JAEPR, *5*(1),

ISSN: 1930-9325

RESEARCH ARTICLE

School Choice and Marginalization: The Case of School District Competition and Political Institutions in the U.S.

Nandan K. Jha
Valdosta State University

This paper studies effectiveness of school choice and type of school districts' political institutions jointly vis-à-vis student learning. School choice relies on market-oriented policies for reforming public education, but their effectiveness, i.e., equity and productive efficiency is debatable. The effectiveness of different types of political institutions that manage school districts and compete for students in urban regions in the USA is also a neglected area of research. This study fills these gaps by empirically investigating the joint relationships of inter-school district competition- a key dimension of school choice- and local political institutions with student learning. Results from the analysis of a unique data show that inter-school district competition has some productive efficiency effects on student achievement, the political institution does not. The inter-school district competition and political institutions have differential equity effects on student achievement. This paper substantively discusses these results in the context of school choice and marginalization.

Keywords: inter-school district competition, local political institutions, student achievement, regional inequity, school choice

For several decades now, governments have laid their hands on market competition-oriented policies in one or more forms of school choice to reform public education. Numerous studies have investigated these policies and have subsequently generated considerable amount of controversy both theoretically and empirically. However, studies have completely ignored the important role that local political institutions play as street-level implementers of school choice policies in the USA. A study of the effectiveness of these two factors together is warranted as such a study can shed policy relevant insights on policymakers' efforts in reforming public education in the USA. This study therefore investigates the effectiveness of school choice and local political institutions jointly by operationalizing school choice as inter-school district competition in the urban regional market and operationalizing local political institutions as different types of governing bodies that exist across school districts in the USA. Furthermore, consistent with the practice in the literature this study examines this joint effectiveness by evaluating productive efficiency and equity in relationships of these two factors with student learning. This study also undertakes empirical comparison between school choice theory that entails existence of polycentric governments in a region and its contradictory theory of consolidated regional government. A unique dataset allows empirical investigation of these policy relevant questions appropriately.

Proponents of school choice policies rely on the argument that multiple providers including private schools on the supply side bring productive efficiency gains and parents also have significant choices for their kids on the demand side. In the USA the several players that afford school choice in public education market include charter schools, magnet schools, vouchers, federal, state, and local governments and parents (Verger et al., 2016). Each of these school choices has been extensively studied since Chubb and Moe (1990) popularized Friedman's (1955) original idea. One of the less studied topics within this free-market and school choice literature in the USA is inter-school district competition in the context of urban regional markets. Arguably local school districts' governments compete for students in the regional market context from the supply side as they exercise significant autonomy in terms of resource mobilization and allocation. On the demand side, parents exercise their choice to reside in school districts that appropriately match with their preferences for property tax and the quality of public education. Different types of political institutions that govern these local school districts assume a central role in this setup. The idea behind maintaining such a polycentric form of local control is to bring productive efficiency and equity – the two elements of effectiveness - in the public education sector. Proponents argue that these outcomes manifest in terms of appropriate relationships between measures of competition and desirable indicators of student learning and achievement gaps along racial and family income lines.

On the other hand, extant research that holds an opposing view confirms that racial and economic integration in the regional context have the potential to wipe out persistent achievement gaps and pull up overall student learning. Opponents of market-based school choice argue that school choice policies do not fulfill the market principles of freedom of choice and efficiency as competition benefits just the "best" students. Opponents further argue that it is detrimental to equity, social cohesion, and organizational sustainability. Concomitantly, the less educated and lower SES parents face difficulty in exercising choice due to lack of timely information, networks, and transportation. Students with greater needs find themselves in segregated school environments in terms of ethnicity and SES. These arguments together constitute the theory of consolidated regional government.

Although several of the OECD countries have implemented school choice policies for some time now, conclusive empirical evidence on their effectiveness in student learning and reduction in achievement gaps are yet to emerge in this literature (Verger et al., 2016). The theoretical and empirical literatures on school choice policies such as charters and vouchers in general are rife with conflicting arguments and evidence. This paper takes a novel approach and examines the effectiveness of inter-school district competition and types of local political institutions in student achievement in the broader context of school choice and marginalization. The few studies on inter-school district competition offer inconclusive empirical evidence (Hoxby, 2000; Rothstein, 2007). Existing research has ignored the role of local political institutions that are key players in the implementation of inter-school district competition in the regional context. The key set of research questions that I investigate include a) whether school choice or consolidated regional government is effective in public education; and b) why and how governing institutions of school districts perform key roles in managing competition for students in urban region markets. I study effectiveness by evaluating its two key components: productive efficiency and equity. To empirically study competition in the local urban government context, I utilize Craw's (2008) Tamed Leviathan Model and the theory of consolidated regional government. The Tamed

Leviathan Model has integrated public choice and local political reform theories and I adapt and empirically examine this extended theory in the context of urban school districts in the USA. This paper's empirical investigation offers theoretical insights and inform the policy debate on the roles of school choice and political institutions in bringing equity and efficiency in public education. This study fills gaps in the literature also by modeling the equity effects of school choice and political institutions on student achievement. Following Harris et. al. (2001), I utilize joint effects approach of the two factors along with school districts' median household income category in my regression models. The empirical strategy underlying Hausman-Taylor panel data models and Multilevel Linear Regression models are utilized on a uniquely compiled longitudinal dataset from several sources, including Popularly Elected Officials Survey from the US Census Bureau, Local Education Agency (School District) Longitudinal Finance Survey, National Education Longitudinal Study, 1988-92 and School District Demographics System from the National Center for Education Statistics. As will be explained in the data and methodology section, data availability constraints concerning Popularly Elected Officials Survey force this study's empirical analysis to confine within student learning outcomes in years 1990 and 1992. However, longitudinal analysis along with sophisticated modeling strategy allow for the findings of this study to remain valid in the current context. Finally, by highlighting the need to consider the joint effect of school choice and local political institutions in examining the success or failure of school choice policies, this study makes the case that the Popularly Elected Officials Survey is critical in evaluating school choice debate and therefore, it needs to continue in future.

LITERATURE REVIEW

Effectiveness, School Choice, and Public Education in the USA

In the United States, local school districts provide K-12 public education and enroll approximately 8/9 of students in the US (Levin, 2015). 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 also not kept pace with rising funding levels and with various school reforms. Evaluating effectiveness in student learning is of paramount importance to policymakers because K-12 public education consumes about 34% of total state revenues in the US (US Census of Governments, 2007). Furthermore, policymakers also grapple with the issue that 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). These policy problems appear to be resistant to school choice, standards and accountability-based reforms developed over the last three decades. The overall trend in outcomes suggest that the K-12 public education in the US is comparatively less effective than several countries of the world. In contextualizing these problems and proposing policy-relevant solutions, researchers have studied several dimensions of effectiveness in public education. The two major approaches that scholars have taken to study effectiveness in educational outcomes are productive efficiency and equity (Odden and Picus, 2013). Most notably, scholars of school choice-based reforms in public education have studied these two dimensions extensively.

On the efficiency side, school choice policies promised policymakers the expectation that market-like competition for students would nudge public schools toward efficiency in resource use and better educational outcomes (Belfield and Levin, 2005; Chubb and Moe, 1990; Gill and Booker, 2015; Godwin and Kemerer, 2002). Critics of school choice however find such policies both inefficient and inequitable. 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, 2015). 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, 2015; 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, 2015; Levin, 2015; 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, 2015; Mickelson et al., 2011). These opponents would like to see an integrated metropolitan wide local government to realize efficiency because of economies of scale and equity because of mere integration. These arguments together constitute theory on consolidated local government.

