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## Do charter schools crowd out private school enrollment? Evidence from Michigan

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Do Charter Schools Crowd Out Private School Enrollment?  
Evidence from Michigan

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Joydeep Roy

Staff Report no. 472  
September 2010

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## **Do Charter Schools Crowd Out Private School Enrollment? Evidence from Michigan**

Rajashri Chakrabarti and Joydeep Roy

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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 4,500 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 the 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 decennial censuses and 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 some evidence of a decline in enrollment in private schools - but the effect is only modest in size. This finding is reasonably robust, and survives several robustness checks.

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 4000 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).<sup>1</sup>

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<sup>1</sup> 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.

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

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 an improved alternative compared to the regular public school then some households, who were earlier sending their kids to private schools, would now take advantage of this and switch from private to charter schools. Thus, the study relies on parental valuations of the different kinds of schools to assess the relative effectiveness of charter schools, and is the first study to point out that enrollment patterns can be used to study the relative effectiveness and parental valuation of the different kinds of schools.

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, like those parents enrolling their children in charter schools, they may be more sensitive to school quality, and arguably more motivated. Thus, decisions by families who have children

currently enrolled in private schools may be more informative from this perspective and important from a policy point of view, which is why we focus on moves from private schools facing charter penetration (if any) in this paper.

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 or private schools (net of cost), 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 - this may explain the relatively high rates of mobility often seen in charter schools, at least initially.

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. Using decennial data on private school enrollment from the censuses and biennial data on the same from private school surveys conducted by the U.S. Department of Education, and using a fixed effects as well as instrumental variables strategy that exploits exogenous variation from the Michigan charter law, 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 impacts enrollment in

private schools, but the effect is mostly modest in size and often not robust. This is particularly true in the analyzes using biennial data on private schools. The coefficients are in most cases negative, but often not significant at conventional levels of statistical significance. We get similar results when we control for individual pre-charter trends of the private schools. We also find some evidence that as the charter sector grows and becomes more visible, its effect on private schools increases. Moreover, disaggregating private schools in terms of their religious orientation, we find in the fixed effects analysis that competition from charter schools may have had a slightly bigger negative effect on religious private schools, though the coefficients are not always significant at traditional levels of significance. When we further break down the religious private schools into Catholic schools and other religious schools, we find that most of the negative effect for religious schools, if any, is concentrated in the Catholic schools.<sup>2</sup> The differential effect on religious and catholic schools do not however survive in the instrumental variables analysis.

Charter schools are not randomly set up across school districts,- instead, opening a charter is the result of a conscious and deliberate choice by relevant agents and is likely to depend on the characteristics of nearby schools, both private and public. To address this concern about endogenous location of charter schools, we use an instrumental variables strategy, exploiting a specific feature of Michigan's charter law, following Bettinger (2005). The results from this exercise are qualitatively similar - the presence of charter schools leads to a modest, decline in enrollment in neighboring private 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 (see, for example, Hoxby and Rockoff (2004), Bettinger (2005), Booker et al. (2007), Bifulco and Ladd

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<sup>2</sup> There is some anecdotal evidence that the presence of charter schools has negatively impacted enrollment in private schools, particularly Catholic ones in inner cities. The Rev. Ronald J. Nuzzi, the director of the Alliance for Catholic Education leadership program at the University of Notre Dame, had said that charter schools are "one of the biggest threats to Catholic schools in the inner city, hands down," see Cech (2008).

(2006), Sass (2006) and Hoxby and Murarka (2007)); or the competition effect on surrounding regular public schools (see, for example, Hoxby (2002), Bettinger (2005), Sass (2006) and Booker et al. (2008)), or the effects on sorting of students across public and charter schools, particularly based on racial composition (Dee and Fu, 2004). This is one of the few studies which analyze the enrollment effects of charter schools.

This paper is most closely related to Toma et al. (2006) who also look at the enrollment consequences of charter schools in Michigan. Using data from the Michigan Department of Education and from the private school surveys, they find that charter schools are attracting a significant number of students from the private sector. Their results suggest that approximately 17 percent of the students who enroll in charter schools were previously enrolled in private schools, while approximately 83 percent of the charter students had moved from a public school. The present paper differs from this study in some fundamental ways. First, while we use data from 1989-90 through to 2001-02, Toma et al. only use data from 1994-95 through to 1998-99.<sup>3</sup> 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).<sup>4</sup> Second, 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 variable strategy by exploiting exogenous variation in Michigan's charter school law. Third, unlike Toma et al. we estimate multiple specifications and several robustness checks to ensure the validity of our results. For example, we

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<sup>3</sup> 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.

<sup>4</sup> When we include the number of years a charter school has been in operation as an additional explanatory variable, we find that indeed as the charter sector expands and becomes more numerous and visible, its effect on enrollment in private schools increases.



experiment with multiple ways of measuring the extent of competition from charter schools, and we breakdown private schools into secular schools and parochial schools (and parochial schools into Catholic schools and other religious schools). Our results suggest that charter schools may have had a differential effect on religious private schools compared to secular ones, with most of the effect on religious schools stemming from the effect on Catholic schools. Fourth, 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 with private school surveys 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. Fifth, unlike Toma et al. we use geocoding procedures to map the location of every charter and private school and find the respective distances among them. This allows for a much more exact delineation of the competitive effects of charter schools, since we can accurately compute the number of charter schools, charter enrollment etc. within a specified distance (1 mile, 2 miles, 5 miles, etc.) of each private school. 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 use parental valuations of the different kinds of schools to argue that such transfer of students suggests that parents prefer charter schools to the neighboring regular public school. We argue that movements of students between schools contain important information relating to the parental valuation of schools and this allows us to make judgments as to the relative attractiveness of these schools, as perceived by parents.

