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Abstract

Charter schools have been one of the most important dimensions of recent school reform measures in the United States. Currently, there are more than 5,000 charter schools spread across forty U.S. states and the District of Columbia. Though there have been numerous studies on the effects of charter schools, these have mostly been confined to analyzing their effects on student achievement, student demographic composition, parental satisfaction, and the competitive effects on regular public schools. This study departs from the existing literature by investigating the effect of charter schools on enrollment in private schools. To investigate this issue empirically, we focus on the state of Michigan, where there was a significant spread of charter schools in the 1990s. Using data on private school enrollment from biennial National Center for Education Statistics private school surveys, and using a fixed-effects as well as instrumental-variables strategy that exploits exogenous variation from Michigan charter law, we investigate the effect of charter school penetration on private school enrollment. We find robust evidence of a decline in enrollment in private schools—but the effect is only modest in size. We do not find evidence that enrollments in Catholic or other religious schools suffered more relative to those in nonreligious private schools.

Key words: charters, private schools, instrumental variables

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1 Introduction

Since the publication of A Nation at Risk in 1983, efforts to improve public school quality have been at the forefront of national and state policy debates. Concerned over the academic achievement of U.S. students, particularly in comparison to students in other developed as well as developing countries, policy makers have proposed and implemented several reform measures. One of the most important dimensions of these school reform measures has been school choice, and charter schools in particular. Since the first charter school opened in 1991-92 in Minnesota, there has been a rapid spread of charter schools throughout the U.S. and most states now have charter schools. Currently, there are more than 5,000 charter schools spread across the 40 U.S. states and the District of Columbia, though the strength of the charter movement differs significantly across states.

Understanding the effect of charter schools on private school enrollment is paramount from different perspectives. Note first that the question is important in itself, as private schools comprise a vital and salient segment of the education sector, and any policy that affects enrollment in these schools has the potential to significantly impact overall educational outcomes, including student achievement. An important related issue is that of per pupil spending. If it is indeed the case that a significant number of private school students are now transferring to charter schools, which are publicly financed, then this may reduce the amount of per pupil spending in public schools unless total school spending increases at a corresponding rate. On the other hand, if there are more children in the public sector, this increases the number of people with stakes in the quality and performance of public schools. This in turn may lead to demands for more resources to the public sector (and/or other school improvement measures).[1]

This paper can also speak to one of the most hotly debated questions relating to charter schools,

[1] Preston (1984) argues that one of the main reasons that poverty rates among the elderly fell significantly from 1950 to 1980 despite the increase in their numbers is the fact that the increase in the number and percentage of elderly people led to a redistribution of resources towards them.

the question of relative efficacy of charter and public schools. The existing literature typically addresses this question by comparing the achievement of public and charter school students, after controlling for their observable and unobservable characteristics. However, the effect of charter schools on private enrollment, as analyzed in this paper, can also inform this question, from the point of view of parents' perceptions of these two types of schools.

This study is the first to point out that private school enrollment patterns in the presence of charter schools contain important information relating to the relative quality of charter and public schools. The intuition is that any movement from private schools to charter schools will depend not only on the relative qualities of these two types of schools, but also depend in an important way on the quality of the neighboring regular public school. This is because if the new charter school is regarded as an improved alternative in comparison to the regular public school, then some private school households (the ones marginal or close to marginal between public and private schools) would now take advantage of this and switch from private to charter schools. Note that a transfer of students from private schools to charter schools does not necessarily imply that these parents value charter schools more than private schools (as private schools are costly). On the other hand, such a transfer implies that parents prefer charter schools to regular public schools, since both of them are free. Thus the effect of charter schools on private school enrollment gives us valuable information relating to relative attractiveness of charter and public schools, as perceived by private school parents.

Note that moves of public school students to charter schools also imply that their parents value charters more than the public schools. However, there might be differences in the responsiveness of public and private families to school quality in their school choice decision. For example, Hanushek et al. (2007) find that in Texas, the parental decision to exit a charter school is significantly related to charter school quality and that the magnitude of this relationship is substantially larger than the relationship between the probability of exit and quality in the regular public school sector.

Since parents of children currently in private schools have already exercised the choice option once, they may be more sensitive to school quality, and arguably more motivated.

It should however be noted that such moves (moves of private school students to charter schools or moves of public school students to charters for that matter) do not necessarily imply that charters are better than public schools in terms of academic achievement. It merely implies that parents 'value' charter schools more than the regular public schools, and these may be for reasons other than academic achievement. For example, some parents may have a preference for a particular curriculum (e.g., fine arts theme or Afro-centric theme), or the fact that charter schools might be targeted to particular groups like special education students or at-risk students, or the fact that they may be somewhat different in nature from the regular public or private schools (like being technical schools), etc. Of course, it is also possible that being new schools, charters initially attract some families who are shopping around for better school quality.

The empirical part of this paper investigates whether charter penetration has been associated with a fall in private school enrollment. We focus on the state of Michigan where there was a significant spread of charter schools in the 1990s. Data used include biennial data from private school surveys conducted by the U.S. Department of Education and charter school data obtained from the Michigan Department of Education. Using a fixed effects as well as instrumental variables strategy that exploits exogenous variation from the Michigan charter law (following Bettinger (2005)), we investigate whether charter school penetration in Michigan was associated with a downward trend in private school enrollment.

Our results suggest that the introduction of charter schools negatively impacted enrollment in private schools, but the effect was mostly modest in size. We also find some evidence that as the charter sector grows and becomes more visible, its effect on private schools increases. Our results suggest that an additional charter school within a 2-mile radius of a private school decreases its enrollment by 1.19% each year. An additional charter student within its 2-mile

radius reduces private school enrollment by 0.01% (or approximately 0.02 students) each year. Moreover, disaggregating private schools in terms of their religious orientation, we do not find much evidence that Catholic schools or other religious schools lost more students to charter schools than non-religious schools.

Our study is related to the burgeoning literature on various effects of charter schools. However, most of this literature focuses on either the effect on students enrolled in such schools [example, Hoxby and Rockoff (2004), Bettinger (2005), Bifulco and Ladd (2006), Sass (2006), Booker et al. (2007), Hoxby and Murarka (2007), Imberman (forthcoming)]; or the competition effect on surrounding regular public schools [example, Hoxby (2002), Bettinger (2005), Sass (2006) and Booker et al. (2008), Imberman (forthcoming)], or the effects on sorting of students across public and charter schools, particularly based on racial composition (Dee and Fu, 2004). In contrast, our study analyzes the enrollment effects of charter schools.

This study is most closely related to Toma et al. (2006),—the only other paper that looks at enrollment consequences of charter schools. Toma et al. also focuses on Michigan. They find that charter schools are attracting a significant number of students from the private sector. Their results suggest that private schools lose 0.31 student for every student gained by charter schools.

Our findings, outlined above, differ significantly from Toma et.al. in that we find considerably smaller effects of charters on private school enrollment. Even otherwise, this study differs from Toma et al. in some fundamental ways. First, Toma et al. do not account for the fact that the location of charter schools might be endogenous to (unobserved components of) private and public school quality in the neighborhood, so that simple OLS or even fixed effect regressions can yield biased estimates. This paper, on the other hand, pursues an instrumental variables strategy by exploiting exogenous variation in Michigan's charter school law.

Second, Toma et al. look at the effect of *county-level* charter enrollment on *county-level* private enrollment. However, neither charter enrollment nor private school enrollment is restricted

by county boundaries. Proximity rather than county boundaries, we believe, determines such choice of schools. Therefore, in our analysis we use proximity to define the competition variable. Specifically, we estimate the effect of charter competition within certain reasonable radii of private schools on private school enrollment.

Third, while we use data from 1989-90 through to 2001-02, Toma et al. only use data from 1994-95 through to 1998-99.[2] The time-period considered in the Toma et al. paper is too narrow to either effectively control for pre-program trends (the first charter schools in Michigan were established around 1994-95) or post-program effects (as many effects of charter schools may occur only with a lag and mature charter schools can have differential effects). Fourth, we decompose private schools into secular schools and parochial schools (and parochial schools into Catholic schools and other religious schools) to investigate whether there was heterogeneity of effects between the different types of schools.

Fifth, unlike Toma et al. we use several alternative ways to measure the extent of competition and investigate the robustness of the results to alternative measures of competition. Moreover, we estimate multiple specifications and employ a battery of sensitivity checks to ensure the validity of our results. Finally, Toma et al. never discuss or explicitly connect the transfer of students from private schools to charter schools to the quality of schooling in the regular public school. In contrast, we argue that such movements of students between schools reflect the relative attractiveness of these schools, as perceived by parents.

The rest of the paper is organized as follows. Section 2 describes charter schools in Michigan. Section 3 discusses the various sources of the data used. In section 4, we outline the empirical strategy we employ, including the methodology used to address potential endogeneity in charter school location. The results are discussed in section 5, with further robustness checks and discussion in section 6. Section 7 concludes.

