ROLES OF SCHOOL DISTRICT COMPETITION AND POLITICAL INSTITUTIONS IN PUBLIC SCHOOL SPENDING AND STUDENT ACHIEVEMENT

by

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ABSTRACT

NANDAN KUMAR JHA. Roles of school district competition and political institutions in public school spending and student achievement. (Under the direction of DR. STEPHANIE MOLLER)

Equity in school district spending, and equity and productive efficiency in educational outcomes are of paramount importance in the literature on K-12 public education in the US. The research on the effects of school choice (operationalized as inter-school district competition) and local political institutions on unequal school district spending and equity and productive efficiency in educational outcomes is not adequate. This dissertation fills several gaps in the literature by 1) extending the literature on the Public Choice, the Leviathan, the Consolidated Local Government, and the Reformism models that examines the interactive roles of local political institutions and school choice on equity in spending, productive efficiency and equity in student achievement in public schools in metropolitan areas; and 2) modeling the equity effects of school choice and political institutions on school district spending and student achievement. Fixed effects, instrumental variable fixed effects, Hausman-Taylor regression, and Multilevel Linear regression models are utilized on a uniquely compiled longitudinal dataset from several sources, including the Popularly Elected Officials Survey from the US Census Bureau, the Local Education Agency (School District) Longitudinal Finance Survey, the National Education Longitudinal Study (NELS: 1988-92), and the School District Demographics System from the National Center for Education Statistics.

Results from fixed effects models lend support for interactive effects of political institutions and inter-school district competition on school district spending. Additive and interactive models do not robustly support the equity effects of inter-school district competition on school district spending. However, results from fixed effects and instrumental variable fixed effects models support the equity effects of political institutions on school district spending in some cases. School districts with more professional political institutions are also more equitable in public education spending.

Results show that whereas inter-school district competition has productive efficiency effects on student achievement the political institutions do not. In terms of equity, the inter-school district competition and political institutions have differential effects on student achievement. In regard to the former, results imply that the increased inter-school district competition leads to inequity in students' 10th grade reading scores and 12th grade reading and math scores. In regard to the latter, results suggest that differences in political institutions across school districts lead to inequity in students' 10th and 12th grade reading and math scores. School districts with more professional political institutions also have more equitable student achievement. Student's reading and math scores are generally higher in comparatively higher income quintile school districts than those in comparatively lower income quintile school districts. These findings assume significance as they inform the policymakers in regard to why and how organizational and political contexts matter in bringing desirable educational outcomes. The policymakers can bring organizational and political changes in school districts for achieving the goal of more effective public education.

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CHAPTER 1: INTRODUCTION

1.1. Overview

Governments are responsible for providing collective goods and services and fiscal policy is mainly concerned with raising money to pay for the cost of public programs that deliver these collective goods and services (Kraft and Furlong, 2010; Lowry, 2008). In the United States, there is a three tier government system for providing public goods: federal, state and local governments. Local governments provide a range of collective goods and services. In fact, local school districts provide K-12 public education which enrolls approximately 8/9 of students in the US (Levin, 2008). Equity in school district spending and equity and productive efficiency in student learning outcomes are of paramount importance because K-12 public education constitutes about 34% of total state spending in the US (US Census of Governments, 2007). Furthermore, although the US is one of the highest spenders on public education both in terms of real per pupil dollars and as a proportion of GDP, the relative international ranking of the US in student learning falls below the median (Hanushek and Lindseth, 2009). This outcome suggests that the K-12 public education in the US is comparatively inefficient.

This dissertation focuses on the roles of school choice and political institutions on equity in school district spending and productive efficiency and equity in educational outcomes. There is limited research on the role of school choice, defined as inter-school district competition, on unequal school district spending and productive efficiencies and equity in educational outcomes. The few studies on the effects of inter-school district competition on both student achievement and school district spending offer inconclusive empirical evidence (Hoxby, 2000; Rothstein, 2007). Furthermore, existing research has ignored the role of local political institutions. This empirical investigation will offer theoretical insights and inform the larger policy debate on the roles of school choice and political institutions in equity in school district spending and on equity and productive efficiency in student achievement.

1.2. Equity and Efficiency in Public Education

There are several ways to approach and study educational effectiveness (Odden and Picus, 2000). Two measures of effectiveness are efficiency and equity. Efficiency has two subcomponents: allocative efficiency and productive efficiency. Allocative efficiency focuses on consumers' satisfaction with the level of public goods, individually and collectively (Hoxby, 2000; Jimenez and Hendrick, 2010). Productive efficiency is defined in terms of the level of outcome at the lowest possible input (Rice and Schwartz, 2008). This dissertation focuses solely on productive efficiency, where the inputs are inter-school district competition and political institutions. The outcome is student achievement.

A second approach to measuring educational effectiveness is through equity. Equity is distinct from productive efficiency because productive efficiency focuses on the level of inputs in relation to the outcome. In contrast, equity focuses on the variability in inputs and outcomes, without a necessary linkage between the two. In this dissertation, equity is operationalized in terms of regional equity/inequity in school district spending, assessing whether spending varies based on within state groupings of school districts' median household incomes. Furthermore, it examines whether student achievement is predicted by the school district's income levels as measured through household median income. Therefore, consistent with Harris et al. (2001) and Hoxby (1996a), equity is defined as the distribution of school district spending and student achievement across school districts based on within state groupings of school districts' median household incomes.

Productive efficiency in public education is estimated by a production function that links inputs and outputs (Rice and Schwartz, 2008). This is accomplished, in many applications, by assuming a linear relationship between the inputs and outputs and using regression analysis for estimation and hypothesis testing. The estimated coefficients corresponding to respective inputs reflect productive efficiency (Rice and Schwartz, 2008). Moreover, the regression analysis also handles situations of special needs for inputs in addressing inequitable educational outcomes while simultaneously controlling for productive efficiency in the use of inputs (Rice and Schwartz, 2008). These special needs may include, for example, the proportion of students with English as their second language. In essence, the regression analysis provides answers to questions about both efficiency and equity. This dissertation conforms to this research tradition in investigating the role of inter-school district competition and political institutions in equity in school district spending and productive efficiency and equity in student achievement.

1.3. Overview of the Literature, Critical Gaps and Study Significance

Several scholars have suggested that the educational outcomes in the US are not commensurate with the levels of financial resources put into the public education system.

In the last fifty years spending on public schools has tripled in real terms (Peterson, 2010, p. 131), and it has grown five folds in real dollars over the last century (Godwin and Kemerer, 2002). Educational outcomes along racial and socioeconomic status have not kept pace with rising funding levels and with various school reforms. These policy problems also appear to be resistant to school choice, standards and accountability-based reforms developed over the last two decades. In contextualizing these problems and proposing policy-relevant solutions, researchers have taken different positions on the questions of equity and productive efficiency in public education.

Three broad categories of the empirical literature have studied the productive efficiency of public education by relying on the production function approach (Belfield and Levin, 2005b; Odden and Picus, 2000; Rice and Schwartz, 2008). The studies in the first group evaluate the impact of public education spending and school inputs on student achievement after controlling for student, family, class and other school characteristics. These inputs include resources such as class-size and teachers. This research stream follows the tradition of estimating straightforward input-output relationships in public education (Rice and Schwartz, 2008). The second strand of literature examines the relationship between the inner workings of school systems and student learning outcomes. These studies identify various school processes, such as organizational conditions, educational resources, and instructional strategies that influence student achievement (Rice and Schwartz, 2008). The third strand includes studies that evaluate the effect of standards-based accountability and school choice on student achievement.

Within this third strand, the broader view in the literature on school choice is that market-like competition for students would nudge public schools toward productive efficiency in resource use and better educational outcomes (Belfield and Levin, 2005b; Chubb and Moe, 1990; Gill and Booker, 2008; Godwin and Kemerer, 2002). Critics of school choice find such policies inequitable and inefficient. The critics argue that less educated and lower SES parents face difficulty in exercising choice due to a lack of timely information, networks, and transportation (Levin, 2008). On the productive efficiency ground, opponents of school choice further argue that competition will benefit White, higher SES students because choice is associated with segregated school environments (Epple and Romano, 2000; Fiske and Ladd, 2000; Levin, 2008; Orfield and Yun, 1999; Schneider et al., 1997; Wells, 1993). Opponents also argue that private schools would undermine the social purpose of schooling in their pursuit of making profits in the market (Gill and Booker, 2008; Levin, 2008; Wolfe, 2003). The effect of school choice on other public purposes of education, such as student integration and civic socialization are negative (Gill and Booker, 2008; Mickelson et al., 2011).

In light of such unintended consequences, some moderate proponents of school choice suggest designing choice options so that minority and urban inner-city children are not disadvantaged (Godwin and Kemerer, 2002; Levin, 2008). Some moderate critics of school choice suggest that policymakers should “renew and expand regional area-wide choice options that transcend school district boundaries” (Mickelson et al., 2011, p.31). This would promote diverse student composition in schools that would in turn facilitate better learning opportunity to students. This region-wide school choice should include: 1) more transportation for students and information about diversity and choice options to parents; 2) increasing and ensuring accountability in choice schools; and 3) redesigning public / private sector relationships to ensure diversity (Mickelson et al., 2011).

In recent decades, the availability of market-like schools in the form of charter schools, vouchers, and magnet schools has expanded. The empirical evidence on the beneficial effect of school competition, through the development of market-like schools, on school district spending and student achievement, however, is inconclusive (Belfield and Levin, 2005b; Gill and Booker, 2008; Hoxby, 2000; Rothstein, 2007). In fact, empirical evidence suggests that these policies have led to resegregation (Levin, 2008; Orfield and Yun, 1999; Schneider et al., 1997; Wells, 1993). Also, the theoretical and empirical literatures have not conclusively established the supremacy of school choice policies over the traditional public education system.

The literature on school choice includes studies on a range of choice and competition options including homeschooling, private schools, magnet schools, vouchers, charters and existence of multiple school districts in a Metropolitan Area. School choice in the form of market-type competition can take both intra-district and inter-district dimensions. For example, alternative forms of schools including charter schools, magnet schools, vouchers and private schools create competitive market conditions for traditional public schools within a school district.

While there are several studies on school choice, operationalized through the presence of private schools, charter schools and vouchers, researchers have not adequately studied school choice in the form of inter-school district competition (Belfield and Levin, 2005b; Gill and Booker, 2008). The existence of more school districts within a Metropolitan Area is one dimension of school choice as school districts compete for students. The few studies on the role of inter-school district competition in school district spending and efficiency of public education narrowly focus on propositions of a single theoretical tradition of public choice pioneered by Tiebout (1956) and further developed by Ostrom, Tiebout and Warren (1961) (Hoxby, 2000; Marlow, 1997 & 2000; Zanzig, 1997). The proponents of this market-type competition argue that having more school districts to compete for students in a Metropolitan Area produces greater productive efficiency in terms of student learning outcomes.

This argument parallels the general theoretical arguments about spending and productive efficiency of local governments. Proponents of greater inter-local government competition argue for the existence of more local governments in the metropolitan area to accommodate heterogeneity in individual preferences (or public choice) for an optimal tax-expenditure bundle of public goods (Ostrom, Tiebout and Warren, 1961; Tiebout, 1956). This decentralization also works against the natural tendency of local governments to extract higher taxes from residents (Craw, 2008; Brennan and Buchanan, 1980; Jimenez and Hendrick, 2010).

Existing studies ignore the theoretical propositions regarding spending and productive efficiency advanced by the proponents of more consolidated forms of local governments. These theorists argue that greater inter-local government competition cause spillovers, urban sprawl, and racial and economic segregation. Therefore, having greater inter-local government competition in a Metropolitan Area is allocatively and productively inefficient (Altshuler et al., 1999; Burns, 1994; DeHoog, Lowery and Lyons, 1990; Lyons and Lowery, 1989; Morgan and Morescal, 1999; Rusk, 1993; Weiher, 1991). These scholars argue that a metropolitan wide local government is both more equitable and efficient.

This study also investigates the role of political institutions in spending and student learning respectively. This is important because existing studies ignore the role of political institutions in the equity of school district spending and in the productive efficiency of educational outcomes. Political institutions are important to consider while investigating equity in spending and equity and productive efficiency in student learning because the local political institutions influence efficiencies in local taxation and spending (Craw, 2008; Feiock, Jeong, and Kim, 2003). Political institutions also match citizen demand with school district spending (Berkman and Plutzer, 2005). Following Berkman and Plutzer (2005), Berry and Gersen (2009), and Craw (2008), this dissertation defines and operationalizes local political institutions as electoral structures of school districts' governing boards and superintendents' offices. Additionally, school districts' autonomy in raising revenue through the imposition of property taxes is subsumed under the concept of political institutions.

A limited number of studies have examined the role of local political institutions on local government spending, though not particularly in the context of school districts (Berry and Gersen, 2009; Craw, 2008; MacDonald, 2008). However, researchers have not considered the effects of inter-school district competition and local political institutions together on school district spending and student achievement and have ignored equity. This lack of cross fertilization in the literature warrants a fresh investigation of the role of political institutions *and* inter-school district competition on equity in school district spending and student achievement. Furthermore, the empirical literature in the context of both public school finance and general local governments report opposing findings (see Andrews et al., 2002; Belfield and Levin, 2005b; Craw, 2008; Gordon and Knight, 2008;

Hoxby, 2000; Howell-Moroney, 2008; Jimenez and Hendrick, 2010; Rothstein, 2007). This warrants investigation and integration of additional and consistent theoretical propositions for further empirical study.

The research presented in this dissertation is important because it clarifies why and how organizational, political and socioeconomic contexts matter in bringing desirable educational outcomes including equity in spending and equity and productive efficiency in student achievement. Policymakers can reform the organizational and political set-up of school districts to achieve the goal of more effective public education. From a public policy perspective, findings of this research can inform the formulation of appropriate policies for better educational outcomes through reorganization of school finance.

1.4. Organization and Goals

This dissertation proceeds by developing and testing a conceptual model that combines the key propositions of multiple theoretical perspectives. This conceptual model argues that local political institutions moderate the effects of inter-jurisdictional competition on local government's spending, efficiency and outcomes. This conceptual model handles the key propositions of both the proponents of greater inter-jurisdictional competition and the proponents of more consolidated school districts. Chapter 3 presents the data used to test this model and the fourth chapter empirically estimates the interactive effects of political institutions with inter-school district competition on inequity in school district spending in the US.

While the second, the third and the fourth chapters make a novel contribution through the development and empirical testing of the conceptual model in the context of public education funding, the fifth chapter applies the conceptual model to equity and productive efficiency in student learning outcomes. Specifically, the fifth chapter empirically estimates the interactive effects of political institutions with inter-school district competition on inequity and productive efficiency in student achievement. In general, this chapter makes a contribution to the wider literature that studies factors behind student learning outcomes. This chapter also expands the scope of the literature on the impact of school choice in the form of inter-school district competition on student achievement. In doing so, the chapter moves beyond the narrow theoretical focus of the literature on school choice to also include the important factor of political institutions.

1.5. Contributions to the Literature

This dissertation makes several contributions to the literature. One, the theoretical literature is extended to model the interactions of political institutions with inter-school district competition in influencing equity in spending and efficiency and equity in educational outcomes. Two, for addressing endogeneity of inter-school district competition, instrumental variable regression models are utilized. This methodological approach allows empirical studies to go beyond associations and into the issue of causality (Hoxby, 2000). Finally, the approach in Harris, Evans and Schwab (2001) has been followed to study the effects of political institutions and inter-school district competition on equity in school district spending and student achievement. Similar to their approach, school districts have been categorized into quintiles of within-state rankings of school districts' median household income to study the differential effects of political institutions and inter-school district competition on spending and student achievement for districts in each quintile. Previous studies have not taken this particular approach. This approach is innovative because it facilitates investigation of the role of income inequality among school districts in school district spending and student achievement. Overall, this study provides a methodologically rigorous test of theories that will help advance the empirical and theoretical literature on equity in school district spending and equity and productive efficiency in student learning outcomes. Multiple datasets are used including the Popularly Elected Officials Survey data from the US Census Bureau, the Local Education Agency (School District) Longitudinal Finance Survey data and the School District Demographics System data from the National Center for Education Statistics to examine this dissertation's research questions.

CHAPTER 2: FUNDING INEQUITY AND PRODUCTIVE EFFICIENCY IN PUBLIC EDUCATION: ROLES OF INTER-SCHOOL DISTRICT COMPETITION AND POLITICAL INSTITUTIONS

2.1. Overview of Funding for Public Education

The US public education system has evolved over time. The US Constitution did not provide explicitly any federal jurisdiction over education. The Tenth Amendment reserved all residual rights for the states. Therefore, in the context of the federal system of governments in the US, the authority and responsibility for public education rests with state governments (Gordon, 2008; Springer et al., 2008). Since the beginning of the progressive era in the 1850s, the role of the state in public education has gradually expanded with the objective of providing standardized, efficient, equitable and common education to each child (Chubb and Moe, 1990; Howell, 2005; Springer et al., 2008). Indeed, most state constitutions explicitly pledge free school education (Berkman and Plutzer, 2005) and many state constitutions also require equitable provision for all its children (Mickelson, 2003). State constitutions and statutes, with the exception of Hawaii, have delegated major responsibility and political authority for operating and financing public schools to local school districts (Belfield and Levin, 2005a; Gordon, 2008; Peterson, 1981; Springer et al., 2008). In most cases, school districts have the political authority to raise local resources for providing K-12 education within their jurisdictions. However, a significant number of school districts have no fiscal authority and must rely on the state or other local governments for funding (Berkman and Plutzer, 2005). In most cases, the parent governments of these fiscally dependent school districts raise revenue from property taxes (Picus, Goertz, and Odden, 2008).

State governments have shouldered increased burden of funding public education mainly to address twin challenges of inequitable provisioning and inequitable outcomes. However, overcoming these challenges seems intractable. In spite of state governments' efforts at funding equalization, the variation in per-pupil funding across school districts remains (Berkman and Plutzer, 2005; Hertert, Busch, and Odden, 1994; Hoxby, 1998; Odden and Picus, 2004; Wong, 1999). From a comparative international perspective, the US has a fairly decentralized public education system (Gordon, 2008). The aggregate fiscal burden of public education is shared between local, state and federal governments. This sharing of fiscal burden has undergone substantial changes over decades. At the beginning of 1930s, more than 80 percent of public school finance came from local sources (Berkman and Plutzer, 2005; Hanushek and Lindseth, 2009; McGuire and Papke, 2008; Springer et al., 2008). Since early 1980s, states have stepped up their funding and have exceeded local funding. Currently, state governments spend about 50 percent, local governments spend 40 percent and the federal government spends about nine percent (Hanushek and Lindseth, 2009; and Springer et al., 2008).

The federal share has increased from about two percent in 1940 to 8.5 percent in 2002 (Gordon, 2008). The passage of the Elementary and Secondary Education Act of 1965 (Title I) has increased federal funding significantly (Hanushek and Lindseth, 2009). The rich suburban districts spend more money than poor urban school districts because the former enjoy higher per-pupil property wealth. Rich districts can raise more revenue at a lower tax rate, whereas a poor district cannot raise enough revenue even with a higher property tax rate. This double disadvantage is a major roadblock to ensuring equitable and adequate educational opportunities (Berkman and Plutzer, 2005; Odden and Picus, 2000; Springer et al., 2008). Poor urban school districts also have disproportionately high proportions of minority and other disadvantaged and difficult to teach students (Moe, 2001). The existence of school funding disparities, although explained by place, economics, politics, and demographic factors challenges the principle of providing equitable educational opportunities to children. (see Berry and Gersen, 2009; Harris et al., 2001; Hoxby, 2000; Marlow, 2000; Poterba, 1994, 1996 & 1997 for school districts and (Craw, 2008; Feiock, Jeong, and Kim, 2003; Frant, 1996; Merrifield, 1991 & 2000; Nelson, 1986; and Oates, 1985 for other local governments).

2.1.1. Equity in School District Spending

Since the landmark California Supreme Court decision in *Serrano v. Priest* in 1971 and the famous US Supreme Court's judgment in *Rodriguez v. San Antonio* in 1973, there has been a great deal of activism from judiciary, state and civil society actors in promoting equity in school districts' spending in the US. However, in spite of at least a four decade long effort at addressing inequity in public education finance, the problem persists (Corcoran and Evans, 2008; Evans, Murray and Schwab, 1997; Murray, Evans and Schwab, 1998). Public school finance is an important topic because it constitutes about 34% of total state spending in the US (US Census of Governments, 2007). From a public policy perspective, it is important to clarify which factors explain inequity in school district spending. Important factors include: prevailing socio-economic structure of school districts; various court judgments on equity and adequacy in public education finance; differences in local political institutions; and interest groups. To this end, there are several studies that explain the predictors of inequity in school district spending (Berkman and Plutzer, 2005; Berry and Gersen, 2009; Corcoran and Evans, 2008; Evans, Murray and Schwab, 1997; Harris, Evans and Schwab, 2001; Murray, Evans and Schwab, 1998; Poterba, 1997; Wilson, Lambright and Smeeding, 2006). Yet although few studies have examined the effects of inter-school district competition (Hoxby, 2000; Hoxby, 2007; Marlow 2000; Rothstein, 2007) on school district spending, none has considered the role of local political institutions.

2.1.2. Equity in Spending, School District Competition and Political Institutions

In general, levels of per-pupil spending in school districts purportedly ensure equitable provision of public education to all children. This notion has been the basis of legal arguments in support of ensuring equality of educational opportunities. In combination with the Fourteenth Amendment's equal protection clause, scholars voiced the constitutional argument that property dependent school spending disparities within states was an injustice (Coons, Clune and Sugarman, 1970; Wise, 1968). Indeed, Wise (1968) argued that money spent on a child should not depend on geographic accident and socioeconomic status of parents. Coons, Clune and Sugarman (1970) also suggested that money spent on a child should be independent of local community's wealth. Wise (1968) advocated for equal per-pupil spending across school districts, i.e., horizontal equity. This principle of "one scholar, one dollar" did not take into account place-specific cost differentials in providing education (Koski and Hahnel, 2008). The fiscal neutrality principle (Coons, Clune and Sugarman, 1970), on the other hand, implies that local district's wealth should not be a decisive factor in the quality of schooling a child receives, over and above the wealth of the state as a whole (Ericson, 1984; Odden and

Picus, 2000; Springer et al., 2008). This equality principle did not emphasize equal per-pupil spending across school districts, thereby making room for variation in the cost of providing education. The two equity principles also did not require documenting the relationship between education spending and educational outcomes (Koski and Hahnel, 2008). Consistent with the fiscal neutrality principle, the fourth chapter studies equity in school district spending by examining how local political institutions and inter-school district competition explain variation in per pupil spending by urban school districts that fall in different median household income quintiles.

Local political institutions are conceptualized as electoral structures of school districts' governing boards and superintendents' offices following Berkman and Plutzer (2005), Berry and Gersen (2009), and Craw (2008). Additionally, school districts' autonomy in raising revenue through the imposition of property taxes is subsumed under the concept of political institutions. Following Hoxby (2000) and others (Craw, 2008; Marlow, 2000; Millimet and Collier, 2008; Millimet and Rangaprasad, 2007), inter-school district competition is conceptualized as a MA level weighted index of the shares of each school district's student enrollment and student enrollment weighted count of school districts in a MA. This chapter uses terms such as decentralization and competition interchangeably to convey higher levels of inter-school district competition in a MA. Similarly, the use of consolidated school districts conveys lower levels of inter-school district competition.

2.2. Review of the Theoretical Literature

The theoretical literature that examines factors behind levels of local governments spending in general and school districts in particular falls within five traditions, namely

1) The Public Choice Model; 2) The Leviathan Model; 3) The Reformism Model; 4) The Consolidated Local Governments Model; and 5) The Policy Responsiveness Model. The major debate in the literature concerns the appropriateness of more decentralized (Ostrom, Tiebout and Warren, 1961) versus more consolidated forms of local governments (DeHoog, Lowery and Lyons, 1990; Gordon and Knight, 2008; Lowery, 2000; Lyons and Lowery, 1989) and the role of different types of political institutions (Berkman and Plutzer, 2005; Berry and Gersen, 2009; Craw, 2008) in spending levels and equity.

2.2.1. The Public Choice Model

The basic argument in the public choice model is that higher levels of competition between local governments for residents bring economy in local service provision. Local service provision may not be efficient if there are fewer options for residents to realize their choice for most preferred bundle of taxation and local public goods. Proponents of decentralization (or higher levels of inter-local government competition) argue that more local governments in a metropolitan area accommodate heterogeneity in individual preferences for optimal taxes and expenditures on public goods (Ostrom, Tiebout and Warren, 1961). Pioneered by Tiebout (1956), this argument forms the basis for the public choice model. This model is concerned with the choice of efficient levels of goods and services made by the residents within a local jurisdiction. In essence, the public choice model posits that residential choice of individuals to live in communities with tax-expenditure bundles that match their preferences and budgets brings allocative efficiency (Harris et al., 2001; Hoxby, 1994 &1999; Poterba, 1997).

The basic logic in the public choice model is as follows. The communities at the local level seek to attain optimum size[1] for the efficient delivery of public goods and services by local governments. The pursuit of optimum size is essential in order to lower the average cost of public goods and services. The residents reveal their preferences by choosing a package of public goods and services offered by local governments. If the public goods and services are not offered efficiently at some optimum size, the migration of residents will occur until that optimum size has been reached. By choosing to reside in a community with a given package of public goods and services, the residents reveal their preferences or willingness to pay. Consequently, the local government can appropriately tax the community in order to sustain the level of public goods. This simultaneous occurrence of the matching of residents' preferences and attainment of optimum size of the local community ensures both allocative and productive efficiency in the delivery of public goods at the local level (Howell-Moroney, 2008; Hoxby, 1994, 1999 & 2000; Jimenez and Hendrick, 2010; Ostrom, Tiebout, and Warren, 1961; Tiebout, 1956). The majority of studies on local governments have interpreted these efficiency gains to translate into lower levels of per capita revenue or expenditure (Howell-Moroney, 2008; Gordon and Knight, 2008; Jimenez and Hendrick, 2010; MacDonald, 2008).

The public choice model is a demand side perspective in which residents match their preferences with the supply of different tax-expenditure bundles from local governments in a region. Hence, the proponents of public choice argue for the existence of numerous or decentralized local governments in a metropolitan area to capture heterogeneity in citizen demand (Ostrom, Tiebout, and Warren, 1961). Lyons and

[1] Size here refers to "the fixed resource of land and the demand conditions of current residents" for public goods in a local political jurisdiction (Dowding, John, and Biggs, 1994, p. 767).

Lowery (1989, p. 533) note that the decentralized or polycentric model of local government "focuses on the need to maintain numerous units of local governments in each urban area in order to maximize opportunities for individual citizens to choose a tax-service package that best suits their needs."

Subsumed within the public choice model is the median voter hypothesis, which provides a practical approach to aggregate citizen preferences for local public goods and services. The median voter hypothesis permits the use of local jurisdiction data for empirical estimation of the public choice model (Rubinfield, Shapiro and Roberts, 1987). In particular, income level and tax price of the local median voter drives local government spending on public goods (Ahmed and Greene, 2000; Bergstrom and Goodman, 1973; Borcherding and Deacon, 1972). However, such an estimation suffers from selection bias (also termed as "Tiebout Bias") because residents may self select into local communities based on the quantity and quality of public goods provided (Hoxby, 2000; Marlow, 2000; Millimet and Collier, 2008; Millimet and Rangaprasad, 2007; Rubinfield, Shapiro and Roberts, 1987). Additionally, a set of common variables may explain matching of residents to communities with their preferred public expenditures and residents' demand for public goods (Rubinfield, Shapiro and Roberts, 1987). As will be explained in the third chapter, this endogeneity problem has been addressed statistically.

2.2.2. The Leviathan Model

The Leviathan Model proposes that the existence of more decentralized and fragmented local governments in a region constrains governments' abilities to impose higher taxation on residents. Such local governments spend less. However, if residents have fewer options for relocation then they may be taxed at higher rates for a given level of public good. Consequently, local governments spend more. Scholars have argued that greater decentralization of local governments in a MA works against the natural tendency of centralized local governments to extract higher taxes from residents (Brennan and Buchanan, 1980; Jimenez and Hendrick, 2010). This tendency of governments is also termed “Leviathan behavior” (Brennan and Buchanan, 1980; Craw, 2008). The Leviathan model seeks to explain the determinants of government size in terms of the magnitude of tax revenue collection and the size of expenditure (Craw, 2008; Merrifield, 1991 & 2000; Nelson, 1986; Oates, 1985; Poterba, 1994 & 1996). The central concern of the Leviathan model lies in estimating the relationship between levels of inter-jurisdictional competition and levels of taxation and spending. This correspondence is termed the monopoly power of local governments (Craw, 2000). This central concern also makes it consistent with the public choice model.

The Leviathan model is a supply side view of the organization of local governments in a metropolitan area. Proponents argue that lower levels of inter-jurisdictional competition in a metropolitan area lead to higher local spending on public goods because local public officials have the opportunity to raise disproportionately more revenue for satisfying bureaucratic slack and high remuneration (or rent-seeking in Niskanen's terms) as taxpayers have fewer options to relocate to similar jurisdictions in vicinity (Craw, 2008; Niskanen 1971; Yeung, 2009).

2.2.3. The Consolidated Local Governments Model

Although the public choice model takes up a demand side perspective and the Leviathan model takes up a supply side perspective, the two models reach the same conclusion that higher levels of inter-jurisdictional competition within a metropolitan area are associated with lower levels of spending by local governments. In contrast, opponents contend that decentralized local governments cause spillover, such as urban sprawl, and racial and economic segregation. These spillovers bring inefficiency and inequity in local service provision. Consolidated local governments that have jurisdictions over inner-city and suburban regions enjoy economies of scale and can also efficiently and equitably internalize spillovers from inter-dependent localities. Therefore, they are more efficient and equitable. Howell-Moroney (2008, p. 100) has challenged the central assumptions in the public-choice model of decentralized local governments vis-a-vis the actual environment in which such polycentric governments work. He cites recent studies (Downs, 1994; Dreier, Mollenkopf, and Swanstrom, 2001; Rusk 1993; Squires, 2002) and notes that “the residential segregation of people by race and class and the many costs of sprawl are magnified and augmented by arrangements that defer to multiple local jurisdictions.” These spillovers lead to price distortions and people do not pay true costs associated with a polycentric institutional arrangement. In this way, the preferences of the residents are incorrectly aggregated by the local governments for optimum tax-service package. In regions with higher levels of inter-jurisdictional competition, the affluent communities in the suburban regions may not be responsive to the demands of potential low-income residents in spite of the latter's willingness to pay within their limited income. For example, low income citizens have greater demand for social services and affordable housing. But using fiscal zoning and other means as a deterrent, some local governments in the suburbs may not offer social services and affordable housing. Residential mobility of low-income residents is restricted even though they have willingness to reside in such jurisdictions (Howell-Moroney, 2008).

Some scholars have therefore argued against the decentralized model of local governments on equity grounds (Lowery, 2000; Lyons and Lowery, 1989). For example, Lyons and Lowery (1989) argue that any inequity in spending on public goods among the local governments is acceptable on the efficiency criteria under the public choice model because the residents made a conscious decision to live in communities with suitable tax-expenditure offerings. Subsequently, according to Howell-Moroney (2008, p. 98), the problems of sprawl and concentrated poverty are largely due to the existence of municipal boundaries that "circumscribe notions of collective responsibility." Consolidated local governments can overcome these inequalities by internalizing the costs of providing public services (Howell-Moroney, 2008). Consequently, decentralized local governments are allocatively and productively inefficient (Altshuler et al., 1999; Burns, 1994; DeHoog, Lowery and Lyons, 1990; Lowery, 2000; Lyons and Lowery, 1989; Morgan and Morescal, 1999; Rusk, 1993; Weiher, 1991). Proponents argue that more consolidated local governments in a metropolitan area are more equitable and efficient because these local governments enjoy economies of scale and are better able to internalize the external costs associated with urban sprawl and segregation (Gordon and Knight, 2008; Howell-Moroney, 2008; Jimenez and Hendrick, 2010). In contrast to the fragmented local governments, the consolidated local governments provide public goods and services at lower average per unit price (Jimenez and Hendrick, 2010).