The rest of the paper is organized as follows. In section 2 we outline the basic intuition behind our assertion that transfer of students from private to charter schools contains important information regarding the relative attractiveness of charter schools vis-a-vis regular public schools. We

also set up a simple neoclassical framework which formalizes this intuition. Section 3 describes charter schools in Michigan. Section 4 discusses the various sources of the data used. In section 5 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 6, with further robustness checks and discussion in section 7. Section 8 concludes, by summarizing the results and policy implications and outlining directions for future work.

## **2 Theoretical Background**

The theoretical intuition can be briefly laid down as follows: Since private schools require a tuition payment and hence are costly to attend, unlike public schools, families choose private schools only if they strictly prefer the private schools to the public schools. In other words, private schools are expensive, so they are an attractive option only when the differential in quality or attractiveness between them and the regular public schools is sufficiently high. Now with the entry of charter schools, which are publicly financed and barred from charging any tuition, the households have an additional option. If the charter schools are perceived to be an improved alternative over existing public schools, some private school households will find it worthwhile to switch from private to charter schools. More specifically, some of the households who were earlier sending their children to private schools but were doing so marginally - that is, the households for whom the extra benefits of private schooling only slightly outweighed the extra costs of private school tuition - might now take advantage of the growth of charter schools. However, there will be an actual transfer of students from private schools to charters only if the charter school is perceived to be an improved alternative over public schools. In this case, charter penetration will be associated with a fall in private school enrollment. Thus private school enrollment patterns in the presence of charter penetration contain important information relating to the relative quality of charter and public schools.

In other words, we argue that the revealed preference approach to consumer demand implies that there will be a movement of students from private schools to charter schools, but only if these charter schools are perceived to be better than the regular public schools. Note that such a movement does not necessarily imply that the charter schools are better than the private schools - since private schools require a tuition payment while charter schools are free.

To see this more formally, we set up the following simple model where utility-maximizing households choose between private schools, regular public schools and charter schools, taking into account the quality of each type of school and the cost of attending it. Let there be a continuum of households with school-age children, distributed over the unit interval  $[0,1]$  according to their income  $y$ . Utility of a household depends on the quality of the school its kids attend, and its consumption of “all other goods”.<sup>5</sup> The household utility function - given by  $U(x, q)$ , where  $x$  is consumption of all other goods and  $q$  is the quality of the education that it gets - is assumed to be continuous, twice differentiable and concave in each of its arguments.

Let us assume that in the initial scenario the household faces a choice between a private school and a public school. The public school is free, but households attending the private school have to pay a tuition of  $t$ . Thus the income available to households who send their kids to private schools is  $y - t$ , while that available to households who remain in the public sector is  $y$ .<sup>6</sup> Let the private school quality be denoted by  $q^{pr}$ , while the public school quality be  $q^{pub}$ . The utility function of a household which sends its kid to private school will be  $U(y - t, q^{pr})$ , while that of a household whose child attends public school is given by  $U(y, q^{pub})$ .

Since education is a normal good, higher income people will be inclined to spend more for

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<sup>5</sup> The ‘quality’ of a school should be broadly interpreted in terms of the characteristics that households value, and not only in terms of academic achievement (though that can be one of the most important components).

<sup>6</sup> In reality the costs of public schooling are borne by residents of the school district, though a significant part comes from the state (the federal government pays a small portion too). Since this cost is given for the households and does not depend on whether it sends its kids to public school or private school, we abstract from this for simplicity - incorporating this does not change any of the results.

better school quality. Under this circumstance, at equilibrium, we will have sorting by income in the schooling market, in the sense that if a household with income  $y^j$  attends a private school, then household with income higher than  $y^j$  will also do so. Conversely, if a household with income  $y^k$  remains in the public school, then every household with income lower than  $y^k$  will also do so.<sup>7</sup> Let the household which is indifferent between the regular public school and the private school alternative be denoted by  $y^*$ . For this household,  $U(y^* - t, q^{pr}) = U(y^*, q^{pub})$ , that is, the extra benefits from a higher school quality in the private sector is just offset by the extra costs of having to pay tuition for the same.

Charter schools are open to all who reside in the school district and charter schools cannot charge a tuition fee, we can model the introduction of a charter school as a change in the public school quality in the district. Note that if charter school quality is perceived to be lower than the existing public school quality  $q^{pub}$ , then there is no change in the distribution of students (everyone who was attending a private school continues to do so, similarly for students attending the regular public school.) However, if the charter school is perceived to provide a better quality than that in the existing public school, then there will be a transfer of some students from private schools to charters. To see this, note that since the utility function is twice continuously differentiable, we can use the implicit function theorem to write  $y^* = y^*(t, q^{pr}, q^{pub})$ , where  $y^*$  denotes the income of the household which is indifferent between the public and private schools. It can be shown that  $dy^*/dq^{pub} > 0$ ,<sup>8</sup> which implies that after an increase in public school quality - equivalently, the introduction of a charter school which yields higher quality than the existing public school quality  $q^{pub}$  - it is a higher-income household who is indifferent between the private and public schools. Combined with the sorting result above, this implies that after the introduction of a charter school

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<sup>7</sup> To see this, define  $D = U(y - t, q^{pr}) - U(y, q^{pub})$ . It is easily seen that  $dD/dy > 0$ , which implies stratification by income.

<sup>8</sup> This follows because  $dy^*/dq^{pub} = (dU/dq)/(dU/dy(y - t, q^{pr}) - dU/dy(y, q^{pub})) > 0$ . (Since marginal utility is diminishing in consumption, the denominator is positive.)

which is better than the existing regular public school, there is a transfer of students from the private school into the charter school.

