The results of this study suggest that mandatory school district consolidation in Arkansas under Act 60 led to economies-seeking activities and

reductions in administrative spending along with increases in transportation costs.

Administration reductions were a clear goal of consolidation, and reductions did result. The \$70 savings per student in this category corresponds approximately to a cut of one administrator in the median-sized consolidated district. This matches the average reduction in the number of administrators per district. Administrative expenditures as a percentage of total current spending also dropped from 10.6% pre-consolidation to 8.1% by 2008-09. By those who view the fraction of resources used on administration as an indicator of efficiency (e.g., see Greene, Kisida, & Mills, 2010), this change may be viewed as an important improvement. It is not clear, however, what the “right” number of administrators is for a given school district in order to optimize student learning and total expenditures, the balance of which is a more complete gauge of district efficiency.

Unlike administrative expenditures, spending on teachers did not move in the hypothesized direction. In small districts, teacher spending is believed to be a “lumpy” expense, as most districts choose to have at least one teacher in each grade whether they have 12 or 20 students in that grade. Indeed, on average, treatment districts had student-to-teacher ratios that were nearly 1.5 students less than in comparison districts prior to consolidation. Through consolidation and the larger enrollments that it produces, ratios could have been increased, yet more than two-thirds of consolidating districts actually further decreased their

student-to-teacher ratios. Past research has shown that tax burden may predict district responses to new funds (Steinberg, Quinn, Kreisman, & Anglum, 2016). Similarly, local tax rates may explain why some districts sought savings in teacher spending and others reinvested administrative savings to strengthen instruction.

The null effect of consolidation on plant operations is perhaps the most surprising result of these analyses. The 95% confidence interval around the DD estimated effect on plant operations suggests consolidation may have increased plant operations costs by as much as \$75 or saved up to \$32. Considering the best case, the \$32 savings would represent only a 4% reduction in plant operational expenditures, while consolidating districts closed 20% of their schools. Most closures occurred in the second and third years after consolidation, which reduces their effect on the post-treatment average, but if plant operating costs are more closely associated with the number and size of schools than the number of students, the effect of closures would have been expected to be much greater. Future research should explore this relationship between school closures and realized cost savings.

A category where rising costs were expected with consolidation was student transportation. The increase in transportation spending of \$36 per student corresponds to only a 0.5% increase in total current spending, but this increase offsets half of the estimated administrative savings produced by consolidation. Consolidation affected rural districts in Arkansas, so policies to

consolidate suburban districts may not experience as large a negative effect. At the same time, rural districts in other states considering consolidation serve land areas that are on average three or more times larger than those affected by Act 60. There, transportation costs may rise even more markedly as a result of consolidation.

The results of Chapter 7 suggested that Act 60 did not affect spending in consolidated districts, and the expenditure analyses in this chapter provide some indication of the reasons for this. Expected savings in administrative spending were realized as a result of consolidation, but transportation costs rose simultaneously and plant and teacher spending did not decrease. From this, policymakers may infer that merely mandating consolidation will not necessarily lead to reduced spending. Actions desired from districts, such as increasing low student-to-teacher ratios, may require specific direction in the legislation, as Act 60 sought to do by limiting the number of superintendents in a district.

Another policy-relevant reminder stemming from this study relates to the effect of aggregating data. The differences between Figures 8.2 and 8.4 are notable, showing an apparent reduction in administrative spending and an increase in the share of funds used on instruction. These figures, however, merely display the same data from the same time in different forms. Aggregating the data for the separate pre-consolidation districts gives the appearance of desired improvement in use of resources when in fact nothing had yet changed. As policymakers and the public examine measures of efficiency, equity, racial

integration, and other outcomes across districts and states, the effect of system size should be taken into consideration as data aggregation may serve to hide real differences.

Finally, nothing in this study provides evidence that spending equity did not improve. Without detailed data on tax rates and school-level spending, it cannot be determined whether small pre-consolidation districts that had high per-student spending before Act 60 experienced decreases in their burden. It is possible that every small district saw their local spending decrease with the burden shifted to the larger districts with which they consolidated. Despite the lack of a net improvement in systemwide efficiency, individual districts may indeed have benefited from mandatory consolidation.

Chapter 9. Conclusions, Implications, and Future Research

In this dissertation, I have explored the history, theory, and existing evidence about school district consolidation and conducted analyses of recent consolidations in the U.S. From this study, I draw several conclusions, highlight multiple policy implications, and recommend additional future research.

Conclusions

The goals of school district consolidation, both recent and historical, are diffuse. While improved efficiency has frequently been the stated aim, strengthening social control, both from without and from within, and enhancing the legitimacy of individuals and school systems have also been common goals. Even within the efficiency goal, there is ambiguity about whether academic improvement or cost reduction are a higher priority. Cohen and Moffitt argued that such goal ambiguity hinders the ability of education policy implementers to achieve success (2009). If goal specificity is a prerequisite for success, great results would not be expected from school district consolidation.

Theory also casts doubts on claims of great gains from consolidation. From economics, the theory of economies of size predicts meaningful efficiency improvements as school district enrollments grow. Rational systems theory, from the sociology of organizations, also supports this prediction. Natural systems organizational viewpoints, however, would note there are limits to beneficial growth in size due to a reduction of the intimacy necessary in thriving organizations. Diseconomies of size similarly suggest that costs would grow

beyond some optimal enrollment. Lost competition between districts due to consolidation would also work to oppose any efficiency gains due to larger size.

Past empirical research into the potential efficiency effects of school district consolidation does not resolve the conflict in theory. Production function studies, though perhaps methodologically biased, imply that efficiency decreases as district size increases. Cost function studies suggest that large efficiency gains are possible through consolidation, at least for small school districts. Only three studies of the efficiency effects of actual consolidation events have been published, and none show a causal improvement in results. One study found large cost increases associated with consolidation but inferred a possible net savings due to changes in cost associated with enrollment (Duncombe & Yinger, 2007).

I added to the existing consolidation knowledge base with my analyses of Arkansas's 2004 mandatory consolidation, which revealed no evidence of efficiency improvement. In Chapter 7, I calculated a significant decrease in graduation rates among school districts that consolidated compared to those in the state that did not. Along with the decrease in graduation, I found no significant change in per-student spending compared to non-consolidating districts, suggesting that, under these measures, efficiency was made worse by consolidation. This stands in stark contrast to the cost function estimates of Dodson and Garrett (2004), which would have predicted savings of over \$500 per student. My analysis in Chapter 8 showed that administrative costs per pupil

dropped post-consolidation, matching the findings of Streifel, Foldes, and Holman (1991). At the same time, transportation costs rose in consolidating districts, offsetting half of the administrative savings.

Despite the lack of evidence of efficiency gains from consolidation events, school district consolidation has continued at a rapid pace. Rural areas have had the most consolidations recently, but large cities, such as Memphis and Houston, have also been sites for district mergers. In total, I found that more than 10% of U.S. school districts participated in the 900-plus consolidations between 2000 and 2015, affecting over 1.7 million students.

Policy Implications

Several policy implications emerge from my research. One implication relates to the likelihood of consolidation and may offer an insight for those looking to encourage mergers. The other implications follow from the observed effects of consolidation and may inform decisions about whether mandatory consolidation is indeed beneficial.

Of the many descriptive results presented in Chapter 6, the finding that districts that consolidated had significantly less debt than a typical school district is most noteworthy. If financial strain is an impetus for consolidation, as proponent phrases like “cannot afford” (qtd. in Murphy, 2009) might suggest, high debt loads may be expected before consolidation. This has not been the case. Instead, consolidating districts have had much less debt than their non-consolidating counterparts. Qualitative research has found that differences in

debt have been an obstacle to consolidation, with potential partners avoiding mergers with high-debt districts. For policymakers looking to promote consolidation, providing paths around this could be important. Debt forgiveness by the state may offer one such solution. Another approach in place in some states, including Arkansas, allows merging districts to adopt the same tax rate for operational expenditures but maintain separate rates for debt service until the original debts are retired.

Turning to the effects of consolidation, one descriptive result of importance is the relative size of consolidating partners. A typical consolidation unites a small district with one six or more times larger in enrollment. Such a scenario can result in a great loss of political power for those formerly living in the smaller district. Where once they controlled their own school, their voting voice would be diluted as they would represent only a very small percentage of the population in the newly-unified district. This may be particularly concerning where values and identities differ between the small and larger partners. In several consolidations between 2000 and 2015, for example, a small district where over 90% of students identified as black merged into much larger majority-white districts. The classroom integration outcomes of such consolidations have not yet been studied, but research on leadership at the school and elected school board levels in these districts has shown a loss of black representation in key decision-making positions (Jimerson, 2005). As policymakers look to consolidate to improve

academics, efficiency, and integration, consideration of lost political voice may be warranted.

Another key finding, from my analysis of mandatory consolidation in Arkansas, is that policymakers should not assume school district consolidation will improve efficiency. Graduation rates were negatively affected by Act 60, and spending was unchanged by it. Based on these results, the state school system was less efficient after mandating consolidation. This should not be interpreted to mean that consolidation cannot save money nor even that it could not have improved efficiency in Arkansas. It does suggest that merely mandating consolidation does not guarantee better student outcomes or lower spending. The policy in Arkansas was implemented indiscriminately, with all low-enrollment districts required to consolidate. In some cases, such consolidation may have been beneficial, while in others it may have had negative effects. Other details of the policy may also have affected implementation, such as specific stipulations and the timing of the policy. Nonetheless, this analysis provides evidence that mandatory consolidation of small districts does not automatically produce better efficiency.

One resource for which savings from consolidation did occur in Arkansas was administration. Interestingly, this was the only resource specifically addressed in the Act 60 legislation, which required that districts retain only one superintendent. This finding raises the question of whether the realized administrative cost reduction should be expected from all consolidation mandates

or whether the outcome was a result of the specificity of the goal established by policymakers, a finding that Cohen and Moffitt would predict (2009). If goal-specificity is required to achieve cost-savings objectives from consolidation, perhaps stipulating minimum student-to-teacher ratios and building-level enrollments would promote effective implementation of school district consolidation policies.

Directions for Future Research

The large number of communities and students affected by school district consolidation and the ongoing debates about the policy in many states justify increased research attention on the subject. My analyses fill voids in the research base and answer important questions, but both more evidence of this kind and research into other relevant questions are required.

Additional studies of the efficiency effects of school district consolidation can provide the public and policymakers with better information about what to expect from consolidation. My effect study is but one analysis in one context: mandatory consolidation in Arkansas in 2004. Greater confidence of generalizability can come with more analyses in other contexts. Consolidation legislation passed recently in other states may offer more opportunities for such analyses, as may the application of novel statistical methods to national datasets. Other contexts may also allow for more exogeneity in treatment and therefore produce a better causal estimate of the effects of consolidation. While my study reduces the selection bias inherent in past studies of consolidation by examining

district sets that only opted to consolidate when the smaller district was required to do so, larger partner districts nonetheless selected into treatment, leaving some bias in the effect estimates.

Studying which districts or contexts benefit most from consolidation is another area for future contribution. While the average effect on spending in Arkansas was null and graduation rates dropped, consolidation may have had positive effects on some school districts. Understanding the characteristics of districts that improved in efficiency post-consolidation can help policymakers tailor future incentives and mandates to those most likely to gain rather than issuing sweeping mandates that may harm as many districts as they help.

Another important contribution that future research can make is to consider efficiency more broadly. Limited academic data were available for my analysis of Arkansas consolidation, but the increased ubiquity of student testing post-No Child Left Behind means more recent consolidations may afford richer definitions of efficiency. Data on advanced course-taking, where available, would be an additional measure of student learning that could more thoroughly inform future decisions about school district consolidation.

Finally, estimating the effect of school district consolidation on other values should also be a priority in future research. Equity has been a secondary goal of consolidation, and the increased availability of school- and student-level data will facilitate the study of the effects of consolidation on equitable student outcomes. Related to equity is increased racial integration, another possible

outcome of consolidation meriting study. Real estate millage rates may also be used to examine changes in taxpayer equity following consolidation. Changes in liberty, a third value goal of education policy identified by Springer, Houck, and Guthrie (2015), may also be expected with consolidation, as decisions are moved further from citizens and the number of choices among school systems decreases. Finding ways to qualitatively and quantitatively examine and express such changes in liberty can further strengthen the body of knowledge regarding school district consolidation and more fully inform the public and policymakers of its costs and benefits.

