# Urban Catholic Schools in Expanding Charter School Markets: Enrollment Shifts and School Closures

## by

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# DEDICATION

To my mother,
Christine
for her love, encouragement, sacrifice,
and especially for
instilling the importance and value of higher education

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INTRODUCTION


The overarching view that parents should have choices available when it comes to the education of their children is deeply rooted in United States culture (Berends, Cannata, & Goldring, 2011). School choice is generally perceived as a good thing for families when less than desirable schooling alternatives exist. Even with these perceptions the growth of school choice programs--whether intra-district choice, magnet schools, school vouchers, or charter schools--has been the subject of intense public debate. Nevertheless, public and private K-12 school choice programs have vastly expanded throughout the U.S. during the past two decades. As a result of the rapid growth of school choice programs an increasing proportion of educational policy research has focused on better understanding the effects of choice programs on families and their children.

The continued poor performance[1] of many traditional public schools in urban areas is one of the main contributors to the growth of the number and popularity of school choice programs (Berends, Cannata, & Goldring, 2011). The implementation of the No Child Left Behind (NCLB) Act by the Bush Administration in the early 2000s helped to fuel the push for increased choice. With its primary goal to enact standards-based reform to improve

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[1] Throughout this dissertation, I use the term "poorly performing" to refer to schools in which the average achievement of students attending the school is well below average, whether in reference to other schools in the city or some state-defined standard.

educational outcomes, public schools became subject to increased accountability through the performance of their students on state-administered assessments. Public knowledge about schools whose students failed to make adequate achievement progress increased as a result. Consequently, more parents sending their children to a poorly performing public school began to exercise their option for school choice and selected alternative schools.

Charter schools, described further in the next section, have been one of the most recent and popular forms of public school choice. These publicly funded, secular, and autonomous schools serve as an alternative for families who seek a public education alternative to poorly performing urban public schools for their children. Much of the school choice literature has explored the effectiveness of charter school students in comparison to their public schools peers (e.g., Dobbie & Fryer, 2011; Gleason, Tuttle, Clark, & Dwoyer, 2010) along with the competitive pressure exerted by charter schools on public schools (e.g., Hoxby, 2003).

An area of the school choice literature that has received considerably less attention is the unintended consequences of expanding school choice programs. Catholic schools have served as the primary private schooling option for urban families seeking an alternative to traditional public schools. Though Catholic schools have faced nearly a half-century of declining enrollments and a substantial number of school closures the growing presence of charter schools may be hastening their decline. This impact may especially be the case in urban neighborhoods where a charter school open in close proximity to a Catholic school and attempts to serve a similar population of families seeking an alternative to traditional public schools. Even though charter schools primarily seek to provide a

different option for families considering traditional public schools, a residual impact on Catholic schools may result. Therefore, as the number of public school choices grows due to charter schools opening there may be an unintentional reduction of private school choices if Catholic schools close in a more rapid fashion as a result of charter school growth.

## *Problem Statement*

### *Catholic School Enrollment Declines and School Closures*

Catholic schools are private, tuition-based schools operated by local parishes, dioceses, or religious orders of the Catholic Church. These schools have been long-standing educational alternatives to traditional public schools for families and their children. The rigorous academic curricula for all students, social structure, and safety of Catholic schools have attracted many children from poor and minority families living in urban communities that lack quality educational alternatives (Bryk, Lee, & Holland, 1993; Coleman & Hoffer, 1987; Lee, Smith & Croninger, 1997). Part of the mission of Catholic schools is a commitment to providing educational service to individuals from all racial/ethnic or socioeconomic backgrounds (Bempechat, 1998; Lee, Smith, & Croninger, 1997; O'Keefe & Scheopner, 2007). This focus stems from the Second Vatican Council where the Catholic Church as part of its social doctrine focused on the basic human rights of all individuals and the moral obligation of individuals and organizations to commit themselves to serving those less fortunate within their communities (Bryk, Lee, & Holland, 1993).

Over time, urban Catholic schools in the Northeast and Midwest of the United States shifted their initial focus from serving populous communities of white Catholic families to

educating significant numbers of the poor, racial/ethnic minorities, and non-Catholics that now populate urban centers (DeFiore, 2008; O'Keefe & Scheopner, 2007). Many poor, African American families living in these cities, whether Catholic or not, view Catholic schools as a place of safety and educational opportunity for their children when the alternative is a less than desirable public school (Green, 2011; Irvine & Foster, 1996). However, enrollments in Catholic schools, particularly in these urban communities, have substantially declined over the past half-century. In addition, thousands of schools nationwide have closed, in no small part to the plummeting enrollments. Numerous economic and sociological factors contributed to the decline of urban Catholic schools over time.

In the year 1960, at the peak of Catholic primary and secondary schooling in the United States, there were approximately 5.2 million students enrolled in over 13,000 schools (NCES, 2011b). During the next three decades cities primarily located in the Northeast and Midwest, where the overwhelming majority of Catholic schools were located, underwent a period of deindustrialization and population shifts (sometimes denoted "white flight"). By 1990, after substantial numbers of white Catholic families left these cities for suburban residential locations, there were only 2.5 million students enrolled in 8,719 Catholic schools (NCES, 2011b). Although these demographic transitions slowed, resulting in more stable enrollments from the late 1980s through the mid-1990s, sharp enrollment falloffs and increased school closings have returned over the past fifteen years. During the 2011-2012 school year, there were slightly more than 2.0 million students enrolled in 6,841 Catholic schools (McDonald & Schultz, 2011). These enrollment declines

and school closures have been concentrated in 1) elementary and middle school grade levels; 2) in urban and inner city locations with high poverty rates and large numbers of racial and ethnic minorities; and 3) in the Mideast and Great Lakes regions of the United States (CARA, 2006; USCCB, 2005; O'Keefe & Scheopner, 2007).

Several additional factors have contributed to the more recent decline of Catholic schools in cities. The combination of escalating operating costs, large deficits, and shrinking Catholic populations are all internal issues that strain the ability of Catholic schools to continue operating (Grace & O'Keefe, 2007). From the outside Catholic schools have become vulnerable as a result of growing opposition to the Catholic Church's social stances (e.g., abortion, contraception, homosexuality) and recent wave of child abuse cases (Cattaro & Cooper, 2007). As a result of the viewpoints and actions of the Church, many individuals have a developed negative view of Catholic schools themselves (Cattaro, 2002; Cattaro & Cooper, 2007). All of these contributing factors have challenged Catholic schools in maintaining their mission of educating the poor (O'Keefe et al., 2004).

Though urban Catholic schools have faced numerous internal and external challenges one of the prime contributors to the loss of students and schools is rising tuition levels due in part to shrinking enrollments and higher teacher salaries (Cech, 2008). As tuition rises a larger proportion of poor urban families become unable or unwilling to pay tuition. When Catholic schools are no longer viable alternatives to families because of escalating tuition they will enroll their children in a different schooling alternative. The revenue generated from tuition is essential to the sustained operation of Catholic schools so enrolling fewer students will likely result in additional financial difficulties (Grace &

O'Keefe, 2007). This is a paradox for Catholic schools: they have a mission to educate the poor, but find it increasingly difficult to enroll children from poor families.

*Growth of Charter Schools*

Compounding the problem of Catholic schools becoming financially unattractive to urban families is the recent growth of charter schools. Interested families are able to enroll their children in a charter school provided there is an open seat in the school at the requisite grade. When the number of families wanting to send their children to a charter school exceeds the number of seats available in the school (i.e., the charter school is oversubscribed), schools usually conduct a lottery to determine which students can enroll (Finnigan et al., 2004). There is no tuition that parents must pay to send their children to a charter school because charter schools are public. Charter schools receive public funding primarily from state and local sources proportional to the number of students enrolled in the school (Finnigan et al., 2004). For each child enrolled in a charter school state and local appropriations for that child are transferred to the charter school from the public school district in which the child would have enrolled absent any other schooling alternatives (Finnigan et al., 2004).

Charter schools have several characteristics that distinguish them from their traditional public school counterparts. First, they are exempt from many state and local regulations. This means charter schools are granted a greater degree of autonomy in their selection of curriculum, hiring practices and development of their missions (Finn, Manno, & Vanourek, 2001). Second, those individuals or organizations opening a charter school must

establish a set of specific educational goals. These goals are part of the school's charter and the school will be held accountable for attaining these goals (Finnigan et al., 2004; Stein, Goldring, & Cravens, 2011). State-appointed charter authorizing bodies are responsible for approving the school's charter and holding the school accountable for meeting its stated goals (Finnigan et al., 2004). Charter authorizing bodies include local school districts, state education agencies, higher education institutions, or special chartering boards (Finnigan et al., 2004).

Individual states are responsible for drafting laws that authorize the operation of charter schools, with each law containing a cap on the number of charter schools allowed to operate statewide or in specific areas. Laws vary across states in terms of the cap on the number of schools and the ease by which new charter schools may open. Appendix Table A.1 briefly describes features of charter laws for states included in this study. Even with caps and other restrictions, charter schools in most states have experienced substantial growth since the passage of the first state laws during the early 1990s. As of the 2008-2009 school year there were nearly 4,700 elementary and secondary charter schools operating, serving over 1.4 million students across the United States (NCES, 2011a). Some poorly performing charter schools that did not meet their intended goals set forth in their charter have closed, but for the most part new school openings are the norm.

*Competition for Students between Catholic and Charter Schools*

Charter schools have opened primarily within urban communities with poorly performing public schools (Glomm, Harris, & Lo, 2005; Lubienski, Gulosino, & Weitzel,

2009). Meanwhile, Catholic schools have served many of these same urban communities for decades (Brining & Garnett, 2010). Because charter and Catholic schools are both alternatives to poorly performing traditional public schools, both may be trying to serve the same set of families dissatisfied with public schools within a given neighborhood. This may result in charter and Catholic schools competing with one another for enrolling the same students. The degree to which these two types of schools compete for students is based on each family's schooling preferences and actual choices.

Families weigh a set of preferences for schooling differently when deciding where to send their children to school. One of these preferences is the price of schooling (tuition). Charter and Catholic schools are notably different in terms of price whereby Catholic schools charge tuition but charter schools do not. Because there is no tuition at charter schools low-income families may choose a charter school over a Catholic school, especially if tuition within Catholic schools continue to rise (Cech, 2008). Thus, when parents choose a charter school over a Catholic school for their children their decisions may not always be based on the perceived quality[2] of the school but rather on preferences for price. (Chakrabarti & Roy, 2011).

Catholic schools have been experiencing declining enrollments and school closures since the 1960s. Additional impacts from the growth of charter schools may be exacerbating the process. Currently, Catholic school leaders within cities base their

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[2] School "quality" is a broad term that describes the achievement of students, curriculum offerings, and instruction, amongst other factors. Quality is always in the eye of the beholder, and different individuals may have different views of what constitutes school quality. In the context of this dissertation, I refer to school quality as the perceived school quality of a given school by parents. Regardless of the components that an individual considers for defining school quality, parents will prefer "high quality" schools to "low quality" schools.

perception of negative competitive impacts from charter schools on anecdotal evidence. Because there is little research to date on the impact of charter schools on Catholic school enrollments and school closures, this study attempts to fill that gap.

### *Overview of This Study*

The combination of the continued decline in the number of and enrollment in urban Catholic schools, growth of charter schools, and lack of research on whether or not charter schools precipitate a steepening decline of Catholic schools provides the impetus for this study. If Catholic school leaders, policymakers, and others in Catholic schools are interested in developing solutions to keep Catholic schools afloat in the current school choice climate, empirical evidence on this topic could be useful for decision making. Research that better describes the competitive pressure faced by urban Catholic schools in light of a growing charter school movement may be helpful to meet this need.

This study helps to provide empirical evidence of competition for urban students between charter and Catholic schools. In this study I synthesize theories of parental school choice and the location decisions of schools. Together these theories describe the process underlying the proposed conceptual model of charter school competition on Catholic schools. From this model I estimate changes over time in Catholic school enrollments and the likelihood of closures as a result of charter schools located nearby. I also investigate whether and how the charter school impact varies across grade levels, cities, neighborhood types, and Catholic school race/ethnicity compositions. However, I do not empirically study the determinants of individual school choices made by parents or location decisions made

by charter schools.

The sample used in this study is comprised of the population of Catholic schools serving the elementary and middle school grade levels located within ten large city centers in states bordering the Great Lakes and within the area of the United States colloquially known as the "Rust Belt." These cities experienced a substantial decline of their manufacturing base during the 1960s and 1970s, with a concurrent population shift of white families to suburban locations. A substantial number of Catholic schools experienced a steep decline in enrollments and subsequently closed their doors as a result of this population shift, whereas the Catholic schools that remained open began serving a largely poor, African American and Hispanic population. Currently, several urban Catholic schools continue to serve these communities amidst the expansion of charter schools. Cities in this study contain many neighborhoods where public, charter, and Catholic schools are the only viable choices for poor and minority families.

I employ a panel of data spanning the years 1990-2008 to estimate the impact of charter schools on Catholic school enrollments and closures. This panel was constructed from the Private School Survey (PSS), Common Core of Data (CCD) and Census data and contains enrollment, location, and demographic information about the population of public and private schools and the neighborhoods that they serve. In addition, I obtained Catholic school closure information from Catholic dioceses and merged that data with the PSS, CCD, and Census data.

Given that Catholic school enrollments and closures have taken place over time, and that the presence of charter schools also unfolded over time, I employ two longitudinal

estimation strategies. First, I estimate a school fixed-effects model to examine the charter school impact on Catholic school enrollments. Second, I apply a proportional-hazards model to estimate the charter school impact on the likelihood of Catholic school closure. Because no research has considered the variation of charter school impacts across grade levels, cities, neighborhood types, or race/ethnicity compositions, I also include interaction terms to investigate variations along these dimensions.

### *Significance of the Research*

Much of the research to date on school choice in the U.S. has focused on comparing the academic outcomes of private (including Catholic) or charter school students to their traditional public school peers. Catholic schools (mostly high schools) were the subject of intense educational research from the late 1980s through the 1990s. Several studies found that students across races/ethnicities and social classes achieved, to varying degrees, favorable educational outcomes (e.g., Altonji, Elder, & Taber, 2005; Bryk, Lee, & Holland, 1993; Coleman & Hoffer, 1987; Grogger & Neal, 2000; Neal, 1997; Peterson & Viarengo, 2011). Most of this body of research relied on observational data, rendering many of the results subject to issues of selection bias.

In the case of charter schools, the subject of more recent school choice research, the evidence to date is mixed. The results depend largely on the charter school policy, organization, and community contexts (Cannata, 2011). Researchers found positive outcomes for the achievement of charter school students compared to their public school peers in localized studies that compare winners and losers of charter school lotteries

(Abdulkadiroglu, Angrist, Dynarski, Kane, & Pathak, 2011; Dobbie & Fryer, 2011; Hoxby & Murarka, 2008). Meanwhile, researchers found a mix of positive to no charter school advantage comparing charter and public school students in studies generalizable across the United States (Gleason, Tuttle, Clark, & Dwoyer, 2010; Raymond, 2009). However, several of these studies relied on data from charter school lotteries as natural experiments making these results less susceptible to selection issues.

Charter and Catholic schools are both educational alternatives to traditional public schools and both may provide educational advantages for their students. Whether describing the impacts of Catholic schools or charter schools in comparison to traditional public schools outcomes will nevertheless be influenced by the academic and socioeconomic compositions of students enrolled in the schools. Rather than comparing the educational outcomes of students across types of schools I start to answer questions about competition between schools for enrolling students. These answers may serve as a precursor to better understanding what types of students are enrolling in these schooling alternatives and what factors parents consider when choosing schools for their children.

Previous literature found relatively modest competitive impacts of charter schools on private school enrollments when looking across an entire state and all grade levels (Chakrabarti & Roy, 2011). Here I focus only on competition between urban charter and Catholic schools. For many families living in urban neighborhoods, schooling alternatives may be limited to only charter, Catholic, and traditional public schools. There are also a greater number of schooling alternatives located within close proximity to a family's residence in cities as compared suburban and rural locations. Therefore looking only

within cities helps to describe competition where school choice is most prevalent. I also examine competition in only the elementary and middle grade levels. The largest proportion of charter and Catholic schools serve students in grades K-8. Additionally, once a family enrolls their child in a specific type of school (e.g., Catholic), they are more likely to keep them enrolled in the same type of school in later grades. Examining the heterogeneity of charter school impacts allows me to better disentangle the degree of competition at different periods in the schooling process.

Stakeholders in the public and private school sectors are concerned with rising competition as a result of charter school growth (Chakrabarti & Roy, 2011; Epple & Romano, 1998). Although the number of public schooling alternatives expands as more charter schools open, an unintended consequence may be that private schooling alternatives are negatively impacted. In particular, leaders of Catholic schools are concerned with the growth of charter schools as charter schools may compete for the same students. Rising tuition at urban Catholic schools may result in charter schools becoming a more attractive option for low-income families. If an increasing number of families choose charter schools over Catholic schools, Catholic school enrollment levels will decrease.

Recently, private school choice programs have been brought to the floor of state legislatures as a means to boost private school enrollments. The most common program type is a voucher program is which provides monetary subsidies for qualified families to use for tuition at participating private schools. Voucher programs could be a potential boon for Catholic school enrollments, especially with increased competition from charter schools,

but few large-scale programs are currently in operation.[3] Without programs in place that help ease the burden of tuition many urban families may not view Catholic schools as viable alternatives to poorly performing public schools and choose charter schools instead. Given the enrollment declines and number of closures experienced by urban Catholic schools in the absence of charter schools, any additional pressure from charter competition could force many more Catholic schools to close. The presence of fewer Catholic schools within cities could mean that students and communities stand to lose the academic and non-academic benefits of Catholic schools (Brinig & Garnett, 2010). Therefore, I seek to better understand the relationship between charter schools and Catholic school closures in an empirical manner.

Though the presence of Catholic schools in many urban neighborhoods is waning, charter schools are expected to continue expanding. Charter schools are public schooling alternatives with increased flexibility so they have a wide range of appeal across different philosophical and ideological beliefs (Finnigan et al., 2004). Recently, both state and federal authorities have encouraged the continued expansion of charter schools to counter the poor performance of public schools in urban areas (Berends, Cannata, & Goldring, 2011). For example, the federal Race to the Top program enacted by the Obama Administration in 2009 awards substantial funds to state education departments willing to implement innovative educational reforms. One of these reforms includes increasing the cap on the number of charter schools to allow more charter schools to operate. These policies suggest that charter schools will continue to expand within cities throughout the foreseeable future.

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[3] For example, Indiana instituted a new statewide voucher program for the 2011-2012 school year. Discussions of voucher and tax assistance programs have recently begun in other state legislatures.

Urban Catholic and charter schools often have parallel educational missions in that they seek to serve the same population of students. If charter schools essentially replace Catholic school within urban communities then there exists an open question about whether or not charter schools can be effective substitutes for Catholic schools in these communities. For researchers, policy makers, school leaders, and others concerned with the loss of Catholic schools in urban communities, the conclusion of this study describes what the results imply for parents and potential policies that could be enacted.

### *Organization of the Dissertation*

In addition to this introduction, this dissertation contains four chapters. Chapter Two presents a comprehensive literature review by first describing the history of and reasons behind the declines in Catholic school enrollment and substantial number of Catholic school closures. Then the theories of parental school choice and location decisions of charter schools are synthesized to form the basis of the conceptual model used in this study. After reviewing the relevant literature on Catholic school enrollment declines and school closures the chapter concludes with a proposed methodological approach for the study of the impact of charter school competition on Catholic schools. Chapter Three presents the research design including the data source, the sample, research methods, and analytic procedures. Chapter Four consists of a report of the findings from the data analyses structure in three parts: (1) a descriptive analysis of Catholic school enrollments, school closures, and charter school growth over time; (2) the results from the school fixed-effects analysis of the charter school impact on Catholic school enrollments; and (3) the

results from the proportional hazards model of the charter school impact on the likelihood of Catholic school closure. Chapter Five presents the conclusions, implications, and recommendations for future research.

## CHAPTER II

## CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

### *Overview*

The methodological rigor and overall quality of research on school choice programs in the United States has grown tremendously since the early 1980s. In 1982 James Coleman and colleagues published a book titled *High School Achievement: Public, Catholic, and Private Schools Compared* and found that students attending Catholic schools, outperformed their public school peers. While this study relied on observational data and did not explicitly examine school choice per se, it fueled further discussion on the methodologies used to compare students attending different types of schools. As school choice programs have expanded and become central to educational reform policies, first through voucher programs and later through charter schools, the need for high quality research on students and schools impacted by these policies has increased. In accordance, theoretical models for the school choice process continue to be developed and refined over the past few decades.

This chapter serves to synthesize the theoretical and methodological approaches central to the study of school choice. Because the dissertation examines the impact of charter schools on Catholic schools, in terms of enrollment changes and school closures, this review focuses on two main aspects of the school choice process. First, I describe a

random utility model of parental choice that helps to theorize the process by which individual families choose schools for their children. Second, I invoke theories of firm location decisions to discuss factors considered by charter schools when choosing to enter a local educational market. Combined, these two theories help to describe the unobserved mechanism underlying the conceptual model I constructed for this study.

The purposes of this literature review are: 1) to briefly revisit the history of Catholic school enrollment declines and school closures up to the present and describe causes of these events; 2) to describe how individual families choose schools through a random utility model framework; 3) to describe how charter schools choose their locations; 4) to synthesize the two aforementioned theoretical perspectives in the context of a mechanism by which charter schools have a competitive impact on Catholic schools through the choice set of schooling alternatives for urban families; 5) to examine the strengths and weaknesses of prior research and how this study differs from previous work; and 6) to propose a conceptual model for a comprehensive examination of the impact of charter schools on Catholic school enrollments and closures.

### *The History of Catholic School Enrollment Declines and School Closures*

*Urban Catholic Schools from 1960-1990: Demographic Shifts and Financial Struggles*

Urban Catholic schools experienced a combination of substantial declines in enrollment and a large number of school closures from 1960-1990. Influences such as the plummeting numbers of religious vocations or poor academic performance of some Catholic schools contributed to this period of decline. More likely, the main causes stem

from two inter-related components: demographic shifts and financial struggles.

Starting during the early to mid-1960s, urban centers, particularly within the Northern and Midwestern parts of the United States, experienced a decline in their manufacturing base (Faberman, 2002). Concurrently, desegregation policies had been implemented and the civil rights movement was in full swing across the country (Baum-Snow & Lutz, 2011). During this time period, many white, working-class families began leaving city centers to reside in suburban locations, known as "white flight". Catholic families that once sent their children to Catholic schools in their urban neighborhoods were part of this exodus (Brinig & Garnett, 2010; Cattaro & Cooper, 2007; Defiore, 2008; Franklin & McDonald, 1988; Greeley, 1982).

When white, Catholic families moved, a mismatch resulted between the location of Catholic schools in cities and Catholic children who now resided in the suburbs (Brinig & Garnett, 2010). In the suburbs, Catholic schools were fewer in number and more widely dispersed, though some new schools opened as a result of increased suburbanization. Most Catholic families began sending their children to suburban public schools, which were perceived as high quality. Additionally, the travel costs to send children to Catholic schools in the city would have been burdensome for these families (Cattaro, 2002; Cattaro & Cooper, 2007). As a result many of these new suburban Catholic families abandoned urban Catholic parishes and urban Catholic schools for good.

After white families moved to the suburbs a predominately poor, non-Catholic, African American population filled residential vacancies within Northern and Midwestern urban centers (Defiore, 2008). Many of these families migrated from the South to escape

segregationist policies and poor economic opportunities in existence at the time (Defiore, 2008). With these two concurrent migrations urban public schools experienced a demographic shift and a significant decline in the perceived quality of the school system (Baum-Snow & Lutz, 2011). So some non-Catholic African American families began enrolling their children in Catholic schools as an educational alternative to low-quality urban public schools (Greeley, 1982; Franklin & McDonald, 1988). Catholic schools therefore experienced a demographic transition of their own.

These demographic shifts originating during the 1960s are the prime contributor that placed Catholic school enrollments on a downward trajectory. In the year 1960, at the peak of Catholic schooling in the United States, Catholic schools enrolled approximately 5.2 million elementary and secondary students (NCES, 2011b). By 1990 the enrollment dropped to 2.5 million (NCES, 2011b). Despite the temporary growth in enrollments spurred by the influx of a new urban population, Catholic schools were unable to overcome the larger movement of white families out of cities (Green, 2011). This forced Catholic schools to grapple with negative financial situations due to the demographic shifts and dwindling Catholic school enrollments.

Another set of consequences that resulted from changing demographics and shrinking enrollments was a spike in Catholic school closures. The number of elementary and secondary Catholic schools operating in the United States decreased from over 13,000 in 1960 to 8,719 in 1990 (NCES, 2011b). When Catholic families moved from cities Catholic congregations and the subsequent parish financial support provided by these families also declined (Defiore, 2008; Green, 2011). The lesser amount of fiscal support from the

Catholic Church, either from the local parish or from the diocese, contributed to the increasing number of school closures (Defiore, 2008). More central to the Catholic school operating budget is the reliance on the tuition dollars generated from enrollment (O'Keefe & Scheopner, 2007). Many Catholic schools were unable to generate the necessary income from tuition to sustainably operate once enrollments declined. Therefore many Catholic schools were forced to close their doors or merge with another school.

*Urban Catholic Schools In the 21st Century: The Return of a Decline*

The massive demographic shifts over three decades within Northern and Midwestern urban centers and subsequent financial struggles primarily explained why Catholic schools experienced a steep drop in enrollment and a massive number of school closures. From the late 1980s through the mid-1990s, when demographic transitions slowed, Catholic school enrollments actually grew by a small margin (Green, 2011). In the past fifteen years, however, enrollments have once again continued to decrease and there has been an uptick in school closures. Since 2000, enrollments in Catholic schools in the United States have declined 20 percent resulting in only about 2 million students being enrolled in these schools in 2011. During the same time period over 20 percent of Catholic schools closed resulting in only 6,841 primary and secondary Catholic schools operating during the 2011-2012 school year (McDonald & Schultz, 2011). Figure 2a displays the enrollments in U.S. Catholic schools serving grades K-12 from 1960-2010 while figure 2b displays the number of U.S. Catholic schools over the same time period.