However, in response to these criticisms proponents of public choice model argue that with suitable policy designs the effects of fragmented local governments on spending and outcomes are both productively efficient and equitable. For example, in the context of school districts Hoxby (1996a) argues that greater inter-school district competition is productively efficient and distributionally equitable if it is complimented with means-tested vouchers. Godwin and Kemerer (2002) also make similar arguments in regard to the effects of vouchers on educational outcomes. The consolidation of school finance on the other hand results in a situation where loss in productive efficiency outweighs any gains in equity (Hoxby, 1996a). Public choice scholars also argue that the rent-seeking goals of public officials and interest groups will reduce allocative efficiency and will reduce the likelihood that funding will go to where it is most needed. To the extent that interest groups are active and represent producers and to the extent that politicians attempt to capture some portion of the rents they produce, allocative efficiency will be reduced.

2.2.4. The Reformism Model

The reformism model is distinctive from the previous models because it focuses on how the structure of political institutions influences local government spending. The key argument in the reformism model is that if elected officials of a local government exercise less direct control over budgets then that local government would spend less in comparison to a local government where local elected officials have more direct control over budgets. This direct control over budgets permits elected officials to cater to narrow constituency demands. Under the scenario of limited direct budget control, elected officials adopt residents' preferred level of spending on public education. Whereas the public choice and the consolidated local government models do not formally hypothesize the role of local political institutions, the Leviathan model simply uses the logic of the role of bureaucratic slack and high remuneration in explaining higher levels of local government spending. The latter also offers little guidance on the appropriate type of local government for controlling budget maximizing tendencies of the bureaucracy (Craw, 2008). Concerned with bureaucratic slack and other inefficiencies, reformists argue that the type of local government also matters in controlling inflated public budgets and inefficiencies in local taxation and spending (Craw, 2008; Feiock, Jeong, and Kim, 2003; Frant, 1996).

In particular, reformists argue that the council-manager form of local government and at-large council elections are better than the mayor-council form of local government and ward-based council elections in allocating public services. The elected officials in the mayor-council form of government have more direct control over the local government budget. Elected officials have the incentive to reward their supporters for gaining votes and hence stay in office. For rewarding more constituents, elected officials may inflate local taxes and spending (Craw, 2008). The council-manager form of government on the other hand relies on bureaucratic expertise and consensual decision-making where the bureaucrats have increased control over the local government budgets and policymaking. The elected officials' lack of direct control over budgets limits their revenue inflating (or rent-seeking) behavior (Craw, 2008). However, council members' lack of expertise may constrain their ability to monitor the performance of bureaucrats. This absence of effective monitoring may induce bureaucrats to engage in rent-seeking behavior (Craw, 2008; Frant, 1996; Frederickson, Johnson, and Wood, 2004).

2.2.5. The Policy Responsiveness Model

Local political institutions constantly make policy choices differentially from among several, and often competing, policy options that match with citizen preferences for desired policy outcomes. However, forms of political institutions that cannot objectively evaluate broader constituency needs (e.g., ward-based v. at-large elected school boards) will poorly translate citizens' demands into policy outcomes. Similar to the reformism model, the policy responsiveness model explicitly hypothesizes the role of political institutions in local government spending. However, the two models make different hypotheses regarding the role of political institutions in local government spending. Whereas political institutions moderate the effect of inter-local government competition on local spending in the reformism model, they moderate the effect of citizen demand on local spending and other policy outcomes in the policy responsiveness model (Berkman and Plutzer, 2005). By policy responsiveness, the authors imply correspondence between public taste for education spending and actual budgetary allocation of the local school district. Berkman and Plutzer (2005) argue that different types of local political institutions play differential roles in translating citizen preferences for desired policy outcomes because local political institutions constantly make policy choices from among several, and often competing, policy options. For example, at-large elected or appointed school boards are better suited to bring in policy responsiveness in comparison to seemingly more democratic forms of school boards such as districts with ward-based members or districts that allow annual budgets to be passed at annual town hall meetings (Berkman and Plutzer, 2005). School districts with at-large school boards objectively assess the broader constituency preferences, while the latter category of local political institutions either cater to narrower constituency preferences or the turnouts in the meetings are not representative of local residents (Berkman and Plutzer, 2005).

2.3. The Empirical Literature

The empirical literature on local government in general and school districts in particular offers divergent findings on local government spending and student achievement (see Andrews et al., 2002; Belfield and Levin, 2005a; Craw, 2008; Gordon and Knight, 2008; Hoxby, 2000; Howell-Moroney, 2008; Rothstein, 2007). Since the focus of the public choice, the Leviathan, and the Consolidated Local Government models is on levels of decentralization versus consolidation of local governments in a MA in explaining local government spending, the section below includes the review of empirical studies on the topic.

2.3.1. Public Choice, Consolidated Local Government and Leviathan Models

Empirical studies on the virtues of decentralized versus consolidated forms of local governments are inconclusive (Howell-Moroney, 2008; Jimenez and Hendrick, 2010). Some studies have found evidence that higher levels of inter-jurisdictional competition lead to lower spending (Boyne 1992; Oakerson 1999). Citizens of smaller jurisdictions show greater satisfaction with law enforcement compared to residents of bigger communities (Ostrom, 1976; Ostrom, Parks, and Whitaker, 1978; Ostrom and Smith, 1976). In contrast, overall citizen satisfaction did not vary systematically between the two governmental structures (DeHoog, Lowery, and Lyons, 1990). Also, decentralization of local governments leads to racial segregation (Altshuler et al., 1999; Burns, 1994; Morgan and Morescal, 1999; Rusk, 1993; Weiher, 1991).

The concern regarding urban sprawl has also been empirically evaluated. Analyzing a sample of 822 metropolitan counties, Caruthers (2003) finds that decentralization of municipal and special district governments increased growth outside of incorporated areas. Other studies report similar findings (Carruthers and Ulfarsson, 2002; Fulton et al., 2001; Rusk, 1993). The empirical literature on the Leviathan model is mixed (Campbell, 2004; Craw, 2008; Yeung, 2009). Eberts and Gronberg (1990) and Zax (1989) support the Leviathan model, while Dolan (1990) and Oates (1985) find no evidence. Campbell (2004) offers mixed findings. Greater inter-local government competition was associated with higher city expenditures and government size (Dolan, 1990; Santerre, 1991). Higher level of decentralization is associated with lower level of government spending (Lalvani, 2002; Rodden, 2003; Zax, 1989).

Clearly, these studies do not offer indisputable evidence in favor of either of the arguments that more competition between local jurisdictions or consolidated local governments spends less and is more equitable. This lack of consensus in the empirical literature warrants further empirical studies with new contexts and new data. Analyses of school district expenditures provide an opportunity to conduct such studies.

2.3.2. The Reformism Model

The empirical evidence that tests the reformism model also mixed results (Craw, 2008). Lyons (1978) and Stumm and Corrigan (1998) present supporting evidence, while Farnham (1990) and Hayes and Chang (1990) find no evidence. For example, Stumm and Corrigan (1998) report that per capita government expenditure is higher in mayor-council cities than in council-manager cities. Examining five public expenditure categories on U.S. city-level data, Saha (2011) reports that the mayor-council form of government spends more than the council-manager form of government for only police and highways. The form of local government, however, did not matter in explaining fire expenditure, sewerage expenditure, and parks and recreational expenditure. Farnham (1990) reported that the council-manager form of local government has no significant effect on public spending. More recently, empirical results in Jung (2006) and MacDonald (2008) confirm Farnham's findings and indicate that the form of local government has no effect on governments' expenditure decisions. It is evident that in the context of municipal and county governments, empirical studies on the reformism model offer contradictory findings. Moreover, there is an absence of a similar empirical study in the context of school districts in the US. This study fills this gap.

2.3.3. The Policy Responsiveness Model

Utilizing public opinion survey data, Berkman and Plutzer (2005) have studied policy responsiveness in school district spending by estimating the moderating effects of citizen preferences by political institutions. While Berkman and Plutzer (2005) have attempted a complex approach to estimate citizen demand for testing their policy responsiveness hypotheses, there are no other studies following a similar approach in the context of public education. Direct estimation of residents' demand for public education through the use of cumulative national representative sample of General Social Survey and the multilevel modeling technique is indeed a major contribution. However, Berkman and Plutzer (2005) have argued in favor of the validity of their measure of public opinion by showing a strong correlation with median housing values. The latter is an indirect measure of residents' demand for public education spending often used by economists (Ahmed and Green, 2000; Rubinfield, Shapiro and Roberts, 1987). This implies that both direct and indirect measures are not substantively different. Also, the use of a national sample for estimating local constituent units is not without problems. Cnudde (2006) notes: “Because of the stratifying and clustering factors in a national sample, the conclusion that a sample – no matter how large – is representative of a component unit smaller than the nation, such as a state, or a congressional or school, is problematic” (2006: p. 588). Moreover, the data on proxy measures of citizen demand, such as median housing values and median income, are readily available for estimating the policy responsiveness of school districts.

2.4. Synthesizing the Five Models

In light of the multiplicity of theoretical models and corresponding inconclusive empirical literature on each of them, it is pertinent to bring together consistent elements of the theoretical and empirical literature for understanding equity in local governments' spending. In this regard, Craw (2008) has synthesized the public choice, the Leviathan and the reformism models of public spending at the local level recently and proposed the “Tamed Leviathan Hypothesis” for explaining local government spending. However, Craw (2008) applied the “Tamed Leviathan Hypothesis” to municipal governments spending and not school districts. His general approach, however, is applicable to the study of spending behavior of all types of local governments including school districts.

Craw (2008) argues that the Leviathan and the reformism models are not inconsistent and that a comprehensive model of local public finance would have to incorporate consistent elements of both models. Higher public spending with lower levels of inter-jurisdictional competition occurs because residents and businesses in such communities do not have a choice to “vote with their feet.” These local governments face less competition and have greater economic capacity to inflate public budgets and hence squeeze higher levels of taxation from residents. However, the Leviathan model is silent on the question as to why and how the local governments would extract higher taxes from residents, given the democratic political setup (Craw, 2008).

Similarly, studies on the reformism model seek to explain relatively inflated public budgets and higher levels of taxation by the mayor-council form of local government in comparison to the council-manager form because of incentives and opportunities created by different types of political institutions for economic exploitation. However, the literature review suggests that the evidence for this relationship is weak. There is a parallel to this argument while comparing elected officials of ward-based local boards to at-large elected members or elected or appointed school superintendents. This type of behavior of the local elected officials is simply explained in terms of greater and direct control over the distribution of funds from the local government budget. Craw (2008) argues that the reformism hypothesis does not explicitly explain how local governments assume economic capacity to act in their self-interest. There is an implicit assumption that local governments tend to behave as monopolies under certain types of political institutions.

Craw's Tamed Leviathan Hypothesis has attempted to answer the theoretical shortcomings of the Leviathan and Reformism models by synthesizing and integrating them (Craw, 2008). Furthermore, Craw's Tamed Leviathan Hypothesis includes control variables that measure local citizen demand for public services or what Berkman and Plutzer (2005) term as citizen preferences. Craw posits that political institutions moderate the effect of inter-local government competition in a MA on local government spending.

In the context of municipal governments, Craw hypothesizes that higher levels of decentralization / fragmentation of local governments lead to lower spending, but this spending depends on the type of political institution. Higher levels of decentralization restrict the capacity of elected officials with more direct control over budgets from spending more than elected officials with less direct control over budgets. With lower levels of centralization, residents have fewer options to relocate to other local jurisdictions and hence they can be taxed at higher rates for a given level of public good. However, some forms of political institutions can objectively take broader constituency perspectives and spend fewer dollars even when there is less decentralization.

Craw's Tamed Leviathan model seemingly encompasses the public choice model (and its byproduct of the median voter hypothesis), the Leviathan model, and the Reformism model. Additionally, Craw's approach is consistent with the policy responsiveness theory developed by Berkman and Plutzer (2005). Both Craw (2008) and Berkman and Plutzer (2005) emphasize the important role of local demand and political institutions in provisioning of collective goods. However, there are five notable differences between the two. First, the unit of analysis in Craw (2008) is municipal governments, while the school district is the unit of analysis in Berkman and Plutzer (2005). This difference is minor because school districts and municipalities are both local government institutions. However, intergovernmental revenues from federal and state sources constituted 3.75% and 29% respectively for all local governments in 2007[2] in contrast to 9% and 40% respectively for the school districts. Second, Berkman and Plutzer (2005) have directly estimated the public preferences by deriving public opinion

[2] Please see the US Census Bureau, State and Local Government Finance at: http://www.census.gov/govs/local/historical_data_2007.html#state_local.

from the national sample of General Social Survey. Craw (2008) has indirectly measured public preferences for public services by including measures for poverty, non-White population, population of foreign-born residents, non-White council members, population over 65, and homeownership. Craw (2008) treats median housing value as an indicator of the supplying capacity of local governments, whereas Berkman and Plutzer (2005) treat it as an indicator of resident demand. Third, the policy responsiveness model does not include a measure of the level of inter-local government competition in a MA, which is one of the central variables of concern in the Tamed Leviathan Hypothesis. This difference would disappear if the policy responsiveness model included explanations for differences in local government spending. It would then be possible to include the level of inter-local government competition in a MA as an explanatory factor in local government spending. Such a possibility exists because Berkman and Plutzer (2005, p.6) recognize the importance of controlling for "the effects of economics and resources" in empirical estimation of the policy responsiveness model. Fourth, political institutions interact with public preferences in the policy responsiveness model, while in the Tamed Leviathan Hypothesis they interact with the inter-local government competition in a MA. Finally, out of the two measures of interest group strength in the policy responsiveness model, the Tamed Leviathan Hypothesis includes the elderly population, but ignores employee unions. The policy responsiveness model hypothesizes that interest groups moderate the effects of public opinion on local spending.

2.5. The Proposed Conceptual Model

Barring the last two, the other differences between the Tamed Leviathan Hypothesis and the policy responsiveness model are not difficult to reconcile. For example, as noted above, a study of spending levels of local governments in urban regions can include measures of inter-local government competition in a MA without contradicting the basic hypotheses of the policy responsiveness model. The difference concerning the empirical testing of interactions between political institutions and residents' demands for public services is challenging and cumbersome in the absence of a single measure for residents' demand.

This practical challenge is also applicable to the empirical estimation of hypothesized interactions between measures of interest groups and public opinion (i.e., the measure of resident's demand). There are several reasons for not including the two interactions in an empirical model for estimating equity in local government spending. First, estimation of local public opinion with data on higher levels of political units may be inaccurate (Cnudde, 2006); this paper instead uses several conventional demographic and economic variables, such as poverty, non-White population, population of foreign born residents, log of district population, non-White council members, education levels of the population, and homeownership (Harris, Evans and Schwab, 2001; Craw, 2008). These variables capture some of the heterogeneity among districts which may explain preferences for school spending (Harris, Evans and Schwab, 2001). Interactions of several measures for political institutions and interest groups with each of the demographic and economic variables would be empirically unmanageable and would not be parsimonious. Second, inclusion of some of the important covariates in Berkman and Plutzer (2005), such as interest groups as control variables maintains the focus of this paper on estimating the equity implications of political institutions and inter-local government competition in a MA for school district spending. Third, the direct estimation of public opinion (or resident demand) does not address the "Tiebout Bias" in inter-local government sorting of residents. According to Bayer and Timmins (2007, p. 353), "the central problem in an empirical application is simply that of distinguishing the aggregate behavioral effect of local spillovers from that of fixed natural advantages that are tied to locations, particularly when the latter are not observed by the researcher." As will be explained in the methodology section, this paper tackles this empirical problem by utilizing fixed effects and instrumental variable fixed effects panel data models.

This study extends the "Tamed Leviathan Hypothesis" in Craw (2008) by considering the intersection of within-state rankings of school districts' median household income, political institutions and inter-school district competition. I term this model as "Extended Tamed Leviathan Model." This model integrates the Consolidation model in formulating hypotheses in opposite direction to the key arguments in the Tamed Leviathan Model above. This is so because the Leviathan and the Consolidation models predict opposing effects of inter-local competition / decentralization on local government spending. The mechanism in the Tamed Leviathan Model also applies here, albeit in opposite direction. Consolidation of suburban regions with inner-city provides economies of scale. Such local governments can also efficiently and equitably manage spillovers from inter-dependent localities. However, some forms of political institutions may cater to narrower constituency needs and hence may spend higher dollars even when there is less decentralization. Table 4.1 and figure 4.1 in the appendix summarize the key argument, sources of inefficiency and mechanisms through which each of the models discussed above affect equity in local government spending and productive efficiency in educational outcomes.

2.6. Hypotheses: School District Spending

The Extended Tamed Leviathan model provides hypotheses that propose equity effects of political institutions and inter-school district competition in a MA on school district spending. Moreover, since the proponents of local government consolidation formulate hypotheses contrary to the public choice and Leviathan models, the empirical estimation of the Extended Tamed Leviathan model presents the necessary evidence to compare and contrast the competing perspectives. This is possible by formulating hypotheses in opposite direction corresponding to each of the relevant hypothesis of the Tamed Leviathan model. The latter correspond to the interactive effect of inter-jurisdictional competition and political institutions on equity in school district spending. Therefore, the Extended Leviathan model leads to hypotheses and sub-hypotheses in pairs. For each pair, the first hypothesis/sub-hypothesis is consistent with the Tamed Leviathan model and the second is consistent with the Consolidated Local Governments Model. The hypotheses / sub-hypotheses are as below:

The Tamed Leviathan Model (I). Overall, with an increase in inter-school district competition the school districts spend less but political institutions moderate this relationship.

The Consolidation Model: Overall, with an increase in inter-school district competition the school districts spend more but political institutions moderate this relationship.

The Tamed Leviathan (I).a. Fiscally dependent school districts spend less on public education in comparison to fiscally independent school districts as the level of inter-school district competition increases.

The Consolidation Model (a): Overall, as inter-school district competition increases, the school districts spend more but fiscally dependent school districts spend less than fiscally independent school districts.

The Tamed Leviathan (I).b. Appointed superintendents spend less on public education in comparison to elected superintendents as the level of inter-school district competition increases.

The Consolidation Model (b): Overall, as inter-school district competition increases, the school districts spend more but school districts with appointed superintendents spend less than school districts with elected superintendents.

The Tamed Leviathan (I).c. School districts with appointed boards spend less in comparison to school districts with at large boards as the level of inter-school district competition increases.

The Consolidation Model (c): Overall, as inter-school district competition increases, the school districts spend more but school districts with appointed boards spend less than school districts with at large boards.

The Tamed Leviathan (I).d. School districts with at large boards spend less in comparison to school districts with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (d): Overall, as inter-school district competition increases, the school districts spend more but school districts with at large elected boards spend less than school districts with ward-based elected boards.

The Tamed Leviathan (I).e. School districts with appointed boards spend less in comparison to school districts with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (e): Overall, as inter-school district competition increases, the school districts spend more but school districts with appointed boards spend less than school districts with ward-based elected boards.

The Tamed Leviathan (I).f. School districts with appointed boards spend less in comparison to school districts with mixed boards as the level of inter-school district competition increases.

The Consolidation Model (f): Overall, as inter-school district competition increases, the school districts spend more but school districts with appointed boards spend less than school districts with mixed boards.

The Tamed Leviathan (I).g. School districts with at large boards spend less in comparison to school districts with mixed boards as the level of inter-school district competition increases.

The Consolidation Model (g): Overall, as inter-school district competition increases, the school districts spend more but school districts with at large elected boards spend less than school districts with mixed boards.

The Tamed Leviathan (I).h. School districts with mixed boards spend less in comparison to school districts with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (h): Overall, as inter-school district competition increases, the school districts spend more but school districts with mixed boards spend less than school districts with ward-based elected boards.

For estimating equity implications of inter-school district competition and political institutions, two hypotheses are proposed. These hypotheses are consistent with the Consolidated Local Governments Model and the Reformism Model. First, it is expected that the negative effect of inter-school district competition on per-pupil spending of school districts will be more negative for low income school districts than high income school districts. Second, it is expected that the relative negative effects of types of political institutions on per-pupil spending of school districts will be more negative for low income school districts than high income school districts.

2.7. Equity and Productive Efficiency in Educational Outcomes

Studies evaluating the productive efficiency of school resources and school choice have relied on the production function approach (Odden and Picus, 2000; Rice and Schwartz, 2008). Scholarship on the role of school resources, magnitude of spending, various types of school reforms and school processes in influencing student achievement dates back to the Equality of Educational Opportunity study by Coleman and his colleagues (Coleman et al., 1966). Coleman et al. (1966) concluded that school resources had negligible effects on student achievement. The often cited finding of the study is that students' family background is far more influential in explaining achievement gap than both within and between school factors. Using the data collected by Coleman et al. (1966) and contemporary HLM models, Borman and Dowling (2010) however show that conclusions in Coleman et al. were wrong on this key point. The methodology adopted by Coleman et al. was inadequate because it did not properly employ the correct error term.

In the tradition of straightforward input-output relationships, the subsequent studies on productive efficiency of school resources fall under one of the two broader policy positions. One position holds that money does not matter in educational outcomes because of inefficiencies in resource use, i.e., various school inputs on which money is allocated are not producing gains in educational achievement. This argument does not mean that money does not matter at all. It only suggests that additional resources are being wasteful (Hanushek, 1989a, 1989b, 1991, 1994, 1996a, 1996b). The other position posits that money matters for gains in educational outcomes and that a high level of funding is crucial in providing smaller classrooms, schools, more qualified teachers and various other school resources (Greenwald, Hedges, and Laine 1996; Hedges and Greenwald 1996; Hedges, Laine, and Greenwald, 1994). Questioning Hanushek's methodology as mere "vote-counting," Krueger (2002) finds that other approaches to weighting effect sizes lead to more consistent and positive effects of school resources on student achievement. Burtless (1996) and Elliot (1998) have critically summarized the two opposing arguments. Elliot (1998: 223) finds that "per-pupil expenditures indirectly increase student achievement by giving students access to educated teachers who use effective pedagogies in the classroom." Per-pupil expenditures for instruction and the administration of school districts affect students' achievement (Wenglinsky, 1997).

Class size is an important school resource that money can influence. But there is no agreement among researchers that smaller class size is better for student learning (Rice and Schwartz, 2008). However, smaller class size may benefit specific group of students, subject matters, and teachers in special circumstances (Aaronson, Barrow, and Sander, 2007; Hanushek, 2002). The Tennessee STAR class size experiment also could not resolve the general disagreement. Finn and Achilles (1999) and Nye, Hedges, and Konstantopolous (1999) reported positive effect of reduction in class size. Hanushek (1999), however, argued that the experiment was contaminated. Specifically, the contamination produced unmeasured differences between the students in small and large classes leading to unreliable results. Another important school resource is teacher quality. Research shows that quality of teachers is positively related to student achievement (Rivkin, Hanushek, and Kain, 1998; Sanders, 1998). There is, however, lack of agreement on specific teacher qualifications that raise student achievement the most (Hansuhek and Rivkin, 2010; Nye, Konstantopoulos, and Hedges, 2004; Wayne and Youngs, 2003).

Researchers have also evaluated the equity and productive efficiency of public education by estimating the effects of different market-type school choice options on student achievement using production function approach. The issue of school choice is important in school finance because it not only involves public funding of private schools but also because school choice and the resultant competition affects productive use of school resources (Gill and Booker, 2008). There are key arguments on both sides of the school choice debate (Belfield and Levin 2005a & 2005b; Betts and Loveless, 2005; Godwin and Kemerer, 2002; Levin, 2008; Moe, 2001; Peterson, 2010). Godwin and Kemerer (2002) have critically summarized the theoretical debates and testable empirical statements on both sides of the argument. The impact of school choice on urban inner-city children is also a key issue in the debate (Godwin and Kemerer, 2002).

There are two most prevalent forms of school choice in the US (Belfield and Levin, 2005b; Betts and Loveless, 2005; Peterson, 2010). First, parents have the right to choose private school or home schooling for their children. Second, the residential choice of parents also reflects school choice. The latter is in-egalitarian because it has resulted in residential segregation in terms of SES and race (Peterson, 2010). However, the proponents of residential choice or “Tiebout sorting” argue that existence of several jurisdictions for similar public goods, such as public education is both equitable and efficient (Godwin and Kemerer, 2002; Hoxby, 1996a & 2000). On the other hand, the proponents of the consolidated provision of local public goods view residential choice for school districts as both inequitable and inefficient (Howell-Moroney, 2008; Lowery, 2000; Lyons and Lowery, 1989). These scholars argue for a more consolidated form of local governments in Metropolitan Areas for reducing spillovers and ensuring equity. This argument is also consistent with the policy suggestion to “renew and expand regional area-wide choice options that transcend school district boundaries” (Mickelson et al., 2011, p.31). This is required for promoting diverse student composition in schools that would in turn facilitate better learning opportunity to students (Mickelson et al., 2011).

In light of these divergent views, the fifth chapter investigates the effect of residential choice - measured in terms of inter-school district competition among school districts in a Metropolitan Area - on student achievement. The conceptual model developed in this chapter facilitates testing of hypotheses consistent with the theoretical expectations of both the proponents of more school-choice in the form of higher levels of inter-school district competition on the one hand and the theoretical expectations of the proponents of the consolidated form of local governments on the other.

2.8. Public Education Production and the School Choice Debate

The literature on school choice beyond the realm of inter-school district competition is quite vast and it includes studies on various choice options, including magnet schools, charter schools, private schools and vouchers (Betts and Loveless, 2005; Peterson, 2010). This literature is briefly summarized before turning to the school choice literature that operationalizes school choice as inter-school district competition.

The debate on school choice began in earnest with the work of Milton Friedman on government's role in public education production and provision (Friedman, 1955 & 1962). Friedman suggested that the government should fund public education through vouchers, giving them directly to the parents and leaving the provision of education to private schools. However, consistent with the social goals of education, the government should formulate and enforce minimum standards for private schools. This policy suggestion was designed to enhance efficiency through competition in a private market of education; while also fulfilling the social goals of education including social cohesion, civic education, and racial and socioeconomic equity. Advocates of this perspective expected that competition between schools in attracting and retaining students would result in cost reductions, less bureaucracy and efficiency. This policy moves control of education from the state to parents and private schools. The market mechanism is expected to ensure consumer sovereignty. The proponents also argue that this idea is consistent with the advancement of individual liberty because parents could choose from among schools that matched their values.

In recent decades, Chubb and Moe (1990) have reinvigorated the debate on school choice. Proponents of school choice and competition argue that 1) schools would operate more efficiently if their survival hinged on increased competition among schools for students. 2) With a menu of different types of schools to choose from, the less affluent parents and their children will no longer be at a disadvantage (Betts and Loveless, 2005; Chubb and Moe, 1990; Godwin and Kemerer, 2002). The loosening of democratic control is also beneficial to less affluent and minority students who disproportionately reside in inner-city urban areas (Chubb and Moe, 1990; Godwin and Kemerer, 2002). However, there should be special safeguards in the design of school choice programs with regard to the inner-city schools and choice programs in general (Betts and Loveless, 2005; Godwin and Kemerer, 2002; Levin, 2008). The design issue is an important public policy issue in school finance (Belfield and Levin, 2005b; Levin, 2008; Moe, 2005) because school choice should not alienate students with greater needs and exacerbate their isolation in segregated environments (Levin, 2008). 3) Proponents of school choice also argue that democratic control is a wasteful barrier to school productivity. Bureaucratic structure and democratic control in public schools are inherently inefficient and slow down student performance (Chubb and Moe, 1988 & 1990). 4) Democratic control breeds unclear missions and goals, reduces coordination and teamwork among administrators, faculty, and staff. There is reduction in teacher autonomy and satisfaction under the democratically controlled public schools. 5) Finally, the proponents of school choice argue that mimicking private market conditions in public schools handles diverse needs of students more efficiently than the current centralized system of public schools.

The critics of school choice have raised questions about freedom of choice, productive efficiency, equity, social cohesion and organizational grounds (Levin, 2008; Meier, Polinard and Wrinkle, 2000). Less educated and lower SES parents face difficulty in exercising choice due to lack of timely information, networks, and transportation (Levin, 2008). In terms of productive efficiency, opponents argue that competition will benefit just the “best” students. Students with greater needs will find themselves in racial and socioeconomically segregated school environments (Epple and Romano, 2000; Fiske and Ladd, 2000; Levin, 2008; Orfield and Yun, 1999; Schneider et al., 1997; Wells, 1993). On social cohesion grounds, opponents argue that private schools would undermine the common purpose of schooling in their pursuit of making narrow gains in the market (Gill and Booker, 2008; Levin, 2008; Wolfe, 2003). In a response to Chubb and Moe, Meier et al. (2000) argued that bureaucracy increases as schools take actions that are linked to improved performance. This implies that bureaucracy is a consequence of lower academic performance and not a causal factor.

2.9. Empirical Evidence on School Choice Policies

The empirical evidence on the beneficial effects of school choice competition on student achievement is inconclusive (Belfield and Levin, 2005b; Gill and Booker, 2008). Moreover, the studies on the effect of school competition on other public purposes of education, such as student integration and civic socialization provide more reasons for concern (Gill and Booker, 2008; Mickelson et al., 2011). School choice programs, in some cases, increase stratification by race and SES.

Using school level data and school fixed effects, and measuring the existence of competition in a school district if more than 6 percent students attended charter schools, Hoxby (2002) found a positive impact of competition on 4th grade standardized math scores, but she did not find any effect on 7th grade math scores in Arizona. Measuring charter school competition in Michigan as the number of charter schools in a well defined area, Bettinger (2005) found a small positive effect of competition on student learning. The author suggested that this small positive effect could be because of population growth. In all of these studies the data were measured at the aggregate school level. Using student level longitudinal data in Texas and school-student fixed effects, Booker et al. (2006) report a positive effect of charter school competition on student achievement. However, Buddin and Zimmer (2004) find no relationship in California while using similar data and methodology as Booker et al. In North Carolina, using similar data and methodologies as the previous two studies, Bifulco and Ladd (2005) also did not find any relationship between charter school competition and student achievement. In their review of the literature on charter schools and student achievement, Betts and Hill (2006) conclude that a strong, robust association has not yet emerged. In a comprehensive study spanning 16 states of the US, Raymond (2009) reported that students in poverty and English language learner students - two traditionally disadvantaged subgroups - fare better in charter schools than in the traditional public schools. Furthermore, this positive story does not, however, extend to other students who on average have lower performance than the same students who remain in the traditional public school system (Raymond, 2009).

The relationship between the effect of voucher programs and student achievement is also mixed (Gill and Booker, 2008). Using school-level data from the Milwaukee voucher program experiment, Hoxby (2002) and Chakravarti (2005) find a positive relationship between school competition and student achievement. On the other hand, Witte (2000) found no differences in test scores of the Milwaukee's voucher program students and all other students in the Milwaukee school system. Moreover, the findings could reflect population change rather than gains in student achievement (Ladd, 2002). In the Florida voucher program, some studies found a positive relationship between competition and student achievement in schools faced with high-stake voucher threat (Chakravarti, 2005; Figlio and Rouse, 2004; Greene and Winters, 2003; West and Peterson, 2005). However, West and Peterson (2005) and Figlio and Rouse (2004) did not find any relationship in case of low-stake test.