Tables

Table 2.1. Goals of School District Consolidation

Efficiency Goals	Social Control Goals	Legitimacy Goals
Improve test scores	Promote Protestant values	Sustain the status of local schools and their communities
Broaden course offerings	Support segregated schools	Increase the status of school and community leaders
Standardize curriculum	Redistribute wealth	
Reduce teacher expenses	Move schools from democratic to bureaucratic control	
Reduce administrative expenses	Move schools from local to state control	
	Manipulate property values	
	Promote interaction with broader groups of people	
	Advance equal access to education	
	Racially integrate schools	
	Discourage rural residents from moving to cities	

Table 3.1. Concepts from Sociological and Economic Theory and Their Prediction of Efficiency Effects from School District Consolidation

Concepts Predicting Positive Efficiency Effects	Concepts Predicting Negative Efficiency Effects
Rational Systems Perspectives	Natural Systems Perspectives
Economies of Size	Diseconomies of Size
	Competition Decrease

* Open systems perspectives do not offer a clear prediction

Table 4.1. School District Size Production Function Studies Published Since 2000

Study	Sample	Output Measure	Returns to Size
Jacques, Brorsen, & Richter (2000)	Oklahoma School Districts	Standardized Tests	Decreasing
Driscoll, Halcoussis, & Svorny (2003)	California School Districts	Standardized Tests	Decreasing
Robertson (2007)	Highest-enrollment Districts in the U.S.	Standardized Tests	Decreasing
Berry & West (2010)	Lower 48 States	Returns to Education; Educational Attainment; Wages as Adults	Increasing* Constant Constant

* Berry and West (2010) controlled for school size, which is positively correlated with district size, and reported that the negative effect of school size on outcomes would more than offset positive effects of larger district enrollment.

Table 4.2. School District Size Cost Function Studies Published Since 2000

Study	Sample	Cost Measure	Student Outcome Control	Optimal Student Enrollment
Chakraborty, Biswas, & Lewis (2000)	UT School Districts	Operating Expenditures	Graduation Rate	> 25,000
Dodson & Garrett (2004)	AR School Districts	Teacher Pay, Supplies, and Transportation	Dropout Rate and ACT Score	3500
Imazeki & Reschovsky (2006)	TX School Districts	Total Expenditures Less Food and Transportation Expenditures	Standardized Test Growth; College Entrance Exam Pass Rate	85,744
Duncombe & Yinger (2007)	NY Rural Districts	Operating Expenditures; Capital Expenditures	Standardized Test Scores; Dropout Rate	Operating: economies across all sizes; Capital: no economies
Zimmer, DeBoer, & Hirth (2009)	IN School Districts	Total Expenditures	Standardized Test Pass Rate	1942
Gronberg, Jansen, & Taylor (2011)	TX School Districts	Current Expenditures	Growth in Standardized	>200,000

		Less Food and Transportation Expenditures	Test Pass Rate; Advanced Course-taking	
Gronberg, Jansen, & Taylor (2011)	TX School Districts (with Capital Stock Data Available)	Current Expenditures Less Food and Transportation Expenditures	Growth in Standardized Test Pass Rate; Advanced Course-taking	>200,000
Gronberg, Jansen, & Taylor (2012)	TX Metropolitan School Districts	Current Expenditures Less Food and Transportation Expenditures	Growth in Standardized Test Pass Rate	1200
Gronberg, Jansen, Karakaplan, & Taylor (2015)	TX School Districts	Current Expenditures Less Food and Transportation Expenditures	Growth in Standardized Test Pass Rate; Advanced Course-taking	>200,000
Karakaplan & Kutlu (2017)	CA School Districts	Current Expenditures Less Food and Transportation Expenditures	Academic Performance Index (A Test Score Composite)	6704

Table 6.1. States With the Greatest Number of Consolidations: 2000-2015

State	Number of Consolidations
Nebraska	307
Arkansas	72
North Dakota	69
Iowa	57
Montana	52
Illinois	48

Table 6.2. States With the Greatest Percentage of Their Districts Involved in Consolidations: 2000-2015

State	Percent of State Districts Involved in Consolidation
Nebraska	85.7%
North Dakota	48.1%
Arkansas	44.5%
South Dakota	37.5%
Maine	32.2%

Table 6.3. Percentage of Consolidations by Number of Districts Involved: 2000-2015

Number of Districts Involved	Percent of All Consolidations
2	83.8%
3	8.7%
4	3.4%
5 or more	4.1%

Table 6.4. Consolidations of Multiple Large School Districts, by Total Enrollment: 2000-2015

State	Year	Consolidating Districts & Enrollments	Total Enrollment
TX	2013	Houston Independent 203,354	210,047
		North Forest Indep. 6,693	
TN	2013	Memphis City 107,594	154,146
		Shelby County 46,552	
CA	2008	Grant Joint Union 14,043	31,257
		Rio Linda Union 10,460	
		North Sacramento Elem. 5,017	
		Del Paso Heights Elem. 1,737	
CA	2004	Alhambra City Elem. 11,163	19,715
		Alhambra City High 8,552	
SC	2011	Sumter District 02 8,540	17,060
		Sumter District 17 8,520	

Table 6.5. Consolidations With the Smallest Total Enrollments: 2000-2015

State	Year	Consolidating Districts & Enrollments	Total Enrollment
MT	2002	Twin Buttes Elem. 3	5
		Rock Spring Elem. 2	
CA	2000	Forks of Salmon Elem. 7	12
		Sawyers Bar Elem. 5	
NE	2003	Clover Cove 11	17
		Amelia 6	
VT	2004	Hancock 24	34
		Granville 10	
NE	2001	Colfax Co. Dist. 501 23	41
		Colfax Co. Dist. 505 18	

Table 6.6. Consolidations With the Largest Differences Between Districts in
Racioethnic Minority Representation: 2000-2015

State	Year	Consolidating Districts & Enrollments	Racioethnic Minority Representation
MI	2013	Frankenmuth 1,214	7.6%
		Buena Vista 428	97.0%
AR	2004	Star City 1,578	20.6%
		Grady 249	96.0%
AR	2004	Bartonlexa 723	24.7%
		Lakeview 164	99.4%
AR	2004	Marion 3,418	29.8%
		Crawfordsville 218	94.5%
AR	2004	Wynne 2,864	30.6%
		Parkin 347	94.5%

Table 7.1. Summary Statistics on Graduation Rate and Current Expenditures per Student Pre- and Post-Treatment

	Pre-Treatment (2000-01 - 03-04)		Post-Treatment (2004-05 - 08-09)	
	Treatment Districts	Control Districts	Treatment Districts	Control Districts
Graduation Rate				
Mean	78.8%	77.8%	77.6%	79.7%
St. Dev.	8.3%	10.8%	10.8%	11.3%
Median	78.2%	77.7%	77.2%	79.2%
Range	(57.9%, 100%)	(44.8%, 100%)	(38.4%, 100%)	(45.6%, 100%)
CurrExp/Student				
Mean	\$7588	\$7014	\$8722	\$8123
St. Dev.	\$943	\$702	\$1102	\$893
Median	\$7462	\$6900	\$8524	\$7960
Range	(\$5789, \$10,865)	(\$5718, \$10,693)	(\$6784, \$11,833)	(\$6477, \$12,874)
	n = 45 LEAs	n = 190 LEAs	n = 45 LEAs	n =190 LEAs

Table 7.2. Results of DD Model Estimation for Graduation Rate

	Coefficient (Std. Error)	95% Confidence Interval	
		Lower Bound	Upper Bound
$(d_l \cdot p_t)$	-3.12%** (1.16%)	-5.40%	-0.84%
p_t	1.89%*** (0.50%)	0.90%	2.88%
Constant	78.02%*** (0.25%)	77.52%	78.51%

n = 235 LEAs x 9 years

Table 7.3. Results of DD Model Estimation for Current Expenditures per Student

	Coefficient (Std. Error)	95% Confidence Interval	
		Lower Bound	Upper Bound
$(d_l \cdot p_t)$	24.06 (88.68)	-150.64	198.78
p_t	1109.22*** (33.54)	1043.14	1175.30
Constant	7124.20*** (17.41)	7089.89	7158.50

n = 235 LEAs x 9 years

Table 7.4. Results of Sensitivity Tests on DD Estimation for Graduation Rate

	Restricted Sample: LEAs with <2000 students	District-Specific Time Trends
	Coefficient (Std. Error) [95% CI]	Coefficient (Std. Error) [95% CI]
$(d_l \cdot p_t)$	-3.74%** (1.39%) [-6.49%, -0.99%]	-4.48% (2.29%) [-8.99%, 0.03%]
p_t	2.50%*** (0.60%) [1.31%, 3.69%]	2.69%** (0.84%) [1.04%, 4.33%]
$year_t$	-	-1.59%*** (0.36%) [-2.29%, -0.89%]
	n = 183 LEAs x 9 years	n = 235 LEAs x 9 years

Table 7.5. Results of Sensitivity Tests on DD Estimation for Current Expenditures

	Restricted Sample: LEAs with <2000 students	Restricted Sample: 2004-05 Omitted	District-Specific Time Trends
	Coefficient (Std. Error) [95% CI]	Coefficient (Std. Error) [95% CI]	Coefficient (Std. Error) [95% CI]
$(d_l \cdot p_t)$	49.26 (105.72) [-159.32, 257.85]	-6.56 (100.22) [-204.00, 190.88]	21.26 (116.92) [-209.09, 251.61]
p_t	1115.48*** (40.42) [1035.72, 1195.24]	1193.65*** (36.79) [1121.17, 1266.12]	422.03*** (41.00) [341.25, 502.82]
$year_t$	-		279.88*** (18.25) [243.92, 315.83]

n = 183 LEAs x 9 years

n = 235 LEAs x 8 years

n = 235 LEAs x 9 years

Table 7.6. Results of Sensitivity Tests on DD Estimation for Adjusted Expenditure Measures

	Regional Cost-Adjusted Current Exp. per Student	Log Current Expenditures per Student
	Coefficient (Std. Error) [95% CI]	Coefficient (Std. Error) [95% CI]
$(d_l \cdot p_t)$	4.74 (100.56) [-193.38, 202.86]	-0.0071 (0.010) [-0.0268, 0.0127]
p_t	1029.70*** (38.56) [953.73, 1105.67]	0.146*** (0.0039) [0.138, 0.154]

n = 235 LEAs x 9 years

n = 235 LEAs x 9 years

Table 8.1. Results of DD Model Estimation for Expenditures per Student by
Category

	Administration	Instructional Compensation	Plant Operations	Transportation
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
$(d_l \cdot p_t)$	-\$72.49*** (\$17.54)	\$61.82 (\$47.43)	\$21.30 (\$27.51)	\$35.68*** (\$7.09)
p_t	\$21.55** (\$7.94)	\$421.76*** (\$19.09)	\$104.29*** (\$10.97)	\$40.76*** (\$2.66)
Constant	\$702.27*** (\$3.94)	\$3811.35*** (\$9.74)	\$684.31*** (\$5.61)	\$266.38*** (\$1.39)

n = 235 LEAs x 9 years

Illustrations

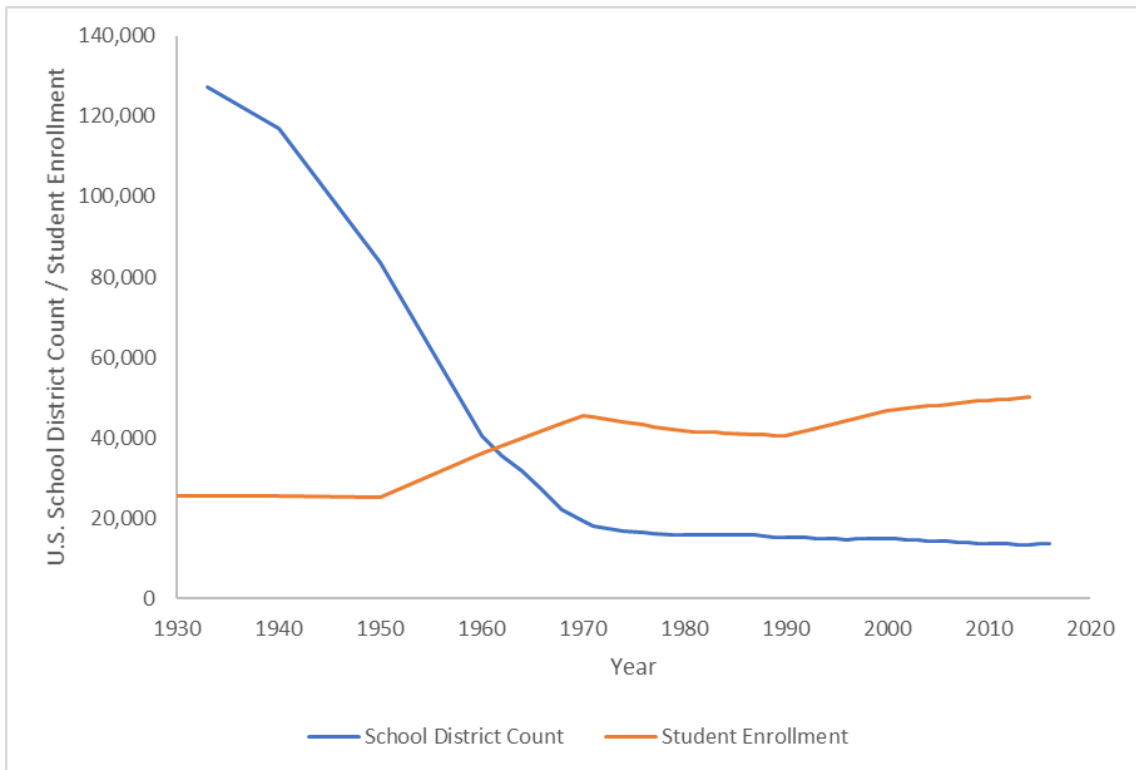


Figure 1.1. U.S. School District Count and School District Enrollment 1933 - 2014

