ABSTRACT

Title of Document: THE RELATIONSHIP BETWEEN TEACHER UNIONS AND TEACHER QUALITY IN LARGE URBAN AND SUBURBAN SCHOOL DISTRICTS

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This study utilizes the binomial hierarchical generalized linear modeling (HGLM) technique and nationally representative data (SASS 2003-2004) to examine the relationship between teacher unions and teacher quality in America's large urban and suburban districts and the effect of teacher unions on the intra-district distribution of teacher quality across schools with varying poverty and minority student concentration in the largest districts. Results reveal that compared with non-unionized districts, strongly unionized districts tend to have higher proportions of NCLB defined highly qualified teachers, teachers with at least five years of experience, teachers with subject-area degrees, and teachers with subject-area certifications in the large urban and suburban districts. But, strongly unionized and non-unionized districts have comparable proportions of empirically-defined high quality teachers and teachers who graduated from selective colleges. Weakly unionized districts are less likely to attract and retain experienced teachers than non-unionized ones. This study also finds that in the largest districts school poverty/minority level has a stronger (and negative) effect on the distribution of experienced teachers in strongly unionized districts than in non-unionized districts, which suggests that in strongly unionized districts the teacher quality gap is much wider across high and low poverty/minority schools in terms of employing experienced teachers.

THE RELATIONSHIP BETWEEN TEACHER UNIONS AND TEACHER QUALITY IN LARGE URBAN AND SUBURBAN SCHOOL DISTRICTS

By

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Dedication

To my husband, Shujun Cao, my mother, 潘文英, and the memory of my father, 张庆贵.

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I would like to express my gratitude to the many supportive and knowledgeable individuals who helped and guided me through my doctoral studies. My family and friends, dissertation committee, and colleagues whom I worked with in the College of Education provided invaluable assistance and care that allowed me to complete my doctoral studies and this dissertation.

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Table of Contents

List of Tables

List of Figures

CHAPTER ONE: INTRODUCTION

Purpose of the Study

Teacher unions have been at the forefront of media reports, educational policy debates, and public school reforms. Hannaway and Rotherham (2006) summarized two polarized views that dominate the public discussion of teacher unions' impact on public schools. Critics argue that collective bargaining, the central piece of teacher unions, is the biggest barrier to improving American public schools (Moe, 2006). Proponents counter by stating that the common goals teacher unions pursue are consistent with the educational interests of the students; the common good of teachers improves the quality of education for students (Casey, 2006). Disregarding the opposing views of unions' influence on school improvement, the rhetoric of both sides on the union-impact argument indicates the acknowledgement that teacher unions have a significant impact on public schools. Teacher unions have a bearing on most aspects of public education, teachers, students, school operation and educational policies (Moe, 2006; Johnson & Donaldson, 2006). Yet, there is no denying that one of unions' direct, most obvious effects on public schools is on teacher related policies, such as teacher pay, teachers' working conditions, teacher assignments, and teacher evaluation and dismissal. These teacher-related policies, in turn, have impacts on who enters and who stays in education, how their talents and skills are used, and how they are supported for their professional growth. In this way, one would assume that teacher unions would be associated with teacher quality, but very limited research has examined this relationship. This study intends to utilize nationally representative data to examine the relationship between unions and teacher quality in America's large urban and suburban districts.

Teachers make a difference in the learning of students and their long-term life opportunities. Parents, educators, researchers, and policy makers all agree the centrality of teachers in student learning (Rice, 2003; Darling-Hammond, 2000; Sanders & Horn, 1998). Teachers' role in learning is particularly critical in urban school districts, where children often have less support at home (Jacob, 2007). But urban schools serving poor and minority students often have difficulty hiring qualified teachers, let alone high quality teachers (Lankford, Loeb & Wyckoff, 2002; Levin & Quinn, 2003).

Among the stake holders of teacher quality issues, teacher unions are not a silent one, particularly after the mid-1980s (Kahlenberg, 2006). Teacher unions claim that "teacher quality is an essential union responsibility" (AFT, 2003, p.5), and strengthening teacher quality a central mission of unions (NEA, 2007a). Many union-negotiated policies have potential to influence districts' ability to employ and retain high-caliber teachers, and the strength of unions in local districts greatly affects the scope of the negotiated policies. Teacher unions are more powerful in large districts than in small ones (Hess & Kelly, 2006; Rose & Sonstelie, 2004). And teachers in urban and suburban districts have more choices regarding where to teach given the relatively large number of school districts in a geographic area. Therefore, the relatively high mobility of teachers and the stronger union power in large urban and suburban districts present an optimal opportunity to examine whether teacher unions play a role in teachers' decision on where to teach, i.e. whether teacher unions affect teacher quality.

Despite the importance of and debate on the possible influence of teacher unions on teachers and schools, very limited empirical research has examined the effect of teacher unionization, and even fewer studies about teacher unions' effect on teacher

quality (Goldhaber, 2006; Johnson & Donaldson, 2006). In a recent review examining the effects of collective bargaining on teacher quality, Johnson and Donaldson (2006) have to focus on intermediate factors that are related to teacher quality, such as teacher pay, working conditions, class size, preparation time, and hire and dismissal. They conclude that little research has assessed the impact of unions, and unions' effect on teacher quality is "shaped far more by rhetoric and ideology than by disinterested thorough inquiry" (p.138).

My own literature review detailed in chapter two reaches the same conclusion as that of Johnson and Donaldson. Most teachers' union research focuses on the effect of unionization on teacher salaries, and finds that collective bargaining increases teacher salaries between three and nine percent (e.g. Baugh & Stone, 1982; Hoxby, 1996). A few studies document union's effects on teachers' working conditions in terms of student-teacher ratio (e.g. Eberts & Stone, 1986; Hoxby, 1996), and teachers' in-school time use, such as preparation time and time meeting with parents (Eberts, 1984). These scant working conditions studies tentatively suggest that unions improve teachers' working conditions through reducing class size, shortening teachers' instructional time, and increasing paid preparation time.

Very few studies, in fact only three, have been found that examined the impact of teachers' unions on teacher attributes commonly assumed to reflect teacher quality, such as teacher experience, teacher certification, teacher preparation programs and degrees, teacher coursework or teacher test scores (see Rice, 2003; Zumwalt & Craig, 2005). Two studies show that stronger collective bargaining contracts tend to retain teachers (Rees, 1991), and attract more fully certified teachers into these districts, but do not alleviate or

exacerbate the teacher quality gap within districts (Koski & Horng, 2007). One study suggests that teacher unionism is highly associated with the 1963 to 2000 decline of teacher aptitude, as represented by college test scores (Hoxby & Leigh, 2004). Evidence is mixed on the relationship between teacher unions and student achievement, a direct measure of teacher effectiveness. Some research finds that stronger union presence is associated with increased student test scores (Nelson & Rosen, 1996; Steelmen, Powell & Carini, 2000; Eberts & Stone, 1987). In contrast, other studies find unionization is negatively related to student achievement as measured either by test scores or drop out rates (Kurth, 1987; Hoxby, 1996)

Several possible reasons explain this scant empirical literature of teacher unionization effects on teacher quality. First and foremost, in the educational community there exists no consensus on how to define teacher quality. Though many scholars and policy makers are deeply engaged in teasing out the characteristics and properties of teacher quality, the definition of it holds a wide range of complexities (Fenstermacher & Richardson, 2005). Secondly, union effects are difficult to isolate empirically because teacher unions do not come into being haphazardly (Goldhaber, 2006). Many factors contributing to the formation and strength of teacher unions, such as the competency of school administrators, may very probably be associated with the characteristics of schools, and teachers schools employ. Thirdly, disaggregating union effects is further complicated by the so called "spillover effects" of teacher unions, the fact that nonunion states and districts tend to copy the practices of their unionized peers (Johnson & Donaldson, 2006). As a preventive effort to discourage their teachers from unionization and to compete for prospective teachers, schools offer salaries and working conditions comparable to those

in unionized ones. The "spillover effects" make it even harder for researchers to isolate the effects of teacher unions on teacher quality.

Defining Teacher Quality

In this dissertation study, acknowledging the complexities born with teacher quality, I review the common approaches of defining teacher quality, including teacher unions' definition(s) of teacher quality. After scrutinizing the prevailing approaches, I adopt two composite measures of teacher quality in this research: One is derived from existing empirical literature and the other from the federal government's viewpoint—NCLB's definition. The empirically based teacher quality measure includes four components: *selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience*. The NCLB's definition of teacher quality consists of three components: *at least a bachelor's degree from a four-year institution, full state certification*, and *competence in the subject area (for elementary school teachers, as demonstrated by full certification in the subject area; and for middle and secondary school teachers, as demonstrated by an academic major in each core subject area taught)*. After analyzing unions' effect on the two composite proxies of teacher quality, I further study unions' relationship with the major components of the composite measures, which are the selectivity of teacher preparation institutions, in-field degree status, in-field certification status, and teacher experience. Under the overarching theme of union effect on teacher quality, I am also interested in its effect on the distribution of teacher quality. Union-negotiated teacher staffing rules frequently give preferences to teachers with seniority in transferring within districts and keeping their positions when schools

experience layoffs. When they have a choice, teachers typically avoid high-poverty, high-minority, and low-achieving schools (Ascher & Fruchter, 2001; Peske & Haycock, 2006). Some argue through their negotiated contracts, teacher unions contribute to or exacerbate the teacher quality gap between schools of different characteristics. So this study also investigates whether unions are associated with the intra-district teacher quality distribution across schools.

Categories of Unionization

In the history of their development, teacher unions adopted and are now still employing two major negotiation approaches with the district management, namely "collective bargaining" and "meet and confer." Meet and confer preceded the occurrence of collective bargaining, and it remains a less binding type of formal negotiation. Within the meet and confer framework, management is under no legal obligation to discuss specific topics with its employees or reach any agreement (Koppich, 2006). Even when a meet and confer session does produce a written agreement, called a memorandum of understanding (MOU), the agreement only lists the mutual commitment but carries no legal obligation with either party (Koppich, 2006). On the other hand, dubbed the "powerful tool" of teacher unions (Angus & Mirel, 2001, P.32), collective bargaining is the central piece of unionization and did not come into education until the post-1960s (Cresswell, Murphy & Kerchner, 1980). A collective bargaining agreement is a "legal contract laying out the rights and obligations of teachers and the school board" (Hess & Kelly, 2006, p.56). The agreement "establishes the terms and conditions of employment of employees, places limitations on the ability of the employer to change those terms and conditions, and specifies certain kinds of duties or requirements of employees"

(Lieberman, 2000, p.19). These two approaches of labor relations exert differential influence on school policies (Kerchner & Mitchell, 1988), which could lead to different distributions of teacher quality.

Not only are there noticeable differences between collective bargaining and "meet and confer" agreements, but also variations exist among collective bargaining agreements across districts. Within the broad category of collective bargaining, teacher unions still represent a variety of power strengths and behavior across the U.S. The power of teacher unions in negotiating contracts favorable to their interests is also related to union membership in a district (Rose & Sonstelie, 2004). Collective bargaining generally will not occur unless at least 50 percent of teachers are union members (Hoxby, 1996). Therefore, to better identify the different categories of unionization and their ensuing power in negotiating with the school districts, in this research I construct a unionization measure by combining the information on union contract type and membership, following the strategy adopted by Hoxby (1996). Specifically, the unionization measure has three categories: stronger unionization, weaker unionization, and no unionization. "Stronger unionization" measure is constructed as having a collective bargaining agreement and union membership exceeding 50 percent of total number of district teachers. The "weaker unionization" category is defined as either 1) having a "meet and confer" agreement or 2) having a collective bargaining agreement but with union membership no more than 50 percent of total number of district teachers. The "no unionization" category includes those districts without any union agreement.

Conceptual Framework

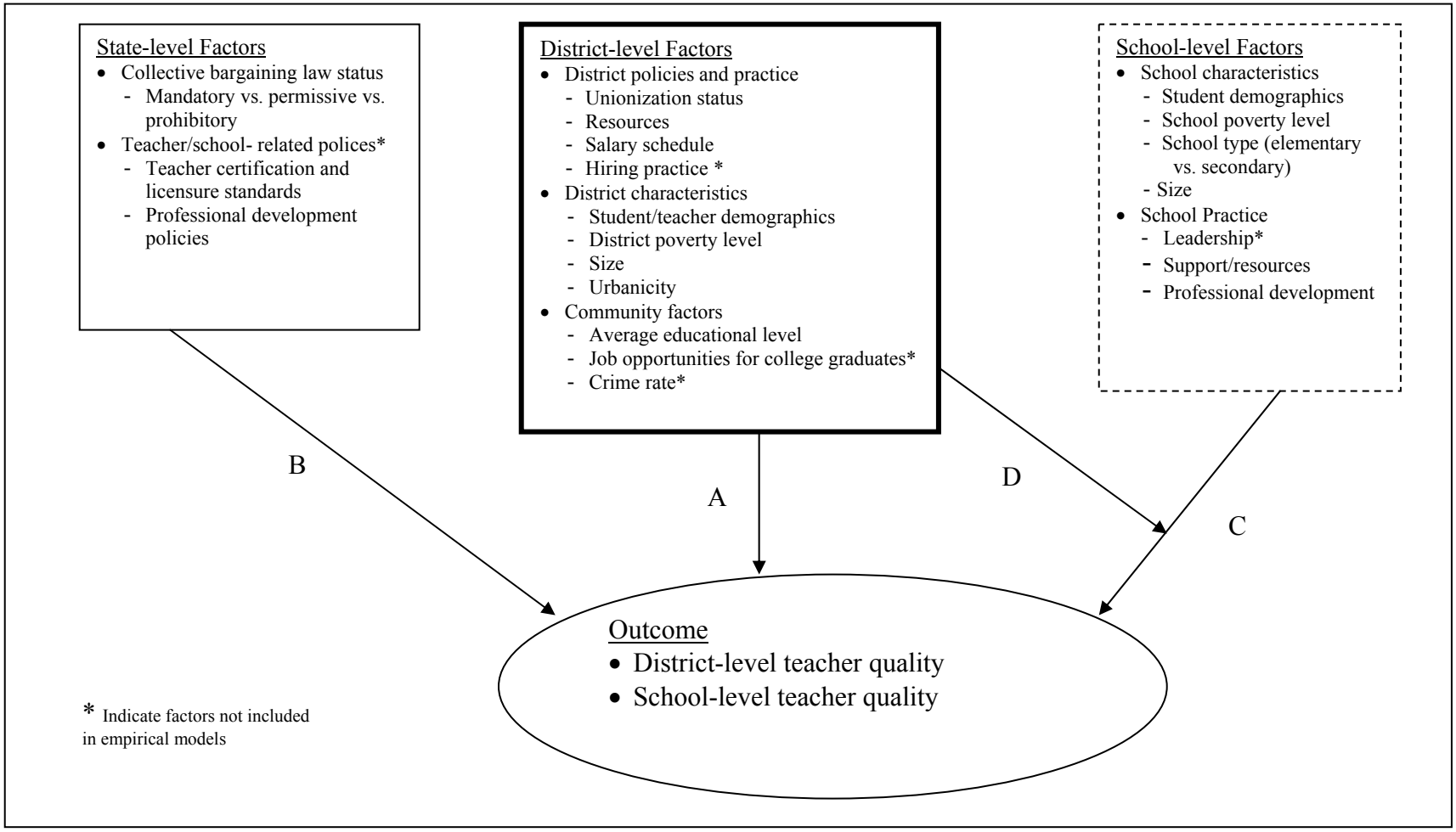
This study is based on a conceptual framework grown out of literature review (see Chapter Two) that multi-level factors —state, district, and school factors— influence teachers' choice to work in a particular school (as graphically presented in Figure 1). A district's teacher quality, as measured by the concentration of teachers possessing certain characteristics linked with teacher quality in a district, is influenced by the district characteristics at the center of Figure 1 as well as state-level policies and practices. District-level factors, such as provisions of varying types of union contracts, district demographics, district wealth, hiring practice, influence teachers' decision to work in the districts. Local community features, such as crime rate, non-teaching job opportunities, also affect prospective teachers' decision to teach in a particular district. The influence of district characteristics on teacher quality is represented by Arrow A in Figure 1. In addition, studying the effects of teacher unions needs to differentiate between the effects of a union on a district and the district characteristics that make a union more likely to form (Hoxby, 1996; Goldhaber, 2006). Therefore, the inclusion of other district characteristics, other than union status, also serves to alleviate the endogeneity concern.

In addition to local factors, a state's collective bargaining law also has an overarching influence on the existence of unions, and the strength of negotiated district contracts in that state (Hess & Kelly, 2006). State level teacher-related policies, such as certification and licensure standards, professional development policies, all presumably affect teacher quality in the state. Thus, state level factors are included in this conceptual framework to control for their possible confounding effects on the distribution of teacher quality, as indicated by Arrow B.

This framework also hypothesizes that teacher quality at the school level, as measured by the proportion of teachers possessing certain characteristics linked with teacher quality in a school, is influenced by individual school characteristics in addition to the district and state level factors. School characteristics, such as leadership, size, poverty status, student population, working conditions etc influence the distribution of teacher quality within districts as indicated by Arrow C. Furthermore, district-level polices such as union status may also interact with these school level factors to exert differential influence on teacher quality across schools within a district, as captured by Arrow D. For example, district unionization status may interact with school poverty level, thus affect the intra-district distribution of teacher quality across schools with varying poverty levels.

With the conceptual framework built out of literature on unions and teacher quality, I acknowledge that my analytical models may not include all of the variables. The reason is simply that some factors, such as state-level certification policies or job opportunities for college graduates, are not accessible to this dissertation research. Therefore variables measuring these factors are not included in the analytical models. These omitted variables present one of the limitations of this study, which is discussed in detail at the limitations section of this study.

Figure 1: Conceptual framework for the relationship between teacher unions and teacher quality in the district; the association between union status and the intra-district distribution of teacher quality across schools



Research Questions

In this dissertation research, I examine the relationship between teacher unions and teacher quality in large urban and suburban districts. Specifically, this study focuses on two research questions:

1. What's the relationship between a district's union status (stronger unionization, weaker unionization, no unionization) and teacher quality in the district among the large urban and suburban districts in the U.S.? Teacher quality is measured by:

   a. The proportion of teachers in a district who are classified as high quality by *the empirically-established teacher quality (ETQ) indictor (composed of selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience);*

   b. The proportion of teachers in a district who are classified as high quality by *the NCLB-defined highly qualified teachers (HQT) indicator (composed of at least a bachelor's degree from a four-year institution, full state certification, and competence in the subject area);*

   c. The proportion of teachers in a district who possess one of the following teacher quality components: *selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience*

Teacher unions, particularly seniority-based transfer rules, give experienced teachers much latitude in choosing which school to teach within the districts. Teacher

unionization theory suggests that experienced teachers would choose to use the rules to leave the undesirable schools, typically high poverty and high minority ones, to teach at schools they find more desirable. My second research question intends to examine this conventional belief. Due to data availability issue, I confine my second research question to the largest districts in the U.S. The largest districts refer to those districts listed among the top 100 largest districts by the National Center on Education Statistics (USDE, 2008). Specifically, I seek to investigate:

2. In the largest school districts in the U.S., how does a district's union status affect the intra-district distribution of teacher quality across schools with different poverty level and minority student concentration? Here, teacher quality is measured by:

a. The proportion of teachers in a school who are classified as high quality by *the empirically-established teacher quality (ETQ) indictor*;

b. The proportion of teachers in a school who are classified as high quality by *the NCLB-defined highly qualified teachers (HQT) indicator;*

c. The proportion of teachers in a school who possess one of the following teacher quality components: *selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience.*

Significance of the Study

The relationship between teacher unions and teacher quality is a fundamental and yet much-debated policy issue. As American policymakers and the public turn their

attention to this thorny issue, strikingly scarce empirical evidence exists to help them make informed decisions. Because of the scant number of studies, a recent review has to focus on intermediate factors, such as teacher pay, working conditions, teaching assignments, evaluation and dismissal, to gauge the effects of collective bargaining on teacher quality (see Johnson & Donaldson, 2006). In addition, virtually all studies except one (Koski & Horng, 2007) on the effects of teacher unions used data from the 1970s and early 1980s, when the educational context was much different from the one exists today. This research provides a piece of new empirical evidence on the effect of teacher unions on teacher quality by analyzing data from the Schools and Staffing Survey, 2003-2004 (SASS 03-04). SASS 03-04 provides the most up-to-date national level data to study teacher unions' effect in the current educational context which affects the way unions function.

The multilevel modeling technique adopted in this study provides a significant advance over traditional one-level analysis performed by prior generation of unions' effect studies. The hierarchical structure of schools within districts, districts within states has to be accounted for in studying union's effect on teacher quality. For example, unions operate at the district level, while the collective bargaining law at the state level has an instrumental effect on districts' unionization status as well as the bargaining scope of union contracts. The multilevel modeling technique takes into account the hierarchical structure of the data in studying unions' effect on teacher quality. In addition, the investigation of unions' effect on the intra-district distribution of teacher quality across schools also calls for multi-level modeling. Whether teacher unionization interacts with school characteristics, such as poverty level, to exert differential effects on schools is of

primary interest to policy makers in understanding union effect and it is an area that needs empirical evidence.

In summary, using most updated national level data and advanced analytical technique, this study provides a piece of empirical evidence which could help policymakers to make better informed judgments about union-related policies in the contemporary times.

CHAPTER TWO: LITERATURE REVIEW

Teacher unions have been in existence since mid-nineteen century, and their role and power have also been evolving with the development of the American society. Studying teacher unions' effect on teacher quality requires an understanding of teacher unions' history, status quo, its role in education and the complexities involved in defining teacher quality.

This chapter begins with a brief history of teacher unions in the U.S, focusing on the evolution of teacher unions in terms of their goals and policy emphases. The second section describes the status quo of union activity in school systems across the U.S. Section three reviews existing literature that measures unions' activities, including union contract studies and union impact studies on teacher-related outcomes, such as teacher pay and teacher quality. Section four synthesizes most commonly used approaches of defining teacher quality, and compares teacher unions' definition(s) of teacher quality with those in other policy arenas. After synthesizing dominant ways of defining teacher quality, I present definitions of teacher quality adopted in this study and the theory of action underlying this unions' effect research. This chapter concludes with a summary of findings from the review of literature.

A Brief History of Teacher Unions in the United States

The National Education Association (NEA) and the American Federation of Teachers (AFT) are the two major teacher unions in the United States. Today, the NEA and AFT are regarded as the most powerful political forces in public education and impact a variety of educational issues (Lieberman, 1997; Murphy, 1990). However, the two organizations were originally founded with quite different missions, and had far less

influence than they have today. The turning point in the role of teacher unions was the advent of collective bargaining in the 1960s, which greatly enhanced the power of the two teacher unions. Growing from 770,000 members in 1960 (Murphy, 1990, p.277), today the NEA and the AFT have a combined membership of 4.3 million [1](NEA, 2007c; AFT, 2007b). Currently, collective bargaining of teachers is established in 42 states and the District of Columbia (DC)[2] (Nelson, 2006), and all 50 states and DC have teacher unions and more than 80 percent of all teachers are union members (Fischer, 2003).

In this section, I present a brief history of teacher unions in the U.S. with a focus on major union developments, particularly those after the establishment of collective bargaining. For every major stage of evolution, I provide unions' goals, major policy emphases, and possible factors driving these policy level emphases.

The Founding of the Two Teacher Unions and Their Early Stage Evolution

The National Education Association (NEA)

The National Teachers' Association, the predecessor of the National Education Association (NEA), was founded in 1857 with the objective of making teaching "a profession, not just an ordinary vocation" (Wesley, 1957, p. 30). In 1870, The National Teacher's Association merged with the National Association of School Superintendents resulting in its name of NEA and the new organization was dominated by school administrators and college professors. School administrators constituted 50 percent of the

[1] This figure includes some non k-12 teachers, such as nurses, paraprofessionals, college students and university faculty and staff (NEA, 2007c; AFT, 2007b)

[2] Teachers in the following eight states do not work under collectively bargained contracts: Alabama, Georgia, Mississippi, North Carolina, South Carolina, Texas, Virginia and West Virginia (Nelson, 2006). Though, according to NEA (2005), teachers in Alabama and West Virginia have permissive collective bargaining rights at the discretion of school boards.

active membership during the 1890s and classroom teachers only 11 percent (Murphy, 1990).

During the 19th century, the NEA remained a small educational organization with no permanent full-time staff, and its membership did not exceed 2000 members (Wesley, 1957, p. 397). The organization did not regard itself as a union until the late 1960s, but instead sought to improve the teaching profession and reform American education (Vinovskis, 2000). In particular, the NEA focused on circulation of educational knowledge, curriculum issues, and more federal involvement in education. Through paper presentations and speeches delivered at its annual conventions, the NEA promoted communication among educators. The NEA established committees and commissions to deal with more specific educational issues. The NEA's Committee of Ten on Secondary School Studies in 1893 tried to standardize the American high school curriculum (Cremin, 1988) and had a major influence on education. The NEA also called for increased federal assistance to education.

The NEA grew rapidly and truly presented itself as a national educational association in the early twentieth century. Its membership expanded from about 8,500 in 1917 to more than 141,000 in 1927 and 200,000 by 1940 (Donley, 1976). Its comprehensive membership represented all facets of public education: teachers, superintendents, and university professors. The control of the organization and of the teaching occupation was still placed in the hands of administrators, though teachers comprised the majority of the NEA's membership (Kerchner & Mitchell, 1988, p. 59).

In the early twentieth century, financial pressures of the time and other social concerns drove teachers to look to their organizations for support and legal advice

(Murphy, 1990). Despite its anti-union attitude, the NEA, at the urge of its members spent much of the decade of the twenties working to raise teachers' salaries through its general program of raising standards of the teaching profession (Murphy, 1990, p.140). The NEA felt if standards were raised high enough, teachers would be paid accordingly (Murphy, 1990). However, this assumption never fully came to fruition and teachers still earned lower salaries even when compared with factory workers with less education in the early twentieth century (Cresswell, Murphy & Kerchner, 1980, p.137).

The American Federation of Teachers (AFT)

Contrary to the NEA's initial mission as a professional education organization, the AFT was founded in 1916 as a teachers' union. The initial goals of AFT were to unite teachers and represent teachers in negotiations with school boards (Urban, 1982, chapter 6).

By the end of nineteenth century, teachers became more concerned about their personal economic needs like salaries, pension, etc, and believed the union could provide a way of attaining their goals (Wesley, 1957). However, the administrator-controlled NEA did not take teachers' interests seriously and rejected unionism. Teachers' self-interest initiatives clashed with the NEA ideology of the selfless service of the teaching profession (Kerchner & Mitchell, 1988, p.54). As a result, NEA members Margaret Haley and her elementary teacher colleagues formed the Chicago Federation of Teachers (CFT) outside of the NEA in 1897 to "fight for the rights to which they were entitled", specifically, better compensation (Braun, 1976, p.22-23). However, their request for higher salaries was viewed "morally obtuse" by NEA's leadership (Kerchner & Mitchell,

1988, p.56), and Haley was regarded as a 'fiend in petticoats" by Nicolas Murray Butler, then president of the NEA (p.56).

In 1916, the CFT merged with three other local unions[3] to form the American Federation of Teachers, and later was granted a charter by the American Federation of Labor (AFL), a group of private-sector unions (Urban, 2000, P.8; Murphy, 1990).

Throughout its beginning decades, the AFT had a limited national presence and struggled for its existence, relying on financial assistance from the AFL and its successor organization, the American Federation of Labor and Congress of Industrial Organization (AFL-CIO) (Murphy, 1990, p. 113-114; Selden, 1985, p. 8-9). Its membership represented less than five percent of the total national teaching force during 1916-1960 (Cresswell, Murphy & Kerchner, 1980, p.110, Table 4-1). Therefore, the AFT did not achieve much in its goal of representing teachers and teachers' interests nationally. Next I will review the obstacles to the AFT's strong teacher unionization.

Limited Influence of Teacher Unions between 1910 and 1960

Between 1910 and 1960, teacher unionists faced several barriers which prevented them from organizing teachers effectively. Among them were the lack of a legal framework for teacher unions and the public's general disposition against public employee unionization, as well as the AFT's internal rifts.

First, early teacher unionists had no legal protection of their rights to organize, and they were subject to retaliation for joining a union. At the state level, courts did not support teachers' union activities. Local school board's "yellow-dog" contracts in the mid-1910s, which declared no rehiring of teachers who belonged to unions, significantly

[3] The Federation of Women High School Teachers, the Chicago Federation of Men Teachers, and one local from Gary, Indiana (Murphy, 1990, p.83)

put a hold in the growing of unionized teachers (Murphy, 1990). State Supreme courts, for example, in Illinois and the State of Washington upheld boards of education's "yellow-dog" contracts in 1917 (Cresswell, Murphy & Kerchner, 1980, p.150). Due to the anti-union movement, the AFT's membership shrank drastically from 4,500 in 1916 to 2,400 in 1917 and 1,500 in 1918 (Murphy, 1990, Appendix table 6).

Second, perhaps the biggest barrier was the popular belief that teachers, as public employees, should not have the right to strike. After the 1919 Boston police strike, Samual Gompers, the founding president of American Federation of Labor (AFL) made it clear that no public employee unions affiliated with AFL should have a strike clause (Murphy, 1990, p.109). Therefore, from its inception, the AFT had a policy that its local unions would not strike (Henderson, 2004). Further, most state laws prohibited strikes by public employees, and where state law did not ban strikes, courts ruled teacher strikes to be illegal (e.g. the Connecticut Supreme Court decision in 1951) (Henderson, 2004, p.4).

A third barrier lay in unions' internal factions. Divisions within AFT prevented the solidarity required for bargaining effectively. Gender issues were persistent. Women activists sought not only economic protection, but also considered unionism as an avenue for social change (Murphy, 1990, p.103). And the latter pursuit was unpopular with male unionists. In addition, gender division existed in high schools where women and men had their separate unions. Male high school teachers were eager to control the process of negotiations, while women strived for equal representation in the discussion (Murphy, 1990, p.103). What was more, high school teachers and elementary school teachers had different requests from unions. The elementary teachers fought for a single salary schedule, which would pay teachers equally regardless of their grade level, and high

school teachers wanted to keep the wage differentials based on the positions (Kahlenberg, 2006; Murphy, 1990, p.88).

The AFT during the period of 1930 and 1940s also struggled for its identity (Cresswell, Murphy & Kerchner, 1980, p.78). The leadership had always been in debate about whether the AFT should evolve into a "bread-and-butter" union, which would strive for securing higher wages and better working conditions for members, or a social re-constructionist union, which would fight for social change, such as civil rights, racial discrimination and women rights (Cresswell, Murphy & Kerchner, 1980, p.78).

As a result, these dissentious issues within teacher unions, as well as the anti-union legal and societal structures, curbed teacher unionism from growing stronger in the first half of the twentieth century.

Conditions for Stronger Unionism Began to Emerge in the 1950s and 60s

Though difficult barriers existed against organizing teachers effectively, certain factors began to emerge for stronger unionism in the mid twentieth century. In the 1950s and1960s, in addition to teachers' declining economic situation and dissatisfaction with their working conditions, the demographic change of the teacher population as well as private sector unionism movement offered more opportunity for teacher militancy and stronger unions.

The post-World War II time represented one of the greatest periods of economic growth in the United States, but not for educators. Teachers' financial situation was becoming increasingly despairing. Teachers' salaries had always been low; however, by 1947 and 1948, the situation became worse than before (Cresswell, Murphy & Kerchner, 1980, p.78). The United States Bureau of Education issued a report stating that "owing to

the greatly increase in cost of living, the 1947-48 average salary (of teachers) had less purchasing power than the lower average salary in 1929-30" (Eton, 1975, p. 24). Besides the worsening financial situations, teachers were also tired of their working conditions (Kahlenberg, 2006). For example, teachers did not have school grievance procedures to protect them from abuse by administrators. They were forced to stay late for long staff meetings as demanded by principals (Murphy, 1990). Teachers, though proclaimed by the NEA leadership to be professionals, had non-educational responsibilities such as removing snow on school grounds and monitor cafeteria and bathrooms (Kahlenberg, 2006).

The demographic change was a second reason for teachers' militancy (Henderson, 2004, p.8). After World War II, due to the GI bill, many veteran soldiers came back to school and were prepared to join the teaching occupation. These more educated male teachers, who had markedly higher expectations for being professionals, found them become "workers in the education industry"; they taught in overcrowded classrooms, and earned a salary with decreased spending power (Selden, 1985, p.228). The influx of male teachers with worsening financial situations led a push to stronger unionism.

A third factor lay in the large scale private-sector labor movement in the 1950s. After World War II, organized labor in the private sector won the legal sanction and protection to secure considerable wage and benefit gains through collective bargaining. In 1952, the AFT president, Carl Megel, noted the salary for the average factory worker was approximately $400 more than that for teachers in 1951 (Murphy, 1990, p.210; Urban, 1982, p.140). This $400 difference was sizable given teachers' average annual salary of $3,050 in the 1950s (Murphy, 1990, appendix table 5). Since the majority of teachers

held college degrees, the income disparity between teachers and workers with considerably less education, was a frustration and motivation for teachers to look into the workers' unionization practice (Cresswell, Murphy & Kerchner, 1980, p.137). Teachers' unions began to determine whether the form of industrial unionism was suitable for their needs (Cresswell, Murphy & Kerchner, 1980, p. 80).

The structure for stronger teacher unionism, namely collective bargaining, started to emerge in the 1950's. Teachers' organization rights began to gain the attention of legislators after World War II. One piece of notable legislation was the passage of the first state act for school bargaining in Wisconsin. The statute recognized the rights of teachers to organize and bargain collectively, but declared strikes against schools to be illegal. The statute also was the first to require school boards to recognize and bargain with teachers' unions (Cresswell, Murphy & Kerchner, 1980, p.150).

In the period between 1952 and the New York schoolteachers strike in 1962, under the slow moving conditions favoring teacher unionism, teachers cautiously pursued some changes, such as in getting rid of the discriminatory laws regarding married woman teachers, and gaining due process procedures for dismissal (Murphy, 1990, p.211).

The favorable social and legal surroundings as well as the worsening economic situations of teachers, contributed to several collective bargaining agreements between local teacher organizations and school boards in Illinois, Connecticut, and Rhode Island (Cresswell, Murphy & Kerchner, 1980, p.150). However, the breakthrough of teachers' unionism in U.S history did not come until the watershed New York schoolteacher strike in the early 1960s.

The New York Schoolteacher Strike in the Early 1960s

The rise of the United Federation of Teachers (UFT) in New York City, a local affiliate of AFT, gave collective bargaining a new thrust. In 1960, after a one-day strike to reinforce demands for collective bargaining rights and certain working conditions, the superintendent quickly agreed to a collective bargaining election and dropped all charges against striking teachers (Selden, 1985, p.34). In the collective bargaining election, teachers would choose whether they opted for collective bargaining and which union they wanted to represent them. Teachers granted an overwhelmingly "yes" to collective bargaining, and elected the UFT to represent them in bargaining with the School Board (Murphy, 1990, p.215). After the negotiation on the scale of pay raise was broken, over 20,000 out of 40,000 New York City teachers struck for one day (Cresswell, Murphy & Kerchner, 1980, p.85; Murphy, 1990, p.215). The strike successfully prompted the governor, the state legislators, and the city to pour in an additional $82 million to the school system, and each of the city's teachers received an average annual pay increase of $700 (Cresswell, Murphy & Kerchner, 1980, p.85).

After the New York City victory, bargaining status of AFT locals began to be established in other major cities in the nation (Cresswell, Murphy & Kerchner, 1980, p.85). Between 1961 and 1965, forty collective bargaining elections took place involving more than 96,000 teachers, of which over 74,000 teachers voted for the AFT locals for representation and about 21,000 voted for NEA representation (Murphy, 1990, p. 224, footnote 38).

The NEA's Response to the AFT's Collective Bargaining Strategy

The AFT's victory in bargaining elections as well as in membership growth did not go unnoticed by the NEA. In 1962, as teachers nationwide increasingly supported

collective bargaining, the NEA developed a policy of "professional negotiations" to differentiate from the AFT's union style collective bargaining (Henderson, 2004). Professional negotiations, essentially the NEA's "meet and confer" agreement between teachers and school boards, covered compensation and working conditions, as did collective bargaining, but still kept a non-strike policy and prohibited use of outside parties to mediate (Stinnett, 1968, p. 90, 119, 122).

Furthermore, the underlying ideologies of collective bargaining and "meet-and-confer" agreement are fundamentally different (Kerchner & Mitchell, 1988, p.5). Meet-and-confer practice was based on the assumption that teachers' interests coincided with those of the school employer (Kerchner & Mitchell, 1988, p.5). In other words, teachers want what their school district wants. In contrast, collective bargaining assumed that each side had its own interest, defined problems differently, and would pursue its own interests in dealing with the problems (Kerchner & Mitchell, 1988, p. 5).

Another difference between collective bargaining and "meet and confer" involved the different roles of school administrators. In collective bargaining, school administrators usually represent the school boards in bargaining with teachers. In contrast, in NEA's professional negotiations, administrators were supposed to advocate for teachers, acting as intermediary between the school board and teachers (Kerchner & Mitchell, 1988, p.6). The professional negotiation, sought to preserve NEA's status as a professional association for both teachers and school administrators and avert any potential breach within the "everybody included" association, especially between teachers and school administrators (Carr, 1978; Henderson, 2004, p.10).

During meet and confer meetings, teachers from high school, elementary school, and middle school might have different requests and they did not have the obligation to act on behalf of each other or as a whole, and only with the intent to secure their own interests (Koppich, 2006). As a result, school boards often successfully took advantage of the differences among groups of teachers to defer or manipulate the negotiations (Koppich, 2006, p. 206). Moreover, the boards had no legal obligation to discuss specific topics teachers requested, or to reach any agreement, or to carry out promises (Koppich, 2006, p.206). Teachers, thus, jokingly called this process "meet and defer" (Kerchner & Mitchell, 1988, p. 65). The NEA adopted a non-strike policy and prohibited use of outside parties to mediate (Stinnett, 1968, p. 90, 119, 122). At the time when the "meet and confer" style professional negotiations did not work for teachers, for example, if boards did not accept teachers' requests, the NEA would impose, instead of strikes, such sanctions as advising teachers not to work for the districts (Henderson, 2004).

During the years of the 1960s when the NEA implemented the professional negotiating strategy, teachers who engaged in professional negotiation disappointedly found that they could not easily solve their disputes with the boards—they did have different interests (Kerchner & Mitchell, 1988, p.66). In contrast, teachers with collective bargaining rights gained more ground. Experiencing the disappointment of professional negotiations and witnessing the successes of collective bargaining, more and more NEA affiliates began to turn to collective bargaining, strikes, and contract negotiations. In 1968-1969, the NEA locals accounted for 80% of the strikes and 40% of the employees involved in the total 123 teacher strikes (NEA research, 1969, p. 4-5, cited in Henderson, 2004, p.11). As a result, by 1968-1969, of the 1019 collective bargaining agreements

negotiated ever since, NEA affiliates accounted for 90.5% of the contracts and 61.2% of the teachers covered (NEA research, 1969, p.4-5, cited in Henderson, 2004, p.11).

As local associations committed to collective bargaining, the differing interests between teachers and school administrators became apparent; therefore, increasing numbers of administrators began leaving the NEA either voluntarily or as demanded by state bargaining statutes or school boards (Henderson, 2004, p.11). The NEA, in rivalry with the AFT to compete for membership and dues, began to embrace collective bargaining actively and pursued to limit administrators' influence in the association. Thereafter, with the disaffiliation of three organizations[4] representing administrators in 1972, the NEA finalized its transformation into a teacher union (West, 1980, p.83-84).

Growing Influence: Collective Bargaining in the 1970s and 80s

With the pressure from the AFT, the NEA, and other unions representing government employees, more and more states began to pass public employee collective bargaining laws. By the late 1970s, 31 states had enacted collective bargaining laws requiring some form of contractual arrangement between school system and employees, and 7 out of the other 19 states did not require but permitted school boards to enter into contracts with teachers (Cresswell, Murphy & Kerchner, 1980, p.153). The remaining 12 states' school boards were prohibited from entering collectively bargained contracts with teacher unions. The laws also describe a process for identifying a bargaining unit as well as the legal scope of the agreement. A bargaining unit defines the individuals to be covered by a contract; and the scope of agreement indicates the subjects that must be

[4] The three organizations were the American Association of School Administrators, the National Association of Elementary School Principals, and the National Association of Secondary School Principals.

negotiated, those that may be negotiated, and those that are not allowed to be negotiated (Koppich, 2006, p.207).

Due to the established legal structure as well as the effectiveness of the teacher strike in New York, the incidence of teacher strikes spread in the 1960-1970s. In 1964 there were 9 teacher strikes; in 1966, 30; in 1967, 105; and in 1975-76 school year, a record high of 203 (Kahlenberg, 2006). The capacity of strikes to disrupt school operation put tremendous pressure on public officials to broker agreements.

Further, since the advent of collective bargaining in early 1960s, union membership increased dramatically. The NEA membership rose from around 714,000 in 1960, before the first major collective agreement, to a little less than 2 million in 1976. The AFT went from 56,156 to 446,000 during the same period (Cresswell, Murphy & Kerchner, 1980, table 4-1). The percentage of teachers represented by unions grew from 55.5 percent in 1960 to more than 90 percent by the late 1970s (Cresswell, Murphy & Kerchner, 1980, table 4-1). Research in the 60s and 70s found that the AFT and NEA tended to attract teachers with different characteristics. Men were more likely to join the AFT and women were more likely to join the NEA (Lowe, 1965). Teachers with master's degrees were more likely to be attracted to the AFT, whereas teachers with lesser training were more likely to join the NEA (Lowe, 1965; Fox & Wince, 1976). It is not clear whether the same pattern still holds at present time.

Along with the growth of collective bargaining and its growing membership, unions began to exert increased influence on state and national educational policies aside from district-level collective bargaining. In addition to other policy involvement, unions strongly supported professionalization of the teachers. The NEA historically had been

transformed from a professional educational association, and its renewed emphasis on professionalization was no surprise. Since the 1970s, the NEA lobbied for teacher-dominated independent state professional boards to set policy regarding teacher education, licensing, professional development, and advanced certification (Ballou & Podgursky, 2000). The local NEA affiliates were the major moving force behind the first establishment of independent professional boards in Oregon (1973) and Minnesota (1980). The momentum for professional boards continued into 1990s and 15 states had independent or semi-independent boards by 2000 (Ballou & Podgursky, 2000). The professional boards in eleven states have full authority to set standards for licensure. In the other four states, the state board of education still retains the authority to veto actions of the professional board (NEA, 1998, p.21 cited in Ballou & Podgursky, 2000).