Indeed, institutional and organizational consolidation of local school districts in most of the 19th and 20th centuries have preceded the current school reforms based on decentralization that is inherent in school choice policies. The number of school districts has declined from over 130,000 in 1930 to about 16,000 in 1970 (Berry, 2005). Currently, there are about 15,000 school districts (Berkman and Plutzer, 2005; Howell, 2005). Number of public schools has also declined during the 20th Century. From a total of 217,000 in 1920, the number of schools in the US currently is over 90,000 (Berry, 2005). The average sizes of school districts and schools have also changed. Between 1930 and 2000, the average daily attendance in school increased from 87 to about 480 students. For school districts, the average daily attendance in school increased from 170 to about 2900 students between 1930 and 2000 (Berry, 2005). The size of the school boards also declined as a result of the movement toward a centralized system of schooling in the 19th and 20th centuries (Howell, 2005).

The consolidation of school districts is a consequence of larger historical developments in the economic and political structure (Howell, 2005). The progressive era embarked on removing politics and inefficiencies on account of corruption and patronage from local and state governments. Howell notes that "Businessmen, professors, and politicians lobbied for the transformation of an agrarian, decentralized pattern of schooling into a bona fide public school system that promoted the values of centralization, efficiency, modernization, and hierarchical control." (Howell, 2005, p. 3) The concerns with objectivity and efficiency gave rise to rational control and professionalism (Howell, 2005; Chubb and Moe, 1990). The civil service was invented to reward merit and modernity in government sector. These changes mirror the ongoing changes in private economic sectors. Increasing involvement of the state governments in public education finance and policy influenced school district consolidation (Strang, 1987). This view on consolidation, however, is a supply side argument, i.e., the progressive leaders supplied those reforms (Fischel, 2009). In terms of demand side perspective, the local residents gave up control over one-room schools in most cases and opted for consolidated, age-graded schools "because the one-room school did not prepare their children for a high school education. Farmers and other rural property owners were penalized if their schools were not "making the grade" and educating resident children in a more systematic way." (Fischel, 2009, p. 2) The penalty was in the form of lowered property values.

Effectiveness of Inter-School District Competition

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 (MA). School choice 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, such as private schools, charter schools and vouchers, researchers have not adequately studied school choice that is operationalized as inter-school district competition (Belfield and Levin, 2005; Gill and Booker, 2015). The existence of more school districts within a Metropolitan Area (MA) is the inter-district dimension of school choice as these school districts compete for students. The few studies on the role of inter-school district competition in effectiveness of public education focus on propositions of a single theoretical tradition in public choice that was 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 (MA) produces greater productive efficiency in student learning outcomes – the one element of effectiveness. Estimating productive efficiency as a positive relationship between measures of inter-school district competition and student achievements, Hoxby (2000) confirmed that such a relationship indeed exists. Consequently, her study's policy recommendation is to maintain polycentric school district governments in an urban area rather than a consolidated regional school district government. However, Rothstein (2007) critically evaluated Hoxby's (2000) study and reported that there was no relationship between inter-school district competition and student achievement. These conflicting findings make it necessary to investigate this topic through a more nuanced approach. This study attempts such an approach.

The Role of Local Political Institutions

Proponents of inter-school district competition also argue that a polycentric form of government works against the natural tendency of local governments to work with plentiful resources (Craw, 2008; Brennan and Buchanan, 1980; Jimenez and Hendrick, 2010). Because of the competitive pressures the local political institutions realize productive efficiencies by providing optimum levels of goods and services at lower levels of resources (Craw, 2008; Feiock, Jeong, and Kim, 2003). As local residents' political representatives, political institutions match citizen demand with school district resources (Berkman and Plutzer, 2005). 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). These studies used the reformism hypothesis to argue that type of local government matters in controlling resource use and inefficiencies in providing public goods and services (Craw, 2008; Frant, 1996; Feiock, Jeong, and Kim, 2003). 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 use lower levels of resources in providing same set of public goods and services in comparison to a local government where local elected officials have more direct control over use of resources. This direct control over resources permits elected officials to cater to narrow constituency demands. Under the scenario of limited direct control over resources, elected officials adopt residents' preferred level of demand for public education. The reformists argue that council-manager form of local government and at-large council elections are better than the mayor-council government and ward-based council elections in this regard.

Joint Effects of Inter-School District Competition and Local Political Institutions: A Theoretical Justification

Craw's (2008) Tamed Leviathan Model is particularly useful theory in examining joint effects of school choice and local political institutions on student learning as his theory has integrated elements of the reformism theory and public choice theory. The reformism theory argues that some type of local governments that exercise direct control over local government operations are not good for productive efficiency and equity than those exercising indirect control. The other key element of Craw's Tamed Leviathan Model is that existence of polycentric form of governments in urban regions is preferable to urban regional consolidated governments in realizing equity and efficiency in various desirable outcomes. The Tamed Leviathan Model posits that some type of local governments that exercise direct control over polycentric local governments' operations are not good for productive efficiency and equity than those exercising indirect control. Craw (2008) empirically tested and affirmed his Tamed Leviathan Model in the context of municipal governments in the USA. This study adapts the Tamed Leviathan Model in the context of school districts in the USA and contrasts this model with the interplay between reformism theory and consolidated local government theory. Following Berkman and Plutzer (2005), Berry and Gersen (2009), and Craw (2008), this study defines 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 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 and productive efficiency in student learning and achievement gaps. 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, 2005; 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.

In this study's context, productive efficiency in particular is defined in terms of the level of outcome at the lowest possible input (Rice and Schwartz, 2015), 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. Following Harris et. al. (2001) this study defines equity in terms of regional equity/inequity in student achievement. This study answers equity issues by assessing whether and how student achievement varies based on within state ranking of median household income in the district. Therefore, consistent with Harris et al. (2001) and Hoxby (1996), in this study equity is defined as the distribution of student achievement in school districts with varying income levels within a state.

RESEARCH QUESTIONS AND HYPOTHESES

Consistent with the Tamed Leviathan Model and consolidated theory of local government, I investigate questions pertaining to productive efficiency and equity in urban school districts in the USA. Broadly, this study's research questions include why and how inter-school district competition and local political institutions jointly matter in policy-relevant goals that include productive efficiency and equity. As discussed in the preceding, the Tamed Leviathan Model and consolidated theory of local government provide the appropriate theoretical framework to investigate these research questions. Several hypotheses help answer these research questions more appropriately. These hypotheses take opposite turns when one evaluates and contrasts the Tamed Leviathan Model and the theory of consolidated government in the context of empirical investigation in this study. This study's hypotheses according to the Tamed Leviathan Model include the following. Regarding efficiency, with an increase in inter-school district competition student achievement increases but political institutions moderate this relationship. In particular, a) student achievement in fiscally dependent school districts is higher in comparison to fiscally independent school districts; b) student achievement in school districts with appointed superintendents is higher in comparison to those with elected superintendents; c) student achievement in school districts with appointed boards is higher in comparison to school districts with at large boards; d) student achievement in school districts with at large boards is higher in comparison to school districts with ward-based elected boards; e) student achievement in school districts with appointed boards is higher in comparison to those with ward-based elected boards; f) student achievement in school districts with appointed boards is higher in comparison to those with mixed boards; g) student achievement in school districts with at large boards is higher in comparison to those with mixed boards; 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. For estimating equity implications of inter-school district competition and political institutions, two hypotheses are proposed. 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.

Data and Methods

This study uses National Education Longitudinal Study of 1988 (NELS:88) survey of the National Center of Education Statistics (NCES). 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 merging of NELS:88

with school district level datasets does not lead to significant number of missing observations on school districts regarding 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 Metropolitan Areas) is about 9,000.

I follow other similar studies to measure inter-school district competition (Hoxby, 2000; Rothstein, 2007). The school district and higher level data for years 1990 and 1992 were merged with data on student achievement and other relevant variables of the first three waves of the NELS. The school district Local Education Agency IDs (LEA) for the NELS data were derived using programs utilized to compile analytical sample in Rothstein (2007). 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. However, in merging the school district level data with the NELS data LEA IDs were used instead of the Metropolitan Statistical Area (MSA) codes that were used by Rothstein (2007). I followed this approach because the Unified Fiscal Non-Fiscal Data (UFNFD) from NCES provided more accurate measures of 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 in School District Data Book 1990 that were used by Hoxby (2000) and Rothstein (2007). Selection of urban school districts generate a panel of 5,017 K-12 pseudo-unified districts for years 1990 and 1992. 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. Since the UFNFD data does not include information on local revenues from property tax sources, the relevant information on the variable came from School District Finance Survey for each of the sample years.