Data Sources: 1933 - U.S. Department of the Interior (Deffenbaugh & Covert, 1933); 1940-2014 - NCES Digest of Education Statistics (National Center for Education Statistics, 2017)

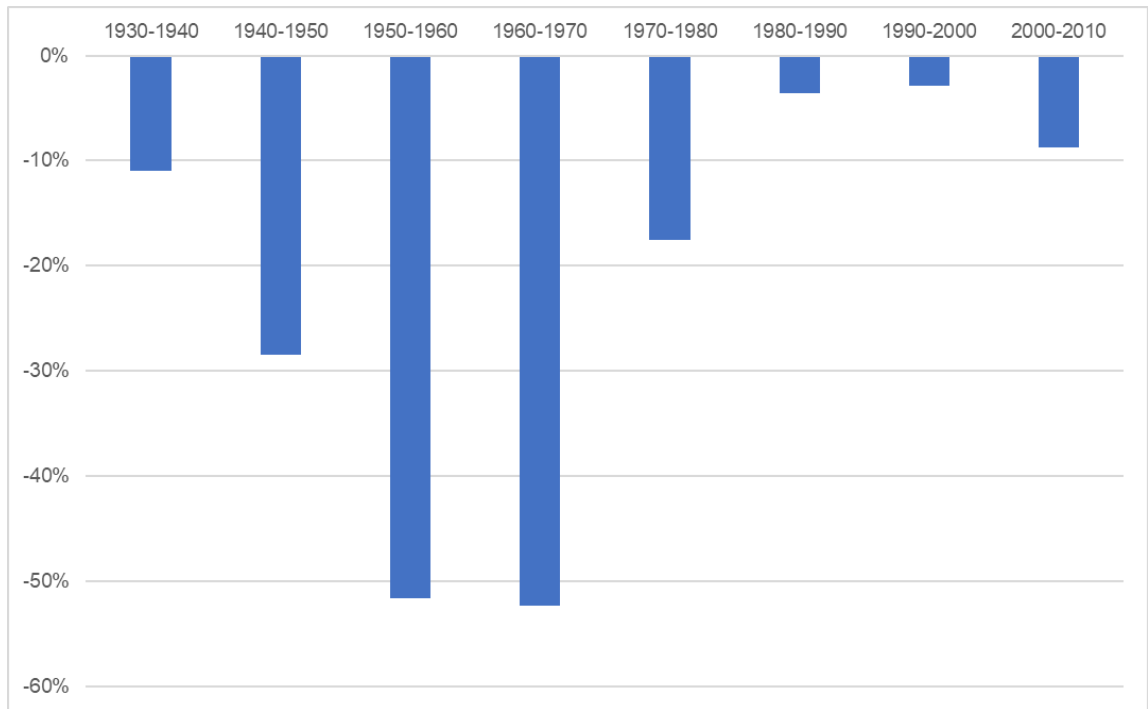


Figure 1.2. Percent Change in U.S. School District Count by Decade, 1930 – 2010.

Data Sources: 1933 - U.S. Department of the Interior (Deffenbaugh & Covert, 1933); 1940-2014 - NCES Digest of Education Statistics (National Center for Education Statistics, 2017)

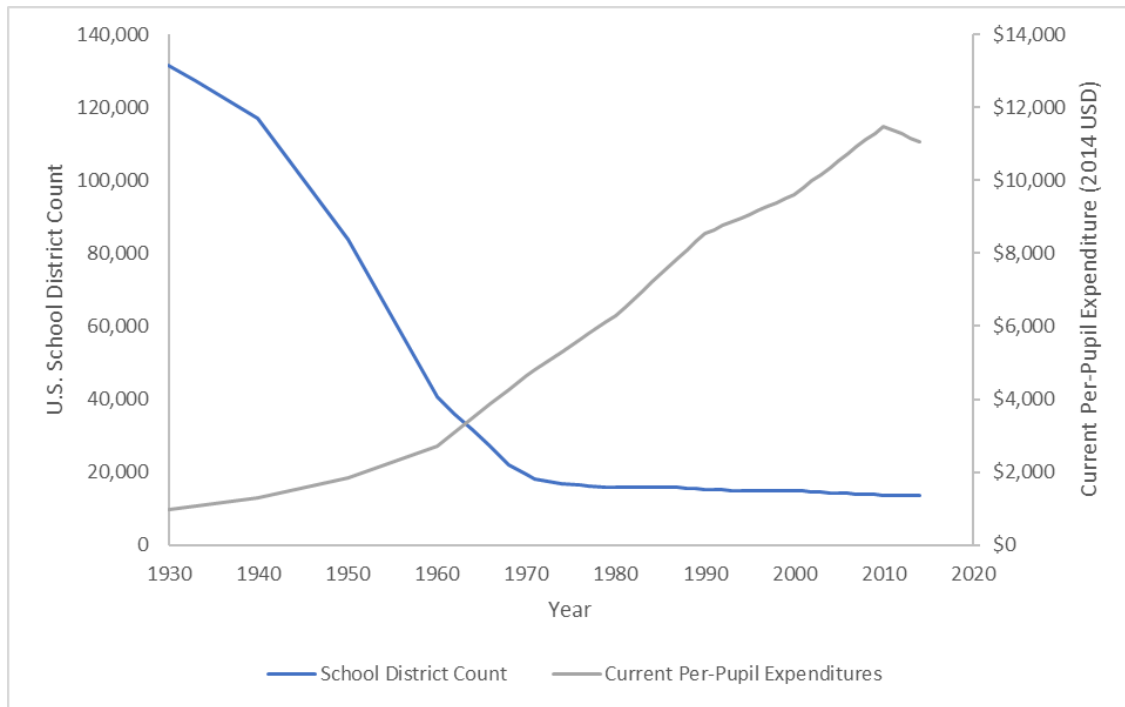


Figure 1.3. U.S. School District Count and Per-Pupil Spending, 1933 - 2014.

Data Sources: 1933 - U.S. Department of the Interior (Deffenbaugh & Covert, 1933); 1940-2014 - NCES Digest of Education Statistics (National Center for Education Statistics, 2017)

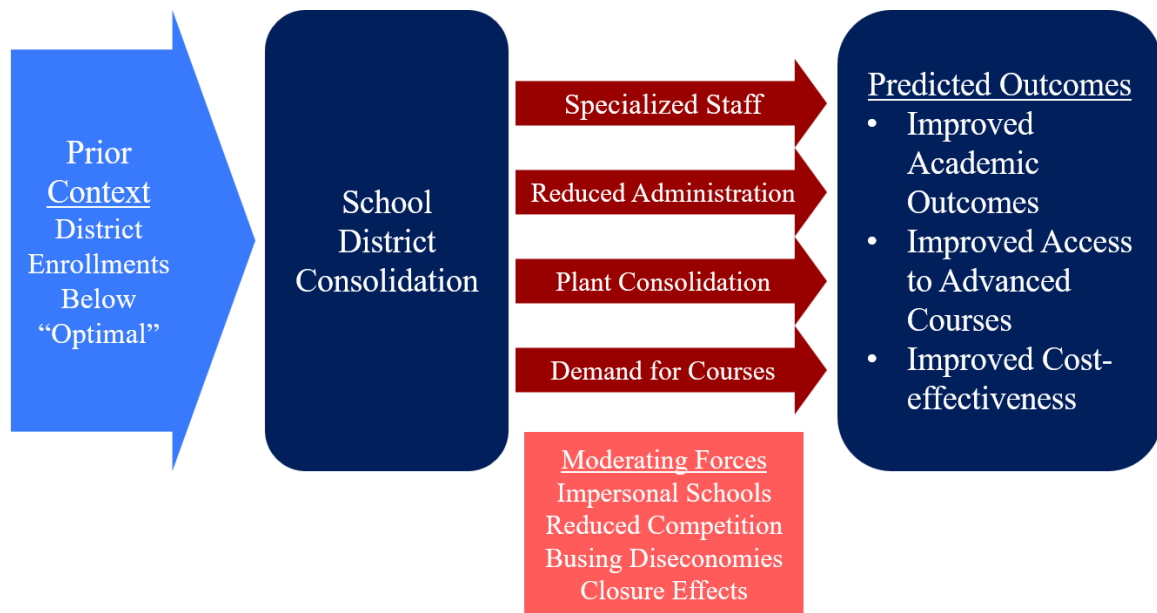


Figure 3.1. Logic Diagram Displaying Mechanisms Through Which Consolidation Is Theorized to Affect Efficiency