For simplicity we have abstracted from several things in this simple model. First, the above framework can easily incorporate multiple private schools with different levels of school quality and hence different tuition levels - the basic intuition that there will be a transfer of students to charter schools only if charter school quality is higher than the existing public school quality still goes through. Second, it is possible that the setting up of charter schools generates competitive pressures and that public schools respond by increasing their school quality. Again, it will still be the case that students transfer from private schools to charters only if they value the charters more than the improved regular public school. Third, this model assumes that the only difference between families sending their children to private schools and those sending their children to public schools is that the former have higher incomes. But it is possible that these families differ in other respects too, for example, with respect to parental education or motivation, children's ability, etc. However, the basic intuition that there is a transfer of students from private schools to charter schools only if the charter schools are considered better alternatives to the regular public schools, still holds good. Third, since in the U.S. a significant part of school revenues is raised locally, it might be the case that there are families who first decide on whether to choose a private school (instead of the available public schools). Once they decide in favor of a private school, these families might decide to stay in a school district with less revenues raised locally, since additional school spending on public school children imposes a cost on these families but do not directly benefit them. Even in such cases, however, it will be true that a transfer of students from private schools to charter schools takes place only if the charter school is preferred to the regular public school. Fourth, school quality here is assumed to be a unidimensional entity. However, quality is likely to be multidimensional and different households are likely to care about different aspects of it. Again, this does not change the basic intuition or the results. Finally, note that such a

transfer of students takes place if the charter school is preferred to the private school itself - even in this case however the transfer implies that the charter school is preferred to the regular public school.

### 3 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; allows charter schools to receive per pupil state funding on the same level as traditional public schools;<sup>9</sup> places no cap on the number of charter schools that can open in the state;<sup>10</sup> 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.

One important feature of the Michigan charter law is that it allows for-profit organizations to manage charter schools. This has led to a large majority of the charter schools being managed

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<sup>9</sup> 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 is around 70-80 percent, unlike many other states where state funds account for a much smaller share of per pupil spending. See section 7 below for more on Proposal A.

<sup>10</sup> Public universities are allowed to authorize charter schools anywhere in the state, but other authorizers can only authorize schools within their jurisdictions. However, public universities are only allowed to authorize a total of 150 charter schools, a limit reached in 1998.)

by for-profit educational management organizations (EMOs) - while nationally, only one in four charter schools are managed by EMOs, such entities run about 75 percent of all charter schools in Michigan (see Mead (2006), who further estimates that more than half of Michigan's charter school students attend schools operated by large, multi-state, full-service EMOs, such as National Heritage Academies, the Leona Group, Helicon Associates, Edison Schools and others). It is generally believed that this advantage stems from the fact that EMOs can offer needed expertise as well as start-up capital to support a school initially. However, the fact that all non-EMO charters must contribute to the state's retirement system for public school employees, while teachers employed by EMOs are exempt, also adds to the advantage of EMOs.

Geographically, 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 - it has been alleged that this preference for serving the lower grades stems from the fact that the state provides the same amount of funding per student, irrespective of grade, even though children in higher grades are more expensive to educate.

## 4 Data

We use data from different sources for our purposes. First we employ data from the last two decennial censuses, 1990 and 2000, which contain information about private school enrollment at the school district level. For data from the 1990 census we use the 1990 School District Data Book, which is based on the 1990 census and certain other administrative data, and provides useful demographic data on every school district in Michigan in 1989-90. Similar data are also

available from the Census Bureau for the 2000 decennial census. Supplementing these census data with data on charter penetration from the state of Michigan, we estimate whether the spread of charter schools has led to a fall in enrollments in private schools.

The major part of the study utilizes 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 are conducted biennially since 1989-90 for the purpose of collecting data on private schools in the U.S. and their teachers and students.<sup>11</sup> These surveys provide detailed 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 the school is affiliated with a religious organization, whether school has a religious purpose, whether the school is Catholic, etc.) - as it is likely that the extent of competition faced by religious private schools may be somewhat different from that faced by 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 true 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.

We supplement our analysis by using data on location and operation of charter schools from the Michigan Department of Education, and also use some relevant data from the Common Core

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<sup>11</sup> 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/>.



of Data. Since we want to find the distance between a private school and its nearest charter school, and the number of charter schools within a specified radius of a private school, we first geocode the locations of every private and charter school in Michigan.<sup>12</sup>

## 5 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 from this perspective as it has several distinct and unique advantages. First, it is one of a handful of states where charter schools, once established, spread very rapidly, thus allowing 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, both in terms of its charter schools and in terms of its private schools, and this allows us to examine the effects of charter competition on enrollment are different for different types of schools, charter or private. Third, and importantly, the presence of a unique feature in Michigan's charter law - granting of chartering authoring to public universities - allows us to pursue an instrumental variables strategy, following Bettinger (2005). This analysis, described in more detail below, addresses the issue of potential endogeneity in location of charter schools and provides an important robustness check to results obtained otherwise. 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 Michigan charter law has been rated as one of the strongest in the nation. Some notable features include - diverse chartering authorities including local school boards, intermediate school boards, community colleges and state public universities; per pupil funding almost on par with

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<sup>12</sup> We use ArcGIS for our geocoding purpose and for finding distances,- the details are available on request.

regular school districts (100% of state and local revenue funding follows students who migrate to charter schools, based on average district per-pupil revenue) and fiscal autonomy.

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 - a negative relationship between spread of charter schools and enrollment in private schools would reflect the demand for charter schools, and imply increased attractiveness of charter schools over the regular public schools.

