Technical Report

IS THERE CHOICE IN SCHOOL CHOICE?

INVESTIGATING PRODUCT DIFFERENTIATION ACROSS NEW ORLEANS DISTRICT AND CHARTER SCHOOLS

EDUCATION RESEARCH ALLIANCE FOR NEW ORLEANS

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Abstract

A common justification for market-based school reform is increasing the variety of schooling options over a typical bureaucratic system. However, decentralization of school governance and more flexible enrollment might not lead to more diverse options if family or charter authorizer preferences are homogeneous, if governments impose strict regulations on schools, or if the increased market share of networked charter management organizations leads them to adopt similar models. We test the effects of decentralization and choice on school differentiation using an extreme case: in the city of New Orleans, charter schools make up 95 percent of the public school market. Using cluster analysis to group New Orleans schools along similar characteristics, we find evidence that, although not all schools are unique, there is considerable product differentiation. A cross-city comparison with more traditional public school systems suggests that similar differentiation might be achieved with a small market share of charters or magnets.

Keywords: economics of education; school choice; charter schools; product differentiation

JEL codes: I21, I24, I28

1. Introduction

Historically, the introduction of market-based education reforms to traditional public school districts has included the use of charter schools both as a competitive mechanism that would pressure existing schools to improve, and as a way to increase the variety of schooling options for families (e.g., Friedman, 1962). If families vary in their preferences and schools are given the autonomy to "innovate" (Wohlstetter, Smith, & Farrell, 2013) and respond to market pressures, then we should expect to see a wider variety of options on the supply side.

There is no guarantee, however, this theory will work practice. First, it is not clear that preference heterogeneity exists among parents. Families are uncertain about their children's skills – particularly for younger children – and may therefore seek out a generic basket of services (Brown, 1992). Second, the contract between government education agencies and charter schools, especially the threat of closure for low performance on standardized tests, may pressure schools to imitate successful charter models or adopt established "best practices" (e.g., Wohlstetter et al., 2013). Similarly, regulations in areas such as curriculum, finance, teacher certification, and facilities may inhibit a school's capacity to offer a unique program (e.g., Chubb & Moe, 1990; Friedman, 1962; Levin, 2012). Finally, growing charter management organizations (CMOs) may attempt to leverage economies of scale by replicating a single successful model across multiple school campuses (e.g., Farrell, Wohlstetter, & Smith, 2012). Given these competing forces, it is not clear what the range of public school offerings would be when school choice is taken to scale. In a large-scale choice district, the strategies of charter schools and large CMOs could potentially drive the market and fail to address parental demand.

This study focuses on the public school market in New Orleans, where, after long-term school closures caused by Hurricane Katrina in 2005, the large majority of public schools were

turned over to more than 30 management organizations, including operators of both independent and networked charter schools. At the same time, policymakers expanded school choice by eliminating geographic attendance zones. Other research on New Orleans suggests that parent preferences for schools in this system vary across a variety of school characteristics (Harris & Larsen, 2015). With diverse parent preferences and many school operators, there is the theoretical potential for an unprecedented level of product differentiation to emerge. Here, charter schools might create their own unique niches, or, for the reasons cited above, a city dominated by charter schools might look as homogeneous as would be expected from a typical traditional public school district.

Previous literature has focused on the differences between charter schools and traditional public schools, treating all charter schools within a district as a unitary type. In effect, these studies take a *top-down* approach and equate the governance structure of the school (e.g., charter versus traditional or within charters, networked or independent) with the product experienced by students. In contrast, we test a *bottom-up* approach, focusing on salient school characteristics, such as instructional hours, grade span, and extracurricular activities – factors that define the actual educational experiences of children and parents.

We examine the degree and type of school product differentiation in New Orleans. Specifically, we ask, are New Orleans schools alike or different? Second, to what degree do differences and similarities across schools conform to the expectations of a top-down structural approach? That is, to what extent are schools that are governed by the same bureaucratic agency or managed by the same CMO providing a similar product? Finally, how is the market structured in terms of large segments, small segments, and unique niches?

Our paper makes several contributions to the supply-side literature on school choice. First, we provide initial evidence of market differentiation in a choice system at scale. Empirical evidence on the nature of public school districts as markets is increasingly important as charter schools and the scope of school choice expand across the U.S. Second, we provide a framework for thinking about how school differentiation might emerge in the context of limited market entry and ongoing government oversight. Finally, this is first study to use empirical clustering methods to characterize a U.S. public school district. This approach enables us to test product differentiation not only at the level of the market, but also to identify whether schools within the same governance regime or CMO display meaningful differences.

We find that a simple typology comparing schools by governing agency or school type is inadequate to capture the considerable market differentiation in New Orleans. Instead, we find a combination of large market segments, smaller segments, and unique niche schools. We also find some differentiation across schools under the same bureaucratic governance regime, across schools within the same networked CMO, and across traditional public schools operated by the local school district. The results are robust to a range of methodological and data approaches, including several different approaches to clustering. Comparing the school characteristics we examined in this study with three traditional public school systems with similar demographics to New Orleans, we find that the most traditional district of the three (containing no charter or magnet schools) is also the most distinct from New Orleans. The other two districts, which contain a small share of charter or magnet schools, tend to be more similar to New Orleans in the degree of variance in the school characteristics we include in our study.

Section 2 provides a more detailed description of the market-based school reforms in New Orleans, and Section 3 summarizes prior literature describing public school markets and

differentiation. Section 4 presents a theoretical framework for how schools differentiate. Section 5 describes our data and empirical clustering method. Results are presented in Section 6 and conclusions in Section 7.

2. The New Orleans Public School Market

The New Orleans context provides a unique opportunity to study product differentiation in education. With 93 percent of students in charter schools, New Orleans has the largest share of public school students enrolled in charter schools of any U.S. city (*National Alliance for Public Charter Schools*, 2013). The groundwork for this choice system was laid in 2003, when the Louisiana Department of Education (LDOE) created the state Recovery School District (RSD) to empower the state to take over failing schools, including several New Orleans schools.

In 2005, in the aftermath of Hurricane Katrina, state leaders voted to have the RSD take over all underperforming schools in the city, a group which included the majority of New Orleans public schools, leaving the locally elected Orleans Parish School Board (OPSB) as the manager of a small number of previously high-performing campuses. Over the next several years, the RSD contracted out each school under its control to a private charter manager, including operators of independent, non-networked charter schools as well as larger CMO networks. This study focuses on the supply of New Orleans public schools operating in the 2014-2015 school year. By this time, 100 percent of schools taken over by the RSD were operated by private non-profit charter operators.

OPSB also elected to turn several of the schools remaining under its control over to charter managers. By the year of this study, only 6 schools remained under direct control of OPSB, operating as traditional public schools in a city full of charter schools. Another small group of charter schools continued under direct control of BESE, having been chartered directly

by the state and not the through the RSD takeover process. Figure 1 illustrates the governance structure for New Orleans public schools for the 2014-2015 school year.

There are several features of the New Orleans context that make it ideal for a study of product differentiation within a schooling market. First, in addition to the large market share of charter schools as a group, the collection of charter schools includes three different government agencies that oversee their own portfolios of schools (BESE, RSD, and OPSB). Multiple pathways for market entry create the potential for different types of charter schools to emerge in response to different sets of rules for authorization and renewal. In addition, more than 30 CMOs (networked and non-networked) manage at least one New Orleans public school; larger CMOs operate portfolios of up to 6 individual schools. This provides the opportunity to test for product differentiation not only within governing agency but also within school operators.

Second, neighborhood attendance zones rarely restrict schooling options in New Orleans,[1] and almost all public schools enroll students through a citywide lottery.[2] Students are free to enter lotteries for any open-enrollment campus in the city, which, in addition to some selective admissions schools, also provide free transportation to students across the city to travel to and from school.[3] New Orleans families also have access to the widely and freely distributed *New Orleans Parents' Guide to Public Schools,* published annually by a local nonprofit agency. This resource provides parents with summaries of several school characteristics and demographics and is intended to reduce the information costs associated with choosing schools.

[1] There are 6 broad catchment areas, but these average 60 square miles in size, and students only receive preference for being in a given catchment zone; the zone does not determine what schools students can attend, and most schools enroll students from across the city. Three OPSB charter schools continue to reserve some seats for students in the school's zip code, but all three also provide a majority of slots for citywide enrollment.

[2] The exception is handful of selective-admissions charter schools. These schools manage their own admissions testing and enrollment processes.

[3] Charter schools in New Orleans are not able to choose their location. Buildings are owned by OPSB and assigned by RSD, and thus, while school leaders can request a building, it is up to the RSD where the school ultimately resides. Importantly, this limits spatial competition among schools.

Third, there is empirical evidence that New Orleans families have heterogeneous preferences based on analysis of parent choices in the citywide school lottery. Harris and Larsen (2015) find that preferences for average test scores and extracurricular offerings vary by family income. Lincove, Cowen, and Imbrogno (2015) also find preference heterogeneity for characteristics such as foreign language offerings and facilities when comparing parents who do and do not apply for private school vouchers. Without differentiated demand, suppliers' incentives to differentiate may be limited, but New Orleans appears to have sufficient variation in parental preferences to support a diverse supply of schools.

Decentralized school management, extensive parental choice, and heterogeneous demand are conditions that are friendly to product differentiation, but as will be discussed further in Section 4, the regulatory and accountability setting could stifle differentiation. For example, strict test-based requirements for charter contract renewal and strong financial oversight has led to the closure or turnover of forty-five New Orleans charter schools since 2007 (Ruble, 2015). The net effect of these policies on product differentiation is unclear, and thus, New Orleans provides an excellent context for the empirical analysis of this question.

3. Related Literature

Prior studies examining differentiation among charter schools can be broadly categorized into two groups: those that compare charter schools to traditional non-charter public schools, and those that compare charter schools to other charter schools. The majority of studies relate to the former, as opportunities to study the latter in charter saturated districts have been limited. Of the studies comparing conventional non-charter public schools with charter schools, a common

theme of examining innovations, rather than differences, emerges.[4] Lubienski (2003) develops a framework within which to assess innovations in charter schools, and using this framework, finds that most studies in the literature suggest that charter schools generally fail to fulfill the anticipated goal of innovation, especially in terms of classroom practices. More recently, the evidence in Preston, Goldring, Berends, and Cannata (2012), using 2007-2008 data from the Schools and Staffing Survey, tends to confirm this assessment.

On the other hand, Glomm, Harris, and Lo (2005) find that charter school operators occupying small market segments in traditional public school districts tend to locate where populations are demographically diverse, but it is unclear if they subsequently differentiate their product. Renzulli, Barr, and Paino (2015) show that charter schools are often specialized in terms of the student population they serve, as well as the programs they offer. Thus, while charter schools may not be innovative in the classroom, they may still provide differentiation among public schooling options by serving targeted populations. Notably, however, none of these studies examines charter school behavior in a setting where they have a large market share.

There is a smaller literature documenting whether charter schools differ from each other. Carpenter (2006) collected information on 182 charter schools in five states (almost 90 percent of charter schools nationwide in 2001-2002) in an attempt to generate a typology of charter schools. With this sample, he developed a two-dimensional approach based on curricular theme and target student population. Carpenter and Kafer (2009) applied this typology to charter schools in Colorado and find that most fall into Carpenter's "traditional" category[5] and serve the general student population, as opposed to targeting a specific population with a unique program.

[4] Note that "innovation" is a more nuanced concept than "differences" alone and can be defined in myriad ways. In the present study we focus on the extent of differentiation across schools and do not expressly define whether something is considered an innovation or not.