Both the NEA and AFT were strong supporters of the founding of the National Board for Professional Teaching Standards in 1987 (Lieberman, 1993). The Board was established to create rigorous and practice-based examinations for experienced teachers (NBPTS, 2006b). The NEA and the AFT, taken together, held at least one third of the Board's membership and the presidents of the two national unions automatically filled two positions in the Board (Ballou & Podgursky, 2000).

The Bargaining Scope in the 1960s to Early 80s

The scope of collective bargaining reflected the major goals and policy emphases of unions. During the period from the 60s to mid-70s, teacher unionism operated by the means of industrial style bargaining. The major reason was that states modeled their public sector bargaining laws directly on the 1935 National Labor Relations Act, which regulates private-sector labor practices (Johnson & Kardos, 2000). As far as the

bargaining scope was considered, teachers sought the basic goals for which industrial workers had fought in the 1930s—improved salaries and benefits, limitation on work load, and due process in transfers and discipline (Selden, 1985, p.109). Contracts set forth standardized pay scales, seniority-based layoffs, teachers' in-school work responsibilities, grievance procedures, and mandated evaluation procedures (Johnson & Kardos, 2000). Between the mid-1960s and mid-70s, teacher unions bargained on more provisions that were favorable to their interests and had the potential to benefit students indirectly, such as smaller classes, time for teachers to prepare for classes, and provisions granting teachers the right to refuse teaching assignments outside their field (Johnson & Kardos, 2000). By 1975, a NEA's survey revealed that almost one-third of teacher collective bargaining agreements contained clauses limiting class size and out-field assignments (Yrchik, 1992, p. 22-23, cited in Henderson, 2004, p.15). Class size changed from an average of 28 for elementary schools in 1965 to an average of 23 in 1975; and in secondary schools class size reduced from 22 to 19 during the same period (Doherty, 1981, p.69)

In addition to the "bread and butter" bargaining items specified in state legislatures, unions began to move to negotiating educational policy issues, including the participation of teachers in curriculum policies, the discipline of students, and the establishment of specific education programs (Kahlenberg, 2006). A survey completed by the NEA in 1971 showed that approximately 53 percent of contracts examined had some clauses on pupil discipline, about 25 percent had curriculum review language, and about 23 percent involved textbook selection processes (Cresswell, Murphy & Kerchner, 1980, p. 326).

Some contracts also included clauses that directly assisted the existing union in maintaining its position as the exclusive representative of teachers in the district, such as an agency clause. The agency shop clause requires that "all employees covered by a union contract must either be members of the union or pay a fee to cover the cost of being represented" (Cresswell, Murphy & Kerchner, 1980, p.329). Paying dues or a fee thus becomes a condition of continued employment, and eliminates the occurrence of "free riders". The agency shop clause, thus, obtained some level of security for the existing union in a school district.

Persisting Controversies and Criticisms

By the early 1980s, controversies around the adoption of the industrial model of unionism in education began to emerge, and criticism of the teacher unions and union provisions persists to the current time. Critics claimed that collective bargaining was the biggest impediment to improving American public schools (Moe, 2006; Lieberman, 1997; Brimelow, 2003)

Traditional teacher unionism first came under scrutiny in the 1980s (Kerchner & Koppich, 2004). Critics charged that unions did much harm to education because the narrow self-interest of teachers often diverged from the needs of students (Moe, 2006). The rigid union contracts reduced flexibility required for initiating school reform. The union work rules, which were effective in protecting teachers from arbitrary treatment by administrators, sometimes also excessively limited administrators' discretion, and set low expectations for teachers' responsibilities. For example, in some districts where contracts specified only a few hours for meetings or professional development, teachers applied

these requirements and refused to participate in school reform initiatives (Johnson, 2004, p. 40).

Union detractors argued that the stringent seniority rule limited school administrators' ability to assign the best-qualified teachers to the positions and schools they were most needed (Liberman, 1997). In school districts where strict seniority rules applied to teacher assignments, a teacher with more years of experience might bump a junior teacher without giving much consideration to whether the change disrupted school operations (Archer, 2002 cited in Johnson, 2004, p.40). Under the seniority rule, more experienced teachers chose more desirable jobs, usually in affluent schools, thus leaving low-income and low performing schools with inexperienced and less qualified teachers (Liberman, 1997, p.221). A school principal anticipated serious problems with the seniority rule: "I can anticipate the time when I'm not able to interview teachers if I have a vacancy in the building. Instead, the seniority list will determine who goes here and who leaves my building (Johnson, 1984, p.80)."

Union critics also argued that provisions in collective bargaining agreements made it time consuming, or even impossible for administrators to fire incompetent teachers (Stern, 2003, p. 24; Johnson, 2004, p.41). For example, in Florida, the involuntary rate of dismissal for teachers was 0.05 percent in 1997, compared with 7.9 percent in Florida's workforce as a whole (Brimelow, 2003, p.41). The average cost of dismissing a teacher in New York during the 1990s was reportedly $200,000 (Toch, 1996 cited in Kahlenberg, 2006). Even teachers themselves felt unions should not be too protective of incompetent teachers. A teacher interviewed by Johnson (1984) echoed this viewpoint: "Why should I knock my head against the wall when he's not even doing his

job" (p.131). The presence of incompetent teachers, thus, created dissatisfaction among teachers.

The single salary schedule also discouraged effective teachers from staying in the teaching positions, critics claim (Liberman, 1997; Moe, 2006). Under the single salary schedule, seniority and academic degrees were rewarded, while actual teacher quality and student learning were sidelined; great teachers often left classrooms and switched to higher paying positions in school administration or non teaching jobs (Liberman, 1997, p.213; Hoxby & Leigh, 2004).

The controversies centering on teacher unionism are deeply imbedded in its industrial characteristics. Industrial style bargaining generally follows three assumptions in conducting negotiations and teacher unionists transferred them directly from industry to education in the 1960s (Johnson & Kardos, 2000).

First is the belief that interests of labor and management are opposite to each other, and that one side's gain is the other's loss (Johnson & Kardos, 2000). Kerchner and Koppich (1993) describe this oppositional relationship as a key feature of industrial unionism, stating: "Industrial unionism assumes permanent adversaries. It organizes around rigorous representation of the differences between teachers and managers (p.15)." However, in education, teachers and administrators generally have common interests in providing effective education to their students. Neither schools nor unions can change the status quo without the other. Teachers by themselves are incapable of reorganizing schools, implementing professional standards or increasing student learning (Kerchner & Caufman, 1993 p.2). Likewise, school administrators can't reorganize schools, change

school schedules, or alter the duties of teachers without accompanied change in labor contracts and defined role of teachers (Kerchner & Caufman, 1993, p.2)

The second assumption of collective bargaining is that standardized practice is desirable; uniform operations across an organization make more efficient production (Johnson & Kardos, 2000). In education, union contracts make certain that the same standards and regulations apply to all teachers in a district, including salary schedules, workload, evaluation procedures (Johnson & Kardos, 2000). This standardized practice, thus, leaves principals and teachers with little latitude to respond to the needs of an ever diversifying student population.

Third is the assumption that similarly skilled workers are interchangeable and should be treated alike (Johnson & Kardos, 2000). In education, this assumption means that teachers with the same level of education and experience are undifferentiated and are to be treated uniformly. When schools initiate performance-based-pay, unions perceive this as a threat to their internal solidarity. Just as Kerchner, Koppich, and Weers (1997) observed "Union power is threatened when the boundaries of existing job classifications are breached and when schools provide different treatment to teachers of the same classification" (p.39). Unions, therefore, have historically opposed differentiation among teachers in pay, such as merit pay. They contend that merit pay is divisive and inappropriate for public education (Berube, 1988, p.141).

Union Reform from the late 1980s to Today

Industrial style unionism proved inadequate to address the problems of education identified in the 1980s (Johnson, 2004). Changing economic conditions during the 1970-80s, declining school enrollment, and a perceived decline in student achievement created

a crisis in education (Henderson, 2004, p.17). Public school teachers and unions were under constant attack for inadequately educating the nation's young generation.

The release of A Nation at Risk in 1983, created an upsoar of the attacks on public education, and called for excellence in education. This reform movement, dubbed the "excellence" movement, emphasized higher academic standards and quality of teaching, which included the suggestion for merit pay (Berube, 1988, p.141).

In response to the increasing challenges created by the excellence movement, teacher unions, first the AFT under their reform-minded leadership, strived to meet them by encouraging reform initiatives (Kahlenberg, 2006). For example, Albert Shanker, then AFT president, changed his previous position that unions did not represent the interest of students because they were not union members (Lieberman, 1998). While suspected and challenged by the AFT's longtime more traditional-minded members, Shanker called for "a second revolution" (Shanker, 1985), in which teachers would bargain for quality of education through professionalism. The professional image Shanker projected was what he borrowed from medicine: Teachers ought to be like doctors, who controlled standards, entry requirements and were not supervised (Berube, 1988, p.144). Shanker's call for a national certification board of teachers, equivalent of board certification for doctors, contributed significantly to the creation of the above mentioned National Board of Professional Teaching Standard. Shanker made his case by arguing that if teachers did not go beyond collective bargaining, teachers will fail in their "major objective: to preserve public education in the United States and to improve the status of teachers, economically, socially, and politically" (Shanker, 1985, p.2, 6).

Under Shanker, the AFT also offered compromises on the three key issues that unions were under constant attack: protection for incompetent teachers, resistance to merit pay, and opposition to school choice (Kahlenberg, 2006). The AFT endorsed the AFT local Toledo, Ohio's peer review plan under which more experienced teachers would assess their peers' performance and may suggest termination of employment. On the issue of school choice, the AFT advocated for public charter school (Cameron, 2005, p.106).

The AFT, under Shanker, embraced the standards movement (Koppich, 2006). It launched its "Making Standards Matter" series, looking analytically at each state's achievement standards and the extent to which they were linked to state accountability systems. The AFT also lobbied for tough legislation for evaluating state standards (Kahlenberg, 2006).

The NEA, at least at its national leadership level, was slow to catch up with AFT as to the idea of reforming unions, just like its belated adoption of collective bargaining in the 1970s. In 1997, twelve years after Shanker's speech on reforming union practice, NEA president Bob Chase urged a New Unionism, which put "issues of school quality front and center at the bargaining table" and advanced the interests of students and schools (Chase, 1997, cited in Kahlenberg, 2006, p. 23). He argued that if unions didn't embrace reform efforts from within the public school system, public schools "would be dismantled from without" (Chase, 1997, cited in Kahlenberg, 2006, p. 23).

With the encouragement of its national leadership, some reform-minded locals began to depart from industrial-style union contracts and practices. To answer the complaint about unions protecting unworthy teachers, the aforementioned AFT local in

Toledo, Ohio first launched a controversial peer review plan in 1981 (Murray, 2004). Under this plan, experienced teachers from a joint labor-management committee would review the performance of their peers and sometimes advocate for termination of employment (Johnson & Kardos, 2000, p.29). Several other districts, such as Cincinnati, and Rochester followed suit, and won the support of teachers. This collaboration blurred the traditionally held adversarial line between administrators and teachers. Remarkably, teacher peers tended to be tougher reviewers. The peer review process led to considerably more teacher termination than before the program began (Johnson & Kardos, 2000, p.29). The plan also created controversy in that unions deviated from their traditional responsibility of equal representation of members (Kahlenberg, 2006).

Inspired by their leaders' call for new approaches to labor relations, some local districts began to experiment with different negotiation practices. They experimented with approaches called "principled" or "win-win" negotiations (Fisher & Ury, 1981). Rather than facing opponents across the table, negotiators sat side by side in labor-management task forces, seeking solutions to challenging problems.

Several districts, such as Cincinnati and Rochester also introduced the program of career ladder with promotional steps that identified and rewarded increasing skills and assuming new responsibilities. In these districts, therefore, unions broke through the undifferentiated single salary schedule (Johnson & Kardos, 2000, p. 29).

In 1996, the above described districts as well as other reform oriented NEA and AFT union locals established the Teacher Union Reform Network (TURN), whose mission states unions are " to seek consistently higher levels of student achievement by… seeking to expand the scope of collective bargaining to include instructional and

professional issues" (Teacher Union Reform Network, 2006). Though TURN locals by no means represent the totality of union reform, they are among the longest running and more extensive reforms (Kerchner & Koppich, 2004). TURN locals expanded bargaining scopes beyond those narrow "bread and butter" issues to a wide range of issues, including shared decision making, peer assistance and review, accountability, professional development, parent involvement, alternatives to the conventional compensation system, charter schools, low-performing schools, learning standards, curriculum reform, and uses of time (Johnson & Kardos, 2000, p.27; Kerchner and Koppich, 2004, p.190).

Koppich (2006) also documented a reform initiative in Rochester for teachers to sign individualized contracts with their principals to tailor to their students' learning needs. These school-based agreements, piloted in the 2005-2006 school year, can cover areas such as school work year, teacher assignments, teaching conditions, class size, and the structure of the student day, with the expressed purpose to "improve school performance and focus on student achievement." (p.214). In sum, reform unions, like the ones cited here strived to meet the challenges posed by ever-increasing diversified needs of students.

The expansion of the bargaining scope to educational policy did not proceed unchallenged and remained contested terrain. Proponents of reform unionism argue that only through involving teachers fully in the process can school improvement be achieved (Kerchner, Koppich and Weeres, 1997). However, antagonists claim that once shared decision making is included in the collective bargaining contracts, flexibility is lost, and the attention soon shifts to whether the principals adhere to the contracts, and the education policy may end up in the hands of a disinterested third-party arbitrator (Black,

2002). Eberts and his colleagues (2004) expressed two concerns about writing reform measures into contracts. First, they argued little empirical evidence exists as to the effectiveness of these reform efforts; some are better than others. However, once they are included in the bargaining contracts, it may be difficult to remove them. Second, unions are eager to get their members in the reform process, but do not explicitly address teachers' accountability for the reform results.

The slow implementation of union reform initiatives, as well as some state legislatures' actions, mirrors these concerns. Two points attest to the slow implementation of union reform. First, the number of districts undertaking reformed bargaining approaches is very small; the TURN only comprises fewer than 25 locals (Kerchner and Koppich, 2004). Second, no definite implementation results exist regarding their effectiveness in improving schools. Though no comprehensive evaluation of local districts' reform results is available, some case studies provide a cue for the difficulty of these reforms. For example, in shared decision making, one of the first reform measures of unions, school committee members in many cases could not reach agreement (Kerchner and Koppich, 2004). One often-recounted story exemplifies this point: A school in Los Angeles spent a year discussing who would have access to the photocopy machine (Kerchner and Koppich, 2004, p.190).

State legislators are moving away from favoring unionism. Some states, such as Wisconsin, Illinois, Michigan, and Pennsylvania have aimed at limiting negotiable issues, perhaps with the underlying theory that unions' involvement in core educational decision would hurt the pace of school reform (Koppich, 2006, p.214). In 1994, the Michigan legislature limited the power of teacher unions by prohibiting unions from bargaining

over issues of school operation such as the date a school year starts, the decision to privatize non-instructional support personnel, and other issues (Boyd, Plank, and Sykes, 2000).

Another reason for unionism's slow progress in reform comes from inside the unions. Union reform is subject to the internal split visions of members. As Kahlenberg (2006) pointed out that reform oriented union presidents in a number of union locals—Chicago and San Francisco, for example, have suffered recent election defeat to challengers who are more traditional unionists.

Kerchner and Koppich, long time researchers in reform unions, concluded that the current reform unions "has little of the momentum that characterized the growth of collective bargaining in the 1960s and 1970s" (2004, p.197). However, union researchers, at the same time, hold qualified optimism about the new unionism in that younger members, particularly those hired in the 1980s and after, are relatively more concerned about school-quality issues than about salaries and benefits compared with veteran teachers (Kahlenberg, 2006).

Conclusion

This brief history of teacher unions presents a picture of teacher unions' growth in response to external economic cycles, political developments, social changes, and legal statutes. Teacher unions' development is also subject to internal factors, such as competition between the two leading national unions, leadership visions, and the demographic change of teachers. During different stages of development, unions established different goals, and focused on different policy emphases. Unions' goal

evolved from survival to winning better contracts for teachers, to exerting policy influence in education with power gained from collective bargaining.

The economic needs of teachers, coupled with the societal labor movement drove teachers to stronger favor of unionism, including provision for collective bargaining. However, as the economy changed from one based on manufacturing to one driven by high-skilled knowledge work, schools are faced with a new task of preparing students with such required skills (Reich, 1991). Quality schooling for students requires quality teachers (Rice, 2003). Traditional industrial-style unionism protects teachers from possible arbitrary, punitive treatment from administrators, but its rigidity may also confine teachers' ability to improve school performance. The reform unionism, though only piloted in a small percentage of local districts, has the potential to address the concerns critics have for unions. Yet, it is too early to predict any major change to traditional unionization. Teacher unions within themselves still have different views on which way to go: traditional or reform unionism?

Union Activities in School Systems across the U.S

This review briefly describes the status quo of union activities, focusing on types of union negotiations, laws within which unions operate, geographical distribution of union activities, the bargaining scope of union contracts, and the frequency of work stoppage or strikes. With this relatively constrained scope of review, I acknowledge that teacher unions perform many other types of activities, such as advocacy for national education policy (e.g. teacher education accreditation and licensing), research, and local union influence in school board elections. Nonetheless, due to the lack of empirical research, I do not focus my review on these activities.

Teacher unions typically adopt two types of negotiations with school districts, "meet and confer" and collective bargaining. "Meet and confer" is the least binding type of formal negotiations between an administration and a union; and a memorandum of understanding (MOU) is the outcome (Hoxby, 1996). Anecdotal evidence suggests that some of the legally non-binding MOUs may be treated as legally binding documents by district officials (Hess & West, 2006). Yet, little empirical data is available on the prevalence, content, or results of nationwide "meet and confer" negotiations. Within the two major negotiation strategies, the "meet and confer" negotiations receive little attention; researchers almost solely focused on collective bargaining and its impact on school operation.

Dubbed the "powerful tool" of teacher unions (Angus & Mirel, 2001, P.32), collective bargaining refers to "the negotiation and administration of a written agreement between the school district as employer and an organization representing employees" (Cresswell, Murphy & Kerchner, 1980, p. 2). The resulting written agreement, or collective bargaining agreement, is the legal document that both parties must abide by in their activities. Currently, collective bargaining of teachers is established in 42 states and the District of Columbia (DC)[5] (Nelson, 2006), and all 50 states and DC have teacher unions and more than 80 percent of all teachers are union members (Fischer, 2003).

In nearly all states, teacher collective bargaining is regulated at the state level (Hess & Kelly, 2006). Thirty-four states and the District of Columbia have enacted laws requiring districts to engage in collective bargaining with organized teachers, and

[5] Teachers in the following eight states do not work under collectively bargained contracts: Alabama, Georgia, Mississippi, North Carolina, South Carolina, Texas, Virginia and West Virginia (Nelson, 2006). Though, according to NEA (2005), teachers in Alabama and West Virginia have permissive collective bargaining rights at the discretion of school boards.

teachers in 10 states have "permissive collective bargaining rights at the discretion of the employer" (NEA, 2005). The remaining six states prohibit teachers from having collective bargaining rights (NEA, 2005; Fischer, Schimmel & Stelman, 2007; Krueger, 2002).[6] Some anecdotal evidence suggests that unions in these prohibitory states may conduct "meet and confer" negotiations with the school districts (Hess & West, 2006). Nonetheless, a comprehensive review of union activities in these states is not available.

Geographically speaking, collective bargaining activities are less prevalent in the southern states, which may be manifested by the fact that sixe states in the south prohibit collective bargaining (NEA, 2005). Differences in the distribution of bargaining activity across the urban, suburban, and rural areas are not particularly visible according to Ebert and Stone (1986). They found that contrary to perceptions unionization had a low correlation with district urbanicity locale. However, their findings pertained to the union status in the 1980s; whether these findings still paint a reasonable portrait of current collective bargaining establishments is unknown. Up-to-date information on the distribution of unions across the U.S. definitely warrants further research.

The collective bargaining legislation has substantial effects on the density of union activities in a state (Saltzman, 1985). Yet, it is naïve to believe that unions function uniformly across districts within a particular state. Researchers (Hess & Kelly, 2006) have found variation in teachers' use of collective bargaining even in states that require school districts to collectively bargain with teacher unions. The presence of a state

[6] For the six states that teachers are prohibited from collective bargaining, NEA (2005) specifically indicates that teachers in North Carolina, Texas, and Virginia are prohibited from having collective bargaining rights. In the other three states, Georgia, Mississippi, and South Carolina, teachers have no legally established collective bargaining rights. According to Fischer, Schimmel & Stelman (2007), "…in the absence of such [collective bargaining] laws, teachers do not have a constitutional right to bargain collectively (p.47)."

legislative bargaining statute does not guarantee that all districts will collectively bargain. For example, in California, which has a mandatory bargaining law, 6.3 percent of districts with fewer than 500 students have no collective bargaining contract; one district with a student enrollment of more than 10,000 (Clovis) also does not collectively bargain (Riley, Fusano, Munk & Peterson, 2002).

The bargaining scope refers to whether bargaining on certain issues is mandated, permitted, or prohibited (Hess & Kelly, 2006). In practice, the scope of negotiations is structured by the state collective bargaining law and other state laws regulating district operations (Hess & Kelly, 2006). For example, many state regulations, besides collective bargaining legislations, govern teacher compensation, teacher employment, the school year, and class size. Because the regulating state laws vary, bargaining scope varies. A more detailed examination of bargaining scope is presented in the "content of contract" section below.

Among the various union activities, strikes are the most visible. A form of work stoppage, striking is typically the last resort when negotiations have reached an impasse (Hess & Kelly, 2006). Forty states have passed legislation prohibiting teacher strikes, though many of these statutes list no penalties (Hess & Kelly, 2006, p.67). Even in states with no-strike laws, teachers occasionally strike. Union leaders generally regard the threat of a strike as a deterrent that can force the district back to the table (Hess & Kelly, 2006, p.67). The number of teacher strikes nationwide fell from the peak number of 241 in 1975 to 99 in 1991 and 15 in 2003 (McDonnell and Pascal, 1979; Hess & Kelly, 2006).

Empirical Examination of Union Effects

In this section, I review empirical literature on unions' effects by paying special attention to their impact on teachers. Researchers have typically examined union effects from first, the content of union contracts (bargaining scope) and second, union action. The "union action" studies focus on the impact of union status on the actual operation of schools or districts. In the following sub-sections, I first present the results of a contract content review, and the review of unions' impact will follow. I review union effect studies *on teacher pay, working conditions, and teacher quality*. Under the "teacher pay and working conditions" category, I examine teacher unions' influence on *teacher salary, class size, and teacher's time use at school.* The "teacher quality" classification will focus on teacher unions' effect on *teacher retention, teacher test scores, and student academic achievement (including drop out rate*).

In selecting empirical literature to include in this analysis, I follow the following criteria. First, all studies included are designed explicitly to examine the relationship between teacher unions and some outcome or measures of union impact, such as union contract, teacher pay, teacher quality, or student achievement. Second, the studies are primarily drawn from peer-reviewed academic-journals; a few widely cited book chapters and research center studies are also included. Third, the studies included are from the last three decades, specifically from the mid-1970s to the present.

Examination of the Content of Union Contract

Currently, no national-level comprehensive data are available on the content of teacher collective bargaining contracts. The few available recent efforts generally focus on a single state and on particular provisions of the contracts, such as compensation,

teacher evaluation, transfers, layoffs, class size, and length and structure of the school day (Ballou, 2000; Hess & Kelly, 2006).

Ballou's (2000) study of Massachusetts teacher unions is the most scholarly of all the contract studies (Hess & Kelly, 2006). Ballou selected 40 contracts in 1999 which included the three largest urban districts in the state, and a sample of suburban and small towns. In addition, the researcher took care to ensure the selection of a mix of high-, medium-, and low-income communities. Besides reviewing contracts, Ballou also interviewed school administrators. Contract provisions governing compensation, teacher evaluation and discipline, transfers, layoffs, and length and structure of the work day were the foci of his study.

Ballou's contract study confirmed that compensation was determined solely by the accumulation of college credits and experience. Though contracts did contain some flexibility, district officials rarely took advantage of this flexibility to recruit candidates for the hard-to-staff fields or to attract candidates with special skills and backgrounds. Teacher evaluation clauses generally allowed administrators to conduct unannounced observations, but the cumbersome procedures required for any disciplinary actions undermined administrators' opportunities and willingness to take action.

Regarding transfers, Ballou found, though only few contracts required transfers be solely on the basis of seniority; however, in practice, current teachers would occupy the more desirable positions and leave the more difficult jobs to new and inexperienced teachers. When layoffs were required, most districts proceeded in the reverse order of seniority in the affected program area. Sixteen (40 percent) districts permitted performance to override seniority in making layoff decisions. The contracts limited

teachers' workload by restricting class size, number and length of classes, number of classes and subjects, length of the work year, and length of after-school meetings.

The Ballou (2000) study concluded that considerable variation existed among contracts and administrators typically failed to take advantage of the flexibility of at least some issues. Contracts in small affluent towns were least restrictive, while large urban districts and less affluent towns tended to have more restrictive provisions.

The most recent effort in analyzing the content of teachers' contracts was conducted by Hess and Kelly (2006). They examined the restrictiveness of contract language on items such as the length of the school day, class size, and teacher transfers in a stratified, random sample of 20 districts nationwide. Half of the sample was from states with mandatory collective bargaining and half from states without mandatory collective bargaining. The study found that due to the ambiguity of contract language, no clear-cut conclusions can be made on the contracts' restrictiveness. The researchers found that "some contracts include both ambiguous language and strict prescriptions within the same article" (p. 83), thus leaving no clear guidance for practitioners. Resonating Ballou (2000)'s findings, Hess and Kelly (2006) suggested district leadership should bear some of the responsibility for the inflexibility customarily attributed to teacher unions.

In summary, recent studies on teacher union contracts are very limited in number, and the available ones usually focus on particular provisions, such as class size, teacher compensation, and transfer. From the very limited available studies, I conclude that traditional bargaining items, such as compensation and working conditions, are still the foci of contracts. Some evidence may also suggest that union contracts, are not as rigid as perceived, and district administrators may need to work as hard as unions to take

advantage of the negotiated contracts in managing the schools. Yet, without more studies on union contracts, it is impossible to obtain a comprehensive review of the current status of contract content.

Examination of Union Impact on Teacher Pay and Working Conditions

Empirical literature measuring teacher unions' impact on teachers primarily focuses on teacher salaries (e.g. Baugh & Stone, 1982; Hoxby, 1996). In addition, few studies document union's effects on teachers' working conditions in terms of student-teacher ratio (e.g. Ebert, 1984; Hoxby, 1996), and teachers' in-school time use, such as preparation time and time meeting with parents (Eberts, 1984).

Teacher Pay

The studies designed to measure teacher unions' pay premium— the effect of unionization on teacher salaries—are purely quantitative in nature, and most, if not all, are conducted from an economic perspective. Most of the studies draw on data from the 1970s, about ten years after collective bargaining was established in education. Several utilize data from the early 1990s (such as Duplantis and colleagues, 1995), and some employ panel data spanning from early 1970s to 1990s (such as Hoxby, 1996).

Aside from focusing on different time periods, the studies vary in measures of compensation as well as measures of unionism. Measures of compensation differ in the unit of analysis adopted. These different units include estimates of hourly wage levels and wage changes of individual teachers; average salaries paid by districts; and average salaries at the state level. Researchers also employ different measures of unionism (Goldschmidt & Painter, 1987), such as the proportion of a state's teachers represented by bargained agreements (see Kleiner and Petree, 1988), the presence of state collective

bargaining statutes, the existence of union contracts (see Duplantis et.al, 1995), and union membership (such as Baugh & Stone, 1982). Some studies even adopt more sophisticated measures of unionism by combining two or more of the aforementioned measures (such as Hoxby, 1996).

Despite the variation in measures of salary and unionism, except for several studies that examine data in the early 1970s (Balfour, 1974; Kasper, 1970; Zuelke & Frohreich, 1976), studies that use data from the late 1970s and thereafter have repeatedly found a positive effect of unionization on teacher pay (Baugh & Stone, 1982; Hoxby, 1996; Duplantis and colleagues, 1995). The failure of early 1970s studies in finding positive union pay premium may be due to the shorter existence of unions in the U.S.; collective bargaining did not emerge until the mid-1960s. Furthermore, most studies found unions had a small (approximately 3 to 10 percent) effect on teacher salaries. Nonetheless, Baugh and Stone (1982) found that teacher unions increased teacher salaries by 12 to 22 percent. In addition, studies of perceptions of teachers, superintendents, and school board members indicate that collective bargaining have positive effects on salaries and fringe benefits (Kersey, 1986; Rogers, 1988; Salter, 1986)

Using stratified national samples from the 1970s (specifically, 1974, 1975, 1977 and 1978) taken from the Current Population Survey[7], Baugh and Stone (1982) examined the relationship between unions and individual teacher wages. They employed two techniques to measure the unionism effect: cross-section *wage-level* regressions (a point estimate) and *wage-change* regressions. In both models, they measured unionism by individual teachers' union membership, and controlled for teachers' years of education,

[7] A stratified random sample of about 56,000 households conducted monthly by the U.S. Bureau of the Census.

years of teaching experience, grade level, and state of residence. The wage-level models revealed that the union premium for teachers in 1974 and 1977 was 7 and 21 percent, respectively. The wage-change model estimated the wage premium for teachers who started as nonunion teachers and were union members one year later; and the estimated union premium from 1977 to 1978 was 12 percent. In other words, by joining unions, teachers' salaries increased by 12 percent. However, the failure to control for the cost of living and alternative job opportunities may confound the findings, at least for the wage premium estimates.

In their study of the impact of teacher unions in states without collective bargaining legislation, Duplantis and colleagues (1995) found that the average teachers' salary in districts with collective bargaining agreements (CBA) was 9.5 % higher than the average salary in districts without collective bargaining agreements. Duplantis and his colleagues surveyed districts with more than 10,000 students in the eleven states without collective bargaining laws in 1992, and got a total sample of 82 districts, including 26 districts with and 56 without collective bargaining agreements. In addition to district's CBA status, the researchers controlled for factors that might serve as alternative explanations for the salary premium effect, such as a district's cost of living indices including per capita income and median value of housing, union political influence, and the availability and quality of alternative employment opportunities. One of the weaknesses of this analysis lies in its failure to control for the spillover effect of unions, namely, unionized districts' non-unionized neighboring districts might pick up the salary schedules from organized districts to compete for teachers. Therefore, the failure to tease out the threatening effect of unions may underestimate the union salary premium.

Hoxby (1996) employed a more sophisticated method in studying the effect of unionization on teacher pay and educational productivity. The study matched district-level data across the nation from the Census of Governments (1972, 1982, 1992), and the decennial Censuses of Population and Housing. Hoxby used a stricter definition of unionization than other researchers. For districts to be included in her study as unionized districts, they had to conform to the following all three criteria: 1) the labor relation was in the form of collective bargaining; 2) a contractual agreement existed between the administration and the teacher unions, and 3) at least 50 percent of teachers were union members. Using techniques called instrumental variables estimation and differences-in-differences, the study took into account the status of a state's collective bargaining laws and made efforts to reduce bias that may be attributed to omitted variables. Comparing the changes in districts' average teacher salary differences between 1972 and 1982 and between 1982 and 1992, the analysis identified a union premium of about 5 percent. Hoxby's (1996) method in gauging the effect of unionism is among the most advanced and come closest to an unbiased estimate of the union wage premium (Johnson & Donaldson, 2006).

In sum, teacher salaries are a well studied area within union impact research. The literature provides evidence that collective bargaining increases teacher salaries between 3 and 9 percent. However, to obtain a more accurate picture of union effects on teachers' compensation, researchers must also take into account fringe benefits. When unions negotiate contracts with school districts, a significant amount of negotiation is spent on fringe benefits. In addition, the fringe benefits for unionized teachers are generally believed to be more generous than those for non-unionized teachers (Podgursky, 2003).

Health care, one substantial component of fringe benefits in particular, in recent years is the biggest issue at the bargaining table (Hess & Kelly, 2006). Nonetheless, researchers have done little in studying the impact of unionism on fringe benefits. Perhaps the biggest obstacle lies in the difficulty of gathering the data to quantify the benefits.

Some studies, however, attempt to investigate the influence of unionism on teachers' working conditions. Below is a synthesis of the results from these studies.

Working Conditions

Unions strive to improve working conditions for their members. Traditionally, they have done so by focusing on reducing class sizes, limiting the length of school days and increasing paid preparation time. However, scant empirical studies on teacher working conditions exist, and particularly even fewer studies focused on the unions' effect on teacher work time.

In his study on unions' impact on teacher time allocation, Eberts (1984) demonstrated that collective bargaining reduced teachers' instructional time, but increased the time teachers spend in class preparation. Eberts' study drew data from a national survey of elementary teachers conducted over a three-year period during the mid-1970s. After controlling for teacher, school and district characteristics, the cross–sectional study found that teachers in CBA districts had 4 percent (about 3 minutes per day) more of paid preparation time, and spent 3 percent (9.4 minutes per day) less time on instruction compared with their non-unionized peers.

Teacher unionism and class size studies, just as the union salary premium studies, have pursued analysis on various levels (such as state, district, school levels), and have found mixed results. Kleiner and Petree (1988) relied on state-level aggregate data to

study the relationship between teacher unionism and student-teacher ratios. Their study found that teacher unionism, measured either by percentage of union membership or percentage covered by collective bargaining contracts, was associated with a higher student-teacher ratio. However, their approach of conducting the study is not without criticism. The pooling of a span of 11 years of data and a limited number of control variables are among the most noticeable. The pooling of years of data ignores the fact that the unionization effect is likely to accumulate over time (Eberts & Stone, 1988). As Goldhaber (2006) stresses, Kleiner and Petree also failed to control for other state level policies that might correlate with non-union status, such as those on limiting class size.

Two studies utilizing less aggregated data, such as district and school level data, found that collective bargaining was associated with reduced class size. The aforementioned Eberts (1984) study also investigated unionization on class size, and found the student-teacher ratio was nearly 12 percent lower in schools with collective bargaining contracts. The Hoxby (1996) study used a more sophisticated statistical design (differences- in- differences specification with instrumental variables) and found that student-teacher ratios in districts with collective bargaining agreements decreased by 9 percent (or 1.7 students).

On the whole, given unions' emphasis on improving teachers' working conditions, it is a surprise to find that so few past empirical studies have attempted to measure the actual effect. Though far from conclusive, existing literature tentatively suggests that unions improve teachers' working conditions through reducing class size, shortening teachers' instructional time, and increasing paid preparation time.

Union Impact on Teacher Quality

Teacher unions and their advocates argue that benefits such as higher pay and better working conditions attract higher quality teachers to the profession and retain them (Casey, 2006). Despite the ideological belief, little empirical evidence exists as to teacher union's impact on teacher attributes commonly assumed to reflect teacher quality, such as teacher experience, teacher certification, teacher preparation programs and degrees, teacher coursework or teacher test scores (Rice, 2003). In this section, I review three studies that have been found, one on teacher retention, one on teacher test scores, and the last one on distribution of credentialed and experienced teachers to offer a snapshot of unions' effect on these aspects. In addition, I present several studies that examine unions' influence on student achievement, another frequently used proxy for teacher quality.

Teacher Retention

Previous research has established that teacher experience is associated with teacher effectiveness, though in a non-linear way (see a synthesis by Rice, 2003). However, very little empirical evidence exists as to unions' impact on teacher experience. After a careful review of the existing literature, one piece of research offers a snapshot of the union provision's impact on teacher retention. Rees (1991) conducted an analysis of the relationship between the strength of a grievance procedure and the rate in which teachers exit from the profession. Using data from New York State, the author found that teachers with the two strongest types of grievance procedures[8] in their contracts had a substantially lower probability of quitting than those working under the most common

[8] The author categorized 8 types of grievance procedures. From strongest to weakest, they are: 1. Binding arbitration for contract and non-contract disputes; 2. Binding arbitration for contract disputes, advisory arbitration for non-contract disputes; 3. Binding arbitration for contract disputes; final step for non-contract disputes is the Superintendent or Board of Education; 4. Binding arbitration for contract dispute. No non-contract grievances; 5. Advisory arbitration for contract disputes. Final step for non-contract disputes is advisory arbitration, the Superintendent, or the Board of Education; 6. Advisory arbitration for contract disputes. No non-contract grievances; 7. No arbitration. Grievances in some contracts limited to contract disputes. Final step is the Superintendent or the Board of Education; and 8. No grievance procedure in contract.

type of grievance procedure. Rees also hypothesized that if teacher turnover negatively affected administrative costs or student learning, the adoption of a stronger grievance procedure could improve school productivity.

This study provides a piece of evidence that the strength of union contracts could have influence over teacher retention, thus on teacher experience. Yet, due to a lack of evidence from other states and on retention rates differentials between unionized and non-unionized districts, it is hard to gauge the overall effect of unionism on teacher experience. Future research utilizing national-level data in particular, could offer a more comprehensive examination on the linkage between teacher unionism and teacher experience. Furthermore, researchers need to study the effect on teacher experience by other provisions of collective bargaining agreements other than the single grievance procedure.

Teacher Test Scores

Using state-level data from 1963 to 2000, Hoxby and Leigh (2004) investigated the decline of teacher aptitude as measured by the mean combined SAT scores of their colleges. Hoxby and Leigh provided two hypotheses in explaining the decline of aptitude. One was the "pull" hypothesis: greater pay parity in non-teaching occupations may have drawn able women out of teaching. Second was the "push" hypothesis: teacher unionization may have compressed pay, benefits, and non-monetary returns for aptitude, and thus pushed out high-aptitude women. The dependent variable in the regression analysis was the percentage of female college graduates in an aptitude group[9] in a state in a cohort who became public-school teachers. Controlling for a state's labor law status,

[9] Six aptitude groups were created: those from colleges with SAT scores in the top five percentiles, the next 10, 15, 20, 25 percentiles, and the bottom 25 percentiles.

female-male earning ratios in non-teaching jobs, male pay in non-teaching occupations, the study found that unions' "push" effect explained 80 percent of the proportion decline of highest aptitude teachers.[10] In other words, the decline of women teacher aptitude was mainly due to the fact that high aptitude women experienced substantial financial and non-monetary losses due to unionization.

This piece of research suggests that teacher unionism is highly associated with the decline of teacher aptitude, as represented by college test scores. However, just as other union studies using state aggregate data, this study may also subject the results, at least partially, to alternative explanations, such as state level policies on teacher recruitment.

Distribution of Credentialed and Experienced Teachers

Drawing data from the State of California, Koski and Horng (2007) studied how the transfer and leave provisions within collective bargaining agreements affect the distribution of quality teachers between districts and between schools within districts. The researchers first surveyed and requested each of districts in CA a copy of their current collective bargaining agreements and they got a response rate of 71 percent.[11] Then they further narrowed the sample of districts to have four or more schools to allow for sufficient within-district transfer opportunities. The final sample size was 488 (86 %) out of 565 districts with the desired 4-plus-schools feature. Koski and Horng coded the transfer and leave provisions in the CBAs and assigned each district a single transfer/leave score which reflects strength of those provisions.[12] The two measures of teacher quality used in the between district study were (1) the percent of teachers in the

[10] Highest aptitude teachers refer to those from colleges with SAT scores in the top 5 percentile. The highest aptitude female teachers declined from five percent in 1963 to one percent in 2000 of the total female teachers.
[11] Most of the CBAs were collected during the 2005-2006 school year.
[12] The scores were based on answers to six questions designed by the researchers to measure the strength of the provision.

district who were fully credentialed, and (2) the percent of teachers in the *district* with more than two years of teaching experience. Applying regression technique in analyzing the effect of transfer/leave score on between-district teacher quality distribution, the study controlled for district size, class size, student academic performance, proportion of minority students, types of school districts (elementary, high school, or unified school districts), urbanicity, teacher service days, teacher salary and per pupil expenditure. The researchers found that districts with more determinative transfer and leave provisions had greater percentage of credentialed teachers. However, the transfer and leave provisions were not a significant predictor of the distribution of experienced teachers among districts.

In studying the effect of transfer and leave provisions on within-district distribution of teacher quality, Koski and Horng (2007) applied Hierarchical Linear Modeling (HLM) technique. The outcome variables were two school-level teacher quality proxies: (1) the percent of teachers in the *school* who were fully credentialed, and (2) the percent of teachers in the *school* with more than two years of teaching experience. The HLM model included two district-level variables—transfer/leave score, and district size and four school-level control variables—average class size, percentage of minority students, school enrollment growth, and student enrollment. The HLM results indicated that the strength of transfer and leave provisions was not significantly associated with within-district, between-school teacher quality inequality.

This newly conducted study offers a piece of evidence that a stronger collective bargaining agreement, as measured by its teacher hiring and transfer rule, is associated with between-district teacher quality difference in CA districts. Within districts, the strength of seniority provisions does not affect the distribution of teachers among schools,

such as those with differing minority student concentrations. However, the findings from one state are not necessarily generalizable to the whole nation. Research drawing data from other states or from nation-wide data could provide further evidence on this relationship between unions and distribution of credentialed or experienced teachers.

Student Achievement

Empirical evidence for drawing conclusions about teacher unions' impact on student achievement is quite thin. Goldhaber (2006) performed a rather comprehensive review of quantitative studies on student achievement, and concluded that the small body of work existing varied in quality and yielded mixed findings. Among possible explanations for the divergent findings are: the time horizon the researchers focused on ("snapshot looks" at union impacts versus longitudinal effects); the characterization of unionization (e.g. collective bargaining districts versus non-collective bargaining districts or the percent of union membership); and the varied research methodologies and samples used by researchers (Goldhaber, 2006). In addition, the unit of analysis (state, district or individual student) as well as measures of achievement (college entrance exam scores, drop out rate or other achievement test scores) are additional contributing factors to the mixed findings.

State-level cross-sectional analyses of unionization effects on student achievement tend to yield positive findings (such as Nelson & Rosen, 1996; Steelman, Powell, & Carini, 2000). Steelman and colleagues (2000) examined the relationship between statewide unionization measures and state averages of SAT and ACT scores. The authors used data from the 1993-1994 Schools and Staffing Survey, with SAT and ACT scores from their respective testing agencies. In their regression models, Steelmen

and colleagues used the percentage of teachers in a state represented by either collective bargaining or meet-and-confer agreements. Taking efforts to mitigate extraneous variables' confounding effect on achievement, the study controlled for student demographic factors, median familial income, geographic region and students' participation rate of taking the SAT and ACT. The study found that greater collective bargaining and meet-and- confer coverage was associated with increased student SAT and ACT scores. The researchers suggested that the positive link between unionization and student achievement was a function of attracting better teachers through securing better pay and working conditions, the promotion of teacher professionalism, and improved administration.