[2] We do not use data from 2002 and beyond, since any true effect of charter schools in that period is likely to be confounded with effects due to the introduction of the federal No Child Left Behind Act.

2 Charter schools in Michigan

The law creating charter schools - also known as public school academies - was passed by Michigan's legislature in December 1993. It is regularly ranked as one of the strongest in the nation - for example, the Center for Education Reform, an advocacy group for school choice including charter schools, ranks Michigan's law to be among the most-accommodating charter laws in the country (Center for Education Reform, 2008). Among other things, the law allows for a wide range of authorizers for charter schools, including local school boards, intermediate school boards, and community colleges and public universities in the state;[3]; allows charter schools to receive per pupil state funding on the same level as traditional public schools;[4] and does not impose automatic collective bargaining agreements for teachers in charter schools, unless these schools have been authorized by local school districts (Mead, 2006). However, charter school students must take the same state tests that students in regular public schools do, and they are subject to the same accountability provisions as regular public schools.

Figure 1 shows the distribution of private and charter schools in Michigan. As can be seen, both private and charter schools are spread across the whole state. However, most of the charter schools are located in the big cities and their suburbs. For example, Detroit and its suburbs account for a significant number of charter schools, as do cities like Grand Rapids, Lansing and Flint. A report to the Michigan legislature estimated that in 2003-04 about 20 percent of the charter schools were located in a small town or in rural areas (Michigan Department of Education, 2005). Most charter school students are in the elementary grades, followed by the middle grades.

[3] Public universities are allowed to authorize charter schools anywhere in the state, but other authorizers can only authorize schools within their jurisdictions.

[4] This is particularly important in Michigan as following a major school finance reform (Proposal A) which occurred around the same time, the share of state revenues in total per pupil spending rose to around 70-80 percent, unlike many other states where state funds account for a much smaller share of per pupil spending. See section 6.3 below for more on Proposal A.

3 Data

In this study, we utilize data from the Private School Surveys (PSS) conducted by the National Center for Education Statistics, an arm of the U.S. Department of Education. The PSS have been conducted biennially since 1989-90 for the purpose of collecting data on private schools in the U.S. and their teachers and students.[5] These surveys provide information on enrollments in private schools in Michigan, and are available for every other year beginning 1989-90. Since the first charter schools opened in Michigan in 1995-96, the PSS data allow us to control for differences in pre-existing trends of private schools and also to test for any differential effect of charter schools on private school enrollment as the charter schools mature and expand. Another important feature of the PSS data is that these surveys have detailed information on the characteristics of the private schools. Of particular importance to us are several variables related to religious affiliation (whether school has a religious purpose, whether the school is Catholic, etc.) - as it is possible that religious private schools will have different enrollment effects than secular private schools. We use these private school data from 1989-90 through to 2001-02. As mentioned earlier, we restrict ourselves to the period prior to 2002, since any effect of charter schools in the post-2002 period is likely to be confounded with effects due to the introduction of the federal No Child Left Behind Act.

Data on demographic composition of private schools are also available from the PSS, but these data are available starting from the 1993-94 school year. While we use the whole dataset for most of our analysis, we test sensitivity of the results to changes in demographic composition using this part of the dataset as well. We supplement our analysis by using data on location and operation of charter schools from the Michigan Department of Education.

[5] The target population for this survey consists of all private schools in the U.S. that meet the NCES definition (i.e., a private school is not supported primarily by public funds, provides instruction for one or more of grades K-12 or comparable ungraded levels, and has one or more teachers). Details about the PSS, including its survey design and its components, are available at http://nces.ed.gov/surveys/pss/.

4 Empirical Strategy

We focus on the state of Michigan where there was a significant spread of charter schools in the 1990s. Michigan is an interesting state to analyze as it has several distinct and unique advantages. First, it is one of a handful of states where charter schools spread very rapidly. This allows researchers to analyze the effect of charter schools in a setting where potential confounding factors like secular time trends are less important. Second, Michigan presents a very diverse perspective in terms of its private schools. This allows us to examine whether the effects of charter competition on enrollment are different for different types of private schools. Third, and importantly, the presence of a unique feature in Michigan's charter law allows us to pursue an instrumental variables strategy, following Bettinger (2005).

Since charter schools are disproportionately concentrated in the elementary grades, we focus on elementary schools in this paper. We look at middle and high schools as part of some robustness checks later.

The significant spread of charter schools in Michigan is shown in Table 1. The total number of charter schools increased from 33 in 1995-96 to over 200 in 2001-02, and enrollment in charter schools increased from 4,449 in 1995-96 to over 64,000 in 2001-02. We investigate whether the prevalence of charter schools was associated with a fall in private school enrollment.

4.1 Estimation using Private School Surveys

The Private School Survey data are available for every other year, beginning in 1989-1990. Using data from 1989-90 to 2001-02,[6] we first estimate the following model. Controlling for year-specific dummy variables to absorb any common shocks we investigate whether there has been any shift in private school enrollment following charter penetration.

[6] Henceforth in the paper, we refer to school years by the calendar year of the spring term - e.g., 1990 refers to academic year 1989-90, and so on.

$$y_{it} = \alpha_0 + \sum_{k=1992}^{2002} \alpha_k . D_k + \gamma . charter_{it} + \beta . x_{it} + f_i + \varepsilon_{it} \quad \ldots (1)$$

Here y_{it} denotes enrollment in private school i in year t, while $charter_{it}$ is a measure of charter competition faced by school i in year t. D_k's refer to the year dummies for the various years and controls for year specific shocks, f_i denotes private school fixed effects, x_{it} denotes demographic controls. The coefficient of interest here is γ, which represents the effect of charter competition on enrollment in private schools.

As mentioned earlier, neither charter enrollment nor private school enrollment is restricted by county boundaries, —households can cross county boundaries to go to their preferred private or charter school. Therefore, we use proximity to define the competition variable. We estimate the effect of charter competition within certain radii of private schools on private school enrollment.[7] For the purposes of our analysis, we geocode every private and charter school in the state of Michigan and compute number of charter schools and charter school enrollment within certain specified radii of each private school. For instrumental variables analysis and robustness checks later, we also geocode each public university and compute their distances from private schools. The results reported here mainly pertain to a 2 mile radius, but we have experimented with 1 mile, 5 mile and 10 mile radii also. The results remain qualitatively similar and hence are not reported here.

We use three measures of charter competition: (i) an indicator variable denoting whether or not there was a charter school within that radius (ii) number of charter schools within that radius of a private school (iii) charter school enrollment within that radius.

While specification (1) as well as the other specifications in this section represent FE specifications that include school-specific fixed effects that control for all non-varying characteristics

[7] Since charter schools are open to any resident, they can in principle attract students from a wide catchment area. However, in practice transportation costs are an important barrier - Kleitz et al. (2000) find that a majority of all racial and economic groups cited location as important in their choice of a charter school, with minorities and low-income households attaching significantly higher weights to this factor. So distance to the nearest charter school should be an important indicator of the competitive pressures faced by private schools.

of the schools, we also estimate OLS versions of these regressions. For brevity, we mainly report results from the FE regressions - the OLS results are similar and available on request. Since the schools are of different sizes, the regression errors are likely to be heteroscedastic. So we employ heteroscedasticity-robust standard errors in all regressions reported here. In addition, to control for serial correlation across observations for the same district, we cluster the standard errors at the county level.

Existence of Differential Pre-Program Trends

The above specification does not control for any pre-existing trends of private schools, so the estimates of the effects of charter competition will be biased if there are differential pre-program trends. We next use the private school survey data and control for the presence of such pre-program trends in our regressions. That is, we estimate a linear time trend for each private school based on only its own pre-program data and generate predicted trend values for the entire period ($trend_{it}$).[8] We estimate the following model.

$$y_{it} = \alpha_0 + \gamma_1.charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + f_i + \varepsilon_{it} \qquad \ldots (2)$$

Here $trend_{it}$ denotes the pre-program trend in school i's enrollment, thus allowing us to control for pre-charter differences in trends across individual schools.

We also estimate a variant of model (2) where we interact the charter competition variable with time trend to allow for the fact that the effect of charter schools might be trending over time.

$$y_{it} = \alpha_0 + \gamma_1.charter_{it} + \gamma_2.trend * charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + f_i + \varepsilon_{it} \qquad \ldots (3)$$

Here the variable trend denotes the time trend, we take trend = 0 for 1993-94, the last year before the introduction of charter schools.[9] The coefficients of interest here are γ_1 and

[8] We run a separate regression for each private school to generate its pre-charter trend, and predict trend values for both the pre-charter and post-charter periods. This will thus control for any differences in pre-charter trends across private schools.

[9] Trend equals -1 in 1991-92, -2 in 1989-90, 1 in 1995-96, and so on.