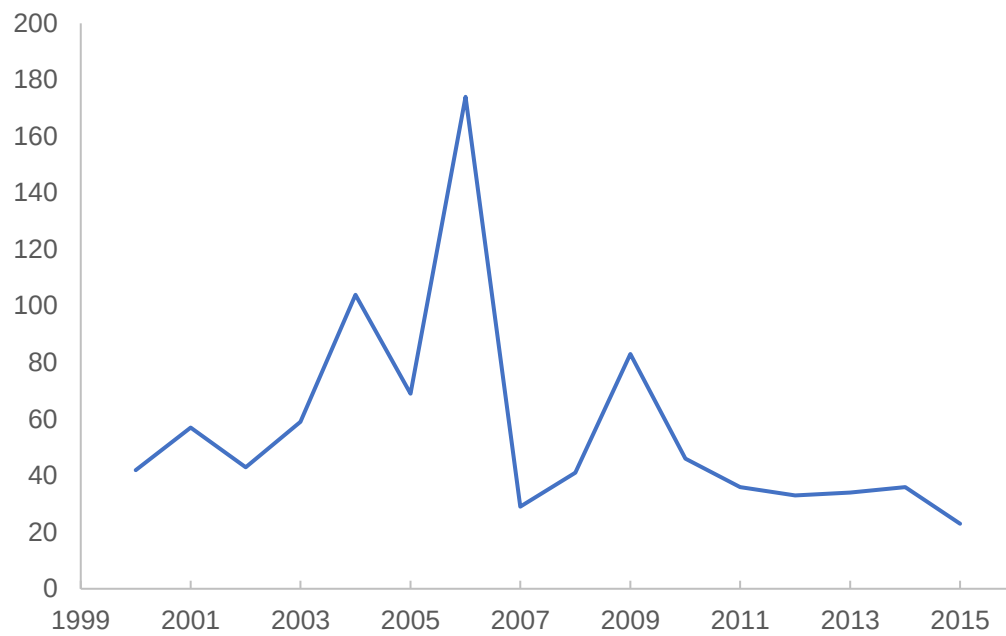


Figure 6.1. Consolidations by Year in the U.S.: 2000-2015

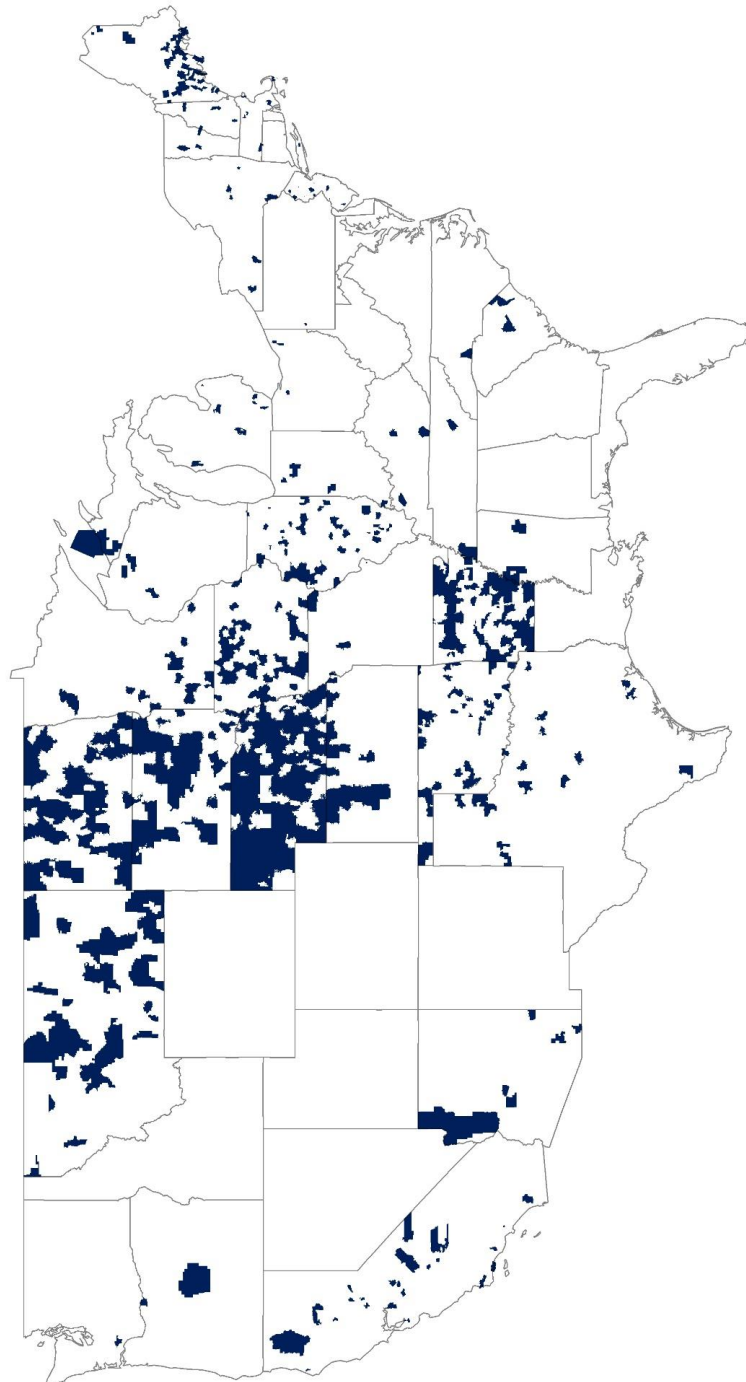


Figure 6.2. Map of Consolidating School Districts: 2000-2015

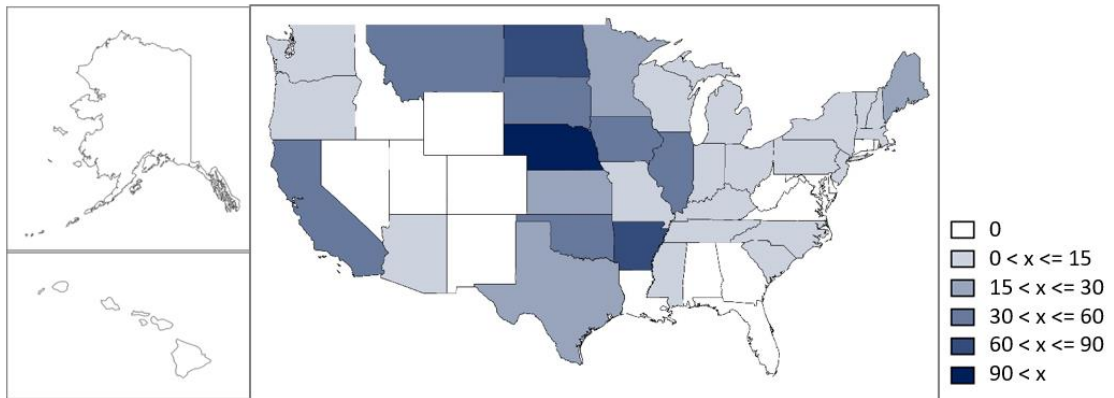


Figure 6.3. Map of Consolidation Counts by State: 2000-2015

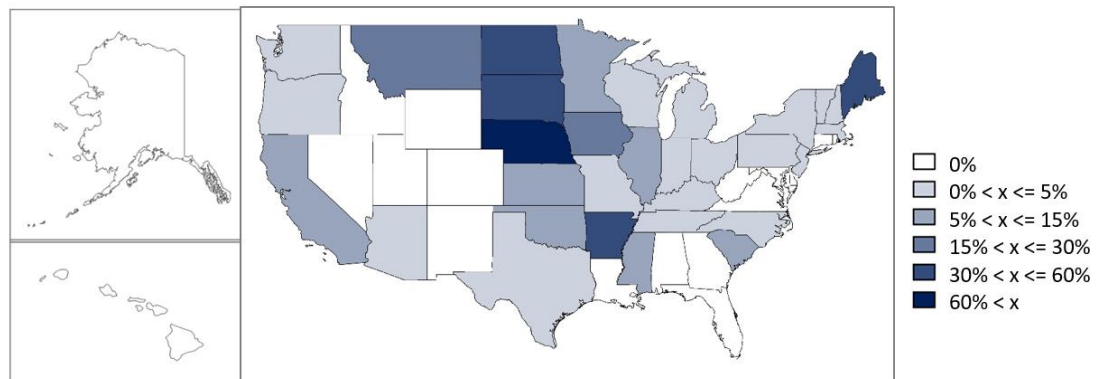


Figure 6.4. Percent of State Districts Involved in Consolidation: 2000-2015

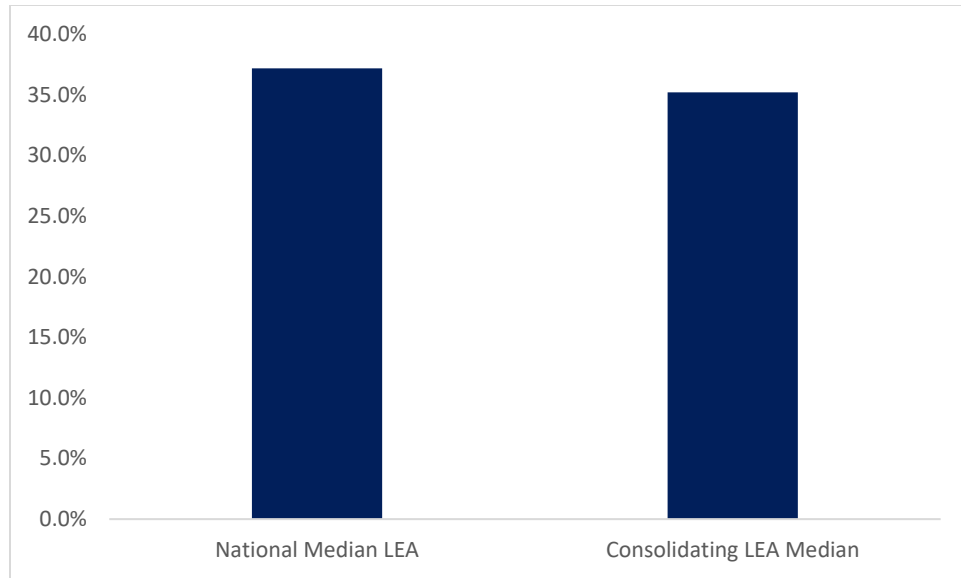


Figure 6.5. Share of Households with a Child

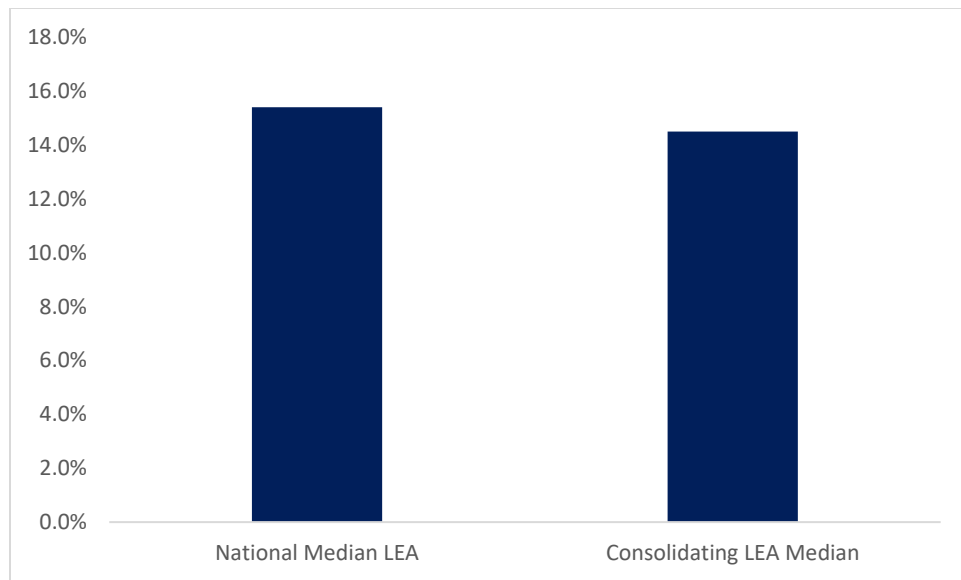


Figure 6.6. Share of Population with Bachelor's Degree or Higher

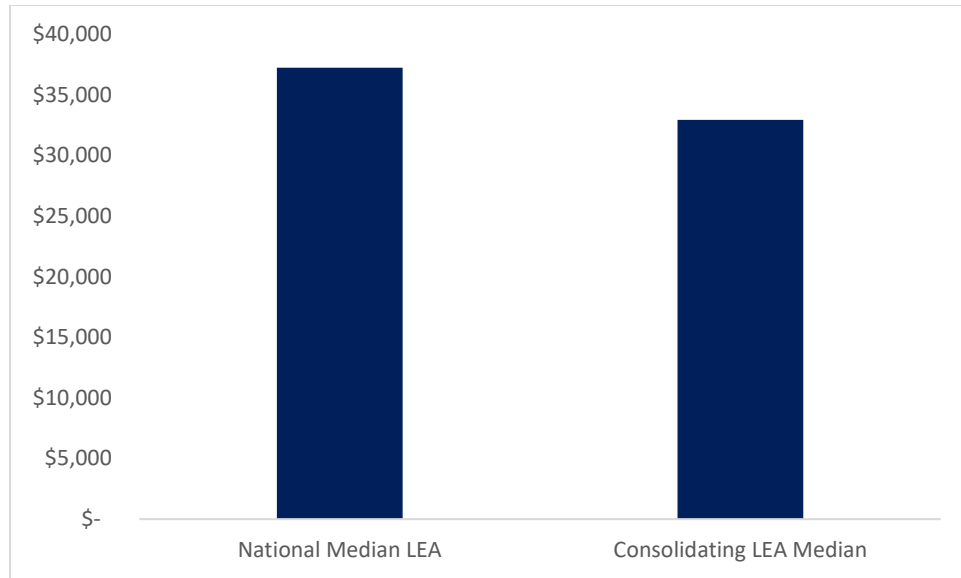


Figure 6.7. Median Household Income (1999 U.S. Dollars)