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 is difficult. Due to this data limitation, the study period is confined to fiscal years between 1990 and 1992.

The Census data on 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 the year 1992 (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).

Following production function studies (Hoxby, 2000; Marlow, 2000; Roscigno et al., 2006; Zanzig, 1997), the public education productivity is measured in terms of joint effects of inter-school district competition and local political institutions on student achievement. The dependent variables for the study include standardized math and reading scores of 10th-grade students in 1990 and 12th-grade students in 1992. These student achievement measures for two years have been selected to match with the corresponding measures of inter-school district competition and political institutions for those years.

The measures for inter-school district competition and political institutions are based on Hoxby (2000), Rothstein (2007), and 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.

Inter-school district competition has two measures. The first measure is one minus the Herfindahl Index of student enrollment shares of school districts and is bounded between 0 - 1. Herfindahl Index is simply the summation of squares of student enrollment in each school district as a proportion of total number of students in a Metropolitan Area. This index captures the concept of inter-school district competition by calculating a common value of competition for students in the urban regional market. A value of Herfindahl index closer to zero implies existence of high levels of competition in a Metropolitan Area. The second measure is the number of school districts per 1000 students in a Metropolitan Area (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 student achievements across school districts based on within state groupings of school districts' median household incomes. Equity is operationalized in terms of regional equity/inequity in student learning, assessing whether student standardized test scores vary based on within state groupings of school districts' median household incomes. School districts are grouped into quintiles according to within state median household income rankings in this regard.

Additionally, various student/family and school characteristics consistent with Goldhaber and Brewer (2000), Hoxby (2000), and Rothstein (2007) are also included 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. Three state level control variables that capture differences in state policies include measures on teacher unionization, court rulings, and regions.

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 this study’s hypotheses. 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. 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 clustering of MSAs at the state level also does not meet the threshold criteria. Therefore, the final analytic sample 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 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 (not included here) of the results from the linear multi-level regressions for interactive models are performed to test hypotheses.

RESULTS

The descriptive statistics and the results for the Hausman-Taylor and multi-level linear models are presented in Appendix A at the end of this paper. Table A1 provides descriptive statistics for the variables included in various regression models. Tables A2, A3, and A4 present the main results for models that include types of electoral composition of school district boards as measures of local political institutions. The set of tables A5, A6, and A7 and the other set of tables A8, A9, and A10 present similar results for models including districts with an elected or appointed superintendent and fiscal dependence as measures of local political institutions respectively. These tables present results for only key independent variables and their interaction terms along with aggregate model-specific statistics. Only statistically significant interactions are included in the tables. Also, standard errors are included for statistically significant coefficients only. All the models in the tables 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. For the multi-level linear models with significant interactions, several additional marginal analyses (not shown here) aid their substantive interpretations. The Hausman-Taylor regression results for the three types of political institutions are presented in tables A2, A5 and A8.

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 A3, A6, and A9. 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 A4, A7, and A10. 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.

Marginal analyses of interactions in multi-level linear regression models (not shown here) 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).

Hausman-Taylor Regression Model Results

The sigma_u in the tables for the Hausman-Taylor regression models (tables A2, A5, and A8) 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 A2, A5, and A8 is intraclass 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 A2, A5, and A8 show that when inter-school district competition is correlated with the individual level effects, the inter-school district competition interacts with the within-state median housing income quintile rankings of school districts in affecting student's reading and math scores. Only one measure of political institutions has a negative and significant effect on student's reading score. In table 8, student's reading scores are significantly lower in fiscally dependent school districts than those in fiscally independent school districts.

Multilevel Linear Regression Models

Multilevel model results for student's 10th grade reading and math scores are presented in tables A3, A6, and A9. Results show that the two measures of inter-school district competition interact with the type of school district's fiscal autonomy in affecting student's 10th grade reading scores. With an increase in inter-school district competition, student's reading scores are higher in fiscally dependent school districts than those in independent school districts.

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. 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 student's 10th grade reading and math achievement with a few exceptions. Student's 10th grade reading score is 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. Student's 10th grade reading and math score is higher in the second, the third and the fourth income quintile school districts with elected superintendent than those in the lowest income quintile school district with appointed superintendent. Student's 10th grade reading and math score is 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. Student's 10th grade math score is 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 model results for student's 12th grade reading and math scores are presented in tables A4, A7, and A10. Results show that the Herfindahl Index measure of inter-school district competition interacts with the type of school district board in affecting student's 12th grade math scores. With an increase in inter-school district competition, student's math scores are higher in at-large, ward-based, and mixed board school districts than those in appointed board school districts.

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 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.

The political institutions also interact with the within-state median household income rankings of school districts in affecting student's 12th grade reading and math achievement with a few exceptions. The type of school district board interacts with the within-state median household income rankings of school districts in affecting student 12th grade reading and math achievement. Specifically, student's 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. Student's 12th grade math scores are higher in the fourth income quintile school districts with mixed boards than those in the lowest income quintile school district with appointed boards. The type of school district superintendent and the type of fiscal autonomy of school districts interact with the within-state median household income rankings of school districts in affecting student’s 12th grade math achievement. Student's 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. Student's 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.

DISCUSSION

This study’s results are 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. Substantively, these results suggest that inter-school district competition does not robustly affect student achievement.

The additive models offer mixed results regarding the effects of political institutions on student achievement. Out of various types of political institutions, only the type of school district superintendent and the type of fiscal autonomy of school districts have significant effects on student achievement in some models. Student's 10th grade math scores are higher in school districts with an elected superintendent than those with appointed superintendents. Student's reading scores are lower in fiscally dependent school districts than in fiscally independent school districts.

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. These results do not support the theory of consolidated government either. Overall, the additive models imply that school districts with appointed superintendents and those that are fiscally dependent are productively less efficient.

Productive Efficiency Effects of Inter-School District Competition and Political Institutions

The interactive models offer mixed results on the joint effects of inter-school district competition and local political institutions on student achievement. The marginal analyses (not shown here) go deeper into the details of productive efficiency effects of inter-school district competition and political institutions. In the multilevel models, inter-school district competition and type of political institutions interact in influencing student achievement (Model M2 in Table A4 and Models R3 and R6 in Table A9). 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, student's 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 theory of consolidated government.

Results in Models R3 and R6 in Table A9 show some support for the Tamed Leviathan Model in Craw (2008). The results from marginal analysis (not shown here) of interaction in Table A9 support the productive efficiency argument in the Tamed Leviathan model because increase in competition widens the gap in student's 10th grade reading scores between those in fiscally dependent school districts and those in fiscally independent school districts. Similar relationship is observed when the inter-school district competition is measured as student weighted count of school districts in a MA.

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 student's 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).

Equity Effects of Inter-School District Competition and Political Institutions

The marginal analyses (not shown here) go deeper into the details of equity effects of inter-school district competition and political institutions. The results in the Hausman-Taylor regression models (Tables A2, A5, and A8) show that inter-school district competition has equity effects on student achievement, but local political institutions do not. Multi-level models (in tables A3, A4, A6, A7, A9, and A10) also provide results concerning equity. 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. Regarding 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, regarding 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 student's reading scores in 10th and 12th grades therefore supporting the claims underlying the theory of consolidated government.

Student's 10th grade reading score is 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. Student's 10th grade reading and math score is higher in the second, the third and the fourth income quintile school districts with elected superintendent than those in the lowest income quintile school district with appointed superintendent in models that use either measures of inter-school district competition. Student's 10th grade reading and math score is 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. Student's 10th grade math score is 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.