γ_2, respectively denoting any intercept and trend shifts in private enrollment following charter competition. These together represent the effect of charter competition. In particular, γ_2 shows whether the effect of competition from charter schools has any significant trend component, that is whether the effect of charter competition changed over time. It is possible that with time there is better information dissemination. As people come to know about charter schools, they want (or do not want) to enroll their children in these schools. It is also possible that as charter schools age, they mature and become more experienced and attract (or discourage) a higher number of students.

Controlling for Post-Program Common Shocks

We also estimate two variants of specification (3) where we control for common post-program shocks in the post-charter period. In the first specification - our most preferred specification - we include separate year dummies for the post-charter period.

$$y_{it} = \alpha_0 + \sum_{k=1996}^{2002} \alpha_k.D_k + \gamma_1.charter_{it} + \gamma_2.trend * charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + f_i + \varepsilon_{it} \quad \ldots (4)$$

In the second specification, we control for common post-charter shocks by allowing for post-program common intercept and trend shifts.

$$y_{it} = \alpha_0 + \phi_1.program + \phi_2.program * trend + \gamma_1.charter_{it} + \gamma_2.trend * charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + f_i + \varepsilon_{it} \quad \ldots (5)$$

Here *program* is a 0-1 binary variable taking the value of 1 for all post-charter years (that is, *program*=1 for 1995-96, 1997-98, 1999-00 and 2001-02). Taken together, the variables *program* and *program* interacted with the time-trend control for any common intercept or trend shifts that may have occurred during the post-charter years and affected all private schools simultaneously.

Allowing for Heterogeneity in effects of Charter Competition

As noted earlier, the PSS data contain information on religious affiliations of private schools. Since it is possible that charter competition might affect regular private school differently from religious private school enrollment, we check for heterogeneity in effects across different types of private schools. We estimate the following model to see if private schools affiliated with a religious organization show different trends than those of secular private schools.

$$y_{it} = \alpha + \sum_{k=1996}^{2002} \alpha_k . D_k + \gamma_1 . charter_{it} + \gamma_2 . charter_{it} * trend + \delta . (charter_{it} * religious\ purpose) + \theta_i . trend_{it} + \beta . x_{it} + f_i + \varepsilon_{it} \quad \ldots (6)$$

The variable *religious purpose* is a 0-1 binary variable, taking the value of 1 if the school in question has a religious purpose, 0 otherwise. Note that *religious purpose* separately is not included in the above regression as it is absorbed by private school fixed effects. It is included, though, in the OLS version. A significant coefficient for $(charter_{it} * religious\ purpose)$ would imply that competition from charter schools had a different effect on religious private schools as compared to secular ones.

Since many of the private schools in the U.S. have traditionally been Catholic, we also run a variant of specification (5) where we disaggregate all schools into three types - Catholic, other religious and those without a religious affiliation. We include separate dummies for Catholic schools and schools affiliated with other religious organizations, secular private schools being the omitted category.

In this paper, we report results from our preferred specifications (specifications (4), (5) and (6)) and the first specification (specification (1)). Results from the intermediate specifications are available on request.

Addressing Concerns about Locations of Charter Schools

One important concern here is that charter school presence is likely to be endogenous,- there might be unobserved characteristics that affect both private school quality and charter school location.

Charter schools may open in areas where the private schools are not very good,- alternately, they may open in districts where there is a high demand for good quality schooling and existing schools are already quite good.[10] Since we estimate all regressions by fixed effects, in addition to OLS, any school or neighborhood-specific characteristic that does not vary over time will be absorbed and not bias the results. However, there might be time-varying features that affect both charter school location and enrollment in private schools. To address this issue, we use an instrumental variables (IV) estimation strategy. This strategy follows Bettinger (2005) who study the effect of charter competition in Michigan on students in public schools. One interesting and unique feature of Michigan's charter law is that public universities are allowed to grant charters, and universities whose boards are appointed by the governor authorized a lot of charter schools (more than 85 percent) during this period (1995-2002) to please the then governor, John Engler, who was a big supporter of charter schools.[11] Also, since the authorizers had to supervise/monitor the charter schools, charters were more likely to be set up closer to these public universities than farther. Bettinger (2005) exploits this exogenous variation created by the charter law - he uses as his instrument for charter school location the distance of public schools from public universities that had governor appointed boards.

This study also exploits this exogenous variation created by the charter law, however there are some differences. Since we are interested in the effect of charter school competition on private school enrollment we use distance of private schools from public universities that had governor

[10] There are a few studies that look at the location decisions of charter schools. Glomm et al. (2005) argue that charter schools are more likely to locate in districts whose populations are more diverse - they find that school districts with more diverse populations in terms of race and adult education are more likely to attract charter schools. When they include the numbers of magnet schools and private schools as additional regressors, the coefficient on the former is insignificant, while the coefficient on private schools is positive and significant. Glomm et al. also argue that charter schools are more likely to locate in less efficient public school districts - their results provide mixed support for this.

[11] As per the Michigan Constitution (Michigan Constitution, Article 8, sections 5 and 6), the governor appoints board members of only some of the public universities, while the boards of the other public universities are elected by the public in statewide elections.

appointed boards ("authorizing universities" from now on). However, unlike the cross-sectional nature of the Bettinger study, this study is a panel data analysis and we need an instrument that provides exogenous variation that varies over time. We use as instruments the distance of private schools from public universities that had governor appointed boards and interactions of this variable with post-program year indicator variables. As a robustness check, we also use a related but alternate set of instruments where the instruments are interaction of the distance of private schools from authorizing universities with program dummy and its interaction with program dummy and trend. We focus on results from the first set of instruments, results from the second set of instruments are similar and available on request. In addition, we consider the prospect that the location of public universities may not be exogenous. Most public universities have been set up decades before and their locations were historically determined, so this may not be a big problem. But as a robustness check we carry out falsification tests exploiting location of public universities that do not have governor appointed boards. We also carry out falsification tests using pre-program data and institutional details of charter school law. We discuss results from these falsification tests in section 6.2.

5 Results

5.1 Results from Fixed Effects Analysis

The remaining tables show results from regressions using the PSS data. Table 2 shows estimates from running specification (1). The first three columns (marked (1)-(3)) are from regressions where we use charter school competition within 2 miles of a private school as our main variable of interest, while columns (4)-(6) are from regressions where we use 5 miles as the radius. The results show that there has been a significant decline in private school enrollment following the spread of charter schools. For example, the presence of charter schools within 2 miles of a private school leads to about 18 students transferring out (column (1)), whereas a private school loses

about 6 students for *each* charter school within a 2-mile radius (column (2)). The effects of charter schools are much attenuated when we consider charter competition within a larger 5-mile radius as opposed to a 2-mile radius. The coefficients in columns (4)-(6) are only about one-third to one-fourth as large as the corresponding ones in columns (1)-(3), though they are still mostly significant. This is expected,—the presence of the same number of charter schools within a 2-mile radius as within a 5-mile radius should generate much more opportunities to transfer out of private schools in the former case (assuming that the charter schools are more or less evenly spread out). This general trend is repeated in all of the regressions that we run - while qualitatively similar, the effects from charter competition are economically larger when we consider a smaller distance (1 mile, 2 miles) around private schools instead of a larger distance (5 miles, 10 miles). For brevity, from now on we only report results from regressions using 2 miles as the radius,- the other results are available on request.

Table 3 shows results from running specifications (4) and (5). Here we allow each private school to have a separate pre-program trend - the effects of charter competition are estimated over and above these trends for individual schools. The regressions in columns (1)-(3) control for post-program shocks using year dummies for the post-charter period (specification 4), while the regressions in columns (4)-(6) control for these shocks using common intercept and trend shifts (specification 5). To see whether the effect of charter schools might be trending over time we interact the charter competition variable in each regression with time trend.

The results suggest that competition from charter schools has negatively impacted enrollment in private schools. The coefficients are in most cases negative and statistically significant, and are consistent across the three different measures of competition used. For two of the three competition measures used - presence of charter schools and number of charter schools - the interactions with trend are highly significant, suggesting that as the charter sector grows and becomes more visible, its effect on private schools increases.

Table 4 provides evidence on the heterogeneous effects of charter schools. We run specification (6), controlling as earlier for pre-existing trends of individual private schools and include year dummies to capture any common shocks. In columns (1)-(3) we use the *religious purpose* variable, which takes the value of 1 if the school in question has a religious purpose, 0 otherwise. In columns (4)-(6) we employ the three-way classification of private schools and include dummies for Catholic schools and other religious schools (secular private schools being the omitted category). While the effect on the non-religous private schools remain similar to those in table 3, the results do not provide much evidence that competition from charter schools had a bigger negative effect on religious private schools. While the interaction terms between competition variable and different measures of religiosity are in most cases negative (and often economically meaningful), they are never statistically significant. Also at the risk of foreseeing later results, the coefficients on these interaction terms are not even negative in the instrumental variables results and they are never statistically significant.