**Figure 2a. U.S. Catholic School Enrollment 1960-2010**
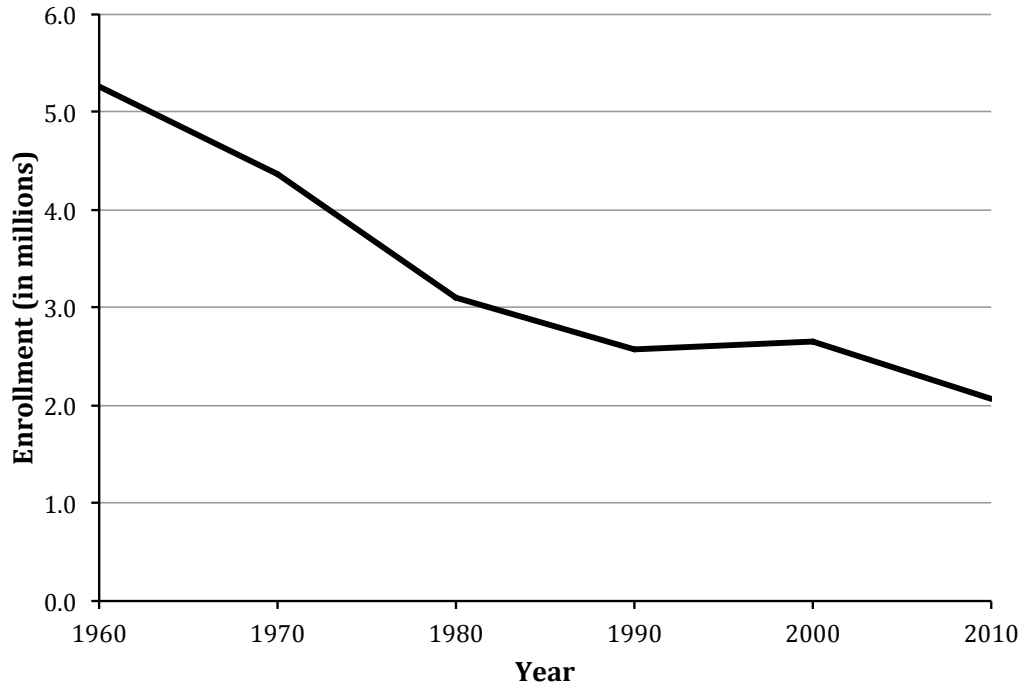


**Figure 2b. Number of U.S. Catholic Schools 1960-2010**
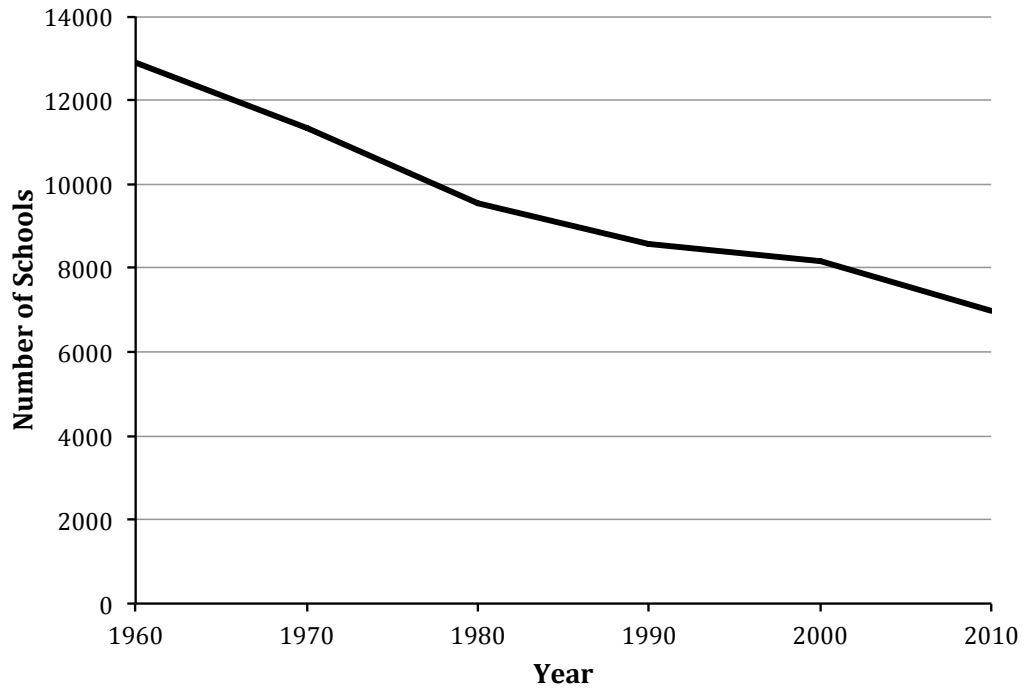
The greatest concentration of enrollment declines and school closures have been at 1) the elementary and middle school grade levels; 2) in urban and inner-city locations with high poverty rates and large numbers of racial and ethnic minorities; and 3) in the Mideast and Great Lakes regions of the United States (CARA, 2006; USCCB, 2005; O'Keefe & Scheopner, 2007). For these Catholic schools in particular, enrollments have continued to decrease and the overall market share of elementary and middle grade students enrolled within these communities has declined (CARA, 2006; Cattaro & Cooper, 2007). While closings are most common among Catholic schools, some schools have also opened to meet a growing demand in certain areas. Catholic school openings are more common in the South and West, where there has been a substantial influx of Catholic, Latino families (CARA, 2006; Green, 2011). However, the growth of newly constructed Catholic schools to serve this population has been slow (Holter, 2012).

*Potential Causes of Declining Enrollments and Increases in School Closures*

Because massive demographic shifts no longer appear to be the primary cause of Catholic school enrollment declines one might ask: "What is the driving force behind a continued decline in enrollments in Northern and Midwestern cities over the past fifteen years?" The answer is likely a combination of the demographic composition of the remaining urban population and the continually escalating tuition at Catholic schools. In this region urban Catholic schools are enrolling an increasing share of academically disadvantaged, non-Catholic, poor, minority students. Enrollments of these students are especially high in communities with poorly performing public schools and where parents

view Catholic schools as places of opportunity for their children (Brinig & Garnett, 2010; Favors & Carroll, 1996; Green, 2011; Neal, 1997; O'Keefe & Scheopner, 2007).

Although children of these urban families may stand to benefit from Catholic schools, the tuition required to enroll or keep their children enrolled in Catholic schools may be too high (Green, 2011). Despite the modest national average Catholic school tuition in comparison to non-Catholic private schools in 2010 ($3,383 elementary, $8,787 secondary), many poor urban families are unable or unwilling to pay tuition (McDonald & Schultz, 2011; Peterson, 2009). Financially constrained Catholic schools are finding it more difficult to provide scholarship money to families in need making forms of tuition assistance a rarity. Moreover, government-initiated tax-credit or voucher programs remain scarce. These factors combined have likely contributed to continuing enrollment declines despite a lack of empirical evidence indicating that rising tuition or lack of tuition subsidies are actual causes.

The main contributor to more recent Catholic school closures is also likely related to declining enrollments even though the process by which any individual Catholic closes is complex (CARA, 2006; O'Keefe & Scheopner, 2007). The decision to close a school could originate from either the priest of an individual parish or the diocese, but both are usually involved in the final decision (Brinig & Garnett, 2010; O'Keefe & Scheopner, 2007). Schools that enroll children at the elementary and middle school grade levels tend to be attached to a specific parish and neighborhood. These schools are particularly susceptible to closures because their budgets are tightly tied to parish finances. The decline in both the number of Catholic parishioners and their financial support has put additional strain on parish

budgets (Defiore, 2008). In turn, lower revenue for the parish impacts the budget for the school. Catholic high schools are more likely to be centrally operated, often by the diocese or a religious order, so they are less tied the financial situations of individual parishes.

In addition to financial difficulties originating from the parish many urban Catholic schools face other financial hurdles. Catholic parishes and schools have received less central support from their dioceses in recent years (Defiore, 2008). Meanwhile, a growing proportion of Catholic schoolteachers and principals are from the laity instead of religious orders—a direct result of the shrinking number of clergy. Although Catholic schoolteachers tend to be paid less than public school teachers and principals, schools have to pay substantially higher salaries to lay teachers and principals in order to staff their schools (Defiore, 2008; Hamilton, 2008).[4] Also, in these cities many school buildings are old thereby requiring substantial funds to keep them operational. Furthermore, the Catholic Church has been rocked by many recent sexual abuse scandals resulting in large legal settlements that have put even more financial strain on the Catholic parishes and schools along with fueling negative publicity (Defiore, 2008). As with Catholic school enrollments, the main causes of Catholic school closures have not been studied empirically to an extensive degree.

Urban Catholic schools that are located in neighborhoods with a high proportion of African American residents are particularly vulnerable to closure (CARA, 2006; Cibulka, 1988). Some of the contributing factors include deteriorating building conditions,

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[4] Members of the clergy (e.g., nuns or religious sisters) that teach in Catholic schools have their living expenses paid for by their congregation. Their actual salaries are given directly to their congregation and they generally only receive a small discretionary budget for minor expenses. Lay teachers and principals are normally paid a traditional salary.

neighborhoods in social and physical transition, and the inability or unwillingness of poor

minority families to pay the tuition (Cibulka, 1988). These deteriorating schools are located

in the neighborhoods that Catholic schools seek to serve. A 2011 New York Times article

written about the closing of Rice High School[5] in Harlem describes the primary reasons for

closing urban Catholic schools quite well:

> *"There are reasons, of course, for closing Rice and the schools like it, and those reasons fall into a familiar pattern: declining enrollment; less money from parish or diocesan coffers; far fewer clergy members to serve as an unpaid administrative and teaching force; annual tuition that, typically in the mid-four figures, is too expensive for many working-poor and working-class families yet far short of actual per-student costs" (Freedman, 2011).*

### *The Current Urban Catholic School Dilemma*

All of these aforementioned factors have negative influences on the health of urban

Catholic schools today. When buildings are in disrepair, salaries escalate, and fewer

students are enrolled in the school, Catholic schools face the pressure of increasing their

tuition in order to remain operating. As tuition increases Catholic schools may be pricing

themselves out of the market for many of the students they seek to serve. These challenges

result in a cycle of further declining enrollments and puts more pressure on Catholic

schools to keep their doors open. Therefore, Catholic schools are faced with a dilemma:

they must choose between efficiency, by closing or merging schools to minimize costs, and

responsiveness, to stay open and meet an articulated need by serving a population of poor,

non-Catholic families (Cattaro & Cooper, 2007; Cibulka, 1988).

Families living in urban neighborhoods must make a choice about where to send

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[5] It is worthwhile to note that Rice High School faced an additional factor that played a role in its closing: the religious order which founded and operated the school filed for bankruptcy after it collapsed under the weight of payments to victims of sexual abuse by members of the order (Freedman, 2011).

their children to school regardless of whether or not Catholic schools are an option. For most families the default has always been to choose their assigned neighborhood public school. For others, particularly those seeking an educational alternative to traditional public schools, other public and private alternatives have grown in number and complexity over the past few decades (Berends, Cannata, & Goldring, 2011). Catholic schools, despite being largely perceived as higher-quality schools, face substantial challenges to attract students. In addition to internal challenges, they must acknowledge the growing competition from charter schools. One of the primary reasons for closing 48 Catholic schools in the Archdiocese of Philadelphia was that "the rise of charter schools has siphoned off many students" (Bayliss, Masterson, & Chang, 2012).

These threats to the survival of urban Catholic schools highlight the degree to which competitive pressures exist among schools in a local educational market (Grace & O'Keefe, 2007). The degree to which charter schools are actual competitors to urban Catholic schools is a result of two inter-related components: (1) the factors considered by parents when making a decision about where to send their children to school and (2) the location in which a charter school decides to open in terms of both its proximity to a Catholic school and the type of neighborhood which it serves. Here, I describe these two mechanisms and describe how they are linked to the growing competition for students between urban Catholic and charter schools.

## Mechanism of Parental Choice of Schools

### Description of Random Utility Model

An important component in the study of competition between schools for students is the process by which parents make school choices for their children. Parents determine how to best allocate their resources among alternative goods when deciding where to send their children to school (Chakrabarti & Roy, 2011). There are a multitude of factors that families consider when making these decisions. However, parents can make one and only one choice of school at a time. The actual choice made by the family reflects the schooling option that best maximizes the sum of the preferences for schooling for each child, known as utility.

One mechanism that reflects the process by which parents choose schools is the random utility model. The random utility model is an econometric model that can be applied to represent an individual's preferences for a good or service resulting in a choice; choice of schools is one such application. In a random utility model of school choice, each family with a school-aged child is assumed to evaluate a fixed set of schooling options and select the single alternative that best maximizes household utility (Lankford & Wyckoff, 1992). Families will choose school A over school B—or over any other number of finite alternatives—if the utility provided to the household by choosing school A is greater than the utility provided by school B (or any other schooling alternative). Utility is a function of several attributes of the school, household, and family preferences, each containing a mixture of observed and latent components.

Manski & Wise (1983) first described a random utility model applied to school

choices in the context of postsecondary education choices. Their approach was extended further by Lankford & Wyckoff (1992) to describe choice in the context of K-12 schools where families choose between a traditional public school and private school as a result of a newly instituted voucher program. Here, I extend the theoretical model further to account for the three primary present-day schooling choices for many poor urban families: traditional public schools, Catholic schools, and charter schools.

Following directly from previous work (Lankford & Wyckoff, 1992; Manski & Wise, 1983), a more formal representation of the random utility model is:

$$U_{ij} = U(q_j, C_{ij}, S_{ij}, \varepsilon_{ij})$$

where $U$ represents the utility for a given household ($i$) choosing between a finite set of schooling options ($j$). The utility is a composition of: $q$, a vector of relevant characteristics of schools, including, but not limited to school quality, composition, price, and location; $C$, a composite measure of other goods consumed in the household; $S$, a vector of socioeconomic and demographic characteristics of the student and members of the household accounting also for student inputs and a proxy for both the educational and cultural preferences of the household. The utility model contains a random error component, $\varepsilon$, accounting for all unobserved but relevant components including unmeasured school characteristics by the researcher. Therefore, the probability that a given household ($i$) selects a given school ($A$) over all other schooling alternatives (B) happens when $U_{iA} > U_{iB}$. Lankford and Wyckoff (1992) describe several of these components of the school choice random utility model in more detail. In this dissertation I only observe the sum of individual choices (the outcomes) at the school level, meaning that

all components of the random utility model are unobserved. However, the random utility model serves as an underlying mechanism to the proposed conceptual model I empirically test.

In the next few sections I focus on some components of the random utility model to help describe the school choice process at work in an urban household. Some of the primary forces that drive school choice include: school quality, in terms of academic and non-academic outcomes; the social and demographic composition of students in the schools; cultural preferences of the family; tuition level; and location (Betts et al., 2006; Howell, 2004; Saporito & Lareau, 1999; Schneider & Buckley, 2002; Stein, Goldring, & Cravens, 2011).

*Perceived School Quality, School Composition, and Family Preferences*

School quality, composition, and preferences of the family are all important factors that families consider in the choice process. If a family's choice of school was based solely on the perceived quality of academic and non-academic outcomes of the school, the school with the highest quality would be preferred (Hanushek, Kane, Rivkin, & Branch, 2007). For example, if families perceive the neighborhood public school to produce the highest quality outcomes for its children, families would always opt for the neighborhood public school over all other alternatives, including Catholic or charter schools.

One of the primary reasons for the growth of school choice is that parents at one time sought alternatives to poorly performing neighborhood public schools (Kleitz, Weiher, Tedin, & Matland, 2000; Schneider, Teske, & Marschall, 2000). In other words, many

parents viewed their neighborhood public school as low quality. As a result of parents caring about the quality of schooling their children receive they have historically turned to Catholic schools in the private sector and more recently to charter schools in the public sector as schooling alternatives.

Though parents may strongly weight and consider school quality first when choosing a school (Lacireno-Paquet & Brantley, 2008), they also consider several other factors. These school factors include the social and demographic characteristics of other students in the school, safety, educational philosophy, curriculum, and civil, moral, and religious instruction (Lankford & Wyckoff, 1992). Notably, families with strong religious beliefs, family traditions, or desires to educate their children in a religious school may choose a Catholic school regardless of other considerations (Bryk, Lee, & Holland, 1993). Like Catholic schools, charter schools also often offer an additional degree of civil and moral education and also offer alternative educational philosophy not present in traditional public schools (Weiher & Tedin, 2002). Parents with strong preferences for these features in their children's education and prefer a secular education may choose charter schools.

*Tuition Level*

When families consider private schools as part of their choice set, the tuition level plays a substantial role in the school choice mechanism. In order to choose a private school parents must be willing to pay for the price of schooling (tuition). Though dated, a U.S. Department of Education survey in 1983 found that over half of public school parents

stated that finances were considered when choosing an alternative to a public school. Only 17 percent of private school parents said finances were considered. Public schools do not charge tuition, so there is no payment required for families to send their children to their assigned neighborhood public school. Likewise, charter schools are also tuition-free. On the other hand, families must pay tuition to send their children to a Catholic or any other private school. Parents will only choose a private school if the benefits of private schooling outweigh all the potential costs in their minds.

According to the school choice model of Peltzman (1973), in the case of traditional public or charter schools families can spend their disposable income on other goods and still consume education. For private schools, families are purchasing a higher quantity of education and forgoing their opportunity to a free public education (Peltzman, 1973; Dynarski, Gruber, & Li, 2009). Families will choose a private school alternative over a public school when the tuition at the private school is affordable after accounting for all other goods that the family consumes and their preferences for school quality are met (Chakrabarti & Roy, 2011). This budgetary constraint makes the overall utility for a given private school alternative an indirect function of both the tuition at that school and the disposable income of the family (Lankford & Wyckoff, 1992).

Higher-income families with higher-ability children who have the financial means often choose to send their children to elite, often high-tuition, private schools (Epple & Romano, 1998). For many poor urban families there are usually fewer, if any, disposable financial resources after consuming basic goods. This makes lower-income families more sensitive to the level of tuition at Catholic schools  (Dynarski, Gruber, & Li, 2009). For these

families the financial cost to send their children Catholic schools may outweigh the potential benefits of Catholic schooling.

### *Mechanism of Charter School Location Decisions*

*School Location and the Parental Choice Random Utility Model*

An additional factor considered by families when choosing a school for their children is the distance to the school and the associated transportation costs. Most families choose schools or want to choose schools based on a combination of perceived school quality, tuition, and other family considerations (Lankford & Wyckoff, 1992). For low-income families in particular, the ability to send children to preferred schools that are farther away is often constrained by access to and the cost of transportation (Kleitz, Weiher, Tedin, & Matland, 2000; Teske, Fitzpatrick, & O'Brien, 2009). In some cities (e.g., New York) public transportation is free for children attending any school.

In 2009, Teske, Fitzpatrick, & O'Brien conducted a survey of parents living in Washington, D.C. and Denver regarding their choice of schools and the role that distance and transportation played in making these choices. The authors found several trends among lower-income families. Lower-income families are more likely to live nearby low-quality public schools. These families are also less likely to have access to transportation (e.g., owning a car or having subsidized, non-public school busing/transportation) to attend alternative schools. In addition, children of these families are likely to rely on public transportation or walk to school. Higher-quality schools tend to be located farther away from where low-income families live. Although high-quality private schools may be nearby,

these families may not be able to afford tuition. The children of these families are typically enrolled in neighborhood public schools unless private schooling is subsidized or there is a charter nearby (Teske, Fitzpatrick, & O'Brien, 2009).

When considering the role of location in the random utility model of parental choice, these findings suggest how parents weigh the location of schools when making schooling decisions. If families are constrained by access to or the cost of transportation they are more likely to choose a school located closer to their home. Proximity plays a large role for these families, especially when choosing schooling alternatives outside a neighborhood public school. Even though enrollment in urban Catholic or charter schools is not constrained by any geographical boundaries, if families choose a Catholic school or a charter school they are more likely to choose one that is nearby. Therefore, the greatest degree of competition will occur between schools located near one another because they are likely to attract similar students living near the school.

*Individual-level vs. Firm-level Location*

When choosing where to live urban families consider many factors. One inherent part of the residential choice process is that when all families choose their home they are also choosing a default public school system. In most cases children are typically assigned at the start of the schooling process to a specific public elementary school based on the neighborhood in which they live. Later the same process is used to place students in middle and high schools. For the most part public elementary and middle schools are neighborhood schools comprised of children that have demographic and socioeconomic

characteristics reflective of their neighborhood populations (Zimmer & Toma, 2000). This is not representative of public schools in all cities; some (e.g., Chicago) offer strong intra-district choice programs that allow families to send their children to a different public school of their choice within the city, resulting in a more heterogeneous student population.

Families exercise residential school choice when deciding where to live based on a school's academic and demographic characteristics. Housing prices and property taxes within neighborhoods surrounding public schools are positively related to school quality (Black, 1999; Brinig & Garnett, 2010). Families seeking higher-quality public schools who are able to afford housing in a different neighborhood often move to urban or suburban communities where many perceived higher-quality public schools exist (Tiebout, 1956). Families that are unable to afford housing in areas with higher-quality public schools must either enroll their children in the assigned neighborhood public school or choose from alternatives. This study operates under the assumption that the location of an individual urban family is relatively fixed and that the choice set of schooling alternatives for these families is mostly constrained to the assigned neighborhood public school and public and private schooling alternatives located within close proximity to a given family's home.

The schools in the choice set for a given family are therefore tied to the locations of the schools themselves. Most neighborhood public schools and Catholic schools have been in the same locations for years prior to a present-day family making schooling decisions. Public schools were established at one point in time to meet the need for schooling of the number of residents in the area. Catholic schools serving the elementary and middle school

grade levels were for the most part established as part of local parishes to meet the schooling needs of parish families (Brinig & Garnett, 2010). In the past, the Catholic Church expected Catholic families to educate their children in Catholic schools resulting in a high demand for Catholic schools when Catholic families lived in cities. Therefore, the location of neighborhood public or Catholic schools can be treated as fixed. If a public or Catholic school closes it would not be considered as part of the choice set for families. Meanwhile, few urban public and Catholic schools have opened, especially in the last two decades.

While the locations of most neighborhood public and Catholic schools are long-established, charter schools are in the process of entering local educational markets. Just as parents weigh a set of factors when choosing where to send their children to school, charter schools also weigh a set of factors when choosing a location in a local educational market. Next I explore the theoretical construct that underlies charter school location decisions though research that investigated firm entry into local markets.

Bresnahan and Reiss (1990, 1991) established a set of empirical models of firm entry that attempt to measure the structural determinants of entry. The authors investigated the relationship between the entry of retailers and other small businesses within markets containing a small population. These models are best suited for markets where there are small numbers of entrants, which closely resembles local educational markets. Within these local contexts Bresnahan and Reiss suggested that demand for a good is a function of total population and demographic characteristics, which varies across markets (Bresnahan & Reiss, 1990; 1991).

When choosing where to locate new schools must consider both the supply and

demand of a local educational market (Stein, Goldring, & Cravens, 2011). Charter schools illustrate this example well. From the supply side, charter schools choose locations where they can remain in business. In order to do so schools must be responsive to the needs and wants of the families living in the area. On the demand side, schools may choose their location based on the schooling preferences of families living in the area (Stein, Goldring, & Cravens, 2011). To evaluate the supply and demand of a local market organizations operating a charter school consider the quality of schools already existing in the area (i.e., the competition), costs to operate, and demographics (Downes & Greenstein, 1996).

*Locations of Charter Schools*

Charter schools will enter local educational markets if there is a demonstrated need for schooling alternatives in a given area. Some locations that may be especially targeted by charter schools are those with low-quality traditional public schools, such that the charter school can assume an advantageous market position. Researchers found that charter schools often locate in areas that have a more heterogeneous racial composition and poorly performing public schools (Booker, Zimmer, & Buddin, 2005; Glomm, Harris & Lo, 2005; Lubienski, Gulosino, & Weitzel, 2009). Effectively this generates competition between charter and traditional public schools for students as traditional public schools stand to lose students and funding to charter schools (Friedman, 1962; Lubienski, Gulosino, & Weitzel, 2009). Because charter schools receive public funding in the form of per-pupil subsidies from the local school district proportional to the number of students enrolled, new charter schools can only survive if they choose locations that where there is sufficient

demand (Hoxby, 2003).

Secondary to basing location decisions on public school quality, charter school location decisions are also positively correlated with the number of private schools in an area (Glomm, Harris, & Lo, 2005). This suggests that charter schools tend to locate in areas where competition already exists, though this relationship may be simultaneously tied to the public school quality in an area. Catholic schools have thrived in areas of urban centers where many families viewed them as a preferred alternative to public schools. Organizations planning to open a charter school may view areas with a higher concentration of Catholic and other private schools as areas where there exists sufficient demand for alternatives to public schools. If charter schools open in areas where Catholic schools are already operating, both types schools may be attempting to serve the same population of students. Measuring the effect of the entry of charter schools on Catholic school enrollment levels or the likelihood of school closures is consequently a measure of the competitive pressure exerted by charter schools on Catholic school (Bresnahan & Reiss, 1991; Davis et al., 2009).

### Competition between Catholic, Charter, and Public Schools

#### Choice Set of Schools

The set of schooling alternatives from which a given urban family chooses is jointly influenced by the mechanisms of how parents choose a school for their children and the location decisions of schools. Individual families weigh various factors to make a schooling decision for their children. The number of schooling alternatives within a given proximity

to the family's residence is influenced both by the locations of pre-existing schools and new schools. Therefore, the realistic choice set from which families choose is comprised of options that match preferences for school quality, price, and location, and is highly unlikely to include all possible schools within a city. Given their availability and accessibility when compared with all other schooling alternatives the three primary schooling options for most urban families are neighborhood public schools, Catholic schools, or charter schools.

It is worth noting that other schooling alternatives exist within cities but tend to be less viable alternatives for many families. Soon after the *Brown vs. Board of Education* ruling in 1954, public choice programs such as magnet schools (public schools with specialized curriculum) and intra-/inter-district choice (being able to choose any public school within a district/across districts) began as a means to reduce racial segregation (Brinig & Garnett, 2010). In cities where intra- or inter-district choice policies exist, urban families may be constrained in their access to schools located farther from their homes (Teske, Fitzpatrick, & O'Brien, 2009). Magnet schools serve approximately 1.5 million students nationwide, often require an application, have selective entrance criteria if demand is high, and offer a specialized curriculum for high school students (NCES, 2011a).

Other religious and secular private schools enroll over 3 million students nationwide. These private schools tend to serve specific niches of students. Other religious and secular private schools also often have higher tuition levels than Catholic schools, which are likely to be well out of the range of many poor urban families (Hoxby, 2003). Overall, these other schooling alternatives have not faced the extensive decline experienced by Catholic schools or the rapid growth of charter schools, which is are the topics of focus

in this study. As I discuss later, I account for any competition that may be occurring between Catholic schools and these alternatives in the empirical models of this study.

*Catholic School Tuition Levels*

Working from a choice set of public, charter, and Catholic schools, Catholic schools are the only alternative for which families must pay tuition. Therefore, Catholic schools need to demonstrate an advantage over public and charter schools because families need to be willing to pay tuition. Catholic schools have long differentiated themselves from public schools to attract families by simultaneously exhibiting academic success; having an alternative educational mission focused on serving the common good; and instituting a more structured, disciplined learning environment (Betts, Goldhaber, & Rosenstock, 2005; Bryk, Lee, & Holland, 1993; Chubb & Moe, 1990; Greeley, 1982; Peterson, 2009). Although Catholic schools may be perceived as high quality, their tuition level is still an important factor for many urban families.

From the 1960s to 1980s, many central city families opted for low-tuition, high-quality Catholic schools as an alternative to neighborhood public schools. Many poor, minority families that could not afford housing in areas with higher-quality public schools often chose to enroll their children in urban Catholic schools (Franklin & McDonald, 1988). During the mid-1970s, the Catholic League for Religious and Civil Rights found that the average annual tuition level over fifty-four urban Catholic schools was $400. The average family income at the same time was $15,000, so many families viewed Catholic schools as affordable schooling alternatives for their children (Franklin & McDonald, 1988).

In recent years, tuition levels within urban Catholic schools have risen steadily (Cech, 2008; O'Keefe & Scheopner, 2007). The current average tuition for Catholic schooling may remain substantial for low-income, urban families, even with a modest national average tuition level in comparison to non-Catholic private schools in 2010 ($3,383 elementary, $8,787 secondary) (McDonald & Schultz, 2011; Peterson, 2009). Forms of tuition assistance are scarce. Private school voucher programs, which families can use for tuition at participating Catholic schools, have been implemented in various cities over the past twenty years, including Cleveland, Milwaukee, and Washington, D.C. Presently few large-scale voucher programs exist. I describe a more detailed history of voucher programs in Chapter V. Vouchers, or other programs that discount the price of tuition (e.g., tax incentives, scholarships, sibling discounts, etc.) all subsidize the price of private education for families (Dynarski, Gruber, & Li, 2009). Depending on the size of the voucher, families may be more inclined to choose private schools over public when the tuition burden is less. Any substantial discounts to the tuition will increase the likelihood that poor urban families will choose a Catholic school.

*Parental Choice Among Catholic, Charter, and Public Schools*

Though programs that subsidize the price of private education exist their size is small relative to statewide charter school initiatives. Charter schools, as described in Chapter I, have a unique advantage in local educational markets because they operate in a more autonomous manner than traditional public schools. They are also an alternative to private schools based on price because there is no tuition. As a result of this position,

charter schools may be attracting families who once considered Catholic schools a viable alternative or seek a secular alternative to traditional public schools.