Student's 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 in models that use either type of inter-school district competition. Student's

12th grade math scores are higher in the 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. Student's 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 in models that use either type of inter-school district competition. Student's 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 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 student's reading and math scores in 10th and 12th grades as political institutions with little direct control over school district's resources do not produce equity in student learning.

Marginal analysis of interactions in Table A3 show that the 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. The comparative marginals however show that increase in competition widens the gap in student's 10th grade reading scores between those in the third income quintile school districts and those in the lowest income quintile school districts. The comparative marginals similarly show that increase in competition widens the gap in student's 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. These findings support the equity argument in the consolidated local government model. The singular comparative marginal similarly supports the equity argument in the consolidated local government model because there is inequity in student's 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 has similar finding because student's 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 from marginal analyses of 10th grade reading scores in the relevant model that uses student enrollment weighted count measure of inter-school district competition 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 for interactions in the model that uses the Herfindahl Index measure of inter-school district competition 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. Marginal analysis produces similar results in case of 12th grade reading score and student enrollment weighted count measure of inter-school district competition, 12th grade math score and the Herfindahl Index measure of inter-school district competition, and 12th grade math score 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 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, there is partial support for the reformism perspective because student's 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. Student's 12th grade math score is also 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.

Regarding equity effects of elected / appointed superintendents, marginal analysis results suggest that school districts with appointed superintendents are more inequitable than those with elected superintendents. This is evident because student's 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. Results from marginal analyses for 10th grade math scores for interactions in the model that uses 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 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. Similar results for 12th grade math scores hold. 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, marginal analysis results do not support the reformism perspective because student's 10th grade math scores are higher in the fourth and the second income quintile school districts with elected superintendent than those with appointed superintendents in similar income quintiles respectively and because appointed superintendents are arguably more professional.

Results from marginal analysis of equity effects of fiscally dependent / independent school districts for student's 10th grade reading scores and for 10th grade math scores suggest that fiscally independent school districts are more inequitable than fiscally independent school districts. This is evident because inequity exists for a greater number of comparisons across income quintiles for fiscally independent school districts than those for fiscally dependent school districts. Results in 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, these results do not support the reformism perspective because student's 10th grade math score 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 have arguably more professional governing arrangement.

Results support the equity argument in the consolidated local government model. Student's 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. Student's 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 student's 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. Student's 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. Student's 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 student's 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 achievement 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 student's reading and math scores. Student's 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.

In sum, 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. 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.

POLICY IMPLICATIONS AND LIMITATIONS

This study informs questions concerning the policy implications of equity and productive efficiency in educational outcomes in K-12 public education in the USA. It focuses on the role of school district-level locational factors including inter-school district competition and the type of political institutions in student achievement.

There is limited research on the role of school choice, defined as inter-school district competition, on productive efficiencies and equity in educational outcomes. The broader view in the literature on school choice is that market-like competition for students among public schools bring productive efficiency in resource use and better educational outcomes (Belfield and Levin, 2005; Chubb and Moe, 1990; Gill and Booker, 2015; 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 student learning is important because existing studies ignore the role of political institutions in equity and productive efficiency of educational outcomes. Political institutions are important to consider while investigating equity and productive efficiency in student learning because the local political institutions influence efficiencies in resource mobilization and use (Craw, 2008; Feiock, Jeong, and Kim, 2003). As local residents' political representatives, political institutions also match citizen demand with school district's provision for public education (Berkman and Plutzer, 2005).

This study utilizes the Tamed Leviathan model and the theory of consolidated government to evaluate the joint effects of political institutions and inter-school district competition on student achievement. This investigation makes empirical contributions to the literatures on productive efficiency of school choice in general and school choice as 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. There is no conclusive evidence on positive impact of school choice reform policies on educational outcomes. In fact, empirical evidence suggests that these policies have led to re-segregation. Also, the theoretical and empirical literatures have not conclusively established the supremacy of school choice policies over the traditional public education system.

This study looks at this debate afresh in the context of inter-school district competition. Specifically, the empirical estimation evaluates the joint effects of political institutions and inter-school district competition on productive efficiency and equity in student achievement.

This study offers several interesting findings. 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 from Hausman Taylor regression model show that while the inter- school district competition has equity effects on student achievement the local political institutions do not. In the multilevel models however, inter-school district competition and type of political institutions interact in influencing student achievement. The interactive multilevel linear regression models show that inter-school district competition has productive efficiency and equity effects on student achievement. The political institutions only 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 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. Regarding 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. Regarding 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 global, regional, and local contexts such as the roles of the levels of inter-school district competition and types of local political institutions in equity and productive efficiency in educational outcomes helps policymakers adapt policies to those contexts. The empirical findings of this study clarify why and how organizational, socioeconomic, and political contexts matter in bringing desirable educational outcomes. The 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 public policy perspective, findings of this study therefore inform the formulation of appropriate policies for better educational outcomes through reorganization of school finance.

Regarding 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 study 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 achievements, but the gaps in student achievements between the lower and the higher income school districts also register spike. However, the policymakers can mitigate this tradeoff to some extent by appointing 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 after the year 1992 when such data were collected last. Given that data on political institutions are crucial for understanding the holistic effectiveness of school choice policy, this study recommends that the Census Bureau should reconsider collection of data on Popularly Elected Officials Survey. Additionally, 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 study 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.

As having more professional political institutions is good for 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 outcomes.

REFERENCES

Andrews, M., Duncombe, W. D. and Yinger, J. (2002). Revisiting economies of size in American education: are we any closer to a consensus? *Economics of Education Review*, 21: 245-262.

Belfield, C.R. and Levin, H.M. (2005). *Privatizing Educational Choice: Consequences for Parents, Schools, and Public Policy*. Paradigm Publishers: Boulder, CO.

Berkman, M. B., and Plutzer, E. (2005). *Ten Thousand Democracies: Politics and Public Opinion in America's School Districts*. Washington, DC: Georgetown University Press.

Berry, C. R. and Gersen, J. E. (2009). Fiscal consequences of electoral institutions. *Journal of Law and Economics*, 52 (3): 469-495.

Brambor, T., Clark, W. R., and Golder, M. (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis*, 14(1): 63–82.

Brennan, G., and Buchanan, J. (1980). *The power to tax: Analytic foundations of a fiscal constitution*. Cambridge. Cambridge Univ. Press.

Bryk, A.S. and Raudenbush, S. (1992). *Hierarchical linear models*. First Edition. Thousand Oaks, CA: Sage Publications.

Cameron, A. C., and Trivedi, P. K. (2009). *Microeconometrics using stata* (Vol. 5). College Station, TX: Stata Press.

Chubb, J.E. and Moe, T.M. (1990). *Politics, Markets, and America's Schools*. Washington, D.C.: Brookings Institution.

Corcoran, S.P. and Evans, W.N. (2008). Equity, Adequacy and the Evolving State Role in Education Finance. In H.F. Ladd and Edward B. Fiske (eds.) *Handbook of Research in Education Finance and Policy*. Routledge, New York.

Craw, M. (2008). Taming the local Leviathan: Institutional and economic constraints on municipal budgets. *Urban Affairs Review*, 43 (5): 663-690.

Dawson, J. F., and Richter, A. W. (2006). Probing three-way interactions in moderated multiple regression: Development and application of a slope difference test. *Journal of Applied Psychology*, 91(4), 917–926.

DiPrete. T.A. and Forristal, J.D. (1994). Multilevel models: Method and substance. *Annual Review of Sociology*, 200, 331-357.

Epple, D. and Romano, R. (2000). *Neighborhood Schools, Choice, and the Distribution of Educational Benefits*. NBER Working Paper #W7596.

Feiock, R. C., Jeong, M.-G., and Kim, J. (2003). Credible commitment and council-manager government: Implications for policy instrument choices. *Public Administration Review*, 63(5): 616–25.

Fiske, E. and Ladd, H.F. (2000). *When schools compete: A cautionary tale*. Brookings Institution: Washington, D.C.