The empirical studies on the effects of school competition and choice on student sorting are also relevant in the context of testing empirical statements of school choice theory. Using student-level data from the Charlotte-Mecklenburg Schools in North Carolina, Godwin et al. (2006, abstract) find that school choice "was neither neutral in the opportunity it provided students to attend their school of choice nor in its academic outcomes." In particular, white students were more likely than African American students to receive their first choice of schools. Also, while white students improved their test scores, African American students' scores declined. In another study of Charlotte Mecklenburg Schools, Mickelson and Southworth (2007) also find increased resegregation in some suburban public schools as a result of school choice. In the 1999 Civil Rights Project study of the Harvard University, Orfield and Yun (1999) also reported that school choice has increased resegregation across public schools. Similarly, Bifulco and Ladd (2006) reported increased racial stratification due to competition and sorting from charter schools in North Carolina. Ross (2005) reports increase in racial stratification in Michigan public schools due to charter school competition. These studies underscore negative effects of school choice in terms of increased racial segregation and widening achievement gaps between white and African American students.

Few studies have empirically evaluated the impact of school choice operationalized as inter-school district competition in a Metropolitan Area on student achievement. This is a very under-researched area (Gill and Booker, 2008). Borland and Howsen (1992 & 1993) found that increases in the level of inter-school district competition lead to higher student achievement, but they did not control for endogeneity of school choice. This is important because controlling for endogeneity produces the unbiased estimated coefficient. Controlling for endogeneity, Hoxby (2000) finds a positive relationship between more competition and student achievement. However, Rothstein (2007) finds that Hoxby's results did not hold across various specifications. Additionally, Rothstein (2007) reports that having more inter-school district competition in a Metropolitan Area is not statistically linked to student achievement. In the case of California school districts, Zanzig (1997) reports that competition among school districts positively affects student achievement, but only up to a specific threshold. Marlow (1997 & 2000) reports that greater numbers of school districts promote higher student achievement and lower high school drop-out rates, but are associated with higher public education spending.

2.10. Gaps in the School Choice Literature

In light of conflicting evidence and unintended consequences, the debate over school choice reforms between its proponents and opponents is poised to continue in future. The extant literature does not establish that school choice policies lead to better educational outcomes in comparison to the traditional public education system. Moreover, it is important to recognize that there are several important gaps in the theoretical and empirical literature on the productivity effects of different types of school choice. Notably, the literature has paid scant attention to the role of inter-school district competition among school districts in influencing productive efficiency. Inter-school district competition is an important source of school choice for students because residential choice of parents in most cases also decides the school system where their children will study.

Furthermore, the literature has completely ignored the role of political institutions of school districts in influencing productive efficiency. School districts are governed through different types of political institutions. These political institutions are the ultimate decision making bodies in regard to raising resources, allocating resources and overseeing the day-to-day management of public school systems. Third, empirical studies on different types of school choice in general and the few studies on inter-school district competition in particular are inconclusive thereby warranting further research on the issue. The fifth chapter fills these gaps by evaluating the interactive impact of inter-school district competition and political institutions on productive efficiency and equity in student achievement. These research questions are studied within the conceptual framework developed in this chapter.

2.11. Hypotheses: Equity and Productive Efficiency of Educational Outcomes

The Tamed Leviathan Model (I). Overall, with an increase in inter-school district competition student achievement increases but political institutions moderate this relationship.

The Consolidation Model: Overall, with an increase in inter-school district competition student achievement declines but political institutions moderate this relationship.

The Tamed Leviathan (I).a. Student achievement in fiscally dependent school districts is higher in comparison to fiscally independent school districts as the level of inter-school district competition increases.

The Consolidation Model (a): Overall, as inter-school district competition increases, student achievement declines but student achievement in fiscally dependent school districts is higher in comparison to fiscally independent school districts.

The Tamed Leviathan (I).b. Student achievement in school districts with appointed superintendents is higher in comparison to those with elected superintendents as the level of inter-school district competition increases.

The Consolidation Model (b): Overall, as inter-school district competition increases, student achievement declines but student achievement in school districts with appointed superintendents is higher than those with elected superintendents.

The Tamed Leviathan (I).c. Student achievement in school districts with appointed boards is higher in comparison to school districts with at large boards as the level of inter-school district competition increases.

The Consolidation Model (c): Overall, as inter-school district competition increases, student achievement declines but student achievements in school districts with appointed boards is higher than those with at large boards.

The Tamed Leviathan (I).d. Student achievement in school districts with at large boards is higher in comparison to school districts with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (d): Overall, as inter-school district competition increases, student achievement declines but student achievement in school districts with at large elected boards is higher than those with ward-based elected boards.

The Tamed Leviathan (I).e. Student achievement in school districts with appointed boards is higher in comparison to those with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (e): Overall, as inter-school district competition increases, student achievement declines but student achievement in school districts with appointed boards is higher than those with ward-based elected boards.

The Tamed Leviathan (I).f. Student achievement in school districts with appointed boards is higher in comparison to those with mixed boards as the level of inter-school district competition increases.

The Consolidation Model (f): Overall, as inter-school district competition increases, student achievement declines but student achievement in school districts with appointed boards is higher than those with mixed boards.

The Tamed Leviathan (I).g. Student achievement in school districts with at large boards is higher in comparison to those with mixed boards as the level of inter-school district competition increases.

The Consolidation Model (g): Overall, as inter-school district competition increases, student achievement declines but student achievement in school districts with at large elected boards is higher than those with mixed boards.

The Tamed Leviathan (I).h. Student achievement in school districts with mixed boards is higher in comparison to those with ward-based elected boards as the level of inter-school district competition increases.

The Consolidation Model (h): Overall, as inter-school district competition increases, student achievement declines but student achievements in school districts with mixed boards is higher than those with ward-based elected boards.

For estimating equity implications of inter-school district competition and political institutions, two hypotheses are proposed. These hypotheses are consistent with the Consolidated Local Governments Model and the Reformism Model. First, the positive effect of inter-school district competition on student achievement will be more positive for low income school districts than high income school districts. Second, the relative positive effects of types of political institutions on student achievement will be more positive for low income school districts than high income school districts.

CHAPTER 3: DATA AND METHODS

3.1. Competition, Political Institutions, and School District Spending

3.1.1. Data

For measuring different fiscal variables including the fourth chapter's dependent variable - the log of per-pupil total expenditure by school districts for fiscal years 1990 to 1995 - the Longitudinal Unified School District Fiscal-Nonfiscal Detail Datafile (UFNFD) that spans fiscal years 1990 to 2002 has been utilized. This data was released by the National Center for Education Statistics (NCES) in 2006 by condensing the Fiscal-Nonfiscal Detail Datafile (FNFD). The NCES provides longitudinal FNFD & UFNFD data for researchers interested in studying changes in the school district level fiscal or nonfiscal variables over time. The FNFD data for the 15,144 regular school districts has been generated by combining the Local Education Agency (LEA) Universe Survey Longitudinal File for Common Core's nonfiscal data and the school district fiscal (F-33) data for the school years 1989-90 through 1999-2002 (fiscal years 1990 to 2002). These regular districts serve the vast majority of the nation's public school students (Williams et al., 2006). For example, about 90% of total enrolled students were in public schools in the US in 2009 (U.S. Dept. of Education, National Center of Education Statistics, 2012). The UFNFD file combines data from separate but interdependent elementary districts (typically grades K-12) and the secondary districts (typically grades 9-12). These two types of school districts constitute "regular districts" in the FNFD file. This natural combination results in records that contain data for each of the unified K-12 ‘pseudo-district.’ Therefore, the unified K-12 ‘pseudo-district’ is the one where a secondary school district has captive students from an elementary school districts. The folding of the elementary districts (present in the primary longitudinal Fiscal-Nonfiscal Detail file (FNFD) for regular school districts, see Williams et al., 2006 for details) into the K-12 pseudo-districts (in the UFNFD) neither lost nor created any students or dollars. Therefore, the UFNFD file has the same aggregate numbers of students and various dollar amounts each year (Williams et al., 2006). The UFNFD[3] file contains one record for each of 11,518 unified and pseudo-unified K-12 districts.

This study's sample includes only those K-12 pseudo-unified districts that were geographically located in any of the Metropolitan Areas as defined in the UFNFD data (Williams et al., 2006). For measuring the inter-school district competition substantively, other studies have selected sample school districts similarly (Hoxby, 2000; Rothstein, 2007). Selection of urban school districts in this manner resulted in a panel of 5,017 K-12

[3] The UFNFD data has been utilized over the FNFD data because of three reasons. First, the majority of school districts in the US are unified. And the unified K-12 'pseudo-district' in the UFNFD data addresses the methodological challenge in analyzing school districts in different grade spans separately. Many measures, such as mean per pupil expenditures, are different for districts with different grade spans (Williams et al., 2006). The school districts in the secondary grade span typically spend higher dollars than school districts with elementary grade spans (Hussar and Sonnenberg, 2000, p. 7). Williams et al. (2006, p. 8) note that "analyses that attempt to estimate the relation between expenditures and other school characteristics will be distorted when they compare school districts, ignoring the elementary/secondary differential." The authors further add that for avoiding these biases, "such comparisons should be carried out using the UFNFD file of unified K–12 pseudo-districts" because the creation of unified K-12 "pseudo-districts" results in fiscal and non-fiscal measures that are comparable to those for the majority unified regular districts in the US. Williams et al. (2006, p. 8) suggest that "studies that aim to compare school districts in a randomly selected sample will benefit from the availability of the unified K-12 pseudo-district UFNFD file as a sampling frame: per pupil revenues and expenditures, student characteristics, and outcomes can be compared across similarly situated districts or district clusters (i.e., pseudo-districts)." Second, keeping elementary districts separate from secondary school districts to which students from the former transfer after leaving elementary grades would result in upward bias in measuring inter-school district competition. This is so because the separate secondary district is dependent on the former for students rather than competing for students with them. Finally, although similar to the FNFD data, the UFNFD data flags outlier values for closer scrutiny of by researchers because not all outlier values are necessarily wrong (Williams et al., 2006). In this study's sample, 16 school districts were flagged as outliers for just a single year each on per-pupil expenditure and other fiscal variables. I replaced such values with values from most adjacent year (within the study period) that were not considered outliers for each school district. Such replacement values were not themselves outliers because they were either not more than 3 standard deviations from the mean of the other years for any given LEA or not different by a factor of 1.5 in either direction from a preceding year for any given LEA (Williams et al., 2006).

pseudo-unified districts for fiscal years 1990 to 1995.[4] Based on the Common Core of Data, these urban pseudo-unified districts enrolled 74.1% of nation's public school students in 1990 which rose to 77.5% in 1995. The UFNFD data is the source for per-pupil spending, local per-pupil revenue, total per-pupil revenue, total per-pupil revenue from state, student enrollment, region, and FIPS codes for metropolitan area, counties and states. Since the UFNFD data does not include information on local revenues from property tax sources, the relevant information on the variable from the Common Core of Data, School District Finance Survey (F-33) for each of the sample years have been utilized. Measures for local political institutions have been derived from the Popularly Elected Officials Surveys for years 1987 and 1992 by the Census of Governments of the US Census Bureau. This survey has since been discontinued and therefore similar analysis on a national scale for more recent time periods is ruled out. Due to this data limitation, the study period is confined to fiscal years between 1990 and 1995. The Census data for school districts from School District Demographics System of the NCES are utilized for demographic and economic variables including school district population, poverty, median household income, homeownership, and median housing value. The Census data for years 1990 and 2000 have been linearly interpolated to derive data for years between 1991 and 1995 (Millimet and Collier, 2008; Millimet and Rangaprasad, 2007). Following Hirsch and Schumacher (2004), the data on unionization of public sector employees in states was compiled from Hirsch and Macpherson (2003) as a proxy for teachers' unionization. The data on court rulings against state funding system came from Corcoran and Evans (2008).

[4] In the regression models the sample size reduces by about 15% for the pooled OLS and fixed effects models and by about 21% for the instrumental variable fixed effects models because of missing observations for variables in estimation models.

The 10-year lagged inter-school district competition measures have been calculated from the Common Core of Data, School District Finance Survey (F-33) for years 1980, 1981 and 1982 (U.S. Dept. of Education, National Center of Education Statistics, 1999). These measures are used as instrumental variables for inter-school district competition measures. These instruments are appropriate since some of the extensions of the fixed effects model, such as Hausman-Taylor and Arellano-Bond models use lags of the endogenous variables as their instruments (Cameron and Trivedi, 2009). Since the codes and boundaries for the metropolitan areas were changed in 1983 and in 1993, the matching of metropolitan area level measures for inter-school district competition for the 10 year lagged years with those for the years 1990 to 1995 was not straightforward. The county FIPS have been used to the extent possible to match the lagged competition measures with those for the study years for those metropolitan areas whose codes changed.

3.1.2. Variables and Measurements

Following the standard practice in the literature, the dependent variable in the fourth chapter is the log of per pupil total expenditure by school districts (Harris et al., 2001; Hoxby, 2000; Craw, 2008). Political institutions are measured in three ways following Berkman and Plutzer (2005) and Craw (2008). The first measure indicates whether a school district is fiscally dependent on other local governments. The second political institution measure indicates whether a school district has an elected superintendent. The third variable measures whether the school district's governing board is comprised of all appointed members, all elected at-large members, all ward-based elected members or some members elected at large while others ward-based elected. For maintaining logical time sequence between independent and dependent variables, the data on political institutions for years 1987 and 1992 have been used with the log of per pupil total expenditure for years 1990 to 1992 and for years 1993 to 1995 respectively.

Consistent with Craw (2008) and others (Belfield and Levin, 2005b; Hoxby, 2000; Marlow, 1997; and Rothstein, 2007), inter-school district competition is measured with two variables. The first measure is one minus the Herfindahl Index of student enrollment shares of school districts and is bounded between 0 - 1. The second measure is the number of school districts per 1000 students in a MA. A higher value on these MA level measures indicates a higher level of inter-school district competition. The 10-year lagged instruments for inter-school district competition are measured similarly.

Consistent with Harris et al. (2001) equity is defined as the distribution of school district spending across school districts based on within state groupings of school districts' median household incomes. Equity is operationalized in terms of regional equity/inequity in school district spending, assessing whether spending varies based on within state groupings of school districts' median household incomes. School districts are grouped into quintiles according to their within state median household income rankings.

The empirical literature has relied on several control variables to measure heterogeneity in residents' demand for public education (Berkman and Plutzer, 2005; Craw, 2008; Harris et al., 2001; Hoxby, 2000; MacDonald, 2008; Poterba, 1997). These variables include the log of the school district population, the log of the MA population, the proportion of school age population (5-17 years), percent of 25 years and above population with at least high school diploma, percent of foreign born population, percent of non-white population, racial diversity index in a MA, log of median household income, poverty, percent owner-occupied housing units, median housing value, percent of total revenue from local sources, percent of local revenue from property taxes, log of per pupil revenue from state sources, percent of 65 years and above population, percent of public sector employees covered under collective bargaining agreements (Hoxby, 1996b), percent of non-Whites in school district board, and year dummies. The pooled cross-section models additionally control for state dummies, region and state court rulings against state education funding system. Table 4.2 presents yearly means and standard deviations for the variables of the fourth chapter.

3.1.3. Methodology: School District Spending

Given the panel nature of the data, the estimation strategy follows that in Harris et al. (2001) and MacDonald (2008). Similar to these studies, variables vary across districts and over time. Each observation on the dependent and independent variables represents district i in state j at time t. For deriving equity implications, the within-state median household income rankings of the school districts have been interacted with local political institutions and inter-local government competition. Harris et al. (2001) used a similar strategy in evaluating the equity implications of court rulings on state fiscal system on public education. Future studies may include other strategies in evaluating equity in school district spending, such as school district rankings on percent of minorities or percent of students with English as their second language.

Pooled OLS models are utilized as the base for both additive and interactive models. For drawing substantive conclusions however, the results from the fixed effects and instrumental variable fixed effects regressions for both additive and interactive models are used. Additionally, post-estimation marginal analyses of the results from the fixed effects and instrumental variable fixed effects regressions for interactive models are performed to test hypotheses. The following fixed effects interactive model has been estimated.

log (total per pupil expenditure$_{ijt}$) = $\beta_1\times$ inter-school district competition$_{ijt}$ + $\beta_2\times$ political institutions$_{ijt}$ + $\beta_3\times$ (inter-school district competition$_{ijt}$ $\times$ political institutions$_{ijt}$) + $\beta_4\times$ (inter-school district competition$_{ijt}$ $\times$ median household income quintile$_{ijt}$) + β_5 $\times$ (political institutions$_{ijt}$ $\times$ median household income quintile$_{ijt}$) + π X_{ijt} + δ_{ij} + S_{jt} + ϵ_{ijt}; where π is the vector of coefficients for control variables X_{ijt} including the intercept and time dummies; δ_{ij} are district fixed effects that capture those factors that vary across districts but do not change over time; S_{jt} is the state effects to capture the effects of public sector employees covered under collective bargaining agreements; and ϵ_{ijt} is the error term.

The instrumental variable fixed effects models utilize 10-year lags for the inter-school district competition measures in the fixed effects model described above. The panel data instrumental variable fixed effects model appropriately transforms the corresponding fixed effects model to control for district fixed effects and then applies instrumental variable estimation procedure to the transformed model (Cameron and Trivedi, 2009, p. 282).

While estimating the effect of inter-school district competition, there are two key methodological problems (Belfield and Levin, 2005b). First, competition measures are multidimensional and difficult to measure simultaneously. This challenge has been addressed in the context of inter-school district competition in public education by including two measures. Second, there is identification problem. The level of competition may be endogenous (Belfield and Levin, 2005b; Bettinger, 2005; Harris et al., 2001; Hoxby, 2000; Rothstein, 2007). This means that some unobservable factors are part of the random error term and they may be related to both the dependent variable and one or more independent variable (s).

In case of inter-school district competition in a MA, some unobservable factors may influence both supply of per-pupil spending and demand for school districts. For example, according to Hoxby (2000), there may be a situation where one district has a highly productive administration for some peculiar reason. This may result in lower funding levels for the district. Additionally, some of the adjoining school districts might want to consolidate with the district to secure gains for their students from the expertise of highly productive administration. But this implies that the number of school districts in the education market would decline thereby reducing the degree of observed choice. In this situation, the unobservable productive administration is simultaneously correlated with the dependent and independent variables. This results in unpredictable bias in the coefficient of the independent variable (Hoxby, 2000). The cross-section data requires the use of appropriate instrumental variable (IV) and the two-stage least squares (2SLS) estimation approach (Hoxby, 2000; Rothstein, 2007). The selected IV should be highly correlated with the endogenous independent variable, but not with the random error in the regression equation (Gujarati, 1995; Wooldridge, 2006). But finding such an exogenous IV is not an easy task (Gujarati, 1995).

In the context of panel data used for this chapter, the employed fixed effects models effectively address the issue of endogeneity which arises from omission of unit-level unmeasured and unobserved time-invariant variables and which may be correlated with both the dependent and independent variables (Cameron and Trivedi, 2009; MacDonald, 2008). However, there may still remain some time-variant omitted variables that may potentially cause endogeneity and hence the estimated coefficients of the key independent variables may still be biased.[5] This problem is addressed through the use of the instrumental variable fixed effects model (Cameron and Trivedi, 2009; Harris et al., 2001). Following Harris et al. (2001), one measure each for the two inter-school district competition variables have been considered that can arguably serve as valid instruments. Harris et al. (2001) instrument the share of 65 year plus population in their study period with the 10 year lagged share of 54-64 years population. The fourth chapter similarly uses the 10 year lagged inter-school district competition measures as instruments corresponding to the two inter-school district competition measures.

Studies also argue that the endogeneity problem may bias the effect of political institutions on fiscal outcomes of local governments (Berry and Gergen, 2009; Persson and Tabellini, 2003). However, Berry and Gersen (2009, p. 482) argue that concerns about the endogeneity of political institutions "should be allayed by the fact that electoral institutions are enshrined in longstanding provisions of state constitutions and city charters." The authors therefore suggest that at least in the short run the political institutions should be considered exogenous. Berry and Gersen's arguments apply to this study because political institutions are measured at two points in time that are apart by only five years, a very short time period to change local political institutions through

[5] For avoiding estimation bias, Hoxby (2000) and Rothstein (2007) utilize the number of larger and smaller streams in a Metropolitan Area as instruments for inter-school district competition in linear models on cross-section data. This chapter does not use these instruments for inter-school district competition measures because they are time-invariant and therefore they are collinear with unobserved time-invariant school district level factors. Consequently, they will fail to identify an unbiased coefficient for the latter in the fixed effects model setting.

making commensurate changes in the applicable provisions of the state constitutions and city charters.

3.2. Competition, Political Institutions, and Student Achievement

3.2.1. Data

The analytical sample of student achievement data was compiled as follows. The data compiled for the fourth chapter for years 1990 and 1992 was merged with data on student achievement and other relevant variables from first three waves of the National Education Longitudinal Study of 1988 (NELS:88) survey of the NCES. The school district' LEA IDs for the NELS data was derived using Rothstein' STATA programs.[6] These programs were used to compile analytical sample in Rothstein (2007). However, in merging the school district level data in the fourth chapter with the NELS data LEA IDs were used instead of the Metropolitan Statistical Area (MSA) codes that were used by Rothstein (2007). This approach was taken because the UFNFD data provided more accurate measures for inter-school district competition. Also, the correspondence between the MSA codes and the LEA codes is more robust in the UFNFD data than the data used by Hoxby (2000) and Rothstein (2007) from School District Data Book 1990.

The NELS:88 is a large nationally representative sample of students containing data on student achievement, student, family and school characteristics. The dataset for the base year, first follow up year and second follow up year (1988-92) has 27,390 cases for a sample of 1030 schools. These observations include information on drop-out and no response in subsequent follow-ups. The panel for the base year (8th grade), first follow-up (10th grade) and the third follow-up (12th grade) comprise 16,490 students. The

[6] Jesse Rothstein has generously made available his STATA programs that he used in his 2007 paper at: http://gsppi.berkeley.edu/faculty/jrothstein/hoxby/documentation-for-hoxby-comment.

merging of NELS:88 with school district level datasets does not lead to significant number of missing observation on school districts in regard to various measures of dependent variables (Hoxby, 2000). The final analytical sample of students in the urban school districts (i.e., those school districts that are in MAs) is about 9,000.

3.2.2. Variables and Measurements

Following production function studies (for example, Hoxby, 2000; Marlow, 2000; Roscigno et al., 2006; Zanzig, 1997), the public education productivity is measured in terms of student achievement. The longitudinal nature of the data for the first follow up year 1990 (10th grade) and the second follow up year 1992 (12th grade) has been utilized along with the cross-sections of these years. The dependent variables for the fifth chapter include standardized math and reading scores for 10th-grade and 12th-grade. These student achievement measures for two years have been selected to match with the corresponding measures for inter-school district competition and political institutions for those years.

The measures for inter-school district competition and political institutions mirror those in the fourth chapter. Consistent with Hoxby (1996a), equity is defined as the distribution of student achievement across school districts based on within state groupings of school districts' median household incomes. Groupings of school districts' median household incomes calculated in the fourth chapter are included in the fifth chapter. Other school district and MA-level control variables in the fourth chapter are also included in the fifth chapter. Additionally, various student/family and school characteristics consistent with Goldhaber and Brewer (2000), Hoxby (2000), and Rothstein (2007) are also include as control variables. These variables include student's

8th grade scores in reading and math, race, sex, and SES and at the school level, the variables include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

3.2.3. Methodology: Student Achievement

Given the panel and hierarchical nature of the data, two modeling strategies are followed. For applying the panel data model in a situation in which some of the variables are time-invariant and the competition measures are potentially correlated with the time-invariant unit-level errors, Hausman-Taylor regression model is utilized (Cameron and Trivedi, 2009). This modeling approach thus handles a limited form of endogeneity. Additionally, the contemporary Hierarchical Linear Modeling (multi-level modeling) approach has been employed in estimating the key hypotheses of the fifth chapter.[7] The nature of NELS:88-92 is such that sample students cluster within schools. Sample schools may cluster within school districts which in turn may cluster within MAs and states. However, given that the NELS has 1030 schools in its sample, it is unlikely to find more than five schools within a school district. This is well below the threshold level of 5 observations per school district for HLM to be efficient (Gelman and Hill, 2007, p. 247; Raudenbush and Bryk, 2002; Renzulli, Macpherson, and Beattie, 2011). Since inter-school district measure is at the MSA level, it is also likely that schools may cluster at that level. However, given that there are more than 300 MSAs in the US, it is unlikely that the NELS:88 sample will have, on an average, more than 5 schools in each MSA. Similarly, given that there are about 200 MSAs in the final analytical sample, the

[7] However, it must be noted that the multi-level linear modeling approach assumes away any correlation between independent variables and error terms including the unit level time-invariant heterogeneity.

clustering of MSAs at the state level also does not meet the threshold criteria. Therefore, the final analytic sample for the fifth chapter has a two-level data structure. Indeed, the model diagnostic tests (the Likelihood Ratio test, the AIC and the BIC – not shown here) show that three level models do not fit the data any better than two level models. The student/family characteristics are measured at the individual level. School, district and MSA level variables coincide with the MSA level measures.

Clustering of cases around higher level of units produces inefficient coefficients because errors are correlated and there may be group-specific error variances (DiPrete and Forristal, 1994; Kaufman, 1995; Roscigno et al., 2006). The multi-level regression model addresses the error in estimation and also produces accurate standard errors for making inferences. The empirical studies on the relationship between inter-school district competition and educational outcomes have not used multi-level modeling technique. Additionally, post-estimation marginal analyses of the results from the linear multi-level regressions for interactive models are performed to test hypotheses. Following, Raudenbush and Bryk (2002, p. 231-233), the basic framework of the two-level HLM is as follows.

The general conditional level-1 model is:

$Y_{ij} = \pi_{0j} + \pi_{1j}\, a_{1ij} + \pi_{2j}\, a_{2ij} + \ldots. + \pi_{Pj}\, a_{Pij} + e_{ij}$; where:

Y_{ij} is student achievement of child i in MA j.

π_{0j} is the intercept of MA j.

a_{pij} are p = 1, ……, P child/family characteristics that predict achievement.

π_{pj} is the level-1 coefficients corresponding to a_{pij}. This indicates the direction and strength of association between any given child characteristic and outcome in MA j.

e_{ij} is the level-1 random error estimated using student-level model. Random effects are normally distributed with a mean of 0 and variance σ^2.

The general level-2 model now predicts the level-1 coefficient indicating MA effect:

$\pi_{pj} = \beta_{p0} + \Sigma_{(q=1 \text{ to } Qp)}\ \beta_{pq} X_{qj}$ + interaction between political institution & inter-school district competition + interaction between political institution & quintile income group of school districts in state + interaction between inter-school district competition & quintile income group of school districts in state + r_{pj} ; where:

β_{p0} is the intercept in modeling the MA effect π_{pj}.

X_{qj} is a school / MA characteristic and predictor of MA effect π_{pj}.

β_{pq} is the corresponding coefficient that reflects the direction and strength of association between school / MA characteristic X_{qj} and π_{pj}.

r_{pj} is a level-2 random error term.

CHAPTER 4: RESULTS AND DISCUSSION - SCHOOL DISTRICT SPENDING

This chapter tests hypotheses that predict general and equity effects of inter-school district competition and local political institutions on school district spending.

4.1. Results and Discussion

The descriptive statistics and the results for the pooled OLS, fixed effects and instrumental variable fixed effects models are presented in the appendix of this dissertation. Table 4.2 provides descriptive statistics for the variables included in different regression models. Table 4.3 presents the main results for models that include types of electoral composition of school district boards as the measure for local political institutions respectively. Tables 4.4 and 4.5 present similar results for models including districts with elected or appointed superintendents and fiscal dependence as the measures for local political institutions. These tables present results for only key independent variables and their interaction terms along with aggregate model-specific statistics. The list of the control variables included in each of the models is listed in notes below each of the three tables. For the main regression results in each of the tables concerning the panel data models (fixed and random effects models) with significant interactions, several additional tables present results for marginal analyses to facilitate their substantive interpretations.

The results of the Hausman tests (not shown here) for comparing the fit of fixed effects models against random effects models show that the former models are more appropriate for each of the three measures of political institutions. However, for identifying the coefficient for fiscal dependence of school districts (one of the measures for political institutions), a random effects model is utilized. The fixed effects model did not identify the said coefficient because the fiscal dependence measure is collinear with time-invariant unobservable factors. When the fixed effects model is more appropriate than the random effects model, the results from the latter are biased (Cameron and Trivedi, 2009). Therefore, the results in this chapter for fiscal dependence of school districts should be interpreted cautiously and as indicative.

4.2. Aggregate Model Specific Results and Discussion

Tables 4.3 and 4.4 in the appendix present regression results from the pooled OLS, fixed effects, and instrumental variable fixed effects models that include the type of school district board and type of superintendent's office as measures for political institutions. Table 4.5 in the appendix presents regression results for the pooled OLS and random effects models that include fiscal dependence of school districts as a measure for political institution. The regression models are weighted by the number of students in school districts.[8] For the fixed effects models, within mean number of students are used as weight. The instrumental variable fixed effects models that include the hypothesized interaction terms in Table 4.3 are not reported because none of the interactions were significant.

The pooled OLS models in Tables 4.3, 4.4, and 4.5 explain about 77-79% of the variance in the log of per-pupil total expenditure. The fixed effects and the instrumental variable fixed effects models on the other hand explain about 18-28% of overall variance

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[8] The instrumental variable fixed effects command in STATA does not permit the use of weights; therefore fixed effects IV models are not weighted.

in the log of per-pupil total expenditure. The random effects models in Table 4.5 explain about 62-63% of variance in the log of per-pupil total expenditure. The standard errors reported in the three tables for the pooled OLS, the fixed effects, and the random effects models have been adjusted for heteroskedasticity and clustering of school districts within a MA. For the instrumental variable fixed effects models, Tables 4.3 and 4.4 report bootstrap standard errors.

The first-stage results (not shown here) for the additive instrumental variable fixed effects models in Tables 4.3 and 4.4 and interactive instrumental variable fixed effects model in Table 4.4 show that the 10-year lagged Herfindahl index based measure of inter-school district competition is significantly related to the Herfindahl index based measure of inter-school district competition for the study period. The F-statistics (in Tables 4.3 & 4.4) on the joint significance of the excluded instrument are 182.67, 196.03, and 148.14 (the associated p-values are less than 0.001) for the instrumental variable fixed effects models with the type of school district board and the type of superintendent's office as measures for political institutions respectively. These two results imply that the said instrument is not weak (Harris et al., 2001; Hoxby, 2000).

The first-stage results (not shown here) for the additive instrumental variable fixed effects models that include the 10-year lagged enrollment weighted count of school districts in a MA however, show that the instrument is not significantly related to the enrollment weighted count of school districts in a MA for the study period. The F-statistics (reported in Tables 4.3 & 4.4) on the joint significance of the excluded instruments are 923.95 and 1002.09 (the p-value are less than 0.001). Although the correlation between the 10-year lagged enrollment weighted count of school districts in a

MA and enrollment weighted count of school districts for the study period is quite high at 0.66, the t-statistics (not shown here) for the variable in question drops substantially. The latter is quite evident because the bootstrap standard errors are magnified by more than 200 times in Table 4.3 and more than 1000 times in Table 4.4 in comparison to the standard errors for respective fixed effects models. Together these results suggest that the 10-year lagged enrollment weighted count of school districts in a MA is a weak instrument for enrollment weighted count of school districts in a MA for the study period (Cameron and Trivedi, 2009, p. 175). However, since the respective coefficients estimated by instrumental variable fixed effects models for the enrollment weighted count of school districts in a MA do not substantively differ from that estimated by the corresponding fixed effects models, it would serve no appreciable purpose to obtain better instruments. Moreover, the corresponding fixed effects models have partially addressed the endogeneity problem that arises from omitting unobserved time-invariant school district level factors.