## 5.1 Estimation using Census data

To investigate whether a higher prevalence of charter schools is associated with a higher fall in private school enrollment, we estimate the changes in enrollment in private schools across Michigan school districts between 1990 and 2000 and relate them to the corresponding changes in charter school competition.

We use several alternative measures of charter school competition. The first one is a 0-1 dummy variable about the presence of charter schools in the respective school district, taking the value of 1 if there was a charter school in that district in 2000, 0 otherwise. The second competition variable is the number of charter schools within the school district, while the third variable is charter school enrollment as a percentage of total enrollment in the district. Finally, we also use the proximity or distance of nearest charter school as a measure of charter competition.<sup>13</sup>

Using census data from 1990 and 2000, we estimate the following model:

$$y_{it} = \alpha + \delta.2000dummy + \gamma.charter_{it} + \beta.x_{it} + \varepsilon_{it} \quad \dots (1)$$

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<sup>13</sup> Results from this variable - distance of nearest charter school - will not be reported here as the results are qualitatively similar to those of the other competition variables. These results are available on request.

Here  $y_{it}$  denotes total enrollment in private schools in school district  $i$  in census year  $t$ ,  $t = \{1990, 2000\}$ , while  $x_{it}$  denotes other demographic and socioeconomic controls.  $2000dummy$  is a dummy variable for the year 2000.  $charter$  is a measure of charter competition in district  $i$  in year  $t$ . The coefficient of interest here is  $\gamma$ , which represents the effect of charter competition on enrollment in private schools. Note that the census years straddle 1995-96, the year when the first charter schools opened in Michigan.

We estimate specification (1) by both OLS and fixed effects (FE) - the FE specifications include school-specific fixed effects which control for all non-varying characteristics of the schools. For brevity, we only report results from the FE regressions - the OLS results are similar and available on request.

## 5.2 Estimation using Private School Surveys

We follow the same procedure with the biennial data from the Private School Surveys. This dataset includes detailed data on private school enrollments, both at the school level and for individual grades, and allows us to control for any pre-existing trends. It also allows us to test for any differential effect of charter schools as they age and mature.

We check for robustness of our results by employing different measures of charter school competition and running several different specifications. The particular measures of charter school competition that we use are similar to above except that we now consider charter school presence within a certain radii (1 mile, 2 miles, 5 miles) of private schools.<sup>14</sup>

The Private School Survey data are available for every other year, beginning in 1989-1990.

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<sup>14</sup> 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.

Using data from 1989-90 to 2001-02,<sup>15</sup> we first estimate the following model, where controlling for year-specific dummy variables to absorb any common shocks we see whether there has been any shift in private school enrollment following charter penetration.

$$y_{it} = \alpha_0 + \sum_{k=1992}^{2002} \alpha_k \cdot D_k + \gamma \cdot charter_{it} + \beta \cdot x_{it} + \varepsilon_{it} \quad \dots \quad (2)$$

Here  $y_{it}$  denotes enrollment in private school  $i$  in year  $t$ , while  $charter$  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 all year specific shocks.  $x_{it}$  denotes other demographic and socioeconomic controls. The coefficient of interest here is  $\gamma$ , which represents the effect of charter competition on enrollment in private schools.

We estimate specification (1) by both OLS and fixed effects (FE) - the FE specifications include school-specific fixed effects which control for all non-varying characteristics of the schools. 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

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<sup>15</sup> 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.

$(trend_{it})$ .<sup>16</sup> We estimate the following model.

$$y_{it} = \alpha_0 + \gamma_1.charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + \varepsilon_{it} \quad \dots \quad (3)$$

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. As earlier, we also estimate the fixed effects counterpart of this regression,- note that the FE regressions include a school-specific fixed effect in addition to the school-specific trends.

We also estimate a variant of model (3) 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.

$$y_{it} = \alpha_0 + \gamma_1.charter_{it} + \gamma_2.trend * charter_{it} + \theta_i.trend_{it} + \beta.x_{it} + \varepsilon_{it} \quad \dots \quad (4)$$

Here the variable trend denotes the time trend, we take trend = 0 for 1993-94, the last year before the introduction of charter schools.<sup>17</sup> The coefficients of interest here are  $\gamma_1$  and  $\gamma_2$ , respectively denoting any intercept and trend shifts in private enrollment following charter competition. These together represent the effect of charter competition. In particular,  $\gamma_2$  shows whether the effect of competition from charter schools has any significant trend component, increasing over the years. It is possible that as people come to know about charter schools, they want to enroll their children in these schools - it is also possible that as charter schools age, they mature and become more experienced, thereby attracting a higher number of students.

### **Controlling for Post-Program Common Shocks**

We also estimate two variants of specification (4) where we control for common post-program shocks in the post-charter period. In the first specification - our most preferred specification - we

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<sup>16</sup> 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.