[5] Carpenter (2006) defines "traditional" schools as those that "stress high standards in academics and behavior, rigorous classes, lots of homework, and other earmarks of a 'back-to-basics' approach" (p. 3).

These studies are the first to categorize charter schools based on school characteristics in a systematic way. However, as the authors note, the ability of this methodology to explain much of the differences between charter schools is weak given the small number of dimensions they use.

More generally, the main shortcoming of these approaches is that the important characteristics of groups are determined by untested theories before grouping takes place – a strategy that might overlook empirical differences that depart from theoretical expectations. Indeed, Van Ryzin (2008) argues that a multi-dimensional approach using cluster analysis, which is applied in this study, is a better methodology for describing the differences across schools. For example, he notes that simply knowing whether a school meets a researcher's definition of "traditional" or "progressive" might tell us very little, since there is plenty of room for variation within these categories.

4. Theoretical Framework

Differences in products and services can be characterized along a quality dimension (vertical product differentiation), where consumers generally agree on a rank ordering of firm offerings, and a "flavor" dimension (horizontal product differentiation), where consumers may disagree across preferences. In this study, we focus on the latter. To illustrate the difference in a market for schools, it might be reasonable to think that all families want high academic quality (vertical), but some families might actively seek out schools that emphasize fine arts while other families might actively avoid them (horizontal) (Glomm, Harris, & Lo, 2005).

Typically, horizontal product differentiation results from firms responding to the heterogeneity in consumer demand across product characteristics (Hotelling, 1929). Private firms operating in a market with free entry and exit are generally only limited by the degree of preference heterogeneity of the market they are attempting to serve (with the exception of basic

regulations in place for consumer safety). However, in public education markets, entry and exit is controlled explicitly through a bureaucratic authorization process. New charter schools enter the market only by first applying to an elected or appointed board (e.g., charter school authorizers). After authorization, they are subject to ongoing oversight by a government bureaucracy and face regular reviews of contractual obligations in order to meet the requirements for renewal. As a result, authorizer preferences and later, the regulatory environment, may limit differentiation in general or redirect differentiation towards characteristics that are least likely to lead to contract termination. The level of market differentiation, even in the presence of consumer preference heterogeneity, is thus uncertain in the public education market.

Given these two distinct sources of preference heterogeneity (consumers and governing agencies), there are many potential equilibria that could arise, defined by groups of schools that fill large and small market segments, as well as unique schools that occupy niche markets. Using this terminology, we define four stylized equilibria, illustrated in Figure 2, that account for the two main sources of preference heterogeneity described earlier. Each quadrant represents expected schooling market outcomes based on the interaction of parent preferences and governing agency preferences. In the upper left-hand quadrant, charter authorizers are open to allowing a wide variety of operators to enter the market, continuing bureaucratic oversight is relatively unrestrictive, and parent preferences are heterogeneous. This results in a market characterized by highly specialized schools, each serving a small niche. The upper right-hand quadrant shows a market outcome when governing agencies have highly diverse preferences but parent demand is relatively homogenous. This results in a number of small segments of similar schools and relatively few schools filling in niches. Note that niche markets will still arise in this

equilibrium, as governing agencies are open to having more specialized schools, even though the diversity of parental demand may be relatively low.

On the bottom left, governing agencies have homogeneous preferences while parent demand is highly diverse. Here, schools vary only across elements that are important to parents but are less salient to authorizers (such as extracurricular activities rather than curriculum), and bureaucratic regulations are restrictive. In contrast with the previous outcome, niche markets will not exist in this equilibrium, because these schools will not be authorized to operate.

Finally, in the bottom right-hand quadrant both governing agencies and parents have homogeneous demand. This market contains a large segment of similar schools, typical of how a traditional system with centralized bureaucratic control is expected to look.

Post-entry and over time, some additional constraints on market differentiation may occur through changes to contracts and regulations that further limit school-level autonomy. These may include restrictions from state academic standards, curricular requirements, textbook offerings, and testing regimes. For example, if governing agencies increase sanctions associated with failing to meet standardized test performance goals, previously diverse schools might begin to implement similar strategies such as curricular alignment, test preparation, and frequent assessment. Another constraint can come from geographic limitations, which are ignored in the models above. In a large school district, families that want a schooling approach that is very different from the mainstream offerings might be so spread out geographically that having an entire school to fill a market niche is infeasible.[6]

[6] In New Orleans, individual public schools have little control over their location. District-owned buildings are assigned to operators by the RSD. However, RSD might take the spatial distribution of school characteristics into account in deciding where to locate schools (for example, by citing two arts-focused schools sufficiently far apart to serve students from different neighborhoods), and costs of travel are mitigated through free bus service to most campuses.

Finally, there might be high costs to some forms of differentiation. Large CMOs that operate a network of charter schools may take advantage of economies of scale by applying a single school model on multiple campuses.[7] Alternatively, economies of *scope* may allow a CMO to operate with a significant cost advantage even if they operate schools that are in different parts of the product space. For example, accounting, administration, transportation, and food service might have similar costs whether a school specializes in math, science, or art. Schools that can take advantage of economies of scope can then devote resources to improving the quality of service, which is itself attractive to families.[8]

Ultimately, it is unclear what we should expect from a decentralized public school market.[9] We next turn to a description of the data and define which salient school characteristics were used in this analysis.

5. Data and Methods

5.1 Data

Our primary data source for this study is the spring 2014 edition of the *New Orleans Parents' Guide to Public Schools*, a resource for parents that is published by a local non-profit organization.[10] Each fall, all public schools in New Orleans are asked to complete the *Parents' Guide* written school survey, which covers topics such as a school's mission statement, type of extracurricular activities, and a variety of other school characteristics that parents may consider

[7] Prior research has indeed assumed that charter school differentiation occurs from the top-down, emanating from the school's founding organization (Henig et al., 2005; Furgeson et al., 2012). We are able to test this assumption directly by grouping schools with similar characteristics and examining the degree of diversification within CMO portfolio.

[8] Six New Orleans schools remain under the direct control of the local school board (OPSB) and are not charter schools. The OPSB, in this case, may act as the CMO and similar cost arguments may apply.

[9] A complete model of a schooling market would also include private schools, which represent another potential source of differentiation and competition. Analysis of private school characteristics is beyond the scope of our data for this study.

[10] The guide has been published annually since 2008. The current guide can be accessed from the following website: http://neworleansparentsguide.org/index.php.

important when choosing a school. Follow-up surveys are conducted either by phone or in person with non-responsive schools, and there is nearly complete representation of all New Orleans public schools in the guide. The guide is available free to parents on-line, through a phone app, and in-print at sites across the city. While it does not measure all possible dimensions of school differentiation, the guide is the primary comprehensive source of information for families choosing a public school in New Orleans, and prior studies suggest that school characteristics as reported in the guide are part of families' demand function for schools (Harris & Larsen, 2015).[11] To the degree that differentiation occurs, we would therefore expect it to be partly reflected in the *Parents' Guide* measures.

From the expansive list of characteristics that are included in the publication, we limit our analysis to variables that can be objectively defined[12] and those that are most likely to be salient to families when choosing schools.[13] As suggested in the literature, we also omitted characteristics that have little to no variance (Hair et al. 1998).[14]

We selected variables that measure school hours, grade span, extracurricular offerings, academic focus, and targeted student population. School hours is measured as total yearly instructional hours, taking into account daily reported start and end times, early release and

[11] We recognize the possibility of misrepresentation, as schools may be using the *Parents' Guide* as a marketing tool. However, this incentive is somewhat dampened since the guide is published yearly: those schools that continuously misrepresent their products will eventually lose students who are disappointed with the absence of offerings they expected to find. We use the seventh iteration of the guide, which has only three new schools.
[12] For example, we omit potentially informative characteristics such as student discipline and special education strategies in our baseline models because the reporting of these in the guide was vague and did not translate into useful coding. Instead, we run robustness checks using aggregate measures of disciplinary referrals calculated from student-level data provided by LDOE and find similar results to what is reported here.
[13] For example, the school mascot or the color of the building may be characteristics that schools can differentiate on, but they are arguably much less important to families when choosing a school.
[14] Variables omitted for lack of variance include whether uniforms are required, transportation is provided, and whether a school has a parents' group (see Table 1 for summary statistics). In robustness checks not reported here, we find that these omissions do not influence our conclusions about top-down versus bottom-up models, nor do the clustering results change. Because this analysis is based on differences in clustering patterns between the two models, the variables with no variance cannot affect those differences. Later, we discuss the potential implications for the identification of niche schools.

teacher work days, and the total number of school days.[15] Second, we include the school's grade span, calculated as the total number of grade levels currently being served. Under extracurricular offerings, we include both the number of team sports offered and the number of other extracurricular activities (such as student clubs and afterschool programs). We represent a school's academic focus with two dummy variables: the first indicates whether the school identifies itself as a "college prep" school; the second indicates whether the school has selected a specific curricular theme such as math, technology, or arts.[16] To represent a school that differentiates on its target student population, we include an indicator of whether the school has a selective admissions policy or open enrollment. New Orleans schools do not have full autonomy over this characteristic. Selective admissions is not allowed on any RSD-governed campus but can be implemented at the discretion of operators and authorizers at OPSB district-run schools, OPSB charter schools, and BESE charter schools. However, any school can attract or repel certain student populations through the menu of student support services that it offers. For example, schools with a mission focused on special education students might offer more intervention options than what is required by regulations. To identify targeting beyond formal admissions policies, we include a measure of the intensity of student support services, defined as the number of professional staff members who provide student supports (nurses, therapists, social workers, etc.).

In order to benchmark our results to what we might observe in a traditional public schooling system, we also collected data on high schools from three comparison districts[17]: East

[15] This variable was supplemented with schedules taken from the school's website, if the schedule was not included in the guide.
[16] This was captured either from the school's name and/or the mission statement, both included in the guide.
[17] Because we find evidence of greater differentiation among the high schools in our study vis-à-vis the elementary schools (e.g., more outlier schools occupying niche markets), we limited the comparison sample to high schools as well.

Baton Rouge Parish in Louisiana, Clayton County in Georgia, and Jackson County in Mississippi. These three districts were selected because they are similar to New Orleans in size and student demographics, and therefore might face similar heterogeneity of parental preferences. Demographic data for these districts are displayed in the top panel of Table 10 and are taken from each school's profile from the NCES Common Core of Data (2012-2013 school year). The data corresponding to the clustering variables used in the empirical analysis of the New Orleans market were collected from each school's website. When available, these data were supplemented by the school's student handbook. The only exception is the data for sports, which come from each state's high school athletic association website.[18]

5.2 Empirical Methods: Clustering

To address the disadvantages mentioned earlier when using a predetermined one- or two-dimensional qualitative approach to grouping schools, we instead rely on a multi-dimensional quantitative approach to better capture the differences across schools. Cluster analysis is a multivariate statistical method designed to group observations based on multiple variables (Everitt, Landua, Leese, & Stahl, 2011). The method has been previously used in public policy and education to identify similar groups of universities (e.g., Brint, Riddle, & Hanneman, 2006; Shin, 2009), and to identify states with similar approaches to welfare policy (e.g., McKernan, Bernstein, & Fender, 2005) and family support (e.g., Meyers, Gornick, & Peck, 2001). Two studies are most similar to the present one: Yun and Moreno (2006), who cluster California high schools based on the level and type of student disadvantage, and a Mathematica / CRPE Policy

[18] For Louisiana: Louisiana High School Athletic Association (http://lhsaa.org/schools/directory); for Clayton County: Georgia High School Association (https://www.ghsa.net/ghsa-directory-feed); for Mississippi: Mississippi High School Activities Association (http://www.misshsaa.com/Schools/Directory.aspx).