5.2 Results from Instrumental Variables Strategy

Tables 5 and 6 show results from running instrumental variables regressions, where we instrument for charter competition (in the above regressions). These regressions continue to include private school fixed effects, while instrumenting for charter school competition. Table 5 shows the first-stage regressions. For brevity we only show the results from the first stage of two regressions (regressions whose second stage results are reported in columns (1) and (2) of Table 6), the other first stage results are qualitatively similar and available on request. Note that we employ two alternate sets of instruments - (i) interactions of the distance of private schools from public universities that had governor appointed boards with post-program year dummies and (ii) interaction of the distance of private schools from public universities with governor appointed boards with program dummy and its interaction with program dummy and trend. Since the results are similar, we only report results from the first set of instruments - the other results are available on

request.

The first stage results are very strong, suggesting that distance from public universities whose boards were appointed by the governor is a good instrument for presence and extent of charter competition. For each of the endogenous regressors, the instruments are highly significant and always have the expected sign (see table 6).

One point might be worth mentioning here. The authorizing universities are pretty evenly spread across the state and no private school is too far from at least one authorizing university. In fact, 75% of the private schools had at least one authorizing university within its thirty miles. In contrast, the authorizing public universities went considerably farther to authorize charter schools. Thus it is unlikely that the results are driven by uneven distribution of private schools with respect to the authorizing universities.

The second stage results on enrollment in private schools show similar patterns to the FE estimates reported above, though the standard errors are larger, as expected.[12] The results show a modest negative effect of charter schools on private school enrollment and the effects are mostly statistically significant. One important feature of the results is that they seem to suggest a temporal component to the effects of charter schools - each of the charter competition variables interacted with trend have statistically significant negative coefficients, implying that charter schools in later years have relatively larger effects on private schools. However, there does not seem to be any differential effect on religious private schools, nor on Catholic private schools.

With an average private school enrollment of 156 students, the coefficient estimates suggest that an additional charter school within its 2-mile radius decreased private enrollment by 1.19% each year. An additional charter student within the same radius decreased private school enrollment by 0.01% (or approximately 0.02 students) each year.

[12] For brevity, we only show results from using the number of charter schools and enrollment in charter schools as our charter competition variables. The results for the presence of charter schools are similar.

It might be worth comparing our results with those obtained in Toma et al. Toma et al. found that for every additional charter student in a charter school, private schools lost 0.31 student. This suggests that the effects we obtain are considerably smaller than that obtained in Toma et al.[13] As outlined in the introduction, our methodology and data differ from theirs in a variety of aspects which might have contributed to the differences in results. For example, since neither private enrollment nor charter enrollment is restricted by county boundaries and families can cross these boundaries to either go to private and charter schools, we use proximity (a certain radius around a private school) rather than county boundaries to define our competition variable. Since charter location is likely endogenous, unlike Toma et al. we use an instrumental variables strategy along with fixed effects to obtain causal estimates. We also control for pre-existing trends of private schools as well as allow for trending effect of charter schools on private school enrollment, unlike Toma et al. These differences might have very well contributed to the differences in results.

6 Robustness Checks

We have carried out several sensitivity analyses to ensure that our results are robust. First, as already mentioned, we used alternate distance measures for our charter competition variable. The results from regressions where we define the charter competition variable around 5 or 10 miles of a private school - instead of 1 or 2 miles - are qualitatively similar, though attenuated as expected. Other sensitivity checks that we have carried out are as follows.

6.1 Controlling for differences in size of private schools

Two robustness checks that we have performed concern the fact that so far we have used only the current year enrollment in a private school as our dependent variable. However, within the

[13] Though we use a 2-mile radius, unlike Toma et al. who use a county-wide measure of charter competition, most of the competitive effects of charter schools are likely to be felt within shorter distances. This is because parents are usually reluctant to travel long distances to commute to school. This is further supported by our finding that the charter effect on private enrollment actually decreases as we consider larger radii.

private school sector, schools differ significantly in size and not controlling for this may bias the results. We use two alternative strategies to deal with this issue. First, we weight the regressions by the inverse of last year's enrollment in the private school. Second, instead of enrollment, we use current year's enrollment as a percentage of last year's enrollment as our dependent variable. The results from these regressions are discussed below.

Table 7 shows results from running the same regressions as in Table 3 except the above changes. The regressions in columns (1)-(4) are weighted by the inverse of last year's enrollment in the private school, while in regressions (5)-(8) we use current year's enrollment as a percentage of last year's enrollment as our dependent variable. For brevity, in this table and the next, we only show results from using the number of charter schools and enrollment in charter schools as our charter competition variables. The results remain qualitatively very similar. They again suggest that charter competition has led to a modest decline in private school enrollment.

Adjusting for private school size, table 8 investigates whether private schools with a religious orientation experienced different effects. Again, results remain qualitatively similar as earlier. While charter competition had similar negative effect on non-religious private schools, there is not much evidence that charters had a differential effect on Catholic schools or other religious schools. While interactions of the charter competition variable with religiosity is in most cases negative, they are always small and never statistically significant.

Table 9 shows results from the IV estimation. For brevity we only show the results when the dependent variable is current year's enrollment as a percentage of last year's enrollment and charter enrollment is the measure of competition.[14] As earlier, the results suggest that charters had a negative effect on regular private school enrollment, but there is not much evidence of differential effect on Catholic or other religious schools.

[14] The results when we use current year's enrollment in a private school as the dependent variable and weight the regressions by the inverse of last year's enrollment are qualitatively similar and available on request. Other measures of competition also yield similar results and are available on request.

6.2 Falsification tests: Testing validity of using distance from public universities as an instrument

Recall that we used the distance from public universities which had governor-appointed boards - and interactions of this variable with time trends - as our instrument to control for possible endogeneity in location of charter schools. One concern here is the fact that these public universities may be located in areas which differ from other areas in characteristics unobservable to the researcher. Though we include school fixed effects in our regressions which absorb all time-invariant characteristics of private schools (and their neighborhoods), there may be time trends in these areas around the time charter schools were set up which in turn may bias our results.

Note, however, that these public universities have been established decades earlier and their locations are thus historically determined. So this is unlikely to introduce bias in our regressions. But we carry out falsification tests using pre-program data to check whether in the immediate pre-charter period areas which were closer to public universities with governor-appointed boards witnessed any differential growth in private school enrollment. That is, we run regressions using data from 1989-90 to 1993-94 where we regress enrollment in a private school on its distance from public universities with governor-appointed boards and interactions of this distance with the time trend. The intuition is that if indeed distance from these public universities affects private school enrollment only through its effect via charter schools, then we should not expect any significant effect in the pre-charter period.

The results are in Table 10. As earlier, we only show results from fixed-effects regressions where the variable of interest is distance from public universities interacted with time trend. (Note that the variable distance from public universities with governor appointed boards is absorbed by fixed effects.) The dependent variables in columns (1) and (2) are private school enrollment. In column (2) we weight the regression by the inverse of last year's enrollment in private school, and in column (3) we use current year's enrollment as a percentage of last year's enrollment as

our dependent variable. There is no evidence of any differential change in enrollment in private schools in the pre-charter period that varies with distance from public universities with governor-appointed boards. The coefficients are small and insignificant, suggesting that such changes were nonexistent or small and unlikely to bias our results.

We also conduct another falsification test to examine the validity of the instrument. Here we use the locations of public universities that do not have governor appointed boards. Note that our identification strategy for the instrumental variables estimation exploits the fact that public universities in Michigan are allowed to grant charters, and universities whose boards are appointed by the governor authorized more than 85 percent of the charter schools during this period (1995-2002), while the other public universities did not authorize any. It might be argued that places which are host to colleges and universities in general are different from other places, particularly in terms of the demographic and socioeconomic composition of their populations, and this may affect both the location decisions of charter schools as well as private school enrollment. However, this effect is unlikely to be different across those public universities that do not have governor-appointed boards, henceforth called non-authorizing public universities, and public universities that do have governor-appointed boards.[15] Therefore, we use the distance from non-authorizing public universities as a robustness check and investigate whether distance from non-authorizing universities also had a similar effect on private enrollment. Note that if indeed charter schools are driving our above results and not characteristics of universities, then we should not expect distances from non-authorizing universities to have any effect on private enrollment.

The results are in Table 11. The presence of non-authorizing public universities does not seem to have had much effect on regular private school enrollments during this period. Though some of the coefficients are negative, they are insignificant and small.

[15] As stipulated in Michigan Constitution (Michigan Constitution, Article 8, sections 5 and 6), the governor appoints board members of only some of the public universities in Michigan, while the boards of the other public universities are elected by the public in statewide elections.

Another point is worth mentioning here. University of Michigan, Ann Arbor and Michigan State University fall in the set of non-authorizing universities. Since these two universities are arguably different from the other public universities, we repeat this exercise after dropping these two universities. The results are similar to above and are available on request.