<sup>17</sup> trend equals -1 in 1991-92, -2 in 1989-90, 1 in 1995-96, and so on.

include separate year dummies for the post-charter period.

$$y_{it} = \alpha_0 + \sum_{k=1996}^{2002} \alpha_k \cdot D_k + \gamma_1 \cdot \text{charter}_{it} + \gamma_2 \cdot \text{trend} * \text{charter}_{it} + \theta_i \cdot \text{trend}_{it} + \beta \cdot x_{it} + \varepsilon_{it} \dots \quad (5)$$

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

$$y_{it} = \alpha_0 + \phi_1 \cdot \text{program} + \phi_2 \cdot \text{program} * \text{trend} + \gamma_1 \cdot \text{charter}_{it} + \gamma_2 \cdot \text{trend} * \text{charter}_{it} \\ + \theta_i \cdot \text{trend}_{it} + \beta \cdot x_{it} + \varepsilon_{it} \dots \quad (6)$$

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 detailed information on characteristics of private schools. Since it is likely that different types of private schools might face different competition from charter schools and/or respond differently to this competition, we next check for heterogeneity in effects across different private schools. Among the most important indicators of private schools is their religious affiliation. We estimate the following model to see if private schools affiliated with a religious organization show different trends than those of secular private schools.

$$y_{it} = \alpha + \sum_{k=1996}^{2002} \alpha_k \cdot D_k + \gamma_1 \cdot \text{charter}_{it} + \gamma_2 \cdot \text{charter}_{it} * \text{trend} + \delta \cdot \text{religious purpose} \\ + \theta_i \cdot \text{trend}_{it} + \beta \cdot x_{it} + \varepsilon_{it} \dots \quad (7)$$

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. A significant coefficient for *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 (6) 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.

### **Allowing for Maturity of Charter Schools**

Another important question regarding charter schools is whether their effect increases as these schools grow and expand. We include the number of years a charter school has been in existence as an additional charter competition variable - in addition to the regular charter competition variables - to control for this.

### **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,- alternatively, they may open in districts where there is a high demand for good quality schooling and existing schools are already quite good.<sup>18</sup> Since we estimate all regressions by fixed effects, in

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<sup>18</sup> There are few studies that look at the location decisions of charter schools. Glomm et al. (2005) argue that charter schools should be 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 should be more likely to locate in less efficient public school districts - their results provide only mixed support for this. Henig and MacDonald (2002) find that in Washington D.C. charter schools are more likely to locate in areas with high proportions of African-American and Hispanic residents than in the predominantly white neighborhoods, and more likely to locate in neighborhoods with middle incomes and high home ownership than in either poor or wealthy areas of the city. They also conclude that charters take political and practical considerations into account when deciding where to locate. Some commentators argue that the fact that charter schools are typically barred from choosing among applicants (they have to admit all applicants if undersubscribed and have to conduct lotteries to randomly pick applicants if oversubscribed - this is true in Michigan as well) strategic location is one of the few instruments they have at their disposal to influence their

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). The then governor, John Engler, championed charter schools. 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 appointed boards. 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 dummies. As a quick robustness check, we also use a related but alternate set of instruments where the instruments are interaction of the distance of private schools from public 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

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applicant and student pool.



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 and private universities. We also carry out falsification tests using pre-program data and institutional details of charter school law.

## **6 Results**

### **6.1 Results from Census data**

Table 2 shows the results from running specification (1) on census data. For brevity we only show results from fixed effects (FE) specifications (and one OLS result), the other OLS results are very similar. The results show that competition from charter schools has resulted in a modest but significant decline in enrollment in private schools. This result is robust across the four different measures of charter competition that we employ - in each case, there has been a negative and significant effect on private school enrollment. For example, presence of charter schools in a school district is associated with about a 1.5 percentage point decline in the share of private schools in that district's total enrollment. A 1 percentage point increase in the enrollment share of charter schools in a district leads to a corresponding decrease in the enrollment share of private schools by 0.12-0.13 percentage points. The results in the table are from regressions where we control for changes in other relevant attributes of school districts - including racial composition, unemployment rates and median incomes - but the results are very similar if we do not include these variables.

### **6.2 Results from Private School Surveys**

The remaining tables show results from regressions using the PSS data. Table 3 shows estimates from running specification (2). 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 5-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 as 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 in the latter case). This general trend is repeated in all of the regressions that we run - the effects from charter competition are much 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 4 shows results from running specifications (5) and (6). 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 5), while the regressions in columns (4)-(6) control for these shocks using common intercept and trend shifts (specification 6). 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 highly significant, and are consistent across the three different measures of competition used. The results are also robust to controlling for individual pre-charter trends of the private schools. 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 5 provides evidence on the heterogeneous effects of charter schools. We run specification (7) on PSS data, controlling as earlier for pre-existing trends of individual 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). The results provide only modest evidence that competition from charter schools had a bigger negative effect on religious private schools. Consider columns (1)-(3). With the exception of the coefficients on charter competition and its interaction with trend, the coefficients are generally small and not significant at traditional levels of significance, though they are always negative. When we further break down the religious private schools into Catholic schools and other religious schools, as in columns (4)-(6), the results suggest that most of the negative effect for religious schools is concentrated in the Catholic schools. In each of these three columns, the coefficient on Catholic schools is much bigger (in absolute terms) than the coefficient on other religious schools, though the estimates are not statistically significant.

Table 6 shows results from regressions where we include the number of years charter schools have been in existence as an additional charter competition variable. The first three columns show results from our basic specification (specification 2) and include the original charter competition variables, while columns (4)-(6) show results from our most preferred specification (specification 5)

and include the interactions of these variables with the time trend. The coefficients are consistently negative and significant across the different specifications and the different competition measures, implying that this is one of the main channels in the interrelationship between private and charter school enrollments. It is interesting to note that Hanushek et al. (2007) find that in Texas charter schools have difficult start-up periods but they settle down within roughly four years.

### 6.3 Results from Instrumental Variables Strategy

Tables 7 and 8 show results from running instrumental variables regressions. Table 7 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 8), the other first stage results are qualitatively similar and available on request. Note that we employ two alternate sets of instruments - first, the distance of private schools from public universities that had governor appointed boards and interactions of this variable with post-program year dummies and second, the 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 specification - 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.<sup>19</sup> For each of the endogenous regressors, each of the instruments is highly significant and has the expected sign.