Report on CMOs (2012), which clusters CMOs across the U.S. on six core practices.[19] Cluster analysis is also commonly used in analysis of private markets for goods that may or may not be differentiated (e.g., Khan & Manopichetwattana, 1989; Padmore & Gibson, 1998; Sethi, 1971; Cunningham & Maloney, 2001).

This empirical approach begins by measuring the geometric distance between each pair of observations (in our case, schools) across multiple variables (school characteristics). Larger distance measures indicate two observations that are less similar. Thus, the distance measure is interpreted as the *dissimilarity* between two observations. In the case of continuous variables, dissimilarity is often measured by Mahalanobis (1936) distance. However, the inclusion of dichotomous clustering variables makes this inappropriate, as the distance between values of dichotomous variables can only equal zero (if the same) or one (if different). In the case of dichotomous variables, dissimilarity measures are based on the proportion of dissimilar values across multiple clustering variables within each pair of observations. In our school data set, we encounter both continuous variables (such as instructional hours) and dichotomous variables (such as offering a college prep focus).

To accommodate both types of variables, we use the Gower dissimilarity measure for mixed clustering variables (Gower, 1971). The Gower measure calculates the dissimilarity across a pair of observations i and j, within a set of schools k, across v variables as:

$$\text{Dissimilarity}_{ijv} = \frac{\sum_v d_{ijv}}{v}$$

For dichotomous variables:

$$d_{ijv} = 0 \; if \; x_{iv} = x_{jv}$$

[19] The six core CMO practices are as follows: whether the behavior policy is centralized, how frequent the use of formative assessments is, whether the educational approach is centralized, how frequent teacher coaching and mentoring are, whether CMOs utilize merit pay, and yearly instructional hours (Furgeson, et al., 2012).

$$d_{ijv} = 1 \; if \; x_{iv} \neq x_{jv}$$

For continuous variables:

$$d_{ijv} = \frac{\left| x_{iv} - x_{jv} \right|}{\max(x_{kv}) - \min(x_{kv})}$$

That is, dissimilarity for dichotomous variables takes a value of zero (i.e., perfect similarity) when a pair of observations share a characteristic, and a value of one (i.e., perfect dissimilarity) when only one member of the pair has a characteristic. Dissimilarity for continuous variables ranges from zero when two observations in a pair share identical values for a characteristic ($x_{iv} = x_{jv}$), to one if a pair includes observations that reflect the full range of values of a characteristics within the set (i.e., $x_{iv} = \max(x_{kv})$ and $x_{jv} = \min(x_{kv})$). Values in between zero and one reflect increasing levels of dissimilarity for continuous variables. This strategy brings continuous variables and dichotomous variable to a scale where they can be included in a single distance measure. Total dissimilarity for a pair of observations is the mean dissimilarity across all clustering variables.[20]

Once total dissimilarity measures are calculated for each possible pair of observations in a set, a grouping strategy is needed. Hierarchical cluster analysis groups observations by minimizing the distance within groups. Grouping occurs iteratively, with the two most similar observations forming the first two-member cluster. Then, the next two most similar observations

[20] Mathematically, this strategy gives equal weight to all clustering variables, and our results follow this assumption. However, in practice, it is likely that consumers might cluster schools differently by placing greater emphasis on differences in some school characteristics (such as having selective admissions) than others (such as number of sports). In addition, the Gower measure is a ratio that ignores the scale of the variable measured but may be sensitive to the range of observed values on continuous variables. For example, a small difference will appear large in a variable with a small range, while the same difference will appear small in variable with a large range. To test sensitivity to range, we replicate our analysis with and without schools that are identified as outliers in the analysis, thus excluding schools with extreme values that may influence other groupings through their effect on denominator of d_{ijv}. We also conducted cluster analysis with alternative weighting by double-counting individual variables in the calculation of dissimilarity. Our results are robust to these strategies.

are grouped, which could either form a new two-member cluster or add a third member to the existing cluster and so on.

The literature cites several strategies for forming clusters. *Single linkage* iteratively clusters observations by first joining the pair of observations with the smallest dissimilarity measure, then joining the pair with the next smallest dissimilarity measure, etc. (i.e., a nearest-neighbor approach to similarity). Alternative strategies form clusters that maximize the distance between two observations in different clusters (*complete linkage*), minimize the average distance between observations in the same cluster (*average linkage*), or maximize the distance between the geometric centers of different clusters (*centroid linkage*). We start by employing single linkage because the nearest neighbor approach best reflects a reasonable strategy for parents (i.e picking schools based on their similarities to each other rather than their shared differences from other schools), but we use the other three methods to test robustness.

Hierarchical cluster analysis is agnostic on the appropriate number of clusters, and researchers must determine how much dissimilarity is acceptable *within* a cluster as well as how much similarity is acceptable *between* clusters. Mathematically, one could allow clustering to continue until all observations are included in a single group. Prior research often determines the number of clusters based on a theoretical framework that defines how many types are expected – a strategy that requires a clear theoretical framework for expected groupings (Everitt et al., 2011). From there, empirical strategies are used to determine if the groups are meaningfully different from each other in ways that are expected by theory. Univariate and multivariate tests of equality are used to determine if resulting clusters are different from each other, which helps to determine if too many or too few clusters have been formed.[21]

[21] We used F-tests of statistical significance of cluster mean differences and Wilks' λ tests of within vs. across group variance.

Unfortunately, selecting the appropriate number of clusters is more art than science (Hair, Anderson, Tatham, & Black, 1998). If we follow a top-down theory related to school governance, we might expect schools under the same governing agency to be similar and schools under different governing agencies to be different. In New Orleans, this would lead to three market segments – one containing schools governed by BESE, one containing schools governed by OPSB, and one containing schools governed by RSD. Alternately, if we follow prior categorizations of school by market type, we might expect traditional public schools to be similar to each other, independent charter schools to be similar to each other, and charters schools in CMO networks to be similar to each other – with meaningful differences across the three types. Thus, we first attempt a theory-driven clustering into three clusters to see if empirical groupings reflect sorting either by governing agency or by school type. This strategy tests the top-down assumption that schools with similar governance will provide a similar product and schools with different governance will produce different products.[22]

Next, we allow for more nuances in the market using a bottom-up approach by allowing a larger number of clusters to emerge (from 4 up to 13) and selecting the number of clusters that best identifies within group similarities and across group differences. This strategy tests for the possibility of market segments that are not described top-down structures defined earlier. In order to determine the preferred number of clusters, we first selected only those groupings that produced a statistically significant Wilks' λ test of within versus across group variation. From there, we tested whether cluster means across five of our clustering variables (those with continuous values) were statistically different, attempting to account for meaningful with-in group similarities. We also consulted the dendrograms (Figures 3a and 3b) to visually understand

[22] We also attempted a clustering strategy that restricted the number of groups to five, reflecting the combination of governing agency and school type. Results from this effort were qualitatively similar to those from the three-cluster restriction and for brevity, are not included here (results are available upon request).

how similar or different the clusters appeared to be. The combination of these three approaches led to a preferred number of clusters, reported in the results below.

We test the reliability of our clustered groups in several ways. First, we omit variables one at a time to see if groupings are highly dependent on any single measure. Second, we employ alternative linkage strategies of average, centroid, and complete linkage to see if groupings are sensitive to the grouping strategy. Third, we identify outliers (niches), omit these from the sample, and re-cluster the remaining schools. This tests whether outliers influence the clustering of other schools. And fourth, we re-cluster using non-hierarchical clustering methods that fix the number of clusters.[23] Overall, our preferred school clustering results are robust to these alternatives, with exceptions noted in the tables of results.

6. Results

We address three main research questions: First, are New Orleans schools alike or different? This is partly answered through descriptive statistics of New Orleans schools, but also comparison between New Orleans and other cities.

Second, to what degree do differences and similarities across schools conform to the expectations of a top-down structural approach? We answer this by testing for differences in average school characteristics across the three governing agencies, and by comparing these results to what happens under various bottom-up clustering methods.

Finally, how is the market segmented in terms of large segments, small segments, and unique niches? We address this using the same clustering methods, examining the number of

[23] Here, the number of clusters is predetermined, as well as seed values for clusters centers. Observations are then grouped based on their proximity to the seed values. The cluster centers are then recalculated based on the mean or median values of observations in the clusters. These means become the new seeds, and observations are regrouped to minimize distance from the center once again. This process is repeated until no observations are regrouped and the centers are stable.

single-school and small clusters that emerge. Finally, we compare the variance we find in New Orleans to other school districts.

6.1 The Market of New Orleans Schools

We begin with the descriptive summaries of school characteristics. We disaggregate schools by grade level to observe whether differentiation exists in elementary and high school grades. New Orleans school operators can select each school's grade span, and it is quite common for elementary schools to serve grades K–8. Therefore, we define elementary schools as those with any grade K–4, and high schools as those with any grade 9–12.[24] Table 1 displays summary statistics for 56 elementary schools and 22 high schools included in our cluster analysis. We observe a large variance in most of the school characteristics, with the exception of school-required uniforms, whether transportation is provided, and whether a parent group is available at the school. This suggests that New Orleans schools can show similarity across some dimensions. However, these summary statistics also indicate the possibility of school differentiation across many other dimensions. Overall, high schools have more extracurricular activities, sports, and student support staff than elementary schools, while elementary schools have more grade levels and longer school hours.

Student enrollment data was calculated from student level files provided by LDOE for the 2012-2013 school year. On average, elementary schools enroll approximately 540 students, including 86 percent of students on free/reduced-price lunch, and 87 percent black students. Ninety-five percent of elementary schools are charter schools, 50 percent have a college prep mission, 43 percent have a specific academic focus, and 9 percent use selective admissions. For high schools, average enrollment is approximately 560 students, with 77 percent on free/reduced

[24] There are very few distinct middle schools in New Orleans. We do not run our analysis for schools serving middle school grades, because most schools are captured in the elementary or high school categories, and these reflect the two groups most likely to compete with each other for students.

price lunch and 84 percent black. Ninety-one percent of high schools are charter schools, 50 percent have a college prep mission, 59 percent have a specific academic focus, and 23 percent use selective admissions. We first look at differences in these schools through the framework of top-down differences in school governance and connection to a network.[25] Then, we regroup schools based on bottom-up characteristics through cluster analysis.

6.2 Grouping Schools from the Top-Down

6.2.1 Elementary Schools

There are 56 schools in New Orleans that offered grades K-4 in 2013-2014, including 41 schools governed by RSD, 13 governed by OPSB, and 2 governed directly by BESE. Broken down by school type, this includes 33 networked charter schools, 20 independent charter schools, and 3 district-run non-charter schools. Table 2 displays summary statistics for school characteristics by three governing agencies (BESE, OPSB, or RSD) and three school types (district-run, independent charter, or networked charter) for elementary schools. Also included are the results of tests of equality across groups for each continuous variable. The F-test proceeds from the null hypothesis that all types are drawn from the same underlying distribution for each continuous variable. Although the types are not equal across all variables, we fail to reject the null hypotheses of the F-test. The only significant difference is in school hours under governing agency, with significantly longer school hours at RSD schools. This suggests that neither governing agency nor school type identifies meaningful differences in school characteristics.