6.3 Are the estimates biased by the effects of school finance reform (Proposal A) in Michigan?

One factor that might bias the above results is the school finance reform enacted in Michigan during this time. In 1994, Michigan embarked on a comprehensive overhaul of its school finance program when it enacted a new plan called Proposal A. This significantly increased the state share of K-12 spending in all Michigan school districts. It also entailed giving large sums of money to the lowest spending districts, which were allowed to increase their spending at a much faster rate than others. Concurrently, Proposal A also ended local discretion over school spending. It is the state that now decides the amounts by which each school district can raise its expenditures, based on a formula.

However, Proposal A is unlikely to bias our results for several reasons. First, the districts most affected by Proposal A were the ones who were spending at relatively low levels before the reform,- however, these are not the districts which witnessed the rapid spread of charter schools. As Roy (2011) shows, these lowest spending districts are predominantly rural, while charter schools in Michigan mostly serve urban and suburban children and are located in the higher spending districts.[16] In regressions not reported here, we reran our regressions excluding school districts in the lowest spending quintile - the results are qualitatively similar.[17] Second, though

[16] As noted earlier, in 2003-04 only about 20 percent of the charter schools were located in a small town or in rural areas (Michigan Department of Education, 2005).

[17] Some observers argue that school finance reforms, and the associated equalization of per pupil spending, can directly affect private school enrollment. Individual households that value education more may be less able to use Tiebout sorting to achieve their preferred spending levels and thus may have a greater incentive to exit the public system. However, Nechyba (2003) argues that there are two additional effects that may counter this incentive - first,

it is possible for a school finance reform to have broader effects, particularly on socieoeconomic stratification/segregation, studies of Proposal A in Michigan typically find that such effects were modest or small, see Roy (2010), Ferreyra (2009) and Epple and Ferreyra (2008). For example, focusing on the Detroit metropolitan area, both Epple and Ferreyra (2008) and Ferreyra (2009) show that the reform had little impact on neighborhood demographics.

Third, one way to separate out the effect of charter competition from the effect of Proposal A is to exploit the fact that while charter competition is more likely to impact elementary schools (due to the fact that charter schools predominantly serve elementary grades), the effect of Proposal A should be more general and affect all grades. In keeping with this intuition, we next examine whether the enrollment effects at higher levels (middle and high schools) are different from those at elementary level we found above. [18]

Table 12 shows results when the sample is restricted to middle and high schools only. The regressions in columns (1)-(4) estimate the original model, where the dependent variable is enrollment in a private school. In regressions (5)-(6), we use current year's enrollment as a percentage of last year's enrollment as our dependent variable to take account of differences in private school size.[19] The results show that there is not much evidence of a significant effect of charter competition on private school enrollment in middle and high schools. All of the estimated effects are

such equalization of spending may improve public school quality in previously low-spending districts, and second, private school attendees who previously chose to live in poor districts under local public school financing in order to take advantage of depressed housing values and lower property tax payments lose both these incentives under a move to centralized public school financing. The empirical evidence on this is mixed - Downes and Greenstein (1996) find that California experienced a sizeable growth in the number of private schools after its school finance reform while Sonstelie et al. (2000) argue that the move from local to state finance had little impact on private school enrollments in California. Epple and Ferreyra (2008) also argue that the school finance reform in Michigan would have little impact on the allocation of students between public and private schools. Since in Michigan districts most affected by Proposal A were generally not the same ones most affected by charter penetration, it is unlikely that the above mechanisms played any significant role here.

[18] We would like to thank Julie Cullen for suggesting this strategy.

[19] For brevity, in this table, we only show results from using the number of charter schools and enrollment in charter schools as our charter competition variables.

small, often do not have the right sign and never statistically significant.

Table 13 shows the results from the IV estimation. We only show the results using charter school enrollment as the charter competition variable,- the results using other measures of charter competition are qualitatively similar. Again, there is no evidence of charter schools affecting private school enrollment in middle and high schools, all of the coefficients are small and insignificant.

Overall, this implies that there was not much effect of charter schools on private middle and high schools unlike the modest effect on private elementary schools we found earlier. This is expected as most of the charter schools cater to elementary grades and hence there was not much charter competition at the middle and high grades. This result also suggests that our results are not driven by school finance reform, since (unlike charter schools) school finance reform affected all schools similarly.

6.4 Inter-district Choice Program

There is also a small inter-district choice program in Michigan, which was introduced around the same time as charter schools and Proposal A. This allows students to transfer across schools and school districts, but only within the Intermediate School District (ISD) boundaries which are roughly contiguous with counties. However, this program was quite small during the period under consideration here - most districts had either opted out or refused to accept transfer students or set strict limits on the number of transfer students and the grades in which they would be accepted. For example, in 1997-98, only 0.68 percent of all students in Michigan had used this inter-district choice option (Plank and Sykes, 1999).

The presence of this inter-district choice program would have biased our results only if it were true that the areas which witnessed setting up of charter schools were also the areas where this particular choice program was most popular - so that we are mistakingly attributing to charter

schools transfers of students from private schools when in fact these students are leaving private schools to attend public schools in neighboring districts. However, it is unlikely that this has been the case. Further, public school choice has been mainly concentrated in and around Detroit. As Cullen and Loeb (2004, page 242) note, "Student participation in schools of choice has largely been a Detroit phenomenon, with more than one-third of all transfers taking place within the Detroit metropolitan area." To investigate whether the existence of this choice program affected our results, we ran the same regressions as above, but omitting the counties that fall within the Detroit Metropolitan Area (where this program was relatively more popular).

Table 14 shows the results. The first four columns report results from our original specifications, while the regressions in columns (5)-(10) take account of differences in size among the private schools. The dependent variable in columns (1)-(6) and (9) is the current year enrollment in a private school, while the dependent variable in columns (7)-(8) and (10) is current year's enrollment as a percentage of last year's enrollment. The regressions in columns (5), (6) and (9) are weighted by the inverse of last year's enrollment in the private school. As is evident, the results mirror our earlier findings - they show evidence of a negative effect of charter school presence on private school enrollments. This suggests that our results are not biased by the presence of the inter-district choice program, as the relationship between charter schools and private school enrollment trends is very similar even when we exclude schools in and around Detroit, where that program was most concentrated.

6.5 Decline of the auto and manufacturing industry in Michigan

A related concern is the secular decline in auto and manufacturing industries in Michigan throughout the last two and a half decades which may have led to demographic shifts and thus biased our results. To address this, we used the decennial census data to look at the changes in the percentage of workforce employed in manufacturing. The results (not reported here for space

constraints, but available on request) do not suggest much differential movement across Michigan school districts during this period.

Wayne county, which included Detroit, is a hub of manufacturing activity in Michigan. To investigate whether our analysis is being driven by the decline of the auto and manufacturing industry,we repeat our analysis in Section 6 after excluding Wayne county. Our results remain very similar,—this suggests that our results are not being driven by the decline in auto and manufacturing industry. These results are not reported here, but are available on request.

6.6 Are Private School Demographics Affecting Results

As mentioned earlier, data on demographic composition of private schools are available starting only from the 1993-94 school year. To make use of the maximum possible data, the above analysis uses the entire dataset and hence does not control for private school demographics. In this section, we examine the role of private school demographics and assess whether it might have been a confounding factor in the results obtained above. For this purpose, we consider data from the 1993-94 through 2001-02 school years and run two versions of all the above regressions,—the first set runs regressions identical to those above (after adjusting for the shorter time horizon) and the second set adds demographic controls to these set of regressions.

The results from this analysis are presented in table 15. The first panel reports fixed effects results while the second panel reports results from instrumental variables regressions. As can be seen, in each panel the estimates from the regressions that include demographic controls are very similar (both economically and statistically)to those from the regressions that do not include demographic controls for the same time horizon.[20] This gives us confidence that the results reported above are not driven by demographic compositions of private schools.

[20] We have also conducted two versions of all the robustness checks using this shorter time horizon,—where one set included demographic controls while the other did not. The estimates from the former set were indistinguishable (both economically and statistically) from the latter set.

7 Conclusion

The above results suggest that charter competition indeed led to a statistically significant fall in private school enrollment, but the size of the effect is modest. For example, results from instrumental variables regressions suggest that an additional charter school in the near vicinity of a private school decreased private enrollment by 1.19% each year. An additional charter student within the same radius decreased private school enrollment by 0.01% (or approximately 0.02 students) each year. On the other hand, there is not much evidence that charter competition hit Catholic or other religious school enrollment harder. The results are robust to employing alternate measures of competition, controlling for individual pre-charter trends of the private schools, instrumenting for charter school location (using exogenous variation from Michigan charter law) and a variety of other sensitivity checks.