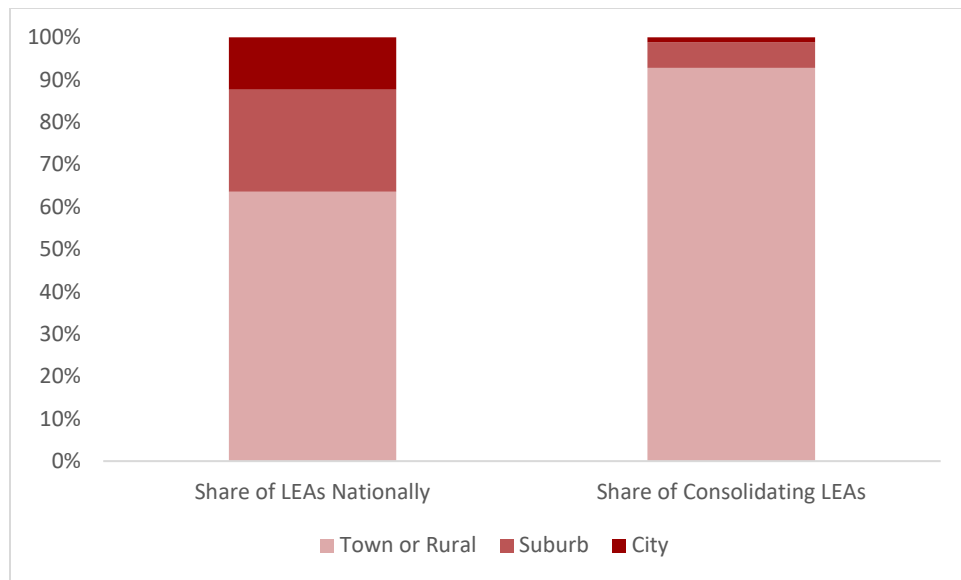


Figure 6.8. Share of School Districts by Locale

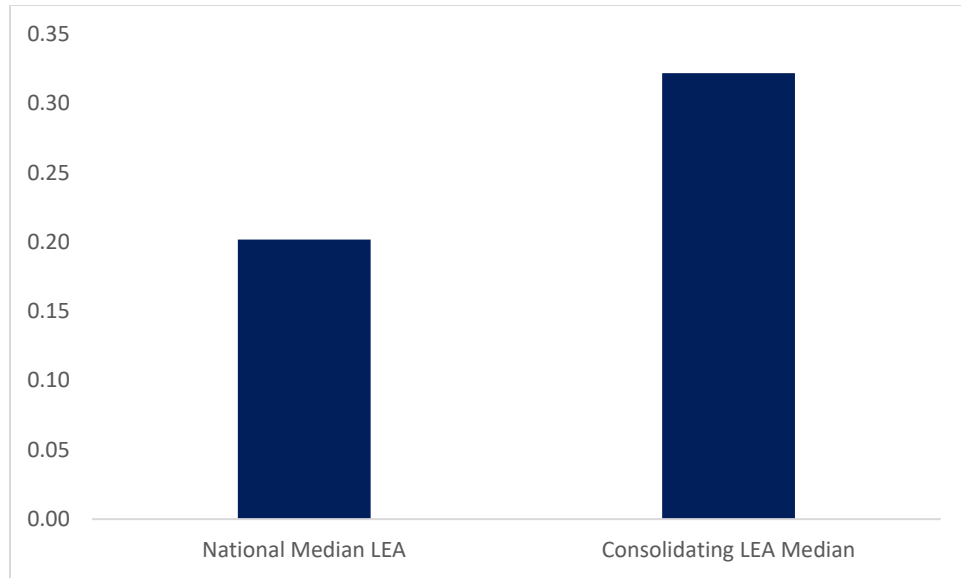


Figure 6.9. Median School District Herfindahl-Hirschman Index

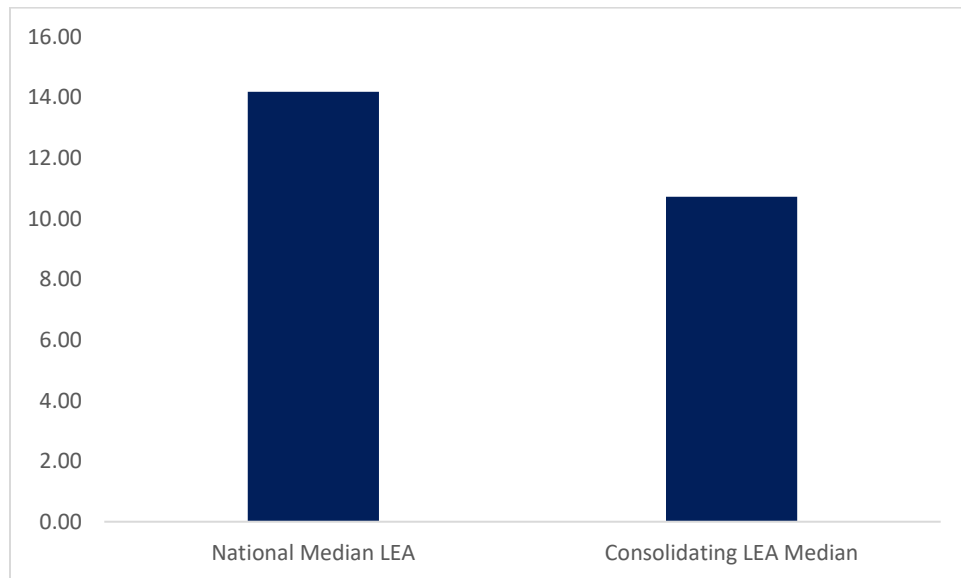


Figure 6.10. Median Student-to-Teacher Ratio

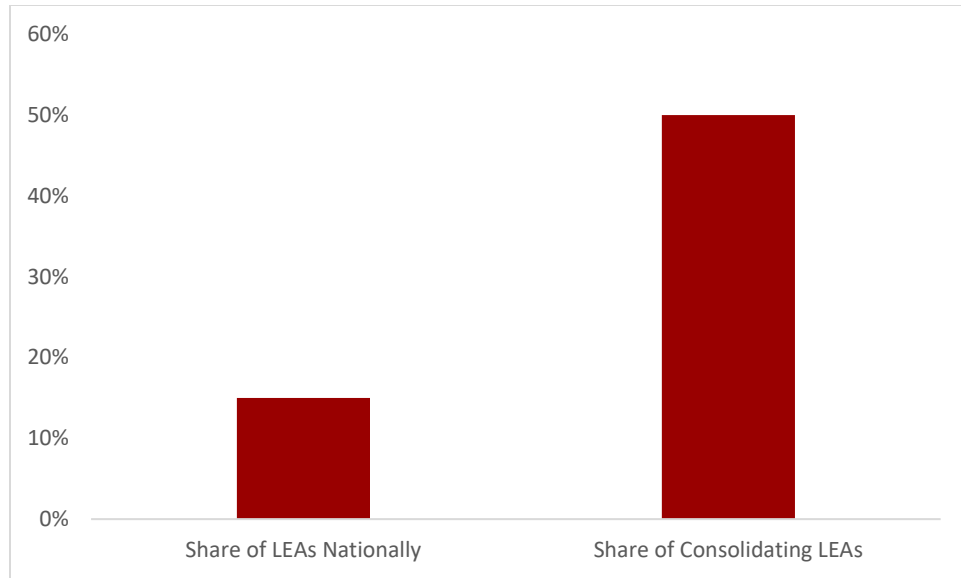


Figure 6.11. Share of School Districts with Exactly One School

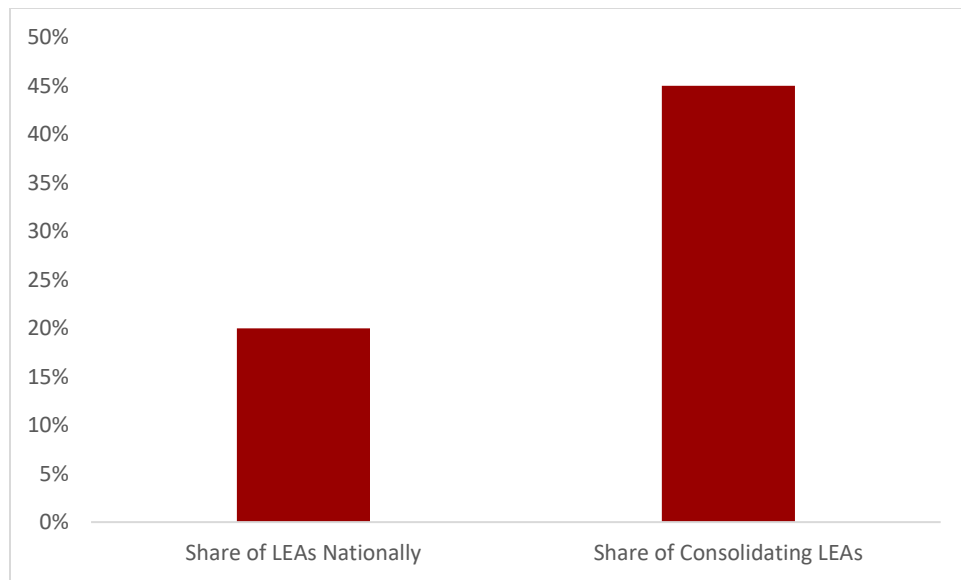


Figure 6.12. Share of School Districts with Zero Debt

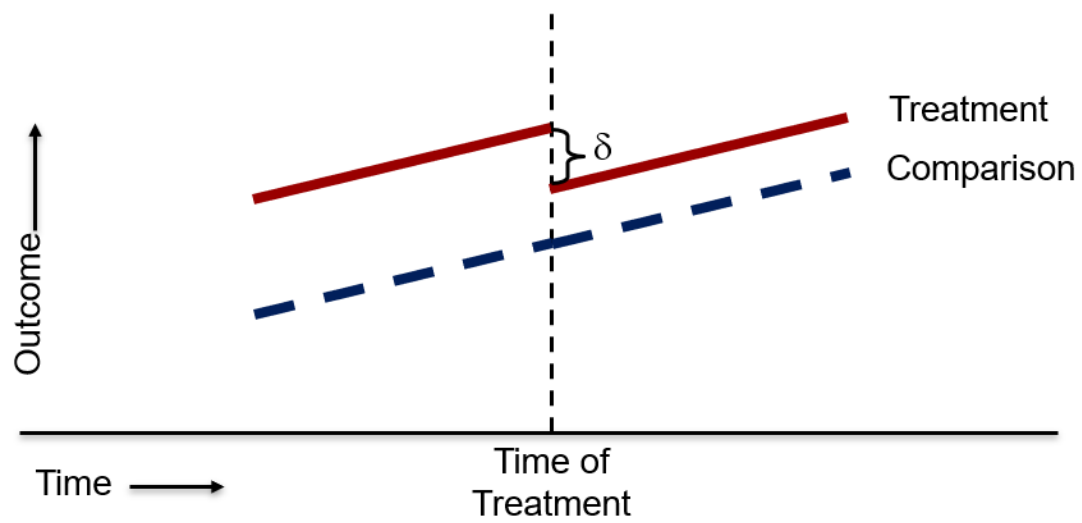


Figure 7.1. Graphical Representation of the Differences-in-Differences Estimator,