Consider a low-income urban family deciding among schooling alternatives for their child. Each family weighs a set of preferences previously described in the random utility model for parental choice. If parents are satisfied with the quality of their neighborhood public school they will continue to send their child to the public school. When families are unsatisfied with their public school quality, they may turn to other alternatives. In choosing other alternatives families will consider a combination of school quality, price, and location, among other factors. If price and location are most heavily weighted, alternatives such as moving to the suburbs with better schools or choosing private schools may be eliminated from the choice set. This leaves low-income families to choose from a more finite set of alternatives.

Catholic schools have historically served the role as a primary alternative to neighborhood public schools due to their perceived higher quality and relatively affordable tuition (Cattaro & Cooper, 2007; Franklin & McDonald, 1988). However, as tuition has continually increased, Catholic schools may have effectively started to price themselves out of the market for many urban families (Cech, 2008; O'Keefe & Scheopner, 2007). Once charter schools started to operate, urban families were offered a less expensive schooling alternative given that charters do not charge tuition. If price has a major influence on the schooling decisions made by families for their children and charter schools are a free alternative compared to Catholic schools, charter schools will be chosen by families based on the price differential (Chakrabarti & Roy, 2011). Additionally, families may be less

inclined to enroll their children in a Catholic school based on religious views so the secular alternative of charter schools may appear more attractive. While price or family views may in fact play a large role for those families preferring charter schools over Catholic schools, only actual choices are observed, not the process by which families choose. Researchers have a difficult time ascertaining the degree to which the *reasons* for choice reflect their *actual choices* (Stein, Goldring, & Cravens, 2011).

*Implications of Parental Choice for Catholic Schools and Communities*

If charter schools are becoming a preferred alternative to Catholic schools for many urban families then it is possible that charter schools have precipitated a further decline in urban Catholic school enrollments and a subsequent increase in school closures. Any declines in school enrollments come back to the choices made by parents. Some families will always choose Catholic schools regardless of price; likewise, some families will never consider these schools as a result of price or religion. The individuals seeking an alternative to a traditional public school that are on the margin of choosing a Catholic school are of the greatest interest.

As families on the margin of sending their children to Catholic schools choose charter schools, it is useful to consider the implications these choices have on Catholic schools and their communities. First, one might consider which families switch their choice to charter schools or are likely to switch their choice. A series of studies examined what types of children enroll in charter schools given that these children were previously enrolled in neighborhood public schools. Researchers concluded that charter schools do

not appear to be "creaming" to a large degree. Most of the students enrolling in charter schools are former public school students that are in comparison to their peers lower achieving, more at-risk, and predominately racial and ethnic minorities (mostly African Americans and Hispanics) (Bifulco & Ladd, 2006; Booker, Zimmer, & Buddin, 2005; Zimmer et al., 2009). Although little is known about what type of students switch from urban Catholic schools to charter schools, it appears the students enrolling in charter schools are likely from similar populations as those enrolled in Catholic schools. Unless charter schools were attracting the very best students in Catholic schools, then the academic composition of Catholic schools—which is largely related to perceived school quality—would not be expected to change.

Second, the timing of when families on the margin of sending their children to Catholic schools are choosing charter schools is crucial to consider. At least two scenarios are possible, especially if decisions are based on price considerations: (1) families may choose to send their child to a charter school instead of a Catholic school at the start of the schooling process or (2) families may choose transfer their child from a Catholic school to a charter school in later years. Once a child is enrolled in the Catholic school system in the elementary grade levels they are more likely to stay enrolled in middle school and subsequently into high school. If families tend to keep their children in Catholic schools once initially enrolled, charter schools may most impact Catholic school enrollments at the start of the schooling process (or upon the transition from the elementary to middle grades) as opposed to families transferring from Catholic to charter schools between grades. Therefore, competition between charter and Catholic schools may be stronger for

the elementary grades than the middle grades.

The mechanisms by which charter schools have a competitive influence differ between traditional public schools and Catholic schools. Charter schools indirectly impact public schools; if the public school is performing poorly, it will feel pressure to improve (Hoxby, 2003). Should the public school fail to improve it may be subject to various sanctions as a result of accountability initiatives. In addition, as more students choose charter schools, charters will draw additional per-child funding allocations away from the public school (Cannata, 2011). Yet the public school may continue operating despite having a smaller enrollment should there still be public need for a school.

Once a family decides to enroll their child in a charter school over a Catholic school the Catholic school stands to lose tuition dollars necessary for the operation of the school. As enrollments decline, Catholic schools lose more and more revenue. Without tuition revenue, the school may be forced to close. Although Cannata (2011) finds no effect of charter schools on whether private school principals state they have a hard time with funding due to charter schools, her study did not exclusively focus on urban schools. In her study, the average distance to the nearest charter school was nine miles. Urban Catholic schools often have one or more charters located in a one- to two-mile proximity suggesting that competition may be greatest when looking within cities.

Closed Catholic schools may actually be a boon for other nearby Catholic schools if families continue to enroll their children in Catholic schools. Likewise, if two or more schools merge the location that receives the students will be in healthier shape. In both cases attending a different Catholic school may impose additional transportation costs on

families. This is especially the case if the closed or merged school was located in close proximity to the family's residence and other Catholic schools are located farther away. These families may in turn choose charter schools, public schools, or other alternatives.

Recent evidence also suggests that a number of Catholic schools have converted to charter schools in various cities, and that several charter schools have chose to open in abandoned Catholic schools (Bowen & McShane, 2011; Lubienski, Gulosino, & Weitzel, 2009; Robelen, 2008). A Catholic school that may have once been a nearby alternative for families, but is now a charter school, increases the availability of charter schools as alternatives. Converting to a charter could be a real alternative for some Catholic schools that want to continue to serve their community but without being dependent on tuition for revenue. In exchange for public funding that a Catholic school would receive by converting to a charter school, the religious aspects of schools would be forfeited. Currently, the degree to which Catholic schools convert to charter schools or charter schools open in abandoned Catholic school buildings has not been extensively studied. Additionally, it is unknown whether a converted Catholic schools can provide the same type of education without many of the religious and moral components inherent within Catholic schooling.

In summary, when families choose a charter school over a Catholic school, the direct impact on the Catholic school is the loss of tuition dollars from lower enrollments. Catholic schools, as a result of lower enrollments and decreased revenues, may be forced to respond by increasing their tuition, putting themselves in jeopardy of becoming increasingly inaccessible to a larger portion of the population. If it becomes infeasible to operate the Catholic school the parish or diocesan authorities may close or merge the school. This

leaves many nearby families without a Catholic schooling option or requires their children to travel farther from their homes to stay enrolled in a Catholic school. Given the inherent challenges already faced by Catholic schools as a result of declining enrollments, any added impact from the availability of charter schools may exacerbate the downward trend.

### *Previous Studies, Methods, and Limitations*

#### *Impact of Charter Schools on Private School Enrollments*

Few studies have attempted to empirically investigate the effect of charter schools on private school enrollments. Toma, Zimmer, and Jones (2006) estimated the impact of charter schools on public and private school enrollments across the state of Michigan. Their study used a district/charter school fixed-effect approach to estimate the impacts of where charters locate within public school districts. The authors found nearly 17 percent of charter school enrollment comes from private schools.

Chakrabarti and Roy (2011) expanded upon the Toma et al. study to investigate charter school impacts on private school enrollments in Michigan. In their study charter school proximity to private schools was used to define competition. After controlling for pre-charter school law, private school enrollment trends, and post-charter school law effects the authors found a more modest decline compared to Toma et al. (2006) in private school enrollment of approximately 1.2 percent annually. They also found no differences between religious and secular private schools. By including the pre-charter law enrollment trends and post-charter school law effects, the authors estimated less-biased charter school effects compared to the previous work. The estimation strategy I use in this study is largely

developed from the Chakrabarti and Roy (2011) approach.

I also make several improvements and additions to the existing research. First, most of the competition for students between Catholic and charter schools occurs within city centers. Cities are where the greatest number of schooling alternatives for families are located and are usually the target for school choice programs such as charter schools. In addition, the school choice mechanism used by parents living in suburban and rural areas is likely different given that there are fewer alternatives within close proximity to a family's home. Second, earlier studies did not have a primary emphasis on Catholic schools. In the cities included in this study Catholic schools comprise over half of the total private school market. Third, these studies concentrate on a single state and have one statewide estimate of charter effects. Including several cities from several states allows for a more robust estimate of charter school effects within cities across a region. Fourth, I investigate the heterogeneity of effects across the elementary and middle school grade levels. Most families choose one type of school over another at the start of the schooling process (in the elementary grade levels) and stick with that type of school, rather than switching types of schools in later grades. By looking at the effect of charter schools on Catholic schools in the elementary and middle grade levels, I can test a hypothesis of whether or not effects are stronger at the start of the schooling process.

*Recent Catholic School Closures*

To date there have been no studies that have explicitly examined the relationship between charter school competition and Catholic school closures. However, a few studies

exist have examined the locations of most Catholic school closures and the impacts of school closures on communities. Brinig and Garnett (2010) used regression models to measure the impacts of closures on neighborhoods in Chicago. They found that social cohesion and collective efficacy in neighborhoods decrease while disorder, measured in part by crime rates, increases following a Catholic elementary school closure. The authors also describe, but do not empirically test, that demographic shifts, enrollment declines, and finances are all primary contributors to why Catholic schools have closed. Additionally, they find that the majority of schools that have closed in Chicago are from lower income neighborhoods with higher Latino populations. Lubienski, Gulosino, and Weitzel (2009), in describing entry decisions of charter schools in Detroit, New Orleans, and Washington, D.C. found that private schools close more often in neighborhoods with higher need. Most of the schools that closed were Catholic. Research from the Center of Applied Research for the Apostolate (2006) suggests that most of the Catholic schools that closed were located in poor neighborhoods of urban centers in the Mideast and Great Lakes regions. These findings influenced the choice of using urban schools in the Great Lakes region for this study.

The findings from the aforementioned studies regarding Catholic school closures serve primarily to motivate this study. The reasons why Catholic schools close and where schools close are well established. With charter schools rapidly expanding within cities and becoming a viable alternative to traditional public schools, competition from charters may be hastening the decline of urban Catholic schools. Analogous to the portion of this study investigating Catholic school enrollment changes, I investigate the heterogeneity of charter

school impacts on the likelihood Catholic school closures across cities, grade levels, neighborhoods, race/ethnicity compositions of Catholic schools, and over time. The results of this study may be particularly important from the perspective of Catholic school leaders. Strong competition from charter schools would indicate yet another obstacle faced by urban Catholic school leaders. Implications therefore focus on potential strategies Catholic school leaders could adopt to mitigate the impact of charter school competition and reduce the risk of closure due to falling enrollments.

## Proposed Framework

Taken together the models of parental school choice and location choice of charter schools explain the process underlying competition between urban Catholic and charter schools. The conceptual model proposed in this study (see Figure 3a on page 56) takes into consideration various components of the theoretical models to explain the impact of charter schools on Catholic school enrollments and closures. These theories also serve as motivating factors for the design of this study and for the development of an empirical model to estimate the proposed problem.

Based on their proximity to a given Catholic school, charter schools potentially influence the trend of Catholic school enrollments over time. I use various specifications of the proximity of charter schools to Catholic schools to define competition in this study. For the majority of Catholic schools, enrollments have already declined over time; here I measure the degree to which charter schools contribute to or accelerate this decline. In the next step I measure the degree to which Catholic schools may or may not close as a result of

charter school competition, after accounting for changes in enrollment. Therefore, the model describes the order in which I empirically test the charter school impact—first on Catholic school enrollments, followed by the impact on the likelihood of closure, where enrollment sits as a mediator.

The unit of analysis in this study is the school. School-level data allow researchers to study aggregate enrollment changes and closures and to identify the degree to which competition for students between charter and Catholic schools exists. If the goal of a research study were to observe choices made by individual families, then individual or family level data would be more appropriate. Only a few studies currently exist on the school-level impacts of charter schools on private schools so the improvements and additions in this study serve to fill that gap in the literature.

Because I estimate the impact of charter schools on Catholic schools at the school-level, the parental choice random utility model and the location choices of charter schools help to explain the process underlying any observed impacts. However, neither of these frameworks is *explicitly* tested in this study. This study does not observe or attempt to estimate the individual school choice decisions made by parents in this study. Additionally, this study does not determine the degree to which school quality vs. tuition price vs. location of schools impacts the decision making process of individual families. The timing of when in the schooling process individual families choose charter schools over Catholic schools is not observed. Also, this study does not analyze the individual decisions made by charter schools when choosing a location in which to open or which specific groups of students they target to enroll.

**Conclusions**

I draw four important objectives from this literature review. First, it provides a historical review of Catholic school enrollments and school closures over the past half-century. The description of challenges faced by Catholic schools in the past and leading up to the present helps to illuminate the current state of urban Catholic schools before considering the impacts of charter school competition. Second, the review describes two theories: a parental school choice random utility model and a description of charter school location decisions. The random utility model brings to light different characteristics that parents consider when choosing schools for their children, especially the impact of tuition. Regarding charter school location decisions, the theory of firm location decisions describes the economic process by which firms choose to enter a market and the characteristics of local educational markets targeted by charter schools. Third, when combined together these two theories help describe the process underlying competition for students between Catholic, charter, and traditional public schools. In an urban educational market where the most viable schooling alternatives for a given family are these three types of schools, the tuition level and the proximity of the school to the household may especially influence schooling decisions. The availability of tuition-free charter schools near Catholic schools may threaten enrollments within the Catholic school and lead to an increased likelihood of school closure. Fourth, the review combines these theories into a proposed framework for this study and potential future research. Because competition between Catholic schools and charter schools has not been studied extensively, the current study uses a synthesis of the theoretical frameworks to motivate an aggregate school-level model. Hopefully the

proposed conceptual model in this study can be useful not only to describe the degree to which urban Catholic schools are impacted by charter schools but also to help describe a series of targeted policy implications after investigating how charter school impacts may differ across cities, grade levels, neighborhoods, race/ethnicity compositions of Catholic schools, and over time.

## CHAPTER III

## RESEARCH DESIGN

The main purpose of this study is to examine the impact that the establishment of charter schools near urban Catholic schools has on the enrollment and likelihood of closure for those Catholic schools. By building upon the strengths of the limited amount of prior research and synthesizing together two theoretical approaches, this study is a first step towards a more comprehensive understanding of the role charter schools play in competition for students with Catholic schools over time and across various subgroups of schools.

This chapter begins with the conceptual model on which this study is based, re-introduces the research questions examined in this study, describes the data sources and sample examined, defines the research variables used, illustrates and defends the validity of the research methods applied, and specifies the analyses employed to address the research questions.

## *Conceptual Model*

The conceptual model is based on the two theories described in Chapter Two. This model synthesizes two theoretical approaches that are underlying the process by which charter schools compete with Catholic schools for students. As illustrated in Figure 3a, the major components contained in this model include:

- Charter school competition (various specifications; based on distance from Catholic school)

- Time (time since first Catholic school observation, years since charter opening)

- Catholic school pre-charter law enrollment trend

- Catholic school characteristics (city, grade levels served, student-teacher ratio, neighborhood socioeconomic need index, race/ethnicity composition)

- Other school alternatives (enrollments in traditional public schools, magnet schools, other Catholic schools, other religious private schools, secular private schools)

- Charter school law passage

**Figure 3a. Conceptual Model**



**Operationalized as:**
- Charter present
- Number of charters
- Enrollment in charters
  *within 1, 2, or 5 mile radius of Catholic school*

**Control Variables**
- Catholic school characteristics (city, grade level, student-teacher ratio, prop. minority students) Nearby enrollments (public, magnet, Catholic, other religious private, secular private schools)
- Neighborhood SES need index
- Nearby Catholic school closures
- Charter law time-varying covariate
- Functions of time and enrollment

**Charter School Competition**

*time-varying effects*

**Catholic School Enrollment** (Outcome #1)

*enrollment as mediator*     *time-varying effects*

**Catholic School Closure** (Outcome #2)

*Research Questions*

Based on the aforementioned conceptual model I address the following questions in this study:

(1) How have the enrollments in and the number of schools serving elementary and middle grade levels in urban Catholic schools changed over the past two decades?

(2) How have the enrollments in and the number of schools serving elementary and middle grade levels in urban charter schools changed since the passage of

state laws authorizing charter schools?

(3)  What effects over time do charter schools located near a Catholic school have on Catholic school enrollments?

(4)  Are there differences in charter school effects on Catholic school enrollments across grade levels, cities, neighborhood types, or race/ethnicity composition?

(5)  Do charter schools located near a Catholic school increase the likelihood over time that a Catholic school closes?

(6)  Are there differences in charter school effects on Catholic school closures across grade levels, cities, neighborhood types, or race/ethnicity composition?

### *Hypotheses*

The exploration of charter school impacts on urban Catholic school enrollments and likelihood of school closures are based on the following three hypotheses. Each hypothesis contains two components: one pertaining to Catholic school enrollments and one to the likelihood of Catholic school closures. In Chapter IV these three hypotheses are tested to address the research questions for the two sets of models.

Hypothesis I: *The impact of charter schools on urban Catholic school enrollments and likelihood of school closures will increase with time.* Specifically, there will be an interaction between time and charter school entry. Upon opening many charter schools enroll students in a few grades as opposed to offering a full range of elementary or middle grade levels. In time, information about the charter school will become more widely disseminated, cohesiveness will grow amongst its staff, and it may start to demonstrate academic success.

If this occurs, then the charter school will likely attract more students in more grade levels over time. A successful charter school will attract students already enrolled in or planning to attend a traditional public school or private school. A Catholic school is likely to be the first private school alternative considered by many urban families. Therefore, I hypothesize after the first charter school opens near a given Catholic school, the proportion of students lost by the Catholic school increases with each passing year. As Catholic schools lose more students, the likelihood of school closures also increases.

Hypothesis II: *The impact of charter schools on urban Catholic school enrollments will vary across school grade levels but the likelihood of school closures will not.* Families may choose to send their child to a Catholic school at the start of the schooling process. Once a child is enrolled in the Catholic school system, he or she is more likely to stay enrolled in middle school, and subsequently into high school. If families tend to keep their children in Catholic schools once initially enrolled, perhaps the greatest opportunity for charter schools to attract students from Catholic schools is in the early grades. Therefore, I hypothesize that the charter impacts on Catholic school enrollments are stronger in the elementary grade levels than the middle grade levels. Regarding closures, most Catholic schools include grades K-8 within the same building. Charter schools may impact enrollment differentially across grade levels, but once a school decides to close, it usually closes for all grade levels. As a result, I hypothesize there are no perceivable differences of charter school impacts on the likelihood of Catholic school closures between the elementary and middle grade levels.

Hypothesis III: *The impact of charter schools on urban Catholic school enrollments and likelihood of school closures will vary substantially across cities.* Each city within the analytical sample has its own unique features and policies related to school choice. I focus on and describe the impacts within four cities in the sample: Chicago, Cleveland, Detroit, and Milwaukee. Chicago is the largest city in the sample and has one of the smallest numbers of charter schools per capita. In addition, the city boasts a substantial intra-district public school choice program of which many schools are magnet schools specializing in given subject areas. I hypothesize the impact of charter schools are weak in Chicago. Cleveland has a history of public and private school choice programs, including a city- and state-run voucher program. Although the city has a substantial number of charter schools for its size, the voucher programs when in existence probably aided Catholic school enrollments. Therefore, I hypothesize the charter school effects are weak to moderate in Cleveland. The city of Detroit, the second largest in this study, became quickly saturated with charter schools shortly after the passage of Michigan's charter school law in 1993. Because there are few Catholic schools still in operation in Detroit (many were closed in the early 1990s) I hypothesize the charter school impacts are moderate to large in Detroit. Charter schools in Milwaukee took a longer period of time to begin operation compared to other cities, despite Wisconsin being one of the first states to pass a charter law. Concurrently within the city, a widely used and well-established voucher program was in place, which may have limited the initial growth of charters and possibly contributed to few Catholic schools closing.. Today, both charter schools and Catholic schools coexist as the two main schooling alternatives in Milwaukee, with the voucher program still in place.

Thus, I hypothesize the charter impacts on Catholic enrollment in Milwaukee are moderate, as families not opting for a Catholic school are especially likely to choose a charter school.

### *Data Source, Sample, and Research Variables*

#### *Data Description*

The sample consists of enrollment, demographic, and location[6] data from two main sources: the Private School Survey (PSS) and Common Core of Data (CCD), both of which are sponsored by the National Center for Education Statistics (NCES). The PSS provides the main portion of data on Catholic and other private schools whereas the CCD provides information on charter and other public schools. I also use two additional sources of data: the 2000 U.S. Census provides demographic information about neighborhoods in this study, and through personal communication with diocesan Catholic school offices for cities included in this study I obtained information on Catholic school closures. The following section discusses each of these data sources.

The Private School Survey (PSS) is a biennial survey of the population of private schools in the U.S. The survey began during the 1989-1990 school year and now contains information on the universe of private schools through the 2009-2010 school year. I make use of these data from the start of the survey in 1989 through the 2007-2008 school year, which was the last year publicly available when the analyses in this study were conducted. The PSS is specifically designed to collect descriptive data from administrative personnel that accurately describe the total number of private schools, teachers, and students. It is

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[6] Missing Catholic school addresses from the public-use data were supplemented with addresses provided from personal correspondence with NCES.

contains information on school enrollment, religious orientation, level of school, coeducational status, race/ethnicity composition of students enrolled, location, as well as other important factors regarding teachers and programs within the school.

The Common Core of Data (CCD) is an annual comprehensive survey of the population of public schools in the U.S. The survey began during the 1986-1987 school year and now contains information on the universe of public schools through the 2010-2011 school year. In order to match the timing of data from the PSS, I use data from the CCD starting during the 1989-1990 school year and continuing every two years through the 2007-2008 school year. Similar to the PSS, the CCD is designed to collect annual fiscal and non-fiscal information on all public schools, public school districts, and state education agencies. It contains information on school enrollment, charter or magnet status, level of school, race/ethnicity composition of students enrolled, location, as well as other important factors regarding teachers, staff, students, and finances within the school. Data from both the PSS and CCD are useful for examining a variety of policy- and research-relevant issues. Given these features, the PSS and CCD together present a unique opportunity for this study to examine the impact of charter schools on Catholic schools enrollments and the likelihood of school closure over time.

In addition to the two NCES data sources I used information from the 2000 U.S. Census Summary File 3. This file contains a series of social, economic, and housing characteristics from a nationally representative sample of approximately 19 million households (about 1 in every 6) that received the Census 2000 long-form questionnaire administered by the U.S. Census Bureau. The information contained in Summary File 3 is

tabulated down to the block group (for many factors) or the census tract levels for others. Specifically, it contains several demographic and socioeconomic measures at the census tract level, including the proportion of minority residents (tabulated across various race/ethnicity groups), educational attainment, public assistance income recipients, household structure, employment status, and population by age group. These data are useful for constructing a measure of socioeconomic need in the area surrounding Catholic schools, detailed further in the research variables section.

The other source of data is from personal communication with diocesan Catholic School offices. Rather than relying solely on the PSS to determine whether or not a Catholic school closed, I obtained information directly from eight of the ten diocesan Catholic School offices within cities included in this study on Catholic school closures[7]. These reports, while not standardized, contained at least the name and address of the closed school and the year in which the school closed. Some dioceses provided further information about school mergers or other useful historical markers of Catholic schools within a given city. With the address information I matched the school closure information with the PSS data to indicate the year in which a Catholic school closed.

*Sample Description*

Because the goal of this study is to estimate the impact of charter schools on urban Catholic schools, the cities within the U.S. on which I chose to focus was a critical decision. When choosing the cities I decided to focus on a specific geographic region of the country.

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[7] For those dioceses not providing information (Indianapolis & Toledo) the numbers of closures were relatively small. To determine which schools closed and when, I crosschecked the PSS data with current Diocesan school information online along with Internet searches for news articles about likely closed schools.

Constraining the analysis to a specific geographic region limits the ability to draw generalizations to a national context. However, if I selected a random sample of cities from different regions of the United States many cities do not contain a sizable number of Catholic or charter schools. Therefore, my approach was to choose a geographic region of the country that contained sizable populations of students and schools, create a set of decision criteria by which I would choose cities, and then select all cities within that region that meet those criteria.

I focus on cities located within the region of the country defined as the Great Lakes by the National Catholic Education Association. The five states in this administrative region include Wisconsin, Illinois, Indiana, Michigan, and Ohio. During the 2011-2012 school year, the Great Lakes region contained the largest number and proportion of K-12 Catholic schools operating nationwide of all NCEA administrative regions (1,632 schools; 23.9% of all U.S. Catholic schools) (McDonald & Schultz, 2012). In addition to the sizable Catholic school population, there were 915 K-12 charter schools (18.5% of all U.S. charter schools) in operation within these five states. This suggests that there are a sufficient number of Catholic and charter schools operating within these states to merit an analysis of this geographic region.

Although the numbers of schools and enrollments in schools in this region are large enough to support a quantitative study, there must also be a theoretical reason for choosing to focus on a narrow geographical area. These states are also part of what is colloquially known in the U.S. as the "Rust Belt" region. In Chapter II, I mentioned that several urban centers located in the Northern and Midwestern parts of the United States,

many with historically large Catholic populations and numbers of Catholic schools, experienced a substantial decline in their manufacturing base (Faberman, 2002; Feyrer, Sacerdote, & Stern, 2007; Keating, 2007). As a result of this economic transition many white, working-class Catholic families moved out of cities and into the suburbs, with a predominately poor, non-Catholic, African American population taking their place (Brinig & Garnett, 2010; Cattaro & Cooper, 2007; Defiore, 2008; Franklin & McDonald, 1988; Greeley, 1982).

These demographic transitions sparked a trend that continues today of declining Catholic school enrollments and a substantial number of Catholic school closures. These falloffs have occurred despite Catholic schools still being chosen by many families as alternatives to low-quality public schools (Greeley, 1982; Franklin & McDonald, 1988). Most of the enrollment declines and school closures were located in Mideast and Great Lakes urban and inner city locations with high poverty rates and large numbers of racial and ethnic minorities (CARA, 2006; USCCB, 2005; O'Keefe & Scheopner, 2007). Currently, a sizable number of urban Catholic schools serve their communities within these states that have been a hotbed for the start and growth of many public (charter schools in all states) and private (vouchers in Wisconsin, Ohio, and recently, Indiana) school choice policies.

The sizable number of Catholic and charter schools operating along with the common historical economic and demographic transitions experienced by most cities in the region makes the choice of the Great Lakes ideal for the study of the impact of charter schools on Catholic schools. Working within this geographical region of five states, I chose to select all cities with 2010 Census populations over 250,000 people. These cities

classified as "large" cities by NCES. Within large cities, there are larger student populations, number of schools, and options for school choice. The availability of more choice options, particularly charter schools, increases the likelihood of detecting any competitive effects of charter schools on Catholic schools. In addition, the mechanism by which parents choose schools in rural areas or suburbs, where public schools tend to have higher achieving students and/or there are fewer schooling alternatives, is likely different than that for urban areas.

Based on these selection criteria, cities selected as part of this study include: Chicago, Cincinnati, Cleveland, Columbus, Detroit, Indianapolis, Milwaukee, and Toledo. In addition to these cities within the states within the Great Lakes region I also chose to include the cities of Buffalo, New York and Pittsburgh, Pennsylvania. Both of these cities share characteristics common with the other cities included in the study: the *states* in which they are located border at least one of the Great Lakes; they had a population of over 250,000 people as of the 2010 Census; they have experienced the same economic and demographic transitions as part of the Rust Belt; they have had historically large Catholic populations with a sizable number of Catholic schools; and charter schools operate in both cities. Figure 3b displays a map of the cities included in the analytical sample.

**Figure 3b. Map of Cities Included in Study Sample**



New York City and Philadelphia also meet the selection criteria for size of city and are located in the same states, but these two cities are far removed from the Great Lakes region and historically did not rely on manufacturing as their primary source of industry. Minnesota also borders at least one of the Great Lakes. However, its largest metropolitan area, Minneapolis/St. Paul, did not experience the same degree of economic and demographic transitions as other Rust Belt cities. Also, St. Louis, Missouri is commonly considered as a Rust Belt city and has a large Catholic population. However, Missouri does not border one of the Great Lakes and its inclusion based on other criteria would suggest

including many other large Midwestern cities in nearby states including Kansas City, Louisville, Memphis, Nashville, and perhaps even Omaha.