It is interesting to observe here that these results go against general public perception (often reflected in the media) that charter schools are draining private enrollment, and especially Catholic enrollment. For example, Sarah Scheitzer notes, "Nationwide, about 10% of the charter school student population came from private schools in 2000" (Scheitzer, Sarah, St. Petersburg Times, 2000). Reverend Ronald J. Nuzzi, the director of the Alliance for Catholic Education leadership program at the University of Notre Dame, called charters "one of the biggest threats to Catholic schools in the inner city, hands, down" (Scott Cech, Education Week, 2008). The reason behind this apparent inconsistency may be the quality of charter schools. It is possible that the charter schools in Michigan were not good enough or did not appeal to the private school parents enough. This hypothesis is consistent with the findings of Bettinger (2005) where he finds that test scores of charter school students in Michigan did not improve and may have actually fallen relative to their counterparts in public schools.

Still another reason may be that raw enrollment numbers (as is often cited in the media) do not always tell the whole story. Enrollment levels in charter and private schools do not reflect

causal trends. These numbers may be caused (or affected) by pre-existing trends in private enrollment, regular mobility of students between schools, and state or district wide policies or events. Furthermore, the location of charter schools is not random. These factors are not accounted for when simply looking at the raw enrollment numbers. Similarly, the decline in Catholic school enrollment (often reported in the media) does not necessarily imply that charter schools caused the change. The decline in Catholic school enrollment could be a part of a larger trend ,—the result of recent tuition increases in Catholic schools or recent scandals in the Catholic Church. As Reverend Nuzzi noted, "Catholic school tuition, once very low, has had to increase over the years, and now runs thousands of dollars a year". "The increased tuition", he said,"is needed to pay for lay teachers, who earn salaries much closer to public school teachers than the pay provided the teaching nuns of decades past" (Scott Cech, Education Week, 2008). Catholic schools are often seen as an attractive alternative to secular private schools because of their lower tuition costs, so the recent increases are likely to make Catholic schools less desirable. Rigorous empirical analysis aimed at ruling out other potential confounding papers done in this paper reveals that at least in Michigan charters did not lead to a relative decline in Catholic school enrollment and the impact on general private school enrollment, though negative was modest.

It might be worth discussing a little bit as to what the above analysis reveals relating to the relative attractiveness of public and charter schools,as perceived by private school parents. Some private school parents preferred charter to public, as revealed by the move away from private. But the effect is modest implying that private school parents did not overwhelmingly favor charter over public school. It is comforting to see that parental valuations matched well with the objective relative measures of quality found in Bettinger (2005). To summarize, the findings of this paper suggest that, at least in Michigan, the private school parents did not perceive charter schools as a considerably improved alternative over the regular public schools.

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Table 1: Spread of Charter Schools in Michigan
(1995-96 to 2001-02)

Year	Number of Charter Schools	Total Enrollment in Charter Schools
1995-96	33	4,449
1997-98	108	21,175
1999-00	176	46,833
2001-02	202	64,103

Source: Authors' calculations from Bulletin 1014's issued by the Michigan Department of Education.

Table 2: Effect of Charter Competition on Private School Enrollment

(Using PSS data, 1989-90 to 2001-02)

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Charter Presence	-18.16***			-6.02		
	(4.54)			(3.88)		
Number of Charter Schools		-5.66***			-1.62***	
		(1.14)			(0.37)	
Charter Enrollment			-0.015***			-0.004***
			(0.003)			(0.001)
Controls for pre-existing trends	N	N	N	N	N	N
Year Dummies	Y	Y	Y	Y	Y	Y
Observations	6625	6625	6625	6625	6625	6625
R-squared	0.95	0.95	0.95	0.95	0.95	0.95

Notes: See specification (1) in the text. The dependent variable is the enrollment in a private school. The first three columns (marked (1)-(3)) are from regressions where we use charter school competition within 2 miles of a private school as our main variable of interest, while columns (4)-(6) are from regressions where we use 5 miles as the radius. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 3: Effect of Charter Competition on Private School Enrollment: Allowing for differential pre-program trends, trending effect of charter schools and post-program common shocks

(Using PSS data, 1989-90 to 2001-02)

	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)
Charter Presence	2.62			2.32		
	(3.21)			(2.85)		
Charter Presence * Trend	-6.31***			-6.83***		
	(1.59)			(1.51)		
Number of Charter Schools		-1.94**			-0.99	
		(0.94)			(0.97)	
Number of Charter Schools * Trend		-0.58*			-0.85***	
		(0.34)			(0.27)	
Charter Enrollment			-0.019**			-0.015*
			(0.007)			(0.008)
Charter Enrollment * Trend			0.001			-0.001
			(0.001)			(0.002)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	N	N	N
Program and Program Trend Interations	N	N	N	Y	Y	Y
Observations	5405	5405	5405	5405	5405	5405
R-squared	0.96	0.96	0.96	0.96	0.96	0.96

Notes: See specifications (4) and (5) in the text. The dependent variable is the enrollment in a private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 4: Effect of Charter Competition on Private School Enrollment: Do Private Schools with Religious Purpose or Orientation have Different Effects?

(Using PSS data, 1989-90 to 2001-02)

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Charter Presence	6.70			6.98		
	(7.48)			(7.25)		
Charter Presence * Trend	-6.24***			-6.32***		
	(1.60)			(1.53)		
Charter Presence * Religious Purpose	-4.79					
	(7.27)					
Charter Presence * Catholic				-8.54		
				(6.48)		
Charter Presence * Other Religious				-1.16		
				(10.77)		
Number of Charter Schools		-1.63			-1.67	
		(1.93)			(1.92)	
Number of Charter Schools * Trend		-0.58*			-0.55*	
		(0.32)			(0.33)	
Number of Charter Schools * Religious Purpose		-0.36				
		(2.16)				
Number of Charter Schools * Catholic					-2.16	
					(1.78)	
Number of Charter Schools * Other Religious					1.97	
					(3.16)	
Charter Enrollment			-0.010*			-0.017***
			(0.006)			(0.006)
Charter Enrollment * Trend			0.001			0.000
			(0.002)			(0.001)
Charter Enrollment * Religious Purpose			-0.002			
			(0.005)			
Charter Enrollment * Catholic						-0.007
						(0.004)
Charter Enrollment * Other Religious						0.003
						(0.007)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
Observations	5405	5405	5405	5405	5405	5405
R-squared	0.96	0.96	0.96	0.96	0.96	0.96

Notes: See specification (6) in the text. The dependent variable is the enrollment in a private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 5: First-Stage IV Regressions

(Using PSS data, 1989-90 to 2001-02)

	Dependent Variable	Dependent Variable	Dependent Variable	Dependent Variable
	Number of Charter Schools	Number of Charter Schools * Trend	Charter Enrollment	Charter Enrollment * Trend
	FE	FE	FE	FE
	(1)	(1)	(2)	(2)
Distance * Year 1996	-0.020***	-0.022	-2.23	-2.55
	((0.007)	(0.024)	(2.29)	(8.72)
Distance * Year 1998	-0.044***	-0.088***	-6.34***	-12.57
	(0.007)	(0.025)	(2.36)	(8.99)
Distance * Year 2000	-0.063***	-0.187***	-15.37***	-45.91***
	(0.007)	(0.026)	(2.47)	(9.38)
Distance * Year 2002	-0.068***	-0.269***	-23.43***	-93.19***
	(0.007)	(0.027)	(2.49)	(9.50)
Controls for pre-existing trends	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y
Observations	5392	5392	5392	5392
R-squared	0.09	0.11	0.29	0.09

Notes: The table shows the first-stage regressions corresponding to the first two IV regressions reported in Table 7. The columns marked (1) correspond to the first regression (column (1)) of Table 6 and the columns marked (2) correspond to the second regression (column (2)) of Table 6. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The first stage regressions for the other regressions reported in Table 7 are similar and hence not reported separately.

Table 6: Effect of Charter Competition on Private School Enrollment: Results from IV estimation

(Using PSS data, 1989-90 to 2001-02)

	FE-IV (1)	FE-IV (2)	FE-IV (3)	FE-IV (4)	FE-IV (5)	FE-IV (6)
Number of Charter Schools	4.90		6.20		6.27*	
	(3.10)		(3.42)		(3.41)	
Number of Charter Schools * Trend	-1.85**		-1.30		-1.31	
	(0.88)		(1.01)		(1.01)	
Number of Charter Schools * Religious Purpose			1.53			
			(1.64)			
Number of Charter Schools * Catholic					0.25	
					(1.65)	
Number of Charter Schools * Other Religious					2.94	
					(1.89)	
Charter Enrollment		0.03		0.05		0.05
		(0.02)		(0.03)		(0.03)
Charter Enrollment * Trend		-0.01**		-0.015**		-0.015**
		(0.004)		(0.007)		(0.007)
Charter Enrollment * Religious Purpose				0.008		
				(0.007)		
Charter Enrollment * Catholic						0.002
						(0.007)
Charter Enrollment * Other Religious						0.015*
						(0.008)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
p-value of excluded instruments in stage 1	0.00	0.00	0.00	0.00	0.00	0.00
Observations	5392	5392	5392	5392	5392	5392
R-squared	0.82	0.82	0.82	0.79	0.81	0.77