The second stage results on enrollment in private schools show similar trends to those reported above, though the standard errors are sometimes large as expected. These show a modest effect

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<sup>19</sup> 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.

of charter schools on private school enrollment, though the effects are not always robust and consistently significant. One important feature of the results is that they seem to suggest a temporal component to the effects of charter schools - both the charter competition variables interacted with trend have modest to large 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.

## **7 Robustness Checks and Discussion**

We have carried out several sensitivity analyzes 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.

### **7.1 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 private school sector, schools differ significantly in size and not controlling for this may bias the results. For example, even with exactly the same number of overall students transferring out of private schools into charter schools, an area with a lesser number of private schools, but larger ones, will show up a greater effect from charter competition per school compared to an area with more, but smaller, private schools. 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 9 shows results from running the same regressions as in Table 4 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. Comparing these results to those in Table 4, there is some quantitative as well as qualitative change in the estimated effects. As can be expected, the coefficients are generally much smaller in magnitude. However they are also mostly insignificant. For example, the coefficient on charter enrollment is no longer significant in any of the regressions - charter enrollment interacted with trend is only marginally significant in column (4). The coefficients on the number of charter schools too are mostly insignificant, though the number of schools interacted with trend is significant in columns (1) and (3).

Table 10, which shows whether private schools with a religious orientation experienced different effects, mirrors the same results. The regressions in columns (1)-(6) are weighted by the inverse of last year's enrollment in the private school, while in regressions (7)-(12) we use current year's enrollment as a percentage of last year's enrollment as our dependent variable. The only charter competition variable to have a significant effect is the number of charter schools interacted with time trend in columns (1), (3) and (5). Similar to the results in Table 9, when we use current year's enrollment as a percentage of last year's enrollment as our dependent variable (instead of just using current year's enrollment), the coefficients are small and statistically insignificant. There is suggestive evidence that Catholic schools suffered larger enrollment declines than their counterparts, both other religious schools and secular schools, but the effect is not large and never significant. Overall, this suggests that though there may have been some decline in private school enrollment following the establishment of charter schools, the effects are mostly small or modest in size.

Table 11 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 only show the results using charter enrollment as the measure of competition.<sup>20</sup> As in earlier tables, there is not much evidence of charter schools affecting enrollment in private schools. There is a negative effect on trend, marginally significant at 10%, but it is small in magnitude. As earlier, there is suggestive evidence that Catholic schools suffered larger enrollment declines than their counterparts, both other religious schools and secular schools, but the effect is not large and never significant.

## **7.2 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 (2004, Table 11) shows, these lowest spending districts are predominantly rural, while

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<sup>20</sup> 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. Similarly for the results using the number of charter schools as the measure of competition.

charter schools in Michigan mostly serve urban and suburban children and are located in the higher spending districts.<sup>21</sup> In regressions not reported here, we reran our regressions excluding school districts in the lowest spending quintile - the results are qualitatively similar.<sup>22</sup> Second, it is possible that the increase in resources in low-spending districts raises the quality of education they provide and hence make them attractive to some families who were so far sending their kids to private schools. However, it would still be true that any movement from private schools to charter schools implies that these parents prefer the charter schools to their neighboring regular public schools. 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. Below (section ??) we examine whether the enrollment effects at higher levels (middle and high schools) are different from those at elementary level and use this to net out the effect of Proposal A.<sup>23</sup>

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<sup>21</sup> 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).

<sup>22</sup> 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, 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. 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.

<sup>23</sup> We would like to thank Julie Cullen for suggesting this strategy.



### 7.3 Interdistrict Choice Program

There is also a small interdistrict 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 interdistrict choice option (Plank and Sykes, 1999).

The presence of this interdistrict 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 affects 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 12 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 - there is a suggestive negative effect of charter school presence on private school enrollments. However, the results are not very robust - though many of the coefficients are negative and some are negative significant, most of the coefficients are small and insignificant. Overall, 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.

#### **7.4 Are the effects for middle and high schools different from those for elementary schools?**

Next we examine whether there is a differential effect for elementary schools as compared to middle schools and high schools. Since charter schools are generally more numerous at the elementary level - this is true in Michigan as well - it is possible that the effects from charter competition will be different for schools serving different grade levels. To check for the presence of such heterogeneity, we estimate the effects separately for middle and high schools. Table 13 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 while 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.<sup>24</sup> The results show that there is not much evidence of a significant effect of charter competition on private school enrollment. All of the estimated effects are small and never significant

Table 14 shows the results from the IV estimation. We only show the results using charter

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<sup>24</sup> 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.

school enrollment as the charter competition variable,- the results using other measures of charter competition are qualitatively similar. Again, there is not much evidence of charter schools affecting private school enrollment, 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. See Tables 4 and 5. 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.

### **7.5 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 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 15. As earlier, we only show results from fixed-effects regressions where the variable of interest is distance from public universities interacted with the time trend. (Note that the variable distance from public universities with governor appointed boards is absorbed by fixed effects.) 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 along 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 employ an alternate strategy to further explore this issue. Here we use the locations of public universities that do not have governor appointed boards. Note that our identification strategy for the IV 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). The then governor, John Engler, championed charter schools. 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 (and hence were able to authorize charter schools). 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 16. The presence of non-authorizing public universities does not seem to have much effect on private school enrollments during this period. Though some of the coefficients are negative, they are always insignificant and very small.<sup>25</sup>

## 8 Conclusion

Since their introduction in the early 1990s, charter schools have become a very popular school reform movement. Charter schools are publicly funded but are exempt from many of the regulations that school reformers have argued stifle innovation in the public sector. Supporters of charter schools assert that this freedom to innovate and experiment will allow a diversity of educational practices, and the resultant competition for students among the different types of schools will lead to improved educational outcomes all round.