4.3. Additive Models: Key Results and Discussion

Results for additive models in Tables 4.3, 4.4, and 4.5 in the appendix show that the inter-school district competition has no effect on the log of total per pupil expenditure except for the fixed effects models in Tables 4.3 and 4.4 that use Herfindahl index as the measure for inter-school district competition. The fixed effects model in question in Table 4.3 shows that raising inter-school district competition in a MA from 0 (no competition) to 1 (perfect competition) results in about 81% increase in per-pupil total spending by school districts.[9] The corresponding increase for the fixed effects model that uses the type of superintendent office as a measure for political institution in Table 4.4 is

[9] The corresponding interactive model shows similar results.

75%. However, the corresponding instrumental variable fixed effects models in Tables 4.3 and 4.4 estimate positive coefficients for the Herfindahl index that are not statistically different from zero. Additionally, the additive random effects model in Table 4.5 also reports a coefficient for the Herfindahl index which is statistically not different from zero.

The type of school district board in Table 4.3 does not have a significant effect on the log of per-pupil total expenditures in both the fixed effects and instrumental variable fixed effects models. However, the results from corresponding models in Table 4.4 show that school districts with elected superintendents significantly spend about 6-7% more per-pupil total dollars than those with appointed superintendents. The results from the corresponding random effects models in Table 4.5 similarly show that fiscally dependent school districts spend about 14% less per-pupil total dollars than fiscally independent school districts.

Overall, the additive models offer mixed findings. The two measures for the inter-school district competition in a MA have no effect on per-pupil total expenditure by school districts in fixed effects instrumental variable models. However, the Herfindahl index of inter-school district competition has a positive effect in the fixed effects model (without the instrument). This result is consistent with similar empirical studies. Using instrumental variable regression model on cross-section data, Rothstein (2007) report that inter-school district competition has no effect on student achievement. On the other hand, the study by Hoxby (2000) found positive effect of inter-school district competition on student achievement and a small but negative effect on per-pupil spending by school districts. Few earlier studies in the context of different type of local governments, such as Dolan (1990) and Forbes and Zampelli (1989) also report similar findings. These results do not robustly support the hypothesis pertaining to the public choice, the Leviathan models and the consolidated local government model. Substantively, these results suggest that inter-school district competition does not robustly affect school district spending.

The additive models also offer mixed results in regard to the effects of political institutions on per-pupil spending by school districts. Whereas the type of school board does not influence school district spending, the other two measures of political institutions have significant effects on per-pupil spending by school districts. Using fixed effects models, a similar study by MacDonald (2008) reports no effects of political institutions on log of per-capita total municipal government expenditure. However, consistent with Craw (2008), results in respect of the type of school superintendent's office and the type of fiscal autonomy of school districts support the reformism hypothesis. The reformism hypothesis is supported because accountability to parent local government and efficiency from appointed school superintendent restrict the ability of these school districts in inflating budgets for rent-seeking. The finding in regard to the type of fiscal autonomy of school districts lends support to the hypothesis in the consolidated local governments model. This implies that the consolidation of school districts with their respective parent local governments results in overall economies of scale (Howell-Moroney, 2008) and therefore fiscally dependent school districts spend less than fiscally independent school districts. Overall, the additive models imply that fiscally dependent school districts and those with appointed superintendent spend less.

4.4. Interactive Models: Key Results and Discussion

The interactive models show the joint effects of inter-school district competition and local political institutions on school district spending. These models also show the equity effects of inter-school district competition and political institutions. Concerning the pooled OLS models with Herfindahl index as the measure for inter-school district competition, the interactions between school district competition and political institutions, between school district competition and median household income rankings, and between political institutions and median household income rankings are significant in Tables 4.3, 4.4, and 4.5. For the pooled OLS models with student enrollment weighted count of school districts in a MA, however, the interactions between school district competition and median household income rankings are not significant in Tables 4.3, 4.4, and 4.5. Additionally, the interactions between political institutions and median household income rankings are not significant in Table 4.5. Among the fixed effects models with Herfindahl index as the measure for inter-school district competition in Tables 4.3 and 4.4, only the interactions between political institutions and median household income rankings are significant. Among the fixed effects models with student enrollment weighted count of school districts in a MA as the measure for inter-school district competition, additionally the interactions between school district competition and political institutions are significant in Table 4.3 when the political institution is measured by the type of school district board. The interactive random effects model with student enrollment weighted count of school districts in a MA as the measure for inter-school district competition in Table 4.5 reports that only the interaction between fiscal dependence and inter-school district competition is significant.

In regard to the joint effects of inter-school district competition and local political institutions on school district spending, Tables 4.3.1 and 4.3.2 in the appendix present results for marginal analyses of interactions in the two fixed effects models in Table 4.3.

This is done to separate marginal effects of the interacting variables from each other (Brambor, Clark, and Golder, 2006; Craw, 2008; Dawson and Richter, 2006). This separation also facilitates testing of various interactive hypotheses: whether differences in marginal effects and marginal predictions reported at different combinations of specific values of the moderating variables are different from zero. Bonferroni adjusted standard errors are applied in this regard (Dawson and Richter, 2006).

Results from marginal analyses for interactions in the fixed effects model that uses the Herfindahl index as the measure for inter-school district competition are not presented because none of the comparisons for marginal predictions of log of per pupil spending across school districts, which are grouped by type of local political institutions and median household income rankings, are significant when P-Values are Bonferroni adjusted, except for those in the main results in Table 4.3.

Results in Tables 4.3, 4.3.1, and 4.3.2 in the appendix show that school districts with ward based and mixed district boards spend more than those with appointed boards as inter-school district competition increases. Similarly, school districts with ward based district boards spend more than those with at-large boards. These results are consistent with the reformism perspective.

Table 4.3.2 presents differences in marginal effects of student enrollment weighted count of school districts in a MA for all possible comparisons across different types of school boards. The results are presented only for either significant or marginally significant comparisons. As is evident from the relevant fixed effects model in Table 4.3, school districts with ward based and mixed boards spend significantly more than those with appointed boards with an increase in inter-school district competition. Table 4.3.2

additionally demonstrates that school districts with ward-based boards spend more than those with at-large boards as inter-school district competition increases. However, the student enrollment weighted count of school districts in a MA is statistically significant for school districts with appointed boards only.

Table 4.3.2 in the appendix presents statistically significant results for differences in marginal predictions of log of per-pupil total expenditure for all the possible comparisons between school districts that are grouped by different types of school district boards and different levels of inter-school district competition. The levels of inter-school district competition has been defined as low if the value of the competition measure is about one standard deviation below its weighted mean. The weighted mean for the measure defines the average competition. School district competition is designated as high if the value for the measure is about one standard deviation above its weighted mean. The statistical significance of the sole comparison reveals that in the fixed effects interactive model with student enrollment weighted count of school districts in a MA as the measure for inter-school district competition, among school districts with low competition those with ward-based boards significantly spend less than those with at-large boards.

Tables 4.3 and 4.3.3 in the appendix also present the equity effects of inter-school district competition and the type of school district board. It is apparent from looking first at school districts in third and fourth (second highest) income quintile groups in Table 4.3 that districts with at-large and mixed boards spend less than those with appointed boards. In the second income quintile group, school districts with ward-based boards spend significantly less than those with appointed boards. Table 4.3 shows similar results for the fixed effects model that uses student enrollment weighted count of school districts in a MA as a measure for inter-school district competition, except for school districts with mixed boards. The mixed school district boards in all income quintiles do not significantly spend any different dollars than their counterparts with appointed boards in comparable income quintile groups. Additionally, Table 4.3.3 shows that school districts with appointed boards in the second income quintile group spend more than school districts with appointed boards in the lowest income quintile group. All other possible comparisons are not statistically different from zero, and therefore they are not presented in Table 4.3.3 for parsimony.

Tables 4.4.1, 4.4.2, and 4.4.3 in the appendix present results for the marginal analyses of the interactions in the two fixed effects and one instrumental variable fixed effects models in Table 4.4. The results for interactions in the two fixed effects models in Table 4.4 show that school districts with elected superintendents spend significantly more in comparison to those with appointed superintendents for all income quintile groups. Results for the instrumental variable fixed effects model that uses the Herfindahl index as a measure for inter-school district competition are similar except that there is no significant difference in spending by school districts with elected and those with appointed superintendents in the second lowest income quintiles.

Table 4.4.1 reports some additional differences in marginal predictions of log of per-pupil total expenditure across school districts that are grouped by the type of superintendent's office and median household income ranking quintiles for one of the fixed effects models in Table 4.4. The fixed effects model in question uses Herfindahl index as a measure for inter-school district competition. The results are presented only for either significant or marginally significant comparisons from among all possible comparisons. Results in Table 4.4.1 show that school districts with elected superintendents in the top two income quintiles spend significantly more than those with appointed superintendents in the two lower income quintiles.

Table 4.4.2 reports additional differences in marginal predictions of log of per-pupil total expenditure across school districts that are formed by the type of superintendent's office and median household income ranking quintiles for the other fixed effects model in Table 4.4. The fixed effects model in question uses student enrollment weighted count of school districts in a MA as a measure for inter-school district competition. The results are presented only for either significant or marginally significant comparisons from among all possible comparisons.

The results in table 4.4.2 provide partial support for the reformism perspective in terms of school district spending because school districts with elected superintendents in the top income quintile group spend more than school districts with appointed superintendents in the same quintile.

Table 4.4.3 reports additional differences in marginal predictions of log of per-pupil total expenditure across school districts that are grouped by the type of superintendent's office and median household income ranking quintiles for the instrumental variable fixed effects model in Table 4.4. The model in question uses Herfindahl index as a measure for inter-school district competition. The results are presented only for either significant or marginally significant comparisons from among all possible comparisons.

These results illustrate that the extent of inequity in school district spending is slightly higher in school districts with elected superintendents than those with appointed superintendents. This is evident because school districts with elected superintendents in all income quintiles demonstrate inequity in school district spending, whereas the school districts with appointed superintendents in all income quintiles except those in the second income quintile show similar patterns. Appointed superintendents help with equity when the focus is on poorer school districts. The school districts with appointed superintendents are more equitable perhaps because they are better able to manage cooperation with other school districts in providing public education. Frederickson (1999) and LeRoux, Brendenburger, and Pandey (2010) argue that that professional managers are more adept in brokering and maintaining cooperative service arrangements across local government boundaries than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation.

Table 4.4.3 also provides partial support for the reformism perspective in terms of school district spending because school districts with elected superintendents in the fourth income quintile group spend more than school districts with appointed superintendents in the same quintile.

Tables 4.5.1 and 4.5.2 in the appendix present results for the marginal analyses of the interactions in the random effects model in Table 4.5 that uses student enrollment weighted count of school districts in a MA as the measure for inter-school district competition. Results in Tables 4.5 and 4.5.1 show that the gap in spending between fiscally dependent and fiscally independent school districts for increasing inter-school district competition from 0 (no competition) to 1 (perfect competition) is about 46%

lower for the former type of school districts. However, as shown in the notes below Table 4.5.1, the inter-school district competition has a significantly negative effect for the fiscally dependent school districts spending only.

Table 4.5.2 additionally breaks down this interaction by presenting statistically significant results for differences in marginal predictions of log of per-pupil total expenditure for all the possible comparisons between school districts that are grouped by different types of fiscal autonomy and different levels of inter-school district competition. The statistically significant comparisons reveal that in the random effects interactive model with student enrollment weighted count of school districts in a MA as the measure for inter-school district competition, fiscally dependent school districts in the average and high competition groups spend less than fiscally independent school districts in average and high competition groups respectively. This finding confirms the Extended Tamed Leviathan hypothesis (I).a in section 2.2.6.

4.4.1. Discussion of the Key Findings

Marginal analyses of the significant interaction effects show that the increase in inter-school district competition leads to lower school district spending. This result is consistent with hypotheses under the public choice and the Leviathan Models. However, the non-significance of interaction terms and the significance of main effects in other relevant fixed effects models imply that the increase in inter-school district competition leads to higher school district spending. Substantively, this result is consistent with the consolidated local governments model. Similar to the corresponding results in the additive models, these results together suggest that inter-school district competition does not robustly affect school district spending.

Similar to the variation in marginal effects of inter-school district competition with different types of local political institutions, results of the variation in the marginal effects of local political institutions at different levels of inter-school district competition are presented. Unlike the additive models, marginal analyses of these interactions show that local political institutions do not conclusively affect school district spending. Among school districts with low competition in the fixed effects interactive model with student enrollment weighted count of school districts in a MA as the measure for inter-school district competition, those with ward-based boards spend significantly less than those with at-large boards. This finding fails to support the efficiency argument in the reformism model concerning the presence of fewer incentives for at-large elected local representatives than ward-based elected local representatives for inflating public budgets to win votes and allies. Additionally, in the random effects interactive model where student enrollment weighted count of school districts in a MA is the measure of inter-school district competition, fiscally dependent school districts in the average and high competition groups spend less than fiscally independent school districts in these groups. This result implies that if school districts are either an arm of other local governments or fully dependent on state governments, they reap the benefits from economies of scale and hence spend less than independent school districts. This finding supports the extended Tamed Leviathan Model and the consolidated local governments models.

The interactive models also show the effects of inter-school district competition and local political institutions on equity in school district spending. The non-significance of the interactions between inter-school district competition and within-state median household income rankings of school districts shows that inter-school district competition does not influence equity in school district spending. This finding does not support the relevant hypothesis in the consolidated local governments model. This absence of equity implications may partly stem from the fact that court-ordered school finance reform has more than proportionately increased spending in lower income school districts in comparison to those in higher income groups (Harris et al., 2001; Murray et al., 1998).

However, the type of local political institutions does have equity implications for school district spending. For example, with few exceptions school districts with appointed boards spend more than their counterparts in similar income quintile groups. The results in regard to the type of school district superintendent suggest that the extent of inequity in school district spending is slightly higher in school districts with elected superintendents than those with appointed superintendents. School districts with professional officials are more equitable perhaps because they are better able to manage cooperation with other school districts in providing public education. Frederickson (1999) and LeRoux, Brendenburger, and Pandey (2010) argue that professional managers are more adept in brokering and maintaining cooperative service arrangements across local government boundaries than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation. These results partially support the reformism perspective in terms of school district spending.

Overall, the findings robustly support the equity effects of the type of local political institutions. School districts with relatively more professional political institutions are also more equitable. The additive models, the interactive models, and the marginal analyses support the reformism model, the extended Tamed Leviathan Model and the consolidated local governments models to some extent. With an increase in competition school districts with relatively more professional political institutions spend less. Dependent school districts reap the benefits from economies of scale and hence spend less than independent school districts. Inter-school district competition does not lead to inequity in spending.

CHAPTER 5: RESULTS AND DISCUSSION - STUDENT ACHIEVEMENT

This chapter tests hypotheses that predict equity and productive efficiency effects of inter-school district competition and local political institutions on student achievement.

5.1. Presentation of Results

The descriptive statistics and the results for the Hausman-Taylor and multi-level linear models are presented in the appendix. Table 5.1 provides descriptive statistics for the variables included in various regression models. Tables 5.2, 5.3, and 5.4 present the main results for models that include types of electoral composition of school district boards as the measure for local political institutions. The set of tables 5.5, 5.6, and 5.7 and the other set of tables 5.8, 5.9, and 5.10 in the appendix present similar results for models including districts with an elected or appointed superintendent and fiscal dependence as the measures for local political institutions, respectively. These tables present results for only key independent variables and their interaction terms along with aggregate model-specific statistics. The list of the control variables included in each of the models is listed in notes below each table. For the multi-level linear models with significant interactions, several additional tables present results for marginal analyses to facilitate their substantive interpretations. The Hausman-Taylor regression results for the three types of political institutions are presented in tables 5.2, 5.5 and 5.8. The multi-level linear regression results for student's math and reading scores in the 10th grade for the three types of political institutions are presented in tables 5.3, 5.6, and 5.9. Finally, the multi-level linear regression results for student's math and reading scores in the 12th grade for the three types of political institutions are presented in tables 5.4, 5.7, and 5.10. The regression models are weighted by the number of students in school districts. One of the key methodological difference between the Hausman-Taylor model and the linear multilevel model is that whereas the former models a limited form of endogeneity the latter assumes away any correlation between independent variables and the error term.

5.2. General Results[10]

5.2.1. Hausman-Taylor Regression Model Results

The sigma_u in the tables for the Hausman-Taylor regression models (tables 5.2, 5.5, and 5.8) is the standard deviation of the individual student effect and sigma_e is the standard deviation of the idiosyncratic error. Similarly, the rho in tables 5.2, 5.5, and 5.8 is infraclass correlation of the error. A value close to 1 implies that the variance in random effects (the individual student effect - sigma_u squared) is very large relative to the variance of the idiosyncratic error (sigma_e squared). This happens to be the case in the Hausman-Taylor regression models because the rho varies between 0.77 to 0.92.

Tables 5.2, 5.5, and 5.8 show that when inter-school district competition is allowed to be correlated with the individual level effects, the political institutions and inter-school district competition do not have any interacting effects on students' reading and math scores. The political institutions do not interact with the within-state median housing income quintile rankings of school districts in affecting students' reading and math scores. The two measures of inter-school district competition do not influence students' reading and math scores as can be seen from the additive models in tables 5.2,

[10] The Chi-square and F-test statistics for the joint significance of the interaction coefficients (not shown here) support findings in regard to interactions.

5.5, and 5.8. However, the inter-school district competition interacts with the within-state median housing income quintile rankings of school districts in affecting students' reading and math scores. Only one measure of political institutions has a negative and significant effect on students' reading scores. In table 5.8, students' reading scores are significantly lower in fiscally dependent school districts than those in fiscally independent school districts.

5.2.2. General Results from Multilevel Linear Regression Models

Multilevel results for students' 10th grade reading and math scores are presented in tables 5.3, 5.6, and 5.9 in the appendix. Results show that the two measures of inter-school district competition do not interact with the type of school district board and superintendent's office in school districts in affecting students' 10th grade reading and math scores. However, the two measures of inter-school district competition interact with the type of school district's fiscal autonomy in affecting students' 10th grade reading scores. With an increase in inter-school district competition, students' reading scores are higher in fiscally dependent school districts than those in independent school districts.

The Herfindahl Index measure of inter-school district competition does not interact with the within-state median household income rankings of school district in affecting students' 10th grade reading and math scores. The student enrollment weighted count measure of inter-school district competition does however interact with the within-state median household income rankings of school district in affecting students' 10th grade reading scores. Specifically, results in models using the type of school district board and the type of fiscal autonomy of school district show that students in the third income quintile school district have higher reading scores than those in the lowest income quintile school districts as the inter-school district competition increases. Additionally, results in models using the type of school district superintendent show that students in the second and the third income quintile school districts have higher reading scores than those in the lowest income quintile school districts as inter-school district competition increases.

Political institutions also interact with the within-state median household income rankings of school districts in affecting students' 10th grade reading and math achievement with a few exceptions. In models that use the Herfindahl Index measure of inter-school district competition, the type of school district board does not interact with the within-state median household income rankings of school districts in affecting students' 10th grade reading and math achievement. In fact, the type of school district board has no effect on students' reading and math scores in models that use the Herfindahl Index measure of inter-school district competition. The type of school district board does not interact with the within-state median household income rankings of school districts in affecting students' 10th grade math achievement in the model that uses student enrollment weighted count measure of inter-school district competition. The type of fiscal autonomy of the school district does not interact with the within-state median household income rankings of school districts in affecting students' 10th grade reading achievement in the model that uses student enrollment weighted count measure of inter-school district competition. Students' 10th grade reading scores are lower in third income quintile mixed-board school districts than those in the lowest income quintile appointed-board school districts in the model that uses student enrollment weighted count measure of inter-school district competition. Students' 10th grade reading and math scores are higher in the second, the third and the fourth income quintile school districts with elected superintendents than those in the lowest income quintile school district with appointed superintendents. Students' 10th grade reading and math scores are lower in the second, the third and the fourth income quintile fiscally dependent school districts than those in the lowest income quintile independent school districts in the models that use the Herfindahl Index measure of inter-school district competition. Students' 10th grade math scores are lower in the fourth and the top income quintile fiscally dependent school districts than those in the lowest income quintile independent school districts in models that use student enrollment weighted count measure of inter-school district competition.

Multilevel results for students' 12th grade reading and math scores are presented in tables 5.4, 5.7, and 5.10 in the appendix. Results show that the two measures of inter-school district competition do not interact with the type of fiscal autonomy of school district and superintendent's office in school districts in affecting students' 12th grade reading and math scores. However, the Herfindahl Index measure of inter-school district competition interacts with the type of school district board in affecting students' 12th grade math scores. With an increase in inter-school district competition, students' math scores are higher in at-large, ward-based, and mixed board school districts than those in appointed board school districts.

The Herfindahl Index measure of inter-school district competition does not interact with the within-state median household income rankings of school district in affecting students' 12th grade reading scores. The student enrollment weighted count measure of inter-school district competition does however interact with the within-state median household income rankings of school district in affecting students' 12th grade reading scores in the model that uses the type of school district board as political institution. Specifically, results in models using the type of school district board show that students in the fourth income quintile school districts have higher reading scores than those in the lowest income quintile school districts.

Political institutions also interact with within-state median household income rankings of school districts in affecting students' 12th grade reading and math achievement with a few exceptions. The type of school district superintendent and the type of fiscal autonomy of school districts do not interact with the within-state median household income rankings of school districts in affecting students' 12th grade reading achievement. In fact, the two measures of political institutions do not have any effect on students' 12th grade reading scores. The type of school district board does however interact with the within-state median household income rankings of school districts in affecting students' 12th grade reading and math achievement. Specifically, students' 12th grade reading scores are lower in the second and the third income quintile school districts with ward-based boards than those in the lowest income quintile school district with appointed boards. Students' 12th grade math scores are higher in the fourth income quintile school districts with mixed boards than those in the lowest income quintile school districts with appointed boards. The type of school district superintendent and the type of fiscal autonomy of school districts interact with within-state median household income rankings of school districts in affecting students' 12th grade math achievement. Students' 12th grade math scores are lower in the fourth and the top income quintile fiscally dependent school districts than those in the lowest quintile independent school districts. Students' 12th grade math scores are higher in the third and the fourth income quintile school districts with elected superintendents than those in the lowest income quintile school districts with appointed superintendents.

5.2.3. Substantive Summary of General Results

The two measures for the inter-school district competition in a MA have no effect on students' reading and math scores in 10th and 12th grades in additive models. This result is consistent with similar empirical studies. Using instrumental variable regression model on cross-section data, Rothstein (2007) report that inter-school district competition has no effect on student achievement. On the other hand, the study by Hoxby (2000) found positive effect of inter-school district competition on student achievement. Although these results reject the hypothesis pertaining to the public choice and the Leviathan models, they do not robustly confirm the commensurate hypothesis of the consolidated local government model either. Substantively, these results suggest that inter-school district competition does not robustly affect student achievement.

The additive models also offer mixed results in regard to the effects of political institutions on student achievement. Whereas the type of school board does not affect student achievement, the type of school district superintendent and the type of fiscal autonomy of school districts have significant effects on student achievement in some models. Students' 10th grade math scores are higher in school districts with an elected superintendent than those with appointed superintendents. Students' reading scores are lower in fiscally dependent school districts than in fiscally independent school districts. Although prior studies do not exist on the relationship between local political institutions and student achievement, there are several studies that report mixed findings on the effects of political institutions on log of per-capita total municipal government expenditure. Using fixed effects model, a similar study by MacDonald (2008) reports no effects of political institutions on log of per-capita total municipal government expenditure. Results in respect of the type of fiscal autonomy of school districts and the type of school district superintendents are counter to the reformism hypothesis (Craw, 2008) because accountability to parent local government body due to fiscal dependence and employer-employee dynamics does not translate in productivity gains in student achievement. Overall, the additive models imply that school districts with appointed superintendents and those that are fiscally dependent are productively less efficient.

The interactive models offer mixed results on the joint effects of inter-school district competition and local political institutions on student achievement. The results in the Hausman-Taylor regression model show that inter-school district competition and local political institutions do not have interactive effects on student achievement. While the former have equity effects on student achievement the latter do not. In the multilevel models however, inter-school district competition and type of political institutions interact in influencing student achievement (Model M2 in Table 5.4 and Models R3 and R6 in Table 5.9). With an increase in the Herfindahl Index measure of inter-school district competition, students' 12th grade math scores are higher in at-large, ward-based, and mixed board school districts than those in appointed board school districts. This finding does not support the Tamed Leviathan Model in Craw (2008) because with an increase in competition more professional political institutions such as the appointed school district board did not turn out to be productively more efficient. With an increase in inter-school district competition, students' reading scores are higher in fiscally dependent school districts than those in independent school districts. This finding implies that the fiscally dependent school districts are productively more efficient than their independent counterparts. This finding supports the Tamed Leviathan Model in Craw (2008).

The student enrollment weighted count measure of inter-school district competition interacts with the within-state median household income rankings of school district in affecting student's 10th grade reading scores. In regard to the type of school district board and the type of fiscal autonomy of school districts, students in the third income quintile school districts have higher 10th grade reading scores than those in the lowest income quintile school districts as the inter-school district competition increases. Additionally, in regard to the type of school district superintendent, students in the second and the third income quintile school districts have higher 10 grade reading scores than those in the lowest income quintile school districts as inter-school district competition increases. Results in the model using the type of school district board show that students in the fourth income quintile school districts have higher 12th grade reading scores than those in the lowest income quintile school districts as the student enrollment weighted count measure of inter-school district competition increases. These results imply that the increased inter-school district competition leads to inequity in students' reading scores in 10th and 12th grades.

Students' 10th grade reading scores are lower in the third income quintile mixed board school district than those in lowest income quintile appointed board school district in the model that uses student enrollment weighted count measure of inter-school district competition. Students' 10th grade reading and math scores are higher in the second, the third and the fourth income quintile school districts with elected superintendents than those in the lowest income quintile school district with appointed superintendents in models that use either measures of inter-school district competition. Students' 10th grade reading and math scores are lower in the second, third and fourth income quintile fiscally dependent school districts than those in the lowest income quintile independent school districts in the models that use the Herfindahl Index measure of inter-school district competition. Students' 10th grade math scores are lower in fourth and top income quintile fiscally dependent school districts than those in the lowest income quintile independent school districts in models that use student enrollment weighted count measure of inter-school district competition.

Students' 12th grade reading scores are lower in second and third income quintile school districts with ward-based boards than those in the lowest income quintile school district with appointed boards in models that use either type of inter-school district competition. Students' 12th grade math scores are higher in fourth income quintile school districts with mixed boards than those in the lowest income quintile school district with appointed boards in models that use either type of inter-school district competition. Students' 12th grade math scores are lower in fourth and top income quintile fiscally dependent school districts than those in the lowest quintile independent school districts in models that use either type of inter-school district competition. Students' 12th grade math scores are higher in third and fourth income quintile school districts with elected superintendents than those in the lowest income quintile school districts with appointed superintendents in models that use either type of inter-school district competition.

Clearly, these results imply that differences in political institutions across school districts lead to inequity in students' reading and math scores in 10th and 12th grades.

5.3. Substantive Results from Multi-level Models

Tables 5.3.1, 5.3.2, 5.4.1, 5.4.2, 5.4.3, and 5.4.4 in the appendix present results for marginal analyses of interactions in multi-level linear regression models in tables 5.3 and 5.4. Tables 5.6.1, 5.6.2, 5.6.3, 5.6.4, 5.6.5, 5.7.1, 5.7.2, 5.7.3, and 5.7.4 in the appendix present results for marginal analyses of interactions in multi-level linear regression models in tables 5.6 and 5.7. Finally, Tables 5.9.1, 5.9.2, 5.9.3, 5.9.4, 5.9.5, 5.9.6, 5.10.1, 5.10.2, and 5.10.3 in the appendix present results for marginal analyses of interactions in multi-level linear regression models in tables 5.9 and 5.10. This is done to separate marginal effects of the interacting variables from each other (Brambor, Clark, and Golder, 2006; Craw, 2008; Dawson and Richter, 2006). This separation also facilitates testing of various interactive hypotheses: whether differences in marginal effects and marginal predictions reported at different combinations of specific values of the moderating variables are different from zero. Bonferroni adjusted standard errors are applied in this regard (Dawson and Richter, 2006).

As noted above, while the main results in the interactive model M2 in Table 5.4 do not support the Tamed Leviathan Model in Craw (2008), similar results in Models R3 and R6 in Table 5.9 show some support. The results in table 5.9.1 support the productive efficiency argument in the Tamed Leviathan model because increase in competition widens the gap in students' 10th grade reading scores between those in fiscally dependent school districts and those in fiscally independent school districts. The singular comparative marginal in table 5.9.3 shows similar relationship when the inter-school district competition is measured as student weighted count of school districts in a MA.

The results in Table 5.3.1 support the equity argument in the consolidated local government model with one exception. They show that increased competition helps students in the third income quintile school districts score higher in 10th grade reading scores than those in the top income quintile school districts. This finding does not support the equity hypotheses under the consolidated local government model. The singular comparative marginals in table 5.6.2 however shows that the increase in competition widens the gap in students' 10th grade reading scores between those in the third income quintile school districts and those in the lowest income quintile school districts. This finding supports the equity hypotheses under the consolidated local government model. The comparative marginals in tables 5.7.1 and 5.7.2 similarly show that increase in competition widens the gap in students' 12th grade reading and math scores respectively between those in the fourth income quintile school districts and those in the second income quintile school districts for the former and between those in the top and the fourth income quintile school districts and those in the lowest income quintile school districts for the latter.

The singular comparative marginal in table 5.9.4 similarly supports the equity argument in the consolidated local government model because there is inequity in students' 10th grade reading scores between those in the third income quintile school districts and those in the lowest income quintile school districts as the inter-school district competition increases. The singular comparative marginal in table 5.10.1 reports similar finding because students' 12th grade reading scores are higher in the fourth income quintile school districts than those in the second income quintile school districts as the inter-school district competition increases.

Results for marginal analyses of 10th grade reading scores are presented in table 5.3.2 for interactions in the model that uses student enrollment weighted count measure of inter-school district competition. These results suggest that school districts with at-large boards are the most inequitable, followed by those with the mixed boards, those with the ward-based boards in that order. The school districts with the appointed boards however show equal student achievements across all income quintile districts. This is evident because school districts with appointed boards in all income quintiles demonstrate equity in student achievement, whereas the school districts with at-large boards in all income quintiles show inequity in 10th grade reading scores. Similarly, school districts with mixed boards in the top and the fourth income quintiles and school districts with ward-based boards in the top income quintiles show inequity in 10th grade reading scores. So, appointed school district boards help with equity when the focus is on poorer school districts.

Results for marginal analyses of 12th grade reading scores are presented in table 5.4.1 for interactions in the model that uses the Herfindahl Index measure of inter-school district competition. Similar to the results in table 5.3.2, the results in table 5.4.1 suggest that school districts with at-large boards are the most inequitable, followed by those with the ward-based boards, those with the appointed boards and those with the mixed boards in that order. So, in addition to the appointed school district boards, the mixed school district boards also help with equity when the focus is on student outcomes in poorer school districts. Tables 5.4.2, 5.4.3, and 5.4.4 report similar results in case of 12th grade reading scores and student enrollment weighted count measure of inter-school district competition, 12th grade math scores and the Herfindahl Index measure of inter-school district competition, and 12th grade math scores and student enrollment weighted count measure of inter-school district competition respectively.

The school districts with appointed and mixed boards are more equitable perhaps because they are better able to manage cooperation with other school districts in providing public education. Frederickson (1999) and LeRoux, Brendenburger, and Pandey (2010) argue that professional managers are more adept in brokering and maintaining cooperative service arrangements across local government boundaries than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation.