δ

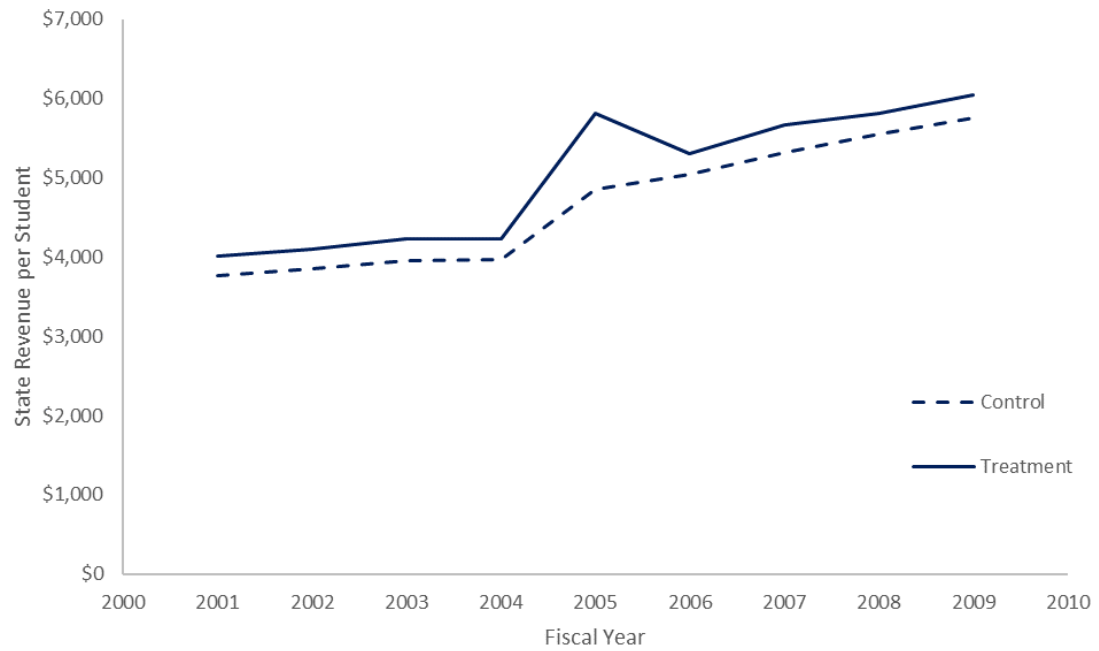


Figure 7.2. State Revenue Per Student by Treatment Status, 2000-01 to 2008-09

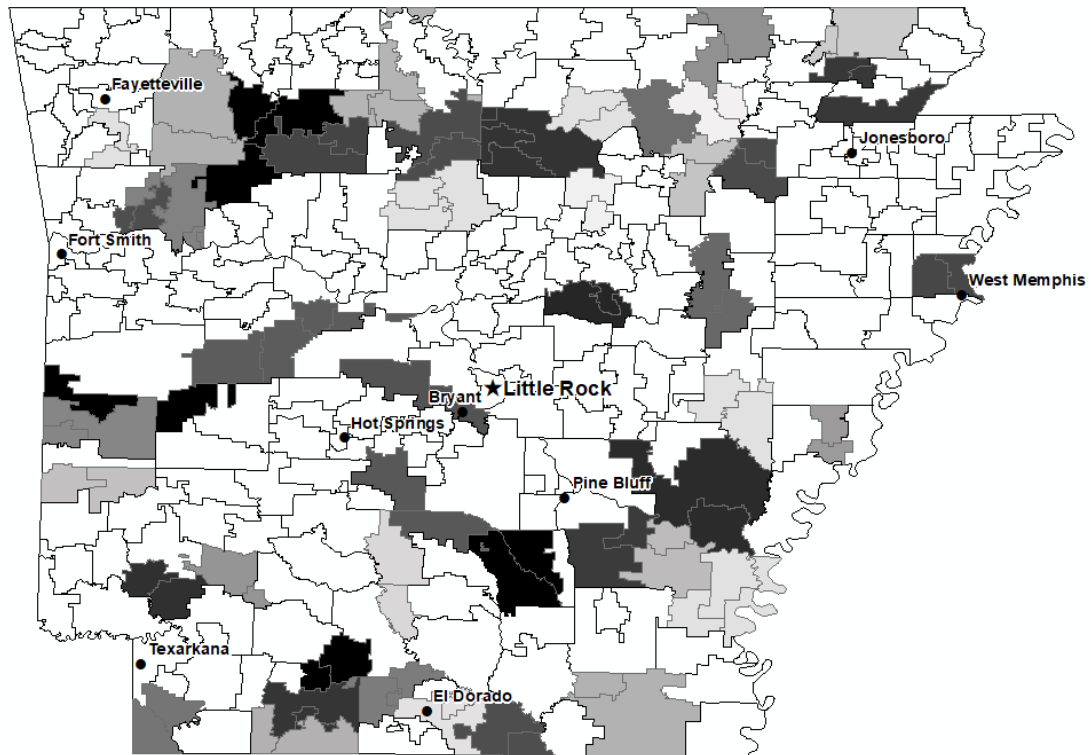


Figure 7.3. Map of Arkansas School Districts with Act 60 Consolidations Highlighted

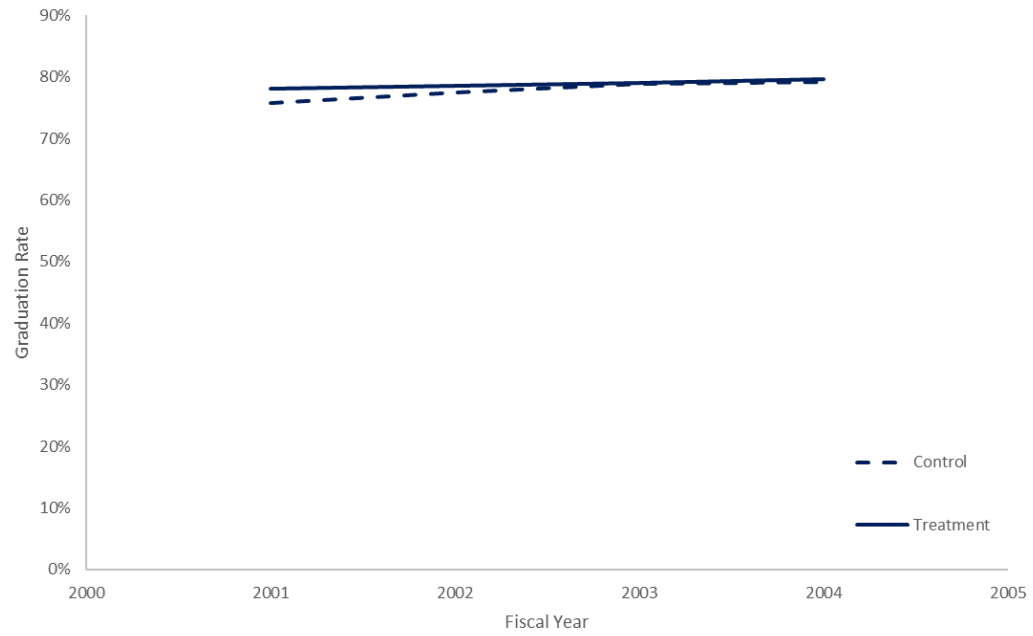


Figure 7.4. Mean Graduation Rates by Year for Treatment and Control Groups Before Treatment

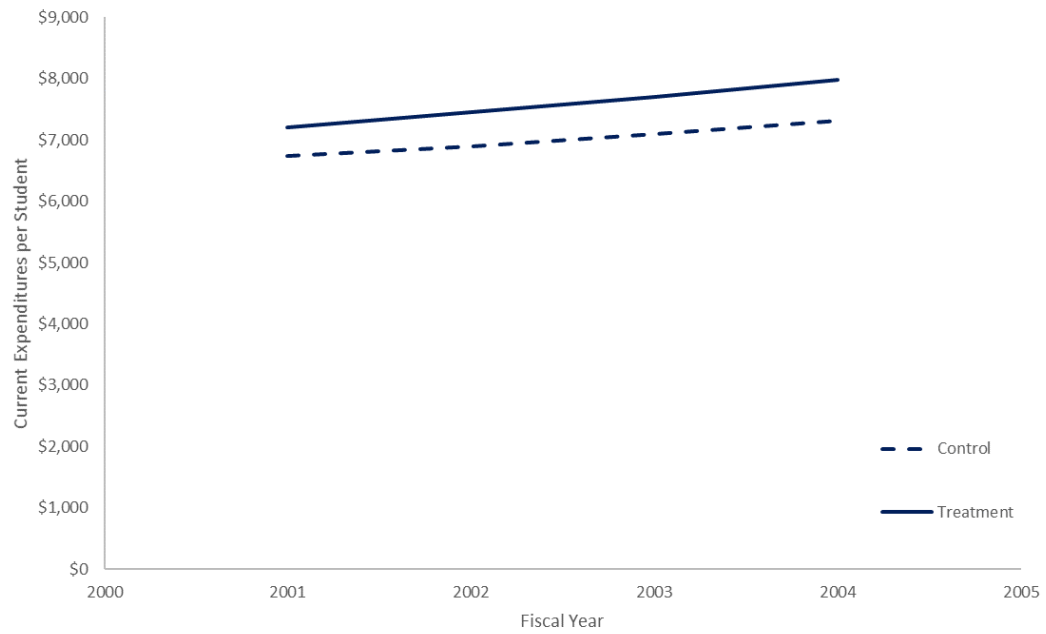


Figure 7.5. Mean Current Expenditures per Student by Year for Treatment and Control Groups Before Treatment

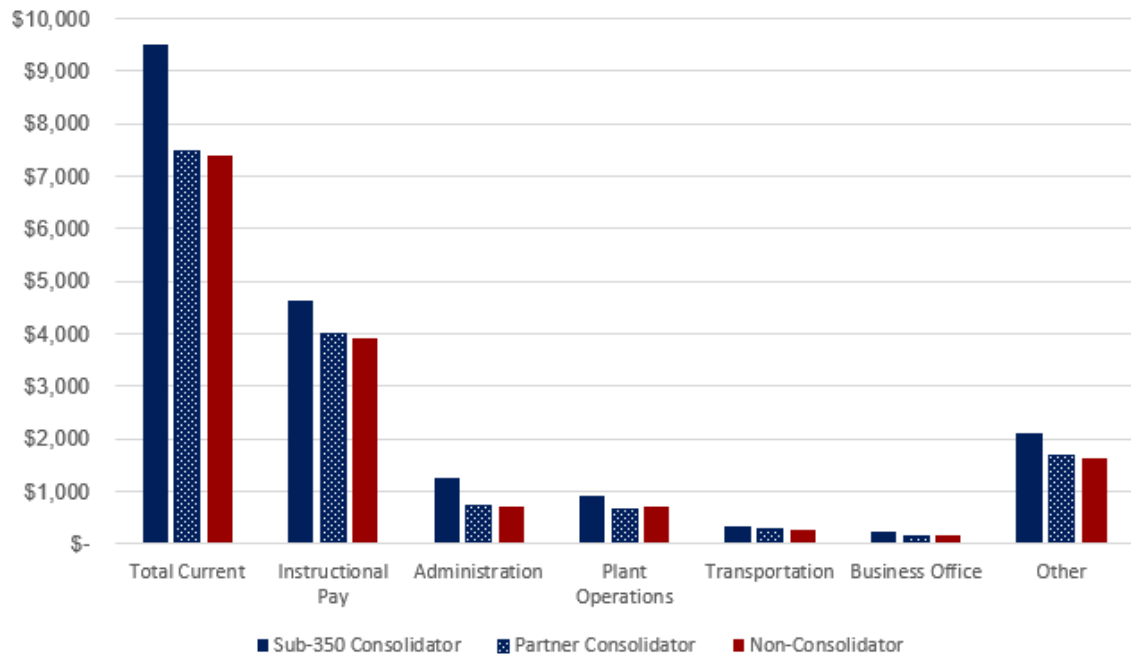


Figure 8.1. 2003-04 Per-student Expenditures by Category, by 2004 Consolidation Status

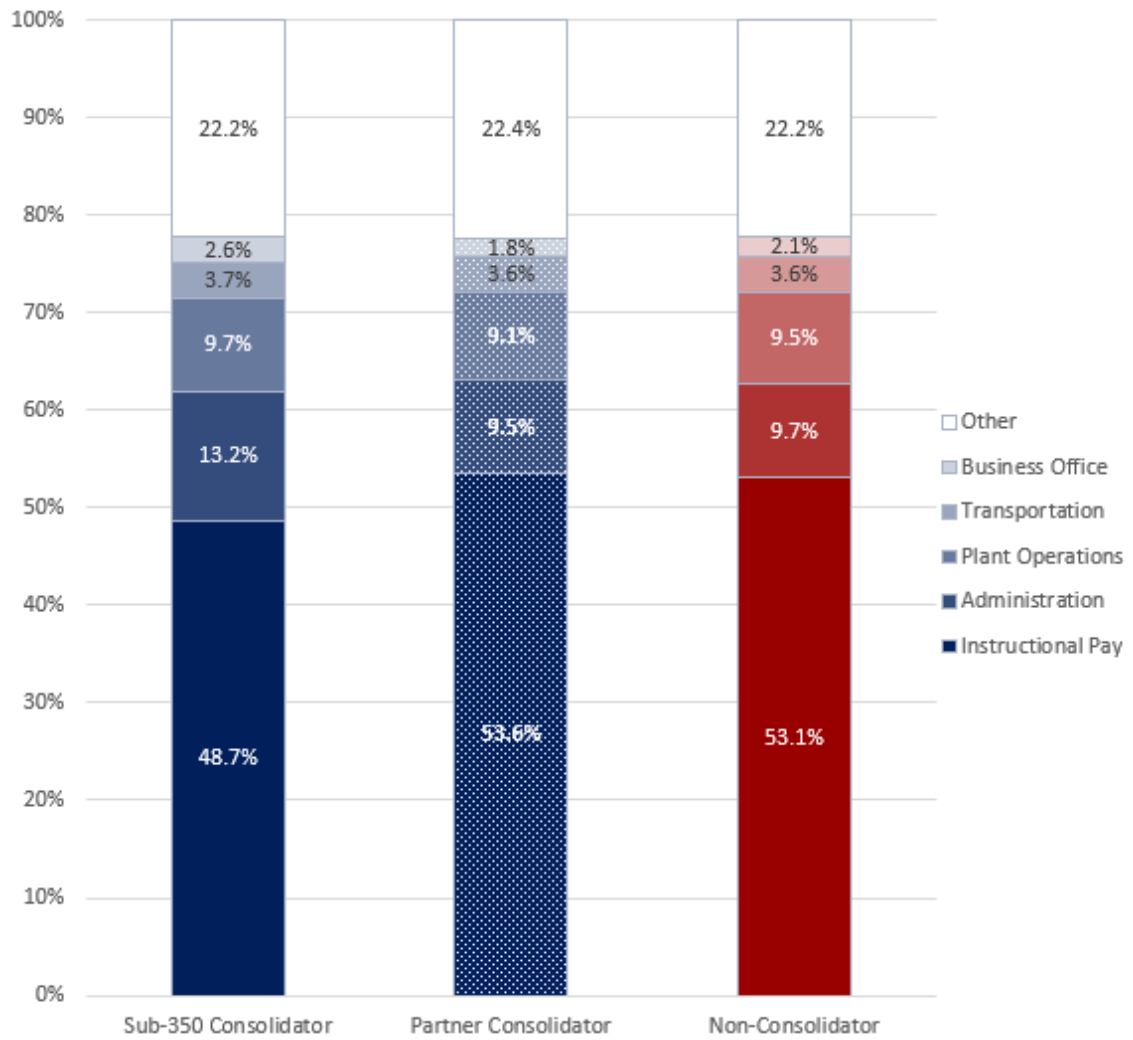


Figure 8.2. 2003-04 Percentage of Spending by Category, by 2004 Consolidation Status