In this paper we document the effect of charter schools on enrollment in private schools and show how this relates to the relative attractiveness of charter schools vis-a-vis traditional public schools. We argue that any movement of students from private schools to charter schools implies that families prefer the charter schools over the regular public schools, the intuition being that families who were earlier sending their kids to private schools would now transfer their kids to the charter schools *only if* the new charter school is an improved alternative compared to the regular public school. By approaching the question of relative effectiveness of charter schools in

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<sup>25</sup> There is suggestive evidence, in columns (3) and (4), that private schools with a religious purpose, particularly Catholic private schools, may have been negatively impacted (though the estimates are no longer significant in columns (7) and (8)). Note however that, if true, this will only imply that our earlier results are an overestimation - the true effect of charter schools on private school enrollment is even lower than we found.

a new light we are able to provide important additional evidence and point to the important inter-relationships between private schools, charter schools and regular public schools.

The results suggest that introduction of charter schools has only a modest negative effect on enrollment in private schools. The results are robust to employing alternate measures of competition and controlling for individual pre-charter trends of the private schools. We also found some evidence that as the charter sector grows and becomes more visible, its effect on private schools increases. Moreover, disaggregating private schools in terms of their religious orientation, there is suggestive evidence that competition from charter schools had a bigger negative effect on religious private schools, most of which is concentrated in the Catholic schools. Results using exogenous variation in Michigan's charter law to control for possible endogeneity in location of charter schools are similar - the presence of charter schools leads to a small decline in enrollment in neighboring private schools. The results are reasonably robust since they survive a variety of robustness checks.

In future work it would be interesting to examine the aspects of charter schools that make them attractive to prospective families. It could be academic achievement, though the evidence for this is mixed. While some studies find positive effects of charter schools on student achievement (Hoxby and Rockoff, 2004), the few studies conducted so far in Michigan yield inconclusive results (Bettinger, 2005; Horn and Miron, 1999; Eberts and Hollenbeck, 2006).<sup>26</sup> It might be a focus on particular curriculum (e.g., Afro-centric course or emphasis on visual arts), or a particular method of instruction (say, Montessori), or some other considerations like school peer group (Schneider and Buckley, 2002) or school safety. It is also possible that lack of adequate information or an inability to distinguish between effective and ineffective schools is an important factor, - recent studies have started to look at whether parents have enough information to allow them to play

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<sup>26</sup> Note, however, that most of these studies either use few years of data or use data from the early years of charter schools in Michigan.

the consumer role effectively (Hastings and Weinstein, 2007; Mizala and Urquiola, 2007).

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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 1990 and 2000 Censuses)

	OLS	FE	FE	FE	FE
Presence of Charter School	-1.44 (1.39)	-1.50* (0.85)			
Number of Charter Schools			-0.10*** (0.01)		
Charter enrollment as % of total district enrollment				-0.13* (0.08)	
Charter enrollment as % of total public enrollment					-0.12* (0.07)
Observations	1058	1058	1058	1058	1058
R-squared	0.03	0.92	0.92	0.91	0.89
2000 Year dummy	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	No	Yes	Yes	Yes	Yes

Notes: See specification (1) in the text. The dependent variable is the percentage of a school district's enrollment that attends a private school. \*, \*\* and \*\*\* denotes significance at the 10, 5, and 1 percent levels, respectively. All regressions have been weighted by enrollment of the respective school districts and control for racial composition, unemployment rates and median incomes. 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**

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

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Charter Presence	-18.16*** (4.54)			-6.02 (3.88)		
Number of Charter Schools		-5.66*** (1.14)			-1.62*** (0.37)	
Charter Enrollment			-0.015*** (0.003)			-0.004*** (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 (2) 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 4: 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 (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Charter Presence	2.62 (3.21)			2.32 (2.85)		
Charter Presence * Trend	-6.31*** (1.59)			-6.83*** (1.51)		
Number of Charter Schools		-1.94** (0.94)			-0.99 (0.97)	
Number of Charter Schools * Trend		-0.58* (0.34)			-0.85*** (0.27)	
Charter Enrollment			-0.019** (0.007)			-0.015* (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 Interactions	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 (3), (4), (5) and (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: 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	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(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 (7) 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 6: Effect of Charter Competition on Private School Enrollment: Do “Years of Existence” Matter?**

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

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Charter Presence	-7.72** (2.98)			-1.87 (3.32)		
Charter Presence * Trend				-2.62* (1.52)		
Number of Charter Schools		-3.19*** (0.74)			-1.35 (1.14)	
Number of Charter Schools * Trend					-0.09 (0.23)	
Charter Enrollment			-0.005** (0.002)			-0.010 (0.010)
Charter Enrollment * Trend						-0.002 (0.001)
Years of Existence	-4.68*** (1.31)	-4.43*** (1.49)	-5.49*** (1.65)	-2.42 (1.60)	-3.86*** (1.13)	-4.65*** (1.14)
Controls for pre-existing trends	N	N	N	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
Observations	6502	6502	6502	5308	5308	5308
R-squared	0.95	0.96	0.95	0.96	0.96	0.96

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: First-Stage IV Regressions**

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

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

Notes: The table shows the first-stage regressions corresponding to the first two IV regressions reported in Table 8. The columns marked (1) correspond to the first regression (column (1)) of Table 8 and the columns marked (2) correspond to the second regression (column (2)) of Table 8. \*, \*\*, and \*\*\* denote significance at the 10, 5, and 1 percent levels, respectively. The first stage regressions for the other regressions reported in Table 8 are similar and hence not reported separately.