However, we do observe differences in dichotomous variables. Based on Louisiana chartering rules, selective admissions schools cannot operate through RSD; thus selective admissions schools only exist under OPSB or BESE (note that all OPSB district-run elementary

[25] Note that our clustering variables are the first eight school characteristics listed in Table 1; uniforms, transportation, and parent group availability are omitted for the cluster analysis portion (see Section 5.1 for further information).

schools are open enrollment). Any school type can have a special focus or mission, but we observe differences in the percentages of schools that have specialized missions across school types. For example, OPSB and BESE schools are more likely to have a special focus, while RSD schools are more likely to have a college prep mission. All district-run non-charter schools have a specific academic focus, compared to only 30 percent of networked charter schools and about half of all independent charter schools. At the same time, 70 percent of networked charter schools have a college prep mission, compared to one-third or less of schools in the other types. A Wilks' λ test of group variance indicates that grouping by governing agency explains only 22 percent of the total in elementary schools (based on one minus the Wilks' λ statistic), and we fail to reject the null hypothesis that the groups are similar across the full set of continuous clustering variables (F=1.29). Similarly, when grouping by school type, only 30 percent of the variance is explained, and F=1.88 (reject at 5%).

6.2.2 High Schools

There are 22 New Orleans public schools with high school grades. Table 3 provides mean values for clustering variables by governing agency and school type (3 groups each). There are 12 RSD high schools, 7 OPSB high schools, and 3 BESE high schools. Under school types, there are 11 networked charter schools, 9 independent charter schools, and 2 district-run non-charter schools. Within governing agency, the groups vary statistically in the number of sports offered and student support staff. The average number of sports ranges from 4.3 at BESE schools to 8.71 at OPSB schools, while student support staff ranges from a mean of 2.33 at BESE schools up to almost 6 specialized staff members at OPSB schools. High school grade spans run up to 6-12, but the overall average of 4.43 is closer to a traditional 9-12 range. Selective admissions high schools are again limited to BESE and OPSB schools, with no selective admissions allowed at

RSD governed schools. Schools with a special academic focus appear in all governing agency and school type groups, and schools with a college prep mission appear in all groups except BESE schools, which all have a special academic focus instead. The Wilks' λ statistic indicates that grouping by governing agency or school type explains more total variance for high schools (56 and 44 percent, respectively) than elementary schools, but the F-statistic for either grouping is also not statistically significant (F=1.52 and F=0.99, respectively).

6.3 Grouping from the Bottom-up

6.3.1 Elementary Schools

Figure 3a displays a dendrogram illustrating single-linkage clustering of New Orleans' elementary schools based on the Gower measure of dissimilarity. The dendrogram provides a visual depiction of iterative clustering of schools. Each school is represented on the x-axis, with the level of dissimilarity between schools measured by the height of each box and displayed on the y-axis. The minimum value of dissimilarity is zero, at which point the number of clusters is equal to the number of schools. Because all schools contain a box above the zero line, this indicates that no two New Orleans elementary schools are identical across all eight clustering variables. The two most similar schools, Franklin Elementary (an OPSB direct-run school) and King Elementary (an RSD networked charter school), are the first to join together through single-linkage. Allowing slightly more dissimilarity within groups, the next pair of most-similar schools is Behrman (an RSD networked charter school) and Hynes (an OPSB independent charter school), which form a second cluster of two schools. These first two groupings provide initial evidence that the most similar schools across characteristics are not similar in governance or school type. Moving up the dendrogram, more clusters are formed, and more schools join existing clusters by allowing increasing levels of dissimilarity between observations in the same

group. At the very top of the dendrogram, all schools have joined a single cluster. In our data, this is a dissimilarity of approximately 0.23 within the group—the maximum dissimilarity between two single elementary schools in New Orleans.

We first test whether the portfolios of governing agencies and CMOs include a diverse product mix, clustering elementary schools into three groups. These results are displayed in Panel A of Table 4. Top-down theories predict that the three empirical groups should reflect the three governance types (BESE, OPSB, and RSD), or the three types (district-run, independent charter, and networked charter). The largest cluster consists of 38 total elementary schools, containing 30 RSD schools and 8 OPSB schools. The second largest cluster contains 13 total schools, including 11 RSD schools and 2 OPSB schools. The final cluster contains the only two BESE elementary schools and 3 OPSB schools. Overall, these results suggest that the RSD, whose schools are mostly clustered in the first group, and BESE, whose schools cluster together in the third group, are managing schools that are more similar to each other than the OPSB, whose schools appear in all three groups. In terms of school type, 100 percent of the district-run non-charter schools appear in the first cluster, in addition to 84 percent of the networked charter schools. Independent charter schools, on the other hand, appear in all three clusters. Thus, there is some evidence from this clustering that connection to a network produces schools with similar characteristics.

The results in Panel A of Table 4, particularly in Cluster 1, however, are not robust to alternative linkage strategies, which suggests that there may be significant within-group differences and sensitivity to outliers. This is explored further in Panel B, which displays summary statistics for clustering variables across these three clusters. F-tests of differences in group means of the continuous variables are not significant, which suggests that there are no

meaningful group differences described by this grouping other than the differences in admissions, focus, and missions discussed above. We thus reject the hypothesis that governing agency or school type predicts either similarities within schools or differences across schools and, overall, conclude that grouping along the top-down structures does not characterize the market structure of New Orleans schools based on salient school characteristics. Although we observe that RSD-governed schools tend to cluster together, note that we also observe charter schools from the same network in different clusters, which suggests there may be differentiation within operators. In addition, a careful look at the dendrogram suggests that a small number of elementary schools are potential niche schools that only join clusters at higher levels of dissimilarity.

We next attempt a more flexible approach to clustering to find a better characterization of the market. An analysis of the cluster means by elementary school post-estimation suggests the optimal number lies between 8 and 10 clusters.[26] At 8 clusters, only 69 percent of the variation across groups is explained. At 9 clusters, 80 percent of the variation is explained, and at 10 clusters, 84 percent is explained. Our preferred number of clusters is 10, where we additionally account for a pair of schools that tend to cluster differently across other linkage strategies by allowing them to form their own cluster. This grouping allows dissimilarity up to 0.10 within a group, and the groups are statistically different across all continuous clustering variables, except the number of student support staff. These results are displayed in Table 5, and means by cluster and F-tests are reported in Table 6.

The first cluster, which is identical to the results from Table 4 above, contains 17 RSD networked charter schools and two RSD independent charter schools. These schools are

[26] The F-test for 7 clusters is not statistically significant; at 11 clusters, the individual F-test of one of the continuous variables is no longer statistically significant at 10 percent.

characterized by longer-than-average school hours and a college prep mission. The second cluster is also nearly identical to the results in Table 4. It contains two OPSB independent charter schools, six RSD independent charter schools, and four RSD networked charter schools. This group can be characterized as basically average – they have near average values for all clustering variables, and they do not have any specialized focus or college prep mission.[27]

The remaining six clusters capture more nuances in the supply of schools than was previously captured by clustering into only three groups. All of the schools in these remaining six clusters have a specialized academic focus, and three of the six clusters contain only schools that also have a college prep mission.[28] However, the clusters vary across continuous variables, as indicated by significant F-tests for all continuous clustering variables except student support staff. For example, schools in Cluster 3, which includes OPSB direct-run non-charter schools, OPSB independent charter schools, and schools from two different CMO networks, offer more than average extracurricular activities and sports and have a longer grade span than schools in some of the other clusters. Cluster 5 includes four selective admissions schools and shorter-than-average school hours paired with a larger number of extracurricular activities. The two schools in Cluster 7 have a college prep mission paired with school hours that are well above average.[29]

Finally, two elementary schools appear as outliers in the analysis, which suggests that they occupy a unique niche in the market across the combination of characteristics included in this analysis. The first is a selective admissions OPSB independent charter school with a special

[27] The distinction between being have a college prep mission vs. no special mission or focus appears to be the most important distinction for these two large groups. Excluding these indicators from the cluster analysis causes the two groups to overlap and appear more similar.
[28] Having an academic focus appears to be an important distinguishing feature. Several schools that appear in small clusters join larger clusters when this variable is excluded from the cluster analysis.
[29] This grouping is robust when the college prep indicator is excluded.

academic focus, low school hours, high extracurriculars and sports, and a large grade span.[30] The second is an RSD networked charter school with no special focus or college prep mission, but larger than average extracurriculars, sports, and student support staff.[31]

Overall, the more flexible clustering strategy creates groupings that are more similar within group and more different across groups than groupings based on the top-down structures of governing agency or school type alone. We observe that a single CMO network can manage elementary schools that are quite different from each other, and also, similar schools can be managed by several different types of organizations and governed by different agencies. RSD schools are more likely to cluster together than OPSB schools, which are often in smaller market segments. Finally, elementary schools cluster in groups with varied levels of school characteristics – except for student support staff.[32] This number may be largely a function of meeting requirements for students with special education designations. Elementary schools do not specialize by providing greater student support services.

Because several New Orleans CMOs are known as "no excuses" schools with strict discipline, we also attempted groupings with measures of strictness. The *New Orleans Parents' Guide to Public Schools* includes descriptions of discipline practices that are too vague for coding into a "no excuses" indicator variable. Instead, we tested several empirical measures of strictness using school aggregates of LDOE disciplinary data on suspension and expulsion rates. Clustering was stable with the inclusion of these variables with the exception that some clustered

[30] This school joins cluster 3 when selective admissions is excluded, indicating that it is similar to these schools across other variables.
[31] This school clusters with some special focus and college prep schools when these indicators are omitted from the analysis, indicating that it is similar to some schools across other variables.

schools occasionally become outliers. In particular, schools operated by the CMO network, ReNEW, formed their own cluster outside of Cluster 1.[33]

6.3.2 High Schools

The dendrogram for clustering high schools is displayed in Figure 3b. Here, the first two schools to cluster based on the Gower dissimilarity measure are Carver Collegiate and Carver College Prep, two schools that are operated in the RSD by the Collegiate Academies CMO. Compared to elementary schools, high schools appear to join clusters higher up on the dendrogram, indicating that there are more differences across high schools than elementary schools, and the maximum dissimilarity for high schools is also greater at approximately 0.30.

Results of clustering high schools into three groups are displayed in Panel A of Table 7, with mean values for clustering variables by cluster in Panel B. The first cluster contains 19 of the 22 high schools, including schools from all three governing agencies. The second cluster contains two schools, one from OPSB and the other, an RSD charter school. The final cluster includes only one OPSB school. The three clusters are significantly different only in the number of extracurricular activities. The difference in extracurricular activities is driven by Cluster 3, which includes only one high school with an usually high number of extracurriculars. Overall, these findings do not support the assumption that schools differentiate by governance type, although as with elementary schools, BESE and RSD schools tend to cluster together, while OPSB schools appear in all three clusters. Similarly, with respect to school type, we find that independent charter schools appear in all three clusters, while networked charter schools are all contained within the first cluster. The results in Table 7 are not robust to alternative linkage strategies, which suggests that the grouping is sensitive and might contain, and be influenced by,

[33] We not include number of disciplinary incidents in the main analysis because the number of incidents is more an outcome of disciplinary practices than a characteristic of schools per se.

outliers. Indeed, observation of the dendrogram (Figure 3b) suggests that a number of outliers are forced into groups when we limit our analysis to three groups. The minimum number of clusters that is somewhat meaningful appears to be four; however, when the two outlier schools that emerge from this grouping are omitted, the F-test suggests there is no statistical difference between the remaining two clusters. Thus, more clusters are needed to account for meaningful differences among the groups. Looking within the large cluster of 18 schools, seven groups emerge, four of which contain only one school. When we omit all of the outlier high schools (overall), the remaining four clusters are statistically different from each other. Thus, our preferred number of clusters is also 10, in this case. These results are displayed in Table 8, with mean values by cluster in Table 9. Here, the Wilks' λ falls to less than 0.005, suggesting that nearly all the variation in continuous clustering variables is explained by allowing outliers to remain ungrouped.