Additionally, table 5.4.2 provides partial support for the reformism perspective because students' 12th grade reading score is higher in the third income quintile school districts with appointed boards than those with mixed boards in the same quintile. However, in another case the reformism perspective is not supported because student's 12th grade reading score is higher in school districts with ward-based boards than those with at-large boards within the lowest income quintile school districts. Results in Tables 5.4.3 and 5.4.4 also do not support the reformism perspective. As can be seen from Table 5.4.3 students' 12th grade math scores are higher in the fourth income quintile school districts with mixed and at-large boards than those with appointed boards in the same quintile. So school districts with more professional political institutions aren't showing higher student achievement. Results in Table 5.4.4 show similar relationships.

Tables 5.6.1, 5.6.3, 5.6.4, and 5.6.5 list equity effects of elected / appointed superintendents. Results in Table 5.6.1 and 5.6.3 suggest that school districts with appointed superintendents are more inequitable than those with elected superintendents.

This is evident because students' 10th grade reading scores are higher in most income quintile school districts with appointed superintendents in comparison to those with appointed superintendents in lower level income quintiles respectively. However, as is evident from Table 5.6.1, school districts in the second income quintile with elected superintendent do not show any inequity in 10th grade reading scores. Results from marginal analyses for 10th grade math scores in table 5.6.4 for interactions in the model that uses the Herfindahl index measure of inter-school district competition suggest that school districts with either types of superintendents are equally inequitable. Results from marginal analyses for 10th grade math in table 5.6.5 for interactions in the model that uses student enrollment weighted count measure of inter-school district competition however suggest that school districts with appointed superintendents are more inequitable than those with elected superintendents. Tables 5.7.3 and 5.7.4 show similar results for 12th grade math scores. So, overall school districts with elected superintendents help with equity when the focus is on student outcomes in poorer school districts.

These findings do not support the argument that professional managers are better able to manage cooperation with other school districts in providing public education than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation. Additionally, results in table 5.6.4 do not support the reformism perspective because students' 10th grade math scores are higher in the fourth and the second income quintile school districts with elected superintendents than those with appointed superintendents in similar income quintiles respectively and because appointed superintendents are arguably more professional.

Table 5.9.2 lists equity effects of fiscally dependent / independent school districts for students' 10th grade reading scores. Similar results from marginal analyses for 10th grade math scores are presented in table 5.9.5 for interactions in the model that uses the Herfindahl Index measure of inter-school district competition. And results from marginal analyses for 10th grade math scores are presented in table 5.9.6 for interactions in the model that uses student enrollment weighted count measure of inter-school district competition. These results suggest that fiscally independent school districts are more inequitable than fiscally independent school districts. This is evident because inequity in exists for more number of comparisons across income quintiles for fiscally independent school districts than those for fiscally dependent school districts. Results in Tables 5.10.2 and 5.10.3 for 12th grade math scores show similar patterns. So, fiscally dependent school districts help with equity when the focus is on student outcomes in poorer school districts. This finding supports the equity argument in the consolidated local government model.

Additionally, results in table 5.9.6 do not support the reformism perspective because students' 10th grade math some in the fourth income quintile fiscally independent school districts is higher than those in the same income quintile fiscally dependent school districts and because fiscally dependent school districts are arguably more professional. Similarly, results in tables 5.10.2 and 5.10.3 do not support the reformism perspective.

5.4. Summary of Key Findings

The marginal analyses go deeper into the details of productive efficiency and equity effects of inter-school district competition and political institutions. With an increase in the Herfindahl Index measure of inter-school district competition, student's 12th grade math scores are higher in at-large, ward-based, and mixed board school districts than those in appointed board school districts. This finding does not support the Tamed Leviathan Model in Craw (2008) because with an increase in competition more professional political institutions such as the appointed school district board did not turn out to be productively more efficient. With an increase in inter-school district competition students' 10th grade reading scores however, are higher in fiscally dependent school districts than those in fiscally independent school districts in models that use either type of inter-school district competition. This finding implies that productive efficiency of inter-school district competition is higher in fiscally dependent school districts than in independent school districts. This finding supports the Tamed Leviathan model in Craw (2008). However, there are no productive efficiency effects of different types of political institutions in different school districts with different levels of inter-school district competition.

Students' 10th grade reading scores are lower in the top income quintile school district than those in the third income quintile as the competition increases in the model that uses student enrollment weighted count measure of inter-school district competition and the type of school district board. Students' 10th grade reading scores are higher in the third income quintile school districts than those in the lowest income quintile school districts as the inter-school district competition increases in the model that uses student enrollment weighted count measure of inter-school district competition and the type of school district superintendent. Similar model for students' 12th grade reading scores shows that they are higher in the fourth income quintile school districts than those in the second income quintile school districts as the inter-school district competition increases. Students' 12th grade math scores in the top and the fourth income quintile school districts are higher than those in the lowest income quintile school districts as the inter-school district competition increases in the model that uses the Herfindahl Index measure of inter-school district competition and the type of school district superintendent. Students' 10th grade reading scores are higher in the third income quintile school districts than those in the lowest income quintile school districts as the inter-school district competition increases in the model that uses student enrollment weighted count measure of inter-school district competition and the type of school district fiscal autonomy. Similar model for students' 12th grade reading scores shows that they are higher in the fourth income quintile school districts than those in the second income quintile school districts as the inter-school district competition increases. These results show that with an increase in competition inequity in student achieve widens between students in higher income quintile school districts and those in lower income quintile school districts. These findings support the equity argument in the consolidated local government model.

The marginal analyses of equity effects of different types of political institutions show that there are equity implications of different types of political institution on students' reading and math scores. Students' 10th grade reading scores are generally higher in comparatively higher income quintile school districts than those in comparatively lower income quintile school districts. These results suggest that school districts with at-large boards are the most inequitable, followed by those with the ward-based boards, those with the mixed boards and those with the appointed boards in that order. Similarly, fiscally independent school districts are more inequitable than fiscally dependent school districts. And school districts with elected superintendents are less inequitable than school districts with appointed superintendents. Overall, these findings support the argument that professional managers are better able to manage cooperation with other school districts in providing public education than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation. Within income quintile group comparison shows that the reformism model is not supported. These findings collectively suggest that differences in types of political institutions and differences in income levels of school districts matter in equitable distribution of student achievements across school districts in the US.

Overall, the findings robustly support the equity effects of the type of local political institutions and inter-school district competition. The additive models, the interactive models, and the marginal analyses support the productive efficiency arguments in the Tamed Leviathan Model, the equity argument under the consolidated local government model but reject the reformism hypothesis to some extent. Results from Hausman-Taylor regression refute consolidated local governments models because increased inter-school district competition does lead to equitable educational outcomes. However, results from multilevel linear regression model show that competition leads to inequity in student achievement and therefore the consolidated local government model is supported. There is mixed support for the Tamed Leviathan Model. Findings support productive efficiency argument in the Tamed Leviathan Model in one case, but negates in another. So, there is some support for the productive efficiency effects of competition. However, there is no support for the productive efficiency effects of political institutions. Overall, the findings support the equity effects of the type of local political institutions with few exceptions. School districts with relatively more professional political institutions are also relatively less inequitable.

CHAPTER 6: CONCLUSIONS, POLICY IMPLICATIONS AND LIMITATIONS

This dissertation studies interrelated questions concerning the policy implications of equity in provisioning and equity and productive efficiency in educational outcomes in K-12 public education by filling several gaps in the relevant theoretical and empirical literature. In addressing these gaps, this dissertation focuses on the role of school district-level locational factors including inter-school district competition and the type of political institutions in school district spending and student achievement. In order to study these relationships, this dissertation combines and extends the extant theoretical traditions in a novel way. This synthesis of the extant literature on efficiency and equity implications of inter-school district competition provides a conceptual model that entails empirical estimation of the interactive effects of political institutions with inter-school district competition on provisioning and efficiency of public education. Provisioning and efficiency of public education have not been studied along this line before.

There is limited research on the role of school choice, defined as inter-school district competition, on unequal school district spending and productive efficiencies and equity in educational outcomes. The broader view in the literature on school choice is that market-like competition for students would nudge public schools toward productive efficiency in resource use and better educational outcomes (Belfield and Levin, 2005b; Chubb and Moe, 1990; Gill and Booker, 2008; Godwin and Kemerer, 2002). Critics of school choice find such policies inequitable and inefficient. The few studies on the effects of inter-school district competition on both student achievement and school district spending offer inconclusive empirical evidence (Hoxby, 2000; Rothstein, 2007). Therefore, an empirical investigation of the role of school choice defined as inter-school district competition is important and has policy relevance.

Similarly, an investigation of the role of political institutions in spending and student learning is important because existing studies ignore the role of political institutions in the equity of school district spending and in the productive efficiency of educational outcomes. Political institutions are important to consider while investigating equity in spending and equity and productive efficiency in student learning because the local political institutions influence efficiencies in local taxation and spending (Craw, 2008; Feiock, Jeong, and Kim, 2003). As local residents' political representatives, political institutions also match citizen demand with school district spending (Berkman and Plutzer, 2005).

The questions about inequity in provisioning have received significant policy attention during past several decades. Since the landmark decision in Serrano v. Priest in 1971 in California and the famous US Supreme Court's judgment in *Rodriguez v. San Antonio* in 1973, there has been a great deal of activism on the part of the judiciary, states and civil society actors in attaining the goal of equitable provisioning of public education among school districts in the US. The funding of public schools is a very important issue because it consumes a major portion of resources of the state and school districts in the US. In spite of several decades of effort at addressing inequity in education financing, the problem still persists. From the public policy perspective, therefore, it is very important to list out the factors that explain this inequity in provisioning. The findings on the interactive effects of inter-school district competition and political institution on spending levels inform the policymakers in regard to bringing appropriate institutional and political changes for more equitable and better outcomes. Furthermore, since public education is a de facto public good, the political institutions of the local school districts and state governments should be made aware of the most appropriate ways of translating public preferences into spending levels. In such an endeavor, spending behavior of different types of political institutions of local governments plays important role. This dissertation attempts to disentangle the most important factors that explain inequitable provisioning in the school districts across the US. This goal is achieved by examining the roles of political institutions and inter-school district competition on differential spending by school districts in different within-state income quintiles in the US after controlling for a number of other relevant factors.

Specifically, the interactive effects of political institutions and inter-school district competition in a MA on school district's spending are examined in general and equity in school district's spending in particular. The equity effects of political institutions and inter-school district competition on school district spending are examined by separately testing their interactions with school districts' within-state median household income rankings. The empirical investigation of these interactive hypotheses are situated within the purview of the Extended Tamed Leviathan model that integrates several topical theories, including the public choice, the Leviathan, the consolidated local governments, the reformism, the Tamed Leviathan, and the policy responsiveness models.

The Extended Tamed Leviathan model accomplishes this integration by formulating hypotheses in opposite direction to the key arguments in the Tamed Leviathan and the consolidated local governments models because the two models predict opposing effects of inter-local competition / decentralization on local government spending. The theoretical argument in the Extended Tamed Leviathan model is that the consolidation of government between suburban regions and inner-cities provides economies of scale. Such local governments can also efficiently and equitably manage spillovers from inter-dependent localities. However, some forms of political institutions may cater to narrower constituency needs and hence may spend higher dollars even when there is less decentralization. Conversely, the Tamed Leviathan model argues that with fewer options to relocate to other local jurisdictions, the residents can be taxed at higher rates for a given level of public good. However, some forms of political institutions can objectively take broader constituency perspective and spend fewer dollars even when there is less decentralization.

Prior studies have not considered these interactive effects in the contexts of school district spending in the US and the Extended Tamed Leviathan model. For examining these hypotheses, a unique longitudinal dataset has been constructed by combining relevant datasets from several sources. Fixed effects and instrumental variable fixed effects regression models are employed to handle the endogeneity problem in most econometric studies (Cameron and Trivedi, 2009) and several policy evaluation studies that utilize non-experimental data (see for example, Harris et al., 2001; Bettinger, 2005).

This dissertation also utilizes the Extended Tamed Leviathan model to evaluate the interactive effects of political institutions and inter-school district competition on student achievement. This investigation makes theoretical and empirical contributions to the literatures on productive efficiency of school choice in general and school choice option in the form of inter-school district competition in particular. School choice in terms of home schooling, private schools, and residential choice has always existed. Some scholars favor residential choice, while others find it inequitable and inefficient in public education. School choice reform creates market-type schools so that parents have more choice and schools have autonomy. Several scholars propose that through program design, school choice programs can protect inner-city students from disadvantages on account of ethnicity and SES. Critics of school choice find such policies inequitable and inefficient. In recent decades, more market-like schools in the form of charter schools, vouchers, and magnet schools have come up. However, there is no conclusive evidence of the positive effects of such reform policies on educational outcomes. In fact, empirical evidence suggests that these policies have led to resegregation. Also, the theoretical and empirical literatures have not conclusively established the supremacy of school choice policies over the traditional public education system. This dissertation looks at this debate afresh in the context of the school choice in the form inter-school district competition. Specifically, the empirical estimation evaluates the interactive effects of political institutions with inter-school district competition on productive efficiency and equity in student achievement.

This dissertation offers several interesting findings. In regard to school district spending the results show that inter-school district competition does not robustly affect school district spending. Results also show that local political institutions do not conclusively affect the level of school district spending. School districts with ward based and mixed boards spend more than those with appointed boards as the level of inter-school district competition increases. These results are consistent with the reformism and the Tamed Leviathan models. However, results show that the type of school district board with seemingly less incentive for inflating public budgets to win votes and allies such as the at-large district boards actually spend more than ward-based school district boards that arguably have more incentive to spend. These findings provides some evidence against the reformism perspective. Results also show that school districts that are either an arm of other local governments or fully dependent on state governments reap the benefits from economies of scale and hence spend lower amounts than fiscally independent school districts. This finding supports the consolidated local government model. Additionally, the Tamed Leviathan hypothesis is supported because accountability to parent local government restricts the ability of fiscally dependent districts from inflating budgets for rent-seeking.

The absence for evidence for interaction between inter-school district competition and median household income rankings implies that inter-school district competition does not lead to inequity in spending by school districts in different income quintiles. This result is not surprising because there is not enough support for the general overall effects of inter-school district competition in both additive and interactive models. This finding does not support the relevant hypothesis in the consolidated local governments model. This absence of equity implications may be due to the fact that court-ordered school finance reform has resulted in relatively higher spending in lower income school districts in comparison to upper income school districts (Harris et al., 2001; Murray et al., 1998).

In respect of equity effects of different types of political institutions on school district spending, results show that with few exceptions school districts with appointed boards are more equitable in spending than their counterparts in similar income quintile groups. Similarly results show that the extent of inequity in spending is more pronounced for school districts with elected superintendents. School districts with professional officials are more equitable perhaps because they are better able to manage cooperation with other school districts in providing public education. Frederickson (1999) and LeRoux, Brendenburger, and Pandey (2010) argue that professional managers are more adept in brokering and maintaining cooperative service arrangements across local government boundaries than elected officials, who have a shorter time horizon and may be averse to the electoral consequences of cooperation. These results partially support the reformism perspective in terms of school district spending.

Overall, the findings in regard to school district spending robustly support the equity effects of the type of local political institutions. School districts with relatively more professional political institutions are also more equitable. The additive models, the interactive models, and the marginal analyses support the reformism model, the extended Tamed Leviathan Model and the consolidated local governments models to some extent. With an increase in competition school districts with relatively more professional political institutions spend less. Dependent school districts reap the benefits from economies of scale and hence spend less than independent school districts. Inter-school district competition does not lead to inequity in spending.

In regard to the equity and productive efficiency effects of inter-school district competition and local political institutions on student achievement the interactive models offer mixed results. The results in the Hausman-Taylor regression model show that inter-school district competition and local political institutions do not have productive efficiency effects on student achievement. Additionally, the Hausman-Taylor regression results show that while the former have equity effects on student achievement the latter do not. In the multilevel models however, inter-school district competition and type of political institutions interact in influencing student achievement. In particular, the interactive multilevel linear regression models show that inter-school district competition has productive efficiency and equity effects on student achievement. Although the political institutions do not have any productive efficiency effects on student achievement in interactive models, they do affect the equity in distribution of student achievement across school districts in various income quintiles.

The multilevel linear interactive regression models find evidence that the inter-school district competition has differential productive efficiency effects on student achievement in school districts with different political institutions. However, the results confirm the hypotheses in the Tamed Leviathan Model in Craw (2008) in one case and negate those hypotheses in others. With an increase in inter-school district competition, student's 10th grade reading scores are higher in fiscally dependent school districts than those in independent school districts. This finding implies that the fiscally dependent school districts are productively more efficient than their independent counterparts. This finding also supports the Tamed Leviathan Model in Craw (2008). With an increase in the Herfindahl Index measure of inter-school district competition, student's 12th grade math scores are higher in at-large, ward-based, and mixed board school districts than those in appointed board school districts. This finding does not support the reformism hypothesis in Craw (2008).

The multilevel linear interactive regression models also suggest that the inter-school district competition and political institutions have differential equity effects on student achievement. In regard to the former, results imply that the increased inter-school district competition leads to inequity in student's 10th grade reading scores and 12th grade reading and math scores. In regard to the latter, results imply that differences in political institutions across school districts lead to inequity in student's 10th and 12th grade reading and math scores. Student's reading and math scores are generally higher in comparatively higher income quintile school districts than those in comparatively lower income quintile school districts.

Overall, the findings robustly support the equity effects of the type of local political institutions and inter-school district competition on student achievement. The additive models, the interactive models, and the marginal analyses support the productive efficiency arguments in the Tamed Leviathan Model, the equity argument under the consolidated local government model but reject the reformism hypothesis to some extent. Results from Hausman-Taylor regression refute consolidated local governments models because increased inter-school district competition does lead to equitable educational outcomes. However, results from multilevel linear regression model show that competition leads to inequity in student achievement and therefore the consolidated local government model is supported. There is mixed support for the Tamed Leviathan Model. Findings support productive efficiency argument in the Tamed Leviathan Model in one case, but negates in another. So, there is some support for the productive efficiency effects of competition on student achievement. However, there is no support for the productive efficiency effects of political institutions on student achievement. Overall, the findings support the equity effects of the type of local political institutions on student achievement with few exceptions. School districts with relatively more professional political institutions are also relatively less inequitable.

An adequate understanding of the regional and local contexts such as the roles of the levels of inter-school district competition and types of local political institutions in equity in school district spending and equity and productive efficiency in educational outcomes helps policymakers adapt policies to those contexts. The empirical findings of this dissertation clarify why and how organizational, socioeconomic, and political contexts matter in bringing desirable educational outcomes. Policymakers can bring commensurate changes in the organizational and political set-up of school districts for achieving the goal of more equitable and effective public education. From a public policy perspective, findings of this dissertation therefore inform the formulation of appropriate policies for better educational outcomes through reorganization of school finance.

The findings of this dissertation suggest that if policymakers intend to address inequity in spending across school districts without raising the level of spending then they might consider having more professional political institutions such as appointed boards in school districts as one of the policy solutions. Additionally, in achieving this policy goal, policymakers needn't worry about the degree of inter-school district competition in metropolitan areas because it neither affects the level of spending nor inequity in spending among school districts.

In regard to the equity and productive efficiency in educational outcomes, the findings are more nuanced. While the Hausman-Taylor regression model that addresses endogeneity in a limited way finds no support for the productive efficiency effects of inter-school district competition and political institutions and equity effects of political institutions, it does find that increased inter-school district competition leads to inequity in educational outcomes. Based on these results, this dissertation would suggest policymakers to formulate policies that lift student achievements in lower income school districts without any negative impact on student achievements in higher income school districts in metropolitan areas where inter-school district competition is high. One such policy may include some reorganization in school finance: for example, consolidating a low income school district with an adjacent high income school district. This policy would abate the level of overall inequity in educational outcomes in metropolitan areas by lowering the level of inter-school district competition and hence its negative effects on equity in student achievements.

Except for the productive efficiency effects of the types of local political institutions, results from the multilevel linear regression models support the productive efficiency effect of inter-school district competition and equity effects of political institutions and inter-school district competition on educational outcomes. The findings in regard to the inter-school district competition pose a dilemma for policymakers. On one hand having higher levels of inter-school district competition in metropolitan areas encourages overall growth in student achievement, but the gaps in students' achievement between the lower and the higher income school districts also register a spike. However, policymakers can mitigate this tradeoff to some extent by generating more professional political institutions as such political institutions reduce inequality in student achievements across school districts with different income levels.

There are however a few data and methodological limitations of this study. The Census Bureau has stopped collecting data on local political institutions in years subsequent to the year 1992 when such data were collected last. The results from the random effects models for the fiscally dependent districts are indicative because the fixed effects models are more appropriate. However, the latter did not identify the coefficient for the fiscally dependent school districts, so the random effects model was used instead.

Apart from the methodological issues, the policy suggestions from this dissertation entail support from important local political constituents with varying political interests in public education including parents with children, old-age population, and inner-city residents. Local school district governments may face a situation in which the old-age population is less supportive of higher spending on public education (Poterba, 1997; Harris et. al., 2001) because they may believe that families with school-age children receive nearly all of the benefits from spending on public schools. However, Harris et. al. (2001) offer a number of reasons why the elderly might support public education. One, the old-age population may expect to receive higher revenue for Social Security and Medicare from taxing higher wages of younger workers. This economic scenario becomes possible because higher investment in public education improves workers' skills and productivity that ultimately result in higher wages. Two, the elderly may simply believe in philanthropy when it comes to public education. Three, elderly homeowners may hold the expectation that higher spending on education will be capitalized into the value of their homes. Four, Tiebout sorting by the elderly could leave education spending unchanged because they may simply choose to live in districts with low education spending. Finally, the elderly may have higher interests in reducing crime rates and increasing economic activities. In achieving these goals the elderly may support public education because public schools socialize children, giving them an understanding of civic duties, social norms, and regular work habits.

Since having more professional political institutions is both good for equity in spending and student achievement, the elderly may support this policy option. Although the elderly may prefer more school districts within their metropolitan area for raising general skills and educational outcomes of younger generation in public schools, they might also prefer to achieve some balance in equity and productive efficiency as having more inter-school district competition leads to inequitable educational outcomes.

Since parents with school-age children have real interest in supporting public education with better educational outcomes, the other important local interest group that influences local educational policy comprises inner-city residents. Unlike the elderly, the inner-city residents do not possess the wherewithal to exercise the Tiebout residential choice. In fact they bear the brunt of several bad policy consequences of Tiebout competition. However, similar to the elderly it is in economic interests of inner-city residents to support policy options for equitable public education spending and educational outcomes.

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APPENDIX: TABLES and FIGURES

Table 4.1: Key Arguments in the Theoretical Models Concerning Efficiency and Equity in Local Government

Models	Policy Outcome / Feature			
	Key Efficiency / Equity Argument	Sources of Inefficiency	Mechanism of Inefficiency	Discussion of Equity
The Public Choice Model	Higher levels of competition between local governments for residents bring efficiency and economy in local service provision. These governments spend less.	Fewer local governments in a region and concentration of residents in fewer of these local governments.	Fewer options for residents to realize their choice for most preferred bundle of taxation and local public goods.	No
The Leviathan Model	The decentralization hypothesis of the Leviathan Model implies that the existence of more decentralized / fragmented local governments in a region constrains them in imposing higher taxation on residents. Such local governments spend less.	Fewer local governments in a region.	Residents have fewer options to relocate to other local jurisdictions and hence they can be taxed at higher rates for a given level of public good.	No
The Consolidation Model	Higher levels of competition between local governments for residents cause sprawl and segregation. These spillovers bring inefficiency and inequity in local service provision. Consolidated local governments that have jurisdictions over inner-city and suburban regions enjoy economies of scale and can internalize spillovers. Therefore, they are more efficient and equitable. Such local governments spend less.	More local governments in a region lead to flight of affluent residents from inner-city to suburbs. Suburban localities prevent low-income and minority population from residing there.	Consolidation of suburban regions with inner-city provides economies of scale. Such local governments can also efficiently and equitably manage spillovers from inter-dependent localities.	Yes
The Reformism Model	If elected officials of a local government exercise less direct control over budgets then that local government would spend less in comparison to a local government where local elected officials has more direct control over budgets.	Type of local governing / political institution and direct control over budgets.	The political institutions that have the incentive to cater to narrow constituency demands will ignore the preferred level of spending on public education by the residents and hence spend more.	No
The Policy Responsivenes s Model	Different types of local political institutions constantly make policy choices differentially from among several, and often competing policy options that match with citizen preferences for desired policy outcomes.	More democratic forms of school boards (e.g., ward-based v. at-large elected school boards) and miscalculation of local needs.	The forms of political institutions that cannot objectively evaluate broader constituency needs (e.g., ward-based v. at-large elected school boards) will poorly translate citizens' demand into policy outcomes.	No
The Tamed Leviathan Model	Higher levels of decentralization / fragmentation of local governments lead to lower spending, but this spending depends on the type of political institution. Higher level of decentralization restricts the capacity of elected officials with more direct control over budgets from spending more than elected officials with less direct control over budgets.	Fewer local governments in a region, the type of local political institution and direct control over budgets.	Residents have fewer options to relocate to other local jurisdictions and hence they can be taxed at higher rates for a given level of public good. However, some forms of political institutions can objectively take broader constituency perspective and spend lower dollars even when there is less decentralization.	No
The Extended Tamed Leviathan Model (ETL)	The ETL integrates the Consolidation model in formulating hypotheses in opposite direction to the key arguments in the Tamed Leviathan Model above. This is so	Levels of competition between local governments and the type of local	The mechanism in the Tamed Leviathan Model also applies here. Consolidation of suburban regions with inner-city provides economies of scale. Such local	Yes

Table 4.1 (continued)

because the Leviathan and the Consolidation models above predict opposing effects of inter-local competition / decentralization on local government spending.	political institution	governments can also efficiently and equitably manage spillovers from inter-dependent localities. However, some forms of political institutions may cater to narrower constituency needs and hence may spend higher dollars even when there is less decentralization.

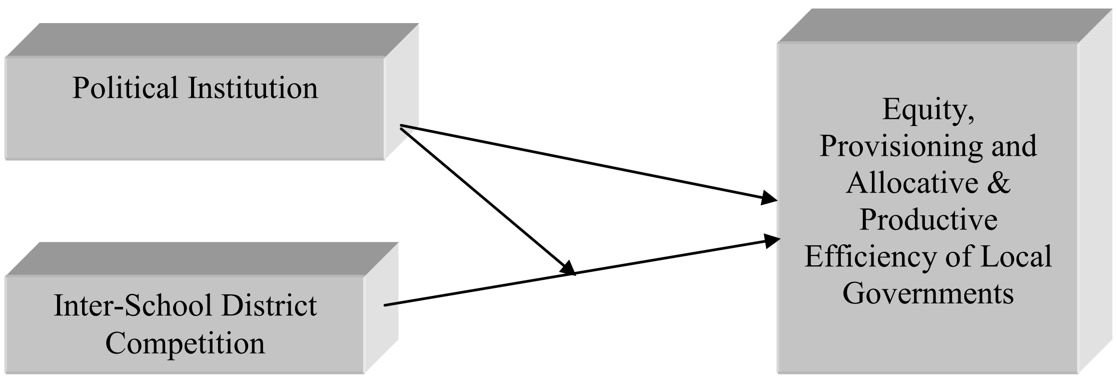

Figure 4.1: The Extended Tamed Leviathan Model

Table 4.2: Descriptive Statistics: Year-wise Means and Standard Deviations of the Study Variables

	Mean						Std. Dev.					
Variables / Years	1990	1991	1992	1993	1994	1995	1990	1991	1992	1993	1994	1995
Per Pupil Total Expenditure	5314.244	5607.904	5742.480	6022.332	6221.938	6452.584	1554.057	1670.829	1692.010	1751.245	1790.705	1823.180
Herfindahl Index of School District Competition	0.762	0.762	0.762	0.762	0.763	0.764	0.237	0.238	0.239	0.240	0.240	0.240
Number of School District Per 1000 Students in Metro Areas	0.159	0.155	0.152	0.149	0.146	0.144	0.126	0.124	0.122	0.120	0.119	0.117
10 Year Lag: Herfindahl Index of School District Competition	0.760	0.761	0.758	0.758	0.757	0.757	0.236	0.237	0.238	0.238	0.239	0.240
10 Year Lag: Number of School District Per 1000 Students in Metro Areas	0.191	0.200	0.207	0.205	0.205	0.204	0.150	0.157	0.169	0.168	0.167	0.167
Appointed School Board	0.113	0.112	0.112	0.098	0.098	0.098	0.317	0.316	0.315	0.298	0.298	0.297
Elected at-Large School Board	0.700	0.702	0.703	0.550	0.551	0.552	0.458	0.458	0.457	0.498	0.497	0.497
Ward-Based Elected School Board	0.120	0.120	0.119	0.253	0.253	0.252	0.325	0.325	0.324	0.435	0.435	0.434
Mixed School Board	0.067	0.066	0.066	0.099	0.098	0.098	0.250	0.248	0.248	0.298	0.297	0.297
Elected School Superintendent	0.072	0.074	0.075	0.032	0.033	0.033	0.259	0.262	0.263	0.177	0.178	0.179
Fiscally Dependent School District	0.180	0.179	0.178	0.178	0.179	0.179	0.384	0.383	0.383	0.383	0.383	0.383
School District Population	531879	540632	545621	550278	555685	559809	1383380	1396183	1405916	1416783	1428407	1438086
Metropolitan Area Population	2193146	2212752	2239840	2264007	2291228	2317606	2483891	2492284	2510792	2526836	2543717	2559111
Percent School Age (5-17 Years) Children	0.181	0.183	0.184	0.185	0.186	0.187	0.031	0.030	0.029	0.029	0.028	0.028
Percent 25 Years Plus: High School and Above Educated	76.391	76.827	77.290	77.744	78.201	78.663	10.043	9.971	9.900	9.832	9.782	9.747
Percent Foreign Born Population	8.917	9.331	9.711	10.029	10.362	10.708	10.042	10.241	10.415	10.549	10.705	10.880
Percent Non-White Population	21.073	21.724	22.372	22.999	23.596	24.132	18.942	18.866	18.943	19.045	19.155	19.267
Racial Diversity Index	0.336	0.346	0.355	0.364	0.372	0.379	0.146	0.149	0.149	0.149	0.150	0.150
Median Household Income	33009.050	34337.620	35681.110	37012.270	38370.820	39764.670	10370.780	10744.230	11136.450	11549.600	11992.370	12467.070
Percent Owner Occupied Housing	63.525	63.686	63.846	64.042	64.242	64.471	14.683	14.658	14.643	14.630	14.635	14.645
Median House Value	105225.100	108456.400	111867.500	115028.100	118296.600	121709.800	66753.030	66523.970	66853.110	67314.570	68089.570	69215.570
Percent Local Revenue from Property Taxes	61.613	61.696	64.351	64.341	64.304	63.365	32.003	31.938	32.506	32.506	32.555	32.616
Percent of Population in Poverty	13.735	13.566	13.378	13.192	12.992	12.788	10.714	10.143	9.607	9.097	8.624	8.217
Percent State Public Sector Employees Under Collective Bargaining Agreements	44.532	44.882	44.839	45.343	46.495	45.534	17.903	18.161	17.609	17.154	17.776	18.472
Percent 65 Years-Plus Population	11.523	11.530	11.542	11.552	11.564	11.576	4.192	4.151	4.106	4.068	4.038	4.018
Court Rulings Against State Funding System	0.320	0.323	0.326	0.325	0.325	0.324	0.467	0.468	0.469	0.469	0.468	0.468
Fiscal Capacity: Percent Per Pupil Revenue from Local Sources	47.928	47.751	47.232	46.694	47.697	46.861	20.221	20.499	20.895	19.883	19.195	18.732
Per Pupil State Revenue	2312.525	2432.322	2511.227	2706.312	2701.525	2874.236	968.448	1041.725	1092.515	1087.688	1087.373	1160.475
Percent Non-White in Governing Board	19.623	19.545	19.471	27.466	27.372	27.244	28.972	28.875	28.841	33.891	33.891	33.871