Frant, H. (1996). High-powered and low-powered incentives in the public sector. *Journal of Public Administration Research and Theory*, 6 (3), 365–81.

Frederickson, H. G. (1999). The Repositioning of American public administration. *PS: Political Science and Politics*, 32(4), 701–711.

Friedman, M. (1955). The Role of Government in Education. In R. Solo, Economics and the Public Interest (pp. 123-144). New Brunswick, NJ.: Rutgers University Press.

Gelman, A. and Hill, J. (2007). *Data Analysis using Regression and Multilevel/Hierarchical Models*. New York: Cambridge University Press.

Gill, B. and Booker, K. (2015). Student Competition and Student Outcomes. In H.F. Ladd and Edward B. Fiske (eds.) *Handbook of Research in Education Finance and Policy*. Routledge, New York.

Godwin, R.K. and Kemerer, F.R. (2002). *School Choice Tradeoffs: Liberty, Equity, and Diversity*. Texas: University of Texas Press.

Goldhaber, D.D. and Brewer, D.J. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis*, 22(2), 129-145.

Gordon, N. and Knight, B. (2008). The Effects of School District Consolidation on Educational Cost and Quality. *Public Finance Review*, 36(4): 408-430.

Hanushek, E.A. and Lindseth, A.A. (2009). *Schoolhouses, Courthouses, and Statehouses: Solving the Funding-Achievement Puzzle in America's Public Schools*. Princeton University Press, Princeton, NJ.

Harris, A.R., Evans, W.N., and Schwab, R.M. (2001). Education spending in an aging America, *Journal of Public Economics*, 81: 449–472.

Hirsch, B. T. and Macpherson, D. A. (2003). Union membership and coverage database from the current population survey: Note. *Industrial and Labor Relations Review*, 56(2), 349-54.

Hirsch, B. T. and Schumacher, E. J. (2004). Match Bias in Wage Gap Estimates Due to Earnings Imputation. *Journal of Labor Economics*, Vol. 22 (3): 689-722.

Howell-Moroney, M. (2008). The Tiebout hypothesis 50 years later: Lessons and lingering challenges for metropolitan governance in the 21st century. *Public Administration Review*, 68(1), 97-109.

Hoxby, C.M. (1996). Are efficiency and equity in school finance substitute or complements? *Journal of Economic Perspectives*, *10*, 51-72.

Hoxby, C.M. (2000). Does competition among public schools benefit students and taxpayers? *American Economic Review*, *90*(5), 1209-1238.

Jimenez, B.S., & Hendrick, R. (2010). Is government consolidation the answer? *State and Local Government Review*, *42*(3), 258-270.

Kaufman, R.L. (1995). Taking Structure Seriously: The Perils of Ignoring Structural Error in Contextual Analysis. Paper presented at the Annual Meetings of the American Sociological Association. Washington D.C., August.

LeRoux, K., Brandenburger, P. W., & Pandey, S. K. (2010). Interlocal service cooperation in U.S. cities: A social network explanation. *Public Administration Review*, *70*(2), 268-278.

Levin, H.M. (2015). Issues in Education Privatization. In H.F. Ladd and Edward B. Fiske (eds.) *Handbook of Research in Education Finance and Policy*. Routledge, New York.

MacDonald, L. (2008). The impact of government structure on local public expenditures. *Public Choice*, *136*(3–4), 457–473.

Marlow, M.L. (1997). Public education supply and student performance. *Applied Economics*, *29*, 617-626.

Marlow, M.L. (2000). Spending, school structure, and public education quality: Evidence from California. *Economics of Education Review*, *19*, 89-106.

Mickelson, R.A., Bottia, M., & Southworth, S. (2011). School Choice and Segregation by Race, Ethnicity, Class, and Achievement. *Education Policy Research Unit*. Online access at: http://epsl.asu.edu/epru/documents/EPSL-0803-260-EPRU.pdf

Millimet, D. L. and Collier, T. (2008). Efficiency in public schools: Does competition matter? *Journal of Econometrics*, *145*(1-2), 134–157.

Millimet, D.L., Rangaprasad, V., 2007. Strategic competition amongst public schools. *Regional Science & Urban Economics*, *37*(2), 199–219.

Odden, A.R. and Picus, L.O. (2013). *School Finance: A Policy Perspective.* McGraw-Hill, Boston.

Orfield, G. and Yun, J. (1999). *Resegregation in American Schools*. Cambridge, MA: Harvard Civil Rights Project.

Ostrom, V., Tiebout, C. M., and Warren, R. (1961). The Organization of government in metropolitan areas: A theoretical inquiry. *American Political Science Review*, *55*(4), 831-842.

Peterson, P.E. (2010). *Saving Schools: From Horace Mann to Virtual Learning*. The Belknap Press of Harvard University Press, Cambridge.

Poterba, J.M. (1997). Demographic structure and the political economy of public education. *Journal of Policy Analysis and Management*, *16*(1), 48−66.

Raudenbush, S., and Bryk, A.S. (2002). *Hierarchical linear models*. Second Edition. Thousand Oaks, CA: Sage Publications.

Renzulli, L., Parrott, H.M., & Beattie, I.R. (2011). Racial mismatch and school type: Teacher satisfaction and retention in charter and traditional public schools. *Sociology of Education*, *84*(1), 23-48.

Rice, J.K., & Schwartz, A.M. (2015). Toward an understanding of productivity in education. In H.F. Ladd and Edward B. Fiske (eds.) *Handbook of Research in Education Finance and Policy*. Routledge, New York.

Roscigno, V.J., Tomaskovic-Devey, D., & Crowley, M. (2006). Education and the inequalities of place. *Social Forces*, *84*(4), 2121-2145.

Rothstein, J. (2007). Does competition among public schools benefit students and taxpayers? Comment. *American Economic Review*, *97*(5), 2026-2037.

Schneider, M., Teske, P., Roch, C., & Marschall, M. (1997). Network to nowhere: Segregation and stratification in networks of information about schools. *American Journal of Political Science*, *41*, 1201-1223.

Tiebout, C. (1956). A pure theory of local expenditure. *Journal of Political Economy*, *64*(October): 416-424.

U.S. Census Bureau, Census of Governments. (2007). Survey of Local Government Finances - School Systems.

Verger, A., Fontdevila, C., & Zancajo, A. (2016). *The privatization of education: A political economy of global education reform*. Teachers College Press.

Wells, A.S. (1993). *Time to choose: American at the crossroads of school choice policy*. Hill and Wang: New York.

Wolfe, A. (2003). *School Choice. The Moral Debate*. Princeton, NJ: Princeton University Press.

Zanzig, B.R. (1997). Measuring the impact of competition in local government education markets on the cognitive achievement of students. *Economics of Education Review*, *16*, 431-441.