Though studies using SAT test score levels (point estimate) as an indicator of educational quality found positive results, a study using state average SAT score changes over time, found contrary results. Kurth (1987) examined the decline in state SAT scores between 1972 and 1983 by focusing on three possible explanations: the changing social environment (measured by percentage of working women, urbanization, and divorce rate), the change of financial resources devoted to education (measured by local funding levels, per-pupil spending, teacher pay, and school consolidation), and the emergence of teacher unions (measured by percentage of state teachers represented by either collective bargaining or meet-and-confer agreements). The findings showed that unionization had a negative effect on SAT scores. Kurth thus concluded that teacher unionism was "the most significant factor in the decline of scores" (p. 351).This study is unique in its recognition of teacher unions' lagged effect on student achievement: it used the state's unionism

status in 1972, rather than 1983[13], to reflect the union effect on the change in SAT scores from 1972 to 1983. However, the collapsing of collective bargaining and meet-and-confer agreements into one category limits the researcher's ability in identifying each and every agreement's unique effect.

Complicating matters more, a few micro-level studies focusing on district level or individual student academic performance also provided mixed results. Eberts and Stone (1987) analyzed data from a nationwide sample[14] of 14,000 fourth graders in the late 1970s. Using a union/nonunion productivity differential[15] technique, the researchers found that over a period of one school year and holding other input constant, students in union districts obtained about 3 percent higher achievement gains than those in nonunion schools. In addition, students with average pretest scores benefited the most from unionization among all students, about 7 percent in achievement gains. The researchers attributed the favorable impact to the standard classroom instructional techniques in union districts, which worked best for average students. Nonetheless, students whose achievement was well below or above average performed better (about 7 percent) in non-union districts, which the researchers suggested could be due to greater use of specialized programs and instructional techniques than in union districts.

The above discussed Hoxby (1996) study, which combined district-level data from two national datasets at three points (1972, 1982, and 1992) within a thirty year period, used district's dropout rate as a proxy for student achievement. With a more sophisticated statistical model trying to account for confounding factors, the author found

[13] Kurth's reasoning was that SAT scores were the culmination of eleven or twelve years of education. Not until 1983 would students educated entirely by teachers unionized in 1972 begin taking the SAT test.

[14] The dataset is Sustaining Effects Study under a grant from the Office of Education (now the Department of Education). The data base contains information on educational programs for a stratified sample of about 14,000 fourth graders in 328 elementary schools nationwide.

[15] Calculated by estimating two educational production functions, one for union schools and one for nonunion schools.

that unionized districts had 2.3 percent higher student dropout rates than non-unionized districts. Again, Hoxby's study was lauded as a most close to unbiased estimate due to its effort in trying to account for "endogeneity" of union effect. By endogeneity, it means the level of unionization effect in a school district may be related to some key determinants of student achievement that are not accounted for in the research design (Johnson & Donaldson, 2006; Goldhaber, 2006).

In summary, existing research efforts have failed to reach any agreement on the student achievement effect of teacher unionism. On every level of analysis, whether state, district or individual student level, conflicting results emerge. With careful review of the statistical models employed, I concur with Goldhaber's (2006) endogeneity concern with some of the research designs. The unaccounted factors that relate to both student achievement and unionization could pose a serious challenge to the overall findings of the unionization effect.

Conclusion

A synthesis of existing research on union activities across school districts in the previous subsection reveals that teacher unions exert significant influence on teachers, students, schools and school districts. However, despite the importance of teacher unions' effect on public education, educational scholars have demonstrated little interest in examining the influence of unions on the nation's schools. Almost all research investigating the effects of unions is conducted by economists.

Within the few existing studies, teacher pay is a predominant theme. Research in the past thirty years shows that unionized teachers enjoy higher salaries than their peers in non-unionized districts, with the same studies demonstrating the pay difference does

not exceed 10 percent. The few available studies on teacher working conditions tentatively suggest that unionized teachers teach smaller classes, have shorter instructional time, and have more paid preparation time. Studies also demonstrate that unionized schools tend to spend more than non-unionized schools on a per pupil basis.

Despite teacher unions' direct association with teachers, researchers have demonstrated little attention to unions' effects on teacher attributes that educators generally assumed to have influence on teacher quality, such as teacher experience, teacher training programs, teacher certification (Rice, 2003). Two studies show that stronger collective bargaining contracts tend to retain teachers (Rees, 1991), and attract more fully certified teachers into these districts, but do not alleviate or exacerbate the teacher quality gap within districts (Koski & Horng, 2007). One study suggests that teacher unionism is highly associated with the 1963 to 2000 decline of teacher aptitude, as represented by college test scores (Hoxby, 2004). Evidence is mixed on the relationship between teacher unions and student achievement, a direct measure of teacher effectiveness. Some research finds that stronger union presence is associated with increased student test scores (Nelson & Rosen, 1996; Steelmen, Powell & Carini, 2000; Eberts & Stone, 1987). In contrast, other studies find unionization is negatively related to student achievement measured either by test scores or drop out rates (Kurth, 1987; Hoxby, 1996)

Readers should keep several caveats in mind when reviewing the above synthesized union impact studies. The most noticeable one, of course, lies in the scarcity of studies, which makes it hard to draw final conclusions on union impact. Another equally important caveat is the timing; a significant portion of the literature used data

from the 1970s and early 1980s except the study by Koski and Horng (2007). The context of these studies was very different from the one that exists today (Goldhaber, 2006). The past twenty years have seen an unprecedented focus on school improvement and school reform is now a prominent national policy (Hannaway & Rotherham, 2006). Among them, the accountability movement and the drive for greater school choice, such as charter schools and vouches, are most noticeable reform efforts. Meanwhile, with these context changes, teacher unions have initiated some reforms (as evidenced by Kerchner & Koppich, 1993; Koppich, 2006; Murray, 2004). These changes in educational context as well as within teacher unions may well change the way unions impact teachers, students, and the overall performance of schools. To illuminate the heated debate on teacher unions, more up-to-date independent studies are needed to guide public policy. In the absence of research, policy making will be swayed by purely ideological beliefs rather than hard empirical evidence.

Teacher Quality Definitions

Teachers make a significant difference in the lives of children. Parents, educators, researchers, and policy makers all agree the centrality of teachers in student learning. In addition, the mandate of "highly-qualified" teachers by The *No Child Left Behind Act* further substantiates that teacher quality matters in student learning (Cochran-Smith & Fries, 2005). Given the consensus on the importance of teacher quality, little consensus exists as to how to define it, how to measure it or how to improve it. Various approaches to defining teacher quality underline the ideological assumptions people hold toward teaching, teachers, and the products of teaching. In this section, I intend to review the

dominant methods of defining teacher quality and come up with definitions that I will use in carrying out my research.

For decades, educators and policy makers have debated approaches to improving teacher quality (Ramirez, 2004). Two major schools of thought on how to improve teacher quality, *Professionalization* versus *Deregulation,* focus on the merit of certification in teacher qualification. Professionalization advocates and deregulators disagree on the effects of state regulation of the teaching profession, and believe that the debate centers on the effects of certification on teacher quality (Darling-Hammond & Ball, 1998; Walsh, 2001a). Advocates of teacher professionalism believe the key to improve teacher quality is to raise standards for prospective teachers and upgrade teacher education programs (such as The Carnegie Task Force on Teaching, the Holmes Group, 1986; and the National Commission on Teaching and America's Future, 1996). Professionalism believes teacher quality is not only defined by the knowledge teachers possess in terms of subject matter but also by knowledge and skills of teaching gained through teacher preparation programs. Generally speaking, teacher professionalism embraces a broad view of teacher quality that is not limited to measured student performance.

In contrast to teacher professionalism, the "deregulation" (Zumwalt & Craig, 2005) or "neoconservatives," as labeled by Lasley and colleagues (2006), advocates for the reduction or deregulation of teacher certification requirements. Proponents of deregulations such as National Council on Teacher Quality (for example see, Walsh, 2006) and Progressive Policy Institute (for example see, Hess, 2001) call for reducing education coursework requirement, lowering barriers to expand the pool of teacher

candidates and expanding alternative forms of teacher training and licensure. Deregulators have a narrower view of teacher quality which is primarily based on measured student achievement. They place greater emphasis on teachers' content knowledge and high levels of verbal ability, which they claim have a stronger relationship with student achievement (Walsh, 2001b). The deregulators claim that the knowledge base that colleges of education seek to impart is "uneven, incomplete, highly disputed and vulnerable to ideological and interest-group manipulation" (Finn, 2001, p. 140).

The views of good teaching are value laden. What teachers are expected to know and be able to do, even what results they are expected to produce, are subject to people's normative perceptions. As Wilson and Youngs (2005) point out, that depending on perspectives, teachers may be viewed as civil servants or professionals; teaching may be viewed as moral or technical work; or as a science or an art. Based on differing ideologies, teachers' work products may be viewed mainly as increased student academic achievement, or cultivation of socially responsible and productive citizens rather than simple content learning (Kanstoroom & Finn, 1999; Rotherham & Mead, 2004; Goals 2000, 1994; Becker, Kennedy & Hundersmarck, 2003). These assumptions about teaching and teachers' roles fundamentally affect how people define teacher quality, and the ways to attain it or assess it. Levine (2006) observes that the clash of beliefs about teaching is "reshaping the world of teacher education, driving it headlong in opposing and incompatible directions" (p.14).

Given the differing views of teaching and ambiguous goals of teachers' work, it is not hard to understand why it is challenging to define teacher quality. Definitions range

from those that focus on who should teach and how teachers should be trained to the kinds of knowledge and training teachers should possess (Darling-Hammond & Ball, 1998; Hess, 2002; Haberman, 1996). However, in practice researchers typically adopt three ways to measure teacher quality: value-added models (Sanders & Rivers, 1996); standards-based teacher evaluation models (Milanowski & Kimball, 2005; Holtzapple, 2003); and teacher qualifications (Rice, 2003; Wilson & Youngs, 2005). These approaches quantify teacher quality through three differing benchmarks: student outcomes, teaching practices, and teacher preparation, respectively. The "value-added" models advocate estimating teacher effectiveness by examining the students' achievement gains brought by each teacher over three or four years (Sanders & Horn, 1998; Sanders & Rivers, 1996). Standards-based teacher evaluation models focus on evaluating teachers' instruction on the basis of teaching standards (Danielson, 1996; Danielson & McGreal, 2000). The third approach is to use teacher qualifications, namely elements of teacher preparation that qualify prospective teachers for their teaching positions, as a measure of teacher quality. In the educational policy arena, concerned about preparing and recruiting the best candidates to classrooms, educators and policy makers most commonly use the third approach to measure teacher quality.

Among the stakeholders of teacher quality issues, teacher unions are not a silent one, particularly after the mid-1980s (Kahlenberg, 2006). Teacher unions claim that "teacher quality is an essential union responsibility" (AFT, 2003, p.5), and strengthening teacher quality is a central mission of unions (NEA, 2007a). In this section, I present measures of teacher quality through teacher qualifications, teacher unions' stand on teacher quality, and the teacher quality measures I use in this study.

Approaches of Defining Teacher Quality

Federal Government's Approach

The federal law of No Child Left Behind (NCLB), the most discussed federal education effort in the past half century, specifically stipulates a "highly qualified teacher" provision. Under the terms of NCLB, a highly qualified teacher is defined as one who *holds at least a bachelor's degree from a four-year institution, holds full state certification* (including certification obtained through alternative routes to certification), and *demonstrates competence in their subject area***.** The law's second requirement suggests that neither professional knowledge and skills nor completion of a teacher preparation program are necessary to be a highly qualified teacher (Ramirez, 2004; Porter-Magee, 2004). Though most states' traditional certification requirements include a pedagogy requirement and the completion of a teacher preparation program, the alternative certifications do not (Feistritzer & Chester, 2003). Thus the law opens some opportunities for alternative preparation programs. This content knowledge provision infers the federal government's emphasis on math and science education, which is critical to the U.S. competitiveness in the emerging information economy (Porter-Magee, 2004). The inference comes from the fact that the content knowledge provision is based on the body of research which suggests content knowledge has greater impact on student achievement, primarily in areas of math and science (Monk, 1994; Monk & King, 1994; Greenwald, Hedges & Laine, 1996; Rowan, Chiang & Miller, 1997; Goldhaber & Brewer, 1998; Brewer & Goldhaber, 2000). The federal government also recognizes student achievement as the indicator of teacher quality. Just as stated in the U.S. Department of Education's (2003) annual teacher quality report "By recognizing the link between

quality teaching and student achievement, NCLB has refocused the national dialogue on how teachers should be trained and certified as well as who should teach."

Education Researchers' Approaches

In addition to the federal government's definition of teacher quality, researchers, such as Jennifer K. Rice (2003), and a panel organized by American Education Research Association (AERA) have reviewed studies on teacher quality, and defined teacher quality based on empirical evidence (Cochran-Smith & Zeichner, 2005).

From an educational economics' perspective, Rice (2003) bases her definition of teacher quality on the practice of typical school hiring and compensation system, which assumes that years of teaching experience, teacher certification, etc. are indicators of high-quality teachers. Therefore, in her review of empirical evidence associated with teacher quality, Rice adopts five broad categories of teacher quality indicators: *teacher experience*, *teacher education programs and degrees*, *teacher certification status*, *specific coursework teachers taken in preparation for the profession*, and *teachers' own test scores*. One thing standing out in Rice's review of teacher attributes studies is the researcher's inclusive definition of teacher performance. In other words, the researcher reviewed the effects of the teacher quality indicators on student achievement gains (on standardized tests) as well as the effects on other teacher performance measures, such as principal's evaluation of teachers and teachers' perception of their own performance. The researcher argues that the broad approach of including other teacher performance indicators may capture teacher quality aspects student standardized scores do not necessarily measure.

Rice (2003)'s review of empirical studies reveals that, when using more *refined measures*, many elements of teacher characteristics contribute to teacher quality, such as preparation in both pedagogical and subject content, education programs and degrees, experience, and test scores. Going beyond the broadly defined variables (for example, highest degrees, and undifferentiated course credits), more refined measures of teacher attributes (for example, *subject-specific degrees*, and *subject-specific pedagogical coursework*) are better predictors of teacher performance. Rice's analysis also demonstrates that various teacher quality indicators interact to make high-quality teachers, and teaching context matters (for example teaching levels, subject areas, and types of students and classrooms) in the effectiveness of these quality measures.

The American Educational Research Association (AERA) commissioned a panel to analyze the relevant research findings on teacher education and published a handbook titled *Studying Teacher Education* (Cochran-Smith & Zeichner, 2005). This panel's charge was to "try to make sense of what the research did and did not say about teacher education and to craft a new research agenda…" (p.ix). Gleaning and providing "critical and evenhanded analysis of the weight of empirical evidence relevant to key practices and policies," the AERA panel book presents teacher characteristics research on the indicators of teacher quality (Zumwalt & Craig, 2005). The panelists, Zumwalt and Craig (2005) use such teacher quality proxies as *college entrance tests scores* (SAT and ACT*), college GPA*, *college major, status of college attended*, *teacher tests, teacher certification status, program certification status, and teaching experience*. Utilizing these quality indicators, the panelists paint a national picture of who teachers are, how they are prepared, where they teach, and how long they stay in the profession. On the impact of

academic ability and achievement such as SAT and ACT scores and GPA, Zumwalt and Craig (2005) conclude that inconclusive evidence exists as to their effect on student achievement; though, generally teachers' verbal ability scores are positively related to student test scores. The panel also points out that no evidence exists as to the "relative importance of teacher verbal ability compared to other aspects of teacher quality" (p.181).

The AERA panelists, Wilson and Youngs (2005) examined three other teacher quality indicators, *teacher testing, traditional teacher certification, and accreditation of teacher education programs,* which the panel termed the three as accountability processes. On teacher testing, the panelists conclude that the National Teacher Examination (NTE) did not predict teacher effectiveness; no research exists as to Praxis tests' relationship with test-takers' later effectiveness as teachers (as measured by student achievement, pupil ratings, classroom observations, employment history, or principal ratings). Wilson and Youngs' (2005) another finding about the teacher testing is that "we know very little about the content and concurrent validity of many of the more than 600 tests currently in use" (p.610), given the increasing high stakes associated with passing or failing the tests. With regard to the effect of certification, Wilson and Youngs (2005) find that the available literature favors certified teachers, particularly in the area of mathematics, with "seven of the eight studies reviewed found positive correlations between certification and student achievement' (p. 614). However, the panelists also acknowledge that existing studies on teacher certification utilized rather rough measures of certification status and few investigated the fields other than mathematics teaching. On the impact of program accreditation, Wilson and Youngs (2005) conclude little empirical research exists as to its effect on teacher effectiveness.

The AERA panel's conclusion about research on teacher education is that better research will help inform discussion of accountability of teacher education, but research itself will not suffice (Wilson & Youngs, 2005). Wilson and Youngs believe three important normative issues underlie the current accountability process: what certified teachers are expected to know and be able to do; who ought to make the decisions; what is the purpose of certification and accreditation. The collective normative assumptions will shape the issues of accountability processes rather than the empirical research.

In summary, from the empirical point of view, though far from conclusive, teacher quality is positively related to teachers' content knowledge, verbal ability scores, and selectivity status of colleges that teachers attended. A positive association between teacher experience and teacher quality is most evident in the first several years of teaching. The relationship between certification status and teacher quality is even less conclusive, but existing limited evidence tends to favor certified teachers. Other teacher quality indicators, such as program certification status, Praxis test scores, and field experience, are rarely studied, thus it is not clear about the relationship between these indicators and teacher quality.

Teacher Unions' Stand on Teacher Quality

Teacher unions, particularly at the national level, support improving teacher quality

through the professionalization of teaching (Ballou & Podgursky, 2000; Kahlenberg, 2006). The NEA and AFT, with the professional unionism movement since the late 1980s (Kerchner & Koppich, 1993), advocate and lobby for enhancing the conventional teacher preparation program, particularly through NCATE certification, raising the standards for

entering and exiting the teaching preparation program, enforcing teacher licensing, and establishing national standards for teacher licensure, such as the National Board for Professional Teaching Standards (NBPTS) (Ballou & Podgursky, 2000; AFT, 2003; NEA, 2007a). The professional unionism, or "reform unionism" as labeled by Koppich (2006), or "new unionism" called by then-NEA president Bob Chase (Kahlenberg, 2006), also promotes incorporating other elements of the teacher professionalism agenda into teachers' contracts, such as mentoring of new teachers, financial support for professional development, new evaluative practices, such as peer review and peer assistance, alternative compensation programs (Kerchner & Koppich, 2004; Murray, 2004). Both unions argue that through expanding the scope of collective bargaining to include professional issues, collective bargaining can and should be a tool for improving teacher quality (Rotherham & Mead, 2004; Teacher Union Reform Network, 2007).

Unions believe "teacher quality is an essential union responsibility" (AFT, 2003, p.3). In its teacher quality publication, "*Where we stand: Teacher quality*" (AFT, 2003), AFT explicitly declared its position on the issue of teacher quality. The AFT embraces a number of factors which are supposed to determine the quality of teachers, including: the preparation teacher candidates receive and the entry-level standards to teaching; working environment (including induction programs, and compensation); professional development; and peer assistance and peer review. Specifically for a teacher education program, the AFT calls for raising existing entrance standards by requiring: a 2.75 grade-point average (GPA) as an initial entry requirement, a national voluntary test in the core subject areas, higher standards of subject-matter knowledge, academic performance and student teaching experiences, and academic major as well as pedagogical studies. In

addition, the AFT calls for teacher preparation to be organized, at a minimum, as a five-year process.

Though the NEA's stand on the issue of teacher quality is not as articulate as that of the AFT, the NEA embraces similar propositions as the AFT. The NEA supports rigorous state-level standards, state licensing systems, mentoring programs for beginning teachers, high quality professional development, and National Board certification of master teachers (NEA, 2007a). In addition, the NEA supports peer review or peer assistance in teacher evaluation, and pay for performance. One thing the NEA particularly emphasizes is professional development and induction. The NEA Foundation (formerly the National Foundation for the Improvement of Education) develops and disseminates reports on the continuing development and mentoring programs for practicing classroom teachers (NEA Foundation, 2009). Its recommendations for the improvement of professional development were endorsed by NCTAF, and were included in NCTAF's professionalism manifesto: *What Matters Most: Teaching for America's Future* (1996).

Teachers unions have been strong advocates of the professionalization of teaching (Ballou & Podgursky, 2000). Professionalization of teaching involves regulating teacher preparation programs as well as licensing teachers. The unions support both the accreditation of teacher preparation programs and teacher licensure, particularly National Board certification (Ballou & Podgursky, 2000). The National Council of Teacher Education (NCATE) is the dominant agency in the accreditation of teacher education programs in the United States. The NEA was one of five founding organizations that established NCATE in 1954. Besides unions' founding position with NCATE,

Rotherham and Mead (2004) credit teacher unions as one of the two major supporters[16] for NCATE's substantial growth and formal recognition in state policy. Today, 540 of the nation's 1,300 teacher training institutions are accredited by NCATE, and these institutions prepare 70 percent of the total teacher workforce (Rotherham & Mead, 2004). Teacher unions adopt a variety of ways to promote a central role for NCATE. For example, the NEA adopted resolutions to urge prospective teachers to attend institutions accredited by the NCATE (Ballou & Podgursky, 2000). Further, the unions call on local affiliates to promote the employment opportunities of gradates from NCATE-accredited programs, requesting the union locals to "develop collective bargaining language requiring local school boards to hire only those professionals who have graduated from NCATE-approved institutions" (Ballou & Podgursky, 2000. p.73).

The unions' support for teacher professionalism can be tracked by their heavy involvement in the establishment of NBPTS as well as their support to National Board certified teachers (NBPTS, 2006a). The AFT's late president, Albert Shanker, first gave the creation of NBPTS a national prominence by calling for a national certification board of teachers (Lieberman, 1993). The NEA and AFT were the founding members of NBPTS, and comprise one third of its membership on the board (Ballou & Podgursky, 2000). The unions' publications regularly feature articles on National Board certified teachers, and on how to prepare portfolios and other materials required by the Board (NEA, 2007b; AFT, 2007a). The unions also lobby and bargain for financial assistance to the Board applicants and higher salaries for Board-certified teachers (Ballou & Podgursky, 2000).

[16] The other major support for NCATE is American Association of Colleges for Teacher Education (AACTE).

Aside from the strong support for NCATE and NBPTS accreditation, the unions are also involved in other notable professionalism agenda, such as the establishment of standards on professionalism, and the founding of many of the organizations that promote teacher professionalism. For example, both the NEA and AFT supported the foundation of the National Commission on Teaching and America's Future in 1994. The president or past president of the NEA and AFT hold two of the 29 commissioner positions in the NCTAF (NCTAF, 2007). The NEA and AFT are two of the eight organizations that form the current Holmes Partnership to advance the agenda of professionalizing teaching (Holmes Partnership, 2007). Both the NEA and AFT are also two of the eight organization members of Interstate New Teacher Assessment and Support Consortium (INTASC), whose primary mission is to develop standards and instruments for teacher education program accreditation and individual teacher licensing (INTASC, 2007).

Generally speaking[17], the unions at the national level support the bold professionalism reform measures of improving teacher quality, such as peer review or peer assistance, pay for performance and incentives for teaching in hard-to-staff schools. Yet, the national level support does not mean local union affiliates are equally in agreement with their national organizations. Great variations exist across local unions in their negotiation with the school management. In fact, though the exact number of local unions who have adopted the more progressive professionalism efforts is not available, the number is surely small, and professional unionism is still at the stage of finding its direction (Koppich, 2006).

[17] Even at the national level, with the change of leadership, the support for professional unionism varies (Koppich, 2006; Kahlenberg, 2006).

Unions' support for the professionalization of teaching infers that unions' definition of teacher quality centers on graduation from NCATE-certified programs, possession of an academic major, passage of licensure tests, knowledge of the discipline as well as the subject areas, and possession of National Board certification.

Analysts like Rotherham and Mead (2004) and Ballou and Podgursky (2000) believe union's embrace of teacher professionalism allow the unions to adopt the rhetoric of "higher standards" to advance their organizational goals. Regulating the teaching profession, such as the accreditation of teacher education programs and teacher licensing, would lead to restricting the supply of teacher candidates, which would put pressure on salaries (Ballou & Podgursky, 2000). In addition, Rotherham and Mead (2004) argue that by gaining control over entry into the profession, unions hope to strengthen their influence over education policy and practice.

Union researchers, such as Kerchner, Koppich, and Weeres (1997) believe unions' embrace of professionalism is indeed the quest for quality, and it is the responsibility of unions to define and defend quality in the knowledge era. Kerchner and colleagues reasoned that in the knowledge-era just like other organizations, schools attach quality to outcomes rather than procedures. The quality outcome requires that "teachers deeply understand and be able to articulate what quality is" (p.44). The researchers believe that teacher unions can improve educational quality through the work of teachers. Teachers can do so through redefining teaching, setting national curriculum and performance standards, and establishing peer review. These perceived ways of improving educational quality are exactly in line with the teacher professionalism belief.

In conclusion, teacher unions embrace the ideology of teaching professionalism, and consider professionalism as the key to preserving public education in the U.S. and improving the status of teachers (Shanker, 1985). Thus, unions' definition of teacher quality is in line with professionalism's stand on teacher quality. However, despite the national level support and advocacy for professionalism and the practice of several dozens of notable reform-minded local unions, professional unionism is not spreading as broadly and quickly as traditional collective bargaining did (Koppich, 2006). Therefore, disconnect may exist between professional unionism's rhetoric and the practice, particularly on the more innovative measures of improving teacher quality, such as performance pay, peer review, etc. Research on the actual union practice of issues related to teacher quality may allow for well-informed judgments.

Teacher Quality Measures

In light of the dominant ways of defining teacher quality and the empirical need for studying the union effect on teacher quality, I adopt two proxies of teacher quality in this study: One is the empirically based, and the other NCLB required. Recognizing that any single measure of "teacher quality" may not capture the characteristics of teachers that produce desirable student outcomes, both proxies are composites of several single measures of teacher characteristics.

The measure from the empirical perspective is composed of four components: *selectivity of teacher preparation institutions, subject-specific degree, subject-specific certification, and teacher experience.* Studies (such as Summers & Wolfe, 1975; Ehrenberg & Brewer, 1994) indicate that selectivity of the institutions teachers attended has a positive effect on student achievement. Rice argues that the measure of institutional

selectivity may serve as a reflection of teachers' cognitive ability (Rice, 2003, p. 28). Both subject-specific degree and certification have been suggested as robust measures of teacher quality, at least in the secondary math or science subject areas (Rice, 2003; Floden & Meniketti, 2005). Teacher experience has a positive relationship with student achievement, with the experience advantage most evident in the first five to nine years (Murnane & Phillips, 1981; Ferguson, 1991; Ferguson & Ladd, 1996). To capture this experience factor, I adopt a threshold of five years of experience.

The NCLB stipulates teacher quality by defining a "highly qualified teacher" as one who *holds at least a bachelor's degree from a four-year institution, holds full state certification,* and *demonstrates competence in their subject area***.** The construction of the two proxies will be illustrated further and in more details later in the Methodology section

The following theory of action section maps out the underlying assumptions of how teacher unions are related to teacher quality.

Unions' Effect on Teacher Quality: Theory of Action

The national teacher unions, the NEA and AFT claim they deeply care about teacher quality and engage in activities that are related to improving teacher quality. Yet, teacher unionization in the U.S. is highly decentralized. Union contracts negotiated at the local level have the ultimate impact on teachers, and have the potential to affect teacher quality. Below I theoretically map out the relationship between the items unions typically negotiated and teacher quality. I develop this theory of action section following Weiss's (1998, chapter 3) illustration on how to build a program's theory of change.

Teacher unions are to represent and protect job-related interests of their members. Through negotiations with district management, teacher unions obtain wage and non-wage outcomes. Each item under the two broad categories has a theoretically positive or negative effect on teacher quality. The wage outcomes include the single salary scale[18] and increased teacher pay. The single salary scale, under which teachers are paid only based on their years of experience and education, not on their performance, dissuades abler candidates from entering the teaching profession; hence it has a negative effect on teacher quality. Increased teacher pay and better working conditions, one of non-wage outcomes, make teaching more attractive to a larger pool of candidates, thus positively impact teacher quality. Typically negotiated working-condition items include safer facilities and increased instructional resources, reduced class size, and work time (including length of school year and day, paid preparation time, time on non-teaching duties).

Besides working conditions, the non-wage outcomes include teacher assignment, grievance procedure, and provisions related to instructional policies, such as professional development, and induction and mentoring. Regarding teacher assignment, union contracts typically stipulate seniority rules in transfer and leave, and grant teachers the right to refuse teaching assignment outside their field. Granting teachers the right to refuse to teach outside their field has a positive effect on teacher quality. The seniority rules grant preference to teachers with seniority in filling vacancies within the district or in keeping them in current positions when schools are forced to lay off teachers. As teachers exercise their seniority preference rules, experienced teachers move to high-

[18] Though single salary scale first appeared in the educational system before teacher unions, teacher unions support single salary scale and object to differentially compensating teachers.

performing, more affluent schools, leaving more needy schools with less experienced or less qualified teachers (Allgood & Rice, 2002). Another impact of seniority rules is that hiring new teachers may not begin until within-district transfer is over, thus significantly hinders districts' ability to hire new high-quality teachers as some studies found (Levin, Mulhern & Schunch, 2005; Levin, Quinn, 2003). Thus, the seniority rules negatively affect districts' teacher quality particularly in high-minority high-poverty schools. However, just as the name suggests, the seniority rules have theoretically positive effect on retention of experienced teachers.

Grievance procedure in teacher evaluation and dismissal has dual and contrasting effects on teacher quality. On one hand, grievance procedure makes it hard to fire incompetent teachers, thus negatively affect teacher quality. On the other hand, it could positively affect teacher quality because it protects teachers from mismanagement of administrators, and it is good for teacher morale and retention.

Similar with the dual effects of grievance procedure, professional development (PD) provisions also have two-sided effects. Some PD provisions may be very rigid by focusing on limiting how many/often PD sessions occur or how long they last (Johnson & Donaldson, 2005). To the extent that well-designed and content-oriented PD is associated with teacher quality (Garet, Porter, Desimone, Birman & Yoon, 2001), these rigid PD stipulations may prevent teachers from attending high-quality PD activities, thus may have a negative effect on teacher quality. Some other PD provisions may focus more on outcome and instruction, and link PD with training and induction, assessment of schools and teacher, etc. In this way, PD provisions may have the potential to positively impact district teacher quality. Provisions on induction and mentoring of new teachers covered

in union contracts decrease new teacher turnover, thus theoretically have a positive effect on teacher quality.

In summary, teacher unions through the negotiated contract provisions have the potential to positively or negatively impact teacher quality in districts. The inability to quantify each effect makes it inappropriate and inaccurate to gauge unions' effect by simply subtracting the number of "positive impact" from the number of "negative impact". We will not be able to gauge the net effect of teacher unions on teacher quality without examining empirical data. This dissertation study intends to provide a piece of empirical evidence in this regard.

Summary of literature Review

Through the review of literature, this chapter presents a picture of teacher unions' evolution in response to external economic cycles, political developments, social changes, and legal statutes. Unions' history also demonstrates that teacher unions' development and standing are subject to internal factors, such as competition between the two leading national unions (the NEA and AFT), leadership visions, and the demographic changes of teachers. The synthesis of existing research on union activities across school districts reveals that teacher unions exert significant influence on teachers, students, schools and school districts.

Review of the empirical studies reveals that despite the fact that teacher unions play an important role in public education, research on unions' effects are scarce. Among the limited numbers of studies on teacher unions, most focused on unions' effect on teacher pay. A few studies investigated teacher unions' effect on student achievement, but produced mixed findings. Even fewer studies examined unions' effect on teacher

quality. Because of the scant number of studies, a recent review has to focus on intermediate factors, such as teacher pay, working conditions, teaching assignments, evaluation and dismissal, to gauge the effects of collective bargaining on teacher quality (see Johnson & Donaldson, 2006). Besides the finding that very limited number of studies examined unions' effects, another finding pertains to the timing of the studies: a significant portion of the literature used data from the 1970s and early 1980s except the study by Koski and Horng (2007). The current education context, such as accountability, and the implementation of NCLB, is much different from the one in the 70s or 80s. These changes in educational context as well as within teacher unions may well change the way unions impact teachers, students, and the overall performance of schools.

The review of literature related to teach quality provides rationale for the teacher quality measures adopted in this study. The theory of action section in this chapter maps out the underlying assumptions of how teacher unions are related to teacher quality.

CHAPTER THREE: METHODOLOGY

This dissertation study is conducted within a framework that hypothesizes that school, district, and state level factors affect schools' ability to employ and retain quality teachers. Chapter one provided a conceptual framework (Figure 1) of the hypothesized relationships between a district's unionization status, district teacher quality, and intra-district distribution of teacher quality. In this chapter I describe the data sources as well as the empirical strategy adopted to examine the hypothesized relationships.

This chapter begins with a description of the data sources and the data collection procedures of the major data source—Schools and Staffing Survey (SASS), 2003-2004. It then continues with the empirical framework and description of variables. This chapter concludes with an illustration of the statistical procedures for conducting this study.

Description of Data Sources

I utilized seven data sources to conduct this dissertation study, with SASS 2003-2004 the principal one. These seven sources include: a) Schools and Staffing Survey (SASS), 2003-2004 (USDE, 2007a); b) Common Core of Data (CCD) (USDE, 2009b); c) Comparable Wage Index Data File (CWI) (USDE, 2006); d) Collective Bargaining Rights for Education Employees in the United States provided by the National Education Association (2005); e) Barron's Profiles of American Colleges (Barron's Educational Series, 2006); f) The Integrated Postsecondary Education Data System (IPEDS) lists of colleges in the U.S. (USDE, 2007b); and g) Census 2000 School District Demographics Project (USDE, 2009a).

Schools and Staffing Survey (SASS), 2003-3004

I drew the majority of my data for this study from SASS 2003-2004, restricted-use dataset, which is well suited for exploring relationships between district union status and teacher quality issues. Information about this data source is provided in the SASS 2003-2004 User's Manual (USDE, 2007a). Sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES), the SASS 2003-2004 provides information about teachers, administrators, and the general condition of elementary and secondary schools in the U.S. Specifically, SASS 2003-2004 collected information on teacher preparation, teacher qualifications, working conditions of teachers, teacher union membership, and the basic conditions in schools and districts as workplaces. SASS also extended the data collection to include measures of school and district policies, such as unionization status and teacher hiring practice. The sampling design of SASS provides national and district-by-district characterization of schools and teachers, and because of the sample's size, SASS allows for disaggregation of data along key characteristics of schools and teachers (USDE, 2007a). Thus, aside from providing a comprehensive portrait of the teacher workforce across the nation, SASS also allows for the comparison of teachers and the structure of schooling on a district-by-district, and school-by-school basis, which serves the needs of this study. Being the "the largest, most extensive survey of school districts, schools, teachers, and administrators in the United States" (USDE, 2005, p.44), SASS provides the most up-to-date source of information to study unionization effects at a national level.

The Common Core of Data (CCD)

The Common Core of Data (CCD), the U.S. Department of Education's primary database on public elementary and secondary education, annually collects fiscal and non-

fiscal data about all public schools and public school districts in the United States (CCD, 2009b). From CCD's School District Finance Survey (F-33), School Year 2003-2004, I obtained the total district expenditure data for each district in the U.S. In addition, CCD's 2003-04 non-fiscal CCD Agency Universe data file provides data on district total enrollment, count of total FTE teachers and FTE secondary teachers. Through the district ID variable "LEAID", I linked the above four variables with the SASS 03-04 data file. The total expenditure and total student enrollment variables were used to calculate the per pupil expenditure variable included in the models. From total student enrollment and FTE teachers count, I obtained the district student-teacher ratio. From the count of total FTE teachers and FTE secondary teachers, I calculated the district percentage of secondary school teachers. In addition, the total student enrollment variable itself served as a control in the models.

Comparable Wage Index (CWI) Data File

This dissertation study involves district cost data— district total per pupil expenditures from CCD and district teacher salary schedules from SASS. It is problematic to use these cost data without adjustment because of the geographic cost differences across school districts. For example, districts that face high market price for teachers, such as New Work City, have to pay more than other districts, such as Suwannee County School District, FL, to purchase the comparable service of teachers (Taylor & Glander, 2006). For comparability across districts, the cost variables need to be adjusted to account for the uncontrollable cost of education. Therefore, in this study, I incorporate the Comparable Wage Index (CWI) developed by the National Center for Education Statistics (NCES) for educational geographic cost adjustment. According to

the developers, Lori Taylor and William Fowler, the Comparable Wage Index (CWI) is "a measure of the systematic, regional variations in the salaries of college graduates who are not educators with the assumption that these non-educators are similar to educators in terms of age, educational background, and tastes for local amenities" (Taylor & Fowler, 2006, p.1). For this study, I merge the CWI of year 2004 (CWI2004) with the SASS 2003-04 district data file by the district ID number "LEAID" assigned by the NCES. In the district file, district PPE and salary schedule data are adjusted as specified in CWI's Users' Guide[19] (Taylor & Glander, 2006).

Data file of Collective Bargaining Rights for Education Employees in the United States

A state's public sector collective bargaining law has tremendous effects on the range of activities local unions can undertake. As illustrated in the literature review chapter, state collective bargaining statutes regulating teachers' collective bargaining rights vary in their definitions of what union activities are authorized, allowed or prohibited. Meanwhile, the enactment of the law itself in a particular state is not an occurrence out of nowhere; rather it is a result of contributing factors from the local and state circumstances. Even after taking into account the observable characteristics of a school district such as demographics and school resources, unobservable factors in a particular state may be correlated with unionization (Hoxby, 1996). For instance, the strength of organized teachers and the general public's sentiment toward them in that state may cause teacher unionization relatively easier than in other states. These unobservable factors in a state may themselves affect teacher quality in the state. The

[19] To make dollar amounts comparable, divide by the index and then multiply by the national average CWI for the relevant year (Taylor & Glander, 2006).

inclusion of a state's collective bargaining law status may capture some effects of these unobservable characteristics, such as the strength of teacher activism.

Another function of teacher unions, though not well documented in research, is advocacy at various levels of government. At the state level, teacher unions with strong influence in a state may play a role in making state-level educational policies that would affect a state's attractiveness to potential teacher candidates and retention of teachers. The strength of a state's collective bargaining law status may also serve as a crude measure of unions' political influence on state-level teacher policies. I obtained a data file *Collective Bargaining Rights for Education Employees in the United States* from one of the teacher unions— the National Education Association. The collective bargaining law file contains information on whether teacher bargaining is mandatory, permitted or prohibited in the 50 states plus the District of Columbia (NEA, 2005). In the study, the state bargaining law status was linked into SASS district files through the "FIPS state code".

Barron's Profiles of American Colleges

An important variable in constructing the empirically-based teacher quality indicator is the ratings of postsecondary institutions teachers attended. Barron's Profiles of American Colleges (Barron's Educational Series, 2006) rates all of the four-year accredited schools in the U.S (p.23). This index groups all the colleges listed in this book according to degree of admissions competitiveness. Researchers often use Barron's ranking of colleges as an indicator of college graduates' academic ability (such as Ehrenberg & Brewer, 1994; Summers & Wolfe, 1975; Lankford, Loeb & Wyckoff, 2002). In this study, I use this index as a measure of the *selectivity of the postsecondary*

institutions teachers attended, one component of the empirically-based teacher quality composite variable.

The Integrated Postsecondary Education Data System (IPEDS) List of Colleges in the U.S.

SASS2003-2004 dataset provides the university IPEDS codes but does not contain the names of the postsecondary institutions teachers attended, while Barron's Profile of American College (2006) only has the names of US colleges. In this dissertation study, the IPEDS list serves as a bridge to match the postsecondary institutions in SASS 2003-2004 dataset with Barron's list.

Census 2000 School District Demographics Project

Census 2000 School District Demographics Project is sponsored by the NCES of the U.S. Department of Education, to "enable users to directly access school district geographic and demographic data" (USDE, 2009a). Census 2000 School District Demographics Project collected data on educational attainment for the population over 25 years of age residing within school district boundaries in the U.S. In this study, I merged this district residents' education attainment information through the district ID variable "LEAID" with SASS 03-04. The education level of residents has a theoretical effect on teacher quality in the district (Koski & Horng, 2007); therefore, I included it in the models to control for its potential confounding effect on teacher quality.

SASS Data Collection Procedures and Questionnaires

SASS 2003-2004 is the fifth administration of Schools and Staff Survey.[20] SASS 2003-2004 consisted of five survey components: the school district survey, the principal survey, the school survey, the teacher survey, and the school library media center survey. This dissertation used data collected from the school district survey, school survey, principal survey, and teacher survey and further restricted to the data to the public school frame.

Schools were the primary sampling units. The public school sampling frame was based on the Common Core of Data (CCD) 2001-02 school year; public schools not in existence in school year 2001-02 were not included. The frame contains regular public schools and special purpose schools such as special education, vocational, and alternative schools.

The data collection for 2003–2004 SASS took place during the 2003–2004 school year. School districts were first contacted prior to the beginning of any data collection to obtain formal approval for their schools and teachers to participate as well as to obtain and/or verify their contact information. In fall 2003, a copy of district questionnaire was sent to a district-designated respondent in each of the sampled district, who was knowledgeable about the school district. The first mail-out phase was followed by a second mailing, and additional non-response follow-up conducted by mailing reminder postcards. Remaining non-respondents were assigned to field representatives, who obtained interviews by phone or personal visit.

The 2003–04 SASS utilized a field-based methodology for the school-level data collection, namely principal, school, and teacher data collection. Field representatives

[20] The first four administrations were conducted in school years 1987–88, 1990–91, 1993–94, and 1999-2000.

were responsible for all data collection at the sampled schools. During the period of June 2003 to May 2004, following advance postcards and phone calls to sampled schools, the field representatives visited schools and distributed the appropriate school, principal, and teachers questionnaires. Follow-up on all questionnaires were conducted by telephone calls or personal visits.

The achieved sample sizes for SASS 2003-2004 were 43,244 public school teachers, 7,991 schools and 4,421 districts, with the response rates of 84.0%, 80.5% and 81.9%,[21] respectively. Non-response bias analyses conducted by NCES indicated that the non-response rates did not pose a substantial bias in SASS estimates.