In addition to concentrating on Great Lakes/Rust Belt cities, I also focus on Catholic schools that serve the elementary and middle grades (K-8). Examining descriptive trends and information contained in the literature, the largest numbers of Catholic school closings and declines in enrollment are at the elementary and middle school grade levels; fewer high schools have closed or lost a substantial proportion of their enrollment. This is likely a result of K-8 schools being for the most part attached to local parishes within neighborhoods, while high schools are more often centralized and operated by the diocese. Schools attached to parishes are more influenced by local fluctuations in population or demographic changes, demand for Catholic schooling, competition, and parish finances. Additionally, most of the charter schools that have opened to date are at the elementary and middle school levels, so I expect competitive effects to be more pronounced in these grade levels.

*Research Variables*

The research variables are described below. Where necessary, I describe both the process used to construct each variable and the rationale for making those decisions. All of the categorical variables included in this study fit into natural categories when creating dichotomous indicator variables. Therefore I did not have to make any decisions about combining or collapsing categories.

Outcome Variables

- <u>Catholic school enrollment.</u> In each PSS year enrollments are measured for each grade. In order to create the dependent variable used for analysis, I separately summed enrollments over two grade levels: 1-5 (elementary[8]) and 6-8 (middle). Most Catholic school buildings house grades 1-8. For the purposes of analyses these buildings were treated as two separate schools in order to investigate the grade level impacts of charter schools, which often have distinct elementary and middle school buildings. Since there is a high degree of variation in the size of schools and because the distribution of enrollment is highly positively skewed, the natural logarithm of student enrollment is used for modeling purposes. This transformation also allows for the interpretation of coefficients, after exponentiation, in terms of percent changes in enrollment from a baseline. As an alternative specification, I also compute the share of a given Catholic school's enrollment as a proportion of total school-age population within a specified radius around the Catholic school. This variation allows the outcome to be sensitive to population changes around the school. Another alternative measure of enrollment, year-to-year percent change, could also be used but data are lost for the first observation year of each school as well as any years in which there is a multiple-survey gap in responses from schools. Catholic school enrollment also serves as an independent variable when examining Catholic school closure as the outcome variable.

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[8] Kindergarten is not considered due to greater differences in the number of hours children attend school, the greater number of other schools that enroll kindergarten students, and variation in state laws concerning compulsory kindergarten attendance. Also, the mechanism by which parents enroll students in kindergarten may operate in a different manner than the other elementary grades.

- <u>Catholic school closure.</u> From information supplied by Catholic school dioceses and the PSS, I constructed a dichotomous variable to indicate Catholic school closure in a given year. I coded the year in which a Catholic school closed as "1" and all years in which a Catholic school remained open as "0". Once a school is closed it no longer appears in these data. Likewise, if a Catholic school remained open throughout the survey period and was thus right censored, all school-year observations were coded as "0". In most cases Catholic schools closed in the year or two after their last valid observation in these data[9]. Therefore, the school was marked as closed in its last valid observation year.

Independent Variables

- <u>Charter School Competition.</u> The main predictor variable of interest is charter school competition. Charter school competition is operationalized in three forms within varying proximities of a given Catholic school: (1) the presence of a charter school, (2) the number of charter schools, or (3) the enrollment within charter schools. All of these forms are with respect to the same grade levels served by a given Catholic school. Presence of charter school is a dichotomous indicator variable where "1" represents at least one charter school located within a given radius of a Catholic school and "0" represents no charter schools

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[9] There were a number of cases in which schools closed well after their last observation year. If the school was only missing one observation period before closure, it was marked as closed in the last valid observation year (three to four years prior). For example, St. Casmir elementary school in Detroit closed in 2005, but did not have any school information in the 2004 PSS survey. Thus, it was marked as closed in 2002, its last valid observation year. An additional indicator variable was constructed for these events and included in all models, but was statistically insignificant. If there was more than one missing observation period prior to closing, the school is treated as right-censored at the time of its last valid observation.

located nearby. The number of charter schools and enrollment levels in charter schools are continuous measures. Enrollment was natural log transformed for the same reasons as transforming Catholic school enrollment. Catholic school enrollment and charter school enrollment are not constrained by any pre-defined boundaries; families are free to travel across cities to send their children to their Catholic or charter school of choice. However, to keep a common definition across cities, I only consider Catholic and charter schools that are located within each city's geographic boundaries.[10] I geocoded the addresses for Catholic and charter schools into latitude and longitude coordinates and then calculated the distances between schools to create the competition measures using Geographic Information Systems (GIS) techniques. I created separate variables—indicators for the presence of a charter and continuous measures for the number of and enrollment in charters—for each of a 1-, 2-, and 5-mile radius around each Catholic school[11].

- Time (observational)
  - <u>School year.</u> A set of dichotomous indicator variables for each year contained within the sample (e.g., 1990, 1992, etc.).

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[10] Geographic city limits often correspond to public school boundaries as well. If concern arises about Catholic schools located close to the city borders, where neighborhood families may send their children to schools outside these boundaries and children from outside the boundaries may be attending those Catholic schools inside the city, Catholic schools within the city and near the city border could be excluded from analysis.

[11] The results here primarily focus on the 1- and 2-mile radius, due to the assumption that the greatest degree of competition within cities occurs between nearby schools. Previous work that estimates the effects of school competition by proximity typically uses a 2- or 2.5-mile radius (e.g. Chakrabarti & Roy, 2011; Sass, 2006).

o <u>Time since first observation.</u> A continuous measure of time where the first time point in these data corresponds to the first observation year for each school. Most schools in these data have observations starting with the 1989-1990 school year, which is the starting time point for the survey. Subsequent observations are marked accordingly as two-year time intervals corresponding to the years of the PSS surveys (e.g., if 1990 is year 1, 1992 is year 2). For those schools that have their first observation year after 1990, the first time point for these schools is marked as the first observation year, which includes schools that have opened since 1990. This is used for the analysis of Catholic school closures.

- Time (relative to charter schools)

  o <u>Year since charter entry.</u> A set of continuous measures of time where time zero in these data corresponds to the observation year in which the first charter school opened within a given radius of a Catholic school. Negative values indicate years prior to charter school entry; positive values indicate years after charter school entry. The scale of this variable is in real-time, such that if a charter school opened in observation year 1998 (year zero), observation year 2000 would be year 2. This allows me to interpret the coefficients as the effect of one-year changes in this independent variable. I constructed this measure for each of a 1-, 2-, and 5-mile radius around each Catholic school.

- o Pre-charter entry. A pair of dichotomous indicator variables for the two time periods prior to a charter school opening within a given radius of a Catholic school. Developed from year since charter entry.

- o Year since charter school law passage. A continuous measure of time where time zero corresponds to the observation year in which a charter law was passed within the state for each city in the sample.[12] Negative values indicate years (on the same-two-year time interval previously mentioned) prior to charter school law passage; positive values indicate years after charter school law passage.

- o Charter school law passage. A dichotomous indicator variable where "1" refers to all years after the charter school law was passed within the state for each city in the sample and "0" refers to all years prior to and including the year when the charter school law was passed.

- School background characteristics

  - o Grade levels served. A dichotomous variable where "1" indicates elementary grade levels (1-5) served by a given Catholic school and "2" indicates middle school grade levels (6-8). This variable is not included as a predictor in any analyses. However, it was initially used to subset the data in order to conduct separate analyses for the elementary and middle grade levels.

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[12] For example in Milwaukee, the Wisconsin charter law was passed in 1993. This corresponds to year 0 (1993-94 PSS year). For cities where the law was passed in between PSS administrations, zero was shifted to the following PSS administration (e.g., Chicago: Illinois law=1996, zero=1997-98).

- o <u>Student-teacher ratio.</u> A continuous measure of the number of students per teacher within a given school. This measure is a proxy for class size, which many parents view as an important consideration when enrolling their children in a school.

- o <u>Race/ethnicity composition.</u> A continuous measure of the proportion of minority (non-white) students enrolled within a given school. There are also measures for the proportion of students enrolled within each minority group (Asian, American Indian, Black/African American, Hispanic).

- <u>City.</u> A set of dichotomous indicator variables for the city in which a school is located.

- <u>Other school alternatives.</u> A set of continuous measures for the natural log of enrollments in traditional public, magnet, other Catholic, other religious private, and secular private schools located within a 1-, 2-, and 5-mile radius around each Catholic school. I constructed these variables using the same approach as the charter school competition variables. Including these measures more accurately describes a local educational market. Previous research failed to include the enrollments of these other alternatives, which may also compete with Catholic schools for students (especially traditional public schools). Including these controls also reflects the fluctuations in the total school-age population within a given area.

- Nearby Catholic school closures. A set of dichotomous indicators where "1" denotes a Catholic school closed within a given proximity to a given Catholic school in the previous time period and "0" indicates no Catholic schools closed nearby. I constructed these indicators for a 1-, 2, and 5-mile radius around each Catholic school.

- Neighborhood socioeconomic need index. A set of continuous measures for the socioeconomic need around each Catholic school. I used an approach from Lubienski, Gulosino, and Weitzel (2009) to develop a socioeconomic need index that sums the proportions of residents that are African American, have less than a high school diploma, receive public assistance income, live in single-headed households, were unemployed, and aged 0-17 from the 2000 U.S. Census. The index includes the census tract in which each Catholic school is located as well as its contiguous tracts within a 1, 2, and 5-mile radius. The contribution of each tract is proportional to the area of each tract within these radii. The index was standardized within each city and inverted, such that negative values indicate those areas with a greater socioeconomic need (lower-SES) and positive values are areas with a lesser socioeconomic need (higher-SES). Because these variables were only measured at one time point they can only be used to study interaction effects.

- Catholic school pre-charter law enrollment trend. A continuous measure of an estimated linear time trend for each Catholic school based on its enrollments in the years prior to and the year of charter law passage. To compute this variable, I

ran a separate regression for each Catholic school to generate its pre-charter law trend. Using the results of the regression, I predict enrollment trend values for both the pre- and post-charter law time periods. The predicted values then serve as a baseline for each school prior to charter schools.

- Interaction effects. A set of continuous measures that interact both the number of charter schools and the enrollment in charter schools with the years since charter school entry. Including this interaction term with the main charter school effect (e.g., number of charter schools) and the time-varying effect (years since charter entry) provides a complete portrayal of the charter school effect over time.

- Heterogeneous effects/interactions. I investigated the heterogeneity of charter school impacts across various sub-groups by interacting both the charter school presence indicator variable and the years since charter entry variable with the following variables:

  - City
  - Neighborhood socioeconomic need index
  - Proportion of Black/African American students enrolled
  - Proportion of Hispanic students enrolled

# Estimation Strategies

Given the longitudinal nature of these data and the need to investigate two different outcomes, I used two different estimation strategies. I use a school fixed-effects approach to estimate the effect of charter schools on nearby Catholic school enrollments and I use a discrete-time hazard model to estimate the effect of charter schools on the likelihood of nearby Catholic school closures. Next, I describe the rationale behind using each strategy, the statistical models used to estimate the two outcomes, and the overall threats to internal validity.

## *School Fixed-Effects Model for Catholic School Enrollment*

Fixed-effects models are used when the primary goal of analyzing observational longitudinal data is to explore a relationship varying over time between predictor and outcome variables within a given unit (e.g., school, state, person, etc.). In the context of this study, the units are Catholic schools, the predictor of interest is charter school entry, and the outcome is Catholic school enrollment. Fixed-effects are a series of indicator variables for each school in the analytical sample. Each Catholic school has its own features that could potentially influence charter school entry. The reason for using a fixed-effects approach is the possibility that some unobserved characteristic within each school is correlated with charter school entry. As a result, this correlation may bias the estimated relationship between the charter school entry and Catholic school enrollment. By including school fixed-effects, the time-invariant characteristics of schools are removed from the estimation, leaving the net impact of charter school entry on Catholic school enrollments.

When included, school-fixed effects accounts for all time constant variation occurring between schools, leaving only variation within schools.

Including school fixed-effects eliminates the confounding influences of unobserved time-invariant characteristics of schools. However, it is also necessary to account for time in order to appropriately identify the charter school entry effect. Enrollments in most Catholic schools have steadily declined over the past fifty years. Therefore, any analysis of enrollments must account for the unobserved variation in enrollments that occurs over time or the impacts of charter school entry may be overstated. One approach is to include year fixed-effects to absorb any variation occurring between years. However, cities in this study have differential timing of the authorization of charter schools within their state. Because the analyses in this study investigate Catholic enrollments relative to charter schools, calendar year is somewhat meaningless as a measure of time.

Another alternative is to shift the time dimension, so that year zero refers to the year the charter law was passed in each state and then include this version of time-fixed effects. While this approach would work, it makes the assumption of homogenous time impacts on Catholic school enrollments across all schools. A more flexible approach, and the one used in this study, is to generate the pre-existing enrollment trends over time for each Catholic school that contains pre-charter law enrollment information. This is created through an interaction between the school fixed-effect, time, and enrollment (see research variables for details). Once included in the model, this set of "enrollment trend fixed-effects" accounts for the time variation in Catholic school enrollments and allows for the identification of the charter school entry effect as the change in enrollment trend within a

given Catholic school from baseline, which is the within-school enrollment trend in the absence of charter schools.

The estimation strategy used in this study for investigating the effect of charter schools on Catholic school enrollments is largely an extension of the school fixed-effects approach used by Chakrabarti and Roy (2011). In their study they estimated the effect of charter schools on private school enrollments throughout the state of Michigan. Here, I describe a basic school-fixed effects model that estimates the intended relationship of interest between charter schools and Catholic school enrollments.

$$CathEnr_{it} = \beta_0 + \beta_1 Charter_{it} + \beta_2 PostEntryYr_{it} + \gamma_i EnrTrend_{it} + \delta \mathbf{X}_{it} + f_i + \varepsilon_{it} \qquad (1)$$

In equation (1), $CathEnr_{it}$ represents the enrollment in Catholic school $i$ in year $t$. $Charter_{it}$ is a measure of charter school competition within a specific radius of a Catholic school. Here, I describe the model using the specification of charter school competition as the presence of a nearby charter school, though I use two additional specifications described in the research variables section as well (number of and enrollment in charter schools). The variable $PostEntryYr_{it}$ represents the number of years after a charter school first opened near Catholic school $i$ in observation year $t$. Therefore, $PostEntryYr_{it}=0$ for all Catholic schools that at time $t$ did not have a charter school open within a given proximity. The post-entry variable also is zero for the first observation year in which a charter school opened within a given proximity. $PostEntryYr_{it}=2$, 4, 6, etc. for the number of observation years after the charter school opened. As charter schools grow and mature, family preferences for charter schools may increase (or decrease) over time. Alternatively, the

post-entry variable controls for information about charter schools within a given area becoming more widely disseminated over time.

Also contained in the model is a vector of controls, $\mathbf{X}_{it}$, accounting for school background characteristics, charter law passage, pre-charter law enrollment trends, pre-charter entry indicators, nearby Catholic school closures, other school alternatives, and any additional heterogeneous impacts being tested. I discuss the step-by-step process of building the models and the rationale behind including these variables in Chapter IV. School fixed-effects are represented by $f_i$ and account for the impact of an entry decision by a charter school that is correlated with unobservable, time-constant variation across Catholic schools. The standard errors in all specifications, $\varepsilon_{it}$, are clustered by city to adjust for possible correlation between Catholic schools within the same city.

Taken together, $\beta_1$ and $\beta_2$ represent the parameters of interest, or effect of charter school competition over time on Catholic school enrollments within a given school. The coefficient $\beta_1$ measures the charter school effect on a given Catholic school's enrollment for a Catholic school facing charter competition versus those that do not. The term $\beta_2$ measures the change in the charter for each year after the first charter school opened near a Catholic school. When thinking about charter school impacts in terms of the trend of Catholic school enrollments, $\beta_1$ is the intercept shift when the first charter school opens and $\beta_2$ is the slope shift of the predicted Catholic school enrollment for each year after a charter school opened. No time lags are used in these models because any lag in charter school impact is contained within the post-charter entry variable. Also, there is no need for school weights in these models since I am working with the population of schools within

cities. One possible weighting scheme would be to have different weights for each city; however, these would be washed out with the inclusion of school fixed-effects. I perform a series of sensitivity checks to test whether or not one city drives the results especially because over 30% of the schools in the analytical sample are from the city of Chicago.

*Discrete-Time Hazard Model for Catholic School Closures*

Discrete-time hazard models are used when the goal of analyzing longitudinal data is to explore how one or many factors impact the occurrence of an event over time. In this study, the event of interest is the closure of a Catholic school, while time is denoted as years since the first observation of a school in these data. The discrete-time hazard model, also known as an event history model, is a variant of survival analysis originally developed in biostatistics to model factors that impact human lifetimes (Cox, 1972). The application of discrete-time hazard models to the study of the timing of educational events is more recent, and has been used to investigate how various factors influence retention of college students (e.g., DesJardins, 2003) or teachers (e.g., Ronfeldt, 2012).

The continuous-time proportional hazards model first developed by Cox (1972) requires that the timing of the event is precisely determined with enough variation in the timing. In educational contexts, time is often discretely observed at higher levels of aggregation, such as years or semesters. As a result, it is more appropriate to use a discrete-time model that is representative of the measure of time and avoids the bias in a continuous-time proportional hazards model from having too many ties (Singer & Willett,

2003). Thus, I employ a discrete-time hazard model because closure of Catholic schools occurs over a finite number (ten) observed time periods.

The hazard is the conditional probability that a school will close in time period $t$, given that it has survived past time period $t-1$. The hazard, in other words, measures the risk of a school closing in each time period. Therefore, risk of closure in this study refers to the conditional closure rate. Any schools that do not close but fall out of the sample at some time point are treated as right-censored cases (their closure time is unknown) and are removed from the risk set in each subsequent time interval. In the discrete-time hazard model time refers to the time since the first observation. The time dimension for all schools is shifted so that the first time period is the first year of observation. Time in this study extends outward in two-year time intervals up to a maximum of 18 years from the first observation, corresponding to the observation window from the 1989-1990 school year through the 2007-2008 school year.

Regarding identification using the discrete-time hazard model, the model contains a series of indicator variables for each time period that a school is open, or time-fixed effects. This flexible baseline model accounts for unobserved variation between time periods. However, the model does not account for the unobserved variation that occurs between schools, as school fixed-effects are incompatible with the discrete-time hazard model (Allison & Christakis, 2006).[13] Although the discrete-time hazard model is appropriate for studying the impact of charter schools on the likelihood of Catholic school closures, the

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[13] When attempting to apply fixed-effects to a discrete-time hazard model where there are non-repeating events, conditional likelihood estimates will not converge for any covariates that are monotonic functions of time or those that change in one direction with time.

results should be cautiously interpreted within a causal framework because of the unobserved variation that remains between schools.

In this study, I used discrete-time hazard models to estimate the likelihood of Catholic school closure as a function of nearby charter schools. Functionally, the model takes the form of a logistic regression model where the event of interest is Catholic school closure.

$$P_{it}(\text{Catholic Close}) = \frac{e^f}{1 + e^f}$$

where $f = \beta_0 + \beta_1 Charter_{it} + \beta_2 PostEntryYr_{it} + \gamma CathEnr_{it} + \delta \mathbf{X}_{it} + \sum_{t=1}^{10} \alpha_t D_t$      (2)

In equation (2), the probability ($P$) that Catholic school $i$, in year since first observation $t$, closes is a function of a set of covariates. As in the fixed-effects model for Catholic school enrollment, $Charter_{it}$ is a dichotomous measure of the presence of a nearby charter school and $PostEntryYr_{it}$ represents the number of years after a charter school first opened near Catholic school $i$ in the year since first observation $t$. The indicator for charter presence varies over time, relative to the observation year, whereas the post-entry variable measures time relative to charter entry.

This model also controls for enrollment in the Catholic school. As described in Chapter II, low enrollments, or enrollments that are trending steeply downward, are highly correlated with the likelihood of a Catholic school closing. In the conceptual model enrollment acts as a mediator. Therefore, models including enrollment measure the charter school impact on Catholic school closures through enrollment. Also contained in the hazard model is a similar vector of controls to the school fixed-effects enrollment model, $\mathbf{X}_{it}$, accounting for school background characteristics, charter law passage, nearby Catholic

school closures, other school alternatives, city fixed-effects, and any additional heterogeneous impacts being tested. The term $D_t$ represents a series of time period indicator variables (time fixed-effects) which account for the impact of charter school entry that is correlated with unobservable components of the likelihood of Catholic school closure that varies over time. These indicators shift the hazard function for schools in the baseline group—those Catholic schools not facing charter school competition—for each two-year time period. The standard errors in all hazard model specifications are also clustered at the city-level.

In the discrete-time hazard model, $\beta_1$ and $\beta_2$ when taken together again represent the effect of charter school competition (over time) on the likelihood of Catholic school closure. Here, $\beta_1$ is the intercept shift in terms of baseline hazard, or the probability of Catholic school closure within a given time period and $\beta_2$ is the slope shift of the baseline hazard for each year after a charter school opened. Both of these parameters are interpreted as odds-ratios, or the change in the odds of Catholic school closure.

*Threats to Internal Validity and Limitations*

The primary internal validity concern in this study, whether estimating the impact of charter schools on Catholic school enrollments or likelihood of closure is related to the location decisions of charter schools. When charter schools open their location in relation to Catholic schools is potentially endogenous--in other words there are potentially unobserved characteristics that simultaneously impact Catholic school quality and charter school location. Charter schools are more likely to locate in low-income urban areas, with

low-performing traditional public schools and mostly attract students from nearby neighborhoods. (Glomm, Harris & Lo, 2005; Kleitz, Weiher, Tedin, & Matland, 2000; Lubienski, Gulosino, & Weitzel, 2009). The location decisions of charters are not primarily based on the quality of Catholic schools but on the quality of public schools. Likewise, all charter schools in a city do not open at the same time in pre-determined locations as the result of a state-level policy. Because opening a charter school is a local decision that takes place on a charter-by-charter basis, large-scale policies would not simultaneously influence individual charter school entry and Catholic school enrollments.

If there were a severe endogeneity issue the entry decision of charter schools would have to be correlated with time-varying characteristics of Catholic schools, such as a steepening decline in perceived Catholic school quality. However, it is unlikely that Catholic schools across the board have been declining in terms of the academic and non-academic benefits they provide to their students and communities. The estimates of the charter school impact would be larger in magnitude in the negative direction if the estimates were biased. The biased estimates would reflect an even larger decrease in Catholic school enrollment or an even greater likelihood of Catholic school closure that is attributed to charter schools than actually exists.

In each of these models I also include information about the timing of the charter school law passage within each state. Accounting for the law acts as a control for unobserved variation that might be correlated with local charter competition and Catholic school closings in the pre- and post-law periods. While the timing in which a charter school law is passed is reasonably exogenous, the focus in this study is on charter school location

and what changes are occurring within the local educational markets around Catholic schools. Laws vary highly across states (e.g., cap on the number of charters, procedures for establishing a charter school), thus I expect a high degree of heterogeneity in charter school impact across cities.

Another threat to internal validity is omitted variable bias, to which both statistical models in this study are susceptible. In Chapter II, I described the role that tuition may play in the choice process for families. Unfortunately, I have no information about the yearly tuition rates at each school, the state of parish or school finances, diocesan support, or how funding for Catholic schools may have changed as a result of sex abuse scandals. Tuition and other financial components are likely endogenous to Catholic school enrollments and school closures. However, by not accounting for the unobserved variation in tuition over time, the charter school effect may be overstated, unless the unobserved variation is captured in the baseline enrollment levels or baseline hazard.

### *Data Analysis*

This section describes the additional processes that took place to prepare these data for analysis as well as clarifies a few concepts used in the next chapter. First, I describe how I created the longitudinal dataset and imputed any cases with missing information for key analytical variables used. Next, I discuss terminology associated with schools opening, closing, and dropping from the sample, as well as time. Then, I briefly describe the final analytical sample used throughout the analyses in Chapter IV.

*Creating the Longitudinal Data Set*

The main source of data used in this study, the Private School Survey, is a cross-sectional design. New data are collected on schools during each school year the PSS is administered. In order to analyze these data using longitudinal methods, individual years of the PSS were merged into a school-period panel dataset. This form of the data contains multiple records for each school for each time period. Whether using a school fixed-effects model, a discrete-time hazard model, or performing exploratory analysis, the data should be in a school-period panel in order to support these analyses of change over time (Singer & Willett, 2003). This process was completed manually in SPSS, first using the school ID number as the key to link multiple data sets and then using the transpose function and inserting the appropriate year next to each school ID. The same process took place for the initial formatting of the data used from the CCD. The final dataset for Catholic schools maintains many of the features from the original school-period panel dataset created from the PSS.

*Imputing Missing Data*

Before any analysis could take place any cases containing missing data for important variables in the analysis needed to be imputed. Fortunately, these data from the PSS and CCD are quite complete, resulting in few imputations. The primary variable for which imputation took place was for one of the outcome variables, Catholic school enrollment. Schools that contained no valid reports of enrollment over any time period were dropped from all analyses. For instances where a Catholic school contained valid

reports of enrollment but skipped one intermittent year (e.g., valid reports in 1998 and 2002, missing in 2000), the skipped year was imputed using the average enrollment of the preceding and following years. Using this approach makes the mild assumption that the enrollment across the three time periods is trending in a linear fashion. Rather than make stronger assumptions for missing enrollments at the beginning or end of the observational period, or in cases where multiple intermittent years are missing enrollments, these observations were not included in the analysis.

The only other variable for which any imputation was necessary was the proportion of minority students enrolled in each Catholic school. The 1990 and 1992 years of the PSS did not contain information about the race/ethnicity composition of students within private schools. I imputed missing values by backfilling the race/ethnicity composition of students in the schools from the 1994 school year. This imputation makes the assumption that the race/ethnicity compositions within schools are changing gradually over time. All models include indicators for imputed values in the enrollment or minority composition variables, but neither indicator was statistically significant across any models.

*Schools Opening, Closing, Dropping and Timing*

Decisions were made about how to handle schools that open, close, or drop out of the sample, along with the relative timing of these events prior to conducting these analyses. For most Catholic schools in the sample (approximately 90% of schools), the year of first observation was the first year of these data, 1990. Schools that decide to close and subsequently drop out of the sample prior to the introduction of charter schools form part

of the baseline likelihood of closure. Overall, 91 schools (16.7%) serving elementary grade

levels closed prior to or in the year of passage of the law authorizing charter schools within

a given state, while 111 schools (20.4%) closed after the law passage.

Schools that randomly drop out of the PSS survey sample are another set of non-

standard schools. These schools may no longer appear in the data for unforeseen reasons

or simply because they chose not to complete the PSS. It is possible that a few of these

schools closed, but that scenario is unlikely because I obtained school closure information

from sources outside the PSS. There are 71 schools (13.2%) serving elementary grade

levels that randomly disappear from these PSS data. While this seems like a substantial

number of schools, most of the schools that randomly disappear were only observed during

a few time periods, so the impact on the overall school-year number of observations is

small. For the fixed-effects model, these schools vanish after their last valid observation.

For the discrete-time hazard model these schools are right-censored. Right censoring

refers to observations that did not experience the event of interest (school closure) and are

either no longer observed in the duration of the study or survive through the last time

period of the study. Schools that exit the sample due to closing or being dropped pose no

problems for estimating either the fixed-effects or discrete-time hazard models.[14]

The other set of schools that are not observed over all years of the study are those

Catholic schools that open. Although Catholic school closures are much more common,

there are still 49 schools (9.2%) serving elementary grade levels that either open or have

their first observation in these data after the 1989-1990 school year. There are no issues

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[14] Pre-charter enrollments trends cannot be calculated for schools that close or drop out of the sample in the first observation year of the study or for schools that open immediately prior to charter law passage. However, these schools are kept in the analysis without a school enrollment trend fixed-effect.

for the analysis of schools that open prior to the passage of the law authorizing charter schools within a state. However, the 25 schools that open after the passage of the charter law were included in all descriptive analyses, but dropped from all analytical models.