APPENDIX A

TABLE A1
Descriptive Statistics by Year - Student Achievement

	1990		1992	
Variable	*M*	*SD*	*M*	*SD*
Reading Score	49.393	10.123	50.419	10.253
Math Score	49.383	10.673	50.372	10.511
8th Gr. Reading Score	50.464	10.203	51.136	10.078
8th Gr. Math Score	50.746	10.583	51.259	10.78
White	0.366	0.482	0.379	0.485
Black	0.317	0.465	0.312	0.463
Hispanic	0.183	0.387	0.177	0.382
Asian	0.117	0.321	0.112	0.315
American Indian	0.017	0.128	0.021	0.142
Male	0.502	0.5	1.48	0.5
Lowest SES Qntl	0.302	0.459	0.283	0.45
2nd SES Quintile	0.224	0.417	0.218	0.413
3rd SES Quintile	0.212	0.409	0.216	0.411
Top SES Quintile	0.261	0.439	0.283	0.451
% Minority-8th	56.636	35.578	56.597	35.994
% Free Lunch-8th	33.792	34.076	33.232	34.119
St.-Teacher Ratio:8th	19.886	6.279	19.931	6.098
Private School	0.227	0.419	0.258	0.437
North East	0.36	0.48	0.324	0.468
North Central	0.098	0.297	0.094	0.292
South	0.245	0.43	0.256	0.436
West	0.297	0.457	0.325	0.469
Herfinhahl Index	0.541	0.308	0.56	0.308
Weighted Count of SDs	0.063	0.062	0.06	0.061
Appointed SBs	0.52	0.5	0.483	0.5
At-Large SBs	0.334	0.472	0.364	0.481
Ward-Based SBs	0.096	0.294	0.1	0.299
Mixed SBs	0.05	0.219	0.053	0.225
Elected Superintendents	0.132	0.339	0.147	0.354
Fiscally Dependent SDs	0.418	0.493	0.387	0.487
Lowest Quintile SDs	0.097	0.297	0.091	0.287
2nd Qntl SDs	0.594	0.491	0.589	0.492
3rd Income Quintile SDs	0.126	0.332	0.139	0.346
4th Income Quintile SDs	0.107	0.309	0.109	0.311
Top Income Quintile SDs	0.075	0.264	0.073	0.259

(continued)

Variable	1990 M	1990 SD	1992 M	1992 SD
% Non-white in SBs	18.614	27.14	19.255	27.535
Fiscal Capacity: % Per- Pupil Revenue from Local Sources	41.747	15.513	38.318	17.749
Per-Pupil State Revenue	2994.9	882.64	3107.4	923.04
Log-Per-Pupil St. Rev.	7.945	0.394	7.98	0.416
Log-Total SD Population	14.402	1.603	14.399	1.519
Total SD Population	3733810	2926200	3620380	2907050
Total MSA Population	5843260	3453980	5831160	3508330
Log- MSA Population	15.164	1.219	15.185	1.109
Proportion of 5-17 Years Pop.	0.169	0.02	0.173	0.018
% with HS or more	70.327	7.481	70.971	7.709
% Foreign Born Pop.	24.258	13.315	25.323	13.747
% Non-white Pop.	40.26	15.393	41.253	15.517
Racial Diversity Index: MSA	0.498	0.136	0.515	0.14
Median HH Income	30330.2	5577.95	32435	6165.57
Log-Median HH Income	10.306	0.163	10.372	0.164
% Owner Occupied Housing	43.671	14.638	44.892	14.658
Median Housing Values	154313	66793.7	158965	65607.1
% Local Revenue	38.847	35.982	48.218	39.001
% Population in Poverty	17.753	6.586	17.764	6.316
% 65 Years & above Pop.	11.611	2.673	11.413	2.61
% Public Sector Employees Under Collective Bargaining	54.461	18.306	53.519	17.109

TABLE A2
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	5.07	-0.032	0.369	-0.833	0.002	-0.028	-0.786	-0.047	-0.074	0.73
3rd Qntl	0.455	0.603	4.36	-0.014	0.557	-0.954	-0.072	-0.166	-0.873	-0.187	-0.346	1.32
4th Qntl	-0.156	-0.124	4.95	-0.601	-0.25	-1.41	-0.143	-0.207	0.849	-0.335	-0.415	1.31
Top Qntl	0.12	0.193	5.14	-0.406	0.177	-0.842	-0.138	-0.271	-0.161	-0.335	-0.594	1.08
School District	3.99	4.39	12.4	-0.101	17.1	12.2	0.518	-1.13	0.155	-0.524	4.1	11
2nd Qntl*Competition			-5.69			5.46			0.932			-3.58
3rd Qntl*Competition			-4.59			7.1			0.823			-32.951
4th Qntl*Competition			-6.25			5.36			-1.31			-38.1066
Top Qntl*Competition			-6.07			4.25			0			-8.78
Intercept	3.87	-5	-11	0.527	4.49	5.46	15.3	22.6	24	5.65	7.17	3.94
Chi-Square Statistics	12171*	9557**	9035**	12765*	11390*	11483*	19555**	15942**	14312**	29133**	27233**	27409***
sigma_u	7.99	9.81	10.2	7.69	8.39	8.34	7.58	8.64	9.43	5.23	5.57	5.49
sigma_e	4.16	4.16	4.16	4.16	4.16	4.16	2.7	2.7	2.7	2.7	2.7	2.7
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

Note. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A3
Results of the Multilevel Linear Regression Models, 10th Grade Reading & Math Scores

Variable	Reading Scores					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 Competition	-0.157	0.135	1.05	-0.892	-5.215	0.146	-0.834	0.187	0.331	-7.784	-5.55
At-Large District Board	-0.316	-1.12	0.934	-0.328	-1.52	-0.186	0.192	0.022	-0.185	-0.496	-0.731
Ward-based District Board	-0.307	0.183	0.139	-0.324	0.289	-0.142	0.696	-0.467	-0.141	0.418	-0.651
Mixed District Board	-0.518	-2.07	-2.01	-0.533	-0.291	0.348	-0.379	-0.477	0.351	-0.137	-0.53
2nd Lowest Income Quintile	0.098	-0.411	0.299	0.083	-1.15	0.168	-0.228	0.225	0.166	0.107	0.185
3rd Income Quintile	-0.006	0.051	0.229	-0.015	-0.266	0.123	0.231	0.2	0.118	0.905	0.163
4th Income Quintile	-0.417	-0.756	-0.187	-0.434	-1.64	-0.164	-1.24	-0.096	-0.167	-0.627	-0.128
Top Income Quintile	-0.508	-0.163	-0.223	-0.524	-1.67	-0.022	0.796	0.059	-0.028	0.889	0.021
2nd Quintile*Competition		-0.176			2.31		1.02			1.82	
3rd Quintile*Competition		0.14			3.560*		1.21			2.79	
4th Quintile*Competition		-0.902			0.358		1.09			1.03	
Top Quintile*Competition		-1.95			-1.8		0.395			-0.282	
2nd Quintile*At-Large DB		0.921			0.983		-0.46			-0.391	
3rd Quintile*At-Large DB		0.313			-0.051		-1.09			-1.42	
4th Quintile*At-Large DB		1.47			1.51		0.426			0.416	
Top Quintile*At-Large DB		1.4			1.6		-1.09			-0.958	
2nd Quintile*Ward DB		-0.3			-0.323		-0.821			-0.669	
3rd Quintile*Ward DB		-1.55			-1.69		-1.59			-1.7	
4th Quintile*Ward DB		-0.441			-0.53		-0.881			-0.866	
Top Quintile*Ward DB		1.06			1.32		-1.36			-0.995	
2nd Quintile*Mixed DB		1.03			0.352		-0.197			-0.168	
3rd Quintile*Mixed DB		-1.48			-3.0562		-1.01			-1.57	
4th Quintile*Mixed DB		1.3			0.814		-0.229			0.017	
Top Quintile*Mixed DB		2.71			2.64		-1.85			-1.48	

(continued)

Variable	Reading Scores					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
Intercept	16.7	19.900* (9.650)	20.500* (9.620)	17.8	20.000* (9.070)	8.88	10.7	10.5	8.32	8.15	9.34
Log-MSA Random Effects (Std. Dev.)	-0.256	-0.04891	-0.0413	-0.261	-0.052785	-0.483*** (0.146)	-0.469** (0.146)	-0.471** (0.145)	-0.482** (0.147)	-0.478** (0.150)	-0.476** (0.148)
Log-Residual Random Effects (Std. Dev.)	1.750*** (0.009)	1.740*** (0.010)	1.750*** (0.009)	1.750*** (0.009)	1.740*** (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	29797***	36810***	30706***	29825***	41164***	33099***	43742***	33592***	34540***	45833***	34499***
Loglikelihood	-30707	-30690	-30703	-30707	-30687	-28575	-28566	-28574	-28575	-28563	-28574

Note. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A4
Results of the Multilevel Linear Regression Models, 12th Grade Reading & Math Scores