Table 4.3: Effects of Inter-School District Competition and Political Institutions (Type of School District Board) on Log of Per Pupil Spending by School Districts

	Models without Interactions						Models with Interactions			
	Pooled OLS		Fixed Effects		Fixed Effects: IV		Pooled OLS		Fixed Effects	
Variables	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count
School District Competition	0.040	-0.036	0.806**	-0.594	2.100	-1.170	0.312***	0.589***	0.816**	-0.829*
	(0.033)	(0.052)	(0.288)	(0.340)	(4.050)	(77.800)	(0.069)	(0.140)	(0.284)	(0.389)
At-Large District Board	0.080***	0.082***	-0.001	-0.001	0.026	0.038	0.324***	0.170***	0.039	-0.027
	(0.016)	(0.017)	(0.029)	(0.030)	(0.027)	(0.333)	(0.060)	(0.020)	(0.038)	(0.054)
Ward-based District Board	0.074***	0.076***	-0.012	-0.012	0.031	0.043	0.299***	0.152***	0.041	-0.073
	(0.020)	(0.020)	(0.028)	(0.029)	(0.027)	(0.325)	(0.064)	(0.028)	(0.037)	(0.054)
Mixed District Board	0.094***	0.096***	0.000	0.003	0.029	0.040	0.292***	0.175***	0.059	-0.029
	(0.019)	(0.020)	(0.030)	(0.032)	(0.028)	(0.411)	(0.063)	(0.035)	(0.046)	(0.058)
At-Large DB *Competition							-0.311***	-0.708***		0.395
							(0.067)	(0.138)		(0.214)
Ward DB *Competition							-0.275***	-0.625***		0.608**
							(0.071)	(0.152)		(0.220)
Mixed DB *Competition							-0.235**	-0.570***		0.527*
							(0.072)	(0.152)		(0.217)
2nd Qntl							-0.050	-0.115**	0.061	0.066*
							(0.046)	(0.040)	(0.033)	(0.029)
3rd Qntl							0.049	-0.050	0.107*	0.105*
							(0.039)	(0.027)	(0.045)	(0.047)

Table 4.3 (continued)

4th Qntl							0.024	-0.058	0.099*	0.086*
							(0.046)	(0.030)	(0.040)	(0.041)
Top Qntl							-0.006	-0.006	0.018	-0.007
							(0.056)	(0.045)	(0.040)	(0.042)
2nd Qntl *Competition							-0.019			
							(0.044)			
3rd Qntl*Competition							-0.113**			
							(0.040)			
4th Qntl *Competition							-0.090*			
							(0.044)			
Top Qntl *Competition							-0.018			
							(0.052)			
2nd Qntl *At-Large DB							0.007	0.053	-0.045	-0.051
							(0.031)	(0.038)	(0.033)	(0.029)
3rd Qntl *At-Large DB							-0.052*	-0.049*	-0.109*	-0.109*
							(0.024)	(0.022)	(0.046)	(0.049)
4th Qntl *At-Large DB							-0.044	-0.043	-0.112**	-0.102*
							(0.026)	(0.026)	(0.042)	(0.044)
Top Qntl *At-Large DB							-0.052	-0.078*	-0.015	0.004
							(0.031)	(0.035)	(0.040)	(0.044)
2nd Qntl *Ward DB							0.019	0.071	-0.074*	-0.068*
							(0.035)	(0.043)	(0.034)	(0.031)
3rd Qntl *Ward DB							-0.073**	-0.064*	-0.117*	-0.109*
							(0.024)	(0.025)	(0.049)	(0.050)
4th Qntl *Ward DB							-0.046	-0.037	-0.125**	-0.101*
							(0.026)	(0.029)	(0.043)	(0.044)
Top Qntl *Ward DB							-0.059	-0.073	-0.029	0.010
							(0.034)	(0.037)	(0.038)	(0.043)
2nd Qntl *Mixed DB							-0.006	0.033	-0.057	-0.062
							(0.045)	(0.051)	(0.047)	(0.044)
3rd Qntl *Mixed DB							-0.048	-0.041	-0.123*	-0.114
							(0.036)	(0.039)	(0.061)	(0.063)
4th Qntl *Mixed DB							-0.064	-0.060	-0.121*	-0.102
							(0.040)	(0.039)	(0.052)	(0.054)
Top Qntl *Mixed DB							-0.094*	-0.118**	-0.091	-0.062
							(0.043)	(0.044)	(0.056)	(0.058)
Intercept	6.080***	6.040***	5.320**	6.240***	2.550	5.040	5.300***	5.430***	5.340**	6.160***
	(0.438)	(0.453)	(1.670)	(1.660)	(3.240)	(52.100)	(0.467)	(0.477)	(1.630)	(1.570)
R^2 (Within for FE Models)			0.467	0.467	0.415	0.416			0.470	0.472
R^2 (Between)			0.240	0.237	0.173	0.210			0.240	0.260
R^2 (Overall)	0.771	0.771	0.251	0.254	0.177	0.226	0.786	0.784	0.250	0.276
Correlation: time-invariant school district effects and Xb			-0.526	-0.427	-0.768	-0.515			-0.522	-0.373
First-stage F-statistics					182.67***	923.95***				
N	25419	25419	25494	25494	23821	23803	25419	25419	25494	25494

Notes: a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies.

c. The pooled cross-section models additionally control for State dummies, Region and State court rulings against education funding system.

d. Numbers in brackets are standard errors.

Table 4.4: Effects of Inter-School District Competition and Political Institutions (Elected School Superintendent) on Log of Per Pupil Spending by School Districts

	Models without Interactions						Models with Interactions				
	Pooled OLS		Fixed Effects		Fixed Effects: IV		Pooled OLS		Fixed Effects		Fixed Effects: IV
Variables	Herfin-dahl Index	Enrol-ment Weigh-	Herfin-dahl Index	Enrol-ment Weigh-	Herfin-dahl Index	Enrol-ment Weigh-ted	Herfin-dahl Index	Enrol-ment Weighted	Herfin-dahl Index	Enrol-ment Weigh-	Herfin-dahl Index

Table 4.4 (continued)

		ted Count		ted Count		Count		Count		ted Count	
School Dist Competition	0.047	-0.021	0.748**	-0.375	2.090	-0.021	0.089	-0.047	0.763**	-0.386	2.060
	(0.033)	(0.054)	(0.281)	(0.339)	(3.850)	(380.000)	(0.047)	(0.054)	(0.284)	(0.339)	(3.160)
Elected Superintendent	0.028	0.028	0.071**	0.070**	0.060***	0.061	0.038	-0.050	-0.018	-0.015	-0.022
	(0.019)	(0.019)	(0.022)	(0.022)	(0.016)	(1.550)	(0.032)	(0.029)	(0.010)	(0.010)	(0.022)
El_Supdt *Competition							-0.081*				
							(0.038)				
2nd Qntl							-0.100*	-0.075***	0.015	0.016	0.002
							(0.049)	(0.016)	(0.025)	(0.024)	(0.010)
3rd Qntl							0.022	-0.102***	0.006	0.006	-0.010
							(0.038)	(0.018)	(0.027)	(0.027)	(0.018)
4th Qntl							0.004	-0.102***	-0.009	-0.009	-0.019
							(0.045)	(0.022)	(0.031)	(0.031)	(0.021)
Top Qntl							-0.014	-0.077**	-0.006	-0.008	-0.022
							(0.059)	(0.028)	(0.033)	(0.032)	(0.024)
2nd Qntl *Competition							0.042				
							(0.058)				
3rd Qntl *Competition							- 0.153***				
							(0.046)				
4th Qntl *Competition							-0.127*				
							(0.055)				
Top Qntl *Competition							-0.080				
							(0.072)				
2nd Qntl *El_Supdt							0.090**	0.077**	0.074*	0.072**	0.120
							(0.035)	(0.025)	(0.029)	(0.028)	(0.098)
3rd Qntl *El_Supdt							0.023	0.085**	0.071***	0.069***	0.078*
							(0.028)	(0.026)	(0.019)	(0.019)	(0.033)
4th Qntl *El_Supdt							0.054	0.104**	0.100**	0.095**	0.098**
							(0.036)	(0.033)	(0.033)	(0.033)	(0.031)
Top Qntl *El_Supdt							0.014	0.048	0.106***	0.104***	0.100***
							(0.036)	(0.031)	(0.028)	(0.028)	(0.029)
Intercept	6.320***	6.260***	5.590***	6.340***	2.610	4.340	5.740***	5.770***	5.550***	6.310***	2.460
	(0.449)	(0.462)	(1.610)	(1.610)	(3.010)	(3.290)	(0.501)	(0.510)	(1.630)	(1.630)	(2.560)
R^2 (Within: FE Models)			0.471	0.471	0.415	0.419			0.472	0.471	0.416
R^2 (Between)			0.233	0.245	0.172	0.304			0.231	0.242	0.175
R^2 (Overall)	0.769	0.768	0.246	0.264	0.177	0.315	0.779	0.776	0.244	0.261	0.180
Correlation: time-invariant school district effects and Xb			-0.486	-0.353	-0.766	-0.327			-0.496	-0.363	-0.761
First-stage F-statistics					196.03***	1002.09***					148.14***
N	25419	25419	25494	25494	23821	23803	25419	25419	25494	25494	23821

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies.

c. The pooled cross-section models additionally control for State dummies, Region and State court rulings against education funding system.

d. Numbers in brackets are standard errors.

Table 4.5: Effects of Inter-School District Competition and Political Institutions (Dependent School Districts) on Log of Per Pupil Spending by School Districts

	Models without Interactions				Models with Interactions		
	Pooled OLS		Random Effects		Pooled OLS		Random Effects
Variables	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count	Herfindahl Index	Enrollment Weighted Count	Enrollment Weighted Count
School Dist Competition	0.029	-0.053	-0.158	0.031	-0.007	-0.112*	0.053

Table 4.5 (continued)

	(0.032)	(0.052)	(0.086)	(0.085)	(0.051)	(0.050)	(0.085)
Dependent School Districts	-0.157***	-0.163***	-0.140***	-0.140***	-0.357***	-0.348***	-0.043
	(0.042)	(0.042)	(0.034)	(0.035)	(0.059)	(0.046)	(0.046)
DepSchdist*Competition					0.254***	0.992***	-0.460*
					(0.057)	(0.159)	(0.192)
2nd Income Quintile					-0.035		
					(0.040)		
3rd Income Quintile					-0.004		
					(0.036)		
4th Income Quintile					-0.015		
					(0.040)		
Top Income Quintile					-0.048		
					(0.047)		
2nd Qntl*Competition					-0.026		
					(0.050)		
3rd Qntl*Competition					-0.108*		
					(0.045)		
4th Qntl*Competition					-0.086		
					(0.050)		
Top Qntl*Competition					-0.014		
					(0.059)		
Intercept	6.290***	6.290***	4.380***	4.440***	5.933***	6.468***	4.382***
	(0.462)	(0.473)	(0.434)	(0.460)	(0.516)	(0.456)	(0.461)
R^2 (Within: RE Models)			0.397	0.397			0.397
R^2 (Between)			0.631	0.624			0.629
R^2 (Overall)	0.773	0.773	0.594	0.589	0.785	0.778	0.593
N	25419	25419	25494	25494	25419	25419	25494

Notes:
a. ***=p<0.001; **=p<0.01; *=p<0.05.
b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies.
c. The pooled cross-section models additionally control for State dummies, Region and State court rulings against education funding system.
d. Numbers in brackets are standard errors.

Table 4.3.1. Significance of Differences in Marginal Effects of School District Competition Log of Per Pupil Spending Across School Districts Grouped by Political Institutions (Fixed Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Marginal Effects of School District Competition Across School Districts Grouped by Political Institutions [a]	dy/dx Contrast	Bonferroni P-Value
Ward DB - Appointed DB	0.608	0.034
Mixed DB - Appointed DB	0.527	0.090
Ward DB - At-Large DB	0.212	0.000

[a] Marginal Effect of Student Enrollment Weighted Count of School Districts is negative and statistically significant for school districts with appointed boards only (b=-0.830; p=0.033). For other school districts grouped by different types of district boards, the marginal effects of Student Enrollment Weighted Count of School Districts are negative but statistically not significant.

Table 4.3.2. Significance of Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Level of School District Competition (Fixed Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Level of School District Competition	Contrast	Bonferroni P-Values
Ward DB & Low Competition - At-Large DB & Low Competition	-0.041	0.024

Note: Bonferroni P-Values used to avoid Type-I Error (Rejecting the true null hypothesis)

Table 4.3.3. Significance of Differences in Marginal Predictions of Log of Per Pupil Total Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings (Fixed Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Differences in Marginal Predictions of Log of Per Pupil Spending Across	Contrast	Bonferroni

Table 4.3.3 (continued)

School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings		P-Values
Appointed & 2nd Qntl - Appointed & Lowest Qntl	0.224	0.031

Table 4.4.1. Significance of Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings (Fixed Effects Model Using Herfindahl Index in an MSA)

Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings	Contrast	Bonferroni P-Value
Elected Superintendent & Top Quintile - Appointed Superintendent & Top Quintile	0.088	0.062

Table 4.4.2. Significance of Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings (Fixed Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings	Contrast	Bonferroni P-Value
Elected Superintendent & 2nd Quintile - Elected Superintendent & Bottom Quintile	0.220	0.008
Elected Superintendent & Top Quintile - Appointed Superintendent & Top Quintile	0.089	0.046

Table 4.4.3. Significance of Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings (Fixed Effects Instrumental Variable Model Using Herfindahl Index in an MSA)

Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Median Household Income Rankings	Contrast	Bonferroni P-Value
Elected Superintendent & Top Quintile - Elected Superintendent & 4th Quintile	0.153	0.001
Elected Superintendent & Top Quintile - Elected Superintendent & 3rd Quintile	0.263	0.000
Elected Superintendent & Top Quintile - Elected Superintendent & 2nd Quintile	0.311	0.038
Elected Superintendent & Top Quintile - Elected Superintendent & Bottom Quintile	0.542	0.000
Elected Superintendent & 4th Quintile - Elected Superintendent & Bottom Quintile	0.389	0.000
Elected Superintendent & 3rd Quintile - Elected Superintendent & Bottom Quintile	0.280	0.000
Elected Superintendent & 2nd Quintile - Elected Superintendent & Bottom Quintile	0.232	0.096
Appointed Superintendent & Top Quintile - Appointed Superintendent & 4th Quintile	0.154	0.000
Appointed Superintendent & Top Quintile - Appointed Superintendent & 3rd Quintile	0.244	0.000
Appointed Superintendent & Top Quintile - Appointed Superintendent & 2nd Quintile	0.334	0.001
Appointed Superintendent & Top Quintile - Appointed Superintendent & Bottom Quintile	0.446	0.000
Appointed Superintendent & 4th Quintile - Appointed Superintendent & Bottom Quintile	0.291	0.000
Appointed Superintendent & 3rd Quintile - Appointed Superintendent & Bottom Quintile	0.202	0.000
Elected Superintendent & 4th Quintile - Appointed Superintendent & 4th Quintile	0.076	0.051

Table 4.5.1. Significance of Differences in Marginal Effects of School District Competition on Log of Per Pupil Spending Across School Districts Grouped by Political Institutions (Random Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Marginal Effects of School District Competition on Log of Per Pupil Spending Across School Districts Grouped by Political Institutions	dy/dx Contrast	Unadjusted P-Value
Fiscally Dependent School District - Fiscally Independent School District [a]	-0.460	0.017

[a] Student Enrollment Weighted Count of School Districts in an MSA has positive and non-significant effect (b=0.053; p=0.533) for independent school districts. For dependent school districts, Student Enrollment Weighted Count of School Districts in an MSA has negative and significant effect (b=-0.406; p=0.031).

Table 4.5.2. Significance of differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Levels of School District Competition (Random Effects Model Using Student Enrollment Weighted Count of School Districts in an MSA)

Differences in Marginal Predictions of Log of Per Pupil Spending Across School Districts Grouped by Type of Local Political Institutions and Levels of School District Competition	Contrast	Bonferroni P-Value

Table 4.5.2 (continued)		
Dependent SD & Average Competition - Independent SD & Average Competition	-0.111	0.008
Dependent SD & High Competition - Independent SD & High Competition	-0.167	0.000

Table 5.1: Descriptive Statistics by Year - Student Achievement

Variable	1990		1992		Variable	1990		1992	
	Mean	Std. Dev.	Mean	Std. Dev.		Mean	Std. Dev.	Mean	Std. Dev.
Reading Score	49.393	10.123	50.419	10.253	Elected Superintendents	0.132	0.339	0.147	0.354
Math Score	49.383	10.673	50.372	10.511	Fiscally Dependent SDs	0.418	0.493	0.387	0.487
8th Gr. Reading Score	50.464	10.203	51.136	10.078	Lowest Quintile SDs	0.097	0.297	0.091	0.287
8th Gr. Math Score	50.746	10.583	51.259	10.780	2nd Qntl SDs	0.594	0.491	0.589	0.492
White	0.366	0.482	0.379	0.485	3rd Income Quintile SDs	0.126	0.332	0.139	0.346
Black	0.317	0.465	0.312	0.463	4th Income Quintile SDs	0.107	0.309	0.109	0.311
Hispanic	0.183	0.387	0.177	0.382	Top Income Quintile SDs	0.075	0.264	0.073	0.259
Asian	0.117	0.321	0.112	0.315	% Non-white in SBs	18.614	27.140	19.255	27.535
American Indian	0.017	0.128	0.021	0.142	Fiscal Capacity: % Per-Pupil Revenue from Local Sources	41.747	15.513	38.318	17.749
Male	0.502	0.500	1.480	0.500	Per-Pupil State Revenue	2994.90	882.64	3107.40	923.04
Lowest SES Qntl	0.302	0.459	0.283	0.450	Log-Per-Pupil St. Rev.	7.945	0.394	7.980	0.416
2nd SES Quintile	0.224	0.417	0.218	0.413	Log-Total SD Population	14.402	1.603	14.399	1.519
3rd SES Quintile	0.212	0.409	0.216	0.411	Total SD Population	3733810	2926200	3620380	2907050
Top SES Quintile	0.261	0.439	0.283	0.451	Total MSA Population	5843260	3453980	5831160	3508330
% Minority-8th	56.636	35.578	56.597	35.994	Log- MSA Population	15.164	1.219	15.185	1.109
% Free Lunch-8th	33.792	34.076	33.232	34.119	Proportion of 5-17 Years Pop.	0.169	0.020	0.173	0.018
St.-Teacher Ratio:8th	19.886	6.279	19.931	6.098	% with HS or more	70.327	7.481	70.971	7.709
Private School	0.227	0.419	0.258	0.437	% Foreign Born Pop.	24.258	13.315	25.323	13.747
North East	0.360	0.480	0.324	0.468	% Non-white Pop.	40.260	15.393	41.253	15.517
North Central	0.098	0.297	0.094	0.292	Racial Diversity Index: MSA	0.498	0.136	0.515	0.140
South	0.245	0.430	0.256	0.436	Median HH Income	30330.19	5577.95	32435.03	6165.57
West	0.297	0.457	0.325	0.469	Log-Median HH Income	10.306	0.163	10.372	0.164
Herfinhahl Index	0.541	0.308	0.560	0.308	% Owner Occupied Housing	43.671	14.638	44.892	14.658
Weighted Count of SDs	0.063	0.062	0.060	0.061	Median Housing Values	154313.1	66793.7	158964.5	65607.1
Appointed SBs	0.520	0.500	0.483	0.500	% Local Revenue-Property Tax	38.847	35.982	48.218	39.001
At-Large SBs	0.334	0.472	0.364	0.481	% Population in Poverty	17.753	6.586	17.764	6.316
Ward-Based SBs	0.096	0.294	0.100	0.299	% 65 Years & above Pop.	11.611	2.673	11.413	2.610
Mixed SBs	0.050	0.219	0.053	0.225	% Public Sector Employees Under Collective Bargaining	54.461	18.306	53.519	17.109

Table 5.2: Results of the Hausman-Taylor Regression Models - Type of School District Governing Board

Variable	Reading Score						Math Score					
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6
2nd Lowest Qntl	0.369	0.406	5.070	-0.032	0.369	-0.833	0.002	-0.028	-0.786	-0.047	-0.074	0.730
	(0.337)	(0.366)	(3.050)	(0.270)	(0.359)	(1.030)	(0.231)	(0.250)	(1.980)	(0.197)	(0.257)	(0.741)
3rd Qntl	0.455	0.603	4.360	-0.014	0.557	-0.954	-0.072	-0.166	-0.873	-0.187	-0.346	1.320
	(0.420)	(0.451)	(3.310)	(0.350)	(0.434)	(1.210)	(0.291)	(0.312)	(2.160)	(0.256)	(0.311)	(0.876)
4th Qntl	-0.156	-0.124	4.950	-0.601	-0.250	-1.410	-0.143	-0.207	0.849	-0.335	-0.415	1.310
	(0.473)	(0.482)	(3.470)	(0.431)	(0.475)	(1.230)	(0.326)	(0.338)	(2.290)	(0.313)	(0.340)	(0.891)
Top Qntl	0.120	0.193	5.140	-0.406	0.177	-0.842	-0.138	-0.271	-0.161	-0.335	-0.594	1.080
	(0.587)	(0.600)	(3.540)	(0.541)	(0.601)	(1.340)	(0.395)	(0.410)	(2.340)	(0.393)	(0.430)	(0.969)
School District	3.990	4.390	12.400	-0.101	17.100	12.200	0.518	-1.130	0.155	-0.524	4.100	11.000
Competition	(2.160)	(5.410)	(7.050)	(3.190)	(15.00)	(15.70)	(1.540)	(3.800)	(4.740)	(2.300)	(10.700)	(11.200)
At-Large DB	-0.132	1.700	3.540	-0.142	1.150	1.220	-0.296	-0.051	1.240	-0.273	0.837	0.694
	(0.344)	(4.760)	(4.920)	(0.337)	(1.500)	(1.510)	(0.299)	(3.400)	(3.470)	(0.249)	(1.070)	(1.080)
Ward-based	0.165	2.300	6.020	-0.018	4.250*	4.340*	-0.283	-13.400	-9.080	-0.273	-1.780	-1.930

Table 5.2 (continued)

DB	(0.404)	(11.40)	(11.70)	(0.386)	(2.110)	(2.150)	(0.344)	(7.990)	(8.040)	(0.285)	(1.510)	(1.540)
Mixed DB	-0.404	-4.640	-1.820	-0.352	-3.560	-3.670	0.282	4.670	6.990	0.287	1.360	2.460
	(0.420)	(6.830)	(7.310)	(0.411)	(2.950)	(3.060)	(0.369)	(4.940)	(5.180)	(0.305)	(2.120)	(2.210)
At-Large DB		-2.350	-4.990		-17.400	-17.000		-0.030	-2.090		-7.660	-9.040
*Competition		(6.730)	(6.940)		(16.10)	(16.10)		(4.780)	(4.870)		(11.500)	(11.600)
Ward DB		-2.970	-8.410		-42.800	-42.300		19.200	12.700		12.700	12.100
*Competition		(16.70)	(17.20)		(22.30)	(22.70)		(11.700)	(11.800)		(15.900)	(16.300)
Mixed DB		5.870	1.990		7.810	9.610		-6.100	-9.310		-8.420	-16.300
*Competition		(9.470)	(10.10)		(21.50)	(22.20)		(6.850)	(7.160)		(15.300)	(15.900)
2nd Qntl			-5.690			5.460			0.932			-3.580
*Competition			(3.660)			(4.430)			(2.370)			(3.210)
3rd Qntl			-4.590			7.100			0.823			-8.300*
*Competition			(4.030)			(5.490)			(2.620)			(3.970)
4th Qntl			-6.250			5.360			-1.310			-9.030*
*Competition			(4.280)			(5.830)			(2.810)			(4.220)
Top Qntl			-6.070			4.250			0.000			-8.780
*Competition			(4.390)			(7.620)			(2.870)			(5.500)
Intercept	3.870	-5.000	-11.000	0.527	4.490	5.460	15.300	22.600	24.000	5.650	7.170	3.940
	(22.70)	(25.40)	(25.60)	(22.70)	(23.30)	(26.00)	(15.500)	(17.600)	(17.400)	(16.400)	(16.800)	(18.700)
Chi-Square Statistics	12171***	9557***	9035***	12765***	11390***	11483***	19555***	15942***	14312***	29133***	27233***	27409***
sigma_u	7.990	9.810	10.200	7.690	8.390	8.340	7.580	8.640	9.430	5.230	5.570	5.490
sigma_e	4.160	4.160	4.160	4.160	4.160	4.160	2.700	2.700	2.700	2.700	2.700	2.700
Rho	0.787	0.848	0.858	0.774	0.803	0.801	0.887	0.911	0.924	0.789	0.809	0.805
N	17068	17068	17068	17068	17068	17068	17037	17037	17037	17037	17037	17037

Notes:
a. ***=p<0.001; **=p<0.01; *=p<0.05.
b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.
c. Numbers in brackets are standard errors.

Table 5.3: Results of the Multilevel Linear Regression Models, 10th Grade Reading & Math Scores

Variable	10th Grade Reading Scores					10th Grade Math Scores					
	Herfindahl Index			Weighted Count of SDs		Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	M1	M2	M3	M4	M5	M6
School District	-0.157	0.135	1.050	-0.892	-5.215	0.146	-0.834	0.187	0.331	-7.784	-5.550
Competition	(0.439)	(1.418)	(1.020)	(1.070)	(5.016)	(0.442)	(1.541)	(1.150)	(0.881)	(5.518)	(3.800)
At-Large District	-0.316	-1.120	0.934	-0.328	-1.520	-0.186	0.192	0.022	-0.185	-0.496	-0.731
Board	(0.494)	(1.200)	(0.684)	(0.490)	(1.120)	(0.394)	(1.130)	(0.748)	(0.397)	(1.060)	(0.535)
Ward-based District	-0.307	0.183	0.139	-0.324	0.289	-0.142	0.696	-0.467	-0.141	0.418	-0.651
Board	(0.523)	(1.560)	(0.699)	(0.518)	(1.380)	(0.410)	(1.310)	(0.838)	(0.414)	(1.110)	(0.582)
Mixed District	-0.518	-2.070	-2.010	-0.533	-0.291	0.348	-0.379	-0.477	0.351	-0.137	-0.530
Board	(0.548)	(1.740)	(1.150)	(0.548)	(1.120)	(0.412)	(1.400)	(0.941)	(0.415)	(1.210)	(0.692)
2nd Lowest Income	0.098	-0.411	0.299	0.083	-1.150	0.168	-0.228	0.225	0.166	0.107	0.185
Quintile	(0.317)	(1.410)	(0.341)	(0.311)	(0.956)	(0.280)	(1.430)	(0.286)	(0.274)	(0.987)	(0.282)
3rd Income Quintile	-0.006	0.051	0.229	-0.015	-0.266	0.123	0.231	0.200	0.118	0.905	0.163
	(0.422)	(1.370)	(0.448)	(0.418)	(1.040)	(0.319)	(1.620)	(0.326)	(0.312)	(1.240)	(0.320)
4th Income Quintile	-0.417	-0.756	-0.187	-0.434	-1.640	-0.164	-1.240	-0.096	-0.167	-0.627	-0.128
	(0.442)	(1.320)	(0.477)	(0.436)	(1.090)	(0.344)	(1.210)	(0.348)	(0.338)	(0.808)	(0.342)
Top Income	-0.508	-0.163	-0.223	-0.524	-1.670	-0.022	0.796	0.059	-0.028	0.889	0.021
Quintile	(0.615)	(1.930)	(0.662)	(0.607)	(1.710)	(0.447)	(1.290)	(0.450)	(0.438)	(0.977)	(0.445)
At-Large DB		0.038	-1.670		3.230		-0.006	-0.267		6.970	5.750
*Competition		(1.040)	(0.997)		(4.850)		(1.110)	(1.100)		(5.450)	(3.810)
Ward DB		0.056	-0.643		-0.048		0.297	0.438		4.710	5.390
*Competition		(1.150)	(1.110)		(5.090)		(1.350)	(1.220)		(5.780)	(3.990)
Mixed DB		1.510	1.950		-0.269		1.580	1.090		8.570	7.500
*Competition		(1.710)	(1.590)		(5.230)		(1.480)	(1.330)		(5.960)	(4.300)
2nd Quintile		-0.176			2.310		1.020			1.820	
*Competition		(1.360)			(2.230)		(1.220)			(1.840)	
3rd Quintile		0.140			3.560*		1.210			2.790	
*Competition		(1.430)			(1.660)		(1.290)			(1.560)	
4th Quintile		-0.902			0.358		1.090			1.030	
*Competition		(1.310)			(1.850)		(1.300)			(1.610)	
Top Quintile		-1.950			-1.800		0.395			-0.282	
*Competition		(1.410)			(2.380)		(1.290)			(1.920)	

Table 5.3 (continued)

2nd Quintile *At-		0.921			0.983		-0.460			-0.391	
Large DB		(0.993)			(0.983)		(0.969)			(1.090)	
3rd Quintile *At-		0.313			-0.051		-1.090			-1.420	
Large DB		(0.914)			(0.959)		(1.300)			(1.210)	
4th Quintile *At-		1.470			1.510		0.426			0.416	
Large DB		(1.010)			(1.060)		(0.682)			(0.819)	
Top Quintile *At-		1.400			1.600		-1.090			-0.958	
Large DB		(1.650)			(1.620)		(0.818)			(0.913)	
2nd Quintile *Ward		-0.300			-0.323		-0.821			-0.669	
DB		(1.340)			(1.310)		(1.120)			(1.160)	
3rd Quintile *Ward		-1.550			-1.690		-1.590			-1.700	
DB		(1.320)			(1.370)		(1.450)			(1.370)	
4th Quintile *Ward		-0.441			-0.530		-0.881			-0.866	
DB		(1.280)			(1.310)		(0.790)			(0.834)	
Top Quintile *Ward		1.060			1.320		-1.360			-0.995	
DB		(1.890)			(1.850)		(0.986)			(1.010)	
2nd Quintile *Mixed		1.030			0.352		-0.197			-0.168	
DB		(1.480)			(1.280)		(1.180)			(1.240)	
3rd Quintile *Mixed		-1.480			-2.590*		-1.010			-1.570	
DB		(1.190)			(1.180)		(1.430)			(1.340)	
4th Quintile *Mixed		1.300			0.814		-0.229			0.017	
DB		(1.190)			(1.330)		(1.680)			(1.820)	
Top Quintile *Mixed		2.710			2.640		-1.850			-1.480	
DB		(2.030)			(2.020)		(0.987)			(1.060)	
Intercept	16.700	19.900*	20.500*	17.800	20.000*	8.880	10.700	10.500	8.320	8.150	9.340
	(9.420)	(9.650)	(9.620)	(9.530)	(9.070)	(7.820)	(7.540)	(7.790)	(7.530)	(7.390)	(7.720)
Log-MSA Random	-0.256	-0.335*	-0.295*	-0.261	-0.345*	-0.483***	-0.469**	-0.471**	-0.482**	-0.478**	-0.476**
Effects (Std. Dev.)	(0.136)	(0.146)	(0.140)	(0.139)	(0.153)	(0.146)	(0.146)	(0.145)	(0.147)	(0.150)	(0.148)
Log-Residual Random Effects (Std.	1.750***	1.740***	1.750***	1.750***	1.740***	1.530***	1.530***	1.530***	1.530***	1.530***	1.530***
Dev.)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Chi-Square Statistics	29797***	36810***	30706***	29825***	41164***	33099***	43742***	33592***	34540***	45833***	34499***
Loglikelihood	-30707	-30690	-30703	-30707	-30687	-28575	-28566	-28574	-28575	-28563	-28574

Notes:
a. ***=p<0.001; **=p<0.01; *=p<0.05.
b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.
c. Numbers in brackets are standard errors.