Questionnaire Descriptions

School District Questionnaire

In the fall of 2003, district-designated administrators completed a self-administered paper and pencil questionnaire that collected data on the school district, student body, teachers, district policies, and district-wide programs. Specifically, the questionnaire consisted of items about student enrollments, number of teachers, teacher recruitment and hiring practices, teacher dismissals, types of union contract, length of the contract year, teacher salary schedules, school choice, magnet programs, home schooling, graduate requirements, and professional development for teachers and administrators. The district questionnaire took about 60 minutes to complete.

For this dissertation study, I use the teacher union contract type information collected by the district questionnaire, because teacher unions negotiate contracts with district managements. Once a teacher union reaches an agreement with the district, the

[21]The weighted questionnaire response rates for districts, schools, and teachers were 82.9%, 80.8%, and 84.8%, respectively.

agreement is a district-wide policy and affects teachers globally in the whole district. I provide more details on those included district-level variables in the Variable subsection.

School and Principal Questionnaires

Almost concurrent with the collection of district information, SASS collected school and principal information through its school and principal questionnaires. Through school questionnaires, school principals or principal designees provided such school information as enrollment, staffing, class organization, and school programs. Principal questionnaires were addressed to principals and collected information on principals' training and experience, attitudes about education and their schools, their schools' professional development opportunities for teachers and so on. The paper and pencil school and principal questionnaires took around 55 and 30 minutes to complete, respectively.

This study draws school level data from the school questionnaires, supplemented with teacher professional development information from the principal questionnaires. I provide detailed information about the variables drawn from the questionnaires in the Variables subsection.

Teacher Questionnaire

Teacher questionnaires were distributed to sampled individual teachers by field representatives in the fall of 2003. The paper and pencil questionnaires collected data from teachers about their education and training, induction, professional development, teaching assignment, certification, workload, union membership, and perceptions and attitudes about teaching. The teacher questionnaire took about 55 minutes to complete. For teacher preparation, SASS collected data on the *names of the higher institutions* from

which teachers obtained their bachelor's degree, their postsecondary *major fields of study*, and information on any *other degrees* they held. The respondents may choose from 81 field of study codes listed in the questionnaire.

Teachers were asked about the subject areas of their assignments and content areas in which their certification(s) may allow them to teach. The questionnaire provided a list of 73 fields for teachers to choose from for reporting their teaching assignments and 82 fields for their certification content area.

This dissertation research makes use of teacher assignments, fields of study and certification, teacher experience, as well as teachers' postsecondary institution names (linking to the rating information from the Barron's Profile file) to create a proxy for teacher quality that is based on empirical evidence. In addition, this study utilizes teacher assignments, fields of study and certification as well as teachers' grade level information to create the NCLB-defined HQT variable. The teacher-level teacher quality variables are further aggregated to school and district levels to create the final dependent variables to be used in the analytical models. Also, I aggregate individual teachers' union membership information to the district-level and create a variable measuring district percentage of teachers who are union members. I combine the district union contract type variable with the created district union membership variable to construct the unionization measure I use in this dissertation study. I describe in more detail the construction of the teacher quality variables, unionization variables as well as other included measures in the Variables subsection below.

Empirical Framework

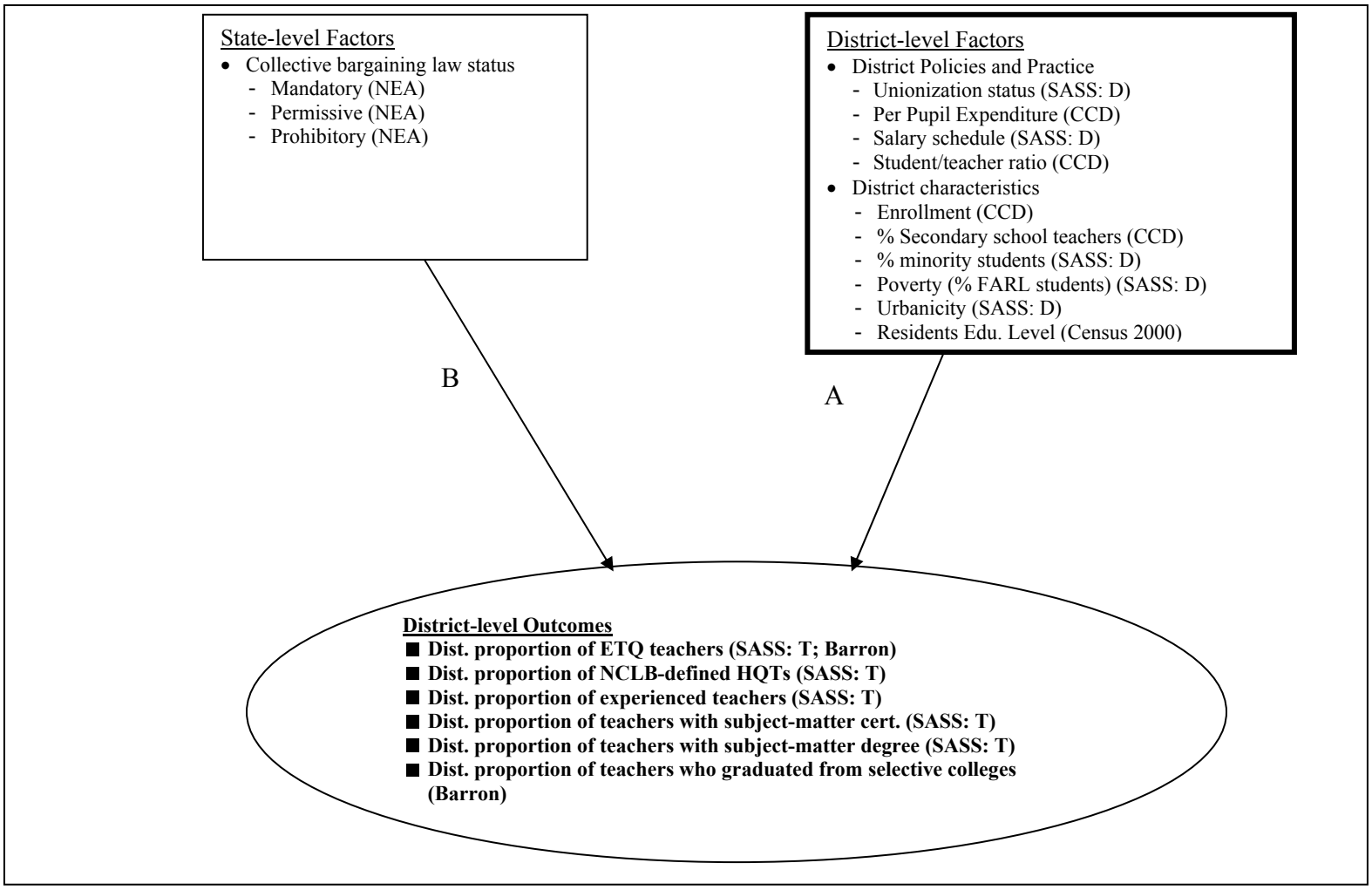
The construction of the empirical framework follows the conceptual framework presented in Chapter One while taking into consideration of the available information from the data sources. The first empirical framework (see Figure 2) guides the construction of my districts-within-states analytical models for analyzing the relationship between district teacher unionization status and district teacher quality in the large urban and suburban districts. The second empirical framework (see Figure 3) guides through the construction of schools-within-districts analytical models for investigating my second research question, namely unionization effects on the intra-district distribution of teacher quality across schools with varying poverty and minority student concentration in the largest districts.

For my second research question, my preliminary analysis found that 52 districts out of the NCES' list of top 100 largest school districts have sufficient data for conducting schools-within-districts analysis. In my analytical sample, on average, approximately 12 schools[22] (total of 613 schools) were sampled from each of the 52 districts. These 52 largest districts are located in 28 states, with a total of 11 districts in 2 states (Florida and Georgia), and the remaining 41 districts in 26 states. The weak-clustering of districts in states makes it impossible to model the state effect. Therefore, I built two-level models (schools nested in districts as shown in Figure 3) to investigate my second research question. Because I focused only on the 52 districts, the interpretation of the results is confined to these districts and should not be extended to the national population of schools.

[22] Districts with less than three schools sampled were dropped to facilitate the intra-district school teacher quality analysis.

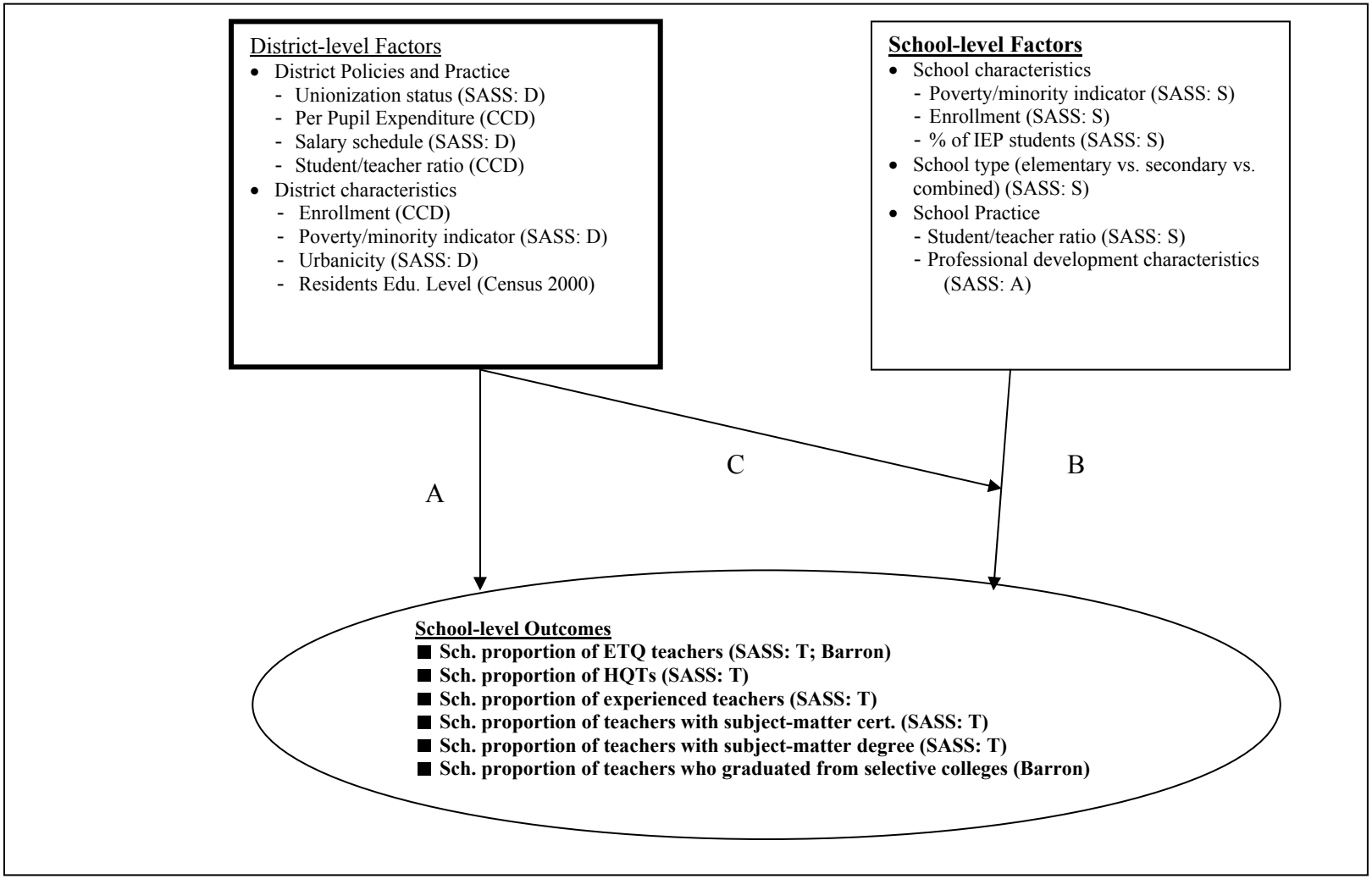
Below I describe procedures for the construction and selection of the dependent, major independent, and control variables. See Tables A1 (Appendix) for a full description of the variables I use in this dissertation study.

Figure 2: Empirical framework for the relationship between teacher unions and teacher quality in the district



Note: parentheses indicate source of data. SASS: D— SASS district questionnaire; SASS: S—SASS school questionnaire; SASS: T—SASS teacher questionnaire; SASS: A—SASS principal questionnaire; CCD—Common Core of Data; NEA—the National Education Association; Barron—Barron's Profiles of American College. Census 2000—Census 2000 School District Demographics Project

Figure 3: Empirical framework for unions' effect on intra-district distribution of teacher quality across schools with varying poverty and minority student concentration



Note: parentheses indicate source of data. SASS: D— SASS district questionnaire; SASS: S—SASS school questionnaire; SASS: T—SASS teacher questionnaire; SASS: A—SASS principal questionnaire; CCD—Common Core of Data; NEA—the National Education Association; Barron—Barron's Profiles of American College. Census 2000—Census 2000 School District Demographics Project

Dependent Variables

The primary outcome variable of interest is the construct of "teacher quality". Two measures of teacher quality were created based on the reviewed literature: one based on empirical research results, and the other one based on NCLB's definition of highly qualified teachers.

Empirically-based Teacher Quality (ETQ) Variable

The empirically-based teacher quality (ETQ) measure is composed of four components: selectivity of postsecondary educational institutions teachers attended, holding a subject-specific degree, holding a subject-specific certificate, and at least five years of teaching experience. Below is a description of the construction process of the ETQ measure.

Barron's Profiles of American Colleges (2006) rated all accredited[23] four-year postsecondary institutions in nine categories according to degree of admissions competitiveness: a) most competitive, b) highly competitive plus, c) highly competitive, d) very competitive plus, e) very competitive, f) competitive plus, g) competitive, h) less competitive, and i) non competitive. Previous research found that the higher rating a college on Barron's Profiles, the better student achievement their graduates tend to produce (Ehrenberg & Brewer, 1994; Summers & Wolfe, 1975). I collapsed the ratings into two categories with category "very competitive" as the cutting point. Those colleges with ratings of "very competitive" and above were coded "more selective", and colleges with ratings of "competitive plus" and below were coded "less selective". I chose the cut point between the "more selective" and "less selective" colleges with reference to the

[23] Colleges not ranked in Barron's list (which indicates they are not accredited) are classified as less selective in this study.

university ranking information from the U.S. News and World Report. The rationale lies in that most (with three exceptions) of the top 50 public national universities ranked by the U.S. News and World Report were included in Barron's categories "very competitive" and above. In this way, about 31 percent of the universities included in the SASS 03-04 sample are classified as more selective according to the newly created binary selectivity measure.

When constructing the ETQ measure, I first created two interim variables: one measuring whether a teacher has a degree in all the core academic subjects he or she teaches,[24] and the other measuring whether a teacher has a certification in all core academic subject areas he or she teaches. By combining the two interim variables, I created an in-field-in-all-assignment measure which has a value of "1" if a teacher has both certification and degree in all of his/her core subject assignments, otherwise "0".

Then I constructed the binary composite variable-ETQ-using the created postsecondary institution selectivity variable, in-field-in-all-assignment variable and teacher experience variable. The ETQ variable has a value of "1" if a teacher graduated from a more selective university, with an in-field degree and certification in all core subject assignments and at least five years of experience; otherwise it has a value of "0". The rationale for creating a composite variable as a proxy of teacher quality is that it captures the cumulative impact of the multiple aspects of teacher quality that have been linked with student achievement (Akiba, LeTendre & Scribner, 2007).

[24] The core academic subjects are defined as English, reading or language arts, mathematics, science, foreign language, civics and government, economics, arts, history and geography (U.S. Department of Education, 2003).

Finally, I aggregated the ETQ indicator variable to the school and district-levels and obtained the proportions of ETQ teachers in the respective levels. These aggregated variables were the dependent variables in the analytical models.

As discussed above, the empirically-based teacher quality variable includes four components: selectivity of postsecondary institutions, in-field certification, in-field degree, and teaching experience. I also obtained the proportions of teachers with each of the four characteristics in the district and school levels, which were modeled respectively by the same set of predictor variables as those used in the composite teacher quality models. This way I was able to estimate unions' effect on each of the four teacher quality components.

The NCLB-based Teacher Quality Variable—Highly Qualified Teachers (HQTs)

NCLB's provision stipulates that a "highly qualified teacher" is defined as one who *holds at least a bachelor's degree from a four-year institution, holds full state certification* and *demonstrates competence in their subject area***.** NCLB further specifies that in order to be "highly qualified**",** teachers need to meet all three requirements in all core academic subjects they teach. The first two requirements for highly qualified teachers—that they have a bachelor's degree and full certification—are fairly straightforward to measure. NCLB provides specific options for teachers to meet the content knowledge requirement. New teachers must pass state subject-matter tests appropriate for the grade level and subject(s) taught and, in the case of new middle or secondary school teachers, must have completed an academic major (or equivalent coursework), graduate degree, or advanced certification in each subject taught. Veteran teachers may either meet the content-knowledge requirements for new teachers, or

demonstrate competency in all subjects taught using a "high objective uniform state standard of evaluation" (HOUSSE) developed by their respective states (USDE, 2002). Though veteran teachers may meet the content knowledge requirement by passing the state-specific HOUSSE, due to data availability in this study I applied the same criterion to both new and experienced teachers in meeting the content knowledge requirement. Specifically, I adopted the approach Kolbe and Rice (2008) used in constructing their "highly qualified teachers" indicator. The measure identified a highly qualified teacher as one who has: 1) at least a bachelor's degree; 2) full state certification; and 3) subject matter competency (for elementary school teachers, as demonstrated by full certification in the subject area in which they teach; and for middle and secondary school teachers, as demonstrated by an academic major in each core subject area taught).

Finally, I also aggregated the NCLB-defined teacher quality indicator variable to the school and district-levels to obtain the proportions of highly qualified teachers in the respective levels. These aggregated variables were the dependent variables in the analytical models.

Independent Variables of Interest

This dissertation focuses on the relationship between a district's unionization status and teacher quality as defined above. On the district questionnaire, districts were asked what types of union contract the districts had with a teacher's union or association. The union contract status variable has three categories: 1) a collective bargaining contract, 2) meet and confer agreement, and 3) no agreement. In addition, on the teacher questionnaire, individual teachers were asked whether they belonged to a union. I aggregated the individual teacher level membership information to the district-level and

got the proportion of unionized teachers in the district. The unionization measure adopted in this study combines the district union contract status and union membership information. Below I provide a description of the rationale.

Not only are there noticeable differences between collective bargaining and "meet and confer" agreements, but also variations exist among collective bargaining agreements across districts. Within the broad category of collective bargaining, teacher unions still represent a variety of power strengths and behavior across the U.S. The power of teacher unions in negotiating contracts favorable to their interests is also related to union membership in a district (Rose & Sonstelie, 2004). Collective bargaining generally will not occur unless at least 50 percent of teachers are union members (Hoxby, 1996). Therefore, to better identify the different categories of unionization and their ensuing power in negotiating with the school districts, in this research I constructed the unionization measure by combining the information on union contract type and membership, following the strategy adopted by Hoxby (1996). Specifically, the unionization measure has three categories: stronger unionization, weaker unionization, and no unionization. I defined the "stronger unionization" measure as having a collective bargaining agreement and union membership exceeding 50 percent of total number of teachers. The "weaker unionization" category includes districts that either 1) have a "meet and confer" agreement or 2) have a collective bargaining agreement but with union membership no more than 50 percent of total number of district teachers. The "no unionization" category includes those districts without any union agreement.

Control Variables

To better isolate relationships between unionization status and teacher quality, I included several school, district, and state characteristics in the final analyses as statistical controls. Statistically controlling for contextual characteristics that may be confounded with the outcomes of interest results in more precise estimates of the effects of the independent variable of interest because the amount of unexplained variance is reduced (Raudenbush & Bryk, 2002).

The selection of control variables follows the conceptual framework presented in Chapter One, which is constructed from literature reviewed in Chapter Two. Yet, due to data availability, control variables only included those that were readily measurable and contained in the SASS 2003-2004 as well as other data files as specified in the Description of Data Sources section (see the empirical framework presented in Figure 2 and 3). Detailed information about these variables is listed in Appendix Table A1.

School-Level Control Variables

School-level control variables include student enrollment, school's student demographics (e.g. percentages of minority students and percentages of LEP students), student-teacher ratio (total enrollment/Count of FTE teachers), school poverty status (percentage of students approved for free and reduced lunch program), school type (elementary, secondary or combined), and characteristics of professional development.

Table 1: Factor Loadings of PD Characteristics Items (rotation solution)

Item	PD for Teaching Improvement Component
Prof dev offered-evaluated for evidence of improvement in teacher classroom practice;	**0.61**
Prof dev offered-evaluated for evidence of effects on student achievement;	**0.57**
Prof dev offered-considered part of teachers' regular work;	**0.43**
Prof dev offered-planned by teachers in this school or district;	**0.82**
Prof dev offered-presented by teachers in this school or district;	**0.83**
Prof dev offered-accompanied by the resources that teachers need (e.g., time and materials) to make changes in the classroom.	**0.74**
Prof dev offered-support the school's improvement goals;	0.23
Prof dev offered-support the district's improvement goals;	0.01
Prof dev offered-support the implementation of state or local standards;	0.15
Rotated % of variance explained by factor	31.84
Cronbach α	0.83

Source: SASS 2003-2004; School level variables weighted by within-district weight.

The SASS School Questionnaire provides direct or close to direct measures of all the school-level controls except the characteristics of professional development. The Principal Questionnaire collected information from principals about the frequency that schools provide professional development to teachers in the following nine categories: a) supported the school's improvement goals; b) supported the district's improvement goals; c) supported the implementation of state or local standards; d) evaluated for evidence of improvement in teacher classroom practice; e) evaluated for evidence of effects on student achievement; f) considered part of teachers' regular work; g) planned by teachers in this school or district; h) presented by teachers in this school or district; and i) accompanied by the resources that teachers need (e.g., time and materials) to make changes in the classroom. For example, the questionnaire asked principals "How often is professional development for teachers at this school designed or chosen to *support the school's improvement goals*?" Principals chose their answers from the following options: 1 (never), 2 (rarely), 3 (sometimes), 4 (frequently), and 5 (always). I created a weighted

professional development composite, or termed component, by running principal component analysis (PCA) with Varimax rotation from the nine questionnaire items.

I first performed a reliability analysis to test the consistency among the nine items. The reliability coefficient (Cronbach α=0.85) indicates these items are reliable measures of a component(s). The PCA scree plot result suggested one professional development component should be created. Table 1 presents the factor loadings for the items included in the PCA as well as the reliability coefficient and the rotated proportion of variance for the scale. Ignoring items that have loadings less than 0.4, we can see that this component focuses on activities that support teaching, which I term *Professional Development for Teaching Improvement*. I also conducted a reliability analysis of the items forming the professional development composite and the Cronbach α of 0.83 indicates good reliability. The created composite serves as a measure of professional development provided in the schools.

A school's poverty and/or minority student concentration plays a role in the school's ability to hire and retain high quality teachers. High poverty and/or minority concentration schools tend to have uncertified, inexperienced teachers and teachers without a major in the subject they teach (Ascher & Fruchter, 2001; Darling-Hammond, 2004; Ingersoll, 1999). School poverty and minority student concentration are two independent variables of interest in answering research question two. However, in this research, because school poverty and minority concentration are highly correlated (coefficient=0.7), I created a school poverty/minority level composite variables by averaging the poverty and minority concentration level.[25] By including this school poverty/minority variable, the HGLM models are able to examine unions' potential effect

[25] Poverty/minority level=(%FARL+%minority student)/2.

on alleviating or gratifying the intra-district teacher quality gap across schools with different poverty/minority status in the largest districts.

I included other variables to control for their potential influences on the proportion of high quality teachers. For instance, teachers in elementary schools tend to have different academic degree background than those in secondary schools (Feistritzer, 1999), which may have a confounding effect with union status on the teacher quality measures. Small class size in a school may serve to attract high quality teachers or decrease teacher quality due to the fact schools may be forced to hire low quality teachers to support small class size (Koski & Hornig, 2007). By incorporating these control variables, the coefficients of union status variables can be interpreted as union effects while holding constant these controlled factors.

District-Level Control Variables

The inclusion of district-level control variables parallels previous union-effects studies' strategies (Hoxby, 1996; Koski & Horng, 2007, etc). District-level control variables included district's demographic characteristics, such as *district size*, *district poverty status* (as measured by percentage of students approved for free and reduced lunch program), *the percentage of minority students*, *the education level of residents within district boundary, percentage of secondary teachers in districts* and the *urbanicity*. Besides the demographic variables, I also included several district practice and policy measures to control for their possible confounding effects, such as *per pupil expenditure, salary schedule for new teachers with bachelor's degree,* and *student teacher ratio.* I recognize that districts' salary schedules have multiple steps, and I utilized the step for new teachers with bachelor's degree as a proxy for a district's salary schedule. The

district-level controls served to account for differences in teacher quality relative to the district locale and district resources. For example, research documented that urban schools differ from suburban ones in their teacher composition as to the competitiveness of teachers' undergraduate institutions (Lankford, Loeb & Wykoff, 2002). Therefore, a district's urbanicity has a theoretical relationship with teacher quality. Both per pupil expenditure and salary schedule variables were adjusted[26] by Comparable Wage Index (CWI) to account for geographic variations in expenditure and salaries. The CWI-adjusted per pupil expenditure and teacher salary variables accounted for the differences in teacher quality that may be attributed to them. High poverty districts with limited resources are less likely than affluent ones to have presumably high quality teachers, such as teachers with full-certification and more years of experience (Darling-Hammond, 2003). The percentage of secondary teachers in a district has a theoretical effect on teacher quality in that districts tend to have a difficult time hiring high quality teachers in secondary grades, particularly in hard-to-staff subject areas like math and science (Koski & Horng, 2007). Residents' education level is measured by the percentage of adults in district boundary holding at least an associate degree. The inclusion of residents' education level is due to its theorized effect that a higher percentage of college-educated adults within the district boundary is very likely to increase the pool and quality of teacher candidates (Koski & Horng, 2007).

State-Level Control Variables

As stated in the data source section, states vary in their legislation on teachers' unionization rights. Some states mandate schools to engage in collective bargaining with

[26] The adjustment was achieved through dividing the raw dollar amount by the index and then multiplying by the national average CWI for the year of 2004.

teacher unions, some permit teachers to bargain collectively, but don't mandate schools to do so, and others prohibit teacher unions from collectively bargaining with schools. The inclusion of collective bargaining law at the state level contributes to more precise estimates of union effect. A state's collective bargaining law status may capture some of the unobservable characteristics the particular state has that contribute to unionization or affect teacher quality. The law status variable has three categories: mandate, permit, and prohibit. I created three indicator variables to represent the three categories.

Weights

Due to its complex sampling design, SASS provided several sampling weights for researchers to adjust for the differential probabilities of sample selection and the effects of differential non-response of sub-groups when producing population estimates. In the districts-within-states models constructed to address my research question one, I utilized the district final weight (DNLWGT) in HGLM to compensate for the non-random sampling of districts. At the state-level, because the SASS sample included all states, no weight was applied. Thus results from the districts-within-states models can be generalized to the large urban and suburban districts in the U.S. In the schools-within-districts models for investigating research question two, because my analyses focused on the 52 largest districts (no intent to generalize to national districts), no district-level weight was applied in HGLM. Due to the fact that no within-district school weight was available from the SASS data, I constructed a within-district school weight[27] variable from the school final weight (SFNLWGT) and district final weight (DNLWGT). The within-district school weight was applied in the school-level HGLM models for analyzing my second research question.

[27] Within-district school weight= SFNLWGT/DFNLWGT.

Also because no within-school teacher weight or within-district teacher weight was available from the SASS data, I constructed within-school[28] and within-district teacher[29] weights from the teacher final weight (TFNLWGT), district final weight (DNLWGT), and school final weight (SFNLWGT), respectively. I made use of the within-school and within-district teacher weight variables in aggregating the teacher level teacher quality data to the school-level and district-level, respectively. The missing data analyses utilized the district-level weight variable (DFNLWGT) to compare characteristics of the analytical sample to the full SASS sample of large urban and suburban districts. For the descriptive statistics of schools and districts included in the analysis, I utilized the district final weight (DFNLWGT) in the sample of large urban and suburban districts, and the within-district school weight constructed in the sample of schools belonging to the largest districts.

Analytical Procedures

In this section, I describe the procedure as well as statistical approaches I utilize in conducting this research. I first present the way I created my analytical samples from the SASS 2003-2004 data files. Then I provide a description of how I performed my statistical analyses, including descriptive analyses as well as Hierarchical Generalized Linear Modeling (HGLM) analyses.

Analytical Samples

The SASS 2003-2004 has a stratified design structure comprised of 43,244 public school teachers, 7,991 public schools and 4,421 districts around the nation. I constructed my two analytic samples through a four-stage process. At stage one, I selected full-time

[28] Within-school teacher weight=TFNLWGT/SFNLWGT.
[29] Within-district teacher weight=TFNLWGT/DFNLWGT.

elementary and secondary public school teachers who taught in core academic subjects.[30] The teacher sample was further refined to only include teachers with data on the measures important to this study, namely, degree, certification, years of teaching experience, the ranking information of postsecondary institution teachers attended, and union membership. At stage two, I refined the district sample to include only those districts which satisfy all the following three criteria 1) had valid teacher data, 2) had no missing values on all the district-level variables that are to be included in the analyses, and 3) included at least three teachers from the teacher sample. These district restrictions eliminated additional teachers from the initial teacher and district sample.

At stage three, I dropped districts with less than 10,000 students as well as districts in rural areas. Thus, I created my first analytic subsample, one that includes districts with enrollment over 10,000 students in suburban and urban areas, which I named "Large Urban and Suburban Districts". I analyzed this sample to investigate the first research question: What's the relationship between a district's union status and teacher quality in the large urban and suburban districts? The "Large Urban and Suburban Districts" analytical sample has 480 districts (with 7,752 teachers sampled) nested in 49 states. At stage four, I selected my second analytical sample, focusing on districts that (1) belonged to the top 100 largest districts in the United States, (2) contained no missing values on either district or school level variables that are to be included in the analysis, and (3) had at least three schools sampled from each district. Named the "Largest Districts" Sample, this sample has 613 schools nested within 52 districts (with an average

[30]Core academic subjects refer to English, reading or language arts, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography (U.S. Department of Education, 2003).

within-district sample of around 12 schools). The "Largest Districts Sample" served to investigate my second research question.

I performed a missing data analysis for the "Large Urban and Suburban Districts" to determine whether the exclusion of cases jeopardizes the generalizability of the findings to the large urban and suburban districts across the U.S. For the second analytic sample, since I focused on the top 100 largest districts and I did not intend to generalize its findings to other districts, I did not conduct any missing data analysis.

In the missing data analysis of "Large Urban and Suburban Districts" sample, the analytic sample was compared with the excluded cases as well as the base sample on selected district characteristics, namely, district demographics, unionization status, and other variables measuring relevant district policies, such as student-teacher ratio, salary schedule. Differences between samples were tested using T-test (for continuous variables) and chi-square test (for categorical variables), respectively. Here the base sample refers to the non-rural districts with over 10,000 student enrollment, and in the SASS 2003-2004 data file, a total of 578 such districts were sampled. The excluded sample is composed of districts that were in the base sample, yet excluded from the analytical sample due to missing values. Reported differences indicate statistically significant at the p level of less than 0.05.

Table 2: Missing Data Analysis for Large Urban and Suburban Districts

Variables	Excluded sample			Analytic sample			Base sample				
	Unwgted Max.N	Mean	SE	Unwgted N	Mean	SE	Unwgted Max. N	Mean	SE	M_{ana}-M_{excl}	M_{ana}-M_{base}
Stronger Unionization	98	0.40	0.05	480	0.58	0.02	578	0.55	0.02	0.18**	0.03
Weaker Unionization	98	0.41	0.05	480	0.14	0.02	578	0.19	0.02	-0.27***	-0.05
No Unionization	98	0.19	0.04	480	0.27	0.02	578	0.26	0.02	-0.08	0.01
Urban	98	0.41	0.05	480	0.44	0.02	578	0.44	0.02	0.03	0.01
Suburban	98	0.59	0.05	480	0.56	0.02	578	0.56	0.02	-0.03	-0.01
Northeast region	98	0.13	0.03	480	0.07	0.01	578	0.08	0.01	-0.06*	-0.01
Midwest region	98	0.23	0.04	480	0.17	0.02	578	0.18	0.02	-0.06	-0.01
South region	98	0.28	0.04	480	0.42	0.02	578	0.39	0.02	0.14*	0.03
West region	98	0.36	0.05	480	0.34	0.02	578	0.35	0.02	-0.02	-0.01
Salary Schedule--Bachelor w/o Experience (x1000)	98	33.53	0.35	480	32.71	0.15	578	32.85	0.14	-0.83*	-0.14
District Student Enrollment (X1000)	98	19.11	1.19	480	33.04	2.91	578	30.48	2.39	13.92*	2.56
Per Pupil Total Expenditure (X1000)	98	9.40	0.20	480	9.35	0.10	578	9.36	0.09	-0.04	-0.01
%District Minority Student Enrollment	98	47.37	2.67	480	46.30	1.30	578	46.50	1.17	-1.07	-0.20
Student/Teacher Ratio	98	18.23	0.49	480	17.52	0.15	578	17.65	0.15	-0.71	-0.13
% District FARL Students	98	41.33	2.33	480	41.46	1.05	578	41.44	0.96	0.13	0.02

Notes: *p<.05, **p<.01,***p<0.001; weighted by normalized district final weight; Mean differences between categorical variables are tested using chi-square test, and continuous variables using T-test. Unweighted Ns for the excluded and base samples are maximum of 98 and 578 due to missing data.

Table 2 above presents the missing data analysis results for the "Large Urban and Suburban Districts" sample. The base sample (n=max of 578) includes all non-rural districts with an enrollment over 10,000 students. The excluded cases sample (n=max of 98) includes those districts that have missing data on any of the teacher and district-level variables used in this analysis and districts with less than three teachers sampled. Compared with the excluded sample, the analytic sample has a higher percentage of strongly unionized districts and a lower percentage of weakly unionized districts. A higher proportion of districts in the analytical sample are located in the south region, and a lower proportion in the northeast region. Districts in the analytic sample, on average, are larger (33,040 vs. 19,110) and offer lower salaries[31] ($32,710 vs. $33,530) to novice teachers with bachelors' degree. The two samples were comparable in other characteristic, such as poverty level, minority student concentration etc. A comparison between the analytic sample and the full base sample indicates that the "Large Urban and Suburban

[31] Salary is adjusted with Comparable Wage Index (CWI).

Districts" analytic sample is not noticeably different from the base sample in terms of demographic characteristics, unionization status and other relevant district policies. In summary, although the analytic sample has significant differences with the excluded sample, it is comparable with the full sample of urban and suburban districts with enrollment over 10,000 students. Therefore, I can generalize the results derived from the analytical sample to the national population of non-rural districts with enrollment over 10,000 students.

Descriptive Analyses

Prior to the HGLM analyses, I calculated population estimates of means (for continuous variables) and percentage distributions (for categorical variables) for all the district variables and school variables included in the analysis. Comparison analysis between districts with different unionization status was performed, and differences in the estimates were tested using either t-test (for continuous variables) or chi-square tests (for categorical variables). Results from the descriptive analyses provided information about the overall teacher quality in the large urban and suburban districts (also the largest districts) as well as variations in teacher quality, school characteristics and district characteristics in districts with different unionization status. In addition, the statistics and plots obtained in the descriptive analyses procedure assisted in outlier identification and assumption checking. Thus further data transformation or other data management techniques may be conducted after these analyses.

Hierarchical Generalized Linear Modeling (HGLM) Analyses

I conduct this dissertation research within the context of multilevel modeling framework, which recognizes the nested structure of schools within districts, and districts within states (Raudenbush & Bryk, 2002). The hierarchical structure of the data, and the form of the dependent variables (proportions bounded between "0" and "1"), require an analytical technique that can simultaneously take into consideration both properties of the data. Hierarchical generalized linear modeling (HGLM) offers an appropriate framework to model multilevel data with dependent variables expressed as proportions (Raudenbush & Bryk, 2002, chapter 10). Particularly, I employed the binomial sampling model with logit link using HLM 6.07 software to conduct my analyses. I conducted two separate sets of HGLM models, districts-within-states models and schools-within-districts models, to study the effect of unions on district-level teacher quality and unions' effect on intra-district distribution of teacher quality, respectively. I modeled each of the empirically and NCLB-established teacher quality composite variables as well as their component variables separately. Specifically, the predicted variables were the two teacher quality composite indicators: a) proportion of empirically-established teacher quality (ETQ) teachers; b) proportion of NCLB defined highly qualified teachers (HQTs); and the four components indicators: c) proportion of teachers with at least five years of experience; d) proportion of teachers with subject-matter certifications; e) proportion of teachers with subject-matter degrees; and f) proportion of teachers who graduated from selective postsecondary institutions.

I present results from the binomial HGLM models in the log odds metric. Positive log odds coefficients are associated with districts/schools having a greater likelihood of

employing high quality teachers, whereas a negative log odds coefficient suggests an association with a lower likelihood. In addition, the log odds coefficients were also converted to odds (odds=exp(log-odds)), which represents the ratio between p, the probability of employing high quality teachers, and 1-p, probability of employing non-high quality teachers. Subsequently, converting odds to probabilities, the analyses yielded districts' and schools' rates or proportions of high quality teachers employed. In this study, *odds, log odds, likelihood*, *probability, and proportions* are positively aligned: that is greater odds of districts employing high quality teachers also indicate a greater log odds, a greater likelihood, a greater probability of districts employing a high quality workforce, and a higher/larger proportion of teachers being high quality ones. However, in reporting the results, I frequently use the odds metric, which permits an estimate of the percent increase or decrease in the odds of employing high quality teachers. The construction of HGLM models in this study closely followed the structure of an HGLM binomial model with logit link as specified by Raudenbush and Bryk (2002, p.294).

Construction of Districts-Within-States HGLM Models

Step I: Fully Unconditional Model. I constructed district-within-state HGLM models to address my first research question: What's the relationship between a district's union status and its teacher quality in the large urban and suburban districts in the U.S? In step I, I first built an unconditional model, with no predictors, for the proportion of district-level teacher quality outcome variables to explore how variation in the outcome measures is allocated across states.

Level-1 model: $\eta_{ij} = \beta_{0j}$

with a logit link, that is $\eta_{ij} = \log\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right)$ [3.1a]

Level-2 model: $\beta_{0j} = \gamma_{00+} \mu_{0j}, \quad \mu_{0j} \sim N(0, \tau_{00})$. [3.1b]

Where

φ_{ij} is the probability of district i in state j employing high quality teachers; and

η_{ij} is the log odds of district i in state j employing high quality teachers; and

β_{0j} is the average log odds of districts employing high quality teachers in state j;

γ_{00} is grand mean of log odds of districts employing high quality teachers across states; and

μ_{0j} is a random "state effect", that is, the deviation of state j's mean log odds from the grand mean of log odds. These effects are assumed normally distributed with a mean of 0 and variance τ_{00}. Within each of the j states, the variability among districts is assumed the same.

Note, because variance in the log odds of employing high quality teachers is not random across level-1units (districts), but determined by the probability φ_{ij} (where variance= φ_{ij} (1- φ_{ij})), HGLM with binomial distribution does not estimate the level 1 (district-level) variance separately.

Between-District HGLM Models (Step II, Step III, and Step IV Models). Research question one intends to study the relationship between district union status and the district proportion of high quality teachers. At level-1 (district-level), a fully specified between-districts model was constructed to examine the effects of a district's union status on the probability of districts employing high quality teachers across districts within states. I built the fully-specified model in a step-wise fashion. First, following the fully-unconditional model, I constructed my step II models by adding only districts' union status variables to examine union effects without any control variables. Then in step III, I further added district demographic variables to control for any possible effects they might

have on districts' probability of hiring high quality teachers. Step IV models serve as the fully specified models by including the district policy measures (i.e. district per pupil expenditure, student-teacher ratio, and district salary schedule).

In all the district-level models (Equations 3.2-3.4), I grand-mean centered all the independent variables, constraining all the slopes associated with the predictors to be equal across states, and only allowed the intercept (β_{0j}) to vary randomly from state to state. The intercept, $\beta_{0j,}$ was set as a function of state characteristics in the between-states model. Below are the step-wise models.

Step II: District-level HGLM Models with Only Unionization Status:

Level-1: $\eta_{ij}=\beta_{0j}+ \beta_{1j}$(Stronger Unionization) + β_{2j}(Weaker Unionization) [3.2a]

Level-2: $\beta_{0j}= \gamma_{00}+\mu_{0j}$ [3.2b]

$\beta_{pj}= \gamma_{p0}$ (p=1-2) [3.2c]

Step III: District-level HGLM Models with Demographic Controls:

Level-1: $\eta_{ij}= \beta_{0j}+ \beta_{1j}$(Stronger Unionization) + β_{2j}(Weaker Unionization) + β_{3j} (% Secondary School Teachers) + β_{4j}(Urban) + β_{5j}(District Enrollment[32])+ β_{6j}(Minority Student Concentration[32])+ β_{7j}(% FARL) +β_{8j}(Residents Edu. Level) [3.3a]

Level-2: $\beta_{0j}= \gamma_{00}+\mu_{0j}$ [3.3b]

$\beta_{pj}= \gamma_{p0}$ (p=1-8) [3.3c]

Step IV: Fully-specified District-level HGLM Models:

[32] Both "district enrollment" and "Minority student concentration" represent a number of dummy-coded categorical variables.

Level-1: $\eta_{ij}=\beta_{0j}+ \beta_{1j}$(Stronger Unionization) + β_{2j}(Weaker Unionization) + β_{3j} (% Secondary School Teachers) + β_{4j}(Urban) + β_{5j}(District Enrollment)+ β_{6j}(Minority Student Concentration)+ β_{7j}(% FARL) +β_{8j}(Residents Edu. Level) +β_{9j}(PPE) + β_{10j}(St-T Ratio)+β_{11j}(Salary Schedule) [3.4a]

Level 2: $\beta_{0j}= \gamma_{00}+\mu_{0j}$ [3.4b]

$\beta_{pj}= \gamma_{p0}$ (p=1-11) [3.4c]

where

β_{0j} is the average log odds of district employing high quality teachers in state j; and

β_{1j} measures the average log odds difference of employing high quality teachers between strongly-unionized districts and non-unionized districts in state j (net of other district-level characteristics); and

β_{2j} measures the average log odds of difference of employing high quality teachers between weakly-unionized districts and non-unionized districts in state j (net of other district-level characteristics); and

β_{3j}- β_{11j} are the corresponding coefficients that indicate the direction and strength of associations between other district characteristics and the log odds of districts employing high quality teachers in state j (net of other district-level characteristics); and

γ_{00} is average log odds of districts employing high quality teachers across states; and

μ_{0j} is a random "state effect", that is, the deviation of state j's mean log odds from the grand mean log odds; and

γ_{p0} is average slope of respective district-level variables across states.