Notes: The dependent variable is the enrollment in a private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 7: Effect of Charter Competition on Private School Enrollment: Robustness Checks
(Is Private School Size Driving the Results? Using Two Strategies to Adjust for Differences in Private School Size)

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)	FE (8)
Number of Charter Schools	1.27		1.83		-0.57		-0.31	
	(1.07)		(1.06)		(2.53)		(3.24)	
Number of Charter Schools * Trend	-1.10***		-1.26***		-0.41		-0.47	
	(0.29)		(0.27)		(0.58)		(0.50)	
Charter Enrollment		0.002		0.005		0.001		0.002
		(0.008)		(0.008)		(0.010)		(0.10)
Charter Enrollment * Trend		-0.002		-0.003*		-0.001		-0.002
		(0.002)		(0.002)		(0.001)		(0.002)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	N	N	Y	Y	N	N
Program and Program Trend Interations	N	N	Y	Y	N	N	Y	Y
Observations	4496	4496	4496	4496	4496	4496	4496	4496
R-squared	0.96	0.96	0.96	0.96	0.23	0.23	0.23	0.23

Notes: The dependent variable in columns (1)-(4) is the current year enrollment in a private school, while the dependent variable in columns (5)-(8) is current year's enrollment as a percentage of last year's enrollment. The regressions in columns (1)-(4) are weighted by the inverse of last year's enrollment of the private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 8: Effect of Charter Competition on Private School Enrollment: Do Private Schools with Religious Purpose or Orientation have Different Effects?

(Is Private School Size Driving the Results? Using Two Strategies to Adjust for Differences in Private School Size)

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)	FE (8)
Number of Charter Schools	0.65		0.50		0.98		0.99	
	(1.19)		(1.22)		(2.38)		(2.40)	
Number of Charter Schools * Trend	-1.13***		-1.03**		-0.40		-0.39	
	(0.30)		(0.31)		(0.56)		(0.55)	
Number of Charter Schools * Religious Purpose	0.88				-1.75			
	(1.70)				(2.65)			
Number of Charter Schools * Catholic			-2.65				-2.18	
			(1.85)				(2.40)	
Number of Charter Schools * Other Religious			3.47				-1.21	
			(1.93)				(3.05)	
Charter Enrollment		0.001		0.001		0.007		0.007
		(0.004)		(0.004)		(0.009)		(0.009)
Charter Enrollment * Trend		-0.002		-0.002		-0.001		-0.002
		(0.002)		(0.001)		(0.001)		(0.001)
Charter Enrollment * Religious Purpose		0.001				-0.007		
		(0.005)				(0.006)		
Charter Enrollment * Catholic				-0.009				-0.010
				(0.06)				(0.007)
Charter Enrollment * Other Religious				0.008				-0.004
				(0.005)				(0.005)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	N	N	Y	Y	N	N
Program and Program Trend Interations	N	N	Y	Y	N	N	Y	Y
Observations	4496	4496	4496	4496	4496	4496	4496	4496
R-squared	0.96	0.96	0.96	0.96	0.23	0.23	0.23	0.23

Notes: The dependent variable in columns (1)-(4) is the current year enrollment in a private school, while the dependent variable in columns (5)-(8) is current year's enrollment as a percentage of last year's enrollment. The regressions in columns (1)-(4) are weighted by the inverse of last year's enrollment of the private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 9: Effect of Charter Competition on Private School Enrollment: Robustness Checks (continued)
Is Private School Size Driving the Results? Results from IV Estimation

	Dep. var. = Current Enrollment as % of last year's			
	FE-IV (1)	FE-IV (2)	FE-IV (3)	FE-IV (4)
Charter Enrollment	0.035	0.039	0.031	0.031
	(0.027)	(0.028)	(0.028)	(0.028)
Charter Enrollment * Trend	-0.007	-0.013*	-0.013*	-0.013*
	(0.007)	(0.007)	(0.007)	(0.007)
Charter Enrollment * Religious Purpose			-0.001	
			(0.003)	
Charter Enrollment * Catholic				-0.004
				(0.002)
Charter Enrollment * Other Religious				0.002
				(0.005)
Controls for pre-existing trends	Y	Y	Y	Y
Year dummies	Y	N	Y	Y
Program and Program Trend Interactions	N	Y	N	N
p-value of excluded instruments in stage 1	0.00	0.00	0.00	0.00
Observations	4488	4488	4488	4488

Notes: *, **, ***: significant at the 10, 5, and 1 percent level, respectively. The standard errors, shown in parenthesis, are robust to heteroscedasticity and are clustered at the county level. The dependent variable is the current year's enrollment as a percentage of last year's enrollment.

Table 10: Using Pre-Program Data to do Falsification Tests: Testing Exogeneity of Instruments

(Results from using PSS data, 1989-90 to 1993-94)

	FE	FE	FE
	(1)	(2)	(3)
Distance * Trend	-0.009	-0.062	0.066
	(0.060)	(0.043)	(0.116)
Observations	2695	1581	1581
R-squared	0.98	0.99	0.83

Notes: The dependent variable in columns (1) and (2) is the current year enrollment in a private school, while the dependent variable in column (3) is current year's enrollment as a percentage of last year's enrollment. The regression in column (2) is weighted by the inverse of last year's enrollment of the private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county.

Table 11: Is distance from the authorizing public universities driving results? Robustness check using distance from non-authorizing public universities

	Dep. var. = Number of Students				Dep. var. = Current Enroll. as % of last year's			
	FE	FE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance from non-authorizer * Program	-0.025	-0.024	0.060	0.061	-0.018	-0.018	0.013	0.012
	(0.021)	(0.021)	(0.036)	(0.037)	(0.058)	(0.058)	(0.115)	(0.115)
Distance from non-authorizer * Program * Trend	-0.020	-0.020	-0.020	-0.020	0.021	0.021	0.021	0.021
	(0.012)	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.015)	(0.015)
Distance from non-authorizer * Program * Religious Purpose			-0.057				-0.032	
			(0.039)				(0.091)	
Distance from non-authorizer * Program * Catholic				-0.087				-0.018
				(0.057)				(0.091)
Distance from non-authorizer * Program * Other Religious				-0.069				-0.042
				(0.046)				(0.094)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	N	Y	Y	Y	N	Y	Y
Program and Program Trend Interations	N	Y	N	N	N	Y	N	N
Observations	5392	5392	5392	5392	4486	4486	4486	4486
R-squared	0.96	0.96	0.96	0.96	0.23	0.23	0.23	0.23

Notes: *, **, ***: significant at the 10, 5, and 1 percent level, respectively. The standard errors, shown in parenthesis, are robust to heteroscedasticity and are clustered at the county level. The dependent variable in columns (1)-(4) is the current year enrollment in a private school, while the dependent variable in columns (5)-(8) is current year's enrollment as a percentage of last year's enrollment.

Table 12: Robustness Test Using Middle and High Schools:
Analyzing Effects of Charter Competition on Private Enrollment in Middle and High Schools

	Dep. var. = Number of Students				Dep. var. = Current Enroll. as % of last year's	
	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Charter Schools	-6.54		-3.62			
	(9.95)		(9.39)			
Number of Charter Schools * Trend	2.88		2.02			
	(3.29)		(3.12)			
Charter Enrollment		0.004		0.013	0.010	0.009
		(0.024)		(0.015)	(0.008)	(0.007)
Charter Enrollment * Trend		0.000		-0.002	-0.003	-0.003
		(0.005)		(0.003)	(0.002)	(0.002)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	N	N	Y	N
Program and Program Trend Interactions	N	N	Y	Y	N	Y
Observations	477	477	477	477	399	399
R-squared	0.96	0.96	0.96	0.96	0.64	0.64

Notes: *, **, ***: significant at the 10, 5, and 1 percent level, respectively. The standard errors, shown in parenthesis, are robust to heteroscedasticity and are clustered at the county level. The dependent variable in columns (1)-(4) is the current year enrollment in a private school, while the dependent variable in columns (5)-(6) is current year's enrollment as a percentage of last year's enrollment.

Table 13: Robustness Test Using Middle and High Schools FE-IV (continued)
Results from IV estimation

	Dep. var. = Number of Students		Dep. var. = Current Enroll. as % of last year's	
	FE-IV	FE-IV	FE-IV	FE-IV
	(1)	(2)	(3)	(4)
Charter Enrollment	0.094	0.034	-0.016	0.003
	(0.095)	(0.065)	(0.026)	(0.007)
Charter Enrollment * Trend	-0.020	-0.004	0.003	-0.001
	(0.026)	(0.007)	(0.007)	(0.001)
Controls for pre-existing trends	Y	Y	Y	Y
Year dummies	Y	N	Y	N
Program and Program Trend Interactions	N	Y	N	Y
p-values of excluded instruments in stage 1	0.00	0.00	0.00	0.00
Observations	477	477	399	399

Notes: *, **, ***: significant at the 10, 5, and 1 percent level, respectively. The standard errors, shown in parenthesis, are robust to heteroscedasticity and are clustered at the county level. The dependent variable in columns (1)-(2) is the current year enrollment in a private school, while the dependent variable in columns (3)-(4) is current year's enrollment as a percentage of last year's enrollment.