Again, we see a mixture of school governance types within clusters. In Table 8, the largest cluster includes 6 high schools – one OPSB independent charter school and 5 RSD networked charter schools run by four different CMOs. The second cluster is also diverse with 5 total schools coming from three school governance types. With the more liberal grouping strategy, we also observe two networked CMOs and the OPSB operating high schools in different clusters. The six outlier high schools include one OPSB direct-run non-charter school, two OPSB charter schools, two BESE independent charter schools, and one RSD independent charter school. With the exception of one RSD networked charter school, the results in Table 8 are robust both to alternative clustering strategies and to removing outliers from the analysis.

F-test results in Table 9 suggest that the bottom-up approach yields significant variation across clusters in extracurriculars and grade span, but not sports, school hours, or student

services staff. Schools in Cluster 1 are not selective admissions or special focus, but all have a college prep mission. These schools are near average in sports, activities, and hours, and the grade span is small at less than 4 years. Cluster 2 includes all schools with a special focus but not selective admissions; activities, sports, and hours are all below average within this cluster. Cluster 3 includes schools that have both a special focus and a college prep mission, and school hours that are slightly longer-than-average. Cluster 4 includes only two schools that are not specialized or college prep, but they share a longer-than-average grade span.

Five of the 6 high school outliers are selective admissions schools. Five of these six also have a specialized academic focus, and two also have a college prep mission. Outliers tend to have more extracurriculars (Outlier 1), no sports (Outlier 4), longer school hours (Outliers 2 and 4), shorter school hours (Outlier 3), and longer grade spans (Outliers 2 and 6). Overall outliers are much more common among high schools, and all New Orleans selective admissions schools are unique by our measure of dissimilarity; that is, they have their own niches.

6.4 Cross-City Comparison

Finally, we also conduct a comparison of the school characteristics we used in this study across other public schooling systems that are more traditional than the New Orleans market. This speaks to the generalizability of our results to other districts but also to the potential role of decentralization in creating market diversity. In Table 10, we compare New Orleans high schools to other school districts in the region with similar size and student demographics – East Baton Rouge Parish (EBR) in Louisiana, Clayton County in Georgia, and Jackson County in Mississippi. While New Orleans reflects a high degree of charter saturation (91% charter schools), EBR Parish has a moderate degree (25%), Clayton County has a low degree (9%), and Jackson County has no charter high schools. Through F-tests of equal variance, we estimate

whether New Orleans has greater variance across five of the continuous school characteristics (grade span, hours, extracurricular activities, sports, and student service staff). We also test whether the New Orleans schooling market is more likely to contain schools with a special academic focus, college prep mission, or selective admissions. These results are displayed in the bottom panel of Table 10.

Beginning with the most centralized schooling market, the results suggest that Jackson County (fourth column) differs from New Orleans on six out of the eight school characteristics, with similarity only in the range of sports. In contrast, moving from right to left, Clayton County only differs on five of the eight, while EBR Parish differs on three of the eight clustering variables. It is very likely that the presence of charter or magnet schools within Clayton County and EBR Parish (9 percent and 54 percent, respectively) can account for the greater similarities with the New Orleans market.

In terms of individual characteristics, New Orleans tends to vary more than all three of the comparison districts on average instructional hours per day, number of student services staff, and the share of schools that have an academic focus. The difference in school hours is likely explained by the degree of centralization that characterizes each market and whether teacher unions are present (e.g., greater centralization or the presence of teacher unions likely leads to more similarity across these basic school components). The range of student services staff is much smaller in the New Orleans schooling market compared to the three traditional districts. The population of special needs students may be endogenous to zoning laws, which could result in a small number of schools staffing a larger number of specialists than others within the same district. Because New Orleans does not have attendance zones, we would expect a more even distribution of special needs students across the city, and thus, a smaller variance of student

services staff.[34] Finally, New Orleans is more likely to have a school that specializes in a particular academic theme. Due to the large number of school operators managing schools in New Orleans, this result is unsurprising, as it is a relatively obvious way of differentiating a school quickly. In general, these results suggest that the presence of even a small number of charter or magnet schools is sufficient to provide similar variation to what we find in the New Orleans schooling market on several of the school characteristics we measured.

7. Discussion and Conclusion

Prior efforts to describe and categorize differences across charter schools have been limited both by existing theories of public school markets and the limited scale of school choice across most districts. Previous studies have relied on a top-down view of market differentiation, where school offerings are expected to be a function of school structure (either governance arrangement or school type), or are captured by a limited number of dimensions. Opportunities to observe public school markets taken to scale have been constrained by the small number of charter schools that actually operate (due either to regulatory or demand constraints) in most public school systems. In these settings, research has typically observed charter schools filling market niches in areas with differentiated demand (Glomm, Harris, & Lo, 2005). However, market theory provides several possibilities for what a competitive school market could look like when taken to scale – ranging from widespread imitation and similarity to unique specialization.

In this study, we attempt to advance our theoretical and empirical understanding of school choice markets by characterizing product differentiation among schools in a setting where charter schools comprise 95 percent of the supply of schools and are attended by 90 percent of students. In some ways, the New Orleans setting is unique – having been initiated in the wake of

[34] Author calculations of LDOE enrollment data suggests that the variance of the share of 9th grades with an IEP is smaller in New Orleans relative to EBRP, lending support for this argument.

a particularly destructive natural disaster. However, the New Orleans public school student population (majority minority and majority lunch-subsidy eligible) is typical of other urban centers where school reform is growing, and demand-side factors in New Orleans are also typical of lower-income families nationwide (see Harris & Larsen, 2015). Furthermore, the CMOs in New Orleans are supported by many of the same national foundations supporting charter schools across the U.S., suggesting that these outcomes might emerge in other places that scale up the market approach. Our cross-city comparison suggests that New Orleans may be an appropriate model for cities with more moderate charter saturation.

Like prior studies, our findings are limited by the obstacles to measuring and categorizing data across many schools (Bailey, 1994). We are limited in what we can observe and measure about schools. Clearly schools can be different or similar in myriad ways. In this study, we identify a modest number of key dimensions from a publicly available source. We selected a small number of characteristics that reflect decisions schools in a decentralized setting must make in designing their "product" for consumers. We implicitly use these measureable differences as a signal of unobservable differences, as is common in the research literature.

We find that there is considerable variance across New Orleans schools. Although there are similarities across schools along a few school characteristics (e.g., school-required uniforms, transportation provided, and parent group availability), New Orleans schools tend to vary across most dimensions reported here. Furthermore, when comparing the New Orleans schooling market to more traditional public schooling systems along the variables that show variation in New Orleans, we also find evidence of greater diversity.

Prior research has not investigated similarities across schools within governing agency or school type, nor is there much empirical evidence on settings with multiple authorizers. When

we group schools through cluster analysis on key school characteristics, we find that schools do not predictably cluster into groups with similar governance arrangements or school types. Instead, we find that school characteristics vary within both governing agency and individual CMO networks, and often, the most similar schools are governed by different agencies. Based on our analysis, we observe a greater amount of market differentiation than we would expect from a top-down structural approach.

In our results, we find statistically significant differences with an empirical grouping that produces ten types of elementary schools that includes large segments of similar schools, small segments of 2-3 schools, and unique niche schools, as well as an empirical grouping of high schools that includes four segments (both large and small) and a larger number of unique niches.

We do find that charter schools governed by the state Recovery School District are often, but not always, similar to each other, with emphasis on college prep missions and longer school hours. Furthermore, networked charter schools run by large CMOs are often, but not always, similar to each other, and similar schools are operated by most of the city's largest CMOs. It is unclear if this is due preferences in the authorization process or the fact that RSD schools are, by definition, previously low-performing and therefore may be more constrained by test-based accountability. Amidst this similarity, we also find that large CMOs in the RSD can and do create diversified portfolios of schools.

The general similarity of RSD charter schools is complemented by schools that are more likely to differentiate under other governing bureaucracies. For example, OPSB charter schools are quite different from each other and often serve a unique market niche. Particularly at the high school level, we find that charter schools governed through OPSB or BESE create niche markets with a specialized focus, while large CMOs from the RSD form a segment of similar schools,

often sharing a college prep mission. In New Orleans, uniqueness often comes with selective admissions, which suggests that access to diverse school choices is greater for students who through ability or parent involvement can navigate a complex system of admissions rules and testing.

The remaining OPSB direct-run non-charter schools appear in smaller clusters or stand alone as different from the majority of charter schools. OPSB schools also do not typically cluster together, unlike schools from the RSD, which suggests that even a bureaucratic system can manage diverse options in a school choice system. Again, this may be related to the interaction of accountability pressures and incentives to innovate. District schools in New Orleans are relatively high-performing, while RSD schools have a history of low-performance. The corresponding relief from accountability pressure may afford district schools more room to experiment and diversify. Also, as relatively high performing schools, OPSB and BESE may feel additional market pressure to compete with the city's numerous private schools for students who have the resources to pay tuition.

These findings have several implications for policy and future research. First, the structure of the schooling market as well as the range and availability of opportunities provided by schools in New Orleans suggests that we do see variation in school characteristics in a choice setting — a key aim of such policies. There is evidence of horizontal product differentiation, and parents can choose from schools that are different from one another on several key dimensions. This aligns with qualitative research that has found that some school leaders in New Orleans respond to competitive pressure by differentiating their programs and services (Jabbar, 2015).

We also find that these differences are not necessarily driven from the top-down through the decisions of charter authorizing agencies, regulating bureaucracies, or large CMO networks.

There is evidence of diversity in governing agencies' preferences, and whether the school is networked is also not frequently indicative of school similarity. With regard to large networked CMOs, our results suggest that policymakers seeking to replicate already successful CMOs may find that there is significant within-CMO variation; for example, the expansion of KIPP to five elementary campuses in New Orleans did not result in five elementary schools with identical characteristics. In fact, despite the presence of large CMOs, no two New Orleans schools are identical on the small number of characteristics observed here. There is also some evidence that independent charter schools are often similar to networked schools from larger CMOs, which may suggest that they are imitating "best practices," rather than establishing new models.

These findings raise important questions for authorizers, funders, and policymakers regarding the appropriate balance of replication and differentiation. In particular, much of the market differentiation in New Orleans comes from schools that are run by or authorized by either OPSB or BESE, which oversee fewer schools than the state's RSD, and which serve a higher-performing, lower-risk portion of the student population. Having multiple governing agencies may be important for market differentiation but may also create inequality in access to meaningful choice for parents across different schooling models.

This study takes an important first step in understanding these complex questions by providing an empirically-driven analysis of one public school market taken to scale. As more cities expand school choice, we will be able to compare New Orleans to other markets to determine how factors such as economies of scale, regulatory context, and demand influence the level and type of differentiation. We will also be able to observe the evolution of public school markets over time, to see if competitive pressures result in more differentiation or a drift towards imitation, and how changes affect student outcomes. These two future steps are needed to

understand to what degree the schooling market theorized by Friedman more than a half-century ago, might actually be feasible and effective.