Step V: Fully Specified State-Level Model. Finally, I constructed the level-2 (state- level) model to control for the effects of states' collective bargaining law status on

the district mean intercept (β_{0j}). Level-1 (district-level) model remains identical to Equation 3.4a. Level-2 (state level) model becomes,

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Prohibit}) + \gamma_{02}(\text{Permit}) + \mu_{0j} \quad [3.5]$$

Where

γ_{00} is the average log odds of districts employing high quality teachers across states; and

γ_{01} is the expected log odds difference between states with prohibitory collective bargaining laws and states with mandatory bargaining laws on the outcome; and

γ_{02} is the effected log odds difference between states with permissive collective bargaining laws and states with mandatory bargaining laws on the outcome; and

μ_{0j} is a random "state effect", that is, the deviation of state j's mean log odds from the grand mean log odds.

Although the resulting coefficients of state law classifications are not the focus of this study, they serve as important controls for possible extraneous state characteristics that may relate to districts' unionization status and district teacher quality in that state.

Construction of Schools-Within-Districts HGLM models

Step I: Fully Unconditional Model. I constructed schools-within-districts models to investigate my second research question: How does a district's union status affect the intra-district distribution of teacher quality across schools with different poverty level and minority student concentration? The building of models followed the same rationale as the building of districts-within-states models. At step I, I specified a fully unconditional model with no predictors added.

Level-1 model: $\eta_{ij} = \beta_{0j}$

with a logit link, that is $\eta_{ij}=\log\left(\frac{\varphi ij}{1-\varphi ij}\right)$ [3.6a]

Level-2 model: $\beta_{0j} = \gamma_{00+} \mu_{0j,}$ $\mu_{0j} \sim N(0, \tau_{00})$. [3.6b]

Where

φ_{ij} is the probability of school i in district j employing high quality teachers; and

η_{ij} is the log odds of school i in district j employing high quality teachers; and

β_{0j} is the average log odds of schools employing high quality teachers in district j;

γ_{00} is grand mean of log odds of schools employing high quality teachers across districts; and

μ_{0j} is a random "district effect", that is, the deviation of district j's mean log odds from the grand mean of log odds. These effects are assumed normally distributed with a mean of 0 and variance $\tau_{00.}$ Within each of the j districts, the variability among schools is assumed the same.

Step II: School-level Model. Because the purpose of building schools-within-districts models is to address the intra-district distribution of teacher quality across schools with varying poverty/minority status, at step II, I constructed the school-level model by including school level poverty/minority variable and other school level control variables. I group-mean centered the poverty/minority variable and allowed its slope to vary randomly across districts (i.e., the variance of its residue, $\mu_{1j,}$ was set free). Thus this model allowed both the intercept and poverty/minority slope to vary randomly across districts. I grand-mean centered all other control variables and constrained their coefficients to be fixed across districts. Below are the model specifications.

Level-1 model:

$$\eta_{ij}=\beta_{0j}+\beta_{1j}(\text{School Poverty/minority})+\beta_{2j}(\text{School Grade Level}^{33})+\beta_{3j}(\text{School size}^{34})+\beta_{4j}(\text{School PD})+\beta_{5j}(\%\text{IEP})+\beta_{6j}(\text{St-t Ratio}) \quad [3.7a]$$

Level-2 model:

$$\beta_{0j}=\gamma_{00}+\mu_{0j} \quad [3.7b]$$

$$\beta_{1j}=\gamma_{10}+\mu_{1j} \quad [3.7c]$$

$$\beta_{pj}=\gamma_{p0}\ (p=2\text{-}6) \quad [3.7d]$$

where

β_{0j} is the average log odds of schools employing high quality teachers in district j; and

β_{1j} is the coefficient measuring the direction and strength of association between school poverty/minority level and the log odds of school employing high quality teachers in district j (net of other school level characteristics); and

β_{2j}- β_{6j} are the corresponding coefficients that indicate the direction and strength of associations between school characteristics and the log odds of school employing high quality teachers in district j (net of other school level characteristics); and

γ_{00} is average log odds of schools employing high quality teachers across districts; and

μ_{0j} is the unique effect of district j on mean log-odds of teacher quality; and

γ_{10} is the average log-odds of poverty/minority slope across districts; and

μ_{1j} is the unique effect of district j on Poverty/minority slope; and

γ_{p0} is average slope of respective school level variables across districts.

Step III: District-level Model with Only Unionization status. At step III, school-level model remained identical to equation 3.7a. When the poverty/minority slope varied across districts, I added district-level unionization status variables to model both the intercept and the poverty/minority slope. As the analysis found that the poverty/minority

[33] Represents a set of dummy-coded indicator variables.
[34] Represents a set of dummy-coded indicator variables.

slope did not vary across districts in modeling some dependent variable (i.e. the proportion of HQTs), I did not add any district-level variables to model the intercept or poverty/minority slope. The rationale is that because modeling slope is to address the second research question of this study, i.e. the effects of districts' unionization status on the intra-district distribution of teacher quality across schools with varying poverty and minority student concentration, there would be no need to further model the slope due to the non-varying nature of the slope. Assuming the poverty/minority slope varies across districts, the level-2 (district-level) model becomes

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Stronger Unionization}) + \gamma_{02}(\text{Weaker Unionization}) + \mu_{0j} \quad [3.8a]$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Stronger Unionization}) + \gamma_{12}(\text{Weaker Unionization}) + \mu_{1j} \quad [3.8b]$$

$$\beta_{pj} = \gamma_{p0} \ (p=2\text{-}6) \quad [3.8c]$$

Where

γ_{00} is the average log odds of employing high quality teachers across districts; and

γ_{01} is the log-odds difference between districts with stronger unionization and districts with non-unionization regarding school employing high quality teachers; and

γ_{02} is the log-odds difference between districts with weaker unionization and districts with non-unionization regarding school employing high quality teachers; and

γ_{10} is the average log-odds of poverty/minority slope across districts; and

γ_{11} is the log-odds difference between districts with stronger unionization and districts with non-unionization regarding the poverty/minority slope; and

γ_{12} is the log-odds difference between districts with weaker unionization and districts with non-unionization regarding the poverty/minority slope; and

$\mu_{0j \text{ and }} \mu_{1j}$ are the unique effect to the intercept and slope associated with district j; and

γ_{p0} is average slope of respective school level variables across districts.

Step IV: Fully Specified District-level Model. At step IV, I added all the district-level control variables to model both the intercept and poverty/minority slope. Below is the final and fully specified school-within-district model. Again, the level-1 model is identical to equation 3.7a, and level-2 model becomes

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Stronger Unionization}) + \gamma_{02}(\text{Weaker Unionization}) + \gamma_{03}(\text{District Poverty/minority composite}) + \gamma_{04}(\text{District Enrollment}) + \gamma_{05}(\text{Urban}) + \gamma_{06}(\text{Residents Edu. Level}) + \gamma_{07}(\text{PPE}) + \gamma_{08}(\text{St-T Ratio}) + \gamma_{09}(\text{Salary Schedule}) + \mu_{0j} \quad [3.9a]$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Stronger Unionization}) + \gamma_{12}(\text{Weaker Unionization}) + \gamma_{13}(\text{District Poverty/minority composite}) + \gamma_{14}(\text{District Enrollment}) + \gamma_{15}(\text{Urban}) + \gamma_{16}(\text{Residents Edu. Level}) + \gamma_{17}(\text{PPE}) + \gamma_{18}(\text{St-T Ratio}) + \gamma_{19}(\text{Salary Schedule}) + \mu_{1j} \quad [3.9b]$$

$$\beta_{pj} = \gamma_{p0} \ (p=2\text{-}6) \quad [3.9c]$$

Where

γ_{00} is the average log odds of having high quality teachers across districts; and

γ_{01} is the log-odds difference between districts with stronger unionization and districts with non-unionization on school having high quality teachers; and

γ_{02} is the log-odds difference between districts with weaker unionization and districts with non-unionization on school having high quality teachers; and

γ_{03}- γ_{09} are the corresponding coefficients that indicate the direction and strength of associations between other district characteristics and the log odds of schools employing high quality teachers (net of other district-level characteristics); and

γ_{10} is the average log-odds of poverty/minority slope across districts; and

γ_{11} is the log-odds difference between districts with stronger unionization and districts with non-unionization on the poverty/minority slope; and

γ_{12} is the log-odds difference between districts with weaker unionization and districts with non-unionization on the poverty/minority slope; and

γ_{13}- γ_{19} are the corresponding coefficients that measure the effect of other district characteristics on the poverty/minority slope (net of other district-level characteristics); and

$\mu_{0j \text{ and }}$ μ_{1j} are the unique effect to the intercept and slope associated with district j; and

γ_{p0} is average slope of respective school level variables across districts.

In summary, the key HGLM models in this dissertation study are the fully specified state-level models (3.4a and 3.5) and the fully specified district-level models (3.9a and 3.9b), which estimate the relationship between unionization status and teacher quality while taking into consideration other control variables. The fully specified state-level models (3.4a and 3.5) seek to address the first research question, namely the relationship between a district's unionization status and teacher quality in the district among the large urban and suburban districts in the U.S. Equation 3.9b addresses the second research question, that is the relationship between a district's unionization status and the intra-district distribution of teacher quality across schools with varying poverty level and minority student concentration in the largest school districts. Chapter 4 presents the results from the descriptive analyses and HGLM analyses.

CHAPTER FOUR: RESULTS

This chapter presents results from analyses conducted to explore the following research questions:

1. What's the relationship between a district's union status (stronger unionization, weaker unionization, no unionization) and teacher quality among the large urban and suburban districts in the U.S.? Teacher quality is measured by:

   a. The proportion of teachers in a district who are classified as high quality by *the empirically-established teacher quality (ETQ) indictor (composed of selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience);*

   b. The proportion of teachers in a district who are classified as high quality by *the NCLB-defined highly qualified teachers (HQT) indicator (composed of at least a bachelor's degree from a four-year institution, full state certification, and competence in the subject area);*

   c. The proportion of teachers in a district who possess one of the following teacher quality components: *selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience.*

2. In the largest US school districts, how does a district's union status affect the intra-district distribution of teacher quality across schools with different poverty status and minority student concentration? Here, teacher quality is measured by:

a. The proportion of teachers in a school who are classified as high quality by *the empirically-established teacher quality (ETQ) indictor*;

b. The proportion of teachers in a school who are classified as high quality by *the NCLB-defined highly qualified teachers (HQT) indicator;*

c. The proportion of teachers in a school who possess one of the following teacher quality components: *selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience.*

I present the results in three sections. The first section presents results for research question one, i.e. whether there is teacher quality differential between unionized and non-unionized large urban and suburban districts. The second section presents findings for research question two, i.e. for the largest districts, whether a district's union status affects the intra-district distribution of teacher quality across schools in the districts. The third section provides working condition comparison analyses between unionized and non-unionized large urban and suburban districts. The supplementary analyses on working conditions intend to provide an insight into how teacher unionization might relate to teacher quality in the large urban and suburban districts.

Each of the first two sections includes results from the descriptive analysis as well as from HGLM modeling. In the descriptive analysis, I present the results in the original

metrics of all variables except for the teacher quality variables for intuitive interpretation. The teacher quality variables are proportions in the HGLM models bounded between "0" and "1" (Note: Due to limit of space, in all the tables reporting HGLM model results, I use "%" to denote proportion in the outcome variavles). I but I present and report the descriptive statistics of teacher quality variables in the metric of percentage for intuitive understanding. In the HGLM modeling, all continuous variables were standardized (i.e. z-scored), and all categorical ones were converted to dummy-coded ones. Therefore, the coefficient estimates in the HGLM models can be interpreted as effect sizes. Note that the reported results are statistically significant at the p level of 0.05, unless otherwise explicitly stated.

Results from the Large Urban and Suburban Districts

This section first presents findings from the descriptive analyses, then results from the Hierarchical Generalized Linear Modeling (HGLM). Descriptive analyses provide information on teacher quality and unionization status across large urban and suburban districts as well as related district-level characteristics. The results from HGLM models explore the relationship between teacher unions and teacher quality after accounting for potential confounding district and state factors.

Descriptive Results

Table 3 presents the descriptive statistics for all the district-level and state-level variables I use in the "Large Urban and Suburban Districts" sample. Table 4 presents descriptive statistics for the same variables but separates the results into subgroups based on districts' unionization status— stronger unionization, weaker unionization, and no

union agreement. Stronger and weaker unionization districts are compared against non-unionized ones. Differences on categorical variables were tested using chi-square test (specifically through the logistic regression technique), and continuous variables using t-test (specifically through the ANOVA multiple comparison technique). Correlation statistics between district-level variables are included in Table 6. In all tables, I weighted the district-level variables using the normalized district weight variable.

Table 3: Descriptive Statistics of Variables in Large Urban and Suburban Districts (District n=480)

		Variables	Mean	SD	Min.	Max.
District Level Variables (district n=480)	DV[b]	% District ETQ Teachers	15.22	16.48	0	79.26
		% District Highly Qualified Teachers (HQTs)	68.58	22.05	0	100
		% District Teachers with at least Five Years of Experience	77.89	17.11	0	100
		% District Teachers with In-field Certifications	70.86	21.56	0	100
		% District Teachers with In-field Degrees	65.52	23.47	0	100
		% District Teachers Who Graduated from Selective Colleges	35.48	25.84	0	100
	IV[b]	Unionization Status				
		Stronger Unionization[a1]	0.58	--	0	1
		Weaker Unionization	0.14	--	0	1
		No Unionization	0.28	--	0	1
		Per Pupil Total Expenditure(X1000)	9.35	2.19	5.34	19.46
		Salary Schedule--Bachelor & No Experience (x1000)	32.71	3.27	24.23	44.51
		Student/Teacher Ratio	17.52	3.18	9.2	26.83
		% District Approved FARL Students	41.46	22.83	0.05	100
		District % Secondary Teachers	37.08	14.21	0	100
		District Minority Student Enrollment				
		% Minority Students	46.3	28.21	0.44	100
		High Minority Enrollment[2]	0.25	--	0	1
		Medium Minority Enrollment	0.50	--	0	1
		Low Minority Enrollment	0.25	--	0	1
		District Student Enrollment				
		Enrollment (X1000)	33.04	63.1	10.01	1,023.67
		Enrollment 25,000 above	0.35	--	0	1
		Enrollment 15,000-24,999	0.29	--	0	1
		Enrollment 10,000-14,999	0.36	--	0	1
		Urbanicity				
		Urban	0.44	--	0	1
		Suburban	0.56	--	0	1
		Residents Edu. Level	23.31	8.31	5.4	48.95
State Level Variable (state N=49)	IV[b]	State Collective Bargaining Law Status				
		Mandatory	0.67	--	0	1
		Permissive	0.20	--	0	1
		Prohibitory	0.12	--	0	1

Notes: Source: SASS 2003-2004; District level used normalized district weight variable (NDFNLWGT). [a] "Stronger Unionization": refers to districts having a collective bargaining contract and where more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or districts having collective bargaining agreements but in which no more than 50% of teachers are union members. [b] "DV" and "IV": Abbreviations for "Dependent variables", and "Independent variables", respectively. [1] Due to rounding, three categories do not add up to 100%. [2] "High, medium and low" refer to the top, middle two and bottom quantiles in terms of percentage of minority students in districts, with cuts being 21% and 69%, respectively.

Table 4: Descriptive Statistics of Variables by Unionization Status in Large Urban and Suburban Districts (District n=480)

Variables		Unionization Categories: [a]Stronger Unionization Mean (SD)	Weaker Unionization Mean (SD)	No Unionization Mean (SD)	Total Mean (SD)
Unweighted N (weighted %)		266 (58.36%)	74 (14.33%)	140 (27.31%)	480 (100%)
% District ETQ Teachers		15.84 (16.53)	16.47 (17.05)	13.24 (16.02)	15.22 (16.48)
% District Highly Qualified Teachers (HQTs)		71.95** (20.84)	64.63 (22.22)	63.46 (23.27)	68.58 (22.05)
% District Teachers with at Least Five Years of Experience		79.67 (16.56)	73.34 (18.96)	76.48 (16.78)	77.89 (17.11)
% District Teachers with In-field Certifications		74.23*** (20.68)	68.48 (22.56)	64.91 (21.58)	70.86 (21.56)
% District Teachers with In-field Degrees		65.49 (24.52)	64.49 (22.72)	66.14 (21.66)	65.52 (23.47)
% District Teachers Who Graduated from Selective Colleges		37.11 (25.58)	36.95 (24.39)	31.22 (26.81)	35.48 (25.84)
Per Pupil Total Expenditure(X1000)		9.79*** (2.52)	8.58 (1.46)	8.82 (1.42)	9.35 (2.19)
Salary Schedule--Bachelor & No Experience (x1000)		32.77 (3.32)	32.40 (2.64)	32.73 (3.46)	32.71 (3.27)
Student/Teacher Ratio		18.60*** (3.39)	17.06 *** (2.61)	15.44 (1.42)	17.52 (3.18)
% District Approved FARL Students		39.69 ~ (23.08)	41.73 (20.33)	45.11 (23.27)	41.46 (22.83)
District % Secondary Teachers		36.99 (15.24)	37.91 (17.86)	36.83 (8.88)	37.08 (14.21)
District Minority Student Enrollment					
	%Minority Student Enrollment	45.63 (29.09)	45.42 (26.64)	48.19 (27.21)	46.30 (28.21)
	High Minority Enrollment	0.26	0.23	0.24	0.25
	Medium Minority Enrollment	0.43**	0.57	0.60	0.50
	Low Minority Enrollment	0.31**	0.20	0.17	0.25
District Student Enrollment					
	Enrollment (X1000)	35.26 (78.95)	32.82 (35.59)	28.40 (24.43)	33.04 (63.10)
	Enrollment 25,000 above	0.33	0.37	0.37	0.35
	Enrollment 15,000-24,999	0.26	0.30	0.34	0.29
	Enrollment 10,000-14,999	0.41*	0.33	0.29	0.36
Urbanicity					
	Urban	0.46	0.49	0.39	0.44
	Suburban	0.54	0.51	0.61	0.56
Residents Edu. Level		24.18** (8.35)	23.14 (7.20)	21.54 (8.54)	23.31 (8.31)
State Law Status					
	Prohibitory	0.00***	0.20***	0.78	0.24
	Mandatory	0.91***	0.35***	0.02	0.59
	Permissive	0.09**	0.45***	0.20	0.17

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; District level used normalized district weight variable (NDFNLWGT); Stronger and weaker unionization groups are compared against non-unionized group. Differences on categorical variables are tested using chi-square test, continuous variables using t-test. [a] "Stronger Unionization": refers to districts having collective bargaining contracts and where more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreements or districts having collective bargaining agreements but in which no more than 50% of teachers are union members. [1]"High, medium and low" refer to the top, middle two and bottom quartiles in terms of percentage of minority students in districts, with cuts being 21% and 69%, respectively.

Description of Large Urban and Suburban Districts

According to the descriptive statistics (see Table 3), slightly more than 15 percent of teachers in an average large district are empirically-established high teacher quality (ETQ) teachers, while about 68[35] percent are classified as NCLB-defined Highly Qualified Teachers (HQTs). Slightly less than 78 percent of teachers in an average large district have at least five years of teaching experience. Also approximately 70 percent of teachers in the average large district are certified in the subject areas and about 65[35]percent hold subject-area degrees. Around 35 percent of teachers graduated from selective colleges.

A majority (58 percent) of the districts have stronger unionization status, which means they have collective bargaining agreements with teacher unions and more than 50 percent of district teachers are union members. Fourteen percent of the districts are weakly unionized, which means that either they are covered by "meet and confer" agreements or they are covered by a collective bargaining contract but no more than 50 percent of district teachers are union members. Twenty-eight percent districts have no union agreement with teacher unions. On average, these large districts spend $9,350[36] per pupil in educating their students, and pay an annual salary of $32,710[37] to novice teachers with bachelors' degree according to districts' salary schedule. With a student-teacher ratio of 17.5, these large districts have an average enrollment of about 33,000 students.

[35] The finding that an average district has higher percentage of HQTs (68 %) than teachers with subject-matter degree (65%), one of HQT's components, is due to the methodology adopted in measuring a teacher's *competence in the subject area* required to be an HQT. In this study, *competence in the subject area* is measured by *full certification in the subject area for elementary school teachers, and by an academic major in each core subject area taught for middle and secondary school teachers.* In the large urban and suburban district sample, an average district has 81.57 % elementary teachers fully-certified in the subject area, which explains the above finding.
[36] Adjusted with CWI.
[37] Adjusted with CWI.

Among the districts, 65 percent have enrollment between 10,000 and 25,000. Slightly over 41 percent of district students are approved for the National Free or Reduced Lunch (FARL) program, and 46 percent of district students are minority students. About 37 percent of teachers in an average large urban and suburban district are secondary school teachers. About 44 percent of the districts are located in urban settings and 56 percent in suburban areas. In an average large urban and suburban district, 23 percent of adults within the district boundaries have at least an associate degree. These large districts are located in 49 states, of which 67 percent (33 states) require districts to have collective bargaining with teacher unions, 20 percent (10 states) grant teacher collective bargaining rights at the discretion of district administrators, and 12[38] percent (6 states) prohibit districts entering collective bargaining agreements with teacher unions.

Differences between Unionized vs. Non-unionized Districts

As shown in Table 4 (above), compared with non-unionized districts (NUDs), strongly unionized districts (SUDs, or districts with stronger unionization) have a higher percentage of "highly qualified teachers" as defined by NCLB (71.95 vs. 63.46) as well as a higher percentage of teachers with in-field certifications (74.23 vs. 64.91). But SUDs are not statistically different from NUDs in teacher quality on the other measures, namely percentage of ETQ teachers, teachers with at least five years of experience, teachers with in-field degrees, or teachers who graduated from selective colleges. Weakly unionized districts (WUDs, or districts with weaker unionization) are not significantly different from NUDs on any of the teacher quality measures.

[38] Percentage does not add up to 100 due to rounding.

In terms of district policies and practices, SUDs tend to spend more in terms of per pupil expenditure[39] than NUDs ($ 9,790 vs. $8,820), but they do not offer statistically higher salaries to new teachers with a bachelors' degree than NUDs after taking into account geographic cost differences. On average, SUDs have a higher student-teacher ratio than NUDs (18.60:1 vs. 15.44:1), which contradicts the findings from previous research that unionized districts tend to have smaller class sizes.

SUDs are different from NUDs in a number of district demographic characteristics. SUDs are more affluent than NUDs as measured by the proportion of students approved for the National Free or Reduced Lunch program (39.69 vs. 45.11 percent, $p<0.10$) and their communities tend to have more educated work force as measured by the percentage of college degree holders within district boundaries (24.18 vs. 21.54 percent). Though SUDs and NUDs are not significantly different in terms of their overall student enrollment or minority student concentration, SUDs are more likely to fall into the category of relatively small districts (10,000-14,999) and low-minority student districts (less than 21% of minority students). The percentage of secondary school teachers in SUDs is not significantly different from that in NUDs, and SUDs are equally likely as NUDs to be located in urban or suburban settings.

In congruence with literature and unionization theory, state collective bargaining laws have an instrumental influence on districts' unionization. An overwhelming majority of SUDs (91 percent) are located in states with mandatory bargaining laws and the rest in states that grant teachers permissive bargaining rights. Not surprisingly, no SUD is located in a state that prohibits districts from collective bargaining. Close to half of WUDs (45 percent) are located in states that grant teachers permissive bargaining

[39] Adjusted with CWI.

rights and 35 percent in states that mandate districts to enter collective bargaining contracts with teachers. The majority of NUDs (78%) are located in states that prohibit teachers from collective bargaining. Yet even in states that require collective bargaining some teachers choose not to do so, as evidenced by the two percent of NUDs located in mandatory states, a fact also documented by Hess and Kelly (2005). In order to further gauge the law status effect on teacher unionism, I performed a separate analysis examining districts' unionization status according to states' collective bargaining law status (see Table 5).

Table 5: District Unionization Status by State Law Status

	State Law Status			
	Require	Permit	Prohibit	Total
	Mean	Mean	Mean	Mean
unweighted N(weighted%)	267(58.8%)	93 (16.9%)	120(24.2%)	480 (100%)
Stronger Unionization	0.91	0.30	0.00	0.58
Weaker Unionization	0.08	0.38	0.12	0.14
No Unionization	0.01	0.32	0.88	0.27

Source: SASS 2003-2004

The separate analysis reveals that when states prohibit teachers from collective bargaining, the majority of districts choose not to unionize (88 percent) and a small portion (12 percent) has weaker unionization status. When states grant teachers permissive collective bargaining rights, districts are roughly equally split among the three unionization forms: stronger unionization, weaker unionization, and non unionization. In states with mandatory collective bargaining laws, though the majority of districts (91 percent) have stronger unionization, one percent chooses not to unionize and eight percent are weakly unionized.

Correlations among District-level Variables

As the bivariate correlations in Table 6 indicate, the two teacher quality composite variables are inter-correlated (r=0.218). Also as expected, the two composite measures correlate with their component variables, correlations varying from low to high (r=0.141-0.692 for ETQ and r=0.607-0.817 for HQT). Unionization status variables correlate with a number of district characteristics variables, which corresponds to the findings from the above subgroup comparisons. Per pupil expenditure (PPE) is positively correlated with salary schedule (r=0.260), but negatively related to student-teacher ratio (r=-0.337). This makes sense in that teacher salary makes up the biggest chunk of district spending; and as class size increases, fewer teachers are needed, and per pupil expenditure will decrease. Salary schedule for novice teachers positively correlates with district poverty status and percentage of minority students, which may reflect district practices that utilize financial incentives to attract new teachers to their districts as documented by recent literature and studies (Prince, 2003; Koski & Horng, 2007). Proportion of residents with a college degree is negatively correlated with district poverty level (r=-0.66) and percentage of minority students (r=-0.41).

Summary of descriptive results

In summary, the descriptive results suggest some trends across the large urban and suburban districts in terms of their unionization status. The majority (about 72 percent) of large urban and suburban districts in the U.S. are unionized. Generally speaking, districts with stronger unionization status (SUDs) exhibit some differences from non-unionized districts (NUDs); and weakly unionized districts (WUDs) do not differ much from their non-unionized counterparts. Compared with NUDs, SUDs tend to have a higher concentration of HQTs and teachers with in-field certifications. SUDs

spend more in educating each student, and tend to have larger class sizes. SUDs are located in more affluent and more educated communities.

Table 6: Correlations between District Variables in Large Urban and Suburban Districts (n=480)

	% ETQ	% HQT	% Emperienced	% Certified	% In-field Degree	% Selectivity	Stronger Union	Weaker Union	No Union	PPE	Salary Schedule
% ETQ											
% HQT	.218**										
% Emperienced	.141**	-									
% Certified	.245**	.817**	.094*								
% In-field Degree	.322**	.607**	-	.445**							
% Selectivity	.692**	-	-	-	-						
Stronger Union	-	.181**	.123**	.185**	-	-					
Weaker Union	-	-	-.109*	-	-	-	-.484**				
No Union	-	-.142**	-	-.169**	-	-.101*	-.726**	-.251**			
PPE	-	.115*	-	.092*	.124**	-	.238**	-.145**	-.150**		
Salary Schedule	-.175**	-	-	-	-.172**	-.187**	-	-	-	.260**	
St-tch Ratio	-	-	-	-	-.186**	-	.404**	-	-.401**	-.337**	.127**
% FARL	-.193**	-	-	-	-	-.268**	-.092*	-	.098*	.150**	.173**
% Second Tch	-	-	-	-	.137**	.134**	-	-	-	-	-
% Min St.	-.263**	-	-	-	-.213**	-.244**	-	-	-	.096*	.352**
High Min.	-.232**	-	-	-	-.150**	-.230**	-	-	-	.103*	.264**
Med. Min.	.113*	-	-	-	-	.118**	-.155**	-	.122**	-	-
Low Min.	.101*	-	.113*	-	.131**	.093*	.146**	-	-.121**	-	-.230**
Enrollment	-	-	-	-	-	-	-	-	-	-	-
Size (>25000)	-	-	-	-	-	-	-	-	-	-	-
Size (15000-24999)	-	-	-	-	-	-	-	-	-	-	-
Size (10000-14999)	-	-	.096*	-	-	-	.112*	-	-.100*	-	-
Urban	-.094*	-	-	-	-	-.146**	-	-	-	.169**	.183**
Suburban	.094*	-	-	-	-	.146**	-	-	-	-.169**	-.183**
Edu Level	.204**	-	-	-	-	.334**	.124**	-	-.131**	-	-.156**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6: Correlations between District Variables in Large Urban and Suburban Districts (n=480) continued

	St-tch Ratio	% FARL	% Second Tch	% Min St.	High Min.	Med. Min.	Low Min.	Enroll't	Size (>25000)	(15000-24999)	(10000-14999)	Urban	Suburban	Edu Level
St-tch Ratio														
% FRL	-.116*													
% Second Tch	-	-.286**												
% Min St.	-	.626**	-.216**											
High Min.	-	.534**	-.200**	.808**										
Med. Min.	-	-.162**	-	-.097*	-.574**									
Low Min.	-	-.346**	.098*	-.693**	-.337**	-.578**								
Enrollment	-	.132**	-	.197**	.167**	-	-.128**							
Size (>25000)	-	.140**	-	.270**	.182**	-	-.214**	.383**						
Size (15000-24999)	-	-	-	-	-	-	-	-.137**	-.465**					
Size (10000-14999)	.093*	-.102*	-	-.191**	-.145**	-	.171**	-.249**	-.552**	-.482**				
Urban	-	.330**	-	.313**	.260**	-	-.188**	-	-	-	-	-1.000**		
Suburban	-	-.330**	-	-.313**	-.260**	-	.188**	-	-	-	-	-.129**	.129**	
Edu Level	-	-.659**	.161**	-.413**	-.354**	.145**	.186**	-	-	-	-	-	-	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Results from Hierarchical Generalized Linear Modeling (HGLM) Analyses

HGLM analyses assess the extent to which districts' unionization status influences the proportions of high quality teachers across large urban and suburban districts across the nation. Though the variation among states in teacher quality is not the focus of this study, due to the impact of state collective bargaining law on teacher unionization in a particular state, I first constructed a fully unconditional model to gauge the variation among states. In the HGLM analyses, all categorical variables were dummy-coded (coded 1 and 0) and continuous variables were standardized (z-scored with Mean=0, and SD=1). This decision simplifies the interpretation of coefficients, and enables comparisons of the relative magnitude of coefficients. Independent variables with positive coefficients indicate a higher likelihood of employing high quality teaches, whereas negative coefficients suggest an association with lower likelihood. Results from binomial HGLM models are reported in log-odds metric. For easier interpretation, in reporting the results I frequently translated the log-odds metric into odds metric, which allows an estimate of the percent increase or decrease of the odds of having high quality teachers. As stated in the Methodology chapter, I built the fully-specified model in a step-wise fashion.

Step I: Fully Unconditional Models

Table 7 presents the results from the unconditional models on the two composite teacher quality measures, as well as on each of their component variables.

Table 7: Step I Models—Fully Unconditional Models

	% ETQ		% HQT		% Experienced		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
Intercept	-1.65*** (0.09)	0.19	0.81*** (0.05)	2.25	1.24*** (0.05)	3.44	0.89*** (0.05)	2.42	0.82*** (0.06)	2.27	-0.64*** (0.10)	0.53
Reliability, Intercept	0.65		0.43		0.42		0.43		0.58		0.80	
Variance Component (τ_{00}), Intercept	0.25***		0.05***		0.06***		0.05***		0.10***		0.44***	

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; weighted by normalized district final weight; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded.

The results indicate across the U.S. the average log odds of large urban and suburban districts employing ETQ teachers and HQTs are -1.65 and 0.81, respectively. Converting log odds to probabilities (p=1/{1+exp(-log-odds)}, we see that these districts are about four times more likely to have HQTs than ETQ teachers (probabilities: 0.69 vs. 0.16). The large urban and suburban districts have similar probabilities of employing experienced teachers, in-field certified teachers and teachers with in-field degrees (probabilities =0.69-0.77), but have a much lower probability of employing teachers who graduated from selective colleges (probabilities=0.35). Given the high correlation between the selectivity component and ETQ (r=0.69 from Table 6), it is not surprising to have the above finding that districts have relatively low probabilities of employing EQT teachers.

The unconditional models also provide valuable information about the between-state variability in teacher quality. Given the estimate of τ_{00}=0.25 and τ_{00}=0.05 for EQT and HQT respectively, we expect 95% of the states to have log-odds of districts employing EQT teachers between -2.63 to -0.67[40], and HQTs between 0.38 and 1.24. Converting to probabilities, the results reveal that states' average district concentration of ETQ teachers range from 0.07 to 0.34, and HQTs from 0.59 to 0.78. Results from modeling the teacher quality component variables show that between-state variability is

[40] Calculated from equation: -1.65±1.96*$\sqrt{0.25}$

smaller for district proportion of experienced teachers (probability=0.69-0.85), district proportion of in-field certified teachers (probability=0.61-0.79), and district proportion of teachers with in-field degree (probability=0.55-0.81). States vary more in their districts' probability of employing teachers who graduated from selective colleges, ranging from 0.13 to 0.66. This between-state variability in teacher quality measures indicates that including state-level measures could be fruitful in explaining the variability; therefore it provides empirical support for the need to use multilevel methods, beyond the theoretical rationale offered in the Methodology chapter.

Step II: District-level HGLM Models with Only Unionization Status

District-level HGLM models explore how district-level characteristics are associated with the teacher quality outcomes before controlling for state characteristics. In step II following the fully-unconditional models, I constructed my models by adding the primary variables of interest, i.e. districts' unionization status, to examine union effects without controlling for any other variables.

Table 8: Step II models—District-level HGLM Models with Only Unionization Status Variables

	% ETQ		% HQT		% Experienced		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District-level equation: effects on district proportion of high quality teachers within states												
Intercept	-1.68*** (0.09)	0.19	0.79*** (0.05)	2.20	1.22*** (0.05)	3.40	0.86*** (0.05)	2.37	0.81*** (0.07)	2.24	-0.63*** (0.12)	0.53
Stronger Unionization[1]	0.19 (0.15)	1.21	0.27* (0.11)	1.31	0.09 (0.10)	1.10	0.24* (0.12)	1.26	0.14 (0.12)	1.15	-0.06 (0.24)	0.94
Weaker Unionization[1]	-0.04 (0.15)	0.96	0.00 (0.10)	1.00	-0.23* (0.09)	0.79	-0.06 (0.13)	0.94	-0.13 (0.09)	0.88	-0.04 (0.21)	0.96
Reliability, Intercept	0.65		0.44		0.43		0.44		0.60		0.81	
Variance Component (τ_{00}), Intercept	0.25***		0.05***		0.06***		0.05***		0.12***		0.45***	

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; weighted by normalized district final weight; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; [1]Reference group "no unionization" , indicating districts having no union agreement; "Stronger Unionization": refers to districts having a collective bargaining contract and in which more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but in which less than 50% (inclusive) of teachers are union members.

Results from step II models (see Table 8) indicate that compared with non-unionized districts (NUDs), districts with stronger teacher unionization (SUDs) are more

likely to employ HQTs (log-odds=0.27, or odds=1.31 or a 31 percent increase of the odds), but are equally likely to have ETQ teachers. Weakly unionized districts (WUDs) are not statistically significantly different from NUDs in terms of employing ETQ teachers or HQTs.

Examining the effects of unionization on the teacher quality component measures reveal that the log-odds of having in-field certified teachers is higher in SUDs (log-odds=0.24 or an increase of odds of 26 percent) than in NUDs, but there exists no significant difference between WUDs and NUDs. SUDs are not significantly different from NUDS in log-odds of employing in-field degree teachers, experienced teachers or teachers who graduated from selective colleges. A noteworthy finding is that WUDs demonstrate some very different patterns from SUDs in employing more experienced teachers. Specifically, in comparison with NUDs, WUDs are *less* likely to have teachers with at least five years of teaching experience (log-odds=-0.23, or odds=0.79 or a decrease of odds of 1-0.79=0.21**).** WUDs are not significantly different from NUDs in terms of the other teacher quality indicators, namely ETQ, HQT, teachers with in-field certifications or degrees, or teachers who graduated from selective colleges.

Table 9: Step III models—District-level HGLM Models with Demographic Controls

	% ETQ		% HQT		% Experienced		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District-level equation: effects on district proportion of high quality teachers within states												
Intercept	-1.70***		0.80***		1.25***		0.89***		0.82***		-0.63***	
	(0.09)	0.18	(0.06)	2.22	(0.05)	3.50	(0.05)	2.43	(0.06)	2.26	(0.11)	0.53
Stronger Unionization[1]	0.25~		0.26*		0.13		0.22		0.17		-0.01	
	(0.15)	1.28	(0.12)	1.30	(0.09)	1.14	(0.14)	1.24	(0.12)	1.19	(0.22)	0.99
Weaker Unionization[1]	0.00		0.00		-0.20*		-0.05		-0.09		0.01	
	(0.12)	1.00	(0.11)	1.00	(0.08)	0.81	(0.14)	0.95	(0.09)	0.91	(0.16)	1.01
Urban[2]	0.06		0.08		0.07		0.07		0.03		-0.05	
	(0.14)	1.06	(0.12)	1.08	(0.13)	1.07	(0.08)	1.07	(0.06)	1.04	(0.11)	0.95
Size(over 25,000)[3]	0.13		0.01		-0.13		-0.03		0.03		0.11	
	(0.19)	1.13	(0.14)	1.01	(0.13)	0.88	(0.14)	0.97	(0.08)	1.03	(0.20)	1.12
Size(15,000-24,999)[3]	0.28~		0.13		-0.32*		0.17~		0.07		0.13	
	(0.15)	1.32	(0.10)	1.14	(0.16)	0.72	(0.09)	1.18	(0.10)	1.07	(0.16)	1.14
High Min. Enrollment[4]	-0.23		-0.03		-0.33***		0.03		-0.15		-0.10	
	(0.19)	0.80	(0.22)	0.97	(0.07)	0.72	(0.21)	1.03	(0.11)	0.86	(0.17)	0.91
Low Min.Enrollment[4]	-0.02		0.28*		0.31**		0.35**		0.07		-0.14	
	(0.13)	0.98	(0.13)	1.33	(0.11)	1.37	(0.11)	1.41	(0.13)	1.07	(0.13)	0.87
District % Secondary Teachers	0.06		-0.13*		-0.05		-0.09		0.04		0.06	
	(0.06)	1.06	(0.06)	0.88	(0.04)	0.95	(0.07)	0.92	(0.05)	1.04	(0.04)	1.06
% FARL	0.03		-0.05		0.02		-0.06		-0.07		-0.01	
	(0.08)	1.03	(0.07)	0.95	(0.07)	1.02	(0.07)	0.94	(0.07)	0.94	(0.07)	0.99
Residents Edu. Level	0.24*		-0.10~		-0.07		-0.11~		-0.04		0.31***	
	(0.09)	1.27	(0.05)	0.91	(0.06)	0.93	(0.06)	0.90	(0.06)	0.96	(0.06)	1.36
Reliability, Intercept	0.62		0.45		0.37		0.41		0.58		0.78	
Variance Component (τ_{00}), Intercept	0.21***		0.05***		0.04***		0.05***		0.10***		0.38***	

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; weighted by normalized district final weight; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; [1]Reference group "no unionization" , indicating districts having no union agreement; "Stronger Unionization": refers to districts having a collective bargaining contract and in which more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but in which less than 50% (inclusive) of teachers are union members; [2] reference group "Suburban"; [3] Reference group "district enrollment 10,000-14,999"; [4] Reference group "medium minority student enrollment". "High, medium and low" refer to the top, middle two and bottom quartile in terms of percentage of minority students in districts, with cuts being 21% and 69%, respectively.

Step III: District-Level (Level-1) Models with Demographic Controls

Results from Step III models (see Table 9) focus on unionization effects after controlling for the possible effects of district demographic variables on districts' likelihood of hiring high quality teachers. The likelihood of SUDs having HQTs remains virtually unchanged (log-odds=0.26) after controlling for districts' size, urbanicity, poverty level, minority student concentration, percentage of secondary school teachers, and residents' education level within district boundary. Yet, holding constant the district demographic characteristics, the effects of SUDs on the likelihood of employing ETQ teachers increased. Now, SUDs are significantly more likely to have ETQ teachers (log-odds=0.25, or an increase of odds of 28 percent, p<.10) than NUDs. The inclusion of these demographic variables also demonstrates that district proportions of ETQ teachers

or HQTs vary with district characteristics. In the model on ETQ, districts with student enrollment of between 15,000 and 24,999 have a higher likelihood of employing ETQ teachers than districts with 10,000 to 14,999 enrolled students (log-odds=0.28, or an increase of odds of 32 percent, $p<.10$). The higher percentage residents having college education within district boundary, the more likely a district to have ETQ teachers (log-odds =0.24 or an increase of odds of 27 percent). A puzzling finding about residents' education level is its effect on HQT. A standard deviation increase in the percentage of residents with college degree and above is associated with a 9 percent *decrease* in the odds of employing HQTs. We would typically assume that a more educated workforce would increase teacher quality in the schools. But here the results suggest a different story in the large urban and suburban schools when using NCLB's definition of teacher quality. Low minority student enrollment is positively associated with HQT concentration, which is not surprising. Compared with districts with medium minority student enrollment, low-minority districts have 33 percent greater odds of having HQTs. In addition, a district's composition of grade levels is associated with districts' concentration of HQTs. As expected, districts with more secondary school teachers are less likely to have HQTs (log odds=-0.13 or a reduction of odds of 12 percent).

Examination of the teacher quality component variables reveals similar trends. After accounting for district demographic characteristics, the effects of unionization status on districts' concentration of experienced teachers, teachers with in-field degree and teachers who graduated from selective colleges remain virtually unchanged. Stronger unionization status still has no significant effect on proportions of experienced teachers, teachers with in-field degrees or teachers who graduated from selective colleges. One

exception is the effect on the proportion of teachers with in-field certification. Holding constant district demographic characteristics, SUDs are no longer significantly different from NUDs in employing teachers with in-field certification. The effects of weakly unionization status on districts' ability to employ high quality teachers remain virtually unchanged after adjusting districts' demographic characteristics. WUDs are still less likely to have experienced teachers than NUDs (log-odds=-.0.20, or an odds decreases of 19 percent), and they are not significantly different from NUDs in employing high quality teachers as measured by the rest of the indicators.