Table 5.3.1: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R5 with Weighted Count of School District in Table 5.3)

Sch_Dist Income Quintile & Weighted Count of School District Competition	Contrast	Bonferroni P-Value
Top Quintile Sch_Dist – 3rd Quintile Sch_Dist	-5.366	0.085

Note: All the variables in the model are controlled at their means.

Table 5.3.2: Comparative Marginal Effects of Different Types of School District Boards and School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R5 with Weighted Count of School District in Table 5.3)

Sch_Dist Income Quintile & Type of School District Board	Contrast	Bonferroni P-Value
Top Qntl*Ward_SB - 4th Qntl*Ward_SB	3.480	0.000
Top Qntl*Ward_SB - 3rd Qntl*Ward_SB	4.601	0.000
Top Qntl*Ward_SB - 2nd Qntl*Ward_SB	4.586	0.000
Top Qntl*Ward_SB - Lowest Qntl*Ward_SB	5.510	0.000
Top Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	6.836	0.000
Top Qntl*Mixed_SB - 2nd Qntl*Mixed_SB	5.238	0.054
Top Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	6.851	0.000
4th Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	3.382	0.055
4th Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	3.396	0.001
Top Qntl*At-Large_SB - 4th Qntl*At-Large_SB	1.785	0.000
Top Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	3.128	0.000

Table 5.3.2 (continued)

Top Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	3.492	0.000
Top Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	5.531	0.000
4th Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	1.344	0.000
4th Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	1.707	0.000
4th Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	3.747	0.000
3rd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.403	0.000
2nd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.039	0.000

Note: All the variables in the model are controlled at their means.

Table 5.4: Results of the Multilevel Linear Regression Models, 12th Grade Reading & Math Scores

Variable	12th Grade Reading Score						12th Grade Math Score				
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index		Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M4	M5	M6
School District	-0.793	-1.669	-1.530	-1.820	-1.246	-0.531	0.250	-4.727**	1.790	-4.602	-2.890
Competition	(0.537)	(1.438)	(0.805)	(1.650)	(5.135)	(4.520)	(0.593)	(1.573)	(1.270)	(7.806)	(7.310)
At-Large District Board	-0.561	-1.260	-1.330	-0.549	-0.284	-0.442	-0.338	-2.360	-0.325	-0.436	-0.370
	(0.430)	(1.150)	(1.110)	(0.431)	(1.130)	(1.120)	(0.438)	(1.230)	(0.441)	(1.530)	(1.490)
Ward-based District	-0.210	1.340	1.170	-0.200	1.230	1.170	-0.179	-1.020	-0.157	0.414	0.342
Board	(0.417)	(1.320)	(1.300)	(0.419)	(1.120)	(1.130)	(0.454)	(1.520)	(0.453)	(1.650)	(1.710)
Mixed District Board	-0.893	-2.260	-2.500	-0.875	-0.093	-0.206	-0.038	-1.030	-0.047	-0.968	-1.020
	(0.516)	(1.690)	(1.670)	(0.516)	(1.430)	(1.430)	(0.478)	(1.530)	(0.479)	(1.550)	(1.510)
2nd Lowest Income	0.141	0.110	0.146	0.164	0.450	0.477	-0.171	-2.440	-0.151	0.403	0.477
Quintile	(0.390)	(1.510)	(0.929)	(0.384)	(1.050)	(1.010)	(0.342)	(1.450)	(0.340)	(1.360)	(1.290)
3rd Income Quintile	-0.148	0.758	1.230	-0.102	1.010	1.220	-0.216	-1.460	-0.213	0.955	1.250
	(0.470)	(1.610)	(1.130)	(0.464)	(1.120)	(1.110)	(0.439)	(1.630)	(0.432)	(1.530)	(1.430)
4th Income Quintile	-0.281	-1.970	-1.790	-0.251	-1.970	-1.630	-0.663	-4.170**	-0.634	-2.310	-2.190
	(0.491)	(1.440)	(1.050)	(0.486)	(1.020)	(1.030)	(0.535)	(1.480)	(0.529)	(1.250)	(1.210)
Top Income Quintile	0.202	-0.483	-0.514	0.241	-0.626	-0.543	-0.293	-2.530	-0.278	-0.153	-0.133
	(0.613)	(1.710)	(1.230)	(0.609)	(1.220)	(1.240)	(0.621)	(1.420)	(0.617)	(1.340)	(1.260)
At-Large DB		0.592	0.655		-2.300	-2.000		2.680*		5.220	4.070
*Competition		(1.000)	(0.793)		(4.530)	(4.280)		(1.240)		(7.440)	(7.130)
Ward DB *Competition		0.659	0.804		3.410	4.040		2.940*		7.950	7.770
		(1.100)	(1.040)		(4.550)	(4.450)		(1.330)		(7.560)	(7.370)
Mixed DB		1.610	1.870		-3.650	-3.370		1.590		8.120	7.590
*Competition		(1.600)	(1.530)		(5.500)	(5.080)		(1.540)		(7.840)	(7.390)
2nd Quintile		-0.001			-1.730			2.780*		-0.239	
*Competition		(1.580)			(2.870)			(1.250)		(2.470)	
3rd Quintile		0.653			2.570			3.200*		2.870	
*Competition		(1.590)			(2.660)			(1.330)		(2.500)	
4th Quintile		0.269			4.380			2.050		0.968	
*Competition		(1.360)			(2.800)			(1.500)		(2.700)	
Top Quintile		0.001			0.408			2.910*		-1.120	
*Competition		(1.820)			(3.410)			(1.450)		(2.890)	
2nd Quintile *At-Large		0.125	0.091		0.242	-0.214		-0.229		-0.734	-0.863
DB		(0.959)	(0.955)		(1.030)	(1.040)		(1.130)		(1.350)	(1.350)
3rd Quintile *At-Large		-1.210	-1.160		-1.470	-1.150		-1.360		-1.770	-1.460
DB		(1.090)	(1.110)		(1.150)	(1.110)		(1.300)		(1.500)	(1.440)
4th Quintile *At-Large		1.650	1.670		1.110	1.510		1.990		1.550	1.640
DB		(1.090)	(1.100)		(1.120)	(1.100)		(1.130)		(1.360)	(1.300)
Top Quintile *At-Large		0.854	0.863		0.821	0.866		-0.173		-0.174	-0.282
DB		(1.180)	(1.180)		(1.270)	(1.230)		(1.090)		(1.240)	(1.220)
2nd Quintile *Ward DB		-2.730*	-2.680*		-2.500*	-2.680*		-0.812		-1.120	-1.090
		(1.120)	(1.130)		(1.140)	(1.180)		(1.340)		(1.550)	(1.590)
3rd Quintile *Ward DB		-3.940**	-3.890**		-3.910**	-3.760**		-2.900		-3.190	-2.990
		(1.210)	(1.220)		(1.200)	(1.220)		(1.560)		(1.730)	(1.790)
4th Quintile *Ward		-0.481	-0.424		-0.296	-0.186		0.066		0.085	0.212
DB		(1.130)	(1.120)		(1.100)	(1.130)		(1.270)		(1.440)	(1.510)
Top Quintile *Ward		-0.878	-0.838		-0.695	-0.796		-1.370		-1.020	-1.180
DB		(1.180)	(1.160)		(1.290)	(1.280)		(1.320)		(1.500)	(1.580)
2nd Quintile *Mixed		0.975	1.040		0.075	0.014		-0.399		-0.352	-0.304
DB		(1.780)	(1.790)		(1.710)	(1.740)		(1.470)		(1.630)	(1.640)
3rd Quintile *Mixed		-2.330	-2.330		-3.140*	-2.910*		-2.230		-2.020	-1.820
DB		(1.520)	(1.540)		(1.470)	(1.430)		(1.470)		(1.610)	(1.550)
4th Quintile *Mixed		2.980	3.010		2.180	2.590		3.060*		3.120*	3.230*
DB		(1.780)	(1.780)		(1.870)	(1.820)		(1.410)		(1.500)	(1.460)
Top Quintile *Mixed		-0.036	-0.027		-0.209	-0.193		-0.665		-0.151	-0.305
DB		(1.460)	(1.440)		(1.510)	(1.460)		(1.520)		(1.560)	(1.540)
Intercept	13.800	16.900	16.900	17.300	17.300	17.500	10.000	15.600	7.800	4.700	6.630
	(12.300)	(13.400)	(12.200)	(12.500)	(12.600)	(12.200)	(11.300)	(11.300)	(10.900)	(11.300)	(10.800)
Log-MSA Random	-0.161	-0.155	-0.161	-0.153	-0.195	-0.182	-0.254	-0.273	-0.257	-0.294	-0.262
Effects (Std. Dev.)	(0.209)	(0.206)	(0.205)	(0.207)	(0.217)	(0.213)	(0.168)	(0.179)	(0.166)	(0.173)	(0.164)
Log-Residual Random	1.850***	1.850***	1.850***	1.850***	1.850***	1.850***	1.620***	1.620***	1.620***	1.620***	1.620***
Effects (Std. Dev.)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)

Table 5.4 (continued)

Chi-Square Statistics	17597***	23743***	21780***	18050***	21526***	20926***	29687***	44199***	30432***	43406***	40587***
Loglikelihood	-24211	-24200	-24201	-24211	-24194	-24198	-22482	-22465	-22481	-22464	-22467

Notes:
a. ***=p<0.001; **=p<0.01; *=p<0.05.
b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.
c. Numbers in brackets are standard errors.

Table 5.4.1: Comparative Marginal Effects of Different Types of School District Boards and School Districts with Different Income Levels on Student's 12th Grade Reading Score (the Model R3 with Herfindahl Index in Table 5.4)

Sch_Dist Income Quintile & Type of School District Board	Contrast	Bonferroni P-Value
Top Qntl*Ward_SB - 4th Qntl*Ward_SB	2.836	0.000
Top Qntl*Ward_SB - 3rd Qntl*Ward_SB	4.392	0.000
Top Qntl*Ward_SB - 2nd Qntl*Ward_SB	4.939	0.000
Top Qntl*Ward_SB - Lowest Qntl*Ward_SB	3.983	0.000
4th Qntl*Ward_SB - 2nd Qntl*Ward_SB	2.103	0.010
Top Qntl*At-Large_SB - 4th Qntl*At-Large_SB	2.433	0.000
Top Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	3.348	0.000
Top Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	3.848	0.000
Top Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	5.683	0.000
4th Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	1.416	0.032
4th Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	3.250	0.000
3rd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.335	0.000
2nd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	1.834	0.001
Top Qntl*App_SB - 2nd Qntl*App_SB	2.975	0.003
Top Qntl*App_DB - Lowest Qntl*App_SB	4.816	0.001
Top Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	4.799	0.001
Lowest Qntl*App_SB - Lowest Qntl*At-Large_SB	2.625	0.000
Lowest Qntl*Ward_SB - Lowest Qntl*At-Large_SB	2.621	0.000

Note: All the variables in the model are controlled at their means.

Table 5.4.2: Comparative Marginal Effects of Different Types of School District Boards and School Districts with Different Income Levels on Student's 12th Grade Reading Score (the Model R6 with Weighted Count of School District in Table 5.4)

Sch_Dist Income Quintile & Type of School District Board	Contrast	Bonferroni P-Value
Top Qntl*Ward_SB - 4th Qntl*Ward_SB	2.550	0.000
Top Qntl*Ward_SB - 3rd Qntl*Ward_SB	4.148	0.000
Top Qntl*Ward_SB - 2nd Qntl*Ward_SB	4.412	0.000
Top Qntl*Ward_SB - Lowest Qntl*Ward_SB	3.582	0.000
4th Qntl*Ward_SB - 2nd Qntl*Ward_SB	1.862	0.039
Top Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	4.107	0.006
Top Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	4.711	0.000
Top Qntl*At-Large_SB - 4th Qntl*At-Large_SB	2.395	0.000
Top Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	3.365	0.000
Top Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	3.844	0.000
Top Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	5.673	0.000
4th Qntl*At-Large_SB – 3rd Qntl*At-Large_SB	0.969	0.075
4th Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	1.449	0.019
4th Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	3.278	0.000
3rd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.308	0.000
2nd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	1.829	0.001
Top Qntl*App_SB - 2nd Qntl*App_SB	2.686	0.082
Top Qntl*App_DB - Lowest Qntl*App_SB	4.665	0.003
3rd Qntl*Mixed_SB - 3rd Qntl*App_SB	-3.700	0.010
Lowest Qntl*Ward_SB - Lowest Qntl*At-Large_SB	2.914	0.006

Note: All the variables in the model are controlled at their means.

Table 5.4.3: Comparative Marginal Effects of Different Types of School District Boards and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M2 with Herfindahl Index in Table 5.4)

Sch_Dist Income Quintile & Type of School District Board	Contrast	Bonferroni P-Value
Top Qntl*Ward_SB - 4th Qntl*Ward_SB	3.904	0.000
Top Qntl*Ward_SB - 3rd Qntl*Ward_SB	4.619	0.000
Top Qntl*Ward_SB - 2nd Qntl*Ward_SB	4.728	0.000
Top Qntl*Ward_SB - Lowest Qntl*Ward_SB	6.430	0.000
Top Qntl*App_SB - 4th Qntl*App_SB	5.117	0.000
Top Qntl*App_SB – 3rd Qntl*App_SB	2.753	0.057
Top Qntl*App_SB - 2nd Qntl*App_SB	4.830	0.000
Top Qntl*App_SB - Lowest Qntl*App_SB	6.375	0.000
3rd Qntl*App_SB - Lowest Qntl*App_SB	5.033	0.027
Top Qntl*At-Large_SB - 4th Qntl*At-Large_SB	3.164	0.000
Top Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	4.241	0.000
Top Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	5.305	0.000
Top Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	7.628	0.000
4th Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	2.141	0.000
4th Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	4.464	0.000
3rd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	3.387	0.000
2nd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.323	0.000
Top Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	4.504	0.000
Top Qntl*Mixed_SB - 2nd Qntl*Mixed_SB	4.813	0.004
Top Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	7.130	0.000
4th Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	2.994	0.085
4th Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	5.620	0.000
3rd Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	2.626	0.000
4th Qntl*Mixed_SB - 4th Qntl*App_SB	3.234	0.039
4th Qntl*At-Large_SB - 4th Qntl*App_SB	1.650	0.052

Note: All the variables in the model are controlled at their means.

Table 5.4.4: Comparative Marginal Effects of Different Types of School District Boards and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M6 with Weighted Count of School District in Table 5.4)

Sch_Dist Income Quintile & Type of School District Board	Contrast	Bonferroni P-Value
Top Qntl*Ward_SB - 4th Qntl*Ward_SB	3.758	0.000
Top Qntl*Ward_SB - 3rd Qntl*Ward_SB	4.648	0.000
Top Qntl*Ward_SB - 2nd Qntl*Ward_SB	4.392	0.000
Top Qntl*Ward_SB - Lowest Qntl*Ward_SB	6.438	0.000
Top Qntl*Mixed_SB - 3rd Qntl*Mixed_SB	4.348	0.000
Top Qntl*Mixed_SB – 2nd Qntl*Mixed_SB	4.481	0.014
Top Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	7.321	0.000
4th Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	5.711	0.000
3rd Qntl*Mixed_SB - Lowest Qntl*Mixed_SB	2.973	0.000
Top Qntl*At-Large_SB - 4th Qntl*At-Large_SB	3.147	0.000
Top Qntl*At-Large_SB - 3rd Qntl*At-Large_SB	4.109	0.000
Top Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	5.199	0.000
Top Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	7.594	0.000
4th Qntl*At-Large_SB - 2nd Qntl*At-Large_SB	2.052	0.000
4th Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	4.447	0.000
3rd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	3.486	0.000
2nd Qntl*At-Large_SB - Lowest Qntl*At-Large_SB	2.395	0.000
Top Qntl*App_SB - 4th Qntl*App_SB	4.990	0.000
Top Qntl*App_SB – 3rdQntl*App_SB	3.049	0.034
Top Qntl*App_SB - 2nd Qntl*App_SB	4.774	0.000
Top Qntl*App_DB - Lowest Qntl*App_SB	8.164	0.000
3rd Qntl*App_SB - Lowest Qntl*App_SB	5.116	0.036
4th Qntl*Mixed_SB - 4th Qntl*App_SB	3.158	0.051

Note: All the variables in the model are controlled at their means.

Table 5.5: Results of the Hausman-Taylor Regression Models - Elected / Appointed Superintendent

Variable	Reading Score						Math Score					
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6
2nd Income	0.341	0.154	4.290	-0.025	-0.035	-1.010	-0.062	-0.048	-0.795	-0.106	-0.097	0.631
Quintile	(0.338)	(0.340)	(2.990)	(0.267)	(0.269)	(1.030)	(0.232)	(0.233)	(1.950)	(0.195)	(0.195)	(0.749)
3rd Income	0.323	0.316	3.990	-0.012	-0.012	-1.010	-0.184	-0.188	-0.229	-0.284	-0.280	1.280
Quintile	(0.391)	(0.393)	(3.250)	(0.343)	(0.344)	(1.240)	(0.277)	(0.279)	(2.140)	(0.250)	(0.250)	(0.906)
4th Income	-0.323	-0.374	4.950	-0.607	-0.607	-1.110	-0.286	-0.268	1.170	-0.466	-0.470	1.040
Quintile	(0.438)	(0.440)	(3.520)	(0.420)	(0.420)	(1.270)	(0.310)	(0.313)	(2.330)	(0.305)	(0.306)	(0.925)
Top Income	-0.085	-0.040	5.220	-0.420	-0.411	-0.506	-0.292	-0.318	0.152	-0.477	-0.486	0.831
Quintile	(0.549)	(0.546)	(3.590)	(0.529)	(0.529)	(1.380)	(0.379)	(0.378)	(2.380)	(0.385)	(0.385)	(1.000)
School Dist	3.580	2.460	7.720	-0.896	-1.070	-3.590	0.284	0.601	-0.438	-0.675	-0.443	3.410
Competition	(2.310)	(2.450)	(4.490)	(3.180)	(3.200)	(4.850)	(1.640)	(1.750)	(3.000)	(2.290)	(2.320)	(3.530)
Elected	1.250	-3.140	-3.760	0.079	-0.242	-0.275	0.593	3.860	2.070	0.493	0.887	0.448
Superintendent	(0.811)	(3.860)	(4.240)	(0.439)	(0.899)	(0.958)	(0.602)	(2.660)	(2.890)	(0.322)	(0.653)	(0.697)
El_Supdt		8.910	9.570		6.420	7.310		-7.110	-4.520		-7.860	-3.910
*Competition		(7.830)	(8.230)		(15.700)	(16.100)		(5.380)	(5.600)		(11.400)	(11.700)
2nd Quintile			-5.060			4.520			0.903			-2.820
*Competition			(3.610)			(4.480)			(2.350)			(3.280)
3rd Quintile			-4.500			4.430			-0.001			-7.220
*Competition			(4.000)			(5.520)			(2.610)			(4.030)
4th Quintile			-6.620			1.750			-1.800			-7.370
*Competition			(4.350)			(5.830)			(2.870)			(4.250)
Top Quintile			-6.550			-1.740			-0.485			-5.760
*Competition			(4.460)			(7.500)			(2.940)			(5.460)
Intercept	5.620 (22.700)	6.750 (22.300)	2.730 (22.500)	2.380 (22.700)	3.740 (22.800)	-1.670 (25.200)	15.200 (15.500)	16.600 (15.400)	19.900 (15.400)	6.060 (16.400)	4.260 (16.600)	4.250 (18.400)
Chi-Square Statistics	12040***	9151***	8351***	12553***	12337***	12460***	20206***	16081***	14650***	29032***	29297***	29218***
sigma_u	8.080	10.100	10.8	7.810	7.940	7.860	7.380	8.770	9.380	5.250	5.190	5.180
sigma_e	4.160	4.160	4.160	4.160	4.160	4.160	2.700	2.700	2.700	2.700	2.700	2.700
Rho	0.791	0.856	0.872	0.779	0.785	0.782	0.882	0.913	0.923	0.79	0.786	0.786
N	17068	17068	17068	17068	17068	17068	17037	17037	17037	17037	17037	17037

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

c. Numbers in brackets are standard errors.

Table 5.6: Results of the Multilevel Linear Regression Models, 10th Grade Reading and Math Scores

Variable	10th Grade Reading Score					10th Grade Math Score					
	Herfindahl Index			Weighted Count of SDs		Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	M1	M2	M3	M4	M5	M6
School Dist	-0.041	0.254	0.313	-0.628	-3.651**	0.531	-0.798	0.279	0.778	-0.429	0.629
Competition	(0.469)	(1.151)	(0.516)	(1.110)	(1.285)	(0.485)	(1.109)	(0.504)	(0.856)	(1.316)	(0.845)
Elected	0.240	-1.100	-1.190	0.170	-3.590***	0.877**	-1.730	-1.690	0.784*	-1.170	-0.988
Superintendent	(0.498)	(1.060)	(1.040)	(0.476)	(0.824)	(0.329)	(0.969)	(0.975)	(0.328)	(0.758)	(0.673)
2nd Income	0.130	0.153	0.110	0.110	-0.778	0.113	-0.945	0.046	0.095	-0.249	0.042
Quintile	(0.303)	(1.100)	(0.301)	(0.292)	(0.486)	(0.283)	(0.960)	(0.286)	(0.273)	(0.494)	(0.276)
3rd Income	-0.006	-1.440	-0.092	-0.025	-1.230*	0.010	-0.780	0.023	-0.011	-0.402	0.004
Quintile	(0.412)	(1.240)	(0.410)	(0.405)	(0.599)	(0.323)	(1.080)	(0.324)	(0.314)	(0.551)	(0.318)
4th Income	-0.413	-0.017	-0.508	-0.425	-1.150	-0.334	-1.890	-0.408	-0.349	-0.925	-0.439
Quintile	(0.431)	(1.090)	(0.430)	(0.422)	(0.607)	(0.341)	(0.992)	(0.342)	(0.332)	(0.529)	(0.338)
Top Income	-0.516	0.065	-0.713	-0.518	-1.130	-0.256	-0.773	-0.318	-0.276	-0.501	-0.357
Quintile	(0.599)	(1.390)	(0.602)	(0.590)	(0.828)	(0.448)	(1.050)	(0.451)	(0.438)	(0.693)	(0.447)
El_Supdt		-1.900	-1.950		5.910		1.330	1.400		3.020	4.050
*Competition		(1.160)	(1.120)		(5.150)		(0.910)	(0.801)		(3.530)	(3.420)
2nd Quintile		-0.069			3.790*		1.240			1.210	
*Competition		(1.360)			(1.860)		(1.200)			(1.760)	
3rd Quintile		1.720			5.070***		0.997			1.700	
*Competition		(1.490)			(1.530)		(1.340)			(1.610)	
4th Quintile		-0.593			2.640		1.850			2.400	
*Competition		(1.290)			(1.810)		(1.190)			(1.560)	
Top Quintile		-0.923			1.310		0.633			0.132	
*Competition		(1.530)			(2.330)		(1.290)			(2.270)	
2nd Quintile		0.738	0.885		2.620*		2.76***	2.60***		2.24**	2.02**
*El_Supdt		(1.430)	(1.360)		(1.160)		(0.812)	(0.714)		(0.779)	(0.641)

Table 5.6 (continued)

3rd Quintile		2.92**	2.47**		3.62***		1.020	0.936		0.894	0.529
*El_Supdt		(0.907)	(0.892)		(0.874)		(0.789)	(0.775)		(0.820)	(0.707)
4th Quintile		1.98**	2.26***		3.13***		2.37***	2.06***		2.22**	1.83***
*El_Supdt		(0.690)	(0.654)		(0.731)		(0.590)	(0.587)		(0.677)	(0.551)
Top Quintile		2.500**	3.06***		4.02***		2.020**	2.170**		1.910*	1.81**
*El_Supdt		(0.936)	(0.790)		(0.888)		(0.701)	(0.685)		(0.830)	(0.663)
Intercept	15.900 (8.860)	16.600 (9.120)	15.900 (8.680)	16.400 (8.910)	15.600 (8.680)	9.200 (7.770)	9.260 (7.950)	7.600 (7.830)	7.560 (7.340)	6.220 (7.280)	6.480 (7.330)
Log-MSA Random	-0.263	-0.309*	-0.284	-0.273	-0.298*	-0.502***	-0.573***	-0.549***	-0.500**	-0.560**	-0.537**
Effects (Std. Dev.)	(0.138)	(0.148)	(0.145)	(0.142)	(0.145)	(0.150)	(0.168)	(0.164)	(0.154)	(0.172)	(0.167)
Log-Residual Random Effects (Std. Dev.)	1.75*** (0.009)	1.75*** (0.009)	1.75*** (0.009)	1.75*** (0.009)	1.75*** (0.009)	1.53*** (0.012)	1.53*** (0.012)	1.53*** (0.012)	1.53*** (0.012)	1.53*** (0.012)	1.53*** (0.012)
Chi-Square Statistics	29568***	1.2E+5***	1.3E+5***	29852***	1.2E+5***	29630***	2.3E+5***	2.2E+5***	30368***	2.3E+5***	2.2E+5***
Loglikelihood	-30708	-30701	-30704	-30823	-30699	-28574	-28569	-28570	-28575	-28570	-28571

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

c. Numbers in brackets are standard errors.

Table 5.6.1: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R3 with Herfindahl Index of School District in Table 5.6)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4^{th} Qntl*Elec_Supdt	2.652	0.000
Top Qntl*Elec_Supdt - 3^{rd} Qntl*Elec_Supdt	3.708	0.000
Top Qntl*Elec_Supdt - 2^{nd} Qntl*Elec_Supdt	5.293	0.001
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	8.356	0.000
4^{th} Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.704	0.000
3^{rd} Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	4.648	0.000
Top Qntl*App_Supdt - 4^{th} Qntl*App_Supdt	1.928	0.000
Top Qntl*App_Supdt - 3^{rd} Qntl*App_Supdt	3.334	0.000
Top Qntl*App_Supdt - 2^{nd} Qntl*App_Supdt	3.437	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	5.262	0.000
4^{th} Qntl*App_Supdt - 3^{rd} Qntl*App_Supdt	1.406	0.000
4^{th} Qntl*App_Supdt - 2^{nd} Qntl*App_Supdt	1.510	0.000
4^{th} Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.335	0.000
3^{rd} Qntl*App_Supdt - Lowest Qntl*App_Supdt	1.929	0.000
2^{nd} Qntl*App_Supdt - Lowest Qntl*App_Supdt	1.825	0.000
Lowest Qntl*Elec_Supdt - Lowest Qntl*App_Supdt	-2.816	0.005

Note: All the variables in the model are controlled at their means.

Table 5.6.2: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 10^{th} Grade Reading Score (the Model R5 with Weighted Count of School Districts in Table 5.7)

Type of School District Income Levels & Weighted Count of School Districts Competition	Contrast	Bonferroni P-Value
3rd Income Qntl - Lowest Income Qntl	5.067	0.009

Table 5.6.3: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R5 with Weighted Count of School District in Table 5.6)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4th Qntl*Elec_Supdt	2.939	0.000
Top Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	3.537	0.001
Top Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	4.702	0.002
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	8.841	0.000
4th Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.902	0.000
3rd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.304	0.000
2nd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	4.139	0.015
Top Qntl*App_Supdt - 4th Qntl*App_Supdt	1.934	0.000
Top Qntl*App_Supdt - 3rd Qntl*App_Supdt	3.355	0.000
Top Qntl*App_Supdt - 2nd Qntl*App_Supdt	3.427	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	5.292	0.000
4th Qntl*App_Supdt - 3rd Qntl*App_Supdt	1.421	0.000
4th Qntl*App_Supdt - 2nd Qntl*App_Supdt	1.493	0.000
4th Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.358	0.000
3rd Qntl*App_Supdt - Lowest Qntl*App_Supdt	1.937	0.000
2nd Qntl*App_Supdt - Lowest Qntl*App_Supdt	1.866	0.000

Note: All the variables in the model are controlled at their means.

Table 5.6.4: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 10th Grade Math Score (the Model M3 with Herfindahl Index of School District in Table 5.6)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4th Qntl*Elec_Supdt	3.087	0.000
Top Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	5.716	0.000
Top Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	4.334	0.000
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	9.464	0.000
4th Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	2.629	0.002
4th Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	1.247	0.103
4th Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	6.377	0.000
3rd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	3.748	0.000
2nd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.130	0.000
Top Qntl*App_Supdt - 4th Qntl*App_Supdt	2.914	0.000
Top Qntl*App_Supdt - 3rd Qntl*App_Supdt	4.330	0.000
Top Qntl*App_Supdt - 2nd Qntl*App_Supdt	4.536	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	7.316	0.000
4th Qntl*App_Supdt - 3rd Qntl*App_Supdt	1.416	0.000
4th Qntl*App_Supdt - 2nd Qntl*App_Supdt	1.622	0.000
4th Qntl*App_Supdt - Lowest Qntl*App_Supdt	4.402	0.000
3rd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.986	0.000
2nd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.780	0.000
4th Qntl*Elec_Supdt - 4th Qntl*App_Supdt	1.449	0.019
2nd Qntl*Elec_Supdt - 2nd Qntl*App_Supdt	1.824	0.001

Note: All the variables in the model are controlled at their means.

Table 5.6.5: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 10th Grade Math Score (the Model M6 with Weighted Count of School District in Table 5.6)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4th Qntl*Elec_Supdt	2.992	0.000
Top Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	5.469	0.000
Top Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	4.242	0.000
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	8.818	0.000
4th Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	2.477	0.004
4th Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.827	0.000
3rd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	3.350	0.000
2nd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	4.577	0.000

Table 5.6.5 (continued)

Top Qntl*App_Supdt - 4th Qntl*App_Supdt	2.925	0.000
Top Qntl*App_Supdt - 3rd Qntl*App_Supdt	4.333	0.000
Top Qntl*App_Supdt - 2nd Qntl*App_Supdt	4.530	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	7.325	0.000
4th Qntl*App_Supdt - 3rd Qntl*App_Supdt	1.408	0.000
4th Qntl*App_Supdt - 2nd Qntl*App_Supdt	1.604	0.000
4th Qntl*App_Supdt - Lowest Qntl*App_Supdt	4.400	0.000
3rd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.992	0.000
2nd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.795	0.000

Note: All the variables in the model are controlled at their means.