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Figure 1. New Orleans Public Schools by Governance Type

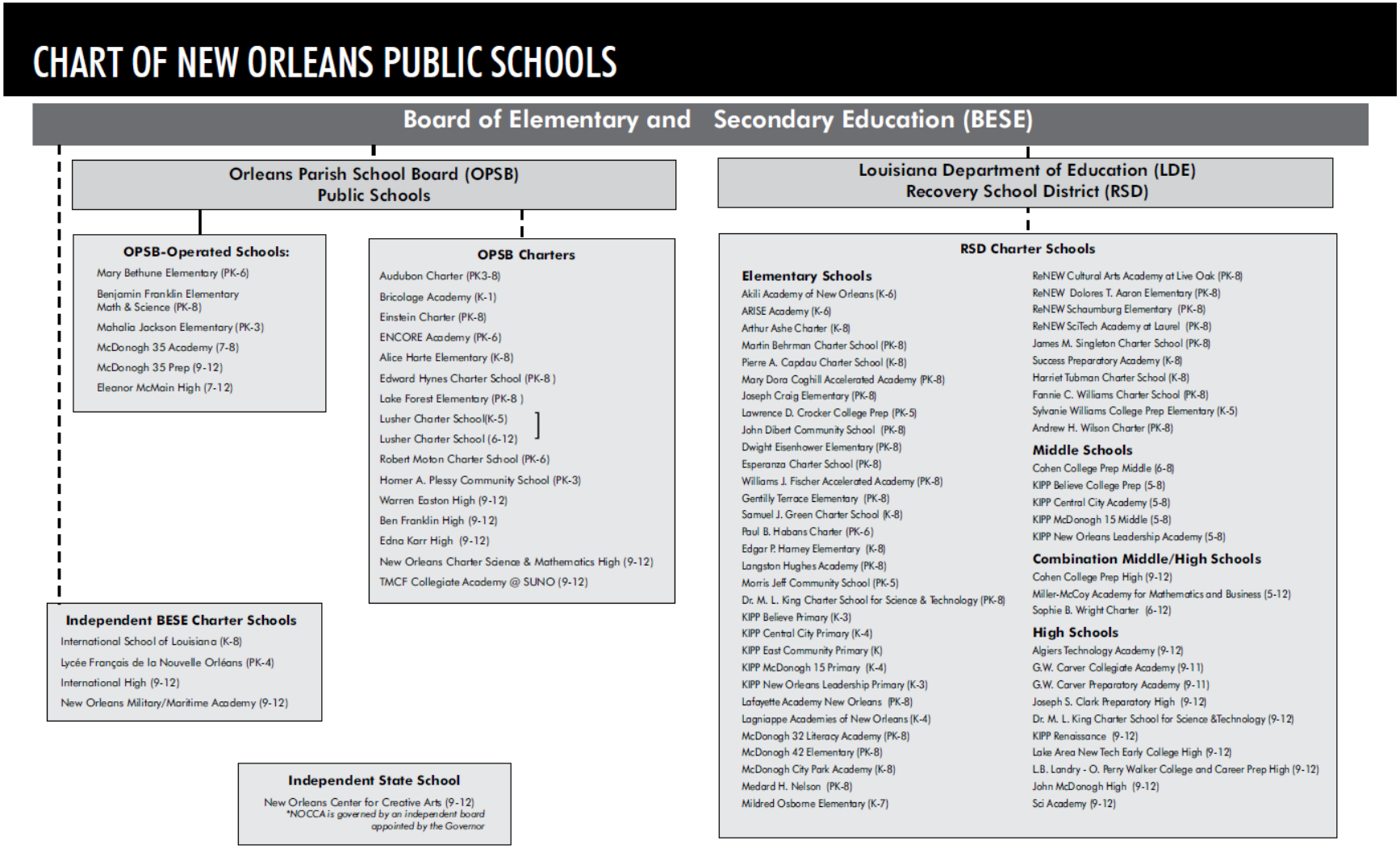

Figure 2. Potential Market-Level Outcomes

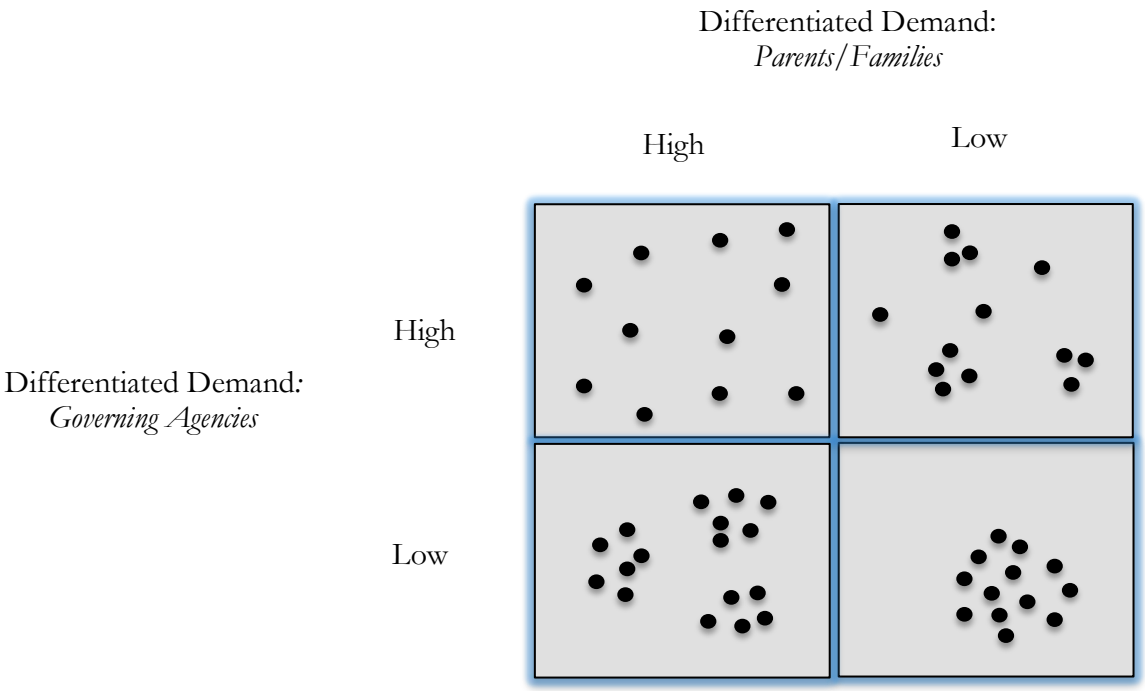

Figure 3a: Dendrogram of Elementary School Clustering

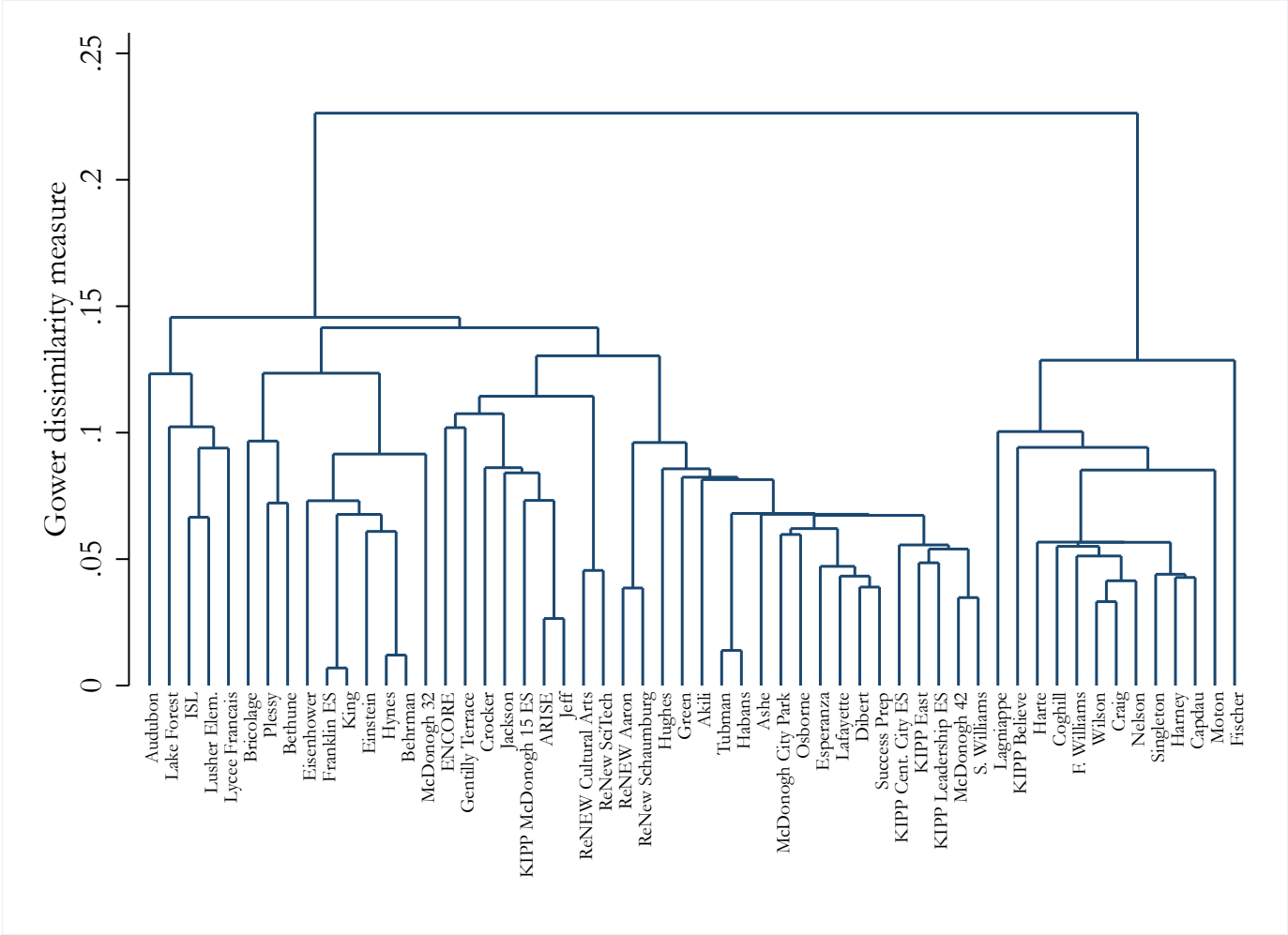

Figure 3b: Dendrogram of High School Clustering

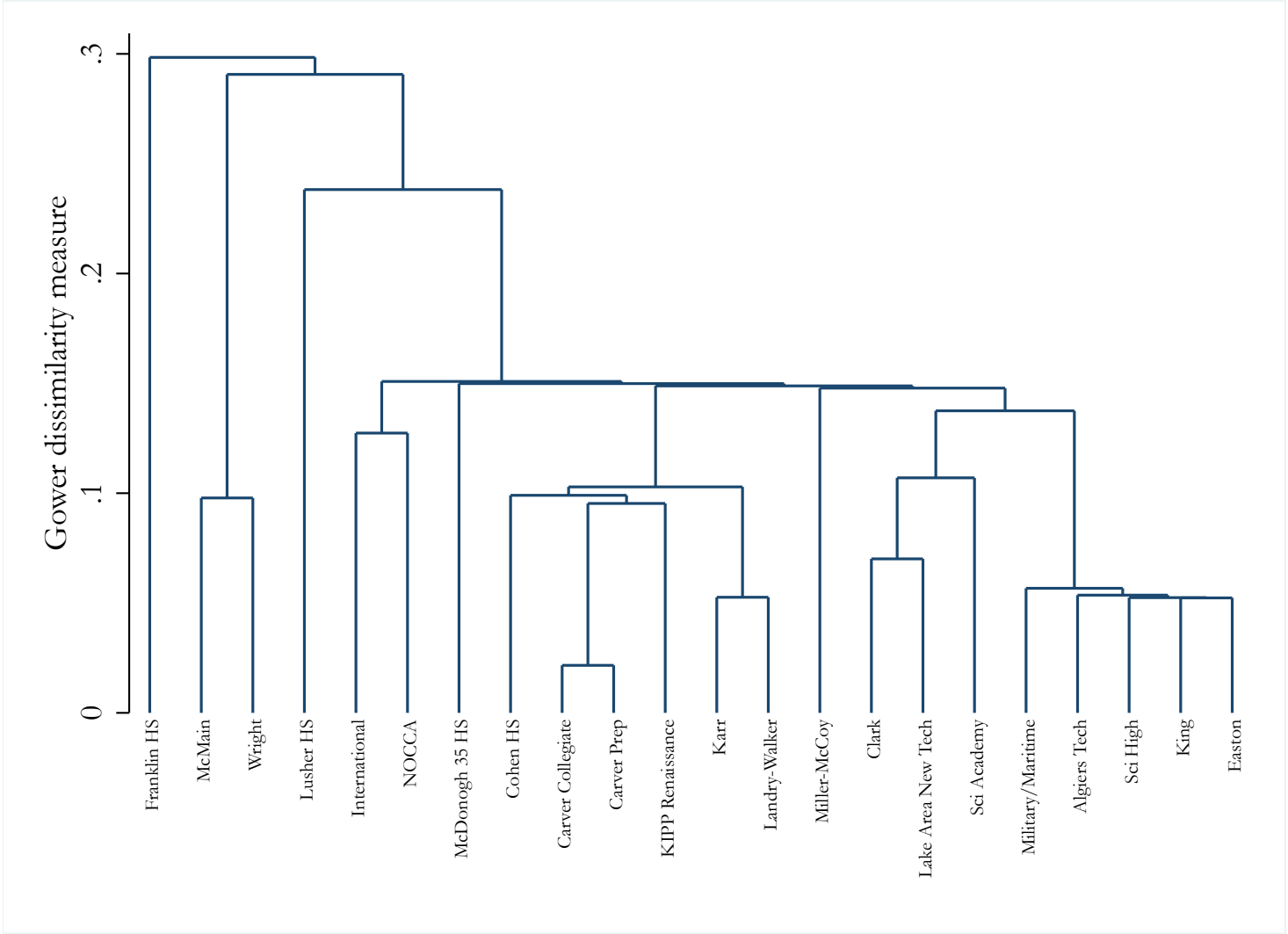

Table 1. Descriptive Statistics for New Orleans Public Schools (2014-2015)

	Elementary Schools	High Schools
School characteristics		
No. of extracurricular activities	6.70	13.23
	(4.40)	(12.44)
No. of sports offered	3.05	6.77
	(2.60)	(2.58)
No. of student support staff	3.25	4.55
	(1.38)	(2.18)
No. of grade levels	8.39	4.45
	(2.23)	(1.30)
Instructional hours (total annual)	1237.72	1218.11
	(241.89)	(214.66)
School has selective admissions	0.09	0.23
	(0.29)	(0.43)
School has a special academic focus	0.43	0.59
	(0.50)	(0.50)
School has a college prep mission	0.50	0.50
	(0.50)	(0.51)
School requires uniforms	0.95	0.86
	(0.23)	(0.35)
School has a parent group	0.80	0.91
	(0.40)	(0.29)
School provides transportation	0.93	0.95
	(0.26)	(0.21)
Student demographics		
Total enrollment	537.90	561.91
	(239.56)	(375.08)
Black	0.87	0.84
	(0.21)	(0.24)
White	0.07	0.10
	(0.15)	(0.18)
Hispanic	0.04	0.03
	(0.09)	(0.05)
Free or Reduced Price Lunch	0.86	0.77
	(0.19)	(0.22)
Special Education	0.09	0.09
	(0.04)	(0.05)
Charter school	0.95	0.91
	(0.23)	(0.29)
Number of schools	56	22

Notes: School characteristics are coded by researchers from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. Student demographic information is calculated from the LDOE student-level enrollment files for the Fall of 2013. Elementary schools include all schools that offer any grades K-4. High schools include all schools that offer any grades 9-12. Student support staff include school nurses, social workers, psychologists, counselors, and other staff that support students with special needs.

Table 2. Elementary Schools by Top-Down Structure

	Governing Agency				School Type			
	BESE	**OPSB**	**RSD**	**F-test**	**Networked Charter**	**Independent Charter**	**District-Run Non-Charter**	**F-test**
Clustering variables								
No. of extracurricular activities	7.00	7.54	6.41	0.32	6.45	6.85	8.33	0.26
	(4.24)	(4.45)	(4.46)		(4.74)	(3.57)	(6.81)	
No. of sports offered	1.50	2.69	3.24	0.58	3.42	2.70	1.33	1.19
	(2.12)	(2.84)	(2.56)		(2.75)	(2.32)	(2.31)	
No. of student support staff	3.00	2.85	3.39	0.80	3.48	2.80	3.67	1.73
	(1.41)	(1.63)	(1.30)		(1.30)	(1.51)	(0.58)	
No. of grade levels	7.50	7.85	8.59	0.67	8.52	8.30	7.67	0.22
	(2.12)	(2.67)	(2.14)		(2.21)	(2.32)	(2.52)	
Instructional hours (total annual)	1079.70	1110.46	1285.78	3.29*	1301.85	1154.72	1085.60	3.16
	(25.03)	(144.04)	(255.61)		(260.85)	(191.19)	(40.88)	
School has selective admissions	1.00	0.23	0.00		0.00	0.25	0.00	
	(0.00)	(0.44)	(0.00)		(0.00)	(0.44)	(0.00)	
School has a special academic focus	1.00	0.85	0.27		0.30	0.55	1.00	
	(0.00)	(0.38)	(0.45)		(0.47)	(0.51)	(0.00)	
School has a college prep mission	0.00	0.15	0.63		0.70	0.20	0.33	
	(0.00)	(0.38)	(0.49)		(0.47)	(0.41)	(0.58)	
Number of schools	2	13	41		33	20	3	

Notes: Mean values of clustering variables by governing agency and school type. Data are from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. We test the null hypothesis that all observations in all three school types (by governing agency or school type, respectively) are pulled from the same distribution. No values are sufficient to reject the null hypothesis, with the exception of instructional hours under governing agency, suggesting that neither governing agency nor school type fully explains differences between schools. * Indicates f-statistic sufficient to fail to accept the null hypothesis (95 percent confidence level).