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	M4	M5	M6
School District Competition	-0.793	-1.669	-1.53	-1.82	-1.246	-0.531	0.25	-4.727** (1.573)	1.79	-4.602	-2.89
At-Large District Board	-0.561	-1.26	-1.33	-0.549	-0.284	-0.442	-0.338	-2.36	-0.325	-0.436	-0.37
Ward-based District Board	-0.21	1.34	1.17	-0.2	1.23	1.17	-0.179	-1.02	-0.157	0.414	0.342
Mixed District Board	-0.893	-2.26	-2.5	-0.875	-0.093	-0.206	-0.038	-1.03	-0.047	-0.968	-1.02
2nd Lowest Income Quintile	0.141	0.11	0.146	0.164	0.45	0.477	-0.171	-2.44	-0.151	0.403	0.477
3rd Income Quintile	-0.148	0.758	1.23	-0.102	1.01	1.22	-0.216	-1.46	-0.213	0.955	1.25
4th Income Quintile	-0.281	-1.97	-1.79	-0.251	-1.97	-1.63	-0.663	-4.170** (1.480)	-0.634	-2.31	-2.19
Top Income Quintile	0.202	-0.483	-0.514	0.241	-0.626	-0.543	-0.293	-2.53	-0.278	-0.153	-0.133
At-Large DB*Competition		0.592	0.655		-2.3	-2		2.680* (1.240)		5.22	4.07
Ward DB*Competition		0.659	0.804		3.41	4.04		2.940* (1.330)		7.95	7.77
Mixed DB*Competition		1.61	1.87		-3.65	-3.37		1.59		8.12	7.59
2nd Quintile*Competition		-0.001			-1.73			2.780* (1.250)		-0.239	
3rd Quintile*Competition		0.653			2.57			3.200* (1.330)		2.87	
4th Quintile*Competition		0.269			4.38			2.05		0.968	
Top Quintile*Competition		0.001			0.408			2.910* (1.450)		-1.12	
2nd Quintile*At-Large DB		0.125	0.091		0.242	-0.214		-0.229		-0.734	-0.863
3rd Quintile*At-Large DB		-1.21	-1.16		-1.47	-1.15		-1.36		-1.77	-1.46
4th Quintile*At-Large DB		1.65	1.67		1.11	1.51		1.99		1.55	1.64
Top Quintile*At-Large DB		0.854	0.863		0.821	0.866		-0.173		-0.174	-0.282
2nd Quintile*Ward DB		-3.0576	-3.0284		-2.85	-3.1624		-0.812		-1.12	-1.09
3rd Quintile*Ward DB		-3.940** (1.210)	-3.890** (1.220)		-3.910** (1.200)	-3.760** (1.220)		-2.9		-3.19	-2.99

(continued)

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	M4	M5	M6
4th Quintile*Ward DB		-0.481	-0.424		-0.296	-0.186		0.066		0.085	0.212
Top Quintile*Ward DB		-0.878	-0.838		-0.695	-0.796		-1.37		-1.02	-1.18
2nd Quintile*Mixed DB		0.975	1.04		0.075	0.014		-0.399		-0.352	-0.304
3rd Quintile*Mixed DB		-2.33	-2.33		-4.6158	-4.1613		-2.23		-2.02	-1.82
4th Quintile*Mixed DB		2.98	3.01		2.18	2.59		3.060* (1.410)		3.120* (1.500)	3.230* (1.460)
Top Quintile*Mixed DB		-0.036	-0.027		-0.209	-0.193		-0.665		-0.151	-0.305
Intercept	13.8	16.9	16.9	17.3	17.3	17.5	10	15.6	7.8	4.7	6.63
Log-MSA Random Effects (Std. Dev.)	-0.161	-0.155	-0.161	-0.153	-0.195	-0.182	-0.254	-0.273	-0.257	-0.294	-0.262
Log-Residual Random Effects (Std. Dev.)	1.850*** (0.012)	1.850*** (0.012)	1.850*** (0.012)	1.850*** (0.012)	1.850*** (0.012)	1.850*** (0.012)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)
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

Note. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A5
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
Intercept	5.62	6.75	2.73	2.38	3.74	-1.67	15.2	16.6	19.9	6.06	4.26	4.25
Chi-Square Statistics	12040***	9151***	8351***	12553***	12337***	12460***	20206***	16081***	14650***	29032***	29297***	29218***
sigma_u	8.08	10.1	10.8	7.81	7.94	7.86	7.38	8.77	9.38	5.25	5.19	5.18
sigma_e	4.16	4.16	4.16	4.16	4.16	4.16	2.7	2.7	2.7	2.7	2.7	2.7
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

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors. None of the interactions in the models turned out to be statistically significant.

TABLE A6
Results of the Multilevel Linear Regression Models, 10th Grade Reading and Math Scores

Variable	Reading Score					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 Competition	-0.041	0.254	0.313	-0.628	-3.651** (1.285)	0.531	-0.798	0.279	0.778	-0.429	0.629
Elected Superintendent	0.24	-1.1	-1.19	0.17	-3.590*** (0.824)	0.877** (0.329)	-1.73	-1.69	0.784* (0.328)	-1.17	-0.988
2nd Income Quintile	0.13	0.153	0.11	0.11	-0.778	0.113	-0.945	0.046	0.095	-0.249	0.042
3rd Income Quintile	-0.006	-1.44	-0.092	-0.025	-0.73677	0.01	-0.78	0.023	-0.011	-0.402	0.004
4th Income Quintile	-0.413	-0.017	-0.508	-0.425	-1.15	-0.334	-1.89	-0.408	-0.349	-0.925	-0.439
Top Income Quintile	-0.516	0.065	-0.713	-0.518	-1.13	-0.256	-0.773	-0.318	-0.276	-0.501	-0.357
2nd Quintile*Competition		-0.069			3.790* (1.860)		1.24			1.21	
3rd Quintile*Competition		1.72			5.070*** (1.530)		0.997			1.7	
4th Quintile*Competition		-0.593			2.64		1.85			2.4	
Top Quintile*Competition		-0.923			1.31		0.633			0.132	
2nd Quintile*El_Supdt		0.738	0.885		2.620* (1.160)		2.76*** (0.812)	2.60*** (0.714)		2.24** (0.779)	2.02** (0.641)
3rd Quintile*El_Supdt		2.92** (0.907)	2.47** (0.892)		3.62*** (0.874)		1.02	0.936		0.894	0.529
4th Quintile*El_Supdt		1.98** (0.690)	2.26*** (0.654)		3.13*** (0.731)		2.37*** (0.590)	2.06*** (0.587)		2.22** (0.677)	1.83*** (0.551)
Top Quintile*El_Supdt		2.500** (0.936)	3.06*** (0.790)		4.02*** (0.888)		2.020** (0.701)	2.170** (0.685)		1.910* (0.830)	1.81** (0.663)
Intercept	15.9	16.6	15.9	16.4	15.6	9.2	9.26	7.6	7.56	6.22	6.48
Log-MSA	-0.263	-0.045732	-0.284	-0.273	-0.04321	-0.502*** (0.150)	-0.573*** (0.168)	-0.549*** (0.164)	-0.500** (0.154)	-0.560** (0.172)	-0.537** (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***
Longlikelihood	-30708	-30701	-30704	-30823	-30699	-28574	-28569	-28570	-28575	-28570	-28571

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A7
Results of the Multilevel Linear Regression Models, 12th Grade Reading and Math Scores