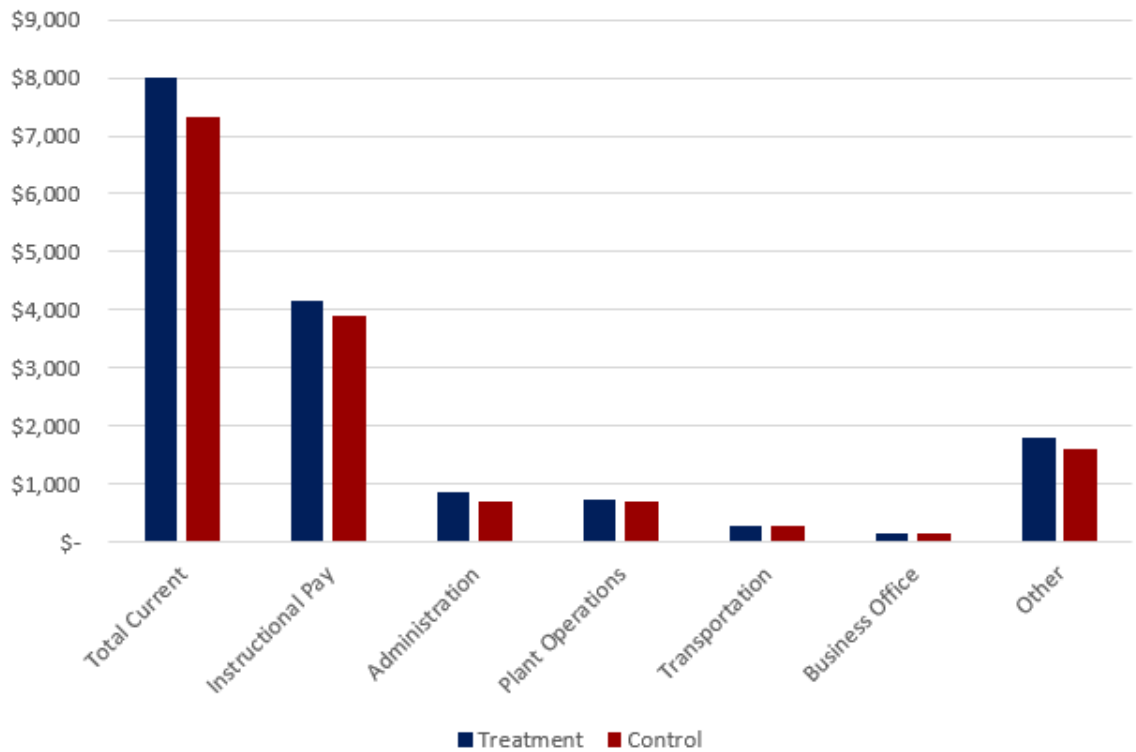


Figure 8.3. 2003-04 Per-student Expenditures by Category for Control and Aggregated Treatment Districts

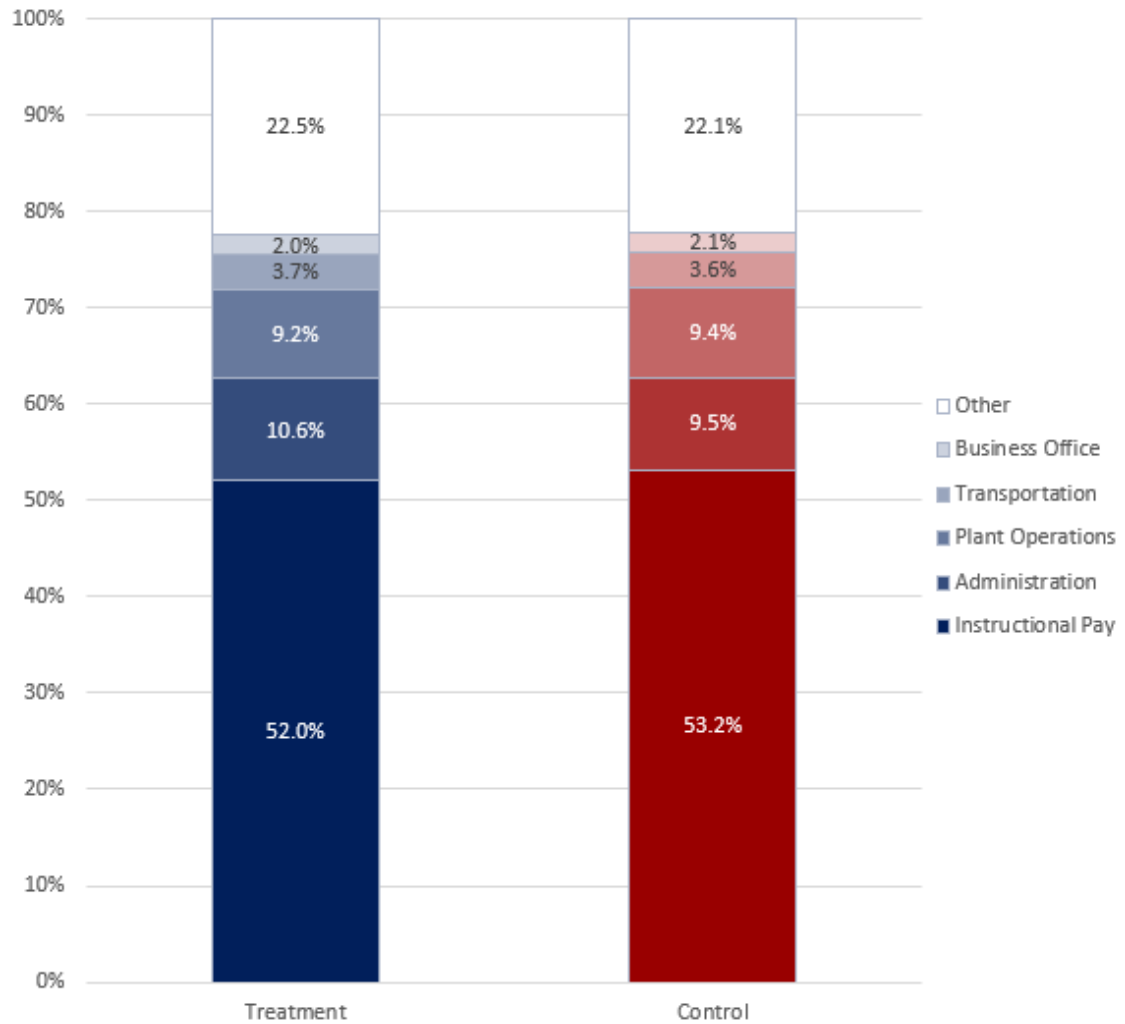


Figure 8.4. 2003-04 Percentage of Spending by Category for Control and Aggregated Treatment Districts

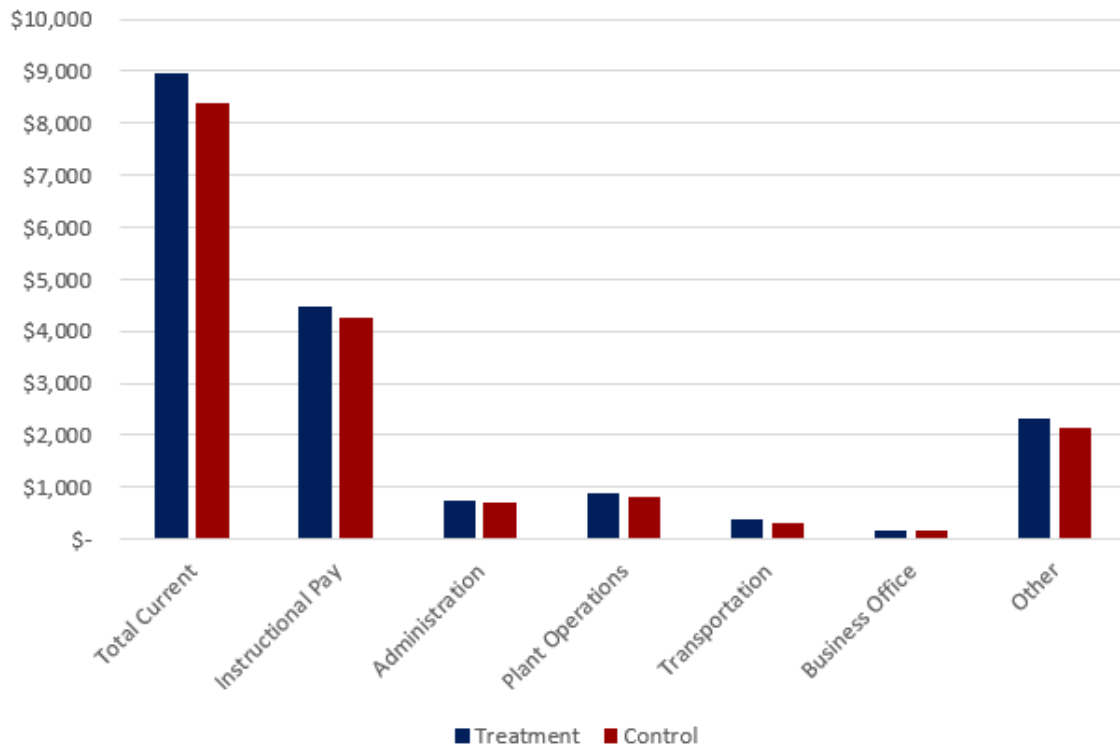


Figure 8.5. 2008-09 Per-student Expenditures by Category for Control and Aggregated Treatment Districts