Table 3. High Schools by Top-Down Structure

	Governing Agency				School Type			
	BESE	**OPSB**	**RSD**	**F-test**	**Networked Charter**	**Independent Charter**	**District-Run Non-Charter**	**F-test**
Clustering variables								
No. of extracurricular activities	7.00	21.14	10.17	2.45	16.00	11.45	10.50	0.36
	(3.61)	(19.41)	(5.18)		(18.35)	(6.61)	(0.71)	
No. of sports offered	4.33	8.71	6.25	4.89*	6.67	6.82	7.00	0.02
	(4.04)	(2.29)	(1.60)		(3.57)	(1.89)	(1.41)	
No. of student support staff	2.33	5.86	4.33	3.59*	4.00	4.91	5.00	0.45
	(0.58)	(1.46)	(2.31)		(1.94)	(2.55)	(0.00)	
No. of grade levels	4.00	4.71	4.42	0.31	5.11	3.82	5.00	3.20
	(0.00)	(1.25)	(1.51)		(1.69)	(0.40)	(1.41)	
Instructional hours (total annual)	1152.62	1101.14	1302.71	2.39	1180.39	1277.35	1062.00	1.10
	(231.76)	(94.55)	(235.88)		(151.53)	(261.49)	(0.00)	
School has selective admissions	0.67	0.43	0.00		0.44	0.00	0.50	
	(0.58)	(0.53)	(0.00)		(0.53)	(0.00)	(0.71)	
School has a special academic focus	1.00	0.57	0.50		0.78	0.45	0.50	
	(0.00)	(0.53)	(0.52)		(0.44)	(0.52)	(0.71)	
School has a college prep mission	0.00	0.29	0.75		0.11	0.82	0.50	
	(0.00)	(0.49)	(0.45)		(0.33)	(0.40)	(0.71)	
Number of schools	3	7	12		11	9	2	

Notes: Mean values of clustering variables by governing agency and school type. Data are from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. We test the null hypothesis that all observations in all three school types (by governing agency or the type of school, respectively) are pulled from the same distribution. No values are sufficient to reject the null hypothesis, with the exception of number of sports and student support staff under governing agency, suggesting that neither governing agency or the school type fully explains differences between schools. * Indicates F-statistic sufficient to fail to accept the null hypothesis (95 percent confidence level).

Table 4. Clustering Results for Elementary Schools in Three Clusters

	Clusters			
	1	**2**	**3**	
Panel A				
Distribution within cluster				*Distribution by agency or school type*
Number of schools	38	13	5	
Share BESE	0%	0%	40%	CL3: 100%
Share OPSB	21%	15%	60%	CL1: 62% | CL2: 15% | CL3: 23%
Share RSD	79%	85%	0%	CL1: 73% | CL2: 27%
Independent charter	21%	62%	100%	CL1: 44% | CL2: 44% | CL3: 11%
Networked charter	71%	38%	0%	CL1: 84% | CL2: 16%
District-run	8%	0%	0%	CL1: 100%
Share of students	61%	24%	15%	
Panel B				**F-test**
Clustering variables				
No. of extracurricular activities	6.45	6.85	8.20	0.35
	(4.58)	(4.28)	(3.70)	
No. of sports offered	3.03	3.00	3.40	0.05
	(2.72)	(1.96)	(3.58)	
No. of student support staff	3.26	3.15	3.40	0.06
	(1.37)	(1.41)	(1.67)	
No. of grade levels	8.24	8.85	8.40	0.35
	(2.38)	(1.82)	(2.30)	
Instructional hours (total annual)	1273.30	1206.74	1047.84	2.14
	(261.65)	(191.01)	(40.36)	
School has selective admissions	0.00	0.00	1.00	
	(0.00)	(0.00)	(0.00)	
School has a special academic focus	0.50	0.00	1.00	
	(0.51)	(0.00)	(0.00)	
School has a college prep mission	0.74	0.00	(0.00)	
	(0.45)	(0.00)	(0.00)	

Notes: Panel A displays the clustering results when limiting to three groups only. Clustering is based on single linkage using the Gower dissimilarity measure. Data are from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. The distribution of governing agency across the three clusters indicates that schools within governing agency are similar across governing agency, rejecting the top-down theory of similarity due to governance. Panel B displays the mean values of clustering variables. We test the null hypothesis that all observations in all three clusters are pulled from the same distribution. No values are sufficient to reject the null hypothesis, suggesting that three groups do not fully explain differences between schools.