District demographic variables are associated with the teacher quality component variables too. All else equal, compared with districts enrolling 10,000 to 14,999 students, districts with enrollment of 15,000 to 24,999 are less likely to have experienced teachers(log-odds=-0.32), but more likely to have teachers with in-field certification (log-odds=0.17, $p<0.10$). Compared with medium-minority districts, high-minority districts are less likely to have experienced teachers (log-odds=-0.33 or a 28 percent decrease of odds), while low-minority districts have a higher likelihood to have experienced teachers (log-odds=0.31 or a 37 percent increase of odds) and teachers with in-field certifications (log-odds=0.35 or an increase of odds of 41 percent). Thus there exists a teacher quality gap between districts with varying minority student enrollment: the more minority students, the less likely for a district to employ teachers with in-field certifications or retain experienced teachers.

The average education level of residents in a district community exerts differential effects on districts' concentration of teacher quality as measured by the component variables. A standard deviation increase in the percentage of residents with at

least an associate's degree is related to a 10 percent decrease in the odds of employing in-field certified teachers (log-odds=-.11, $p<0.10$), but is positively associated with the likelihood of employing teachers who graduated from selective colleges (log-odds=0.31, or a 36 percent increase in the odds). Given the binary correlations findings (see Table 6) that ETQ is highly correlated with the selectivity measure (r=0.69) and HQT is highly correlated with the in-field certification measure (r=0.82), it is no surprise that resident education level has positive effects on both ETQ and the college selectivity measure, but negative effects on both HQT and in-field certification measures.

Step IV: Fully Constructed District-level Models

I build step IV models on top of step III models by including variables measuring district practices and policies, which are districts' per pupil expenditure (PPE), student-teacher ratio, and salary schedule for new teachers with a bachelor's degree. After taking into consideration district demographic characteristic and policy practices, the effects of stronger unionization on ETQ and HQT both are reduced (see Table 10). Specifically, the effect of stronger unionization on ETQ drops from log-odds 0.25 to log-odds 0.20 and is no longer statistically significant ($p<0.10$), and the effect on HQT is no longer significant at the 0.05 level, but only significant at 0.10 level though its magnitude remains at log-odds 0.26, unchanged from step III model. Results from step IV model also indicate that districts' PPE is positively associated with districts' proportion of ETQ teachers. Holding all else equal, one standard deviation increase of PPE increases the odds of employing ETQ teachers by 11 percent (log-odds=0.11 or odds=1.11). Yet, none of the district practices and policies measures is associated with the likelihood of employing

HQTs. The effects of weaker unionization remain non-significant on both the ETQ and HQT measures.

Table 10: Step IV models—Fully Constructed District-level HGLM Models

	% ETQ		% HQT		% Experienced		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District-level equation: effects on district proportion of high quality teachers within states												
Intercept	-1.71*** (0.10)	0.18	0.78*** (0.06)	2.18	1.23*** (0.05)	3.42	0.88*** (0.05)	2.41	0.78*** (0.08)	2.19	-0.65*** (0.11)	0.52
Stronger Unionization[1]	0.20 (0.15)	1.22	0.26~ (0.14)	1.30	0.19* (0.09)	1.21	0.22 (0.14)	1.25	0.22~ (0.13)	1.25	-0.04 (0.21)	0.96
Weaker Unionization[1]	0.00 (0.11)	1.00	0.00 (0.10)	1.00	-0.19* (0.08)	0.83	-0.05 (0.14)	0.95	-0.10 (0.09)	0.91	0.01 (0.16)	1.01
Urban[2]	0.03 (0.14)	1.03	0.06 (0.12)	1.06	0.02 (0.12)	1.02	0.05 (0.08)	1.06	0.03 (0.06)	1.03	-0.05 (0.10)	0.96
Size(over 25,000)[3]	0.16 (0.19)	1.17	0.03 (0.14)	1.03	-0.11 (0.12)	0.90	-0.02 (0.13)	0.98	0.02 (0.08)	1.02	0.12 (0.20)	1.13
Size(15,000-24,999)[3]	0.30~ (0.16)	1.34	0.14 (0.10)	1.15	-0.32* (0.16)	0.73	0.17~ (0.09)	1.18	0.06 (0.10)	1.07	0.14 (0.16)	1.15
High Min. Enrollment[4]	-0.22 (0.19)	0.80	-0.03 (0.22)	0.97	-0.31*** (0.07)	0.74	0.04 (0.21)	1.04	-0.13 (0.11)	0.88	-0.10 (0.17)	0.91
Low Min.Enrollment[4]	0.01 (0.14)	1.01	0.28* (0.13)	1.33	0.33** (0.11)	1.39	0.34** (0.11)	1.41	0.06 (0.13)	1.06	-0.12 (0.13)	0.88
District % Secondary Teachers	0.04 (0.06)	1.04	-0.14* (0.05)	0.87	-0.05 (0.04)	0.95	-0.09 (0.07)	0.91	0.05 (0.05)	1.05	0.05 (0.04)	1.05
% FARL	0.02 (0.08)	1.02	-0.06 (0.07)	0.94	0.00 (0.07)	1.00	-0.07 (0.07)	0.94	-0.08 (0.07)	0.93	-0.02 (0.07)	0.98
Residents Edu. Level	0.24* (0.10)	1.28	-0.11* (0.06)	0.90	-0.07 (0.06)	0.93	-0.11~ (0.06)	0.89	-0.05 (0.07)	0.95	0.29*** (0.07)	1.34
PPE[5]	0.11* (0.04)	1.11	0.04 (0.03)	1.04	0.02 (0.05)	1.02	0.02 (0.04)	1.02	-0.03 (0.06)	0.97	0.10* (0.04)	1.10
Student-teacher Ratio	0.02 (0.10)	1.02	-0.03 (0.06)	0.97	-0.14~ (0.08)	0.87	-0.04 (0.05)	0.97	-0.13 (0.09)	0.87	0.05 (0.12)	1.05
Salary Schedule -Bachelor w/o experience[5]	0.07 (0.07)	1.07	-0.01 (0.05)	0.99	0.07* (0.03)	1.07	0.01 (0.05)	1.01	-0.03 (0.06)	0.97	-0.06 (0.05)	0.94
Reliability, Intercept	0.64		0.48		0.41		0.46		0.57		0.78	
Variance Component (τ_{00}), Intercept	0.23***		0.06***		0.05***		0.06***		0.10***		0.36***	

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; weighted by normalized district final weight; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; [1]Reference group "no unionization" , indicating districts having no union agreement; "Stronger Unionization": refers to districts having a collective bargaining contract and in which more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but in which less than 50% (inclusive) of teachers are union members; [2] reference group "Suburban"; [3] Reference group "district enrollment 10,000-14,999"; [4] Reference group "medium minority student enrollment". "High, medium and low" refer to the top, middle two and bottom quartile in terms of percentage of minority students in districts, with cuts being 21% and 69%, respectively. [5]Adjusted using comparable wage index (CWI).

It is noteworthy that the district policies and practices variables have a suppressor effect on the stronger unionization variable when modeling two of the teacher quality component variables, namely, proportion of experienced teaches and proportion of teachers within in-field degrees. The log-odds for SUDs to have experienced teachers increases from 0.13 (non-sig.) to 0.19 ($p<0.05$) after controlling for student-teacher ratio, PPE, and salary schedule for novice teachers with a bachelor's degree. And the log-odds

for SUDs to have teachers with in-field degrees increases from 0.17 (non-sig.) to 0.22 (P<0.10). Yet, the inclusion of the district practice and policy variables does not change the effects of unionization variables on the rest of teacher quality component variables, namely proportions of in-field certified teachers and teachers who graduated from selective colleges. Student-teacher ratio and salary schedule have small but significant effects on proportion of experienced teachers in a district, though working in opposing directions (for student-teacher ratio log-odds=-0.14 or a 13 percent decrease of odds, p<.10, and for salary log-odds =0.07 or a seven percent increase of odds). One SD increase in PPE slightly increases the odds of districts employing teachers who graduated from selective colleges (log-odds=0.1 or a 10 percent increase in the odds). The effects of weaker unionization on the four teacher quality component variables remain unchanged from those of the model specifications in step III.

Step V: Final models—Fully Specified State-level Models

Table 11 presents results from the final models after accounting for related district and state variables that might have confounding effects on teacher quality. Results from these models indicate that stronger unionization status has a large effect on districts employing HQTs and has no statistically significant effect on districts' proportion of ETQ teachers. After accounting for state and district characteristics, the odds of employing HQTs in SUDs are 56 percent higher than in NUDs (log-odds=0.45). States with mandatory laws have an average lower proportion of HQTs. Specifically, compared with states with mandatory collective bargaining laws, states where teachers have permissive collective bargaining rights and states that prohibit districts from entering collective bargaining with unions are more likely to have HQTs (log-odds=0.36 p<0.10,

and log-odds=0.35, respectively).[41] The fact that the coefficient of stronger unionization in modeling HQT increases after the inclusion of state collective bargaining law status variables suggests collective bargaining law has a suppressor effect on stronger unionization. The suppressor effect of law status indicates that district unionization status interacts with state law status to affect district proportion of HQTs. For example, the combined effect of stronger unionization and permissive law status on HQTs is 0.81 log-odds (i.e. 0.45+0.36), while the combined effect of stronger unionization and mandatory law status is 0.45. I will provide a more in-depth possible explanation for the state law effect and guidance for future research in Chapter Five.

The collective bargaining law status has no statistically significant effect on the likelihood of districts employing ETQ teachers. The inclusion of a state's collective bargaining law status does not change much the effects of other predictors on ETQ and HQT, except for PPE's effect in the HQT model. One standard deviation increase in PPE now is slightly associated with a higher likelihood of districts employing HQTs (log-odds=0.06, or an odds increase of 6 percent, $p<0.10$).

In models on teacher quality component variables, the inclusion of state collective bargaining law status boosts the effect of stronger unionization on proportion of experienced teachers (log-odds from 0.19 to 0.22 [$p<0.10$]), proportion of in-field certified teachers (log-odds from 0.22 [non-sig.] to 0.36), and proportion of teachers with in-field degree (log-odds from 0.22 [$p<0.10$] to 0.34). Compared with states having mandatory collective bargaining laws, states prohibiting districts from entering collective bargaining agreements have a higher average proportion of in-field certified teachers

[41] I ran models without the unionization status variables, and found state law status has no significant effect on average district proportion of HQT.

(log-odds=0.25, $p<0.10$) and teachers with in-field degrees (log-odds=0.36) after taking into consideration district unionization status and other variables. Similar to the law's effect when modeling HQT, law status also has a suppressor effect on stronger unionization status when modeling proportions of experienced teachers, teachers with in-field certifications, and teachers with in-field degree.

Table 11: Step V Models—Fully Specified State-Level Models
(District n=480; State n=48)

	% ETQ		% HQT		% Experienced		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District-level equation: effects on district proportion of high quality teachers within states												
Intercept	-1.73*** (0.10)	0.18	0.75*** (0.06)	2.11	1.23*** (0.05)	3.41	0.85*** (0.06)	2.35	0.76*** (0.08)	2.14	-0.65*** (0.11)	0.52
Stronger Unionization[1]	0.30 (0.20)	1.35	0.45** (0.16)	1.56	0.22~ (0.11)	1.24	0.36* (0.18)	1.43	0.34* (0.15)	1.41	-0.11 (0.25)	0.90
Weaker Unionization[1]	0.06 (0.15)	1.06	0.08 (0.13)	1.09	-0.19* (0.09)	0.82	0.00 (0.17)	1.00	-0.06 (0.10)	0.95	-0.02 (0.17)	0.98
Urban[2]	0.04 (0.14)	1.04	0.07 (0.12)	1.08	0.02 (0.12)	1.02	0.06 (0.09)	1.06	0.03 (0.07)	1.03	-0.05 (0.10)	0.95
Size(over 25,000)[3]	0.15 (0.19)	1.17	0.02 (0.14)	1.02	-0.11 (0.12)	0.90	-0.02 (0.13)	0.98	0.01 (0.08)	1.01	0.12 (0.21)	1.13
Size(15,000-24,999)[3]	0.30~ (0.16)	1.35	0.14 (0.10)	1.16	-0.32~ (0.16)	0.73	0.17~ (0.10)	1.19	0.07 (0.10)	1.07	0.14 (0.16)	1.15
High Min. Enrollment[4]	-0.22 (0.19)	0.80	-0.03 (0.22)	0.97	-0.30*** (0.08)	0.74	0.03 (0.21)	1.03	-0.13 (0.12)	0.88	-0.10 (0.18)	0.91
Low Min.Enrollment[4]	0.01 (0.14)	1.01	0.27* (0.12)	1.31	0.31** (0.11)	1.37	0.33** (0.11)	1.40	0.05 (0.13)	1.05	-0.12 (0.13)	0.88
District % Secondary Teachers	0.03 (0.06)	1.03	-0.15** (0.05)	0.86	-0.05 (0.05)	0.95	-0.10 (0.06)	0.90	0.04 (0.05)	1.04	0.06 (0.04)	1.06
% FARL	0.02 (0.08)	1.02	-0.06 (0.07)	0.94	0.00 (0.07)	1.00	-0.07 (0.07)	0.93	-0.08 (0.07)	0.92	-0.02 (0.07)	0.98
Residents Edu. Level	0.24* (0.10)	1.28	-0.11* (0.05)	0.89	-0.07 (0.06)	0.93	-0.12~ (0.06)	0.89	-0.06 (0.06)	0.95	0.29*** (0.07)	1.34
PPE[5]	0.12* (0.05)	1.12	0.06~ (0.03)	1.06	0.02 (0.06)	1.02	0.04 (0.04)	1.04	-0.02 (0.06)	0.98	0.09~ (0.05)	1.09
Student-teacher Ratio	0.03 (0.10)	1.03	-0.02 (0.06)	0.98	-0.15~ (0.08)	0.86	-0.03 (0.05)	0.97	-0.13 (0.09)	0.88	0.04 (0.12)	1.04
Salary Schedule -Bachelor w/o experience[5]	0.07 (0.07)	1.07	-0.01 (0.04)	0.99	0.07* (0.03)	1.07	0.01 (0.04)	1.01	-0.04 (0.06)	0.97	-0.06 (0.05)	0.94
State-level equation: effects on mean district proportion of high quality teachers between states												
Prohibitory [6]	0.22 (0.26)	1.25	0.35* (0.14)	1.42	0.18 (0.13)	1.20	0.25~ (0.14)	1.28	0.36* (0.16)	1.44	-0.33 (0.31)	0.72
Permissive [6]	0.28 (0.37)	1.32	0.36~ (0.18)	1.43	0.01 (0.18)	1.01	0.26 (0.18)	1.29	0.22 (0.16)	1.25	-0.24 (0.41)	0.78
Reliability, Intercept	0.64		0.46		0.42		0.45		0.56		0.78	
Variance Component (τ_{00}), Intercept	0.23***		0.06***		0.06***		0.06***		0.09***		0.38***	

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; weighted by normalized district final weight; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; [1]Reference group "no unionization" , indicating districts having no union agreement; "Stronger Unionization": refers to districts having a collective bargaining contract and in which more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but in which less than 50% (inclusive) of teachers are union members; [2] reference group "Suburban"; [3] Reference group "district enrollment 10,000-14,999"; [4] Reference group "medium minority student enrollment". "High, medium and low" refer to the top, middle two and bottom quartile in terms of percentage of minority students in districts, with cuts being 21% and 69%, respectively. [5]Adjusted using comparable wage index (CWI); [6] Reference group "Mandatory". Mandatory refers to state law requiring districts to engage in collective bargaining with unions; permissive refers to teachers having permissive collective bargaining rights at the discretion of the employer; prohibitory refers to teachers prohibited from having collective bargaining rights.

Summary of Key Findings from HGLM models

In summary, among large urban and suburban districts in the U.S., strongly unionized districts (SUDs) have a higher likelihood of employing a high quality teaching workforce as measured by some but not all of the teacher quality indicators. Specifically, SUDs are more likely to have high quality teachers as defined by the NCLB "highly

qualified teachers" (HQTs) indicator (log-odds=0.45), but not by the empirically-defined teacher quality (ETQ) indicator. By exploring the association between unionization and components of the above teacher quality indicators, this study finds that compared with NUDs, SUDs have higher concentrations of teachers with at least five years of experience (log-odds=0.22), teachers with in-field degrees (log-odds=0.34), and teachers with in-field certifications (log-odds=0.36). Findings also reveal that SUDs are not significantly different from non-unionized districts in employing teachers who graduated from selective postsecondary institutions. Weakly unionized districts (WUDs) are not statistically significantly different from NUDs in terms of teacher quality except in proportions of experienced teachers: WUDs are less likely to have experienced teachers than NUDs (log-odds=-019).

The magnitude of the stronger unionization status effect is worth noting. Besides the small effect on the experienced teachers indicator (log-odds=0.22), stronger unionization status has a modest effect on other teacher quality indicators (i.e. HQT, in-field degree, in-field certification).[42] In fact, the magnitude of the stronger unionization status effect on HQT, in-field degree, and in-field certification ranks the top one or two largest among all variables included in their respective models. The relatively large and positive effect of stronger unionization on some of the teacher quality proxies suggests districts' unionization status has an important bearing with attracting teachers to and retaining teachers in the districts, and teacher unions should not be left out of school improvement efforts.

[42] I follow the standard of Rosenthal and Rosnow (1984, p.360). Effects less than 0.1 SD are very small, .10—0.29 SD small, and 0.30-0.50 modest. Effects larger than 0.5 are large.

Results from the final models indicate besides the positive effect of stronger unionization on some of the teacher quality proxies, low-minority status is also positively associated with districts' proportions of HQTs, experienced teachers, and teachers with certification in their teaching fields. Therefore, the teacher quality gap among districts with different minority student concentration still exists after holding constant other district characteristics and state collective bargaining law status. An interesting finding concerns the effect of education level of residents within district boundaries. After controlling other variables, education level is positively associated with the concentration of ETQ teachers and the proportion of teachers who graduated from selective colleges, yet it is negatively related to concentrations of HQTs and teachers with certification in their teaching field. Conventional wisdom holds that the greater the level of education, the more likely schools would be equipped with high teacher quality. The results here suggest that this conventional wisdom is partially true; it depends on how teacher quality is defined.

Findings from the final models reveal that state law status has a suppressor effect on stronger unionization, which suggests that state law status interacts with district unionization status to affect the district proportions of HQTs, experienced teachers, teachers with in-field certifications, and teachers with in-field degrees.

Results from the "Largest Districts" Sample

This section presents results from the descriptive analyses and HGLM models of the "Largest Districts" sample. The "Largest Districts" sample has 52 districts and is derived from the 100 largest districts list obtained from NCES. This sample is used to investigate the second research question: How does a district's union status affect the

intra-district distribution of teacher quality across schools with different poverty level and minority student concentration? Here, teacher quality is measured by: a) The proportion of teachers in a school who are classified as high quality by the *empirically-established teacher quality (ETQ) indictor*; b) The proportion of teachers in a school who are *highly qualified teachers (HQTs)* as defined by NCLB; and c) proportion of teachers in a school who possess one of the following teacher quality components: *selectivity of the postsecondary institutions that teachers attended, holding a subject-matter degree, holding a certificate in the subject matter, and at least five years of experience.*

Descriptive Results

Table 12 presents some of the key findings from the descriptive statistics analyses of the schools and districts. Across the 52 largest districts included in this study, the average school percentage of ETQ teachers is 17, while the average school percentage of HQTs is 68. On average, schools in the 52 largest districts are high-minority high-poverty ones, and over 12 percent of their students have individualized education plans (IEPs). Specifically, in an average school, close to 70 percent of enrollment is minority and about 60 percent have been approved for the free or reduced lunch program (FARL).

A majority (79 percent) of the 52 districts are unionized. Among all the districts, 62 percent have stronger unionization, which means they have collective bargaining agreements with teacher unions and more than 50 percent of district teachers are union members. Seventeen percent of the districts have weaker unionization, which indicates that either they are covered by "meet and confer" agreements or they are covered by collective bargaining contracts but no more than 50 percent of district teachers are union members. On average, these largest districts spend $9,570 per pupil each year in

educating their students, and pay an annual salary of $32,360 to novice teachers with bachelors' degree according to districts' salary schedules. These large districts have an average enrollment of 142,200 students, which is no surprise since we are focusing on the largest districts in the U.S. For an average district, close to 49 percent of students are approved for the free or reduced lunch program, and about 59 percent of district students are minority students. The 52 districts are equally distributed in urban and suburban areas, and 24 percent of adults within the district boundaries have a college degree.

Table 12: Descriptive Statistics of Variables in "Largest Districts" Sample

		Mean	SD	Min	Max
School-level Variables (n=613)	% School ETQ Teachers	17.47	24.29	0.00	100.00
	% School Highly Qualified Teachers (HQTs)	67.69	32.21	0.00	100.00
	% School Teachers with over 5 Years of Experience	73.42	26.39	0.00	100.00
	% School Teachers with In-field Certifications	66.70	32.26	0.00	100.00
	% School Teachers with In-field Degrees	66.16	32.35	0.00	100.00
	% School Teachers Who Graduated from Selective Colleges	38.58	32.89	0.00	100.00
	Elementary School	0.81	0.39	0.00	1.00
	Secondary School	0.17	0.37	0.00	1.00
	Combined School	0.03	0.16	0.00	1.00
	School student_teacher ratio	16.09	4.14	3.97	32.81
	PD Characteristics Factor[a]	0.15	0.99	-3.51	2.86
	% FARL students[b]	60.63	30.73	0.00	100.00
	% Minority Students[b]	69.80	30.53	0.91	100.00
	School Poverty/minority Indicator	65.21	28.34	4.55	100.00
	% school students with IEPs	12.52	6.81	0.00	47.34
	School Total Students[d]	839.75	563.78	35.00	4,582.00
	School size (over 1000)	0.26	0.44	0.00	1.00
	School Size (500-1000)	0.39	0.49	0.00	1.00
	School size (below 500)	0.35	0.48	0.00	1.00
District-level Variables (N=52)	Stronger Unionization	0.62	0.49	0.00	1.00
	Weaker Unionization	0.17	0.38	0.00	1.00
	No Unionization	0.21	0.41	0.00	1.00
	% District FRL students[c]	48.69	24.46	3.20	100.00
	% District Minority Students[c]	58.84	25.56	7.66	96.84
	District Poverty/minority Indicator	53.77	22.94	8.06	90.79
	PPE (X1000)	9.57	1.87	5.97	15.26
	Salary schedule -Bachelor w/o experience (X1000)	32.36	2.79	26.62	37.55
	Student-teacher ratio	17.24	2.62	13.29	24.48
	district enrollment (X1000)[d]	142.20	172.43	46.59	1,023.67
	large district size 100,000 above	0.38	0.49	0.00	1.00
	large district size 60,000-99,999	0.44	0.50	0.00	1.00
	large district size 40,000-59,999	0.17	0.38	0.00	1.00
	Urban	0.50	0.50	0.00	1.00
	suburban	0.50	0.50	0.00	1.00
	Residents Edu. Level	0.24	0.06	0.12	0.39

Notes: Source: SASS 2003-2004; School level variables weighted by within-district weight. [a] A standardized factor variable, obtained from principal components analysis (PCA); [bc] These variables are only listed for descriptive purposes. In the HGLM models, a composite variable created from them will be used instead due to high correlations between them. [d] In the HGLM models, recoded dummies variables from this variable will be used due to the skewness of this continuous variable.

Table 13: Descriptive Statistics of Variables by Unionization Status in "Largest Districts" Sample

	Variables	Unionization Categories: [a]Stronger Unionization Mean (SD)	Weaker Unionization Mean (SD)	No Unionization Mean (SD)	Total Mean (SD)
School-level Variables (n=613)	Unweighted N (weighted %)	467(70.88%)	72(16.97%)	74(12.15%)	613(100%)
	% School ETQ Teachers	18.48 (24.62)	13.59 (21.90)	16.98 (25.31)	17.47 (24.29)
	% School Highly Qualified Teachers (HQTs)	67.97 (32.61)	67.54 (34.07)	66.31 (27.14)	67.69 (32.21)
	% School Teachers with at least 5 Years of Experience	73.99 (27.44)	70.49 (24.47)	74.22 (22.43)	73.42 (26.39)
	% School Teachers with In-field Certifications	68.51 (31.58)	58.67 (37.69)	67.35 (26.08)	66.70 (32.26)
	% School Teachers with In-field Degrees	66.61 (32.18)	67.00 (36.49)	62.34 (26.89)	66.16 (32.35)
	% School Teachers Who Graduated from Selective Colleges	39.87 (33.70)	32.83 (30.91)	39.09 (30.27)	38.58 (32.89)
	Elementary School	0.81 (0.39)	0.77 (0.42)	0.83 (0.38)	0.81 (0.39)
	Secondary Schoo	0.16 (0.37)	0.18 (0.38)	0.16 (0.37)	0.17 (0.37)
	Combined School	0.02 (0.15)	0.06 (0.23)	0.01 (0.08)	0.03 (0.16)
	School student-teacher ratio	16.64* (3.95)	14.69 (4.67)	14.86 (3.76)	16.09 (4.14)
	PD Opportunities Factor	0.23* (0.97)	-0.01 (0.90)	-0.12 (1.12)	0.15 (0.99)
	% FARL students[a]	62.88*** (30.54)	62.36** (28.55)	45.05 (30.62)	60.63 (30.73)
	% Minority Students[a]	73.20** (29.98)	64.04 (28.29)	58.01 (32.85)	69.80 (30.53)
	School Poverty/minority Indicator	68.04*** (27.72)	63.20* (26.89)	51.53 (29.99)	65.21 (28.34)
	% school students with IEPs	11.93 (6.36)	14.36 (8.70)	13.43 (5.77)	12.52 (6.81)
	School Total Students	844.07 (556.34)	831.48 (617.77)	826.12 (534.67)	839.75 (563.78)
	School size (over 1000)	0.25 (0.43)	0.30 (0.46)	0.22 (0.42)	0.26 (0.44)
	School Size (500-1000)	0.39 (0.49)	0.36 (0.48)	0.41 (0.49)	0.39 (0.49)
	School size (below 500)	0.36 (0.48)	0.33 (0.47)	0.37 (0.49)	0.35 (0.48)
District-level Variables (N=52)	Unweighted N (unweighted %)	32 (61.54%)	9 (17.31%)	11 (21.15%)	52 (100%)
	District % FRL students[a]	51.95 (23.28)	43.78 (21.52)	43.21 (30.19)	48.69 (24.46)
	District % Minority Students[a]	60.79 (27.90)	57.49 (18.84)	54.28 (24.43)	58.84 (25.56)
	District Poverty/minority Indicator	56.37 (23.65)	50.63 (18.52)	48.75 (24.84)	53.77 (22.94)
	PPE (X1000)	10.07 (2.02)	8.52 (1.02)	9.00 (1.46)	9.57 (1.87)
	Salary schedule -Bachelor w/o experience	32.33 (3.00)	33.28 (1.62)	31.70 (2.89)	32.36 (2.79)
	Student-teacher ratio	17.65 (2.74)	16.74 (1.84)	16.47 (2.78)	17.24 (2.62)
	district enrollment (X1000)[b]	168.56 (213.62)	118.94 (41.40)	84.56 (49.39)	142.20 (172.43)
	large district size 100,000 above	0.38 (0.49)	0.56 (0.53)	0.27 (0.47)	0.38 (0.49)
	large district size 60,000-99,999	0.47 (0.51)	0.44 (0.53)	0.36 (0.50)	0.44 (0.50)
	large district size 40,000-59,999	0.16 (0.37)	0.00 (0.00)	0.36 (0.50)	0.17 (0.38)
	Urban	0.56 (0.50)	0.56 (0.53)	0.27 (0.47)	0.50 (0.50)
	suburban	0.44 (0.50)	0.44 (0.53)	0.73 (0.47)	0.50 (0.50)
	Residents Edu. Level	0.23 (0.06)	0.23 (0.05)	0.26 (0.07)	0.24 (0.06)

Notes: Source: SASS 2003-2004; ~p<0.1, *p<.05, **p<.01,***p<0.001; School level variables weighted by within-district weight. [a]These variables are only listed for descriptive purposes. In the HGLM models, the composite variable will be used due to high correlations between them. [b] In the HGLM models, recoded dummies variables from this variable will be used due to the skewedness of this continuous variable.

Unionized vs. Non-unionized Schools and Districts

As shown in Table 13, school comparisons indicate that unionized schools are not statistically different from non-unionized ones in terms of the percentage of ETQ teachers, HQTs or any of the teacher quality components. Yet, schools with different unionization status are different with respect to a number of school characteristics. Specifically, compared with non-unionized schools (NUS), strongly unionized schools (SUS) have higher student-teacher ratio (16.64 vs. 14.86) and higher scores on the professional development factor (0.23 vs. -0.12). SUSs have higher scores on the school poverty/minority indicator variable than NUSs (68.04 vs. 51.53), which indicates that SUSs have higher percentage of students approved for free or reduced lunch program (62.88 vs. 45.05) and higher minority students concentration (73.20 vs. 58.01).

District characteristics in Table 13[43] (above) indicate that strongly unionized districts are not statistically different from the non-unionized districts in any of the demographic characteristics or district policies and practices included in this analysis.

Results from Hierarchical Generalized Linear Modeling (HGLM) Analyses

As stated in Chapter 3, I construct schools-within-district HGLM models to examine the extent to which districts' unionization status influence the intra-district distribution of high quality teachers across schools in the 52 largest districts in the U.S. Results are presented in a step-wise fashion with simpler models presented first. I first present results from the fully unconditional models (step I models), which are followed by results from step II models, or school level models. On top of step II models, if the

[43] The 52 largest districts do not present similar characteristics as found in the large urban and suburban districts sample, which I don't have a good explanation.

school poverty/minority slope varies across districts, step III models include unionization status variables to simultaneously model the intercept and school poverty/minority slope. The final models (step IV models) take into consideration other related district characteristics that might have confounding effects on the relationship between unionization status and intra-district teacher quality distribution.

As mentioned above, in the HGLM analyses, all categorical variables were dummy-coded (coded 1 and 0) and continuous variables z-scored (with M=0, and SD=1). The reported results are statistically significant at the p level of 0.05, unless otherwise explicitly stated.

Table 14: Step I—Fully Unconditional Models

	% ETQ		% HQT		% Experience		% In-field Cert.		% In-field Degree		% Selectivity	
Fixed Effect	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District mean concentration of teacher quality, β_{0j}	-1.60*** (0.12)	0.20	0.72*** (0.09)	2.05	1.04*** (0.08)	2.83	0.73*** (0.07)	2.08	0.68*** (0.10)	1.98	-0.54** (0.15)	0.58
	Variance component	Coef. Reliability	Variance component	Coef. Reliability	Variance component	Coef. Reliability	Variance component	Coef. Reliability	Variance component	Coef. Reliability	Variance component	Coef. Reliability
District mean concentration of teacher quality	0.40***	0.65	0.14***	0.53	0.08**	0.37	0.07**	0.37	0.22***	0.62	0.65***	0.81

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; School level variables weighted by within-district weight.[a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded.

Step I: Fully Unconditional Model Results

Table 14 presents the results from the unconditional models on the two composite teacher quality measures as well as on their components. The results indicate in the 52 largest districts the log-odds of schools employing ETQ teachers and HQTs are -1.60 and 0.72, respectively. This suggests for an average school in the 52 districts, the expected odds of employing HQT teachers are much higher than those of employing ETQ teachers (odds=exp{0.72}=2.05 VS. odds=exp{-1.60}=0.20). Converting odds into probabilities,[44] we see on average these schools are about four times more likely to have HQTs than ETQ teachers (0.67 vs. 0.17). The log-odds of schools employing experienced teachers, in-

[44] probabilities=1/(1+exp{-log-odds}) or probabilities=odds/(1+odds)

field certified teachers and teachers with in-field degrees are similar (log-odds=0.68-1.04), but have much lower log-odds of employing teachers who graduated from selective colleges (log-odds= -0.54).

The unconditional models also provide valuable information about the between-district variability in teacher quality. Assuming the schools' log-odds of employing high quality teachers, $\boldsymbol{\beta_{0j}}$, to be approximately normally distributed, and given the estimate of τ_{00}=0.40 and τ_{00}=0.14 for EQT and HQT respectively, we expect 95% of the 52 districts to have log-odds of schools employing EQT teachers between -2.84 and -0.36, and HQTs between -0.01 and 1.45. Converting to probabilities, the results reveal that districts' average school concentration of ETQ teachers ranges from 0.05 to 0.41, and HQTs from 0.50 to 0.81. Similarly, from the $\boldsymbol{\beta_{0j}}$ and τ_{00} of the component variables, we can see between-district variability is smaller in terms of school concentrations of experienced teachers, teachers with in-field certifications, and teachers with in-field degrees, but there is much larger between-district variability in employing teachers who graduated from selective colleges.

Table 15: Step II Models—School-Level (Level-1) HGLM Models

Fixed Effect	% ETQ		% HQT		% Experience		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District mean concentration of teacher quality, β_{0j}												
Base, γ_{00}	-1.70*** (0.14)	0.18	0.75*** (0.09)	2.11	1.03*** (0.09)	2.80	0.77*** (0.06)	2.15	0.71*** (0.11)	2.03	-0.53** (0.17)	0.59
School Poverty/minority indicator slope, β_{1j}												
Base, γ_{10}	-0.39** (0.13)	0.68	-0.06 (0.09)	0.94	-0.57*** (0.12)	0.57	0.05 (0.10)	1.05	-0.05 (0.11)	0.95	-0.22 (0.14)	0.80
Secondary School slope[1], β_{2j}	-0.02 (0.18)	0.98	0.14 (0.13)	1.15	0.04 (0.12)	1.04	0.10 (0.13)	1.11	0.22 (0.19)	1.24	0.36* (0.15)	1.43
Combined School slope[1], β_{3j}	-0.68 (0.49)	0.51	-1.76*** (0.35)	0.17	-1.32*** (0.23)	0.27	-1.51*** (0.34)	0.22	-1.58*** (0.39)	0.21	0.78~ (0.46)	2.19
School size (over 1000) slope[2], β_{4j}	0.07 (0.22)	1.07	-0.94*** (0.18)	0.39	-0.06 (0.15)	0.94	-0.82*** (0.22)	0.44	-0.35~ (0.19)	0.70	-0.04 (0.10)	0.96
School size (below 500) slope[2], β_{5j}	-0.31 (0.30)	0.73	-0.10 (0.19)	0.90	-0.30* (0.14)	0.74	-0.10 (0.22)	0.90	-0.13 (0.19)	0.88	-0.31~ (0.17)	0.73
PD Opportunities Factor slope, β_{6j}	-0.03 (0.09)	0.97	0.08 (0.10)	1.09	0.15 (0.11)	1.16	0.00 (0.09)	1.00	-0.03 (0.09)	0.97	-0.10 (0.11)	0.91
% school students with IEPs slope, β_{7j}	-0.17 (0.14)	0.84	-0.16 (0.10)	0.85	0.01 (0.07)	1.01	-0.20* (0.08)	0.82	-0.24* (0.11)	0.79	-0.05 (0.10)	0.95
School student_teacher ratio slope, β_{8j}	-0.16 (0.15)	0.85	0.08 (0.14)	1.09	-0.05 (0.08)	0.96	0.23* (0.10)	1.25	-0.02 (0.16)	0.98	-0.06 (0.11)	0.94
Tau (as correlations)	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope
Mean concentration of teacher quality (intercept)		0.2		0.78		0.98		0.96		-0.2		0.43
Poverty/minority teacher quality slope (Slope)												
	Variance component	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability
Mean concentration of teacher quality	0.55***	0.68	0.14***	0.49	0.06**	0.27	0.03*	0.18	0.31***	0.67	0.80***	0.82
Poverty/minority teacher quality slope	0.16~	0.24	0.04	0.12	0.05~	0.15	0.14**	0.30	0.11**	0.27	0.29***	0.43

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; School level variables weighted by within-district weight [1]Reference group "Elementary schools"; [2] reference group school enrollment 500-1000.

Step II: School Level (Level-1) HGLM Models

School Level HGLM models explore how school-level characteristics are associated with the school teacher quality measures before adjusting for district characteristics. Results (see Table 15) indicate that as schools' poverty/minority level increases the likelihood of employing ETQ teachers decreases (log-odds=-.39, or a decrease of odds of 32 percent) holding constant other school variables. Further, the relationship between poverty/minority level and ETQ (that is, the poverty/minority slope in the model) is significantly different across districts (μ_{1j} =0.16, p<0.10); this provides evidence that including district-level variables, such as unionization status, to model the ETQ gap could be fruitful. Other school level characteristics, such as school's grade level, school size, student-teacher ratio, etc. are not significant predictors of schools employing ETQ teachers.

Results from the model on HQTs reveal that holding all other school characteristics equal, schools' poverty/minority level is not a significant predictor of school concentration of HQTs, and the poverty/minority slope does not vary significantly across districts. The non-varying school poverty/minority slope suggests that the effect of school poverty/minority level on school HQT concentration is not significantly different across districts. Schools with high and low levels of poverty/minority enrollment are equally likely to employ teachers classified as HQTs. There is no need to further model the slope; therefore, this school-level model serves as my final model for HQT.

In the model on HQTs, a school's size matters in terms of employing HQTs. Specifically, all else equal large schools (over 1,000 enrollment) are less likely to have HQTs than medium-sized schools (500-1000 enrollment, logs-odds=-0.94, or a decrease of odds of 61 percent). In addition, compared with elementary schools, combined k-12 schools have a much lower probability of employing HQTs (log-odds=-1.76, or a decrease of odds of 83 percent).

Results from the school level models on the teacher quality components indicate school poverty/minority level is significantly associated with a school's proportion of experienced teachers (log-odds=-0.57). The significant variance components for the school poverty/minority slope indicate that the relationship between poverty/minority and each of the four component variables varies significantly across districts. The varying slopes provide empirical evidence that it would be fruitful to build district-level models to account for the variability. That is, I can include district-level variables to understand why in some districts the association between poverty/minority and each of the teacher quality components is stronger than in others. Similar to the findings from the model on

HQTs, school size and schools' grade level are significantly associated with school concentrations of experienced teachers, teachers with subject-matter certifications, teachers with subject-matter degrees, and teachers who graduated from selective colleges. Overall, medium-sized schools are more likely than large or small schools to have higher concentrations of teachers possessing these aforementioned characteristics. School percentage of IEP students is negatively associated with school concentrations of teachers with subject-matter certifications and teachers with subject-matter degrees.

Step III: District-Level HGLM Models with only Unionization Status

Step III models include the two major district-level variables, i.e. stronger unionization and weaker unionization variables, to model the intercept and the school poverty/minority slope to explore whether unionization status may account for variability in district average school teacher quality and variability in the relationship between poverty/minority and school teacher quality across districts. The results for the slope (see Table 16) indicate that one standard deviation increase in the school poverty/minority level is associated with 0.59 log-odds decrease in school's concentration of experienced teachers in non-unionized districts (NUDs), and in strongly unionized districts (SUDs) one SD increase in poverty/minority level is linked with 1.15 log-odds (0.59+0.56) decrease of school's concentration of experienced teachers. In other words, the gap between high and low poverty/minority schools in employing experienced teachers is wider in SUDs than in non-unionized districts (NUDs). On modeling school proportion of teachers with in-field certifications, weaker unionization status has a significantly positive effect on the relationship between poverty/minority and school's concentration of teachers with in-field certifications (log-odds=0.56, $p<0.10$). Given the non-significant

effect of school poverty/minority level on school proportion of teachers with in-field certifications in NUDs, we can state that in WUDs as school poverty/minority level increases the likelihood of employing teachers with in-field certifications increases. Unionization status variables have no significant effects on any of the intercepts of ETQ and the teacher quality component variables, or any of the slopes of ETQ, in-field degree, and selectivity. The effects of school level variables remain virtually unchanged from those of step II school-level models.