There are three reasons for the exclusion of these 25 schools. First, part of the identification strategy of the school fixed-effects model for analyzing Catholic school enrollments includes pre-charter law enrollment trends. Because these schools opened after charter schools were authorized there are no controls for their enrollment in the absence of charter schools. Second, the mechanism by which these schools make decisions about entering or exiting a local educational market is different from their peers. For Catholic schools that were established prior to the operation of charter schools, they have the option to either remain in operation or exit from the market. In the case of Catholic schools that open after charter schools were authorized, they must first make a decision about entering a market, and then choose to remain open or exit in subsequent years. Like charter schools making an entry decision, Catholic schools weigh several factors before entry. These new Catholic schools will only enter a market if they can be sustainable. If charter schools are seen as a competitor, the school may choose to locate away from a charter, or at minimum, these new schools begin with an a priori notion of how to deal with charter school competition. Nearly half of these new Catholic schools open with a charter school located within one-mile. Pre-existing Catholic schools do not have these advantages and especially do not have a choice of location. The third reason these schools were excluded is from a statistical perspective. Enrollments in most of these new schools actually increase over time as compared to most of their pre-existing counterparts that suffer from

declining enrollments. Additionally, inclusion of these schools in the analytical models dramatically attenuates the impact of charter schools as their enrollment trends are in the opposite direction.

*Analytical Sample*

In this study, the final analytical sample contains 3,900 school-year observations for 520 Catholic schools serving elementary grade levels and 3,989 school-year observations for 524 Catholic schools serving middle grade levels. I generalize these results to the population of Catholic schools within each of the cities in my sample and, on a larger scale, to large urban centers within the Great Lakes/Rust Belt region of the U.S. Based on the description of the cities in this sample, the results may also be generalizable to a wider group of cities that experienced the same type of demographic and economic transitions or have urban Catholic schools that serve several poor and minority families. In the next chapter, I include a descriptive analysis of the data, the estimated results of the school fixed-effects and discrete-time hazard models, various specification tests, and heterogeneous charter school impacts.

## CHAPTER IV

## RESULTS

The results presented in this chapter are presented in three sections. The first section begins with a presentation of the descriptive statistics for relevant variables used in the analysis. I focus on the Catholic school enrollment trends, closures of Catholic schools, and growth of charter schools in each city in the analytical sample over time. The descriptive statistics also include preliminary discrete-time hazard analyses including a life-table and Nelson-Aalen estimation.

The second section presents the findings from the Catholic school enrollment model using school fixed-effects. This analysis aids in the understanding of the effect of charter schools on enrollments. The analyses begin with the baseline school-fixed effects model and include a description of building the final analytical model. I also discuss the results of different competition radii and specifications of charter school competition. Then I present the results from separate analyses of grade levels, cities, neighborhood types, and school race/ethnicity compositions. These results provide useful information about whether the effects of charter schools differ across cities, neighborhoods, or the race/ethnicity composition of Catholic schools. I also describe a series of sensitivity tests that use a different specification of the outcome variable.

The third section presents the findings from the Catholic school closure model using discrete-time hazard analyses. This analysis helps us understand the effect of charter schools on closures. The analyses include the baseline discrete-time hazard model and the final model that contains many of the same predictors as the student fixed-effects model. I focus on differences in results across cities. Results from hazard models can be difficult to interpret, so I present many of the results in graphical form. To conclude the chapter I briefly describe the marginal effects of charter school competition and its contribution to Catholic school enrollments and likelihood of closure.

### *Descriptive Analysis*

#### *Catholic School Enrollments*

Table 4.1 presents the descriptive statistics about the number of Catholic schools, school closures, and change in Catholic school enrollments within each city in the sample from 1990-2008. Indianapolis and Milwaukee notwithstanding, enrollment declines in elementary grade levels range from 36 to 90 percent of 1990 enrollment levels with slightly more modest declines in the middle grade levels. Figures 4a and 4b present information about Catholic school enrollments for elementary and middle grade levels in each city as a proportion of 1990 enrollments. In each of the cities the enrollment drops in Catholic schools are much greater than the decline in total school-age population. Figures 4c and 4d present information about the changes in enrollments in Catholic, public and

magnet,[15] other religious private, and secular private schools as a proportion of 1990 enrollment across the entire sample. To provide a baseline from which to compare, the change in school-age population over time is also plotted. Here the enrollments in other religious and secular private schools increase over time, public and magnet school enrollments mirror the changes in school-age population, and Catholic schools enrollments steadily decrease over time.

**Table 4.1. Catholic School Descriptive Statistics**

| City | Enroll 1990 | Enroll 2008 | %Δ Enroll '90-'08 | %Δ Sch. Pop. '90-'08 | Schools 1990 | Schools 2008 | %Closed '90-'08 |
|---|---|---|---|---|---|---|---|
| *Elementary Grade Levels (1-5)* | | | | | | | |
| Buffalo | 3,620 | 1,055 | -70.9% | -25.9% | 26 | 11 | 61.5% |
| Chicago | 36,967 | 14,821 | -59.9% | -14.7% | 192 | 105 | 46.4% |
| Cincinnati | 8,277 | 4,561 | -44.9% | -27.9% | 42 | 30 | 16.7% |
| Cleveland | 7,053 | 3,438 | -51.3% | -28.8% | 40 | 25 | 37.5% |
| Columbus | 3,462 | 2,204 | -36.3% | -0.9% | 24 | 15 | 33.3% |
| Detroit | 5,861 | 611 | -89.6% | -29.7% | 37 | 8 | 78.4% |
| Indianapolis | 4,462 | 4,471 | 0.2% | 8.1% | 26 | 26 | 3.8% |
| Milwaukee | 5,765 | 4,220 | -26.8% | 2.9% | 41 | 33 | 4.9% |
| Pittsburgh | 5,189 | 1,445 | -72.2% | -38.3% | 34 | 13 | 47.1% |
| Toledo | 5,620 | 2,807 | -50.1% | -22.4% | 34 | 20 | 55.9% |
| | | | | | | | |
| *Middle Grade Levels (6-8)* | | | | | | | |
| Buffalo | 1,665 | 712 | -57.2% | -7.5% | 26 | 11 | 57.7% |
| Chicago | 20,124 | 9,180 | -54.4% | -2.9% | 191 | 105 | 45.5% |
| Cincinnati | 4,044 | 2,770 | -31.5% | -12.0% | 41 | 30 | 17.1% |
| Cleveland | 3,411 | 2,138 | -37.3% | -15.4% | 39 | 25 | 43.6% |
| Columbus | 1,838 | 1,352 | -26.4% | 3.4% | 23 | 14 | 34.8% |
| Detroit | 3,559 | 542 | -84.8% | -24.7% | 39 | 10 | 76.9% |
| Indianapolis | 2,220 | 2,775 | 25.0% | 17.6% | 27 | 27 | 3.7% |
| Milwaukee | 3,033 | 2,784 | -8.2% | 47.0% | 41 | 34 | 4.9% |
| Pittsburgh | 2,860 | 1,066 | -62.7% | -24.7% | 34 | 14 | 47.1% |
| Toledo | 2,903 | 1,878 | -35.3% | -9.3% | 33 | 22 | 57.9% |

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[15]Magnet schools operate within four cities in the sample: Buffalo, Chicago, Indianapolis, and Pittsburgh. Magnet schools are also public schools usually operated by the same local school board and follow nearly the same trend as public schools over time. Therefore, these two schools are grouped together in graphical displays for simplicity.

**Figure 4a. Enrollments in Catholic Elementary Grades 1990-2008**



Catholic School Enrollments 1990-2008
Elementary Grade Levels

Legend: BUF, CHI, CIN, CLE, COL, DET, IND, MIL, PIT, TOL
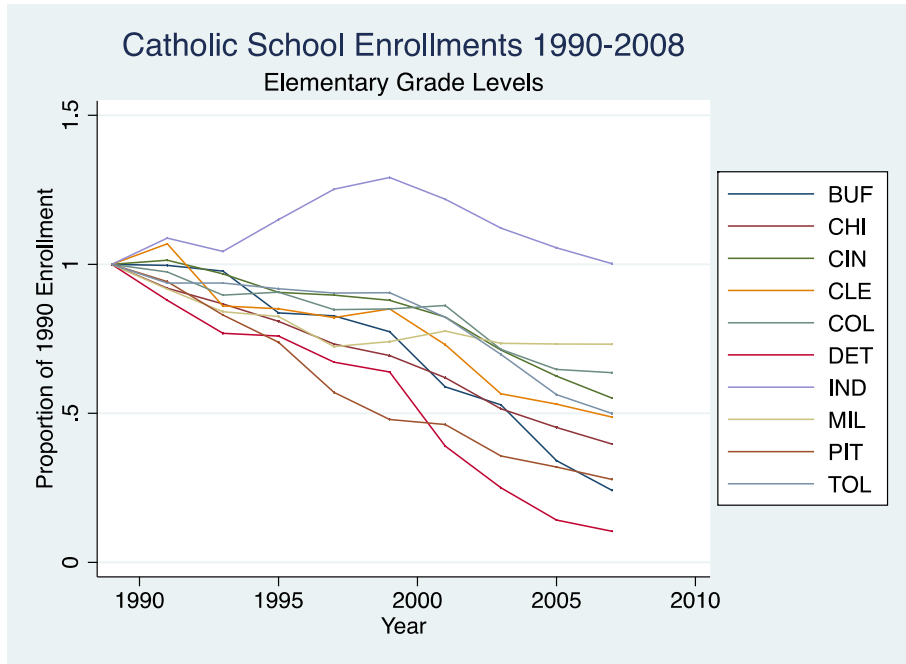
**Figure 4b. Enrollments in Catholic Middle Grades 1990-2008**



Catholic School Enrollments 1990-2008
Middle Grade Levels

Legend: BUF, CHI, CIN, CLE, COL, DET, IND, MIL, PIT, TOL
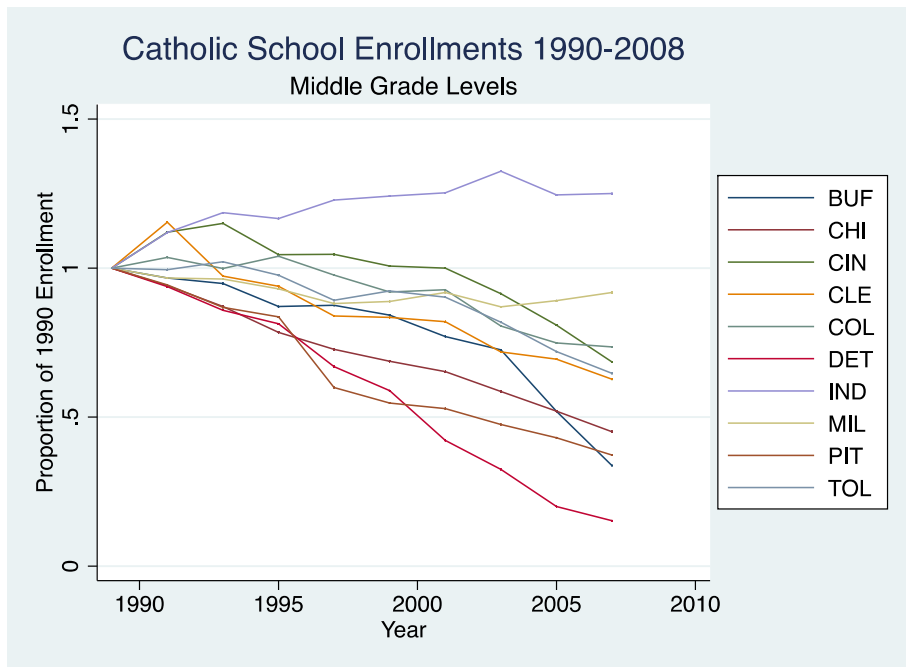
**Figure 4c. Enrollments in Elementary Grades: All Cities 1990-2008**
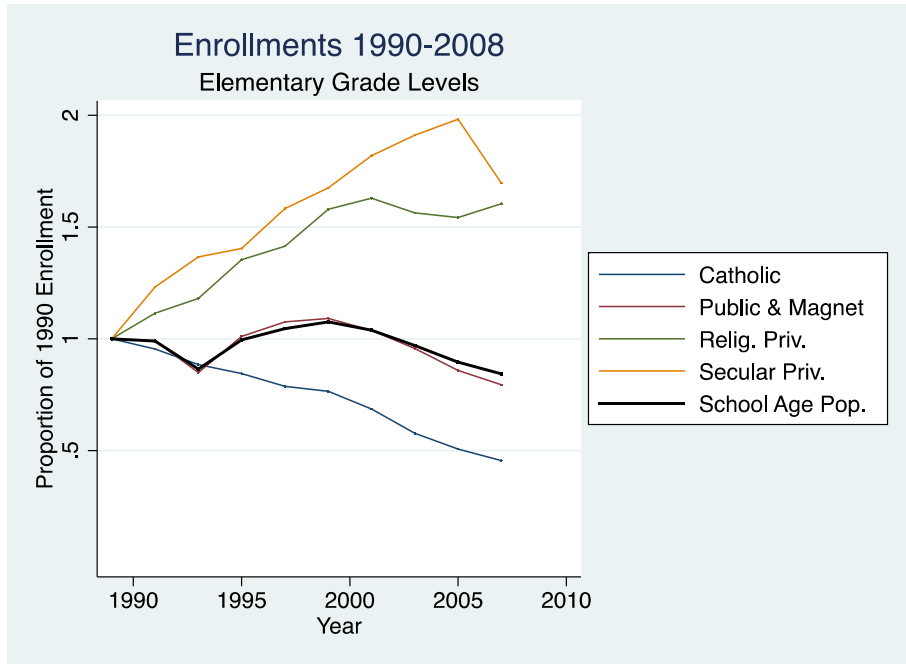


**Figure 4d. Enrollments in Middle Grades: All Cities 1990-2008**
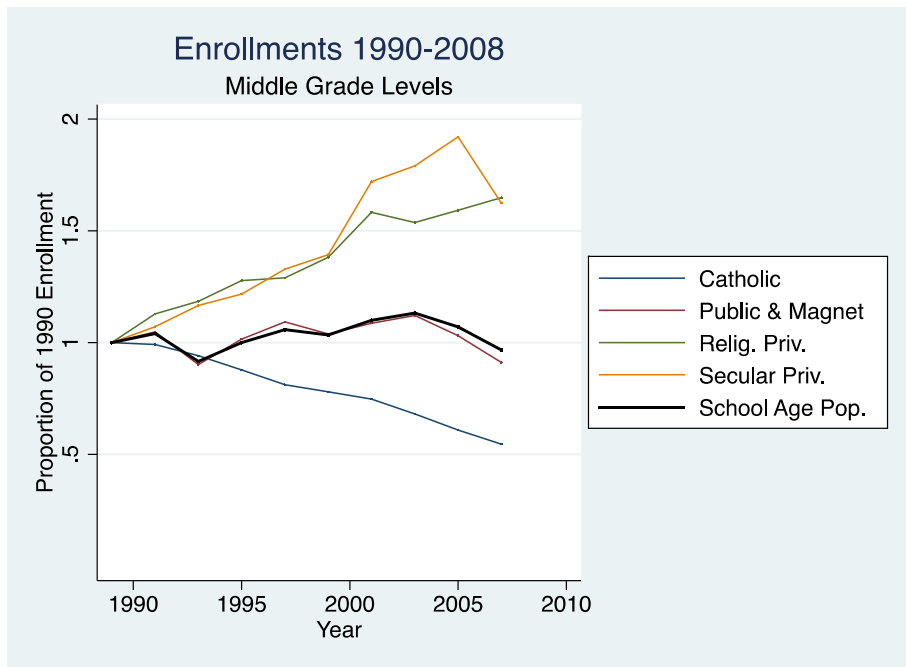
*Catholic School Closures*

Enrollment declines are closely tied to the number of Catholic schools that have closed within each of these cities. Outside of Milwaukee and Indianapolis, which have lost the smallest proportion of Catholic school students, 17 to nearly 80 percent of Catholic schools that serve elementary and middle school grade levels have closed (see Table 4.1). There is little difference in the proportion of school closures between the elementary and middle grade levels because most Catholic schools have grades K-8 within the same building (they are the same schools).

Table 4.2 provides a history of the occurrence of Catholic school closures serving elementary grade levels over time. This is a life table that describes the risk of school closure over time. The time relative to school closures, described in Chapter III, is set relative to the first observation year for each school. At the beginning of the first observation period, when all schools were observed, there were 520 schools serving elementary grade levels. During the first year 30 schools closed and 15 were censored, leaving 475 in the next observation period. This process continues until the tenth observation period where 13 schools closed and 243 were censored, meaning that 243 schools remained in operation over the duration of this study. Results from the life table indicate that within the cumulative risk of closure increased from 5.9% in the first observation year to 44.3% in the tenth observation period (after 18 years). The results for schools serving middle grade levels are similar. The risk of closure fluctuates by year and the closures are calculated relative to a smaller risk set each subsequent observation year as schools close or are censored.

**Table 4.2. Life Table of Catholic School Closures**

| Observation Period | Years From First Observation | Schools in Risk Set | Closed Schools | Censored Schools | Risk of Closure | Cumulative Risk of Closure |
|---|---|---|---|---|---|---|
| 1 | 0 | 520 | 30 | 15 | 0.059 | 0.059 |
| 2 | 2 | 475 | 21 | 5 | 0.046 | 0.100 |
| 3 | 4 | 449 | 15 | 6 | 0.034 | 0.131 |
| 4 | 6 | 428 | 12 | 5 | 0.028 | 0.155 |
| 5 | 8 | 411 | 18 | 6 | 0.045 | 0.192 |
| 6 | 10 | 397 | 10 | 3 | 0.026 | 0.213 |
| 7 | 12 | 374 | 32 | 10 | 0.091 | 0.282 |
| 8 | 14 | 332 | 36 | 8 | 0.116 | 0.360 |
| 9 | 16 | 288 | 10 | 22 | 0.037 | 0.384 |
| 10 | 18 | 256 | 13 | 243 | 0.102 | 0.443 |

Catholic schools serving elementary grade levels.

### *Charter School Growth*

Table 4.3 contains information (over time) about charter school enrollments, the number of schools, and the proportion of Catholic schools with a charter school located within one mile. Milwaukee and Pittsburgh aside, there were several charter schools enrolling students in the other eight cities only four years after the passage of laws authorizing charter schools. During the 2007-2008 school year, the enrollment in charter schools ranged from approximately 2,000-11,000 students in the elementary grade levels and 1,000-6,000 students in the middle grade levels across cities, Pittsburgh [16] notwithstanding. Based on raw numbers there are more elementary grade level students enrolled in charter schools than in Catholic schools in six of the ten cities (Buffalo, Cleveland, Columbus, Detroit, Milwaukee, Toledo). Charter school enrollments in the middle grade levels are more on par with Catholic schools though charter schools still

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[16] There continues to be only a handful of charter schools within the city of Pittsburgh. During the 2010-2011 school year, only four charter schools serving the elementary and middle grade levels were operating.

experience an enrollment advantage in Buffalo, Columbus, Detroit, and Milwaukee. By 2008

the percent of Catholic schools having a charter school operating within a mile was as low

as 15 percent in Indianapolis and as high as 80 percent in Milwaukee.

**Table 4.3. Charter School Descriptive Statistics**

| | | 4 Years Post-Law | | | 2008 | | |
| City | Year Law Passed | Enroll | Schools | %Charter 1-mile | Enroll | Schools | %Charter 1-mile |
|---|---|---|---|---|---|---|---|
| *Elementary Grade Levels (1-5)* | | | | | | | |
| Buffalo | 1998 | 1,631 | 9 | 52.6% | 2,143 | 10 | 77.8% |
| Chicago | 1996 | 2,417 | 7 | 22.9% | 7,372 | 18 | 22.7% |
| Cincinnati | 1997 | 2,416 | 9 | 26.3% | 3,563 | 17 | 32.1% |
| Cleveland | 1997 | 1,517 | 7 | 41.2% | 4,857 | 37 | 70.8% |
| Columbus | 1997 | 1,259 | 4 | 22.2% | 4,679 | 29 | 50.0% |
| Detroit | 1993 | 2,542 | 13 | 32.3% | 10,998 | 42 | 71.4% |
| Indianapolis | 2001 | 1,655 | 8 | 18.5% | 2,235 | 11 | 15.4% |
| Milwaukee | 1993 | 0 | 0 | 0.0% | 5,209 | 28 | 80.0% |
| Pittsburgh | 1997 | 192 | 2 | 23.8% | 469 | 3 | 53.8% |
| Toledo | 1997 | 538 | 4 | 23.3% | 2,937 | 20 | 55.0% |
| | | | | | | | |
| *Middle Grade Levels (6-8)* | | | | | | | |
| Buffalo | 1998 | 366 | 4 | 52.6% | 1,014 | 10 | 70.0% |
| Chicago | 1996 | 1,250 | 10 | 22.3% | 3,268 | 18 | 21.6% |
| Cincinnati | 1997 | 768 | 9 | 27.0% | 1,658 | 18 | 32.1% |
| Cleveland | 1997 | 592 | 7 | 45.2% | 1,875 | 29 | 73.9% |
| Columbus | 1997 | 1,022 | 3 | 23.5% | 2,780 | 30 | 50.0% |
| Detroit | 1993 | 1,401 | 11 | 33.3% | 6,068 | 46 | 80.0% |
| Indianapolis | 2001 | 450 | 8 | 17.9% | 1,126 | 12 | 14.8% |
| Milwaukee | 1993 | 0 | 0 | 0.0% | 4,279 | 26 | 80.0% |
| Pittsburgh | 1997 | 45 | 2 | 23.8% | 99 | 3 | 53.8% |
| Toledo | 1997 | 171 | 7 | 25.0% | 1,545 | 24 | 55.0% |

*Variation in Enrollments Over Time*

This section summarizes the change in the share of enrollments in all types of

schools over time as well as the variation in enrollments since the passage of charter school

laws. Figure 4e describes the trend in the share of enrollments in the elementary grade

levels as a function of the elementary school-age population, across all types of schools and cities in the sample. This figure clearly demonstrates the decline in Catholic school enrollments over the past two decades. In 1990 Catholic schools enrolled approximately 18% of the elementary school-age population in these cities. As of 2008 the share is approximately equal to that of charter schools at nearly 10%. Also noteworthy is the decline in the share of students enrolled by public and magnet schools since the late-1990s, which coincides with the increase of charter school enrollments. These plots are normed to the total school-age population. Therefore, these plots suggest the shares of school-age population that were at one time enrolled in either Catholic, public, or magnet schools now comprise the enrollment of charter schools. The shares of students enrolled by other types of private schools remain relatively stable over time.

**Figure 4e. Enrollment Shares in Elementary Grades: All Cities 1990-2008**
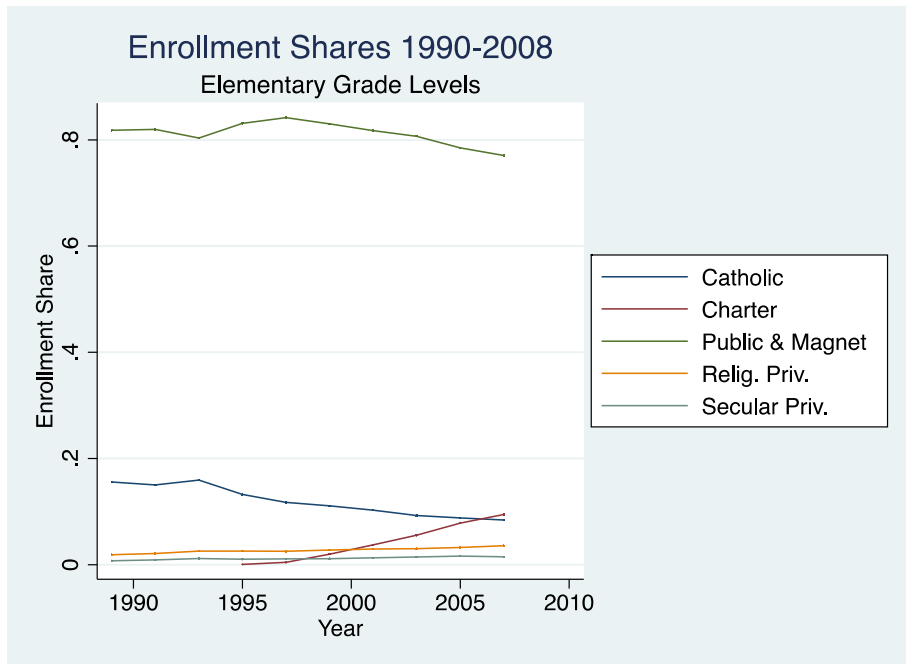
*Catholic School Closures with Nearby Charter Schools*

In this section I describe how the likelihood of Catholic school closures varies by having a charter school located within a one-mile vicinity. Figure 4f displays the cumulative hazard of the risk of Catholic school closure over time from the first period in which a school was observed. The cumulative hazard function measures the accumulated risk of a school closing over time: the higher the cumulative hazard, the higher the risk of school closure by a given time period. The solid line represents Catholic schools serving elementary grades with no charter schools located within one mile. The dashed line represents those schools with at least one charter school operating within one mile. In the first few observation periods before charter schools were established there is no risk of closure due to charter schools. With the authorization of the first charter schools, mostly between observation periods 3 and 5, the cumulative hazard function for those Catholic schools near a charter school roughly parallels the function for those Catholic schools without a charter school nearby. In the later time periods the cumulative risk for closure of Catholic schools facing charter school competition is larger than those schools not facing competition from charters. The two functions are also statistically significantly different from each other ($\chi^2(1)$=4.25; p<0.039).

**Figure 4f. Nelson-Aalen Cumulative Hazard Plot**
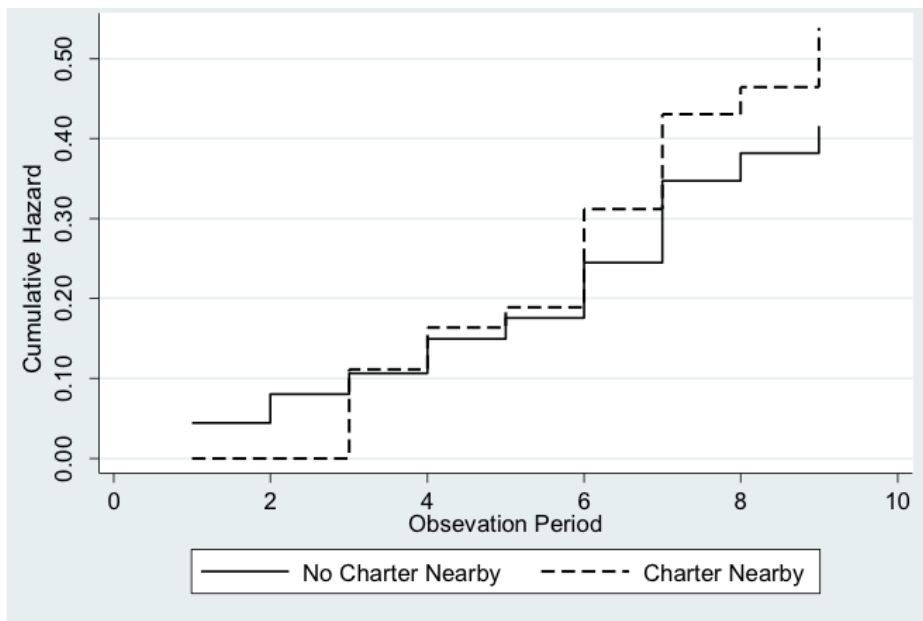


***School Fixed-Effects Models for Catholic School Enrollment***

*Model Building*

The next step of this analysis is to estimate the effect of charter school competition on Catholic school enrollments using a series of school fixed-effects models. I describe the process of building the preferred model for analysis. Table 4.4 displays the results of a series of models that each contain different sets of control variables, starting from the bivariate ordinary least squares (OLS) model. The point estimates here are represented as percent changes in enrollment from baseline. Also these results are for the elementary grade levels and a one-mile competition radius.