Table 5. Elementary Schools in Eight Clusters with Two Outliers

	Clusters								Outliers
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Panel A									
Distribution within cluster									
Number of schools	19	12	7	5	4	3	2	2	2
Share BESE	0%	0%	0%	0%	50%	0%	0%	0%	0%
Share OPSB	0%	17%	43%	20%	50%	100%	0%	50%	50%
Share RSD	100%	83%	57%	80%	0%	0%	100%	50%	50%
Share of students	32%	22%	15%	5%	10%	2%	6%	3%	6%
Panel B									
School types									
BESE + Independent					2				
OPSB + Charter		2	2		2*	2		1*	1
OPSB + Direct-run non-charter			1	1		1			
RSD + Independent	2	6		1					
RSD + Networked:									
Algiers Charter Schools Association			3						1
Arise Academy	1			1					
Choice Foundation	3								
Collegiate Academies									
Crescent City School	3								
FirstLine Schools, Inc.	4*								
Friends of King		1	1						
KIPP New Orleans	3	1		1					
New Beginnings		2						1*	
New Orleans College Prep Academies	1			1					
ReNEW	2*						2		

Notes: Tables displays school groupings resulting from hierarchical clustering into eight groups (excluding outliers) based on the following school characteristics: number of extracurricular activities, sports, student support staff, grade levels, and instructional hours; and whether the school has a special academic focus, a college prep mission, or selective admissions. Clustering is based on single linkage using the Gower dissimilarity measure. Outliers are observations for which all other observations have dissimilarity >0.10. Clustering of observations in clusters 1-8 is robust to inclusion or exclusion of outliers cluster analysis. * Schools appear as outliers or separate clusters with alternative linkage strategies.

Table 6. Clustering Variables for Elementary Schools in Eight Groups with Two Outliers

	Clusters								Outliers		F-test
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	
Clustering variables											
No. of extracurricular activities	5.95	6.17	10.86	2.80	8.00	2.33	6.50	11.00	9.00	15.00	2.92*
	(4.29)	(3.66)	(4.06)	(2.68)	(4.24)	(2.08)	(0.71)	(2.83)			
No. of sports offered	3.26	2.58	5.86	0.40	2.25	0.00	2.00	3.00	8.00	8.00	4.59*
	(2.58)	(1.31)	(1.77)	(0.89)	(2.87)	(0.00)	(1.41)	(2.83)			
No. of student support staff	3.37	3.00	4.14	3.20	2.75	2.00	2.50	2.00	6.00	5.00	1.80
	(1.46)	(1.35)	(1.35)	(0.84)	(0.96)	(1.00)	(0.71)	(0.00)			
No. of grade levels	8.21	8.75	10.00	6.60	7.75	5.00	10.00	9.50	11.00	10.00	2.49*
	(2.42)	(1.86)	(0.00)	(1.52)	(2.06)	(3.00)	(0.00)	(0.71)			
Instructional hours (total annual)	1315.03	1212.90	1073.13	1310.18	1053.15	1100.35	1944.00	1074.04	1026.60	1132.80	5.29*
	(238.96)	(198.14)	(53.80)	(134.43)	(44.54)	(98.68)	(0.00)	(83.10)			
School has selective admissions	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
School has a special academic focus	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
School has a college prep mission	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
Number of schools	19	12	7	5	4	3	2	2	1	1	

Notes: Mean values of clustering variables when allowing the schools to form into 10 total groups. Data are from the 2014 Spring Edition of the New Orleans Parents' Guide to Public Schools. We test the null hypothesis that all observations in all 10 clusters are pulled from the same distribution. All values are sufficient to reject the null hypothesis, with the exception of student support staff, suggesting that ten groups explain most of the differences between schools. * Indicates f-statistic sufficient to fail to accept the null hypothesis (95 percent confidence level).

Table 7. Clustering Results for High Schools in Three Clusters

	Clusters			
	1	**2**	**3**	
Panel A				
Distribution within cluster				*Distribution by agency or school type*
Number of schools	19	2	1	
Share BESE	16%	0%	0%	CL1: 100%
Share OPSB	26%	50%	100%	CL1: 71% | CL2: 14% | CL3: 14%
Share RSD	58%	50%	0%	CL1: 92% | CL2: 8%
Independent charter	42%	50%	100%	CL1: 80% | CL2: 10% | CL3: 10%
Networked charter	53%	0%	0%	CL1: 100%
District-run	5%	50%	0%	CL1: 50% | CL2: 50%
Share of students	83%	11%	7%	
Panel B				
Clustering variables				**F-test**
No. of extracurricular activities	10.79	11.00	64.00	46.72*
	(5.52)	(0.00)		
No. of sports offered	6.68	5.50	11.00	1.70
	(2.56)	(0.71)		
No. of student support staff	4.58	4.00	5.00	0.08
	(2.32)	(1.41)		
No. of grade levels	4.26	6.50	4.00	3.36
	(1.19)	(0.71)		
Instructional hours (total annual)	1228.82	1194.40	1062.00	0.28
	(224.21)	(187.24)		
School has selective admissions	0.21	0.00	1.00	
	(0.42)	(0.00)		
School has a special academic focus	0.68	0.00	0.00	
	(0.48)	(0.00)		
School has a college prep mission	0.58	0.00	0.00	
	(0.51)	(0.00)		

Notes: Panel A displays the clustering results when limiting to three groups only. Clustering is based on single linkage using the Gower dissimilarity measure. Data are from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. The distribution of governing agency across the three clusters indicates that schools within governing agency are similar across governing agency, rejecting the top-down theory of similarity due to governance. Panel B displays the mean values of clustering variables. We test the null hypothesis that all observations in all three clusters are pulled from the same distribution. No values are sufficient to reject the null hypothesis, with the exception of number of extracurriculars, suggesting that three groups do not fully explain differences between schools.

Table 8. High Schools in Four Clusters with Six Outliers

	Clusters				Outliers
	1	2	3	4	
Panel A					
Distribution within cluster					
Number of schools	6	5	3	2	6
Share BESE	0%	20%	0%	0%	33%
Share OPSB	17%	40%	0%	50%	50%
Share RSD	83%	40%	100%	50%	17%
Share of students					
Panel B					
School types					
BESE + Independent		1			2
OPSB + Charter	1	2			2
OPSB + District-run non-charter				1	1
RSD + Independent				1	1
RSD + Networked:					
Algiers Charter Schools Association	1	1			
Arise Academy					
Choice Foundation					
Collegiate Academies	2*		1		
Crescent City School					
FirstLine Schools, Inc.			1		
Friends of King		1			
KIPP New Orleans	1				
New Beginnings			1		
New Orleans College Prep Academies	1				
ReNEW					

Notes: Tables displays school groupings resulting from hierarchical clustering into four groups (excluding outliers) based on the following school characteristics: number of extracurricular activities, sports, student support staff, grade levels, and instructional hours; and whether the school has a special academic focus, a college prep mission, or selective admissions. Clustering is based on single linkage using the Gower dissimilarity measure. Outliers are observations for which all other observations have dissimilarity >0.10. Clustering of observations in clusters 1-4 is robust to inclusion or exclusion of outliers cluster analysis. * Schools appear as outliers or separate clusters with alternative linkage strategies.

Table 9. Clustering Variables for High Schools in Four Clusters with Six Outliers

	Clusters				Outliers						F-test
	1	2	3	4	1	2	3	4	5	6	
Clustering variables											
No. of extracurricular activities	12.67	9.60	11.00	11.00	64.00	12.00	10.00	8.00	10.00	8.00	7.29*
	(8.26)	(6.19)	(2.00)	(0.00)							
No. of sports offered	7.17	6.00	8.00	5.50	11.00	12.00	5.00	0.00	8.00	5.00	5.02
	(1.60)	(1.87)	(1.00)	(0.71)							
No. of student support staff	5.67	4.20	4.00	4.00	5.00	7.00	3.00	2.00	5.00	3.00	0.51
	(3.08)	(1.92)	(2.00)	(1.41)							
No. of grade levels	3.67	4.00	4.00	6.50	4.00	7.00	4.00	4.00	4.00	8.00	24.45*
	(0.52)	(0.00)	(0.00)	(0.71)							
Instructional hours (total annual)	1327.29	1084.37	1307.82	1194.40	1062.00	1306.26	979.87	1416.00	1062.00	1274.40	0.73
	(304.00)	(22.17)	(251.71)	(187.24)							
School has selective admissions	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)							
School has a special academic focus	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)							
School has a college prep mission	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)							
Number of schools	6	5	3	2	1	1	1	1	1	1	

Notes: Mean values of clustering variables when allowing the schools to form into 10 total groups. Data are from the 2014 Spring Edition of the *New Orleans Parents' Guide to Public Schools*. We test the null hypothesis that all observations in all 10 clusters are pulled from the same distribution. All values are sufficient to reject the null hypothesis, with the exception of student support staff, suggesting that ten groups explain most of the differences between schools. * Indicates f-statistic sufficient to fail to accept the null hypothesis (95 percent confidence level).

Table 10. Comparison across traditional public school districts with similar student populations

	Louisiana		Georgia	Mississippi	
	New Orleans	East Baton Rouge Parish	Clayton County	Jackson County	
Number of high schools	22	13	11	7	
Demographic variables					
District enrollment	41,092	42,982	51,757	29,898	
Mean enrollment (high schools)	561.91	839.00	1303.00	1146.86	
	(375.08)	(446.28)	(607.26)	(223.36)	
Percent black (high schools)	0.84	0.84	0.77	0.99	
	(0.24)	(0.17)	(0.12)	(0.01)	
Percent FRPL (high schools)	0.77	0.77	0.78	0.87	
	(0.22)	(0.15)	(0.08)	(0.07)	
Percent charter (high schools)	0.91	0.23	0.09	0.00	
	(0.29)	(0.44)	(0.30)	(0.00)	
Percent magnet (high schools)	0.00	0.31	0.00	0.00	
	(0.00)	(0.48)	(0.00)	(0.00)	
Clustering variables					**Comparison result**
Grade span	4.45	4.85	4.09	4.00	Nola varies more
	(2.18)	(1.07)	(0.70)**	--	
Instructional hours per day	7.92	7.26	7.17	7.17	Nola varies more
	(0.69)	(0.15)***	(0.00)***	--	
Extracurricular activities	13.23	24.17	14.60	8.00	Nola varies about the same or more
	(12.44)	(16.44)	(9.81)	--	
Sports	6.77	7.85	10.36	7.57	Nola varies about the same or less
	(2.58)	(2.48)	(4.20)**	(2.23)	
Student services staff	4.55	7.88	14.80	14.14	Nola varies less
	(2.18)	(6.71)***	(11.16)***	(4.06)**	
Special academic focus	0.59	0.15	0.09	0.14	Nola more likely
	(0.50)	(0.38)***	(0.30)***	(0.38)**	
College prep mission	0.50	0.60	0.27	0.00	Nola about the same or more likely
	(0.51)	(0.52)	(0.47)	(0.00)***	
Selective admissions	0.23	0.23	0.09	0.00	Nola about the same or more likely
	(0.43)	(0.44)	(0.30)	(0.00)*	

Notes: Data shown in the top panel are from each school's profile in the NCES Common Core of Data for the 2012-2013 school year. Data shown in the bottom panel were collected by the authors from each school's website (accessed July 20, 2015), with the exception of the first column (New Orleans schools, which come from the 2014 edition of the *New Orleans Parents' Guide to Public Schools*) and the data on team sports (collected by the authors from each school's profile on their respective state high school athletics association website). One-sided tests of equality of variances were conducted on the first five clustering variables listed, with the null hypothesis that New Orleans varied less on a given variable. One-sided tests of the mean were conducted on the last three clustering variables, with the null hypothesis that New Orleans was less likely to offer the given program. Results across the three comparison districts are summarized in the final column of the bottom panel. *** indicates statistical significance at 1%, ** at 5%, and * at 10%.