**Table 8: 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 (3.10)		6.20 (3.42)		6.27* (3.41)	
Number of Charter Schools * Trend	-1.85** (0.88)		-1.30 (1.01)		-1.31 (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 (0.02)		0.057* (0.03)		0.059** (0.026)
Charter Enrollment * Trend		-0.01** (0.004)		-0.015** (0.007)		-0.015** (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 9: 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	FE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(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 Interactions	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: See specifications (3), (4), (5) and (6) in the text. 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 10: 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)	FE (9)	FE (10)	FE (11)	FE (12)
Number of Charter Schools	0.65 (1.19)		0.50 (1.22)		1.19 (1.14)		0.98 (2.38)		0.99 (2.40)		-0.21 (3.59)	
Number of Charter Schools * Trend	-1.13*** (0.30)		-1.03** (0.31)		-0.95*** (0.26)		-0.40 (0.56)		-0.39 (0.55)		-0.12 (0.80)	
Number of Charter Schools * Religious Purpose	0.88 (1.70)						-1.75 (2.65)					
Number of Charter Schools * Catholic			-2.65 (1.85)						-2.18 (2.40)			
Number of Charter Schools * Other Religious			3.47 (1.93)						-1.21 (3.05)			
Charter Enrollment		0.001 (0.004)		0.001 (0.004)		0.004 (0.009)		0.007 (0.009)		0.007 (0.009)		0.005 (0.010)
Charter Enrollment * Trend		-0.002 (0.002)		-0.002 (0.001)		-0.002 (0.002)		-0.001 (0.001)		-0.002 (0.001)		-0.002 (0.002)
Charter Enrollment * Religious Purpose		0.001 (0.005)										
Charter Enrollment * Catholic				-0.009 (0.06)						-0.010 (0.007)		
Charter Enrollment * Other Religious				0.008 (0.005)						-0.004 (0.005)		
Years of Existence					-0.49 (0.65)	-0.98 (0.70)					-2.50 (1.89)	-2.73 (2.06)
Controls for pre-existing trends	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Program and Program Trend Interactions	N	N	N	N	N	N	N	N	N	N	N	N
Observations	4496	4496	4496	4496	4399	4399	4496	4496	4496	4496	4399	4399
R-squared	0.96	0.96	0.96	0.96	0.96	0.96	0.23	0.23	0.23	0.23	0.23	0.23

Notes: See specification (7) in the text. The dependent variable in columns (1)-(6) is the current year enrollment in a private school, while the dependent variable in columns (7)-(12) is current year's enrollment as a percentage of last year's enrollment. The regressions in columns (1)-(6) 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 11: 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 (0.027)	0.039 (0.028)	0.031 (0.028)	0.031 (0.028)
Charter Enrollment * Trend	-0.007 (0.007)	-0.013* (0.007)	-0.013* (0.007)	-0.013* (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 12: Is Interdistrict School Choice Driving Results?  
(Analysis Using Counties Outside the Detroit Metropolitan Area)**

	Taking Care of Private School Size									
	FE (1)	FE (2)	FE-IV (3)	FE-IV (4)	FE (5)	FE (6)	FE (7)	FE (8)	FE-IV (9)	FE-IV (10)
Number of Charter Schools	-1.438* (0.848)		8.388 (5.205)		2.927 (3.559)		-9.501 (10.990)			
Number of Charter Schools * Trend	-0.640*** (0.220)		-2.452 (1.527)		-1.848* (1.009)		1.714 (2.591)			
Charter Enrollment		-0.014** (0.007)		0.098 (0.205)		-0.011 (0.015)		-0.028* (0.017)	0.211 (0.145)	0.019 (0.112)
Charter Enrollment * Trend		0.001 (0.001)		-0.025 (0.056)		0.000 (0.004)		0.006 (0.005)	-0.046 (0.038)	-0.001 (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 Interactions	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	0.861	0.961	0.961	0.249	0.249	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 13: 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 (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)
Number of Charter Schools	-6.54 (9.95)		-3.62 (9.39)			
Number of Charter Schools * Trend	2.88 (3.29)		2.02 (3.12)			
Charter Enrollment		0.004 (0.024)		0.013 (0.015)	0.010 (0.008)	0.009 (0.007)
Charter Enrollment * Trend		0.000 (0.005)		-0.002 (0.003)	-0.003 (0.002)	-0.003 (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 14: 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 (0.095)	0.034 (0.065)	-0.016 (0.026)	0.003 (0.007)
Charter Enrollment * Trend	-0.020 (0.026)	-0.004 (0.007)	0.003 (0.007)	-0.001 (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 15: 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 (0.060)	-0.062 (0.043)	0.066 (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 16: 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 (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)	FE (8)
Distance from non-authorizer * Program	-0.025 (0.021)	-0.024 (0.021)	0.060 (0.036)	0.061 (0.037)	-0.018 (0.058)	-0.018 (0.058)	0.013 (0.115)	0.012 (0.115)
Distance from non-authorizer * Program * Trend	-0.020 (0.012)	-0.020 (0.012)	-0.020 (0.012)	-0.020 (0.012)	0.021 (0.015)	0.021 (0.015)	0.021 (0.015)	0.021 (0.015)
Distance from non-authorizer * Program * Religious Purpose			-0.087** (0.039)				-0.032 (0.091)	
Distance from non-authorizer * Program * Catholic				-0.097* (0.057)				-0.018 (0.091)
Distance from non-authorizer * Program * Other Religious				-0.079** (0.036)				-0.042 (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 Interactions	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.