The bivariate OLS model contains only the predictor of interest, presence of a charter school within one-mile from a given Catholic school. In specification (1) I add

Catholic school fixed-effects to the OLS model. As described in Chapter III, including school fixed-effects allows for the interpretation of results as within-school estimates after accounting for the unobserved, time-invariant variation that occurs between schools. Next, I include in specification (2) the trend of the charter school competition impact over time, which is the measure of the number of years after at least one charter school opened within a mile of a given Catholic school. When the trend variable is included, the charter school effect on a given Catholic school's enrollment is split into two components: an estimate for the year when the first charter school opens near a Catholic school and an estimate over time for years after the first charter school opens.

The primary shortcoming of the first two fixed-effects specifications is that there are no controls for the pre-charter law enrollment trends over time for Catholic schools. The pre-charter law enrollment trend accounts for both the unobserved time variation and the pre-charter period differences in enrollment trends across schools. Omitting this measure leads to severely overstated estimates of the charter school effect therefore I include the individual school pre-charter law enrollment trends in specification (3).

Specification (4) contains a host of controls including student-teacher ratio, proportion of minority students enrolled in a given Catholic school, enrollments in other school alternatives, pre-charter entry indicators, nearby Catholic school closures. Student-teacher ratio serves as an approximate adjustment for class size. Accounting for the proportion of minority students reflects the race/ethnicity composition of the school and likely that of the neighborhoods surrounding the school. The enrollments in other school alternatives include the enrollment in public, magnet, other religious private, secular

private, and other Catholic schools located within one mile from a Catholic school. Relative to a given Catholic school, these controls account for three factors: the number of students attending all types of schools, any changes in the total school-age population, and any competition occurring as a result of these schools.

This specification also includes indicators for the two time periods prior to a charter school opening. If these indicators are significantly negative it may suggest that charter schools choose a location based on large decreases in Catholic school enrollments, resulting in an endogeneity issue. There is also an indicator of whether or not any other Catholic schools closed in the previous two years within a one-mile vicinity of a given Catholic school. This control mostly accounts for any enrollment influx that may have taken place due to a nearby Catholic school closing.

Specification (5) contains one additional control for the impacts of charter school laws. The variable takes the form of an indicator for all years including and after the passage of the law authorizing charter schools within each state. This control accounts for the threat of charter entry. In addition, the charter law indicator also controls for any external shocks that may have occurred in years since the charter law passed, such as further changes in public school quality or the impact of testing reforms like the No Child Left Behind Act that could simultaneously impact all Catholic school enrollments or the entry decisions of all charter schools.

**Table 4.4. Mean Charter School Competition Impacts on Catholic School Enrollment**

| *Catholic Enrollment* | (OLS) | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| Charter School Present | -23.000*** | -20.215*** | -3.602 | 8.904 | -1.334 | 1.199 |
| | (4.650) | (4.040) | (3.915) | (6.019) | (3.828) | (2.896) |
| Yrs. Post-Charter Entry | | | -2.000*** | -1.606* | -3.135* | -2.967* |
| | | | (0.421) | (0.514) | (1.199) | (1.213) |
| Joint Significance (F-Test) | | | *** | ** | ~ | ~ |
| | | | | | | |
| School Fixed-Effects | N | Y | Y | Y | Y | Y |
| School Background Chars. | N | N | N | Y | Y | Y |
| Other School Enrollments | N | N | N | Y | Y | Y |
| Pre-Entry Controls | N | N | N | Y | Y | Y |
| Nearby Cath. Schl. Closures | N | N | N | Y | Y | Y |
| School Enrollment Trend FE | N | N | N | N | Y | Y |
| Post-Charter Law Control | N | N | N | N | N | Y |
| | | | | | | |
| R² | 0.033 | 0.059 | 0.083 | 0.212 | 0.594 | 0.596 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 | 520 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are percent changes in enrollment from baseline. Elementary grade levels and one-mile radius. Standard errors in parentheses.

I estimate that a given Catholic school serving elementary grade levels that has a charter located within one mile is predicted to have an enrollment 23 percent lower than Catholic schools without a charter school nearby. After adding school fixed-effects in specification (1), the charter school impact shrinks slightly to a predicted Catholic school enrollment 20 percent lower than baseline (p<0.001). Once the time-varying component of charter school competition is included in specifications (2) through (5), the two estimates for charter school competition must be interpreted collectively. The more important point estimate is the trend of the charter school effect over time rather than the enrollment change in the first year that a charter school opens.

I observe that when a charter school first opens near a Catholic school there is no statistically significant difference in the enrollment of Catholic schools compared to those with no charter school across specifications (2) through (5). However, there is a negative and statistically significant time-related charter school effect in each of these specifications. In specification (5), for each year after the first charter school has opened near a given Catholic school enrollment in the Catholic school is predicted to decrease by three percent annually. This result is statistically significant (p=0.036) after holding a host of other factors constant, including the pre-charter enrollment trend of the given school. These results suggest that when charter schools first open near a Catholic school, they may not have an immediate impact on Catholic school enrollments but draw a small proportion of students each year from those families sending their children to or contemplating sending their children to Catholic schools.

I calculated an F-test in order to determine whether or not the overall charter effect (the joint effect between the intercept and time trend of the charter school competition measures) is statistically significant. The intercept and time trend of the charter school effect were jointly statistically significant (F(2,9)=3.09; p=0.095). The full results of this model, with estimates for all predictors, are in Appendix Table B.1. I also find that while there is an impact of charter schools on Catholic school enrollments in the elementary grade levels there is no statistically significant impact on middle grade enrollments (see Appendix Table B.2). The models and discussion of results through the rest of this chapter focus primarily on the elementary grade levels served by Catholic schools.

The results from specification (5) of the fixed-effects models warrant additional discussion. For example, consider a Catholic school that has 100 students enrolled in the elementary grade levels in the year 2000. If a charter opens nearby in that year there is no predicted change in that Catholic school's enrollment. After one year of having a charter nearby the school is predicted to lose three percent of its enrollment, or three students. Over time enrollments are predicted to decrease by three percent annually. By 2005 this school would lose approximately 14 students (14%) and by 2010 approximately 26 students (26%). These results do not mean that each student lost by the Catholic school actually enrolls in a charter school. Still, the mechanism underlying this model suggests that charter schools do compete with Catholic schools for these students.

*Distance and Charter Competition Specifications*

In this section I discuss how the charter school effect on Catholic school enrollments varies by distance, specification of charter school competition, and grade level. The results of these models are displayed in Table 4.5. Within the elementary grade levels, the charter effect is roughly the same when considering the presence of a charter school located within two miles as compared to one mile. At two miles, however, the overall charter school impact is not statistically significant. There is also no statistically significant charter school impact when extending the competition radius to five miles. Because this study focuses within cities, nearly all Catholic schools in the sample have at least one charter school located within five miles after charter schools begin to enter local educational markets within cities. Looking at results across all competition distance radii, the negative effect of

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charter schools on Catholic school enrollments wanes as the competition radius expands. Thus, I mostly focus on results within a one-mile radius where competition for students appears to be the strongest.

Regarding different specifications of charter school competition, an interaction term between the competition measure and post-entry years must be included in order to fully encompass the charter school effect over time. The impacts of charter schools are not predicted to increase with each additional charter school that opens. Thus, the presence of at least one charter school nearby a Catholic school has an impact on enrollments, but as more charter schools open Catholic schools may be less affected. From a statistical standpoint the number of students enrolled in charter schools does matter and impacts appear to be stronger within smaller distances. Notably, the terms that explain the effect of charter school enrollment on Catholic school enrollment are jointly statistically significant at the 5% significance level across all distance specifications.

Because of the complexities in interpreting the point estimates and sophisticated interaction terms, an example may help to illustrate the effect of charter school enrollment For example, consider a Catholic school that has 100 students enrolled in the elementary grade levels in the year 2000. In that year, a charter school opens within one mile and enrolls 50 students in the elementary grade levels in its first year. In 2005 the charter school enrollment may increase to 100 students after the charter school matures and perhaps opens more grades. The initial predicted impact on Catholic school enrollment as a result of the charter school opening is a decrease of 1.2 percent, or one student. After five years, the predicted impact on Catholic schools is a decrease of nearly 19 percent decrease

in enrollment, or 19 students. In this five-year scenario the charter school went from

enrolling 50 students to 100 while the Catholic school went from 100 students to 81.

**Table 4.5. Impacts on Enrollment by Distance and Specification**

| *Catholic Enrollment* | 1 Mile | 2 Mile | 5 Mile |
|---|---|---|---|
| Charter School Present | 1.241 | 1.341 | 3.935 |
| | (2.855) | (3.541) | (5.351) |
| Yrs. Post-Charter Entry | -2.954* | -3.019~ | -2.027~ |
| | (1.224) | (1.468) | (1.103) |
| Joint Significance (F-Test) | ~ | NS | NS |
| | | | |
| Number of Charter Schools | -0.574 | -1.251 | -0.168 |
| | (1.889) | (0.780) | (0.229) |
| Yrs. Post-Charter Entry | -2.653~ | -2.608 | -1.787 |
| | (1.343) | (1.678) | (1.189) |
| Yrs. Post-Entry*No. Charter | -0.385 | -0.046 | 0.001 |
| | (0.407) | (0.149) | (0.019) |
| Joint Significance (F-Test) | NS | ~ | NS |
| | | | |
| Charter School Enrollment | -0.277 | -0.662~ | 0.002 |
| (per percent increase) | (0.567) | (0.362) | (0.389) |
| Yrs. Post-Charter Entry | -2.325 | -2.020 | -1.125 |
| (per percent increase) | (1.312) | (1.829) | (1.263) |
| Yrs. Post-Entry*Char. Enroll | -0.360 | -0.313* | -0.290* |
| (per percent increase) | (0.214) | (0.115) | (0.097) |
| Joint Significance (F-Test) | * | ** | ** |
| | | | |
| School Fixed-Effects | Y | Y | Y |
| School Background Chars. | Y | Y | Y |
| Other School Enrollments | Y | Y | Y |
| Pre-Entry Controls | Y | Y | Y |
| Nearby Cath. Schl. Closures | Y | Y | Y |
| School Enrollment Trend FE | Y | Y | Y |
| Post-Charter Law Control | Y | Y | Y |
| | | | |
| $R^2$ | 0.596-0.598 | 0.600-0.605 | 0.618-0.622 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 |

~p<0.10, *p<0.05, **p<0.01, ***p<0.001. Estimates are percent changes in enrollment from baseline. Only one charter competition specification was included per model. Elementary grade levels and one-mile radius. Standard errors in parentheses.

*Impacts by City*

Table 4.6 displays the mean charter school competition impacts for each of the cities in the sample. City fixed-effects are not included in this model because the school fixed effects would absorb them. As expected, the charter school effects are highly variable across cities. Catholic schools experience a decline in enrollments of 3 percent in Toledo and 29 percent in Indianapolis as a result of a charter school first opening, but do not experience strong charter school effects over time. Catholic schools in other cities (Chicago, Cincinnati, Milwaukee, Detroit, Pittsburgh) experience a decline in enrollments ranging from 1.7 to 5.4 percent per year after a charter school first opens, similar to the results when all cities are combined. Qualitatively, with the exception of Cleveland and Columbus, charter schools appear to have some negative impact on Catholic school enrollments. The charter school intercepts and time trends were jointly statistically significant at the 5% level for elementary schools in all cities with the exception of Cleveland.

I describe the results for four key cities: Chicago, Cleveland, Detroit, and Milwaukee. For the largest city in this study, Chicago, the picture looks similar to the overall impact of charter schools across all cities, which is likely a result of schools in Chicago comprising a substantial proportion of the sample. In Chicago charter schools have a minimal impact on Catholic school enrollments upon opening, but as charter schools expand and mature Catholic elementary schools near charters experience a decline in enrollment of nearly five percent per year. In Milwaukee and Detroit, the two cities with the earliest laws authorizing charter schools, Catholic elementary school enrollments are 10 and 15 percent higher, respectively, once a charter school first opened near a given Catholic school. This

result in Milwaukee may reflect the impacts of the city's voucher program, whereby Catholic school enrollments grew during this time period and charter schools took several years to begin operating. In the years after charter schools open, charter schools in both cities have a negative impact on Catholic school enrollments, with a stronger impact in Milwaukee. In Cleveland, which has historically had a variety of public and private school choice programs (including vouchers), the impacts of charter schools on Catholic school enrollments are smaller and statistically insignificant in comparison to other cities.

**Table 4.6. Impacts on Enrollment by City**

| *Catholic Enrollment* | BUF | CHI | CIN | CLE | COL |
|---|---|---|---|---|---|
| City*Charter Present | -15.089** | 2.115 | -2.874 | -3.950 | 5.420** |
| | (4.367) | (2.106) | (1.914) | (2.255) | (1.409) |
| City*Yrs. Post-Entry | | -5.406*** | -1.741*** | -0.382 | 0.352 |
| | | (0.256) | (0.331) | (0.466) | (0.246) |
| Joint Significance (F-Test) | | *** | ** | ~ | ** |
| | | | | | |
| Number of Observations | 195 | 1447 | 367 | 323 | 180 |
| Number of Schools | 27 | 200 | 44 | 45 | 25 |

| *Catholic Enrollment* | DET | IND | MIL | PIT | TOL |
|---|---|---|---|---|---|
| City*Charter Present | 14.823*** | -28.709*** | 10.099** | -3.509 | -2.938* |
| | (1.933) | (4.457) | (2.226) | (2.354) | (1.167) |
| City*Yrs. Post-Entry | -1.702** | 1.003*** | -4.045*** | -1.481*** | -0.860 |
| | (0.364) | (0.182) | (0.442) | (0.252) | (0.483) |
| Joint Significance (F-Test) | *** | *** | *** | *** | ** |
| | | | | | |
| Number of Observations | 252 | 269 | 335 | 225 | 282 |
| Number of Schools | 39 | 28 | 42 | 35 | 35 |

~p<0.10, *p<0.05, **p<0.01, ***p<0.001. Estimates are percent changes in enrollment from baseline. Standard errors in parentheses. All controls from Specification (5) in Table 4 included. Elementary grade levels and one-mile radius. The statistical software package omitted the time-varying charter school effect in Buffalo because there was not enough statistical variation.

*Impacts by Neighborhood SES Need Index and School Race/Ethnicity Composition*

Table 4.7 displays the results explaining the impacts of charter school competition on Catholic school enrollments by neighborhood SES need index and race/ethnicity composition of Catholic schools. The first three columns represent models that are variants of specification (2) in Table 4.4 above, containing no additional controls besides school fixed-effects. The last three columns are variants of specification (5) in Table 4.4. The SES need index is standardized such that lower values indicate neighborhoods that have greater need or are considered low-SES. For example, these neighborhoods are likely to have a higher proportion of African Americans, individuals with less than a high school diploma, families receiving public assistance income, and unemployed individuals. Both before and after adding a full set of controls, I do not find evidence of a differential charter school impact by neighborhood SES.

This table also displays the impacts of charter school competition by Catholic school race/ethnicity composition. I estimate impacts separately for the proportion of Black and Latino students enrolled in a given Catholic school; the most visible minority groups within cities in the sample. Any evidence of statistically significant impacts of race/ethnicity composition or differential charter school impacts by race/ethnicity composition was washed out when including a full set of controls.

**Table 4.7. Impacts on Enrollment by Neighborhood and Race/Ethnicity Composition**

| *Catholic Enrollment* | (2A) | (2B) | (2C) | (5A) | (5B) | (5C) |
|---|---|---|---|---|---|---|
| Charter School Present | -3.875 | -4.916 | -11.290** | 1.191 | -0.376 | -0.486 |
| | (4.413) | (4.791) | (2.616) | (2.859) | (3.194) | (3.586) |
| Yrs. Post-Charter Entry | -1.919*** | -1.486*** | -1.607* | -2.675* | -1.910 | -2.823~ |
| | (0.337) | (0.297) | (0.501) | (1.000) | (1.337) | (1.276) |
| Joint Significance (F-Test) | *** | ** | *** | * | NS | NS |
| | | | | | | |
| SES Need*Charter Present | -1.253 | | | -0.429 | | |
| | (3.921) | | | (2.864) | | |
| SES Need*Yrs. Post-Entry | 0.494 | | | 0.564 | | |
| | (0.501) | | | (1.401) | | |
| Joint Significance (F-Test) | NS | | | NS | | |
| | | | | | | |
| % Black Composition | | -2.152* | | | -0.526 | |
| (per 10 percent) | | (0.889) | | | (0.677) | |
| % Black Comp.*Char. Pres. | | 1.300 | | | 1.733 | |
| (per 10 percent) | | (3.203) | | | (1.687) | |
| % Black Comp.*Yrs. Post | | -0.145 | | | -0.190 | |
| (per 10 percent) | | (0.105) | | | (0.137) | |
| Joint Significance (F-Test) | | NS | | | NS | |
| | | | | | | |
| % Hispanic Composition | | | -6.080* | | | -0.614 |
| (per 10 percent) | | | (2.217) | | | (1.395) |
| % Hispanic Comp.*Charter | | | 6.196** | | | 1.880 |
| (per 10 percent) | | | (1.671) | | | (1.130) |
| % Hispanic Comp.*Yrs. Post | | | -0.247 | | | 0.088 |
| (per 10 percent) | | | (0.201) | | | (0.206) |
| Joint Significance (F-Test) | | | ** | | | NS |
| | | | | | | |
| School Fixed-Effects | Y | Y | Y | Y | Y | Y |
| School Enrollment Trend FE | N | N | N | Y | Y | Y |
| Other Controls (Spec. (5)) | N | N | N | Y | Y | Y |
| | | | | | | |
| $R^2$ | 0.086 | 0.098 | 0.118 | 0.596 | 0.597 | 0.597 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 | 520 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are percent changes in enrollment from baseline. Elementary grade levels and one-mile radius. Standard errors in parentheses.

*Sensitivity Tests*

I also conducted a pair of sensitivity tests to for the impacts of charter schools on Catholic school enrollments. The first test was to specify a different outcome variable for Catholic school enrollment. I calculated the share of total school-age population within a specified distance (elementary grade levels) that is enrolled in Catholic schools as an alternative approach. In doing this, the model now estimates the impacts of charter schools on the change in Catholic school enrollment normed to the market size of a given area. This approach tests against the null hypothesis of zero change in the proportion of all possible students enrolled in a given area as opposed to zero change in enrollment of a given school. The measures of the enrollments for all other schooling alternatives were also converted to shares of school-age enrollment within a given distance. The share of students enrolled in public schools is omitted as a reference group to avoid collinearity issues.

I estimate that there is no significant initial impact of a charter school opening near a given Catholic school, but that a Catholic school's share of school-age enrollment is predicted to decrease by 1.7 percentage points per year after the first charter school opens nearby. The trend over time is statistically significant ($p=0.067$), but the overall joint impact is not ($F_{(2,9)}=2.94$; $p=0.104$). In terms of the share of charter enrollment, if the charter enrollment share increases by one percentage point in one year, the share of Catholic enrollment is predicted to decrease by 1.4 percentage points. Assuming a charter school growth rate of one percentage point per year, after five years I predict a nearly seven percentage point decrease in the share of enrollment in a given Catholic school located within a mile-wide educational market. These results suggest that not only do

charter schools have an impact on the actual enrollment of a given Catholic school, but also on the share of the population of all students in a given area enrolled by that Catholic school.

The second sensitivity test I conducted was used to test whether or not the charter school impacts within one city significantly influenced the results when all cities were combined. Even though these data contain the population of Catholic schools within each city, this approach is an alternative to including weights for schools. Weights would likely be constructed to account for the variation in school size as a result of a larger population in some cities than others.  When introducing school fixed-effects—or later in the discrete-time hazard model, city fixed effects—weights at the school-level (city-) would be washed away, so this approach serves as an alternative. I dropped each city one at a time from specification (5) of the fixed-effects models in Table 4.4 to perform this test.

For most cities, when removed from the sample, the overall results of charter school impacts across all other cities do not change. The substantial changes in impacts mirror the estimates from investigating the heterogeneous impacts across cities. There was no statistically significant charter impact in Cleveland but once Catholic schools in Cleveland were removed, the negative impacts of charter school competition grew larger. When removing Catholic schools in Chicago from the model, the time-trending impact of charter schools decreases from three to two percent per year (by nearly one-third), but remains statistically significant. There is little change in the point estimate of the time-trending charter effect when removing Catholic schools in Milwaukee, but the overall impact of charter schools is no longer statistically significant (p=0.128).

### Discrete-Time Hazard Models for Catholic School Closure

*Model Building*

In third phase of this analysis I estimate the impact of charter school competition on the likelihood of Catholic school closures using discrete-time hazard models. I build the analytical model in a similar manner as the school fixed-effects model. Table 4.8 displays the results of a series of models from the bivariate discrete-time hazard model to the preferred specification (5). The results here are interpreted as odds-ratio changes from a baseline hazard. All of the results focus on the elementary grade levels and a one-mile competition radius.

The bivariate discrete-time hazard model in specification (1) contains only the presence of a charter school and a series of observation period fixed-effects. The inclusion of time fixed-effects accounts for unobserved time-specific variation. In specification (2) I include the time-trend of the charter school competition impact over time. Based on the conceptual model I described in Chapters II and III, the main route by which charter schools affect Catholic school closures is through enrollment. Therefore, any models containing enrollment effectively test for mediation of the charter school impact. I include the log of Catholic school enrollment within each observation year in specification (3).

Specification (4) contains a full set of controls, many of which are the same as school fixed-effects models. Common predictors between the two models include student-teacher ratio, proportion of minority students enrolled in a given Catholic school, enrollments in other school alternatives, and nearby Catholic school closures. These variables are included for the same purposes as in the enrollment models. In addition to the previously used

variables, I include the SES need index to account for variation in closures by neighborhood type. This measure could not be included as a control in the enrollment models because it is measured at one time point and would be washed out by the fixed-effects. I also include a set of city fixed-effects, with Pittsburgh as the reference group as it has the fewest number of charter schools. The city fixed-effects absorb any unobserved time-constant variation between cities, yielding estimates within a given city in a given time period. In specification (5) the post-charter law indicator is included.

**Table 4.8. Mean Charter School Competition Impacts on Catholic School Closures**

| *Catholic Closures* | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Charter School Present | 1.522 | 0.524~ | 0.328*** | 0.302*** | 0.293*** |
| | (0.399) | (0.183) | (0.099) | (0.076) | (0.072) |
| Yrs. Post-Charter Entry | | 1.397*** | 1.411*** | 1.389*** | 1.396*** |
| | | (0.062) | (0.069) | (0.057) | (0.057) |
| Joint Significance (F-Test) | | *** | *** | *** | *** |
| | | | | | |
| Observation Period FE | Y | Y | Y | Y | Y |
| Catholic School Enrollment | N | N | Y | Y | Y |
| School Background Chars. | N | N | N | Y | Y |
| Other School Enrollments | N | N | N | Y | Y |
| SES Need Index | N | N | N | Y | Y |
| Nearby Cath. Schl. Closures | N | N | N | Y | Y |
| City Fixed-Effects | N | N | N | Y | Y |
| Post-Charter Law Control | N | N | N | N | Y |
| | | | | | |
| Pseudo R$^2$ | 0.029 | 0.083 | 0.214 | 0.282 | 0.283 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 |

~p<0.10, *p<0.05, **p<0.01, ***p<0.001. Estimates are odds-ratio changes from baseline hazard. Elementary grade levels and one-mile radius. Standard errors in parentheses.

I estimate in specification (1) that within a given time period Catholic schools with charter schools located nearby are not statistically significantly more likely to close compared to those without a charter school nearby (p=0.109). In specifications (2) through (5) the impacts of charter schools over time are disentangled. I estimate in specification (5) that upon the initial entry of a charter school near a given Catholic school the likelihood of closures is 0.3 times as large in comparison to Catholic schools without a charter school that opened nearby (p<0.001). For each year after the first charter school has opened near a given Catholic school, the likelihood of Catholic school closure increases by 1.4 times (p<0.001). The intercept and time trend of the charter school effect taken together were jointly statistically significant ($\chi^2(2)$=69.93; p<0.001) suggesting that the overall charter school impact was statistically significant.

The estimates across specifications (2) through (5) remain consistent and robust to adding various controls, including Catholic school enrollment. Enrollment is highly statistically significant (p<0.001) and as enrollment increases, it is associated with a much lower likelihood of Catholic school closure. However, even when controlling for enrollment, the charter impact remains virtually unchanged, with a slightly lower likelihood of closure upon the initial presence of a charter school. The estimates for all predictors in the model are contained in Appendix Table B.3. As hypothesized, there is no perceivable difference in the odds of closure between Catholic schools serving elementary and middle grade levels because most schools contain all grade levels within the same building (see Appendix Table B.4). Also the impacts of charter schools do not vary considerably enough across distance

or various specifications of charter competition to merit further discussion (see Appendix Table B.5).

Figure 4g displays a plot of the cumulative hazard function over time predicted from specification (5) in Table 4.8. The hazard function displayed in the plot represents the predicted risk of closure for Catholic schools facing charter school competition as compared to the baseline group--those not facing charter school competition. In the first handful of years after a charter school enters, the risk of Catholic school closure remains low—or at least no different from those schools not facing charter school competition. This is the same pattern also observed in the initial Nelson-Aalen cumulative hazard function plot (Figure 4f on page 101). However, as charter schools establish themselves within a local educational market, the risk of Catholic school closure increases drastically. When combined with the results of the analysis of Catholic school enrollments this pattern makes conceptual sense. If charter schools precipitate an additional decline in Catholic school enrollments that grows with time, lower enrollments could lead to a sharply increased likelihood of closure.

**Figure 4g. Predicted Hazard Rate for Catholic School Closure**
*Dichotomous Charter Indicator - 1 Mile*
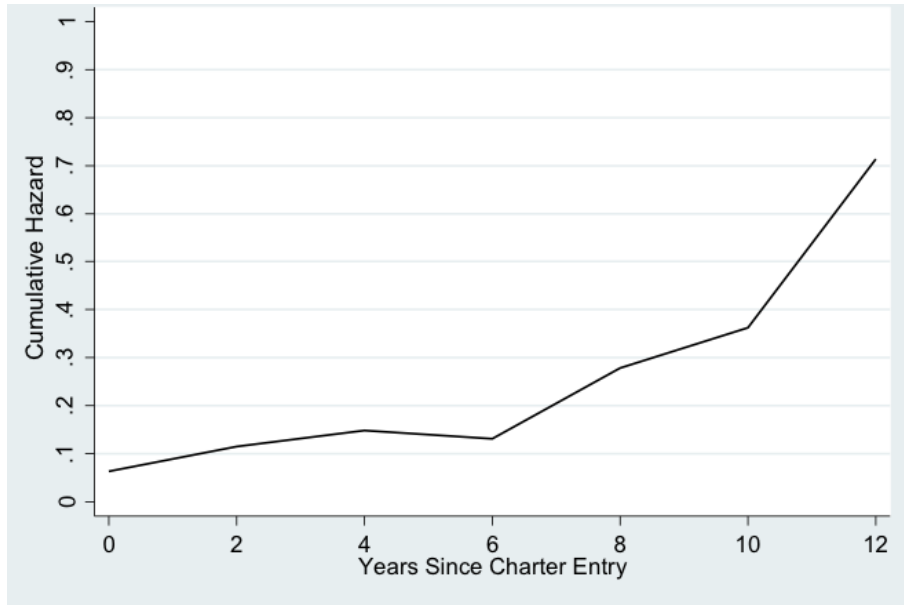


*Impacts by City*

Table 4.9 displays the results of the impact of charter school competition on Catholic school closures across the cities in the sample. Milwaukee and Indianapolis were omitted from this analysis because they contain few schools that closed over the period of this study. The estimates of the main city fixed effects are not of interest here because they only describe differences in the hazard rates of closing across cities from the baseline group, Catholic schools in Pittsburgh. The charter school intercepts and time trends were jointly statistically significant at the 1% level for all cities in the sample. Qualitatively, Catholic schools that have a charter located within one mile are more likely to close compared to the baseline in each city. The interaction between city and the two charter competition variables exhibited joint statistical significance at the 0.1% level across all cities.