Table 16: Step III Models—District-Level (Level-2) HGLM Models with only Unionization Status Variables

	% ETQ		% Experience		% In-field Cert.		% In-field Degree		% Selectivity	
Fixed Effect	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District mean concentration of teacher quality, β_{0j}										
Base, γ_{00}	-1.72*** (0.15)	0.18	1.03*** (0.09)	2.79	0.78*** (0.07)	2.17	0.69*** (0.10)	1.99	-0.52** (0.17)	0.59
Stronger Unionization3b, γ_{01}	0.32 (0.49)	1.37	-0.04 (0.21)	0.96	-0.19 (0.23)	0.83	0.19 (0.30)	1.21	-0.02 (0.47)	0.98
Weaker Unionization3b, γ_{02}	0.07 (0.55)	1.08	-0.08 (0.19)	0.92	-0.09 (0.25)	0.92	0.60 (0.39)	1.83	-0.18 (0.57)	0.84
School Poverty/minority indicator slope, β_{1j}										
Base, γ_{10}	-0.40** (0.14)	0.67	-0.59*** (0.10)	0.56	0.03 (0.10)	1.03	-0.06 (0.11)	0.94	-0.23~ (0.12)	0.80
Stronger Unionization[1b], γ_{11}	0.03 (0.52)	1.03	-0.56** (0.20)	0.57	0.11 (0.23)	1.11	-0.07 (0.21)	0.93	0.49 (0.37)	1.62
Weaker Unionization[1b], γ_{12}	0.03 (0.57)	1.03	-0.38 (0.29)	0.68	0.56~ (0.28)	1.75	0.15 (0.35)	1.16	0.60 (0.43)	1.82
Secondary School slope, β_{2j}	-0.02 (0.18)	0.98	0.02 (0.12)	1.02	0.10 (0.12)	1.11	0.22 (0.19)	1.25	0.37* (0.16)	1.45
Combined School slope, β_{3j}	-0.68 (0.49)	0.50	-1.31*** (0.22)	0.27	-1.49*** (0.34)	0.22	-1.60*** (0.39)	0.20	0.78~ (0.46)	2.18
School size (over 1000) slope, β_{4j}	0.08 (0.23)	1.09	-0.08 (0.15)	0.92	-0.79** (0.23)	0.45	-0.35~ (0.19)	0.70	-0.03 (0.09)	0.98
School size (below 500) slope, β_{5j}	-0.32 (0.31)	0.73	-0.37** (0.14)	0.69	-0.09 (0.23)	0.91	-0.12 (0.20)	0.89	-0.29~ (0.17)	0.75
PD Opportunities Factor slope, β_{6j}	-0.03 (0.09)	0.97	0.15 (0.11)	1.16	0.00 (0.08)	1.00	-0.04 (0.09)	0.97	-0.10 (0.11)	0.90
% school students with IEPs slope, β_{7j}	-0.18 (0.14)	0.84	0.00 (0.07)	1.00	-0.20* (0.08)	0.82	-0.25* (0.11)	0.78	-0.05 (0.10)	0.95
School student_teacher ratio slope, β_{8j}	-0.18 (0.16)	0.83	-0.06 (0.08)	0.95	0.23* (0.10)	1.26	-0.02 (0.17)	0.98	-0.06 (0.11)	0.94
Tau (as correlations)	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope
Mean concentration of teacher quality (intercept)		0.22		0.98		0.99		-0.21		0.42
Poverty/minority teacher quality slope (Slope)										
	Variance component	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability
Mean concentration of teacher quality	0.59***	0.69	0.07**	0.31	0.03*	0.18	0.31***	0.67	0.85***	0.83
Poverty/minority teacher quality slope	0.20~	0.28	0.03	0.09	0.15**	0.31	0.12**	0.28	0.23***	0.39

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; School level variables weighted by within-district weight b. "Stronger Unionization": refers to districts having a collective bargaining contract and at least 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but less than 50% of teachers are union members; [c] Composed of district % FARL and % minority students; [1] reference group "no unionization"; [2] reference group "district enrollment 60,000-99,999 students"; [3]reference group "Suburban"; [d]adjusted using comparable wage index (CWI); [d]Composed of district % FARL and % minority students; [4] Reference group "Elementary schools"; [5] reference group school enrollment 500-1000;

Step IV: Fully Specified District-level HGLM Models

Step IV models (see Table 17) build upon step III models by including variables measuring district demographic characteristics and district policies and practices. Holding constant these district demographic variables and district policies and practices, the negative effect of stronger unionization on the poverty/minority experienced teachers slope remains virtually unchanged in magnitude (log-odds=-0.55, $p<0.10$) from that of the step II model. In the in-field certification model, the positive effect of weaker unionization status on the school poverty/minority slope decreases from 0.56 to 0.43 and is no longer significant at the $p<0.10$ level. However, holding other variables equal, weaker unionization status does have a significantly positive effect on the district average concentration of teachers with in-field degrees (log-odds=0.69, $p<0.10$). One noteworthy finding concerning district control variables is the contextual effect of district poverty/minority level on district average school teacher quality. When modeling the proportion of ETQ teachers and teachers who graduated from selective colleges, the district-level poverty/minority level has an additional negative effect on the school level poverty/minority teacher quality gap (log-odds=-0.51, $p<0.10$ and -0.62, respectively). The contextual effect of poverty/minority level suggests that the social-class composition of a district has a substantial association with its individual school's concentration of teacher quality.

However, as shown in table 17, even after accounting for district-level characteristics, the effects of school poverty/minority level on some of the school teacher quality measures (i.e. ETQ, teachers with in-field certifications, teachers with in-field degrees or teachers who graduated from selective colleges) still vary significantly across districts. For example, in 95 percent of the 52 districts the effect of poverty/minority level

on schools employing ETQ teachers ranges from log-odds-1.50 to 0.45 and employing teachers who graduated from selective colleges from log-odds -1.27 to 0.81.

Table 17: Step IV—Fully Specified District-Level HGLM Models

Fixed Effect	% ETQ		% Experience		% In-field Cert.		% In-field Degree		% Selectivity	
	[a]Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds	Est. (SE)	Odds
District mean concentration of TQ, β_{0j}										
Base, γ_{00}	-1.75*** (0.12)	0.17	1.10*** (0.06)	3.00	0.81*** (0.06)	2.25	0.79*** (0.09)	2.20	-0.47** (0.12)	0.63
Stronger Unionization[b], γ_{01}	0.12 (0.40)	1.13	0.18 (0.19)	1.20	-0.09 (0.21)	0.92	0.27 (0.27)	1.32	-0.22 (0.33)	0.80
Weaker Unionization[b], γ_{02}	0.25 (0.43)	1.28	-0.17 (0.22)	0.85	-0.16 (0.25)	0.85	0.69~ (0.36)	1.98	0.20 (0.35)	1.22
District Poverty/Minority Composite[c], γ_{03}	-0.16 (0.22)	0.85	-0.10 (0.09)	0.90	-0.04 (0.08)	0.96	-0.11 (0.18)	0.89	-0.10 (0.23)	0.90
Size (>100,000)[1], γ_{04}	0.21 (0.26)	1.24	-0.32* (0.14)	0.73	-0.12 (0.14)	0.88	-0.23 (0.23)	0.80	0.57~ (0.32)	1.77
Size (40,000-59,999)[1], γ_{05}	-0.77* (0.37)	0.46	-0.35 (0.21)	0.71	-0.51* (0.24)	0.60	-0.19 (0.27)	0.83	-0.06 (0.40)	0.94
Urban[2], γ_{06}	-0.63~ (0.34)	0.53	0.05 (0.17)	1.05	0.26~ (0.15)	1.29	-0.30 (0.26)	0.74	-0.67~ (0.33)	0.51
Resident Edu. Level, γ_{07}	0.12 (0.16)	1.13	0.08 (0.09)	1.08	0.12 (0.09)	1.13	0.00 (0.16)	1.00	0.19 (0.17)	1.20
PPE[d], γ_{08}	0.56** (0.18)	1.75	-0.16~ (0.09)	0.85	-0.07 (0.09)	0.93	0.08 (0.18)	1.08	0.64** (0.19)	1.90
District Student-teacher ratio, γ_{09}	0.20 (0.15)	1.23	0.02 (0.07)	1.02	0.20* (0.09)	1.22	0.03 (0.15)	1.03	0.23 (0.15)	1.26
Salary -BA w/o experience[d], γ_{010}	-0.12 (0.13)	0.89	0.10* (0.04)	1.10	-0.01 (0.05)	0.99	-0.08 (0.11)	0.92	-0.29~ (0.15)	0.75
School Poverty/minority indicator slope[e], β_{1j}										
Base, γ_{10}	-0.46** (0.15)	0.63	-0.60*** (0.12)	0.55	0.07 (0.12)	1.08	-0.05 (0.13)	0.96	-0.23~ (0.12)	0.80
Stronger Unionization[b], γ_{11}	-0.06 (0.51)	0.94	-0.55~ (0.29)	0.58	-0.25 (0.30)	0.78	0.11 (0.33)	1.12	0.46 (0.36)	1.58
Weaker Unionization[b], γ_{12}	0.03 (0.59)	1.03	-0.43 (0.27)	0.65	0.43 (0.31)	1.53	0.18 (0.29)	1.20	0.65 (0.40)	1.91
District Poverty/Minority Composite[c], γ_{13}	-0.51~ (0.30)	0.60	0.13 (0.18)	1.14	-0.26 (0.24)	0.77	-0.19 (0.18)	0.82	-0.62** (0.22)	0.54
Size (>100,000)[1], γ_{14}	0.62~ (0.35)	1.86	0.02 (0.20)	1.02	0.12 (0.27)	1.13	0.35 (0.28)	1.42	0.79** (0.26)	2.21
Size (40,000-59,999)[1], γ_{15}	0.60 (0.50)	1.82	-0.10 (0.29)	0.91	0.18 (0.31)	1.20	0.78* (0.37)	2.19	0.91* (0.34)	2.49
Urban[2], γ_{16}	0.42 (0.40)	1.52	-0.58* (0.25)	0.56	0.16 (0.43)	1.17	-0.07 (0.29)	0.94	0.46 (0.32)	1.59
Resident Edu. Level, γ_{17}	-0.27 (0.21)	0.76	0.00 (0.17)	1.00	-0.12 (0.13)	0.88	-0.01 (0.18)	0.99	-0.20 (0.18)	0.82
PPE[e], γ_{18}	0.19 (0.18)	1.21	-0.03 (0.12)	0.97	0.18 (0.16)	1.20	-0.04 (0.17)	0.96	0.19 (0.19)	1.21
District Student-teacher ratio, γ_{19}	0.02 (0.12)	1.02	0.05 (0.10)	1.06	0.19~ (0.11)	1.21	-0.07 (0.14)	0.94	0.06 (0.12)	1.07
Salary -BA w/o experience[e], γ_{110}	0.02 (0.14)	1.02	0.03 (0.10)	1.03	-0.16 (0.15)	0.85	0.09 (0.14)	1.09	-0.05 (0.15)	0.95
Secondary School slope[3], β_{2j}	0.00 (0.19)	1.00	0.00 (0.12)	1.00	0.05 (0.13)	1.05	0.22 (0.20)	1.24	0.37* (0.15)	1.45
Combined School slope[3], β_{3j}	-0.71 (0.48)	0.49	-1.27*** (0.22)	0.28	-1.49*** (0.36)	0.22	-1.59*** (0.40)	0.20	0.75~ (0.45)	2.11
School size (over 1000) slope[4], β_{4j}	0.06 (0.24)	1.06	-0.04 (0.15)	0.96	-0.77** (0.22)	0.46	-0.34~ (0.20)	0.71	-0.01 (0.08)	0.99
School size (below 500) slope[4], β_{5j}	-0.25 (0.31)	0.78	-0.43** (0.15)	0.65	-0.18 (0.22)	0.83	-0.14 (0.20)	0.87	-0.25 (0.16)	0.78
PD Factor slope, β_{6j}	-0.02 (0.10)	0.98	0.14 (0.11)	1.15	0.01 (0.08)	1.01	-0.05 (0.09)	0.96	-0.09 (0.11)	0.92
% school students with IEPs slope, β_{7j}	-0.20 (0.13)	0.82	-0.01 (0.07)	0.99	-0.24** (0.08)	0.79	-0.28* (0.11)	0.76	-0.07 (0.09)	0.94
School student_teacher ratio slope, β_{8j}	-0.17 (0.19)	0.84	-0.12 (0.11)	0.89	0.09 (0.14)	1.10	-0.03 (0.20)	0.97	-0.06 (0.12)	0.94
Tau (as correlations)	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope
Mean concentration of teacher quality (intercept)		0.27		0.89		0.99		0.51		0.37
Poverty/minority teacher quality slope (Slope)										
	Variance component	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability	Variance comp't	Coef. Reliability
Mean concentration of teacher quality	0.45***	0.62	0.02	0.12	0.02	0.14	0.32***	0.67	0.62***	0.77
Poverty/minority teacher quality slope	0.28*	0.32	0.04	0.12	0.24**	0.38	0.14**	0.29	0.28***	0.42

Notes: ~p<0.1, *p<.05, **p<.01,***p<0.001; Source: SASS 2003-2004; [a] can be interpreted as effect sizes since all continuous variables are z-scored and categorical ones dummy-coded; School level variables weighted by within-district weight; [b] "Stronger Unionization": refers to districts having a collective bargaining contract and at least 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but in which no more than 50% of teachers are union members; reference group "no unionization"; [c] Composed of district % FARL and % minority students; [d]adjusted using comparable wage index (CWI); [e]Composed of school % FARL and % minority students; [1] reference group "district enrollment 60,000-99,999 students"; [2]reference group "Suburban";[3] Reference group "Elementary schools"; [4] reference group "school enrollment 500-1000";

Summary of Findings from HGLM models in the Largest Districts

Results from schools-within-district models suggest that in the 52 largest districts a district's unionization status has no statistically significant effect on the intra-district distribution of ETQ teachers or HQTs or three of the teacher quality components (concentrations of teachers with in-field certifications, teachers with in-field degrees, or teachers who graduated from selective colleges) across schools with differing poverty and minority student concentration. The social-class composition of school has a stronger effect on the distribution of experienced teachers across schools in SUDs than in NUDs, which suggests that in SUDs the gap between high and low poverty/minority schools in employing experienced teachers is much wider than in NUDs. The very limited sample size (613 schools in 52 districts, with a mode of 5 schools per district), and the skewness of the poverty/minority variable may pose some challenges in finding significant results, which I will discuss in greater detail in Chapter Five in the Limitations section.

Table 18: Description of Variables Used in Supplementary Working Conditions Analysis

Questionnaire Type	Variable Name	Description of Variables	Variable Value Range
District Questionnaire	Salary_BA+0	Base salary for teachers with a bachelor's degree and no teaching experience	Continuous
	Salary_BA+10	Base salary for teachers with a bachelor's degree and 10 years of teaching experience	Continuous
	Salary_master+0	Base salary for teachers with a master's degree (or equivalent credit hrs) and no teaching experience	Continuous
	Salary_master+10	Base salary for teachers with a master's degree (or equivalent credit hrs) and 10 years of teaching experience	Continuous
	Salary_Highest	Salary on the highest possible step	Continuous
	Districts with Formal Procedure to Counsel Out Incompetent Teachers	Are there formal procedures to counsel out poor-performing or incompetent teachers?	Dichotomous, 1=yes; 0=no
	Full State Certification Requirement for Teaching	Criteria used in considering applicants: Full standard state certification for field to be taught	Dichotomous, 1=yes; 0=no
	College Major or Minor Requirement for Teaching	Criteria used in considering applicants: College major or minor in field to be taught	Dichotomous, 1=yes; 0=no
	Contract Year Length	Months in a normal contract year	1=less than 8 hrs; 2=9-16 hrs; 3=17-32 hrs; 4=over 33 hrs
	Pct District Teachers Dismissed	Total number of teachers dismissed last year/total teachers (not FTE)	Continuous
	Pct District Teachers Dismissed with <3 yrs Experience	Number of teachers dismissed with less than 3 years of experience/total teachers (not FTE)	Continuous
	Pct District Teachers Dismissed with >3 yrs Experience	Number of teachers dismissed with more than 3 years of experience/total teachers (not FTE)	Continuous
	Medical Insurance	Does this district offer general medical insurance to teachers?	Dichotomous, 1=yes; 0=no
	Dental Insurance	Does this district offer dental insurance to teachers?	Dichotomous, 1=yes; 0=no
	Life Insurance	Does this district offer group life insurance to teachers?	Dichotomous, 1=yes; 0=no
	Retirement Plan	Does this district offer retirement plan to teachers?	Dichotomous, 1=yes; 0=no
	Tuition Remission	Does this district offer tuition reimbursement to teachers?	Dichotomous, 1=yes; 0=no
Teacher questionnaire	PD support (average of 6 items)	Support for PD: release time from teaching	Dichotomous, 1=yes; 0=no
		Support for PD: scheduled time in contract	Dichotomous, 1=yes; 0=no
		Support for PD: stipend for PD outside regular work hrs	Dichotomous, 1=yes; 0=no
		Support for PD: partial or full reimbursement for college	Dichotomous, 1=yes; 0=no
		Support for PD: reimbursement for conference/workshop	Dichotomous, 1=yes; 0=no
		Support for PD: reimbursement for travel and/or daily expenses	Dichotomous, 1=yes; 0=no
	PD hrs on content	In the past 12 months, hrs spent on professional development concentrating on the contents of teaching field	1=less than 8 hrs; 2=9-16 hrs; 3=17-32 hrs; 4=over 33 hrs
	Induction program	In your first year teaching, did you participate in an induction program?	Dichotomous, 1=yes; 0=no
	Mean hrs in school/wk	Total weekly hrs spend on teaching and all school-related activities	Continuous
	Mean base pay hrs/wk	Weekly hrs rquired to work to receive base bay	Continuous
	Mean teaching Hrs/wk	Weekly hrs spent on delivering instruction to students	Continuous

Supplementary Analysis for the Large Urban and Suburban Districts

Results from the HGLM analysis find that in the large urban and suburban districts, districts with stronger unionization tend to have more high quality teachers as defined by certain indicators. Though not a focus of this study, I am interested in the possible reasons that teacher unions have any effect on teacher quality. In the theory of action section in Chapter 2, I theorized, in concurrence with others (Koski & Horng, 2007, Johnson & Donaldson, 2006) that the negotiated items on union contracts, such as teacher pay, class size, seniority rule in transfer, etc, affect school districts' ability to hire and retain quality teachers. In this section, I conducted a supplementary analysis comparing unionized districts with non-unionized districts on frequently negotiated contract items (see Table 18 of the description of items). Specifically, I focus on districts included in the "Large Urban and Suburban Districts" sample. Table 19 presents comparisons of the frequently negotiated contract items between districts with varying unionization status—stronger unionization, weaker unionization, and no union agreement. Stronger and weaker unionization districts are compared against the non-unionized ones, respectively. Differences on categorical variables were tested using chi-square test (specifically through the logistic regression technique), and continuous variables using t-test (specifically through the ANOVA multiple comparison technique). The analysis suggests some trends in the differences between strongly-unionized districts and non-unionized districts. The reported results are statistically significant at the p level of 0.05, unless otherwise explicitly stated.

Strongly unionized districts (SUDs), on average, offer higher teacher salaries[45] than non-unionized ones according to their salary schedules (see Table 19). Though SUDs do not offer statistically significantly higher salaries to entry level bachelor degree-holders than NUDs, they do offer higher salaries to more experienced teachers. The salary premium in SUDs is larger than that in NUDs as teachers stay longer in teaching, as evidenced by the salary increase of more than $10,000 from the" bachelor without experience" step to the step of "bachelor with 10 years of experience" in SUDs, while the increase in NUDs between the two steps is only about $6,600. The same case is true between the two steps of "master with no experience" and "master with 10 years of experience"; the salary difference is over $13,000 in SUDs and about 7,300 in NUDs. Further testing reveals that the differences in salary premium between SUDs and NUDs are statistically significant. The result that SUDs consistently pay more to teachers with more experience, or backload teacher salary schedules, echoes the findings of Lankford and Wyckoff (1997) that unionized districts tend to offer back-loaded salary schedules.

[45] Salaried adjusted with CWI index 2004.

Table 19: Working Conditions Comparisons across Districts with Varying Unionization Status (n=480)

Variables	Unionization Categories: [a]Stronger Unionization	Weaker Unionization	No Unionization	Total
	Mean (SD)[b]	Mean (SD)	Mean (SD)	Mean (SD)
Unweighted N (Weighted%)	266 (58.36%)	74 (14.33%)	140 (27.31%)	480 (100%)
Salary_BA+0 yrs (x1000)	32.77 (3.32)	32.40 (2.64)	32.73 (3.46)	32.71 (3.27)
Salary_BA+10 yrs[2](x1000)	43.26*** (7.09)	38.54 (3.94)	39.33 (3.46)	41.47 (6.22)
Salary_master+0 yrs(x1000)	36.18~ (3.51)	35.30 (3.27)	35.34 (3.80)	35.83 (3.58)
Salary_master+10 yrs[3] (x1000)	49.37 *** (7.81)	43.69 (5.34)	42.62 (4.38)	46.72 (7.41)
Salary_Highest (x1000)	66.43*** (8.67)	62.69** (7.18)	59.13 (8.10)	63.90 (8.89)
Salary dif. Between Ba 0 and 10 yrs[2]	10.39*** (5.71)	6.13 (3.20)	6.60 (2.48)	8.71 (5.07)
Salary dif between master 0 and 10 yrs[3]	13.18*** (6.17)	8.39 (4.32)	7.28 (3.08)	10.89 (5.91)
Contract Yr: <= 9 Mon	0.16**	0.28	0.28	0.21
Contract Yr: 9.5-10 Mon	0.75	0.67	0.71	0.73
Contract Yr: >=11 Mon	0.09*	0.06	0.01	0.06
Days in sch yr for students	179.18 (3.19)	178.55 (4.38)	179.34 (2.78)	179.13 (3.29)
Mean hrs in school/wk	53.70 (4.19)	54.16 (3.41)	54.40 (3.79)	53.96 (3.98)
Mean base pay hrs/wk	37.33*** (2.28)	38.54* (1.57)	39.15 (1.53)	38.00 (2.16)
Mean teaching Hrs/wk	28.01*** (2.52)	28.67 (2.75)	29.29 (3.14)	28.45 (2.79)
Student/Teacher Ratio	18.60*** (3.39)	17.06 *** (2.61)	15.44 (1.42)	17.52 (3.18)
Full State in-Field Certification Requirement for Teaching	1	1	0.99	1
College Major or Minor Requirement for Teaching	0.96	0.97	0.98	0.96
% Teachers Participated in New Teacher Induction program[1]	68 (29)	72 (28)	71 (31)	70 (30)
Average PD Support	2.31* (0.71)	2.25 (0.71)	2.12 (0.74)	2.25 (0.72)
Districts with Formal Procedure to Counsel Out Incompetent Teachers	0.81	0.84	0.8	0.81
% District Teachers Dismissed	1.90 (10.73)	0.52 (1.09)	1.59 (9.61)	1.62 (9.62)

Table 19: Working Conditions Comparisons across Districts with Varying Unionization Status Cont'd (n=480)

Variables	Unionization Categories			
	[a]Stronger Unionization	Weaker Unionization	No Unionization	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
% District Teachers Dismissed with <=3 yrs Experience	1.24 (9.49)	0.04 (0.11)	1.08 (8.10)	1.02 (8.39)
% District Teachers Dismissed with >3 yrs Experience	0.66 (1.98)	0.48 (1.06)	0.51 (2.47)	0.59 (2.03)
Medical Insurance	1.00	1.00	1.00	1.00
Dental Insurance	0.99	0.95	0.94	0.97
Life Insurance	0.93	1.00	0.95	0.94
Retirement Plan	0.97	0.96	0.96	0.97
Tuition Remission	0.34	0.39	0.45	0.38

Notes: Non-union group is compared against stronger and weaker unionization groups. Differences on categorical variables are tested using chi-square test, continuous variables using t-test. [a] "Stronger Unionization": refers to districts having a collective bargaining contract and more than 50% teachers are union members; "Weaker Unionization" refers to districts having "meet and confer" agreement with teacher unions or having collective bargaining agreements but less than 50% (inclusive) of teachers are union members. [b] SD for conitunous variables; [1] Due to missing data, the ns are 203(54.8%), 64 (16.1%),119(29.1%), 386 (100%) respectively. [2] Due to missing data, the ns for the subgroups and total are 255, 74, 140, 469 respectively. [3]Due to missing data, the ns for the subgroups and total are 264, 74, 138, 476, respectively.

Unionization theory suggests that unions would decrease teachers' workload, such as shortening work time and reducing class size. This analysis reveals mixed findings regarding work time. Among the large urban and suburban districts, nine percent of SUDs have a contract year length of over 11 months, as compared with only one percent of NUDs. And, in comparison with NUDs, a smaller percentage (16%) of SUDs negotiate contract year length to be less than or equal to 9 months (16% vs. 28%). In short, we may infer that teachers in SUDs, on average, have a longer contract year. This analysis also reveals that students' school year is of comparable length between SUDs and NUDs (179.18 vs. 179.34 days). Piecing together the length of teachers' contract year and students' school year, we can infer that, on average, teachers in SUDs have more days in school without instructing students. Teachers in SUDs, on average, have a longer contract year; yet, they report shorter time (about 1.8 hours shorter) required to work per

week to receive base pay (district average 37.33 vs. 39.15 hrs) and they spend fewer hours per week in teaching (28.01 vs. 29.29 hrs), though their total weekly in-school time is not significantly different from that of their peers in NUDs. Thus, the above findings on school time implies that teachers in SUDs have a lighter workload[46] in terms of working with students, but more time to engage in activities without supervising students. Contrary to previous findings, the student-teacher ratio is higher in SUDs than in NUDS (18.60 vs. 15.44).

In terms of requirements for new hires, this analysis reveals that almost all SUDs and NUDs require teacher candidates to have both certification and college major or minor in the teaching field, and there is no difference between SUDs and NUDs in this regard. Once new teachers are hired, both SUDs and NUDs (close to 70 percent) are equally likely to offer induction programs to assist them in their first year of teaching. However, teachers in SUDs report more support for engaging in professional development[47] activities in the form of scheduled time in contract, stipend for professional development outside regular work hours, reimbursement for college tuition, or workshop or travel expenses, etc.

Similar percentages of SUDs and NUDs (81 vs. 80 %) have formal procedures in place to counsel out incompetent teachers. In addition, on the percentage of teachers dismissed (total, with less than or equal to three years of teaching experience, and with over three years of teaching experience) for poor performance, SUDs and NUDs are not significantly different from each other.

[46] Here I define "lighter work load" solely by instructional time length and the number of working hours required to receive base pay. That said, I acknowledge that I do not have information from SASS on how teachers spend their in-school time or instructional time.
[47] Support for PD is composed of six items as specified in Table 18: 1) release time from teaching, 2) scheduled time in contract, 3) stipend for PD outside regular work hrs, 4) partial or full reimbursement for college tuition, 5) reimbursement for conference/workshop fees, 6) reimbursement for travel and/or daily expenses.

So what do we make of the difference in salary, working conditions and all the other frequently negotiated items between SUDs and NUDs? In general, SUDs tend to pay teacher more, especially veteran teachers and teachers with more education. On workload, teachers in SUDs have a shorter contract week and spend less time on teaching. And teachers in SUDs have more paid days exempt from instructing students based on information of contract year length and student school year length. Contradicting previous findings and perceptions, this analysis finds that SUDs have a higher student-teacher ratio than NUDs. This finding does not suggest that unions forgo their demand for smaller classes to better their members' working conditions. One potential explanation may be that non-unionized districts decreased their overall student-teacher ratio through providing more special programs to accommodate the diverse needs of their students, such as LEPs, ESL students. SUDs tend to offer more support for teachers' professional development activities. Yet, SUDs and NUDs are very similar in certification and degree requirements for teacher candidates, and equally likely to offer induction programs to new teachers. And SUDs are not different from NUDs in terms of whether having a formal procedure to counsel out incompetent teachers, or the percentage of teachers being dismissed. Unionized districts (strongly-unionized as well as weakly-unionized ones) are equally likely as non-unionized ones to provide benefits, such as health insurance and retirement plans, to teachers.

CHAPTER FIVE: DISCUSSION AND FUTURE RESEARCH

Discussion

The purpose of this dissertation research is to study the relationship between teacher unionization and teacher quality in large urban and suburban districts. Specifically, this study examined whether unionized districts had more or fewer qualified teachers than non-unionized districts, and whether a district's unionization status was associated with the intra-district distribution of teacher quality across schools in America's largest districts. In this research, I adopted two composite indicators to measure teacher quality: a) the *empirically-established teacher quality (ETQ) indicator*, which is composed of selectivity of the postsecondary institutions teachers attended, holding at least a bachelor's degree in the teaching field, holding a certificate in the teaching field, and at least five years of experience; and b) the *NCLB-defined "highly qualified teachers"(HQT) indicator,* which is composed of at least a bachelor's degree from a four-year institution, full state certification, and competence in the subject area.

Addressing the first research question whether unionized districts have more or fewer qualified teachers, the study finds that in the nation's large urban and suburban districts, districts with stronger unionization status, which refers to districts that have collective bargaining agreements and in which over 50 percent of teachers are union members, tend to have higher proportions of HQTs and have comparable proportions of ETQ teachers when compared with non-unionized districts. Unpacking the association between unionization and components of the above teacher quality indicators, this study finds that districts with stronger unionization status have higher concentrations of teachers with at least five years of experience, teachers with subject-area degrees, and

teachers with subject-area certifications. Yet, findings also reveal that districts with stronger unionization are not statistically significantly different from non-unionized districts in employing teachers who graduated from selective postsecondary institutions, a key component in the ETQ composite. Weakly unionized districts, which refer to districts either 1) having a meet-and-confer agreement or 2) having a collective bargaining agreement but with union membership no more than 50 percent of total number of district teachers, are not significantly different from non-unionized districts in employing high quality teachers as defined by either of the composite variables or any of their component variables, except the experience component. Weakly unionized districts are less likely to be equipped with teachers with at least five years of experience.

The fact that stronger unionization exhibits different relationships with the ETQ and HQT indicators is intriguing and it could be attributed to unions' stance on teacher quality issues. As literature reviewed in Chapter Two suggests, teacher unions are advocates of teacher professionalism. Unions support teacher licensing and call for academic major and pedagogical studies for teacher candidates (AFT, 2003; Kerchner & Koppich, 1993). In addition, the seniority rule as well as single-salary schedules unions typically negotiate give preference to experienced teachers. Therefore, the findings that strongly unionized districts, on average, have higher concentrations of HQTs and teachers with certain characteristics (i.e. teachers with subject-matter degrees, teachers with subject-matter certifications, and experienced teachers) are in line with teacher unions' standing on teacher professionalism and their negotiated policies. However, selectivity of postsecondary institutions teacher attended, the key component of ETQ, is not a union emphasis, which may serve as a possible explanation that stronger unionized

districts are not significantly different from their non-unionized peers in employing ETQ teachers or teachers who graduated from selective colleges.

The second research question examines whether a district's union status affects the intra-district distribution of teacher quality across schools with different poverty status and minority students concentration in the largest districts. Results from the analysis reveal that the poverty/minority level of a school has a stronger (and negative) effect on the distribution of *experienced teachers* in strongly unionized districts than in non-unionized districts, which suggests that in strongly unionized districts the teacher quality gap is much wider across high and low poverty/minority schools in terms of retaining experienced teachers. However, this research finds little evidence that unionization is associated with the teacher quality gap as measured by either the EQT or HQT indicator, or the other three component variables (teachers with in-field certifications, teachers with in-field degrees or teachers who graduated from selective colleges).

What do the results mean to us? At first glance, one may infer that teacher unionization promotes teacher quality in large urban and suburban districts, but exacerbates intra-district teacher quality distribution in the largest districts. However, we should interpret the findings with caution for the following reasons.

First, the issue of teacher quality is complex. Though researchers have reached consensus that teachers are the single most important factor in determining students' schooling experience, the debate continues on the fundamental question of what exactly a high quality teacher is. Even on the two alternative proxies of teacher quality adopted in this dissertation study— ETQ and HQT—teacher unions exhibit different relationships

with them. Unpacking the relationships between teacher unions and components of the two composite measures, this study reveals that stronger unionization has a non-significant relationship with the selectivity component, a key component of ETQ, but significant relationship with other components (i.e. experience, subject-matter degree, and certification). The complexity manifested in the relationships between stronger unionization and different teacher quality measures cautions against oversimplification of the findings. Second, teacher unionization has varying forms and the strength of unions can be measured in varied ways, be it a collective bargaining agreement, meet and confer agreement, or union membership. Even under the broad category of collective bargaining, teacher unions adopt different strategies in negotiating with school districts and can reach varying contracts covering varied items, besides the traditional "bread and butter" items (i.e. pay, working conditions etc). Therefore, given the complexity in measuring teacher unionization, results from this study should only be interpreted congruent with how teacher unionization is measured. Third, though the findings show that stronger unionization is positively related to the concentration of HQTs, experienced teachers, and teachers with subject-matter degrees and certifications, we still cannot state with certainty that teacher unionization creates a more qualified teaching force, as similarly argued by Koski and Horng (2007); the causality may be working in the other direction. Fourth, even though this dissertation study has made diligent efforts to include potential confounding factors which may provide alternative explanations for the unionization effect, this study cannot rule out the possibility that teacher unionization serves as a proxy for some unobservable factors that are linked with teacher quality. For instance, unions may be more likely to form if administrators are incompetent as theorized by

Hoxby (1996); therefore, the effect of teacher unionization may indeed be the effect of poor school management. Lastly, unions' effect on the within-district distribution of teacher quality only pertains to experienced teachers.

Yet, even with all these caveats, the positive link between stronger unionization and districts' concentrations of HQTs, more experienced teachers, and teachers with subject-specific degrees and certifications offers a piece of empirical evidence to the prolonged and much ideologically-centered debate on the relationship between teacher unionism and some of the frequently used, though far from perfect, proxies of teacher quality. Now with increased attention and efforts to increase teacher quality, the single most important resource provided to students, the positive findings provide a glimpse of what might attract potential high quality teacher candidates to classrooms. This dissertation study began with the assumption that teachers are attracted to a particular school district not by the ideology whether a district is unionized or not, but by working conditions that district may offer. With this underlying assumption in mind, I performed a supplementary analysis of the large urban and suburban district sample seeking to explore whether working conditions in unionized districts are different from those in their non-unionized counterparts.

Results from the supplementary analyses reveal that the working conditions in strongly-unionized districts and non-unionized ones are significantly different in some aspects, but not in all aspects. The differences between strongly-unionized districts and their non-unionized counterparts in compensation offered to teachers, teachers' working time, and support for professional development may offer some potential explanations for strong-unionized districts' attraction to teachers. Specifically, compared with non-

unionized districts, districts with stronger unionization status tend to pay higher average salaries to teachers, particularly to teachers with more years of experience and higher educational levels. The backloading of salaries, that is paying disproportionally higher salaries to teachers with more years of experience, may serve as one possible explanation for the finding that strongly unionized districts have higher concentrations of quality teachers, particularly experienced teachers. There has been much attention given to the effect of compensation on teachers' decision to teach, or where to teach. And a large body of literature as synthesized by Lankford and colleagues (2002) suggests that teachers are responsive to pay differences. Though teachers may not enter teaching in hopes of high salaries, researchers found low pay is one of the reasons teachers express dissatisfaction, or quit teaching (Baugh & Stone, 1982; Johnson, 1990). Plus, each urban or suburban area has a larger number of school districts, which provides teachers, particularly experienced ones, with options for where they choose to teach. Given the finding that strongly-unionized districts tend to backload teachers, teachers have an incentive to stay in or move to these backloading districts from neighboring ones without similar salary schedules.

Salary structure is one factor that contributes to teachers' employment decision; other non-pecuniary characteristics, such as working conditions, opportunities for professional development, are also important. The supplementary analysis finds that on average teachers in strongly-unionized districts are required to work fewer weekly hours to receive base pay, and they spend fewer weekly hours in instructing students. Plus, teachers report more support for their professional development in strongly unionized districts, such as scheduled time for professional development in contract, stipend for

professional development outside regular work hours, and reimbursement for college tuition, workshop or travel expenses. According to information on district contract year length and student school year length, the supplementary analysis also reveals that teachers in strongly-unionized districts have more in-school days without supervising or instructing students. The reported lighter workload[48] in strongly-unionized districts (fewer weekly hours on instruction and fewer required working hours to receive base pay) and more support for professional development activities could also work to attract teachers to these districts.

In summary, the supplementary analysis on compensation and working conditions in districts with varying unionization status provides a preliminary insight into what might work to attract and retain teachers of high quality. Though this analysis is not able to test the extent to which the various factors contribute to the findings of higher concentrations of certain teacher quality attributes in strongly unionized districts, higher average salary, lighter workload[49] and more support for professional development create more favorable conditions for teachers. Yet, the conditions benefiting teachers may not as well be beneficial to students. One particular "double-edge sword" item concerns teachers' work time length and time use. Teachers affect students' schooling experience through their interaction with students. The duration as well as effectiveness of the interaction contributes to students' growth. On the one hand, shorter weekly working hours and some extra days without supervising students may lessen the problem of teacher burnout; on the other, the shortened interaction time could also negatively affect

[48] Here I define "lighter work load" solely by instructional time length and the number of working hours required to receive base pay. That said, I acknowledge that I do not have information from SASS on how teachers spend their in-school time or instructional time.

[49] See note 48.

students' learning in school. Though this research finds that higher proportions of teachers in strongly-unionized districts possess certain characteristics (i.e. teacher experience, subject-matter degree and subject-matter certification) contributing to students' academic achievement, the unionized districts may find themselves shortchanging their students through shortening students' instructional time. Teachers are one and one most significant resource provided to students (Rice, 2008). Making good use of this resource is of ultimate importance to schools and students. Teachers in strongly-unionized districts have more days to themselves when students are not at school. To the extent that teachers typically spend their in-service days without instructing students on professional development and preparing for classroom instruction, we may infer that teachers in strongly unionized districts have more time for professional development or preparing for instruction. However, we do not have information on how these extra days are spent. Future research needs to examine how the union provisions affect the use of teachers' time, and ultimately students' schooling.

Taking together the findings of this research, we conclude that strongly-unionized districts are able to leverage more educational resources. Overall, these districts spend more on educating each student; they have more teachers possessing certain characteristics associated with high teacher quality, more time available for teachers' professional development. How to make good use of the resources to simultaneously better teachers and students is at the crux of the issue of teacher unionization. In unionized districts both teacher unions and school district management should shoulder the responsibility of effectively using the resources available to improve their students' learning. As reviewed in Chapter Two, some reform-minded local teacher unions

adopted collaborative bargaining with district management to improve school performance. A few of successful cases, such as Montgomery (MD) created a labor-management partnership that resulted in an extensive school-based professional development program tied to increasing student achievement (Koppich, 2006), and Cincinnati's (Ohio) pay for performance, have demonstrated that teacher unions can work with school management to improve teacher performance, and thus ultimately benefit students. Future research that examines student performance in districts with varying unionization status should be of interest to researchers and policy makers.

The finding that state law status has a suppressor effect on stronger unionization when modeling some teacher quality proxies (i.e. HQTs, experienced teachers, teachers with in-field certifications, and teachers with in-field degrees) warrants particular attention when interpreting the results. The finding reveals that district unionization status interacts with state law status to affect district proportion of teachers with these teacher quality attributes. A possible explanation could be that state law status serves as a proxy for other state teacher-related policies. States with different collective bargaining law status may also have varying state policies and practices with regard to teacher qualification, hiring, or compliance with NCLB's HQT requirement. Some anecdotal evidence suggests that some states with prohibitory laws, such as Georgia and Mississippi, exhibit a higher level of compliance with the HQT requirements than some mandatory collective bargaining states, such as Maryland (Department of Education, 2009c). This finding on and possible interpretation of the state collective bargaining law effect suggests future research needs to account for state policy environment in studying district and/or school policies and practices.

Another noteworthy finding concerns the student-teacher ratio difference between strongly-unionized districts and non-unionized ones. The finding that the student-teacher ratio in strongly-unionized districts is higher than that in non-unionized ones contradicts the findings of previous research that unionized districts tend to have smaller class sizes (Eberts, 1984; Hoxby, 1996). One potential explanation may be that collective bargaining tends to standardize workplaces, in part to reduce the variation in working conditions as well as to reduce arbitrary treatment by employers (Stone, 2000). In the school setting, the "standardizing" effect of unions leads to greater reliance on traditional classroom organization, and less on specialized instructional modes (i.e. with a specialist in an independent, programmed study) as found by Eberts and Stone (1984) and Argys and Rees (1995). As nonunionized districts offer more specialized (usually of much smaller student-teacher ratio) instruction tailored to the needs of a diverse student body, such as special education students, English as a Second Language Learners (ESL) students, the overall average district student-teacher ratio are reduced.

This study began with the understanding that one of the challenges in teasing out the effect of unionization on teacher quality lies in unions' "spillover effect", that is non-unionized districts frequently adopt the practices of unionized districts to preempt their teachers from unionizing. This study finds some traces of evidence that non-unionized districts are similar to their unionized peers in some aspects. Non-unionized districts are equally likely as unionized districts (strongly-unionized as well as weakly-unionized ones) to counsel out teachers and provide health insurance and retirement plans to teachers. The similarities are most evident in requirements of and offerings to new teachers. Districts with varying unionization status are equally likely to offer induction programs, offer

similar salaries to new hires with bachelors' degree, and have in-field certification and degree requirements in place. Though this analysis finds similarities across districts with varied unionization status with respect to these frequently union-negotiated items, I am not able to attribute the similarities to unions' spillover effect. Studies using interviews or other appropriate methods are needed to investigate whether the similarities across districts with differing unionization status may be due to the spillover effect.

Addressing the second research question whether a district's union status affects the intra-district distribution of teacher quality across schools with different poverty status and minority students concentration in the 52 largest districts, the analysis finds that the poverty/minority level of a school has a stronger (negative) effect on the distribution of experienced teachers in strongly unionized districts than in non-unionized districts, but no effect on the distribution of teacher quality as measured by other indicators adopted in this study. The effect of stronger unionization on the distribution of experienced teachers should not be surprising according to teacher unionization theory. Teacher unions, particularly the seniority-based transfer rules give experienced teachers much latitude in choosing where to teach. Experienced teachers typically take advantage of the rule, and they choose to leave undesirable schools, usually high poverty and high minority schools, to teach at schools they find more desirable.

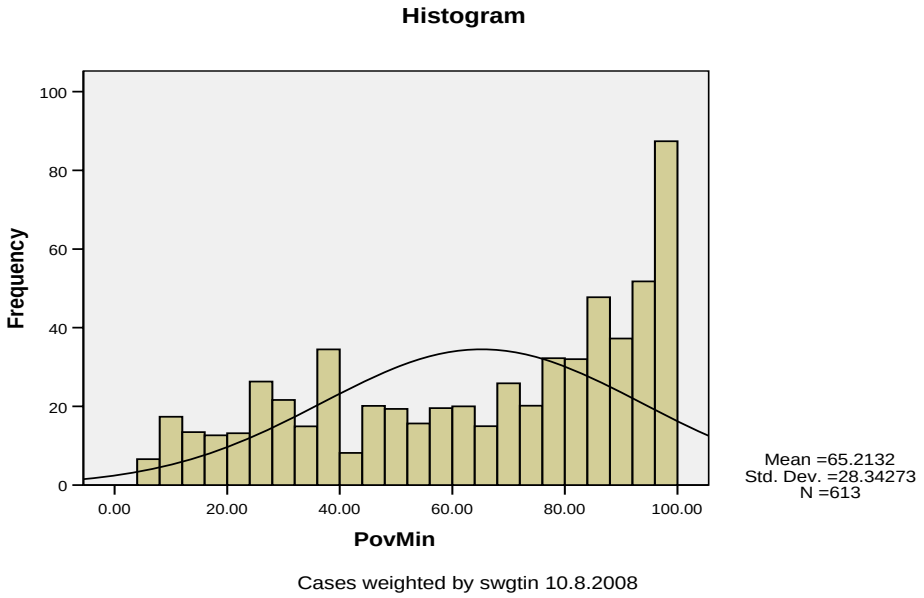
Two interpretations may be offered for the findings that unionization has no effect on the intra-district distribution of teacher quality as measured by the other indicators, i.e. ETQ, HQT, in-field degrees, in-field certifications, and selectivity of colleges. One possible explanation is that district administrators either negotiate flexibility in the union contract concerning teacher assignment or they collaborate with teachers and unions to

work around the district's strict formal polices to aim for a balance in the teacher quality distribution across schools (Koski & Horng, 2007). Koski and Horng, from their interviews with nineteen district human resource directors in California, found out that district and school administrators worked creatively to get around contract languages to meet the needs of students in hard-to-staff schools, such as developing strong working relationships with union leaders to mutually suspend transfer rules, "hiding" open positions until the internal transfer period completed. Besides districts working around union rules, districts policies that encourage best candidates to teach in hard-to-staff schools may also help mitigate poverty/minority's effect on teacher quality distribution across schools (Koski & Horng, 2007; Prince, 2003).