Table 14: Is Interdistrict School Choice Driving Results?
(Analysis Using Counties Outside the Detroit Metropolitan Area)

					Taking Care of Private School Size					
	FE	FE	FE-IV	FE-IV	FE	FE	FE	FE	FE-IV	FE-IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Number of Charter Schools	-1.438*		8.388		2.927		-9.501			
	(0.848)		(5.205)		(3.559)		(10.990)			
Number of Charter Schools * Trend	-0.640***		-2.452		-1.848*		1.714			
	(0.220)		(1.527)		(1.009)		(2.591)			
Charter Enrollment		-0.014**		0.098		-0.011		-0.028*	0.211	0.019
		(0.007)		(0.205)		(0.015)		0.017	(0.145)	(0.112)
Charter Enrollment * Trend		0.001		-0.025		0.000		0.006	-0.046	-0.001
		(0.001)		(0.056)		(0.004)		(0.005)	(0.038)	(0.027)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Program and Program Trend Interations	N	N	N	N	N	N	N	N	N	N
p-values of excluded instruments in stage 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	3422	3422	3409	3409	2862	2862	2862	2862	2852	2852
R-squared	0.969	0.968		0.861	0.961	0.961	0.249	0.249		

Notes: *, **, ***: significant at the 10, 5, and 1 percent level, respectively. The standard errors, shown in parenthesis, are robust to heteroscedasticity and are clustered at the county level. The dependent variable in columns (1)-(6) and (9) is the current year enrollment in a private school, while the dependent variable in columns (7)-(8) and (10) is current year's enrollment as a percentage of last year's enrollment.

Table 15: Investigating the Role of Private School Demographics as a Confounding Factor: Comparing results with & without demographic controls (PSS data 1993-94 to 2001-02)

	No Demographic Controls				Includes Demographic Controls			
Panel A	FE	FE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Charter Schools	3.073*		3.110*		3.451**		3.546**	
	(1.620)		(1.577)		(1.664)		(1.569)	
Number of Charter Schools * Trend	-1.504***		-1.469***		-1.614***		-1.588***	
	(0.359)		(0.355)		(0.404)		(0.391)	
Number of Charter Schools * Religious Purpose	-2.311				-2.223			
	(1.784)				(1.684)			
Number of Charter Schools * Catholic			-5.014***				-4.996***	
			(1.536)				(1.457)	
Number of Charter Schools * Other Religious			1.002				1.172	
			(2.725)				(2.606)	
Charter Enrollment		0.007		0.009		0.010		0.011*
		(0.007)		(0.007)		(0.007)		(0.007)
Charter Enrollment * Trend		-0.002		-0.002		-0.002		-0.003
		(0.002)		(0.002)		(0.002)		(0.002)
Charter Enrollment * Religious Purpose		-0.010**				-0.010**		
		(0.004)				(0.004)		
Charter Enrollment * Catholic				-0.018***				-0.018***
				(0.004)				(0.004)
Charter Enrollment * Other Religious				-0.002				-0.002
				(0.005)				(0.005)
Observations	3764	3764	3764	3764	3764	3764	3764	3764
	No Demographic Controls				Includes Demographic Controls			
Panel B	FE-IV	FE-IV	FE-IV	FE-IV	FE-IV	FE-IV	FE-IV	FE-IV
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Number of Charter Schools	5.972		6.156		6.045		6.253	
	(3.829)		(3.817)		(3.846)		(3.836)	
Number of Charter Schools * Trend	-1.347		-1.340		-1.422		-1.423	
	(1.076)		(1.063)		(1.090)		(1.078)	
Number of Charter Schools * Religious Purpose	1.782				2.043			
	(1.977)				(1.991)			
Number of Charter Schools * Catholic			-0.040				0.200	
			(1.993)				(2.000)	
Number of Charter Schools * Other Religious			3.453				3.737	
			(2.286)				(2.312)	
Charter Enrollment		0.056*		0.057*		0.057*		0.059*
		(0.031)		(0.031)		(0.031)		(0.032)
Charter Enrollment * Trend		-0.015*		-0.015*		-0.016*		-0.016*
		(0.009)		(0.009)		(0.009)		(0.009)
Charter Enrollment * Religious Purpose		0.009				0.010		
		(0.009)				(0.009)		
Charter Enrollment * Catholic				0.001				0.002
				(0.009)				(0.009)
Charter Enrollment * Other Religious				0.017				0.018*
				(0.011)				(0.011)
Observations	3755	3755	3755	3755	3755	3755	3755	3755

Notes: The dependent variable is the enrollment in a private school. *, ** and *** denote significance at the 10, 5, and 1 percent levels, respectively. The standard errors, shown in parentheses, are robust to heteroscedasticity and are clustered at the county level to control for serial correlation across observations for the same county. All regressions control for preexisting trends and include year dummies.

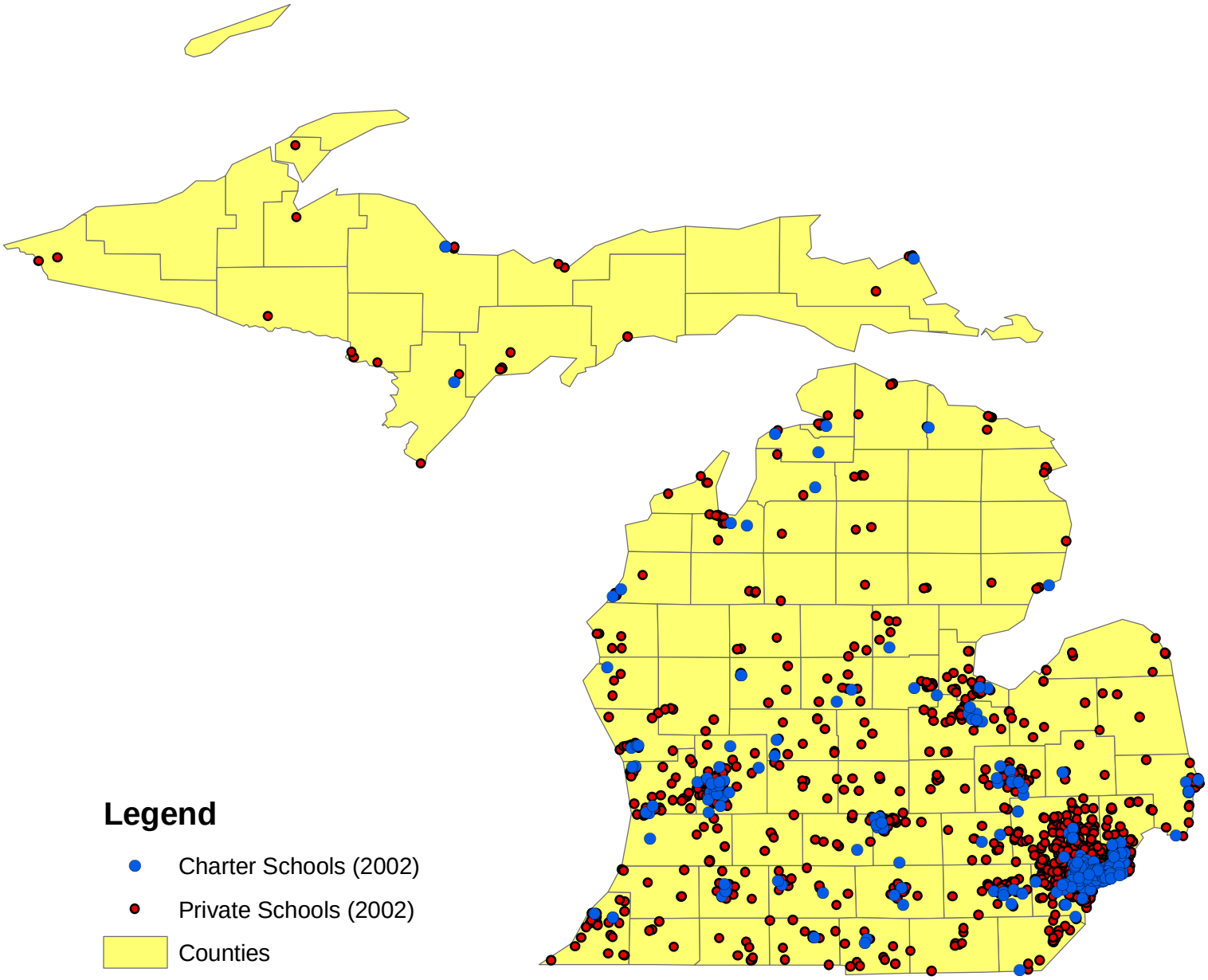

Figure 1. Michigan Charter and Private Schools (2002)

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