### Table 4.9. Impacts on Closures by City

| Catholic Closures | BUF | CHI | CIN | CLE |
|---|---|---|---|---|
| City*Charter Present | 7.668*** | 7.361*** | 1.322 | 7.439*** |
| | (2.932) | (1.765) | (0.565) | (1.933) |
| City*Yrs. Post-Entry | 1.691*** | 1.127* | 1.523*** | 1.287** |
| | (0.233) | (0.063) | (0.176) | (0.118) |
| Joint Significance (F-Test) | *** | *** | *** | *** |
| | | | | |
| Number of Observations | 195 | 1447 | 367 | 323 |
| Number of Schools | 27 | 200 | 44 | 45 |

| Catholic Closures | COL | DET | TOL |
|---|---|---|---|
| City*Charter Present | 9.007*** | 3.056*** | 13.762*** |
| | (3.917) | (0.751) | (3.547) |
| City*Yrs. Post-Entry | 1.118** | 1.202** | 1.236*** |
| | (0.041) | (0.072) | (0.074) |
| Joint Significance (F-Test) | *** | *** | *** |
| | | | |
| Number of Observations | 180 | 252 | 282 |
| Number of Schools | 25 | 39 | 35 |

$\sim p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are odds-ratio changes from baseline hazard. Standard errors in parentheses. Pittsburgh is reference city. All controls from Specification (XX) in Table XX included. Elementary grade levels and one-mile radius.

The impacts within cities are best demonstrated in graphical form, and I further describe results in three key cities: Chicago, Cleveland, and Detroit. Figures 4h, 4i, and 4j depict the predicted hazard rates over time for Catholic elementary school closures within each of these cities. Again, these are plots of the predicted risk of closure for Catholic schools with a charter nearby compared to the baseline of schools with no charter nearby. For the largest city in this study, Chicago, the picture looks similar to the overall impact of charter schools across all cities. That is, charter schools initially have a minimal impact on Catholic school closures compared to baseline, but as charter schools expand and mature, Catholic elementary schools nearby experience a greater risk of school closure. In Detroit,

the second largest city in the study, the negative impacts of charter schools are large immediately upon the introduction of charter schools. However, local educational markets in Detroit became quickly saturated with charter schools, such that only six years after the passage of the charter law in Michigan nearly all Catholic elementary schools had at least one charter school located nearby. Thus, in recent years the predicted hazard rate for Catholic schools facing charter competition is the predicted rate for the entire sample because there is no baseline group. In Cleveland, which has historically had a variety of public and private school choice programs, the baseline hazard appears on par with other cities, but is not statistically significant for middle schools. Catholic elementary schools located near charter schools have been at greater risk for closure since the opening of charter schools in Cleveland, and that risk has increased substantially with time.

**Figure 4h. Predicted Hazard Rate for Catholic School Closure**
*Chicago*
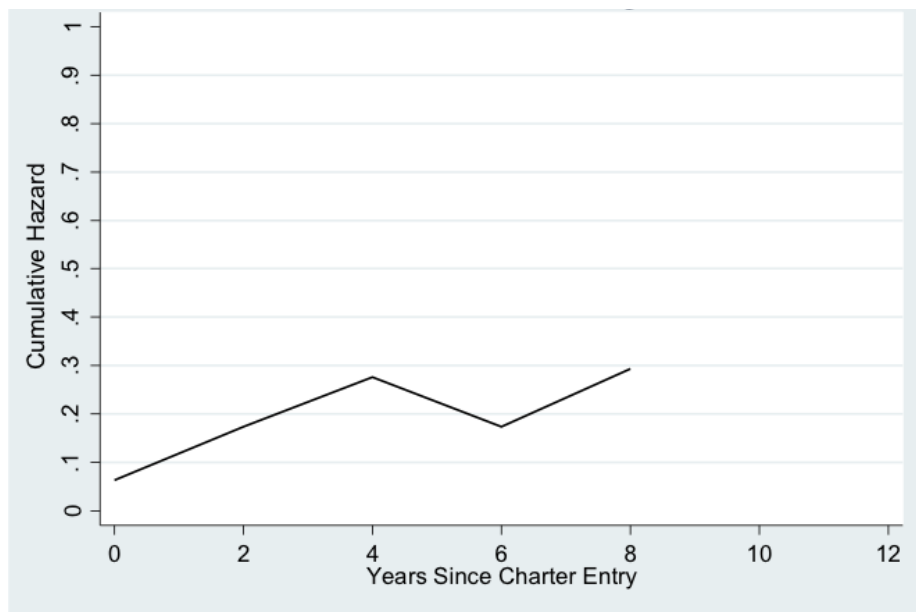
**Figure 4i. Predicted Hazard Rate for Catholic School Closure**
*Cleveland*
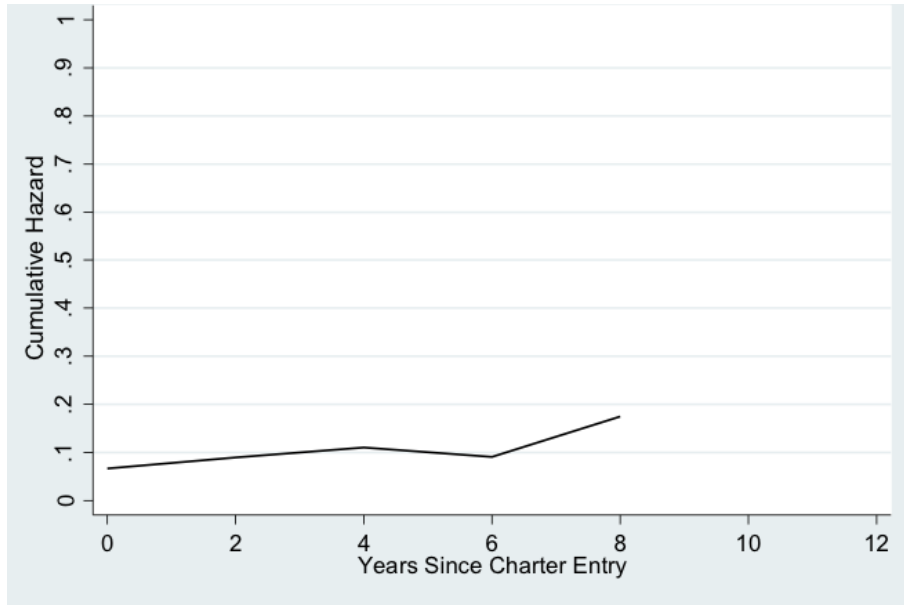


**Figure 4j. Predicted Hazard Rate for Catholic School Closure**
*Detroit*
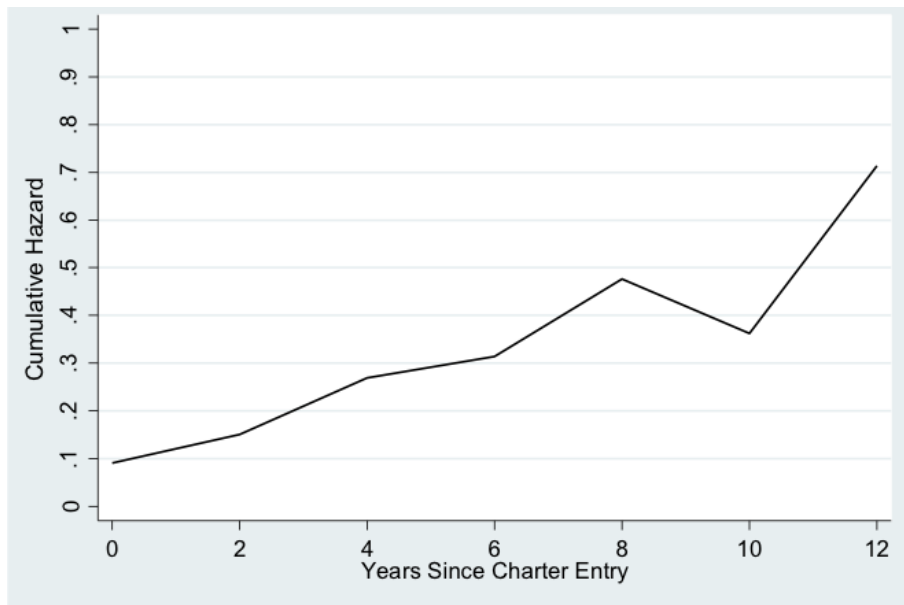
*Marginal Effects*

I calculate a set of marginal effects using results from the final models in the analyses of Catholic school enrollments and Catholic school closures. Here I attempt to investigate both an intensive and extensive margin of the effects charter schools have on Catholic schools. The intensive margin refers to the impact charter schools have on Catholic school enrollments, given that the Catholic school remains open throughout the study. The extensive margin is the impact charter schools have on Catholic school enrollments for those schools that close. These estimates are calculated over the time period since the passage of state charter laws, holding values of all other variables constant.

Across all schools in the sample, I predict the expected enrollment in a Catholic school that is not facing charter competition to be 132 students. This estimate takes into account the probability of survival in the absence of charter schools. Likewise, I predict the expected enrollment in a school that does face charter competition to be 85 students, after taking into account the probability of survival in the presence of charter schools. Therefore, the total enrollment change due to charter schools is 47 students, or a 36 percent reduction in enrollments over the total time period this study investigates. The predicted number of students lost to charters in Catholic schools that face charter competition but do not close is 17. Meanwhile, the predicted number of students lost to charters in Catholic schools that face charter competition but eventually close is 30. Thus, the marginal rate of enrollment loss due to charter schools is greater for those Catholic schools that close versus those that remain open.

## CHAPTER V

## CONCLUSIONS AND IMPLICATIONS

A pair of studies in recent years has examined the relationships between charter schools and private school enrollments for all types of private schools across a given state (Chakrabarti & Roy, 2011; Toma, Zimmer, & Jones, 2006). I focus on the impact of charter schools on only Catholic school enrollments in this dissertation because for many urban families, schooling choices may be limited to charter, Catholic, and traditional public schools. The degree of school choice based on the number of schools within close proximity to a family's residence is much greater in cities as compared to suburban and rural areas. I also look at differences across elementary and middle grade levels because competition may be stronger at different time points (i.e., the start) in the schooling process. In addition to extending the previous literature on private school enrollments I investigated the impact of charter schools on the likelihood of Catholic school closures.

The main goal of this study was to test a conceptually-based model that combined Catholic school enrollments and closures, apply it to a longitudinal sample, and to examine the charter school impacts on enrollments and closure risks over time. By taking into account the heterogeneous nature of a set of Catholic school populations within various cities this study aimed to explore the differential impacts of charter schools on enrollments

and school closures for schools from various cities and neighborhoods that serve different grade levels and racial/ethnic compositions of students.

The primary research questions that helped guide the analyses are as follows:

(1)  How have the enrollments in and the number of schools serving elementary and middle grade levels in urban Catholic schools changed over the past two decades?

(2)  How have the enrollments in and the number of schools serving elementary and middle grade levels in urban charter schools changed since the passage of state laws authorizing charter schools?

(3)  What effects over time do charter schools located near a Catholic school have on Catholic school enrollments?

(4)  Are there differences in charter school effects on Catholic school enrollments across grade levels, cities, neighborhood types, or race/ethnicity composition?

(5)  Do charter schools located near a Catholic school increase the likelihood over time that a Catholic school closes?

(6)  Are there differences in charter school effects on Catholic school closures across grade levels, cities, neighborhood types, or race/ethnicity composition?

The conceptual framework for this study draws upon two theoretical models: a random utility model of parental choice and firm location theory. In Chapter II, I described the factors considered by parents when they choose a school for their children and the factors considered by charter schools when choosing a location in which to operate. When

integrated these theories lie at the root of the conceptual model and estimation strategies in Chapter III of this study. Given the longitudinal nature of changes in enrollment and school closures I used school fixed-effects (enrollment) and discrete-time hazard (closures) models, which are longitudinal analytic techniques for investigating changes in an outcome or the occurrence of an event over time.

The main source of data for this study came from the Private School Survey (PSS), a biennial survey of the population of private schools in the United States, which contains data from the 1989-1990 school year through the 2007-2008 school year. These supplemental data came from the Common Core of Data, 2000 U.S. Census, and correspondence with ten Catholic dioceses. The final sample used in the study was made up of 520 Catholic schools across ten cities (Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Detroit, Indianapolis, Milwaukee, Pittsburgh, and Toledo) serving the elementary grade levels and 524 schools serving the middle grades.

Based on the conceptual model and research questions, the data analysis took place in three parts. The first step was to describe the enrollment trends and closures of Catholic schools along with the growth of charter schools within the study timeframe. In the second step, I discussed building the preferred school-fixed effects model. I also examined different distance and charter school competition specifications; investigated differences in charter school impacts across grade levels, cities, neighborhoods, and race/ethnicity compositions; and performed a series of sensitivity checks. In the third stage I estimated a discrete-time hazard model of Catholic school closures, explored differences in charter school impacts

across cities, and calculated marginal charter effects that combined results from the enrollment and closure models.

I first summarize the findings presented in Chapter IV in this conclusion. Then I discuss policy implications of these results for two main audiences: (1) parents making schooling decisions for their children and (2) policymakers and Catholic school leaders that may be concerned with charter school growth. I end this chapter by discussing the theoretical and methodological implications, study limitations, future work, and providing final comments.

## Conclusions

### Descriptive Analyses

The descriptive analyses provided information about the patterns of Catholic school enrollments and closures from 1990-2008 to help answer research questions 1 and 2. In nearly all cities, Catholic schools on average experienced a moderate to substantial (17-80%) decline in enrollments at the elementary and middle grade levels over this period. Enrollment declines outpaced general decreases in the population of school-age children in each city. The sizable numbers of school closures are correlated with decreases in enrollment. These descriptive trends reflect the general pattern of enrollment declines and closures from the mid-1960s to 1990 throughout the many cities in the Great Lakes and Mideast regions of the U.S. (CARA, 2006). These descriptive results also provide information on how enrollments in and the number of urban Catholic schools have changed over the past two decades (RQ #1).

Whereas Catholic schools declined over the study period, charter schools grew since the passage of charter laws within each state for the cities included in this study. There are double-digit numbers of charter schools operating that enroll at least 2,000 elementary grade students and 1,000 middle grade students in each city except Pittsburgh. Combined across all cities, the share of the elementary school-age population of students attending Catholic schools decreased from about 18 to 10 percent while the share attending charter schools grew from zero to 10 percent. My results suggest that the increasing share of charter school students mostly came from public, magnet, or Catholic schools. Furthermore, the unadjusted risk of Catholic school closure is significantly higher when Catholic schools have a charter school located within one mile. The risk increases over time; especially after charter schools mature, enroll more students, and expand within a given market. These descriptive results provide information on how enrollments in and the number of urban charter schools have changed over the past two decades (RQ #2) along with giving an initial indication of the impacts of charter schools on Catholic school enrollments and closures.

Prior to discussing or the findings of the charter school impacts on Catholic school enrollments or closures, I need to clarify the generalizability of these results to grade levels. First, evidence in this study suggests middle school grade levels do not experience significant decreases in enrollments as a result of charter school availability or enrollments. This may reflect the fact that parents are more likely to continue their children in Catholic schools in the middle grades. Also, in Chapters II and III I proposed that charter school impacts would be greatest at the elementary grade levels, as a result of the higher

likelihood that parents would choose charter schools over Catholic schools at the start of the schooling process. Second, the availability of charter schools serving either elementary or middle grade levels influence the closing of nearby Catholic schools equally. Over 90% of the Catholic schools in this study are K-8 schools, while charter schools come in various levels (27% K-5, 8% 6-8, 42% K-8, 13% 6-12, 10% K-12). Based on a combination of theory and statistical evidence in this study, if the decision to close a Catholic school is strongly tied to changes in enrollment, then the mechanism by which charter schools impact Catholic schools is at the elementary grade levels. Therefore, I focus the discussion of competition between charter and Catholic schools on the elementary grade levels.

*Charter School Impacts on Catholic School Enrollments*

The results from the analysis of Catholic school enrollments using school fixed-effects models assist in answering research questions 3 and 4. When a charter initially opens within one mile of a Catholic school there is no statistical evidence of an enrollment drop. Over time, based on the years since the first charter school opened, a given Catholic school will experience a decrease in enrollment of nearly three percent per year. This finding is approximately double that found by Chakrabarti and Roy (2011) in an investigation of charter school impacts on private schools throughout the state of Michigan. These results are robust when using the alternative specification of the share of school-age population within one mile enrolled in a Catholic school.

The most substantial impact of charter schools on Catholic school enrollments is compounded over time. My estimates suggest that over a five-year period in this study

there is a cumulative 14 percent decrease in Catholic school enrollments, or a nearly 7 percentage point decrease in the share of the school-age population enrolled in Catholic schools. These results provide evidence for the effects of charter schools on Catholic school enrollments (RQ #3). I also observe no variation in effects over neighborhoods or race/ethnicity compositions of Catholic schools. These results suggest that there is heterogeneity in charter school impacts on Catholic school enrollments over time and between grade levels, but not between neighborhoods or race/ethnicity compositions (RQ #4).

With respect to other specifications of charter school competition, as the enrollments in charter schools increase over time Catholic school enrollments are predicted to decrease. However, there is no statistical evidence that the number of charter schools near a Catholic school matters. It appears the influence comes from the first one, two, or three charter schools suggesting that Catholic schools may be resistant to competition from charter schools once the local market becomes saturated. The effects of charter schools on Catholic school enrollments are also stronger based on having a charter school located within one or two miles of the Catholic school as compared to five miles. This result confirms the validity of the location theory as a factor underlying the conceptual model outlined in Chapters II and II which suggests that firms face the greater degree of competition from competitors located nearby.

*Charter School Impacts on Catholic School Closures*

The results from the analysis of Catholic school closures using discrete-time hazard models help to answer research questions 5 and 6. The results suggest the initial availability of charter schools decreases the likelihood of closure, but over time the risk of closure increases by 1.4 times per year. After accounting for the initial lower risk of closure as a result of a charter school opening nearby, in five years time Catholic schools that face competition from charter schools are 1.6 times as likely to close as those schools not facing competition. The odds of closure increase to 8.7 times after ten years. These results provide evidence for the impacts of charter schools on Catholic school closures (RQ #5).

The results of the discrete-time hazard model include a control for Catholic school enrollment, outlined in Chapters II and III as one of the important components individual Catholic schools consider when deciding where or not to close. Enrollment is inversely associated with the likelihood of closure as expected. I found no statistical evidence that the enrollments in nearby charter schools or the number of charter schools located nearby impacts the likelihood of Catholic school closures. Similar to the results for Catholic school enrollments I also observe no variation in effects over neighborhoods or race/ethnicity compositions of Catholic schools, suggesting that there is only heterogeneity in charter school impacts over time and between grade levels (RQ #6).

*Differences across Cities*

In this section I discuss results from a few cities in the study, as there is substantial evidence that impacts of charter schools differ across cities. Putting the results in the

context of individual cities helps to frame the discussion of implications for educational policy. After discussing each city, I propose questions that I further explore when discussing implications. The four cities I discuss are those I focused on in Chapter IV: Chicago, Cleveland, Detroit, and Milwaukee.

The city of Chicago, the largest city in the study, lost nearly fifteen percent of its elementary school-age population between the years 1990 and 2008. During the same period Catholic school enrollments and the number of Catholic schools were cut in half, suggesting the current availability of Catholic schools in Chicago has declined substantially when compared to twenty years ago. In part due to the law in Illinois, charter schools have been much slower to permeate neighborhoods within the city. Even though there are not a sizable number charter schools relative to its size, the availability of charter schools near a given Catholic school in Chicago is associated with a sharp decrease in enrollment and an increase in the likelihood of closure over time.

Chicago also boasts a strong intra-district choice program, and offers numerous magnet schools, suggesting that Catholic schools in the city also face competition for students as a result of other public school choice policies. Given the size of the city, the market for Catholic schools may still be viable even in light of several potential competitors. However, the population in the city is somewhat socially and racially segregated with residents of the north side of the city being relatively more affluent compared to the south and west sides of the city. This study may be more applicable for the less affluent parts of the city. The discussion of Chicago leads to the following question: *What does the increased*

*availability of charter schools, among other schooling alternatives, in poor neighborhoods served by Catholic schools mean for how parents make schooling decisions for their children?*

Detroit, the second largest city in the study, is unique when compared to the other cities considered. The city has lost nearly thirty percent of its elementary school-age population, has a low per-capita income, and has faced widespread societal challenges. Catholic schools in Detroit have not been spared from the city's overall decline. Almost 90 percent of elementary enrollments and 80 percent of schools have disappeared since 1990, with a sizable number of closings being a result of diocesan policies in the early- to mid-1990s. Today, Catholic schools barely maintain a presence in the city.

Charter schools in Detroit, on the other hand, are ubiquitous throughout the city and enroll approximately 20 percent of the school-age population. The growth of charters took place due to the combination of a large part of the population of Detroit students coming from extremely disadvantaged backgrounds and not being served well by Detroit Public Schools. The number of families that live in greatly impoverished situations undoubtedly influenced the decline of Catholic schools in the city as many families find it difficult to afford tuition at a Catholic school. At the same time evidence from this study suggests that charter schools have contributed to the decline and will likely continue to impact the few Catholic schools that remain. The small number of Catholic schools in Detroit leads to this question: *What would be lost if Catholic schools disappeared as schooling alternatives within cities?*

I discuss Milwaukee and Cleveland together as both cities have implemented various school choice programs over the past two decades. These programs include private

school voucher programs (Milwaukee: 1990, Cleveland: 1995, city program; 2005, State of Ohio program), which began operating a few years before charter schools were authorized to operate (Wisconsin-1993, Ohio-1997). Cleveland, like many other cities in the sample, has lost a substantial proportion of its elementary grade Catholic school enrollment and its school-age population as well as having several schools close since 1990. Milwaukee has also lost over a quarter of its elementary Catholic school enrollment, but in contrast has had few school closings along with a having a slight increase in its school-age population. Both cities have numerous charter schools that have started operating and are located close to most Catholic schools.

The effect of charter schools on Catholic schools is different between the two cities. In Cleveland, I do not find evidence for changing enrollments over time as a result of charter school availability, though charter schools are associated with a slight increase in the risk of school closure over time. On the other hand, I find evidence for a strong charter school impact on Catholic school enrollments over time in Milwaukee; however, few schools have closed. These findings are at odds with the conceptual model proposed in this study and are perhaps related to the voucher programs within the cities. In Cleveland it is possible that the city- and state-operate voucher programs helped boost Catholic school enrollments once charter schools began operating, but did not help to prevent schools from closing. The school voucher program operating in Milwaukee remains large amidst the strong presence of charter schools. Catholic schools that face competition from charter schools located nearby experience a decrease in enrollments, though the voucher program may have helped to sustain enrollments at levels where schools do not close. The results in

Cleveland and Milwaukee in the context of voucher programs leads to this question: *What policies or programs can be implemented by various levels of policymakers and Catholic school leaders to sustain Catholic schools amidst the growth of charter schools?*

### *Implications for Educational Policy*

#### *Why Care about Catholic Schools Disappearing?*

Catholic school leaders and others invested in Catholic schools should be rightfully concerned with the growth of charter schools and the negative consequences they pose for enrollments in and closures of urban Catholic schools. From a larger perspective in the social context of education, it is important to consider why both Catholics and non-Catholics invested in the quality and equity of schooling within poor urban areas might be concerned with these results.

Catholic schools serving the elementary and middle grade levels have been declining since the mid-1960s in most of the cities throughout the Great Lakes/Rust Belt region (Brinig & Garnett, 2010; CARA, 2006; Cattaro & Cooper, 2007; Green, 2011; O'Keefe & Scheopner, 2007). The results of this study demonstrate that more recently Catholic schools have experienced an even steeper decline as a result of charter schools opening nearby. In other words, the availability of charter schools has hastened the pre-existing decline of urban Catholic schools in these cities. At this current pace, it is possible that urban Catholic schools may no longer be a viable schooling alternative in these areas.

Consider what might happen to urban Catholic schooling as a result of charter schools. As enrollments decline more schools will become susceptible to closure. When

more Catholic schools close that serve the elementary and middle grade levels, fewer schooling options exist for parents. Because parents are more likely to continue enrolling their children in Catholic schools in later grades if they are enrolled in the elementary grades, the residual impacts of charter schools on the elementary grade levels will surely start to impact to Catholic high schools.

For the most part, urban Catholic high schools have not faced the severe enrollment issues or level of closures experienced schools serving the elementary and middle grades. However, if more high schools start to close as a result of a smaller enrollment base in earlier grade levels, families may be left without Catholic high schools as a schooling alternative. Most of the evidence that demonstrates the benefits of Catholic schooling was found for students attending Catholic high schools (e.g., Altonji, Elder, & Taber, 2005; Bryk, Lee, & Holland, 1993; Coleman & Hoffer, 1987; Grogger & Neal, 2000; Neal, 1997; Peterson & Viarengo, 2011). While many urban families may view Catholic high schools as institutions of opportunity within the communities they serve, the remaining alternatives in the absence of Catholic schools may be viewed as less desirable.

*Implications for Parents*

Should Catholic schools--at any grade level--become no longer viable schooling alternatives to traditional public schools for poor urban families, the only alternatives left would be charter schools, following from the framework established in Chapter II. Alternatively, this scenario could be viewed as the entire Catholic school sector disappearing. The disappearance of urban Catholic schools and the growth of charter

schools in their place raises the question of whether or not charter schools can be effective substitutes for what Catholic schools provide to students in the communities they serve. The current evidence for the effectiveness of charter schools is mixed and varies highly depending on context (Cannata, 2011). Many localized studies based on natural experiments have found positive achievement outcomes for urban charter school students compared to their public school peers (e.g., Abdulkadiroglu, Angrist, Dynarski, Kane, & Pathak, 2011; Dobbie & Fryer, 2011; Hoxby & Murarka, 2008). On the other hand, there is not yet evidence that these positive results are generalizable to charter schools across the United States (Gleason, Tuttle, Clark, & Dwoyer, 2010; Raymond, 2009).

The results from these studies of the achievement of charter school students suggest that in certain contexts, charter schools may be effective substitutes for traditional public schools. A fair amount of stock can be put into these results as they utilize high-quality experimental designs that approach the "gold-standard" of a randomized control trial. Meanwhile, a bulk of the evidence that exists on the advantages that Catholic school students have over their public school peers has relied on observational data. Whether charter schools (which families apply for charter school lotteries, win, and enroll their children) or Catholic schools (which families enroll their children), the characteristics of the students (i.e., academic ability, social background) play some factor in the demonstrated advantages in educational outcomes exhibited by these types of schools over traditional public schools.

Suppose that on average parents perceived both charter and Catholic schools within a city as being of higher quality than public schools. Catholic schools may have historically

served and may continue to serve their students well. Charter schools, though researchers are still learning more about how to duplicate the success of charter schools across educational contexts, may also be serving their students well. When comparing the two alternatives there is no empirical evidence that suggests charter school students outperform their Catholic school peers within urban environments or vice versa.

Because there is no empirical evidence suggestive of one alternative having a demonstrated advantage over another, the question about charter schools serving as effective substitutes for Catholic schools is only relevant if Catholic schools are no longer a viable alternative. Should even more urban families prefer charter schools to Catholic schools, resulting in a further decline in Catholic enrollments and an increase in closures, families would be left with choosing between public and charter schools. If the overall quality of schools within a local educational market decreases without Catholic schools, then families would have a less desirable set of alternatives from which to choose. Those families with the most constraints on their ability to choose stand to be negatively impacted to the greatest degree. These are the very families that expanded school choice opportunities were designed to serve. When the quality of schooling alternatives available to families declines in the absence of Catholic schools, it suggests that Catholic schools may be worth saving.