Table 5.7: Results of the Multilevel Linear Regression Models, 12th Grade Reading and Math Scores

Variable	12th Grade Reading Score						12th Grade Math Score				
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index		Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M4	M5	M6
School Dist	-0.853	-0.970	-0.862	-1.920	-4.034	-4.050	0.498	-2.644**	2.180	1.087	1.920
Competition	(0.564)	(1.264)	(0.644)	(1.690)	(2.492)	(2.442)	(0.638)	(0.967)	(1.330)	(2.265)	(1.330)
Elected	-0.123	1.510	-0.145	-0.007	0.612	0.155	0.487	-3.310*	0.503	-1.570	-1.580
Superintendent	(0.461)	(1.460)	(0.751)	(0.437)	(1.080)	(0.539)	(0.524)	(1.350)	(0.517)	(1.100)	(0.952)
2nd Income	0.237	0.587	0.236	0.257	0.288	0.189	-0.172	-2.490**	-0.161	-0.066	-0.248
Quintile	(0.368)	(1.280)	(0.370)	(0.365)	(0.659)	(0.636)	(0.339)	(0.858)	(0.333)	(0.669)	(0.339)
3rd Income	-0.075	-0.971	-0.076	-0.037	-0.957	-0.940	-0.250	-2.520*	-0.262	-0.831	-0.243
Quintile	(0.461)	(1.460)	(0.461)	(0.457)	(0.672)	(0.643)	(0.443)	(1.010)	(0.435)	(0.822)	(0.442)
4th Income	-0.189	-0.278	-0.189	-0.174	-1.250	-1.140	-0.717	-3.500***	-0.701	-1.560	-0.917
Quintile	(0.478)	(1.250)	(0.478)	(0.479)	(0.672)	(0.638)	(0.537)	(0.936)	(0.529)	(0.879)	(0.542)
Top Income	0.272	0.153	0.272	0.295	-0.207	-0.199	-0.387	-3.570***	-0.385	-0.527	-0.501
Quintile	(0.598)	(1.550)	(0.598)	(0.599)	(0.802)	(0.748)	(0.625)	(1.040)	(0.620)	(0.997)	(0.633)
El_Supdt		-0.716	0.044		-1.440	0.050		2.050		0.549	3.320
*Competition		(1.340)	(1.200)		(5.330)	(5.284)		(1.440)		(4.750)	(4.560)
2nd Quintile		-0.445			-0.532	-0.140		2.710*		-1.230	
*Competition		(1.580)			(2.590)	(2.538)		(1.160)		(2.450)	
3rd Quintile		1.190			4.270	4.274		2.870*		2.680	
*Competition		(1.780)			(2.720)	(2.641)		(1.340)		(2.650)	
4th Quintile		0.123			5.690*	5.361*		3.300**		3.560	
*Competition		(1.570)			(2.720)	(2.622)		(1.270)		(2.720)	
Top Quintile		0.176			1.850	1.950		3.960**		-0.707	
*Competition		(1.860)			(3.260)	(3.113)		(1.430)		(3.180)	
2nd Quintile		-3.480			-2.720			3.400**		1.870	2.170*
*El_Supdt		(1.790)			(1.400)			(1.090)		(1.100)	(0.905)
3rd Quintile		-1.030			-0.312			1.120		0.645	0.149
*El_Supdt		(1.360)			(1.240)			(0.841)		(1.070)	(0.847)
4th Quintile		-1.160			-0.051			3.830***		3.160**	2.710**
*El_Supdt		(0.969)			(0.981)			(0.829)		(1.120)	(0.918)
Top Quintile		-1.050			-0.479			3.060**		1.730	1.850
*El_Supdt		(1.260)			(1.220)			(1.060)		(1.310)	(1.070)
Intercept	13.600	13.800	13.500	17.200	16.500	17.006	10.300	14.000	7.220	3.750	5.990
	(12.300)	(13.600)	(12.300)	(12.300)	(12.600)	(12.610)	(11.500)	(11.300)	(11.000)	(10.900)	(10.900)
Log-MSA Random Effects (Std. Dev.)	-0.173	-0.179	-0.173	-0.164	-0.189	-0.166	-0.255	-0.322	-0.263	-0.395	-0.307
	(0.211)	(0.216)	(0.210)	(0.207)	(0.219)	(0.209)	(0.167)	(0.207)	(0.167)	(0.215)	(0.190)
Log-Residual Random Effects (Std. Dev.)	1.860***	1.850***	1.860***	1.860***	1.850***	1.860***	1.620***	1.620***	1.620***	1.620***	1.620***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Chi-Square Statistics	17578***	74788***	18344***	18087***	71739***	18145***	29062***	3.20E+05***	28440***	2.80E+05***	2.90E+05***
Loglikelihood	-24213	-24211	-24213	-24213	-24207	-24213	-22483	-22470	-22481	-22470	-22475

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

c. Numbers in brackets are standard errors.

Table 5.7.1: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 12th Grade Reading Score (the Model R6 with Weighted Count of School Districts in Table 5.7)

Type of School District Income Levels & Weighted Count of School Districts Competition	Contrast	Bonferroni P-Value
4th Income Qntl - 2nd Income Qntl	5.501	0.034

Table 5.7.2: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M2 with Herfindahl Index in Table 5.7)

Type of School District Income Levels & Herfindahl Index of School District Competition	Contrast	Bonferroni P-Value
4th Income Qntl - Lowest Income Qntl	3.305	0.094
Top Income Qntl - Lowest Income Qntl	3.962	0.055

Table 5.7.3: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M2 with Herfindahl Index of School District in Table 5.7)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4th Qntl*Elec_Supdt	2.883	0.001
Top Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	6.196	0.000
Top Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	4.903	0.000
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	10.521	0.000
4th Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	3.313	0.000
4th Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	7.638	0.000
3rd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	4.326	0.000
2nd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	5.618	0.000
Top Qntl*App_Supdt - 4th Qntl*App_Supdt	3.490	0.000
Top Qntl*App_Supdt - 3rd Qntl*App_Supdt	4.025	0.000
Top Qntl*App_Supdt - 2nd Qntl*App_Supdt	4.924	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	7.447	0.000
4th Qntl*App_Supdt - 2nd Qntl*App_Supdt	1.434	0.000
4th Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.958	0.000
3rd Qntl*App_Supdt - 2nd Qntl*App_Supdt	0.898	0.026
3rd Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.422	0.000
2nd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.524	0.000
4th Qntl*Elec_Supdt - 4th Qntl*App_Supdt	2.067	0.007

Note: All the variables in the model are controlled at their means.

Table 5.7.4: Comparative Marginal Effects of Different Types of School District Superintendent and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M6 with Weighted Count of School District in Table 5.7)

Sch_Dist Income Quintile & Type of School District Superintendent	Contrast	Bonferroni P-Value
Top Qntl*Elec_Supdt - 4th Qntl*Elec_Supdt	2.708	0.035
Top Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	5.651	0.000
Top Qntl*Elec_Supdt - 2nd Qntl*Elec_Supdt	4.492	0.000
Top Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	9.111	0.000
4th Qntl*Elec_Supdt - 3rd Qntl*Elec_Supdt	2.943	0.012
4th Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	6.404	0.000
3rd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	3.461	0.000
2nd Qntl*Elec_Supdt - Lowest Qntl*Elec_Supdt	4.619	0.000
Top Qntl*App_Supdt - 4th Qntl*App_Supdt	3.504	0.000
Top Qntl*App_Supdt - 3rd Qntl*App_Supdt	4.048	0.000
Top Qntl*App_Supdt - 2nd Qntl*App_Supdt	4.940	0.000
Top Qntl*App_Supdt - Lowest Qntl*App_Supdt	7.501	0.000
4th Qntl*App_Supdt - 2nd Qntl*App_Supdt	1.436	0.000
4th Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.997	0.000
3rd Qntl*App_Supdt - 2nd Qntl*App_Supdt	0.892	0.014
3rd Qntl*App_Supdt - Lowest Qntl*App_Supdt	3.453	0.000
2nd Qntl*App_Supdt - Lowest Qntl*App_Supdt	2.561	0.000

Note: All the variables in the model are controlled at their means.

Table 5.8: Results of the Hausman-Taylor Regression Models - Fiscally Dependent School District

Variable	Reading Score						Math Score					
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6
2nd Quintile	0.262	0.236	4.350	-0.119	0.027	-0.819	-0.037	-0.030	-0.521	-0.101	-0.153	0.550
	(0.341)	(0.343)	(3.100)	(0.275)	(0.310)	(1.050)	(0.235)	(0.235)	(2.000)	(0.200)	(0.225)	(0.763)
3rd Quintile	0.290	0.288	3.200	-0.152	0.013	-0.886	-0.115	-0.123	0.005	-0.248	-0.307	1.180
	(0.426)	(0.423)	(3.310)	(0.356)	(0.391)	(1.240)	(0.296)	(0.295)	(2.160)	(0.260)	(0.284)	(0.900)
4th Quintile	-0.367	-0.378	3.990	-0.808	-0.622	-1.040	-0.199	-0.166	1.570	-0.421	-0.488	0.942
	(0.482)	(0.482)	(3.520)	(0.443)	(0.479)	(1.270)	(0.333)	(0.333)	(2.320)	(0.322)	(0.347)	(0.918)
Top Quintile	-0.151	-0.137	4.150	-0.658	-0.467	-0.265	-0.201	-0.158	0.570	-0.431	-0.500	0.706
	(0.596)	(0.593)	(3.590)	(0.554)	(0.585)	(1.410)	(0.402)	(0.401)	(2.360)	(0.403)	(0.424)	(1.020)
School Dist	3.260	2.180	5.760	-1.260	-3.460	-5.910	0.475	-1.900	-2.760	-0.624	0.163	3.760
Competition	(2.130)	(3.780)	(5.390)	(3.180)	(3.840)	(5.150)	(1.520)	(2.750)	(3.690)	(2.290)	(2.780)	(3.730)
Dependent	-1.040*	-2.780	-5.210	-1.040*	-2.130	-2.360*	-0.046	-3.760	-5.000	-0.139	0.247	0.032
School Districts	(0.436)	(5.380)	(5.520)	(0.437)	(1.140)	(1.200)	(0.348)	(3.860)	(3.960)	(0.321)	(0.832)	(0.873)
DepSchdist		2.470	6.030		9.930	11.800		5.260	7.110		-3.530	-2.220
*Competition		(7.630)	(7.830)		(9.700)	(10.000)		(5.410)	(5.560)		(7.000)	(7.260)
2nd Qntl			-5.020			3.980			0.653			-2.640
*Competition			(3.730)			(4.500)			(2.400)			(3.270)
3rd Qntl			-3.480			4.050			-0.209			-6.870
*Competition			(4.040)			(5.440)			(2.620)			(3.940)
4th Qntl			-5.330			1.400			-2.180			-6.980
*Competition			(4.330)			(5.670)			(2.830)			(4.110)
Top Qntl			-5.220			-3.830			-0.836			-5.150
*Competition			(4.440)			(7.550)			(2.900)			(5.470)
Intercept	-0.849	-1.530	-5.450	-4.090	6.170	-1.250	15.200	15.200	19.000	4.820	1.060	2.800
	(22.900)	(22.900)	(23.000)	(22.900)	(25.000)	(26.500)	(15.700)	(15.600)	(15.700)	(16.600)	(18.100)	(19.300)
Chi-Square Statistics	12107***	10746***	9750***	12674***	12630***	12707***	19531***	17257***	15527***	29090***	29164***	29246***
sigma_u	8.050	8.940	9.650	7.750	7.770	7.720	7.590	8.330	8.970	5.230	5.210	5.170
sigma_e	4.160	4.160	4.160	4.160	4.160	4.160	2.700	2.700	2.700	2.700	2.700	2.700
Rho	0.789	0.822	0.843	0.776	0.777	0.775	0.887	0.905	0.917	0.789	0.788	0.786
N	17068	17068	17068	17068	17068	17068	17037	17037	17037	17037	17037	17037

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

c. Numbers in brackets are standard errors.

Table 5. 9: Results of the Multilevel Linear Regression Models, 10th Grade Reading and Math Scores

Variable	10th Grade Reading Score						10th Grade Math Score					
	Herfindahl Index			Weighted Counts of SDs			Herfindahl Index			Weighted Counts of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6
School Dist Competition	-0.163	0.081	-0.383	-0.808	-2.889*	-3.265*	0.166	-0.373	0.182	0.314	0.205	0.587
	(0.436)	(1.544)	(0.463)	(1.050)	(1.326)	(1.324)	(0.438)	(1.091)	(0.429)	(0.848)	(1.300)	(0.833)
Dependent School	-0.861	-0.485	-0.839	-0.846	-0.675	-1.580**	-0.466	0.178	0.222	-0.464	0.696	0.692
Districts	(0.570)	(0.986)	(0.886)	(0.556)	(0.808)	(0.589)	(0.385)	(0.815)	(0.844)	(0.384)	(0.703)	(0.700)
2nd Quintile	0.083	0.610	0.360	0.067	-0.252	-0.492	0.088	-0.327	0.231	0.084	0.125	0.236
	(0.305)	(1.280)	(0.338)	(0.293)	(0.522)	(0.485)	(0.280)	(0.901)	(0.294)	(0.273)	(0.483)	(0.288)
3rd Quintile	-0.038	-0.485	0.210	-0.058	-0.640	-0.848	0.053	-0.485	0.173	0.046	-0.162	0.161
	(0.411)	(1.350)	(0.453)	(0.400)	(0.629)	(0.570)	(0.320)	(0.963)	(0.325)	(0.314)	(0.513)	(0.317)
4th Quintile	-0.482	0.491	-0.177	-0.496	-0.663	-0.923	-0.295	-0.619	0.009	-0.301	-0.090	-0.001
	(0.437)	(1.260)	(0.454)	(0.424)	(0.584)	(0.562)	(0.336)	(0.922)	(0.327)	(0.330)	(0.479)	(0.319)
Top Quintile	-0.574	0.693	-0.328	-0.580	-0.567	-0.737	-0.176	-0.104	-0.001	-0.185	0.047	-0.019
	(0.600)	(1.440)	(0.603)	(0.586)	(0.774)	(0.763)	(0.438)	(0.938)	(0.436)	(0.429)	(0.613)	(0.422)
DepSchdist *Competition		1.000	1.450*		4.940*	6.200**		0.392	0.407		-1.110	-0.847
		(0.926)	(0.723)		(2.170)	(2.170)		(0.683)	(0.666)		(2.020)	(1.980)
2nd Quintile		-0.331			2.730	3.080		0.686			0.427	
*Competition		(1.540)			(1.810)	(1.820)		(1.120)			(1.720)	
3rd Quintile		0.909			3.890**	4.140**		0.819			1.430	
*Competition		(1.640)			(1.510)	(1.530)		(1.210)			(1.500)	
4th Quintile		-0.877			1.950	2.400		0.771			0.230	
*Competition		(1.520)			(1.720)	(1.720)		(1.100)			(1.460)	
Top Quintile		-1.360			0.358	0.441		0.123			-0.831	
*Competition		(1.750)			(2.210)	(2.200)		(1.180)			(2.020)	
2nd Quintile *DepSchdist		-1.350	-1.330*		-1.040			-0.782	-0.854		-1.000	-1.040
		(0.694)	(0.661)		(0.649)			(0.626)	(0.635)		(0.659)	(0.645)
3rd Quintile *DepSchdist		-1.200*	-1.210*		-0.876			-0.753	-0.809		-0.767	-0.870

Table 5.9 (continued)

		(0.602)	(0.611)		(0.600)			(0.573)	(0.582)		(0.598)	(0.580)
4th Quintile *DepSchdist		-1.500* (0.685)	-1.460* (0.652)		-1.060 (0.631)			-1.830*** (0.444)	-1.900*** (0.459)		-1.960*** (0.499)	-1.990*** (0.479)
Top Quintile *DepSchdist		-0.998 (0.887)	-1.080 (0.847)		-0.754 (0.844)			-1.050 (0.576)	-1.130* (0.573)		-1.140 (0.590)	-1.160* (0.585)
Intercept	14.600 (8.790)	17.600 (9.290)	18.200* (8.930)	15.500 (8.850)	19.000* (8.610)	17.500* (8.410)	8.110 (7.780)	11.100 (7.810)	10.200 (7.560)	7.540 (7.450)	8.130 (7.180)	9.010 (7.220)
Log-MSA Random Effects (Std. Dev.)	-0.295* (0.137)	-0.306* (0.138)	-0.297* (0.137)	-0.308* (0.142)	-0.319* (0.145)	-0.344* (0.147)	-0.476*** (0.143)	-0.488*** (0.145)	-0.482*** (0.143)	-0.475*** (0.144)	-0.490*** (0.147)	-0.483*** (0.144)
Log-Residual Random Effects (Std. Dev.)	1.750*** (0.009)	1.750*** (0.009)	1.750*** (0.010)	1.750*** (0.009)	1.740*** (0.010)	1.750*** (0.010)	1.530*** (0.012)	1.530*** (0.012)	1.530*** (0.012)	1.530*** (0.012)	1.530*** (0.012)	1.530*** (0.012)
Chi-Square Statistics	29914***	35511***	33623***	29979***	34759***	32446***	28862***	35055***	34658***	29465***	37581***	34670***
Loglikelihood	-30707	-30697	-30700	-30822	-30696	-30697	-28577	-28568	-28568	-28577	-28567	-28569

Notes:
a. ***=p<0.001; **=p<0.01; *=p<0.05.
b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.
c. Numbers in brackets are standard errors.

Table 5.9.1: Comparative Marginal Effects of School District Competition in School Districts with Different Types of School District Fiscal Autonomy on Student's 10th Grade Reading Score (the Model R3 with Herfindahl Index in Table 5.9)

Type of School District Fiscal Autonomy & Herfindahl Index of School District Competition	Contrast	Bonferroni P-Value
Fiscally Dependent SD - Fiscally Independent SD	1.452	0.045

Table 5.9.2: Comparative Marginal Effects of Different Types of School District Fiscal Autonomy and School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R3 with Herfindahl Index in Table 5.9)

Sch_Dist Income Quintile & Type of School District Fiscal Autonomy	Contrast	Bonferroni P-Value
Top Qntl* Ind_SD - 4th Qntl*Ind_SD	1.850	0.000
Top Qntl* Ind_SD - 3rd Qntl*Ind_SD	3.217	0.000
Top Qntl* Ind_SD - 2nd Qntl*Ind_SD	3.235	0.000
Top Qntl* Ind_SD - Lowest Qntl*Ind_SD	5.501	0.000
4th Qntl* Ind_SD - 3rd Qntl*Ind_SD	1.367	0.000
4th Qntl* Ind_SD - 2nd Qntl*Ind_SD	1.385	0.000
4th Qntl* Ind_SD - Lowest Qntl*Ind_SD	3.651	0.000
3rd Qntl*Ind_SD - Lowest Qntl*Ind_SD	2.284	0.000
2nd Qntl*Ind_SD - Lowest Qntl*Ind_SD	2.266	0.000
Top Qntl* Dep_SD - 4th Qntl*Dep_SD	2.286	0.003
Top Qntl* Dep_SD - 3rd Qntl*Dep_SD	3.501	0.000
Top Qntl* Dep_SD - 2nd Qntl*Dep_SD	3.718	0.000
Top Qntl* Dep_SD - Lowest Qntl*Dep_SD	4.393	0.000
4th Qntl* Dep_SD - Lowest Qntl*Dep_SD	2.107	0.020

Note: All the variables in the model are controlled at their means.

Table 5.9.3: Comparative Marginal Effects of School District Competition in School Districts with Different Types of School District Fiscal Autonomy on Student's 10th Grade Reading Score (the Model R6 with Weighted Count of School District in Table 5.9)

Type of School District Fiscal Autonomy & Weighted Count of School District Competition	Contrast	Bonferroni P-Value
Fiscally Dependent SD - Fiscally Independent SD	6.201	0.004

Table 5.9.4: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 10th Grade Reading Score (the Model R6 with Weighted Count of School District in Table 5.9)

Sch_Dist Income Quintile & Weighted Count of School District Competition	Contrast	Bonferroni P-Value
3rd Quintile Sch_Dist – Lowest Quintile Sch_Dist	4.135	0.068

Table 5.9.5: Comparative Marginal Effects of Different Types of School District Fiscal Autonomy and School Districts with Different Income Levels on Student's 10th Grade Math Score (the Model M3 with Herfindahl Index in Table 5.9)

Sch_Dist Income Quintile & Type of School District Fiscal Autonomy	Contrast	Bonferroni P-Value
Top Qntl* Ind_SD - 4th Qntl* Ind_SD	2.709	0.000
Top Qntl* Ind_SD - 3rd Qntl* Ind_SD	4.433	0.000
Top Qntl* Ind_SD - 2nd Qntl*Ind_SD	4.566	0.000
Top Qntl* Ind_SD - Lowest Qntl*Ind_SD	7.564	0.000
4th Qntl* Ind_SD - 3rd Qntl* Ind_SD	1.724	0.000
4th Qntl* Ind_SD - 2nd Qntl*Ind_SD	1.857	0.000
4th Qntl* Ind_SD - Lowest Qntl*Ind_SD	4.855	0.000
3rd Qntl*Ind_SD - Lowest Qntl*Ind_SD	3.131	0.000
2nd Qntl*Ind_SD - Lowest Qntl*Ind_SD	2.998	0.000
Top Qntl* Dep_SD - 4th Qntl* Dep_SD	3.497	0.000
Top Qntl* Dep_SD - 3rd Qntl*Dep_SD	4.157	0.000
Top Qntl* Dep_SD - 2nd Qntl*Dep_SD	4.358	0.000
Top Qntl* Dep_SD - Lowest Qntl*Dep_SD	6.429	0.000
4th Qntl* Dep_SD - Lowest Qntl*Dep_SD	2.932	0.000
3rd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.272	0.000
2nd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.070	0.002

Note: All the variables in the model are controlled at their means.

Table 5.9.6: Comparative Marginal Effects of Different Types of School District Fiscal Autonomy and School Districts with Different Income Levels on Student's 10th Grade Math Score (the Model M6 with Weighted Count of School District in Table 5.9)

Sch_Dist Income Quintile & Type of School District Fiscal Autonomy	Contrast	Bonferroni P-Value
Top Qntl* Ind_SD - 4th Qntl* Ind_SD	2.726	0.000
Top Qntl* Ind_SD - 3rd Qntl* Ind_SD	4.440	0.000
Top Qntl* Ind_SD - 2nd Qntl*Ind_SD	4.565	0.000
Top Qntl* Ind_SD - Lowest Qntl*Ind_SD	7.570	0.000
4th Qntl* Ind_SD - 3rd Qntl* Ind_SD	1.714	0.000
4th Qntl* Ind_SD - 2nd Qntl*Ind_SD	1.840	0.000
4th Qntl* Ind_SD - Lowest Qntl*Ind_SD	4.844	0.000
3rd Qntl*Ind_SD - Lowest Qntl*Ind_SD	3.130	0.000
2nd Qntl*Ind_SD - Lowest Qntl*Ind_SD	3.004	0.000
Top Qntl* Dep_SD - 4th Qntl* Dep_SD	3.542	0.000
Top Qntl* Dep_SD - 3rd Qntl*Dep_SD	4.180	0.000
Top Qntl* Dep_SD - 2nd Qntl*Dep_SD	4.463	0.000
Top Qntl* Dep_SD - Lowest Qntl*Dep_SD	6.476	0.000
4th Qntl* Dep_SD - Lowest Qntl*Dep_SD	2.933	0.000
3rd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.295	0.000
2nd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.012	0.007
4th Qntl* Dep_SD - 4th Qntl* Ind_SD	-1.414	0.104

Note: All the variables in the model are controlled at their means.

Table 5.10: Results of the Multilevel Linear Regression Models, 12th Grade Reading and Math Scores

Variable	12th Grade Reading Score						12th Grade Math Score					
	Herfindahl Index			Weighted Count of SDs			Herfindahl Index			Weighted Count of SDs		
	R1	R2	R3	R4	R5	R6	M1	M2	M3	M4	M5	M6
School Dist	-0.781	-1.213	-0.884	-1.950	-4.253	-4.332	0.275	-1.223	0.637	1.880	1.926	2.070
Competition	(0.523)	(1.872)	(0.570)	(1.660)	(2.500)	(2.503)	(0.586)	(1.331)	(0.589)	(1.260)	(1.917)	(1.250)
Dependent School Districts	-0.460	-0.431	-0.774	-0.517	-0.701	-0.953	0.274	1.840	2.380**	0.306	2.040**	2.090**
	(0.468)	(1.120)	(0.755)	(0.470)	(0.741)	(0.551)	(0.424)	(0.938)	(0.893)	(0.419)	(0.787)	(0.792)
2nd Income	0.210	0.212	0.217	0.224	0.235	0.245	-0.154	-1.350	-0.010	-0.129	0.356	-0.014
Quintile	(0.373)	(1.560)	(0.376)	(0.369)	(0.704)	(0.648)	(0.339)	(1.040)	(0.343)	(0.337)	(0.593)	(0.346)
3rd Income	-0.121	-0.893	-0.119	-0.083	-0.803	-0.891	-0.195	-2.010*	-0.037	-0.187	-0.642	-0.063
Quintile	(0.467)	(1.660)	(0.468)	(0.463)	(0.642)	(0.656)	(0.443)	(0.999)	(0.433)	(0.437)	(0.687)	(0.433)
4th Income	-0.266	-0.226	-0.260	-0.252	-1.050	-1.140	-0.633	-1.170	-0.174	-0.595	-0.207	-0.163
Quintile	(0.484)	(1.510)	(0.486)	(0.482)	(0.648)	(0.631)	(0.542)	(1.150)	(0.508)	(0.537)	(0.718)	(0.512)
Top Income	0.192	-0.009	0.197	0.217	-0.165	-0.182	-0.290	-2.180*	-0.128	-0.265	-0.020	-0.122
Quintile	(0.604)	(1.810)	(0.605)	(0.601)	(0.752)	(0.746)	(0.623)	(1.050)	(0.611)	(0.622)	(0.858)	(0.618)
DepSchdist		0.546	0.465		3.990	4.380		-0.458	-1.030		-2.590	-2.420
*Competition		(1.130)	(0.827)		(2.390)	(2.330)		(0.954)	(0.847)		(2.280)	(2.270)
2nd Quintile		-0.032			-0.123	-0.154		1.630			-1.870	
*Competition		(1.830)			(2.590)	(2.550)		(1.310)			(2.180)	
3rd Quintile		1.150			4.030	4.220		2.510			2.760	
*Competition		(1.970)			(2.630)	(2.690)		(1.340)			(2.200)	
4th Quintile		0.130			5.390*	5.660*		1.290			0.073	
*Competition		(1.850)			(2.690)	(2.680)		(1.550)			(2.280)	
Top Quintile		0.339			2.050	2.080		2.680			-0.934	
*Competition		(2.220)			(3.170)	(3.150)		(1.550)			(2.750)	
2nd Quintile		-0.112			-0.054			-1.050	-1.150		-1.300	-1.170
*DepSchdist		(0.787)			(0.761)			(0.818)	(0.781)		(0.841)	(0.814)
3rd Quintile		-0.607			-0.340			-1.060	-1.260		-1.070	-1.310
*DepSchdist		(0.883)			(0.832)			(0.659)	(0.697)		(0.738)	(0.736)
4th Quintile		-0.932			-0.424			-3.21***	-3.38***		-3.43***	-3.490***
*DepSchdist		(0.817)			(0.754)			(0.668)	(0.667)		(0.723)	(0.724)
Top Quintile		-0.274			-0.148			-1.150	-1.280		-1.460*	-1.440*
*DepSchdist		(0.993)			(0.930)			(0.657)	(0.664)		(0.710)	(0.703)
Intercept	13.000	14.600	13.200	16.500	18.000	17.600	10.300	16.800	12.400	7.990	7.440	9.630
	(12.40)	(13.60)	(12.40)	(12.50)	(12.70)	(12.60)	(11.30)	(11.000)	(10.900)	(11.00)	(11.000)	(10.700)
Log-MSA Random Effects (Std. Dev.)	-0.180	-0.178	-0.182	-0.175	-0.205	-0.209	-0.247	-0.304	-0.304	-0.250	-0.368*	-0.305
	(0.212)	(0.218)	(0.210)	(0.211)	(0.236)	(0.233)	(0.166)	(0.176)	(0.171)	(0.164)	(0.186)	(0.167)
Log-Residual Random Effects (Std. Dev.)	1.860***	1.850***	1.860***	1.860***	1.850***	1.850***	1.620***	1.620***	1.620***	1.620***	1.620***	1.620***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Chi-Square Statistics	17745***	20080***	17797***	18136***	20288***	19357***	26830***	39464***	35653***	26949***	40744***	35635***
Loglikelihood	-24212	-24210	-24212	-24212	-24206	-24207	-22483	-22466	-22468	-22482	-22464	-22468

Notes:

a. ***=p<0.001; **=p<0.01; *=p<0.05.

b. All the models include log of school district population, log of MSA population, Proportion of school age population (5-17 years), Percent of >25 years population with at least high school diploma, Percent of foreign born population, Percent of non-white population, Racial Diversity Index in MSA, Log of median household income, Poverty, Percent of owner-occupied housing units, Median housing value, Percent of total revenue from local sources, Percent of local revenue from property taxes, Log of per pupil revenue from state sources, Percent of >65 years population, Percent of public sector employees covered under collective bargaining agreements, Percent of non-Whites in School District Board, and Year dummies. The models also control for student's 8th grade scores in reading and math, race, sex, and SES. At the school level, the models include student-teacher ratio in 8th grade, percent of minority students, percent of free and reduced lunch students, the region to which the school belongs, and whether the school is private or public.

c. Numbers in brackets are standard errors.

Table 5.10.1: Comparative Marginal Effects of School District Competition in School Districts with Different Income Levels on Student's 12th Grade Reading Score (the Model R6 with Weighted Count of School District in Table 5.10)

Sch_Dist Income Quintile & Weighted Count of School District Competition	Contrast	Bonferroni P-Value
4th Quintile Sch_Dist – 2nd Quintile Sch_Dist	5.812	0.017

Table 5.10.2: Comparative Marginal Effects of Different Types of School District Fiscal Autonomy and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M3 with Herfindahl Index in Table 5.10)

Sch_Dist Income Quintile & Type of School District Fiscal Autonomy	Contrast	Bonferroni P-Value

Table 5.10.2 (continued)

Top Qntl* Ind_SD - 4th Qntl* Ind_SD	3.064	0.000
Top Qntl* Ind_SD - 3rd Qntl* Ind_SD	4.238	0.000
Top Qntl* Ind_SD - 2nd Qntl*Ind_SD	5.093	0.000
Top Qntl* Ind_SD - Lowest Qntl*Ind_SD	7.765	0.000
4th Qntl* Ind_SD - 3rd Qntl* Ind_SD	1.173	0.001
4th Qntl* Ind_SD - 2nd Qntl*Ind_SD	2.028	0.000
4th Qntl* Ind_SD - Lowest Qntl*Ind_SD	4.700	0.000
3rd Qntl* Ind_SD - 2nd Qntl*Ind_SD	0.855	0.072
3rd Qntl*Ind_SD - Lowest Qntl*Ind_SD	3.527	0.000
2nd Qntl*Ind_SD - Lowest Qntl*Ind_SD	2.672	0.000
Top Qntl* Dep_SD - 4th Qntl* Dep_SD	5.082	0.000
Top Qntl* Dep_SD - 3rd Qntl*Dep_SD	4.105	0.000
Top Qntl* Dep_SD - 2nd Qntl*Dep_SD	4.803	0.000
Top Qntl* Dep_SD - Lowest Qntl*Dep_SD	6.479	0.000
3rd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.375	0.005
4th Qntl* Dep_SD - 4th Qntl* Ind_SD	-1.771	0.018

Note: All the variables in the model are controlled at their means.

Table 5.10.3: Comparative Marginal Effects of Different Types of School District Fiscal Autonomy and School Districts with Different Income Levels on Student's 12th Grade Math Score (the Model M6 with Weighted Count of School District in Table 5.10)

Sch_Dist Income Quintile & Type of School District Fiscal Autonomy	Contrast	Bonferroni P-Value
Top Qntl* Ind_SD - 4th Qntl* Ind_SD	3.080	0.000
Top Qntl* Ind_SD - 3rd Qntl* Ind_SD	4.228	0.000
Top Qntl* Ind_SD - 2nd Qntl*Ind_SD	5.051	0.000
Top Qntl* Ind_SD - Lowest Qntl*Ind_SD	7.753	0.000
4th Qntl* Ind_SD - 3rd Qntl* Ind_SD	1.148	0.002
4th Qntl* Ind_SD - 2nd Qntl*Ind_SD	1.971	0.000
4th Qntl* Ind_SD - Lowest Qntl*Ind_SD	4.673	0.000
3rd Qntl*Ind_SD - Lowest Qntl*Ind_SD	3.525	0.000
2nd Qntl*Ind_SD - Lowest Qntl*Ind_SD	2.702	0.000
Top Qntl* Dep_SD - 4th Qntl* Dep_SD	5.086	0.000
Top Qntl* Dep_SD - 3rd Qntl*Dep_SD	4.170	0.000
Top Qntl* Dep_SD - 2nd Qntl*Dep_SD	4.878	0.000
Top Qntl* Dep_SD - Lowest Qntl*Dep_SD	6.489	0.000
3rd Qntl*Dep_SD - Lowest Qntl*Dep_SD	2.319	0.008
4th Qntl* Dep_SD - 4th Qntl* Ind_SD	-1.702	0.040

Note: All the variables in the model are controlled at their means.