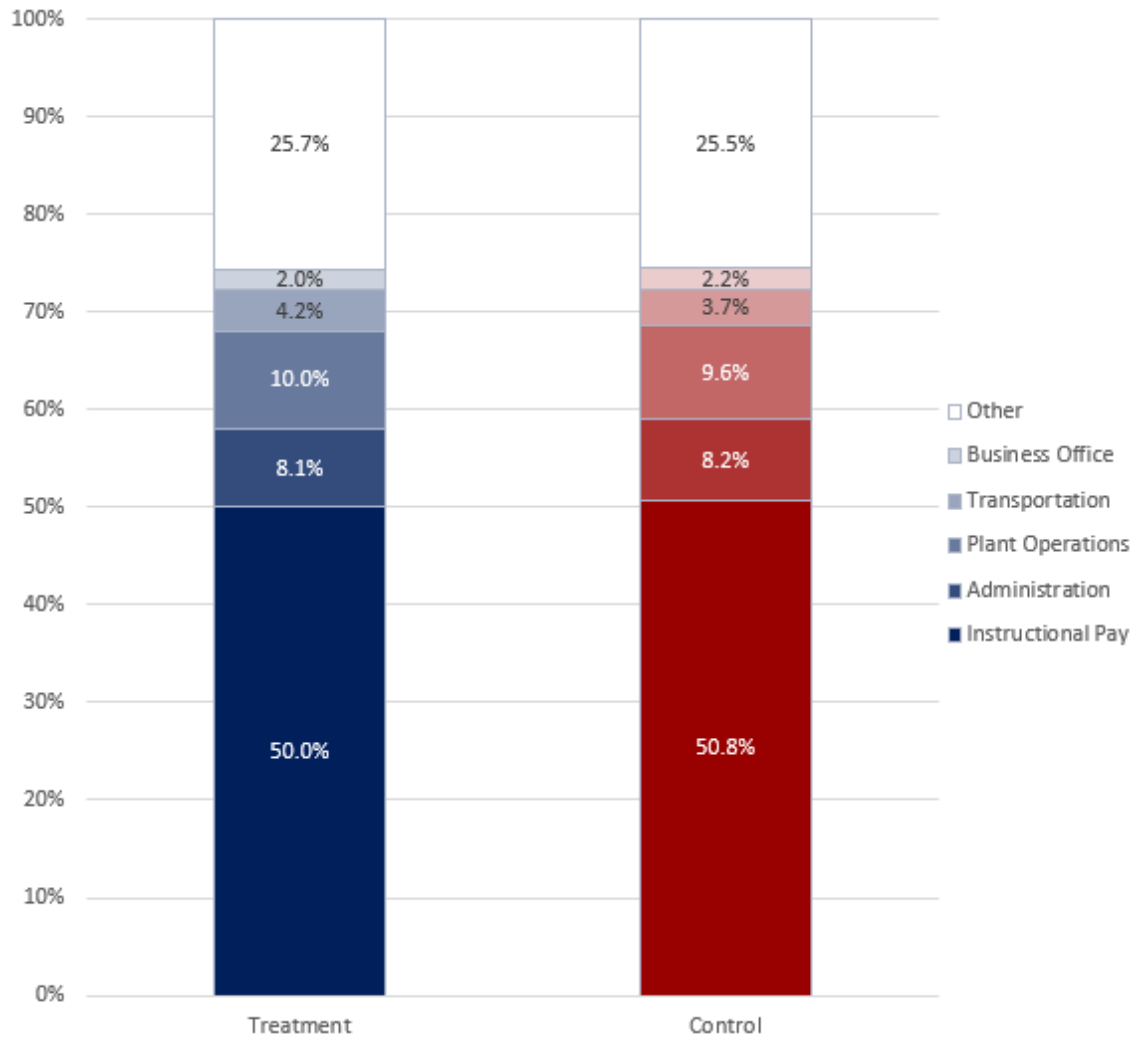


Figure 8.6. 2008-09 Percentage of Spending by Category for Control and Aggregated Treatment Districts

Appendix One. Glossary of Terms

Term	Definition
Age-graded school	a school in which students of different ages are taught in separate classrooms
Allocative efficiency	the degree to which a market provides consumers with the quantity and price of a product or service they desire
Capital expenditures	expenditures used for the purchase of long-lasting goods, such as school buildings and equipment
Competition	the presence of a large number of consumers and producers of a good or service
Consolidation	the union of two or more districts or parts of districts; in this dissertation, consolidation may refer to a merger, an annexation, a unification, or other actions that bring together multiple school districts
Contiguity	sharing part of a political border
Cost function	an economic model relating per-unit costs to output quantities and environmental characteristics
Coterminosity	sharing all political borders
Current expenditures	expenditures used for the daily operation of school districts, such as teacher compensation and student transportation
Differences-in-differences estimation	an econometric technique relating changes in outcome for one group affected by a policy or intervention to changes in outcome for an unaffected comparison group
Dis-economy of size	increase in average unit cost with increases in the quantity produced
Division of labor	production systems where each individual completes only part of the whole process
Economics	the study of the production, allocation, and consumption of resources
Economy of size	decrease in average unit cost with increases in the quantity produced
Efficiency	general term for amount of output per input
Elementary-only district	a school district serving only students in elementary or elementary and middle grades
Legitimacy	the degree of public support for a person or organization

Local education agency (LEA)	a school district
Market	a medium through which producers and consumers interact to make production and consumption decisions
Market concentration	the degree to which service or good provision in a market is produced by a single or small number of producers
Natural systems perspective	organizational perspective that views organizations as collections of people with independent goals acting informally
Non-operating school district	a district that does not operate any schools
Open systems perspective	organizational perspective that views organizations and their actions as part of a broader environment
Production function	an economic model relating outputs produced to the inputs used in production
Rational systems perspective	organizational perspective that views organizations as formalized groups of people with specific goals
Returns to size	the effect on output produced when input quantities increase; can be increasing, constant, or decreasing
School district	a geographical political entity responsible for the provision of education
School district size	school district enrollment, except where specifically noted otherwise
Selection bias	over- or underestimation of treatment effects because the group chosen for treatment was more or less likely to benefit from the treatment than the comparison group
Sociology	the study of human societies
Technical efficiency	the degree to which a producer attains its optimal theoretical productivity

Appendix Two. Optimal Size Studies from the Grey Literature

Table A2.1. Cost Function Studies Published in Grey Literature Since 2000

Study	Sample	Optimal Size
Collins (2018)	Pennsylvania K-12 School Districts	5900 - 7130
Coulson (2007)	Michigan School Districts	2900
Gronberg, Jansen, Taylor, & Booker (2004)	Texas School Districts	>210,000
Taylor, Gronberg, Jansen, and Karakaplan (2014)	Texas Metropolitan School Districts	3200

Appendix Three: State Revenues

Changes in state funding correlated with treatment status would pose a threat to the validity of the DD causal attribution. To test for such differential changes, I estimated a non-parametric model relating state revenues per student with an interaction between year dummies, γ , and treatment status, d . The model, shown in Equation A3.1, also includes district fixed effects, λ .

$$(A3.1) \quad staterev_{lt} = \lambda_l + \gamma_t + \varphi_t(d_l \cdot \gamma_t) + \varepsilon_{lt}$$

Estimation results, displayed in Table A3.1, show a statistically significant interaction of year and treatment only in 2004-05. A Wald test for equality of the remaining coefficients failed to reject the null hypothesis ($p = 0.914$). This suggests that the only year in which a change in state funding was associated with treatment status was 2004-05, the year in which the consolidation assistance bonus was paid to consolidating districts.

Table A3.1. Results of Regression Relating State Revenue per Student and
Treatment Status Over Time

Year Interacted	Interaction of Treatment and Year (Standard Error)
2001-02	4.38 (25.60)
2002-03	27.77 (32.69)
2003-04	17.49 (35.58)
2004-05	711.13*** (78.91)
2005-06	20.45 (59.84)
2006-07	98.82 (110.42)
2007-08	11.32 (133.07)
2008-09	45.56 (182.61)

n =235 LEAs x 9 years

Appendix Four: District Characteristics Before Treatment

Table A4.1 provides enrollment information for consolidating districts at the time of consolidation. The mean enrollment was nearly 50% higher than the median of 1049 students, due primarily to a small number of districts with large enrollments exceeding 3500 students. The median smallest and largest enrollments per consolidation provide some insight into a “typical” Act 60 consolidation, with the larger district having about three times as many students as the smaller district that had been mandated to merge. Also notable in this table is the large fraction of districts that were experiencing declining enrollments. Nearly all consolidations had at least one district with shrinking enrollments, and in more than half of consolidations all involved districts were experiencing decreases in enrollment.

Table A4.1. Enrollment Characteristics of Consolidations and Consolidating Districts at Time of Consolidation

	Median	Mean
Total Enrollment per Consolidation	1049	1490
Enrollment: Smallest District per Consolidation	238	232
Enrollment: Largest District per Consolidation	755	1210
Percent of Consolidations with One or More Decreasing-Enrollment Districts	93.4%	
Percent of Consolidations with All Districts Decreasing Enrollment	54.3%	

n = 46 consolidations

Some characteristics of districts that were required to merge under Act 60 are displayed in Table A4.2. Enrollment was small and decreasing, on average. The median racioethnic minority representation rate was low, at only 5.2%, but the mean was high, exceeding the state average of 22.3%. This is largely explained by eight small districts with racioethnic representation rates exceeding 90%, including one district where all students identified as black. More than 70%

of districts were below Arkansas state medians in resident income and college attainment rates, and over 90% had population densities below the state median. All but one low-enrollment district were classified as rural, with the one exception being a suburban district that merged into a larger rural district.

Table A4.2. Characteristics of School Districts Mandated to Merge (Enrollment < 350 Students) at Time of Consolidation

	Median	Mean
Enrollment	245	241
Five-Year Enrollment Change	-11.1%	-11.8%
Percent of Students per District Identifying as Racioethnic Minority	5.2%	24.3%
Percent with >90% Racioethnic Minority Enrollment	13.3%	
Percent Below State Median on Median Resident Income	71.7%	
Percent Below State Median on Share of Residents Holding a College Degree	71.7%	
Percent Below State Median on Population Density	91.7%	
Percent Rural	98.3%	

n = 60 districts

In Table A4.3, descriptive means and standard deviations are presented for both the control and treatment districts at the time of consolidation. Control districts had larger enrollments, and population density, median income, and college attainment were also greater than in treatment districts. Minority representation was statistically comparable across groups. All treatment districts were classified as rural upon consolidation, compared to the 65.3% of control districts that were rural.

Table A4.3. Descriptive Statistics of Control Districts and Collapsed Treatment Districts at Time of Consolidation. Mean with Standard Deviation in Parentheses.

	Control Districts	Treatment Districts
Enrollment	1943 (2996)	1500 (1205)
Percent of Students per District Identifying as Racioethnic Minority	18.9% (23.4%)	21.3% (23.5%)
Population Density (Persons/Sq. Mi.)	104.4 (244.2)	35.6 (46.9)
Percent of Residents Holding a College Degree	12.1% (5.9%)	10.2% (2.5%)
Median Income of Residents	\$31,102 (\$5498)	\$28,459 (\$4464)
Percent of Districts Rural	65.3%	100%
	n=190	n=45

Appendix Five: Evidence of Parallel Trends for Graduation Rate and Expenditures

The results of the parametric and non-parametric pre-treatment parallel trends estimations are shown in Tables A5.1 and A5.2. No interaction terms of year and treatment, d , are significantly different from zero at the $p = 0.05$ level, suggesting the parallel trends assumption is satisfied.

Table A5.1. Parametric Parallel Trends Regression Results for Graduation Rate and Current Expenditure per Student

	Graduation Rate	Current Expenditures per Student
	Coefficient (Std. Error)	Coefficient (Std. Error)
$(d_l \cdot year_t)$	-0.67% (0.62%)	\$64.41 (\$33.86)
$year_t$	1.18%*** (0.29%)	\$194.50*** (\$13.92)

n = 235 LEAs x 4 years

n = 235 LEAs x 4 years

Table A5.2. Non-Parametric Parallel Trends Regression Results for Graduation Rate and Current Expenditure per Student

	Graduation Rate	Current Expenditures per Student
	Coefficient (Std. Error)	Coefficient (Std. Error)
$(d_l \cdot 2001 - 02)$	-1.13 % (1.49%)	\$85.71 (\$63.32)
$(d_l \cdot 2002 - 03)$	-2.14% (1.61%)	\$128.51 (\$84.31)
$(d_l \cdot 2003 - 04)$	-1.90% (1.96%)	\$200.42 (\$102.16)
(2001 – 02) Dummy	1.67%*** (0.73%)	\$160.44*** (\$26.84)
(2002 – 03) Dummy	3.14%*** (0.86%)	\$366.19*** (\$37.45)
(2003 – 04) Dummy	3.45%*** (0.90%)	\$579.76*** (\$40.71)

n = 235 LEAs x 4 years

n = 235 LEAs x 4 years

Appendix Six: Evidence of Parallel Trends for Expenditures by Category

The results of the pre-treatment parallel trends estimations are shown in Table A6.1. No interaction terms of year and treatment, d_t , are significantly different from zero at the $p = 0.05$ level, suggesting the parallel trends assumption is satisfied.

Table A6.1. Parallel Trends Regression Results for Per-Student Expenditures by Category

	Administration	Instructional Compensation	Plant Operations	Transportation
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
$(d_t \cdot year_t)$	\$8.46 (\$4.84)	\$29.27 (\$15.61)	\$2.36 (\$16.71)	\$0.59 (\$1.60)
$year_t$	\$14.62*** (\$2.65)	\$85.29*** (\$6.71)	\$6.34 (\$7.50)	-\$0.42 (\$0.83)

n = 235 LEAs x 4 years

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