*Implications for Policymakers and School Leaders*

If local, state, and federal policymakers in conjunction with school leaders view Catholic schools as worth saving amidst presence of of charter schools, discussion should

focus on strategies to boost Catholic school enrollments and stem the likelihood of school closures. The rapid growth of charter schools is likely to continue for the foreseeable future. State and federal authorities have encouraged the continued expansion of charter schools to counter the poor performance of public schools in urban areas (Berends, Cannata, & Goldring, 2011). One example is the federal Race to the Top program. This initiative, signed into law by the Obama Administration in 2009, awards substantial federal funds to state departments of education that are willing to implement innovative educational reforms. One suggested reform is to increase the state cap on the number of charter schools authorized to operate within the state[17]. The opportunity would then exist for more charter schools to begin operating by raising or eliminating the charter school cap.

More charter schools starting to operate within cities could spell further trouble for Catholic schools in terms negative competitive impacts. There are several reasons that families may choose charter schools over Catholic schools, as outlined in Chapter II. One of the primary reasons is tuition. Charter schools are tuition-free making them more attractive on the basis of price than Catholic schools, especially for low-income families. If tuition is a barrier to choosing a Catholic school, potential programs can focus on reducing that barrier.

One possible solution is for state or federal governments to directly fund Catholic and other religious private schools. This is a common practice throughout several European nations, including the United Kingdom, France, Belgium, the Netherlands, and Germany (Dronkers & Robert, 2008). The Canadian province of Ontario also directly funds

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[17] Other examples of reforms include introducing performance-based standards for teachers and principals, adopting nationwide standards into state curriculum, developing high-quality assessments, and implementing statewide longitudinal data systems.

Catholic schools with public money by operating a separate Catholic school system; other provinces used to have similar policies (Holmes, 2008). The performance of students in these countries from all socioeconomic backgrounds that attend all types of schools on an international achievement test is more equal. These results are in stark contrast to the large gap in performance between those students at the top and bottom of the socioeconomic distribution in the United States (OECD, 2005; Willms, 2004). However, it is unlikely a policy that *directly* funds all types of private schools, including religious schools, would ever be implemented in the United States due to the separation of church and state.

Another option is for Catholic schools to convert to charter schools. Several Catholic schools located in Washington, D.C. and throughout various other locations have chosen to do just that (Robelen, 2008). When converting to charter schools, the school must no longer include religious instruction as part of its curriculum and make other structural changes in order to receive public funds. By converting to charter status the school no longer charges tuition, which may in turn attract more students. This may be beneficial for former Catholic schools that can keep the same people in charge of the school and maintain the same overall mission as when it was a private, Catholic school. At this time it is unknown whether or not these schools continue to provide the same benefits to students and communities as when they were Catholic schools.

A third solution is a voucher program. When families receive a private school voucher, they are given money for the tuition at a participating private school. The 2002 Supreme Court case *Zelman v. Simmons-Harris* upheld the constitutionality of using vouchers to attend religious schools. The court determined using vouchers in this manner

was not a violation of the separation of church and state on the basis that parents were making a decision about how to use the money and that public funds were not being directly channeled to religious schools. Voucher programs may increase the role Catholic schools can play in assisting poor parents in cities where there are few genuine alternative schooling options. Most Catholic schools are supremely dependent upon tuition to operate, so these programs may help keep more Catholic schools from losing enrollments and closing.

With a voucher, price becomes less influential in the school choice process because families receive money that can be directly applied to tuition. However, that does not mean that all private schools automatically become viable alternatives for urban families. Some high quality private schools will remain unaffordable to families when the costs of enrolling outweigh the benefits. For example, consider a family that earns $25,000 annually. This family is unlikely to have enough disposable income to spend on education. Even if the family receives a $3,000 voucher, the family may not be able to enroll their child in a private school where the tuition is $7,500 annually. However, they may choose to use that voucher to attend a Catholic school where the tuition is $3,500 if the benefits of Catholic schooling outweigh the additional $500 out-of-pocket cost. Therefore, voucher programs may aid families in choosing schools based more on quality when price is less influential. If parents are able to weigh their preferences and eventually make a school choice based more heavily on quality and less on price, Catholic schools may better compete with charter schools for students.

Voucher programs, while intending to boost private school enrollments, may have a spillover effect on charter schools. Should parents within a local educational market perceive Catholic schools to be on par with or of higher quality than charter schools, fewer families may choose charter schools when price is less influential. Charter schools—and public schools as well—would need to demonstrate that they are attractive alternatives in order to remain competitive for students. It is also possible that vouchers may not have their intended effect to combat charter school competition and boost Catholic school enrollments. If the process to enroll a child in a charter school is more simple than obtaining a voucher, families may be discouraged from applying. It is also possible that charter school seats could be in greater supply than the number of vouchers available.

Several voucher programs have been implemented across various states and cities. Milwaukee was the first modern test bed for vouchers and started a citywide program in 1990 and the program has grown substantially since then. Other programs have been tested in Washington, D.C., Cleveland, and the state of Ohio, each with different eligibility criteria. When voucher programs have been evaluated using random assignment studies, nearly all studies find that some (within various subgroups) or all of the voucher recipients that enrolled in private schools benefitted academically (e.g.,, Howell, Wolf, Campbell, & Peterson, 2002; Wolf, Peterson, & West, 2007). Recently, the state of Indiana started the largest statewide voucher program in existence during the 2011-2012 school year. A carefully designed voucher program that specifically targets low-income families could expand the choice set of quality schooling alternatives for these families to include Catholic schools.

### *Implications for Theory and Methodology*

The results of this study have a few implications for the theories underlying the conceptual model and methodology outlined in Chapters II and III. One theory described in this study was a random utility model of parental school choice. Most of the discussion focused on the role of price in the choice process. Parents may choose charter schools over Catholic schools based on price if they weigh price heavily in their decision making process. Voucher programs, such as those implemented in Milwaukee and Cleveland, are meant to make price less influential in the choice process. The results of this study indicate a non-significant decline in enrollments in Cleveland and a small number of school closures in Milwaukee, suggesting that vouchers may have had some positive impact on Catholic schools when competing with charter schools. While components of the parental choice process such as price were not explicitly tested in this study, these two pieces of evidence suggest that price is likely a large contributor to the process.

The second theory described in this study was the process by which charter schools choose to locate. Charter schools may primarily locate in areas where public schools are low-performing. When a charter school chooses to locate its decision is likely exogenously related to where Catholic schools are located. Because parents are more likely to choose schools that are closer in proximity to their home, the greatest degree of competition between schools for students will be between those schools located close to one another. In this study I found that the effect of charter school availability or enrollment on Catholic schools was the strongest for those charter schools located within a one or two miles as compared to five. These results suggest that within cities, the location choice by charter

schools and subsequent competitive impact on Catholic schools will be greatest within smaller distances between the schools. Therefore, Catholic schools with charter schools located close by should be especially wary of the negative impacts resulting from charter school competition.

### *Limitations and Future Work*

Even though this study provides answers to the research questions proposed, limitations of this study remain. Most of the limitations are related to the ability to test and explore parts of the conceptual model, providing impetus for future studies. There are several steps that I can first take with these school-level data to help improve the results. A missing central component of the theory underlying the conceptual model in this study is the tuition rates of Catholic schools over time. I proposed that price may be a contributing factor to why families may choose charter schools over Catholic schools, but did not have the data necessary to model tuition. It may be possible to obtain school-level tuition data from the National Catholic Education Association (NCEA).

I also proposed that parents might choose charters over Catholic schools more frequently at the start of the schooling process. All of the analyses in this study included enrollments summed over several grades into the elementary and middle grade levels. To test the sensitivity of results within specific grades, I could refer back to the original source of data and complete all of the necessary steps using Geographical Information Systems (GIS) to capture grade-by-grade competition. In the future, I could also calculate a new measure of distance to the nearest charter school and track individual charter schools in

terms of their impacts on Catholic schools (e.g., the impacts of the first and second charter schools opening).

With respect to the statistical models used in this study, I will also need to perform more tests on the discrete-time hazard models to control for unobserved heterogeneity. Any unobserved heterogeneity may be due to unmeasured characteristics that differ across various subgroups and are related to Catholic school closures. I plan to test two variations of the functional form for the random unobserved heterogeneity parameter, including using a gamma distribution and a more flexible mixture distribution, two common approaches in the econometric literature (DesJardins, 2003; Wooldridge, 2005).

One additional limitation is that this study only used school-level data to investigate choice between charter and Catholic schools. School choice occurs at the individual family level, so having family- and student-level data would greatly expand the ability to draw conclusions about competition between schools. First, student-level data would allow for the ability to draw generalizations about what types of students are choosing between schooling alternatives based on income, race/ethnicity, academic ability. Second, surveys could be designed for individual families using a multiattribute evaluation approach (Ward & Newman, 1982) to investigate how families weight various factors when making schooling decisions for their children. Third, having information on family location relative to schooling alternatives is important. I make the assumption in this study that charter and Catholic schools located near one another will compete the most for students because students are more likely attend schools closer to their home. When combining these three suggestions, I would be better able to empirically test various components of the random

utility model of parental choice and location decisions of charter schools. These components form the theory behind the conceptual model in this study that investigates school-level changes in Catholic school enrollments and the likelihood of school closures as a result of charter schools. On top of this, engaging in some fieldwork to better understand what happens in Catholic schools, especially those subject to closure, would be extremely useful. Fortunately, I will have the opportunity to explore several of these very topics through my postdoctoral research position working with students, families, and schools in the State of Indiana.

### *Final Comments*

Urban Catholic schools have lost enrollments and closed at alarming rates over the last fifty years, and the decline continues to this day. Presently, those Catholic schools located within neighborhoods where charter schools are available face further enrollment declines and an increased risk of closing. Catholic schools in particular are important to their communities, increasing the degree of social cohesion amongst residents as they maintain their commitment to serving those less fortunate. This is not to say that charter schools are not effective in serving their students or communities. Instead, they are a relatively new types and little is known about how to duplicate their successes while mitigating their failures. Most importantly, if charter schools are replacing Catholic schools, can they provide families with high-quality educational alternatives to public schools and serve as a social support in their communities to the same degree that Catholic schools have historically provided and served?

Given the long-standing history of most urban Catholic schools providing quality educational opportunities to all individuals they serve, schools or dioceses likely do not need to change much with parts of their educational approach. Yet, if Catholic schools are susceptible to losing enrollments as a result of charter schools operating nearby, Catholic school leaders must figure out ways to attract more students while facing growing competition. Due to the numerous social changes that have taken place over the past few decades combined with some teachings of the Catholic Church that are potentially out of line with mainstream viewpoints, Catholic school leaders face the challenge of being attractive to families as a religious schooling alternative in a growing secular society.

In addition to societal challenges, consistently rising tuition rates may deter more and more low-income families from considering a Catholic school for their children. If Catholic school leaders in conjunction with policymakers across various levels can enact quality programs to assist poor families with tuition, then urban Catholic schools may be able to stave off growing competition from charter schools. These programs, including private school vouchers, could help assist families living in parts of cities where there are few genuine alternative schooling options by making Catholic schools a more attractive and viable alternative. When parents have the capability to consider an expanded set of educational alternatives for their most valuable commodity, their children, these families and their communities may be better served.

## Appendix Table A.1. Features of State Charter School Laws

| State | Year Law Passed | Open/ Closed Schools | 2011 Enroll | Cap | Authorizers | Funding |
|---|---|---|---|---|---|---|
| Illinois | 1996 | 105/10 | 48,233 | 120 total; 70 in Chicago | School boards | Through local school district; |
| Indiana | 2001 | 63/2 | 20,372 | None | School boards, Public state universities, Mayor of Indianapolis, Indiana Charter School Board | Through state and local school district |
| Michigan | 1993 | 316/37 | 118,702 | University authorizers only (300) | School boards, Public state universities | From state through authorizing body |
| New York | 1998 | 201/13 | 54,681 | 460 total; 114 in New York | School boards, State board of education, SUNY board of trustees, NYC Chancellor | Through local school district |
| Ohio | 1997 | 368/99 | 122,660 | Yes; New schools can only open in "challenged" districts | School boards, Public state universities, approved nonprofits, State Department of Education | Through state |
| Pennsylvania | 1997 | 170/13 | 98,108 | None | School boards, State Department of Education | Through local school district |
| Wisconsin | 1993 | 256/54 | 47,532 | None | School boards, City of Milwaukee, UW-Milwaukee | Through authorizer |

**Appendix Table B.1. Mean Charter School Competition Impacts on Enrollment**

| *Catholic Enrollment* | (OLS) | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| Charter School Present | -23.000*** | -20.215*** | -3.602 | 8.904 | -1.334 | 1.199 |
| | (4.650) | (4.040) | (3.915) | (6.019) | (3.828) | (2.896) |
| Yrs. Post-Charter Entry | | | -2.000*** | -1.606* | -3.135* | -2.967* |
| | | | (0.421) | (0.514) | (1.199) | (1.213) |
| Joint Significance (F-Test) | | | *** | ** | ~ | ~ |
| | | | | | | |
| Student-Teacher Ratio | | | | 1.308~ | 0.805 | 0.800 |
| | | | | (0.604) | (0.463) | (0.455) |
| % Minority Enrollment | | | | -15.693* | 2.506 | 3.238 |
| | | | | (5.970) | (3.736) | (3.595) |
| Magnet Enrollment | | | | -3.506~ | -0.753 | -0.560 |
| | | | | (1.711) | (2.123) | (2.040) |
| Public Enrollment | | | | 0.537 | 0.845 | 1.085 |
| | | | | (0.970) | (0.784) | (0.868) |
| Other Religious Enrollment | | | | 2.886** | 1.429* | 1.458* |
| | | | | (0.838) | (0.595) | (0.597) |
| Secular Private Enrollment | | | | 0.815 | 0.505 | 0.450 |
| | | | | (0.963) | (0.650) | (0.606) |
| Other Catholic Enrollment | | | | 2.394* | -1.461* | -1.396* |
| | | | | (0.901) | (0.575) | (0.542) |
| Nearby Catholic Closure | | | | 3.085~ | 2.231* | 2.000* |
| | | | | (1.362) | (0.828) | (0.838) |
| 4 Years Pre-Charter Entry | | | | 6.195~ | 4.188~ | 5.090* |
| | | | | (2.707) | (2.200) | (1.905) |
| 2 Years Pre-Charter Entry | | | | 11.061* | 3.948~ | 5.126* |
| | | | | (4.467) | (1.817) | (1.666) |
| Post-Charter Law | | | | | | -5.009 |
| | | | | | | (3.670) |
| | | | | | | |
| School Fixed-Effects | Y | Y | Y | Y | Y | Y |
| School Enrollment Trend FE | N | N | N | N | Y | Y |
| | | | | | | |
| R² | 0.033 | 0.059 | 0.083 | 0.212 | 0.594 | 0.596 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 | 520 |

~p<0.10, *p<0.05, **p<0.01, ***p<0.001. Estimates are percent changes in enrollment from baseline. Elementary grade levels and one-mile radius. Standard errors in parentheses.

**Appendix Table B.2. Impacts on Enrollment by Distance and Grade Level**

| *Catholic Enrollment* | Elementary Grades (1-5) | | | Middle Grades (6-8) | | |
|---|---|---|---|---|---|---|
| | 1 Mile | 2 Mile | 5 Mile | 1 Mile | 2 Mile | 5 Mile |
| Charter School Present | 1.241 | 1.341 | 3.935 | 1.659 | -3.069 | -0.766 |
| | (2.855) | (3.541) | (5.351) | (3.257) | (2.947) | (3.394) |
| Yrs. Post-Charter Entry | -2.954* | -3.019~ | -2.027~ | -0.968 | -0.596 | -0.783 |
| | (1.224) | (1.468) | (1.103) | (1.216) | (1.090) | (1.313) |
| Joint Significance (F-Test) | ~ | NS | NS | NS | NS | NS |
| | | | | | | |
| School Fixed-Effects | Y | Y | Y | Y | Y | Y |
| School Background Chars. | Y | Y | Y | Y | Y | Y |
| Other School Enrollments | Y | Y | Y | Y | Y | Y |
| Pre-Entry Controls | Y | Y | Y | Y | Y | Y |
| Nearby Cath. Schl. Closures | Y | Y | Y | Y | Y | Y |
| School Enrollment Trend FE | Y | Y | Y | Y | Y | Y |
| Post-Charter Law Control | Y | Y | Y | Y | Y | Y |
| | | | | | | |
| $R^2$ | 0.596 | 0.600 | 0.618 | 0.554 | 0.555 | 0.560 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3870 | 3870 | 3870 |
| Number of Schools | 520 | 520 | 520 | 524 | 524 | 524 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are percent changes in enrollment from baseline. Standard errors in parentheses.

**Appendix Table B.3. Mean Charter School Competition Impacts on Closures**

| *Catholic Closures* | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Charter School Present | 1.522 | 0.524~ | 0.328*** | 0.302*** | 0.293*** |
| | (0.399) | (0.183) | (0.099) | (0.076) | (0.072) |
| Yrs. Post-Charter Entry | | 1.397*** | 1.411*** | 1.389*** | 1.396*** |
| | | (0.062) | (0.069) | (0.057) | (0.057) |
| Joint Significance (F-Test) | | *** | *** | *** | *** |
| | | | | | |
| Catholic School Enrollment | | | 0.114*** | 0.085*** | 0.085*** |
| | | | (0.029) | (0.019) | (0.020) |
| Student-Teacher Ratio | | | | 0.998 | 0.997 |
| | | | | (0.015) | (0.015) |
| % Minority Enrollment | | | | 1.460 | 1.456 |
| | | | | (0.868) | (0.868) |
| Magnet Enrollment | | | | 0.980 | 0.982 |
| | | | | (0.017) | (0.016) |
| Public Enrollment | | | | 1.153*** | 1.151*** |
| | | | | (0.044) | (0.042) |
| Other Religious Enrollment | | | | 1.013 | 1.013 |
| | | | | (0.036) | (0.036) |
| Secular Private Enrollment | | | | 0.938 | 0.937 |
| | | | | (0.072) | (0.072) |
| Other Catholic Enrollment | | | | 1.045 | 1.046 |
| | | | | (0.034) | (0.035) |
| Nearby Catholic Closure | | | | 1.050 | 1.053 |
| | | | | (0.126) | (0.125) |
| SES Need Index | | | | 0.868 | 0.866 |
| | | | | (0.092) | (0.093) |
| Post-Charter Law | | | | | 1.549 |
| | | | | | (0.828) |
| | | | | | |
| Buffalo | | | | 1.265** | 1.291** |
| | | | | (0.098) | (0.103) |
| Chicago | | | | 1.393* | 1.380* |
| | | | | (0.203) | (0.200) |
| Cincinnati | | | | 0.289*** | 0.288*** |
| | | | | (0.029) | (0.030) |
| Cleveland | | | | 0.832 | 0.837 |
| | | | | (0.140) | (0.139) |
| Columbus | | | | 1.139~ | 1.141~ |
| | | | | (0.086) | (0.088) |
| Detroit | | | | 0.731* | 0.664* |
| | | | | (0.113) | (0.126) |

| | | | | | |
|---|---|---|---|---|---|
| Indianapolis | | | | 0.124*** | 0.131*** |
| | | | | (0.018) | (0.023) |
| Milwaukee | | | | 0.008*** | 0.007*** |
| | | | | (0.003) | (0.003) |
| Toledo | | | | 1.305 | 1.306 |
| | | | | (0.235) | (0.237) |
| | | | | | |
| Time Period 2 | 0.761 | 0.778 | 0.825 | 0.836 | 0.837 |
| | (0.193) | (0.203) | (0.313) | (0.350) | (0.351) |
| Time Period 3 | 0.611** | 0.620** | 0.679~ | 0.808 | 0.805 |
| | (0.106) | (0.111) | (0.156) | (0.119) | (0.121) |
| Time Period 4 | 0.476* | 0.471* | 0.579 | 0.608 | 0.568 |
| | (0.162) | (0.161) | (0.207) | (0.238) | (0.215) |
| Time Period 5 | 0.763 | 0.701~ | 0.741* | 0.679 | 0.634 |
| | (0.129) | (0.130) | (0.111) | (0.226) | (0.201) |
| Time Period 6 | 0.400* | 0.373** | 0.433* | 0.390* | 0.263* |
| | (0.145) | (0.131) | (0.145) | (0.164) | (0.165) |
| Time Period 7 | 1.337 | 1.106 | 1.087 | 0.949 | 0.618 |
| | (0.292) | (0.211) | (0.238) | (0.351) | (0.361) |
| Time Period 8 | 1.680** | 1.171 | 1.093 | 1.057 | 0.685 |
| | (0.321) | (0.190) | (0.252) | (0.541) | (0.354) |
| Time Period 9 | 0.489 | 0.245~ | 0.230~ | 0.251 | 0.162 |
| | (0.375) | (0.193) | (0.203) | (0.326) | (0.195) |
| Time Period 10 | 0.718 | 0.226* | 0.190~ | 0.218 | 0.140 |
| | (0.437) | (0.145) | (0.165) | (0.277) | (0.167) |
| | | | | | |
| Pseudo $R^2$ | 0.029 | 0.083 | 0.214 | 0.282 | 0.283 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are odds-ratio changes from baseline hazard. Elementary grade levels and one-mile radius. Standard errors in parentheses.

## Appendix Table B.4. Impacts on Closure by Distance and Grade Level

| *Catholic Closures* | Elementary Grades (1-5) | | | Middle Grades (6-8) | | |
|---|---|---|---|---|---|---|
| | 1 Mile | 2 Mile | 5 Mile | 1 Mile | 2 Mile | 5 Mile |
| Charter School Present | 0.293*** | 0.249** | 0.107*** | 0.335*** | 0.236*** | 0.123*** |
| | (0.072) | (0.117) | (0.051) | (0.097) | (0.084) | (0.065) |
| Yrs. Post-Charter Entry | 1.396*** | 1.513*** | 1.969*** | 1.408*** | 1.534*** | 1.907*** |
| | (0.057) | (0.121) | (0.221) | (0.031) | (0.091) | (0.176) |
| Joint Significance (F-Test) | *** | *** | *** | *** | *** | *** |
| | | | | | | |
| Observation Period FE | Y | Y | Y | Y | Y | Y |
| Catholic School Enrollment | Y | Y | Y | Y | Y | Y |
| School Background Chars. | Y | Y | Y | Y | Y | Y |
| Other School Enrollments | Y | Y | Y | Y | Y | Y |
| SES Need Index | Y | Y | Y | Y | Y | Y |
| Nearby Cath. Schl. Closures | Y | Y | Y | Y | Y | Y |
| City Fixed-Effects | Y | Y | Y | Y | Y | Y |
| Post-Charter Law Control | Y | Y | Y | Y | Y | Y |
| | | | | | | |
| Pseudo $R^2$ | 0.283 | 0.317 | 0.347 | 0.250 | 0.294 | 0.326 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3870 | 3870 | 3870 |
| Number of Schools | 520 | 520 | 520 | 524 | 524 | 524 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are odds-ratio changes from baseline hazard. Standard errors in parentheses.

## Appendix Table B.5. Impacts on Closure by Distance and Specification

| _Catholic Closures_ | 1 Mile | 2 Mile | 5 Mile | 1 Mile | 2 Mile | 5 Mile |
|---|---|---|---|---|---|---|
| Number of Charter Schools | 0.861 | 0.856 | 1.035 | | | |
| | (0.167) | (0.134) | (0.061) | | | |
| Yrs. Post-Charter Entry | 1.429*** | 1.482*** | 1.993*** | | | |
| | (0.101) | (0.079) | (0.182) | | | |
| Yrs. Post-Entry*No. Charter | 0.890~ | 0.993 | 0.987 | | | |
| | (0.058) | (0.025) | (0.010) | | | |
| Joint Significance (F-Test) | *** | *** | *** | | | |
| | | | | | | |
| Charter School Enrollment | | | | 0.957 | 0.972 | 1.243 |
| | | | | (0.089) | (0.071) | (0.203) |
| Yrs. Post-Charter Entry | | | | 1.384*** | 1.569*** | 2.933*** |
| | | | | (0.064) | (0.089) | (0.365) |
| Yrs. Post-Entry*Char. Enroll | | | | 0.968* | 0.960~ | 0.877*** |
| | | | | (0.015) | (0.021) | (0.026) |
| Joint Significance (F-Test) | | | | *** | *** | *** |
| | | | | | | |
| Observation Period FE | Y | Y | Y | Y | Y | Y |
| Catholic School Enrollment | Y | Y | Y | Y | Y | Y |
| School Background Chars. | Y | Y | Y | Y | Y | Y |
| Other School Enrollments | Y | Y | Y | Y | Y | Y |
| SES Need Index | Y | Y | Y | Y | Y | Y |
| Nearby Cath. Schl. Closures | Y | Y | Y | Y | Y | Y |
| City Fixed-Effects | Y | Y | Y | Y | Y | Y |
| Post-Charter Law Control | Y | Y | Y | Y | Y | Y |
| | | | | | | |
| Pseudo $R^2$ | 0.284 | 0.316 | 0.346 | 0.248 | 0.294 | 0.353 |
| Number of School-Year Obs. | 3875 | 3875 | 3875 | 3875 | 3875 | 3875 |
| Number of Schools | 520 | 520 | 520 | 520 | 520 | 520 |

~$p<0.10$, *$p<0.05$, **$p<0.01$, ***$p<0.001$. Estimates are odds-ratio changes from baseline hazard. Elementary grade levels and one-mile radius. Standard errors in parentheses.

# APPENDIX C
# ORIGINAL VARIABLE LIST

**Original Variables from Private School Survey (e.g. 2007-2008)**:

| | |
|---|---|
| ppin: | School ID Number |
| pinst: | School Name |
| paddrs: | School Address |
| pcity: | School City |
| pstabb: | School State |
| pzip: | School Zip Code |
| pcntnm: | School County Name |
| latitude: | School Latitude |
| longitud: | School Longitude |
| ulocale: | Urban-centric Locale Code (NCES Assigned) |
| relig: | Religious Affiliation |
| tothrs: | Total Instructional Hours in a School Day |
| p190-300: | Enrollment in Grades 1-12 (twelve variables, e.g. p190, p200, p210, etc.) |
| p335: | Coeducational Status |
| sttch_rt: | Student-Teacher Ratio |
| pindian: | Percentage of American Indian or Alaskan Native Students |
| pasian: | Percentage of Asian or Pacific Islanders Students |
| phisp: | Percentage of Hispanic Students |
| pblack: | Percentage of Black Students |
| pminor: | Percentage of Minority Students |
| pfnlwt: | Final Population Weight for School |
| repw1-88: | Replicate Weights (eighty-eight variables, e.g. repw1, repw2, repw3, etc.) |

**Original Variables from Common Core of Data (e.g. 2007-2008)**:

| | |
|---|---|
| NCESSCH: | School ID Number |
| SCHNAM07: | School Name |
| LSTREE07: | School Address |
| LCITY07: | School City |
| LSTATE07: | School State |
| LZIP07: | School Zip Code |
| CONAME07: | School County Name |
| LATCOD07: | School Latitude |
| LONCOD07: | School Longitude |
| ULOCAL07: | Urban-centric Locale Code (NCES Assigned) |
| MAGNET07: | Magnet School |
| CHARTR07: | Charter School |
| G0107-G1207: | Enrollment in Grades 1-12 (twelve variables, e.g. G0107, G0207, G0307, etc.) |

*Note: In both the PSS and CCD, variable names and numbers occasionally change across waves of data. Most notably, in the CCD, the year appears in the variable names. I accounted for these changes and created standard variables when constructing the panel dataset.*

**Original Variables from 2000 Census Summary Files 1 and 3 (at census tract level)**:
Race/Ethnicity – Total population of one race Black or African American
Age – Total population of age 18 or over
School Enrollment – Population enrolled in elementary or high school
Educational Attainment – Population with less than grade 9 or grades 9-12 with no diploma
Employment Status – Population 16 and over in labor force and unemployed
Welfare Status – Population in households receiving public assistance income
Household Status – Number of households with female householder, no husband present, and children under age 18.

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