The other alternative explanation pertains to the data structure of the sample utilized in addressing the second research question. Due to the limited number of schools sampled within districts, out of the 100 largest districts in the U.S. only 613 schools in 52 districts have sufficient data to allow modeling the intra-district distribution of teacher quality. In addition, the distribution of one of the major independent variables, school poverty and minority concentration level, is very negatively skewed, meaning that a large number of schools have high poverty/minority levels (see Figure 4). Furthermore, about half the sampled districts have low intra-district school poverty/minority variance, which suggests that these sampled schools are not much different from each other in terms of schools' socioeconomic composition. Therefore, the relatively small sample size of districts, skewness and the low intra-district variance of the school poverty/minority variable, pose a challenge in constructing statistical models to tease out the potential

unions' effect on the intra-district distribution of teacher quality across schools with varying poverty/minority levels.

Figure 4: Histogram of School Poverty/Minority Variable



The auxiliary statistics from the schools-within-district HGLM models offer an additional piece of evidence that data used in addressing this research question is limited and the ensuing models based on the data may be unstable. For example, on modeling two of the dependent variables, i.e. proportion of teachers with in-field certification and proportion of experienced teachers, the variance of intercept and of poverty/minority slope in each model is highly correlated (close to "1" for in-field certified and experienced teachers), see Tables 15-17. The high correlation between the variance of intercept and of slope suggests that there is not enough information to separately model the intercept and slope and this may cause instability in the model (SSI, 2009).

Given the limitations existent in the data, the results from the models addressing the second research question of teacher quality distribution should be interpreted with

caution. Future research could be more fruitful in examining the relationship between teacher unionization and intra-district distribution of teacher quality when researchers have access to datasets with a larger number of schools sampled within districts.

In summary, this dissertation examined the relationship between teacher unions and teacher quality, based on the conceptual framework that multilevel factors—district, school, and state factors—influenced teachers' decisions on where to teach. This study fills a gap in understanding the relationship between teacher unions and teacher quality in large urban and suburban districts across the U.S. Particularly, this study extends prior research on the union effect through the adoption of multilevel analysis technique as well the use of the SASS 03-04, a national representative sample of schools and districts that reflect the current educational context, such as accountability, and the implementation of NCLB. Findings from this research provide empirical support to the notion that teacher unionization has a significant effect on teachers and public schools, and teacher unions should not be left out of school improvement efforts. Unions' differential effects on the alternative proxies of teacher quality adopted in this research (non-significant effect on ETQ and selectivity; and significant effects on HQT, experience, subject-matter degree and certification) as well as results from the supplementary analysis on working conditions further suggest that union-negotiated policies and their police emphases matter in attracting and retaining teachers of certain characteristics. The union influence is most apparent with respect to qualifications related to legal requirements (NCLB). Findings from this study also suggest that research focused on teacher quality and other teacher related topics should take into consideration the strength of teacher unions to better understand the phenomenon being studied.

Limitations and Future Research

This dissertation study provides a piece of empirical evidence with respect to the relationship between teacher union and teacher quality, however it is important to identify limitations of this study that may affect the interpretation of the findings. One limitation of this dissertation study pertains to the possible endogeneity issue. In this analysis, to tease out unionization effect, I constructed multilevel models and controlled for district policies and practices which may serve as alternative explanations for union effect, such as district pay schedule for novice teachers, student-teacher ratio, and districts' per pupil expenditure. Yet, according to unionization theory, these policies and practices may have potential endogenous links with unionization; that is unionization may well cause district policies and practices to be different from their non-unionized peers, and thus impact teacher quality through the mediating effects of these practices. By treating these district policies and practices as controls, this study may accidentally underestimate the union effect. While it would be of ultimate satisfaction to build multilevel empirical models that simultaneously taking into consideration the potential mediating effects of the district policies and practices, and the clustering nature of schools within districts and districts within states, the current multilevel modeling techniques do not provide tools to build such models. Therefore, with the advancement of multilevel modeling techniques, future research could be more fruitful in sorting through the intertwined relationship between teacher unions and other potential endogenous district policies, and result in a better estimate of teacher union effect.

Second, the validity of the teacher quality measures should be interpreted with caution. The proxy for teacher quality based on the empirical evidence—ETQ—though

backed up by the best empirical evidence available, should not be interpreted as the final word on teacher quality. Research shows that the components of the ETQ variable have modest effects on student achievement, much smaller than what we know to be the effect of a good teacher. Teacher quality is a complex phenomenon in itself. Before the education field is certain about the crucial attributes of effective teachers, any measure can only serve as a snapshot of what teacher quality is supposed to be. Furthermore, the ETQ measure is defined solely on the effect of its components upon students' academic achievements, which sets a much narrower boundary on teachers' work. The same caution should be paid to the NCLB teacher quality measure. Findings based on this measure should only be interpreted as unions' association with a currently-held view of teacher quality by the federal government.

Third, the method of comparing the difference in teacher quality measures between unionized and non-unionized districts to obtain unionization effect poses another limitation in the findings. Unionization does not take place haphazardly. Unions are more likely to form in certain industries or in certain geographic areas (Goldhaber, 2006). Applying this analogy to education, it could well be that unionized districts have distinct teacher characteristics that prompt teachers to join unions. Meanwhile, these teacher characteristics may be related to the teacher quality indicators adopted in this research. The exclusion of the unknown factors in the models could limit the findings from this research. The fact that the level-1 variance of outcome variables (Y_{ij}) is higher than the variance assumed by level-1 sampling models[50] used in this study may demonstrate that there are important factors omitted. In addition, excluded variables, which refer to those

[50] Also called overdispersion in statistical terms.

variables included in the theoretical framework but are absent from the empirical models due to data unavailability, present another limitation to this study.

Data points available for constructing the empirical models pose another limitation to the findings, particularly in regard to addressing the second research question. As discussed above, when building the schools-within-districts models, only about 613 schools in 52 districts have valid information to conduct the analysis. The relatively small sample size of districts, skewness and the low intra-district variance of the school poverty/minority variable, pose a challenge in constructing statistical models to tease out the potential union effects on the distribution of teacher quality.

This dissertation study finds that stronger teacher unionization status is associated with districts employing teachers possessing certain characteristics related to teacher quality. The ensuing supplementary analysis reveals that working conditions in strongly unionized districts are different from non-unionized ones in a number of ways, which may serve as an exploratory explanation for the findings on union effect. For an in-depth understanding of how teacher unions might affect teacher quality, future research needs to construct multilevel pathway models (with the advancement of the multilevel modeling techniques) that empirically test the mediating effects of these working conditions as suggested in the beginning of the limitation section. In addition, the findings from this research also call for qualitative studies to investigate how and why teacher unions are associated with teacher quality. Teacher union literature has documented that teacher unions negotiate a myriad of items besides the traditional "bread and butter" issues (Johnson, 2004). The real effect on teachers and potentially on teacher quality depends on the execution of the negotiated items, which in turn depends on how

administrators and teachers in the district interpret and apply the contract provisions. Interview and observational data from local school and district administrators, union leadership and teachers would provide rich information on how unions and union contracts influence teachers' decision on where to teach.

Despite the limitations of the study, results from this dissertation provide valuable information on whether teacher unionization is related to teacher quality across U.S. large urban and suburban districts. Limitations in this study should offer guidance on future research that seeks to further explore unions' effect.

Table 20: Definition of Variables Used in this Study

Variable Type	Variable Name	Description
DEPENDENT VARIABLES:		
School Level	% School ETQ Teachers[TQ_MW]	School level mean aggregate of a teacher level dichotomous composite variable based on empirical evidence, composed of teacher experience, in-field certification, in-field degree and selectivity of colleges attended [from Barron's college ratings, and SASS teacher questionnaire variables[1]]
	% School HQTs[HQTJI_MW]	School level mean aggregate of a teacher level dichotomous composite variable based on NCLB's HQT requirement[1]
	% School Teachers with at Least Five Years of Experience[TexperMW]	School level mean aggregate of a teacher level dichotomous variable measuring whether teachers with at least 5 years of teaching experience [from TOTEXPER]
	% School Teachers with In-field Certifications[CERT2_MW]	School level mean aggregate of a teacher level dichotomous variable measuring whether teachers having subject-matter certifications[1]
	% School Teachers with In-field Degrees[DEGR_MW]	School level mean aggregate of a teacher level dichotomous variable measuring whether teachers having subject-mater degrees[1]
	% School Teachers Graduated from Selective Colleges[CORATEMW]	School level mean aggregate of a teacher level dichotomous variable measuring whether teachers attended selective colleges [from Barron's ratings]
District Level	% District ETQ Teachers[TQ_MW]	District level mean aggregate of a teacher level dichotomous composite variable based on empirical evidence, composed of teacher experience, in-field certification, in-field degree and selectivity of colleges attended [from Barron's college ratings, and SASS teacher questionnaire variables[1]]
	% District HQTs[HQTJI_MW]	District level mean aggregate of a teacher level dichotomous composite variable based on NCLB's HQT requirement[1]
	% District Teachers with at Least Five Years of Experience[TexperMW]	District level mean aggregate of a teacher level dichotomous variable measuring whether teachers with at least 5 years of teaching experience [from TOTEXPER]
	% District Teachers with In-field Certifications[CERT2_MW]	District level mean aggregate of a teacher level dichotomous variable measuring whether teachers having subject-matter certifications[1]
	% District Teachers with In-field Degrees[DEGR_MW]	District level mean aggregate of a teacher level dichotomous variable measuring whether teachers having subject-mater degrees[1]
	% District Teachers Graduated from Selective Colleges[CORATEMW]	District level mean aggregate of a teacher level dichotomous variable measuring whether teachers attended selective colleges [from Barron's ratings]
INDEPENDENT VARIABLES:		
School Level	School poverty and minority concentration[POVMIN]	Continuous composite variable =(% FARL+%Minority Student)/2 [from NSLAPP_S, MINENR_S]
	School size (over 1000)	Dummy-coded variable recoded from school student enrollment [from s0422_s]
	School Size (500-1000)	Dummy-coded variable recoded from school student enrollment [from s0422_s]
	School size (below 500)	Dummy-coded variable recoded from school student enrollment [from s0422_s]
	School Student-teacher Ratio[STRATIO_S]	Continuous variable [from S0422_S, NUMTCH_S]
	School Enrollment[S0422_S]	Continuous variable [from S0422_S]
	School % student with IEP[IEP]	Continuous variable measuring the percentage of students with IEP [from IEP]
	Teacher PD Opportunities[FAC1_NW]	Continuous composite variable [from A0125, A0126, A0127, A0128, A0129, A0130, A0131, A0132, A0133]
	Elementary School [ELEMENTARY]	Dichotomous variable where 1=Elementary school; 0=other[from SCHLEVEL]
	Secondary School[SECONDARY]	Dichotomous variable where 1=Secondary school; 0=other[from SCHLEVEL]
	Combined School[COMBINED]	Dichotomous variable where 1=Elementary and secondary combined school; 0=other[from SCHLEVEL]

Table 20: Definition of Variables Used in this Study (continued)

Variable Type	Variable Name	Description
	INDEPENDENT VARIABLES:	
District Level	No Union Agreement[NOUNION]	Dichotomous variable where 1=no union agreement; 0=other [from D0094]
	Weaker Unionization [WEAKU2]	Dichotomous variable [from D0094 and T0407]. Defined as either having a "meet and confer" agreement or having a collective bargaining agreement but with union membership no more than 50 percent of total number of teachers.
	Stronger Unionization [STRONGU2]	Dichotomous variable [from D0094 and T0407]. Defined as having a collective bargaining agreement and union membership exceeding 50 percent of total number of teachers.
	District Per Pupil Total Expenditure(X1000) [CWI-PPE]	Continuous variable measuring district total expenditure per pupil FY2004, adjusted by Comparable Wage Index[from TOTPPE, and CWI_2004]
	District Salary Schedule (Bachelor-no experience)[CWI-SALARY]	Continuous variable measuring the salary level of teachers with bachelor's degree and no experience [from D0114, CWI_2004]
	District Student/teacher Ratio [ST_TCCD]	Continuous variable measuring student teacher ratio [from CCD Member03 and tottch03]
	High Minority Enrollment[MST3C_3]	District minority student exceeding 69% of total enrollment [from NMINST_D, D0064]
	Medium Minority Enrollment[MST3C_2]	District minority student between 21% and 69% [from NMINST_D, D0064]
	Low Minority Enrollment[MST3C_1]	District minority student below 21% [from NMINST_D, D0064]
	Enrollment 25,000 above[SIZE3_3]	Dummy-coded variable recoded from district student enrollment [from Member03]
	Enrollment 15,000-24,999[SIZE3_2]	Dummy-coded variable recoded from district student enrollment [from Member03]
	Enrollment 10,000-14,999[SIZE3_1]	Dummy-coded variable recoded from district student enrollment [from Member03]
	Residents Edu. Level [PCTCOLLEGE]	% adults in district boundary with at least a college degree [from Census 2000]
	District % FARL Approved Students [NSLAPP_D]	Continuous variable measuring the percentage of students eligible for the federal free and reduced lunch program[from NSLAPP_D]
	District % Secondary Teachers[PCTSEC]	Continuous variable measuring district percentage of secondary teachers[from CCD's SECTCH03, TOTTCH03]
	Urban [CTRCITY]	Dichotomous variable where 1=mid-sized or central city; 0=suburban or rural [from URBAND03]
	Suburban [SUBURBAN]	Dichotomous variable where 1=urban fringe of large or mid-sized city; 0=urban or rural [from URBAND03]
State Level	Mandatory[REQUIRE]	State law mandating school districts engage in collective bargaining with organized teachers[from NEA]
	Permissive[PERMIT]	State law grant teachers permissive collective bargaining rights at the discretion of employers [from NEA]
	Prohibitory[PROHIBIT]	State law prohibiting teachers from having collective bargaining rights [from NEA]

1. *Include an array of variables on teacher certification, assignment and degree information from SASS district questionnaires.*

Bibliography

Akiba, M, LeTendre, G. K., Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries, *Educational Researcher, 36 (7), 369-38*

Allgood, W., & Rice, J. K. (2002). The adequacy of urban education: focusing on teache quality. In C. F. Roellke & J. K. Rice (Eds.), *Fiscal Policy Issues in Urban Education*. Greenwich, CT: Information Age.

American Federation of Teachers (AFT) (2003). *Where we stand: Teacher quality.* Washington, D.C.: American Federation of Teachers, AFL-CIO.

American Federation of Teachers (AFT) (2007a). National board certification. Retrieved April 4th, 2007, from http://www.aft.org/topics/teacher-quality/nationalboard.htm

American Federation of Teachers (AFT) (2007b). Who we are. Retrieved April 23rd, 2007 from http://www.aft.org/about/index.htm

Angus, D. L., & Mirel, J. (2001). *Professionalism and the public good: A brief history of teacher certification*. Washington, DC: Thomas B. Fordham Foundation.

Argys, L. M., & Rees, D. I. (1995). Unionization and school productivity: A Reexamination. In S. Polachek (Ed.), *Research in Labor Economics* (Vol. 14). Greenwich, Conn: JAI Press.

Ascher, C., & Fruchter, N. (2001). Teacher quality and student performance in New York city's low-performing schools. *Journal of Education for Students Places at Risk, 63*(3), 199-214.

Balfour, G. A. (1974). More evidence that unions do not achieve higher salaries for teachers. *Journal of Collective Negotiations in the Public Sector, 3*(4), 289-303.

Ballou, D. (2000). *Teacher contracts in Massachusetts*. Boston: Pioneer Institute.

Ballou, D., & Podgursky, M. (2000). Gaining control of professional licensing and advancement. In T. Loveless (Ed.), *Conflicting missions? Teacher unions and education reform*. Washington, DC: Brookings Institution Press.

Barron's Educational Series (2006). *Barron's profiles of American colleges 2007* (27th ed.). Hauppauge, New York: Barron's Educational Series.

Baugh, W. H., & Stone, J., A. (1982). Mobility and wage equilibration in the educator labor market. *Economics of Education Review, 2*(3), 253-274.

Becker, B. J., Kennedy, M. M., & Hundersmarck, S. (2003). *Communities of scholars, research, and debates about teacher quality.* Paper presented at the American Educational Research Association, Chicago, IL. Retrieved April 4th, 2007 from http://www.msu.edu/user/mkennedy/TQQT/Documents/BKH%20Communities.htm

Berube, M., R. (1988). *Teacher politics: The influence of unions*. Westport, CT: Greenwood Press.

Black, S. (2002). Reforming the unions. *American School Board Journal, 189*, 44-47.

Boyd, W. L., Plank, D. N., & Sykes, G. (2000). Teacher unions in hard times. In T. Loveless (Ed.), *Conflicting missions? Teachers unions and educational reform* (pp. 174-210). Washington, DC: Brookings Institution Press.

Braun, R. J. (1976). *Teachers and power: The story of the American Federation of Teachers*. New York: Simon and Schuster.

Brewer, D., & Goldhaber, D. D. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis, 22*, 129-145.

Brimelow, P. (2003). *The worm in the apple: How the teacher unions are destroying American education*. New York: HarperCollinsPublishers.

Cameron, D. (2005). *The inside story of the teacher revolution in American*: Scarecrow Education.

Carr, W. G. (1978). *The continuing education of William g. Carr*. Washington, DC: NEA.

Casey, L. (2006). The educational value of democratic voice: A defense of collective bargaining in American education. In J. Hannaway & A. Rotherham (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge, MA: Harvard Education Press.

Cochran-Smith, M., & Fries, K. (2005). Researching teacher education in changing times: Politics and paradigms. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 69-109). Washington, D.C: American Educational Research Association by Lawrence Erlbaum Associates.

Cochran-Smith, M., & Zeichner, K. M. (2005). *Studying teacher education: The report of the AERA panel on research and teacher education*. Washington, D.C.: American Educational Research Association by Lawrence Erlbaum Associates, Inc.

Cremin, L. (1988). *American education: The metropolitan experience, 1876-1980*: Haper and Row.

Cresswell, A. M., Murphy, M. J., & Kerchner, C. T. (1980). *Teachers, unions, and collective bargaining in public education*. Berkeley, CA: McCutchan Publishing.

Danielson, C. & McGreal, T. L. (2000). *Teacher Evaluation to Enhance Professional Practice.* Alexandria, VA: Association for Supervision and Curriculum Development.

Danielson, C. (1996). *Enhancing Professional Practice: A Framework for Teaching*. Alexandria, VA: Association for Supervision and Curriculum Development.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*(1). Retrieved April 4th, 2007 from http://epaa.asu.edu/epaa/v8n1/

Darling-Hammond, L. (2003). Access to quality teaching: An analysis of inequality in California's public schools. *Santa Clara Review, 43*, 1045-1184.

Darling-Hammond, L. (2004). Inequality and the right to learn: Access to qualified teachers in California's public schools. *Teachers College Record, 106*(10), 1936-1966.

Darling-Hammond, L., & Ball, D. L. (1998). *Teaching for high standards what policymakers need to know and be able to do* (No. ED426491). Philadelphia, PA: Consortium for Policy Research in Education.

Doherty, R. E. (1981). Does teacher bargaining affect student achievement. In G. Angell (Ed.), *Faculty and teacher bargaining*. Lexington, MA: LexingtonBooks.

Donley, M. O. J. (1976). *Power to the teacher: How America's educators became militant*. Bloomington, IN: Indiana University Press.

Duplantis, M., Chandler, T., & Geske, T. G. (1995). The growth and impact of teachers' unions in states without collective bargaining legislation. *Economics of Education Review, 14*(2), 167-178.

Eberts, R. W. (1984). Union effects on teacher productivity. *Industrial and Labor Relations Review, 37*(3), 346-358.

Eberts, R. W., & Stone, J. A. (1984). *Unions and Public School: The Effect of Collective Bargaining on American Education*: Lexington Books, Lexington.

Eberts, R. W., & Stone, J. A. (1986). Teacher unions and the cost of public education. *Economic Inquiry, 24*(4), 631-643.

Eberts, R. W., & Stone, J. A. (1987). Teacher unions and productivity of public schools. *Industrial and Labor Relations Review, 40*(3), 354-363.

Eberts, R. W., Hollenbeck, K., & Stone, J., A. (2004). Teacher unions: Outcomes and reform initiatives. In R. D. Henderson, W. Urban, J. & P. Wolman (Eds.), *Teacher unions and education policy: Retrenchment or reform*.

Ehrenberg, R. G., & Brewer, D. J. (1994). Do school and teacher characteristics matter? Evidence form high school and beyond. *Economics of Education Review, 13*(1), 1-17.

Eton, W. E. (1975). *The American federation of teachers, 1916-1961: A history of the movement*. Carbondale: Southern Illinois University Press.

Feistritzer, C. E. (1999). *The making of a teacher: A report on teacher preparation in the united states*. Washington, D.C.: National Center for Education Information.

Feistritzer, E., C., & Chester, D. C. (2003). *Alternative teacher certification: A state-by-state analysis, 2003*. Washington, DC: National Center for Education Information.

Fenstermacher, G. D., & Richardson, V. (2005). On making determinations of quality in teaching. *Teachers College Record, 107*(1), 186-213.

Ferguson, R. F. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal of Legislation, 28*(465-98).

Ferguson, R. F., & Ladd, H. F. (1996). How and why money matters: An analysis of Alabama schools. In H. F. Ladd (Ed.), *Holding schools accountable: Performance-based reform in education*. Washington, D.C.: Brookings.

Finn, C. (2001). Getting better teachers and treat them right. In T. Moe (Ed.), *A primer on America's schools* (pp. 127-150). Stanford, CA: Hoover Institution Press.

Fischer, L. (2003). *Teachers and the law* (5th ed.). New York: Addison Wesley Longman.

Fischer, L., Schimmel, D., & Stelman, L. R. (2007). *Teachers and the law* (7th ed.). Boston, MA: Pearson Education.

Fisher, R., & Ury, W. (1981). *Getting to yes: Reaching agreement without giving in*. Boston: Houghton-Mifflin.

Floden, R., & Meniketti, M. (2005). Research on the effects of coursework in the arts and sciences and in the foundation of education. In M. Cochran-Smith & K. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 261-308). Washington, D.C.: American Educational Research Association by Lawrence Erlbaum Associates.

Fox, W., & Wince, M. (1976). The structure and determininants of occupational militancy among public school teachers. *Industrial and labor relations review, October 1976*(30), 47-58.

Garet, M., S., Porter, A., C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Goldhaber, D. (2006). Are teachers unions good for students? In J. Hannaway & A. Rotherham (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge, MD: Harvard Education Press.

Goldhaber, D., & Brewer, D. (1998). Why should we reward degrees for teachers. *Phi Delta Kappa October 1998*, 134-138.

Goldschmidt, S. M., & Painter, S., R. (1987). Collective bargaining: A review of the literature. *Educational Research Quarterly, 12*(1), 10-24.

Greenwald, R., Hedges, L., & Laine, R. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66*, 361-396.

Haberman, M. (1996). Selecting and preparing culturally competent teachers for urban schools. In J. Sikula, T. Buttery & E. Guyton (Eds.), *Handbook of research on teacher education* (2nd ed., pp. 747-760). New York: Macmillan.

Hannaway, J., & Rotherham, A. (2006). Conclusion. In J. Hannaway & A. Rotherham (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge, MA: Harvard Education Press.

Henderson, R. D. (2004). Teacher unions: Continuity and change. In R. D. Henderson, W. Urban, J. & P. Wolman (Eds.), *Teacher unions and educational policy: Retrenchment or Reform Advances in Education in Diverse Communities: Research, Policy and Praxis* (Vol. 3, pp. 33-50): Elsevier Ltd.

Hess, F. M. (2001). *Tear down this wall: The case for radical overhaul of teacher certification*. Washington, DC: Progressive Policy Institute.

Hess, F. M. (2002). Break the link. *Education Next, 2*(1), 22-28.

Hess, F. M., & Kelly, A., P. (2006). Scapegoat, albatross, or what? The status quo in teacher collective bargaining. In J. Hannaway & A. Rotherham (Eds.), *Collective bargaining in education: Negotiating change in today's schools* (pp. 53-88). Cambridge, MA: Harvard Education Press.

Hess, F. M., & West, M. R. (2006). *A better bargain: Overhauling teacher collective bargaining for the 21st century*. Retrieved 12/11/2006 http://www.ksg.harvard.edu/pepg/PDF/Papers/BetterBargain.pdf

Holmes Group. (1986). *Tomorrow's teachers: A report of the Holmes group*. East Lansing, MI: Author.

Holmes Partnership (2007). History and work. Retrieved April 4th, 2007, from http://www.holmespartnership.org/history.html

Holtzapple, E. (2003). Criterion-Related Validity Evidence for a Standards-Based Teacher Evaluation System, *Journal of Personnel Evaluation in Education*, 17 (3), 207-219.

Hoxby, C. M. (1996). How teachers' unions affect education production. *Quarterly Journal of Economics, 111*(3), 671-718.

Hoxby, C., & Leigh, A. (2004). Pulled away or pushed out? Explaining the decline of teacher aptitude in the United States. *Teacher Quality, 2006,* 236-240. Retrieved October 18, 2006, from http://www.economics.harvard.edu/faculty/hoxby/papers/hoxbyleigh_pulledaway.pdf

Ingersoll, R. M. (1999). The problem of underqualified teachers in American secondary schools. *Educational Researcher, 28*(2), 26-37.

Interstate New Teacher Assessment and Support Consortium (INTASC) (2007). INTASC membership. Retrieved April 4th, 2007, from http://www.ccsso.org/projects/Interstate_New_Teacher_Assessment_and_Support_Consortium/Membership/

Jacob, B. (2007). The challenges of staffing urban schools with effective teachers. *The Future of Children, 17*(1), 129-153.

Johnson, S. M. (1984). *Teacher unions in schools*: Temple University Press.

Johnson, S. M. (1990). *Teachers at work: Achieving success in our schools*. New York: Basic Books.

Johnson, S. M. (2004). Paralysis or possibility: What do teacher unions and collective bargaining bring. In R. D. Henderson, W. Urban, J. & P. Wolman (Eds.), Te*acher unions and educational policy: Retrenchment or reform Advances in Education in Diverse Communities: Research, Policy and Praxis* (Vol. 3 pp. 1-31): Elsevier Ltd.

Johnson, S. M., & Donaldson, M. (2006). The effects of collective bargaining on teacher quality. In J. Hannaway & A. Rotherham (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge, MA: Harvard Education Press.

Johnson, S. M., & Kardos, S. (2000). Reform bargaining and its promise for school improvement. In T. Loveless (Ed.), *Conflicting missions? Teachers unions and educational reform*. Washington D.C: Brookings Institution Press.

Kahlenberg, R. D. (2006). The history of collective bargaining among teachers. In J. Hannaway & A. Rotherham, J. (Eds.), *Collective bargaining in education: Negotiating change in today's schools (pp.7-26)* Cambridge, MA: Harvard Education Press.

Kanstoroom, M., & Finn, C. (1999). *Better teachers, better schools*. Washington, DC: Thomas B. Fordham Foundation.

Kasper, K. (1970). The effects of collective bargaining on public school teachers' salaries. *Industrial and Labor Relations Review, 24*(1), 57-72.

Kerchner, C. T., & Caufman, K. (1993). Building the airplane while it's rolling down the runway. In C. T. Kerchner & J. E. Koppich (Eds.), *A union of professionals: Labor relations and educational reform* (pp. 1-24): Teachers College Press.

Kerchner, C. T., & Koppich, J. (2004). Organizing around quality: The struggle to organize mind workers. In R. D. Henderson, W. Urban, J. & P. Wolman (Eds.), *Teacher unions and education policy: Retrenchment or reform Advances in Education in Diverse Communities: Research, Policy and Praxis* (Vol.3, pp. 187-221): Elsevier Ltd.

Kerchner, C. T., & Koppich, J. E. (1993). *A union of professionals: Labor relations and educational reform.* New York, NY: Teachers College Press.

Kerchner, C. T., & Mitchell, D. E. (1988). *The changing idea of a teachers' union*. Philadelphia, PA: The Falmer Press.

Kerchner, C. T., Koppich, J. E., & Weeres, J. T. (1997). *United mind workers: Unions and teaching in the knowledge society*. San Francisco: Jossey-Bass.

Kersey, G. F. (1986). Perceptions of selected educational leaders in nonnegotiating local districts toward professional negotiations. *Dissertational Abstracts International, 37*, 2399A.

Kleiner, M. M., & Petree, D. (1988). Unionism and licensing of public school teachers: Impact on wages and educational output. In R. B. Freeman & C. Ichniowski (Eds.), *When public sector workers unionize*: University of Chicago Press.

Kolbe, T., & Rice, J. K. (2008). Are we there yet? the distribution of highly qualified teacher ost NCLB. In J. K. Rice & C. F. Roellke (Eds.), *The cost of accountability*. Charlotte, NC: Information Age Publishing.

Koppich, J. (2006). The as-yet-unfulfilled promise of reform bargaining: Forging a better match between the labor relations system we have and the education system we want. In J. Hannaway & A. Rotherham, J. (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge, MA: Harvard Education Press.

Koski, W., & Horng, E. (2007). Facilitating the teacher quality gap? Collective bargaining agreements, teacher hiring and transfer rules, and teacher assignment among schools in California. *Education Finance and Policy, 3*(2), 262-300.

Krueger, C. (2002). State collective bargaining policies for teachers. Retrieved December 5, 2007, from http://www.ecs.org/clearinghouse/37/48/3748.pdf

Kurth, M. (1987). Teachers' unions and excellence in education: An analysis of the decline in sat scores. *Journal of Labor Research, 8*(4), 351-367.

Lankford, H., & Wyckoff, J. (1997). The changing structure of teacher compensation, 1970-94. *Economics of Education Review, 16*(4), 371-384.

Lankford, H., Loeb, S., & Wykoff, J. (2002). Teacher sorting and the plight of urban schools. *Educational Evaluation and Policy Archives, 24*(1), 36-62.

Lasley, T. J., Siedentop, D., & Yinger, R. (2006). A systemic approach to enhancing teacher quality: The Ohio model. *Journal of Teacher Education, 57*(13), 13-21.

Levin, J., & Quinn, M. (2003). *Missed opportunities: How we keep high-quality teachers out of urban schools*. New York: New Teacher Project.

Levin, J., & Quinn, M. (2003). *Missed opportunities: How we keep high-quality teachers out of urban classrooms.* New York: New Teacher Project.

Levin, J., Mulhern, J., & Schunck, J. (2005). *Unintended consequences: The case for reforming the staffing rules in urban teachers union contracts.* New York: New Teacher Project.

Levine, A. (2006). *Educating school teachers*. Washington, D.C.: The Education Schools Project.

Lieberman, M. (1993). Take the $25 million and run: The case of the National Board for Professional Teaching Standards. *Government Union Review, 11*(1), 1-23.

Lieberman, M. (1997). *The teacher unions: How the NEA and AFT sabotage reform and hold students, parents, teachers, and taxpayers hostage to bureaucracy*. New York: Free Express.

Lieberman, M. (2000). *Understanding the Teacher Union Contract: A citizen's Handbook*. New Brunswick, NJ: Transaction.

Lowe, W. T. (1965). Who joins which teachers' group. *Teachers College Record, April 1965*(66), 614-619.

McDonnell, L., & Pascal, A. H. (1979). *Organized teachers in American schools*. Santa Monica, CA: RAND.

Milanowski, A., & Kimball, S. (2005). The relationship between teacher expertise and student achievement: A synthesis of three years of data. Paper presented at the American Educational Research Association, Montreal, Quebec, Canada.

Moe, T. (2006). Union power and the education of children. In J. Hannaway & A. Rotherham, J. (Eds.), *Collective bargaining in education: Negotiating change in today's schools*. Cambridge MA: Harvard Education Press.

Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review, 13*, 125-145.

Monk, D., & King, J. (1994). Multilevel teacher resource effects on pupil performance in secondary mathematics and science. In R. G. Ehrenberg (Ed.), *Choices and consequence.* Ithaca, NY: ILR Press.

Murnane, R. J., & Phillips, B. R. (1981). What do effective teachers of inner-city children have in common? *Social Science Research, 10*, 83-100.

Murphy, M. (1990). *Blackboard unions: The AFT and the NEA, 1900-1980*: Cornell University Press.

Murray, C. E. (2004). Innovative local teacher unions: What have they accomplished. In R. D. Henderson, W. J. Urban & P. Wolman (Eds.), *Teacher unions and education policy: Retrenchment or reform Advances in Education in Diverse Communities: Research, Policy and Praxis (Vol. 3 PP.149-166):* Elsevier

National Board for Professional Standards (NBPTS) (2006a). About NBPTS: History and facts. Retrieved October 16, 2006 from http://www.nbpts.org/about_us/mission_and_history/history.

National Board for Professional Standards (NBPTS) (2006b). Mission statement. Retrieved October 18, 2006, from http://www.nbpts.org/about_us/background/mission.

National Commission on Teaching and Americas Future (NCTAF) (2007). Board of directors and advisory commissioners. Retrieved April 4th, 2007, from http://www.nctaf.org/who_we_are/commission_members/index.htm

National Commission on Teaching and America's Future. (1996). *What matters most: Teaching for America's future*. New York: Arther.

National Education Association (NEA) (2005). Collective bargaining rights for education employees in the united states. Washington, D.C.: NEA.

National Education Association (NEA) (2006). About NEA. Retrieved October, 18th, 2006, from http://www.nea.org/aboutnea/about.html

National Education Association (NEA) (2007a). NEA committed to improving teacher quality. Retrieved April 4th, 2007, from http://www.nea.org/teacherquality/index.html

National Education Association (NEA) (2007b). Why NEA supports national board certification. Retrieved April 4th, 2007, from http://www.nea.org/nationalboard/index.html

National Education Association (NEA) (2007c). About NEA. Retrieved April, 2007, from http://www.nea.org/aboutnea/about.html?origref=&alias=http://www.nea.org/aboutnea/index.html

NEA Foundation (1009). Resources. Retrieved April, 2009, from http://www.neafoundation.org/resources.htm#pub.

Nelson, F. H., & Rosen, M. (1996). *Are teachers' unions hurting American education? A state-by-state analysis of the impact of collective bargaining among teachers on student performance*. Milwaukee: Institute for Wisconsin's Future.

Nelson, H. F. (2006). The impact of collective bargaining on teacher transfer rates in urban high-poverty schools. Washington, D.C.: American Federation of Teachers, AFL-CIO.

Peske, H. G., & Haycock, K. (2006). *Teaching inequality: How poor and minority students are shortchanged on teacher quality*. Washington, DC: Education Trust.

Podgursky, M. (2003). Fringe benefits. *Education Next* (3), 71-78.

Porter-Magee, K. (2004). Teacher quality, controversy, and NCLB. *The Clearing House, 78*(1), 26-29.

Prince, C., D. (2003). *Higher pay in hard-to-staff schools: The case for financial incentives*. Lanham, MD: The scarecrow Press.

Ramirez, H. (2004). The shift from hands-off: The federal role in supporting and defining teacher quality. In F. M. Hess, A. Rotherham & K. Walsh (Eds.), *A qualified teacher in every classroom? Appraising old answers and new ideas (pp.49-80)*. Cambridge, MA: Harvard Education Press.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Rees, D. J. (1991). Grievance procedure strength and teacher quits. *Industrial and Labor Relations Review, 45*(1), 31-43.

Reich, R. B. (1991). *The work of nations: Preparing ourselves for 21st century capitalism*. New York: Knopf.

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Washington, DC: Economic Policy Institute.

Rice, J. K. (2008). From highly qualified to high quality: An imperative for policy and research to recast the teacher mold. *Education Finance and Policy, 3*(2), 151-164.

Riley, P., Fusano, R., Munk, L., & Peterson, R. (2002). *Contract for failure; the impact of teacher union contracts on the quality of California schools*. San Francisco: Pacific Research Institute.

Rogers, R. K. (1988). San Joaquin county teachers' perceptions of collective bargaining. *Dissertational Abstracts International, 49*, 3272A.

Rose, H., & Sonstelie, J. (2004). School Board Politics, School District Size, and the bargaining Power of Teachers' Unions. Unpublished working paper.

Rosenthal, R., & Rosnow, R. L. (1984). *Essentials of behavioral research: Methods and data analysis.* New York: McGraw-Hill.

Rotherham, A., & Mead, S. (2004). Back to the future: The history and politics of state teacher licensure and certification. In F. M. Hess, A. Rotherham & K. Walsh (Eds.), *A qualified teacher in every classroom? Appraising old answers and new ideas* (pp.11-48). Cambridge, MA: Harvard Education Press.

Rowan, B., Chiang, F. S., & Miller, R. J. (1997). Using research on employee's performance to study the effects of teacher on students' achievement. *Sociology of Education, 70*, 256-284.

Salter, D. E. (1986). The effects of collective bargaining on selected areas of school management in South Dakota. *Dissertational Abstracts International, 47*(3272A).

Saltzman, G. M. (1985). Bargaining laws as a cause and consequences of the growth of teacher unionism. *Industrial and Labor Relations Review, 38*(3), 335-351

Sanders, W. L., & Horn, S. (1998). Research findings from the Tennessee value-added assessment system (TVAAS) database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education, 12*(3), 247-256.

Sanders, W. L., & Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future student academic achievement*: University of Tennessee Value-Added Research and Assessment Center.

Scientific Software International (SSI) (2009). Multicollinearity [Electronic Version]. Retrieved 01/10/2009 from http://www.ssicentral.com/hlm/help6/faq/Multicollinearity.pdf.

Selden, D. (1985). *The teacher rebellion*. Washington, DC: Howard University Press.

Shanker, A. (1985). *A call for professionalism*. Washington, D.C.: American Federation of Teachers, AFl-CIO.

Steelman, L., C., Powell, B., & Carini, R. M. (2000). Do teacher unions hinder educational performance. *Harvard Educational Review, 70*(4), 437-466.

Stern, S. (2003). *Breaking free: Public school lessons and the imperative of school choice*. San Francisco: Encounter Books.

Stinnett, T. M. (1968). *Turmoil in teaching: A history of the organizational struggle for America's teachers*. New York: Macmillan.

Stone, J. A. (2000). Collective bargaining and public schools. In T. Loveless (Ed.), *Conflicting missions? Teacher unions and educational reform* (pp. 47-68). Washington, D.C.: Brookings Institute Press.

Summers, A. A., & Wolfe, B. L. (1975). *Equality of educational opportunity quantified: A production function approach*. Philadelphia, Pa: Federal Reserve Bank of Philadelphia.

Taylor, L. L., & Glander, M. (2006). *Documentation for the NCES comparable wage index data file (EFSC 2006- 865)*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Taylor, L. L., and Fowler, W.J. (2006). *A comparable wage approach to geographic cost adjustment (NCES 2006-321)*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Teacher Union Reform Network (2006). Mission statement. Retrieved October 18, 2006, from http://www.turnexchange.net/about.html

U.S. Department of Eduation (USDE) (2008). *Selected statistics for the 100 largest school districts in the United States and jurisdictions, by school district (Table A-1)*. Washington, D.C.: National Center for Education Statistics.

U.S. Department of Eduation (USDE) (2009a). Census 2000 School District Demographics Project. Retrieved 01/19/2009 http://nces.ed.gov/surveys/sdds/c2000.asp

U.S. Department of Eduation (USDE) (2009b). *District Finance Survey (F-33), School Year 2003-2004: Common Core of Data*. Washington, D.C.: National Center for Education Statistics.

U.S. Department of Education (USDE) (2002). *Meeting the Highly Qualified Teachers Challenge: The Secretary's Annual Report on Teacher Quality*, Washington, D.C: Office of Postsecondary Education, Office of Policy Planning and Innovation,

U.S. Department of Education (USDE) (2003). Meeting the highly qualified teachers standard: The secretary's second annual report on teacher quality: Washington, D.C.: Office of Planning and Innovation, U.S. Department of Education.

U.S. Department of Education (USDE) (2005). *Guide to the schools and staffing survey (SASS) 1999–2000 restricted-use electronic codebook*. Washington, D.C.: National Center for Educational Statistics.

U.S. Department of Education (USDE) (2007a). *2003-04 Schools and Staffing Survey (SASS) and 2004-05 Teacher Follow-up Survey (TFS) (CD ROM) Restricted-Use Data with Electronic Codebook (NCES 2008309)*. Washington, DC: National Center for Education Statistics.

U.S. Department of Education (USDE) (2007b). *The Integrated Postsecondary Education Data System (IPEDS) lists of colleges in the U.S. Washington, DC: Institute for* Education Sciences, National Center for Education Statistics.

U.S. Department of Education (USDE) (2009c). 2004 - 2006 Highly Qualified Teachers and Improving Teacher Quality State Grants (ESEA Title II, Part A) Monitoring Reports. Retrieved April, 2009 http://www.ed.gov/programs/teacherqual/hqt.html

U.S. Department of Education, H. R. 1804 Goals 2000: Educate America Act. Retrieved April 4th, 2007, from http://www.ed.gov/legislation/GOALS2000/TheAct/index.html

U.S. U.S. Department of Eduation (USDE) (2006). *NCES comparable wage index data file (EFSC 2006- 865).* U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Urban, W., J. (1982). *Why teachers organized*. Detroit: Wayne State University Press.

Vinovskis, M. (2000). Teacher unions and educational research and development. In T. Loveless (Ed.), *Conflicting missions? Teacher unions and educational reform*. Washington, DC: Brookings Institution Press.

Walsh, K. (2001a). *Teacher certification reconsidered: Stumbling for quality*. Baltimore, Maryland: The Abell Foundation.

Walsh, K. (2001b). *Teacher certification reconsidered: Stumbling for quality. A rejoinder*. Baltimore, MD: Abell Foundation.

Walsh, K. (2006). *Teacher education: Coming up empty*. Washington, D.C.: National Council on Teacher Quality.

Weiss, C., H. (1998). *Evaluation: Methods for studying programs and policies* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall.

Wesley, E. B. (1957). *NEA: The first hundred years, the building of the teaching profession. New York*: Harper and Brothers.

West, A. M. (1980). *The National Education Association: The power base for education*. New York: Free Press.

Wilson, S., & Youngs, P. (2005). Research on accountability process in teacher education. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 591-644). Washington, D.C.: American Educational Research Association by Lawrence Erlbaum Associates.

Zuelke, D. C., & Frohreich, L. E. (1976). The impact of comprehensive collective negotiations on teachers' salaries: Some evidence from Wisconsin. *Journal of Collective Negotiations in the Public Sector,*

Zumwalt, K., & Craig, E. (2005). Teachers' characteristics: Research on the indicators of quality. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp.

111-156). Washington, D.C.: American Educational Research Association by Lawrence Erlbaum Associates.