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	M4	M5	M6
School Dist Competition	-0.853	-0.97	-0.862	-1.92	-4.034	-4.05	0.498	-2.644** (0.967)	2.18	1.087	1.92
Elected Superintendent	-0.123	1.51	-0.145	-0.007	0.612	0.155	0.487	-4.4685	0.503	-1.57	-1.58
2nd Income Quintile	0.237	0.587	0.236	0.257	0.288	0.189	-0.172	-2.490** (0.858)	-0.161	-0.066	-0.248
3rd Income Quintile	-0.075	-0.971	-0.076	-0.037	-0.957	-0.94	-0.25	-2.5452	-0.262	-0.831	-0.243
4th Income Quintile	-0.189	-0.278	-0.189	-0.174	-1.25	-1.14	-0.717	-3.500*** (0.936)	-0.701	-1.56	-0.917
Top Income Quintile	0.272	0.153	0.272	0.295	-0.207	-0.199	-0.387	-3.570*** (1.040)	-0.385	-0.527	-0.501
2nd Quintile*Competition		-0.445			-0.532	-0.14		2.710* (1.160)		-1.23	
3rd Quintile*Competition		1.19			4.27	4.274		2.870* (1.340)		2.68	
4th Quintile*Competition		0.123			5.690*	5.361* (2.622)		3.300** (1.270)		3.56	
Top Quintile*Competition		0.176			1.85	1.95		3.960** (1.430)		-0.707	
2nd Quintile*El_Supdt		-3.48			-2.72			3.400** (1.090)		1.87	2.170* (0.905)
3rd Quintile*El_Supdt		-1.03			-0.312			1.12		0.645	0.149
4th Quintile*El_Supdt		-1.16			-0.051			3.830***		3.160**	2.710*** (0.918)
Top Quintile*El_Supdt		-1.05			-0.479			3.060** (1.060)		1.73	1.85
Intercept	13.6	13.8	13.5	17.2	16.5	17.006	10.3	14	7.22	3.75	5.99

(continued)

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	M4	M5	M6
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
Log-Residual Random Effects (Std. Dev.)	1.860*** (0.012)	1.850*** (0.012)	1.860*** (0.012)	1.860*** (0.012)	1.850*** (0.012)	1.860*** (0.012)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)
Chi-Square Statistics	17578***	74788***	18344***	18087***	71739***	18145***	29062***	3.20E+05***	28440***	2.80E+05***	2.90E+05***
Longlikelihood	-24213	-24211	-24213	-24213	-24207	-24213	-22483	-22470	-22481	-22470	-22475

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A8
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
Dependent School Districts	-0.45344	-2.78	-5.21	-0.45448	-2.13	-2.832	-0.046	-3.76	-5	-0.139	0.247	0.032
Intercept	-0.849	-1.53	-5.45	-4.09	6.17	-1.25	15.2	15.2	19	4.82	1.06	2.8
Chi-Square	12107***	10746***	9750***	12674***	12630***	12707***	19531***	17257***	15527***	29090***	29164***	29246***
sigma_u	8.05	8.94	9.65	7.75	7.77	7.72	7.59	8.33	8.97	5.23	5.21	5.17
sigma_e	4.16	4.16	4.16	4.16	4.16	4.16	2.7	2.7	2.7	2.7	2.7	2.7
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

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A9
Results of the Multilevel Linear Regression Models, 10th Grade Reading and Math Scores

Variable	Reading Score						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	- 3.830814	-4.32286	0.166	-0.373	0.182	0.314	0.205	0.587
Dependent School Districts	-0.861	-0.485	-0.839	-0.846	-0.675	-1.580** (0.589)	-0.466	0.178	0.222	-0.464	0.696	0.692
2nd Quintile	0.083	0.61	0.36	0.067	-0.252	-0.492	0.088	-0.327	0.231	0.084	0.125	0.236
3rd Quintile	-0.038	-0.485	0.21	-0.058	-0.64	-0.848	0.053	-0.485	0.173	0.046	-0.162	0.161
4th Quintile	-0.482	0.491	-0.177	-0.496	-0.663	-0.923	-0.295	-0.619	0.009	-0.301	-0.09	-0.001
Top Quintile	-0.574	0.693	-0.328	-0.58	-0.567	-0.737	-0.176	-0.104	-0.001	-0.185	0.047	-0.019
DepSchdist*Competition		1	1.450* (0.723)		4.940* (2.170)	6.200** (2.170)		0.392	0.407		-1.11	-0.847
2nd Quintile*Competition		-0.331			2.73	3.08		0.686			0.427	
3rd Quintile*Competition		0.909			3.890** (1.510)	4.140** (1.530)		0.819			1.43	

(continued)

Variable	Reading Score						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
4th Quintile*Competition		-0.877			1.95	2.4		0.771			0.23	
Top Quintile*Competition		-1.36			0.358	0.441		0.123			-0.831	
2nd Quintile*DepSchdist		-1.35	-0.87913		-1.04			-0.782	-0.854		-1	-1.04
3rd Quintile*DepSchdist		-0.7224	-0.73931		-0.876			-0.753	-0.809		-0.767	-0.87
4th Quintile*DepSchdist		-1.0275	-0.95192		-1.06			-1.830*** (0.444)	-1.900*** (0.459)		-1.960*** (0.499)	-1.990*** (0.479)
Top Quintile*DepSchdist		-0.998	-1.08		-0.754			-1.05	-0.64749		-1.14	-0.6786
Intercept	14.6	17.6	18.200* (8.930)	15.5	19.000* (8.610)	17.500* (8.410)	8.11	11.1	10.2	7.54	8.13	9.01
Log-MSA Random Effects (Std. Dev.)	-0.040415	-0.042228	-0.040689	-0.043736	-0.046255	-0.050568	-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

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.

TABLE A10
Results of the Multilevel Linear Regression Models, 12th Grade Reading and Math Scores

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
School Dist Competition	-0.781	-1.213	-0.884	-1.95	-4.253	-4.332	0.275	-1.223	0.637	1.88	1.926	2.07
Dependent School Districts	-0.46	-0.431	-0.774	-0.517	-0.701	-0.953	0.274	1.84	2.380** (0.893)	0.306	2.040** (0.787)	2.090** (0.792)
2nd Income Quintile	0.21	0.212	0.217	0.224	0.235	0.245	-0.154	-1.35	-0.01	-0.129	0.356	-0.014
3rd Income Quintile	-0.121	-0.893	-0.119	-0.083	-0.803	-0.891	-0.195	-2.00799	-0.037	-0.187	-0.642	-0.063
4th Income Quintile	-0.266	-0.226	-0.26	-0.252	-1.05	-1.14	-0.633	-1.17	-0.174	-0.595	-0.207	-0.163
Top Income Quintile	0.192	-0.009	0.197	0.217	-0.165	-0.182	-0.29	-2.289	-0.128	-0.265	-0.02	-0.122
2nd Quintile*Competition		-0.032			-0.123	-0.154		1.63			-1.87	
3rd Quintile*Competition		1.15			4.03	4.22		2.51			2.76	
4th Quintile*Competition		0.13			5.390* (2.690)	5.660* (2.680)		1.29			0.073	

(continued)

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
Top Quintile*Competition		0.339			2.05	2.08		2.68			-0.934	
2nd Quintile*DepSchdist		-0.112			-0.054			-1.05	-1.15		-1.3	-1.17
3rd Quintile*DepSchdist		-0.607			-0.34			-1.06	-1.26		-1.07	-1.31
4th Quintile*DepSchdist		-0.932			-0.424			-3.21*** (0.668)	-3.38*** (0.667)		-3.43*** (0.723)	-3.49*** (0.724)
Top Quintile*DepSchdist		-0.274			-0.148			-1.15	-1.28		-1.0366	-1.01232
Intercept	13	14.6	13.2	16.5	18	17.6	10.3	16.8	12.4	7.99	7.44	9.63
Log-MSA Random Effects (Std. Dev.)	-0.18	-0.178	-0.182	-0.175	-0.205	-0.209	-0.247	-0.304	-0.304	-0.25	-0.06845	-0.305
Log-Residual Random Effects (Std. Dev.)	1.860*** (0.012)	1.850*** (0.012)	1.860*** (0.012)	1.860*** (0.012)	1.850*** (0.012)	1.850*** (0.012)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (0.013)	1.620*** (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

Note. a. ***=p<0.001; **=p<0.01; *=p<0.05; b. Numbers in brackets are standard errors.