Participation in a National, Means-Tested School Voucher Program

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Abstract

We use data from a sample of applicants to a national means-tested school voucher program and a national sample of the population eligible for the program to evaluate the factors leading families to use school vouchers. Our analysis divides the process of voucher usage into two distinct stages: initial application and subsequent take-up. Using a nested logit model, we find that some factors, like religious affiliation and religious service attendance, affect both stages. Others, like mother's education, affect only one (application). Still others, like ethnicity, have opposite effects at the two stages. Compared to Whites, minorities are more likely to apply for vouchers, but less likely to take them when given the opportunity. © 2005 by the Association for Public Policy Analysis and Management

The Supreme Court's 2002 decision in *Zelman v. Simmons-Harris* that Cleveland's means-tested school voucher program passes constitutional muster has intensified interest in this policy innovation. Much public discussion about the impact of vouchers centers on the critical question of who would use vouchers to switch their children from public to private schools. To date, however, there has been little empirical evidence brought to bear on the subject. In this paper, we examine data that shed light on the question of which families are most likely to avail themselves of a voucher to move their children from the public to private sector. Specifically, we divide this process into two distinct but, obviously, related stages. First, families become *applicants* to the voucher program, which, because it is oversubscribed, must award vouchers by lottery. Then, upon winning the lottery, families become voucher *users* by enrolling in a suitable private school.

Our analysis draws on data from a representative sample of applicants to the nation's largest privately funded school voucher program, with comparisons to families who were eligible for the program but did not apply. The sample of voucher applicants was drawn from the universe of applicants to the privately funded Children's Scholarship Fund (CSF), the only program that has offered a voucher-like opportunity to families nationwide. The national urban sample of the population eligible for the program was obtained by an Internet survey conducted under our direction by Knowledge Networks. We supplemented this individual-level data with contextual information on the characteristics of respondents' public school districts and the local supply of private schooling to assess whether these factors influence

Manuscript received April 2004; review complete September 2004; revision complete November 2004; revision review complete December 2004; revision complete December 2004; accepted December 2004.

Journal of Policy Analysis and Management, Vol. 24, No. 3, 523–541 (2005)

Published by Wiley Periodicals, Inc. Published online in Wiley InterScience (www.interscience.wiley.com)
DOI: 10.1002/pam.20113

the propensity to apply to the program, and subsequently to take advantage of a voucher if given the opportunity.

Although privately funded, the CSF program shares many characteristics of public voucher programs currently in operation or under consideration by policymakers. The findings reported below thus shed light on the characteristics of those most likely to participate in a voucher program in its early stages of operation. Nonetheless, we stress from the outset that our findings can only properly be generalized to programs similar to the CSF.

PREVIOUS RESEARCH

Much of the debate over school voucher usage has been normative and theoretical (Carnegie Foundation for the Advancement of Teaching, 1992; Cobb, 1992; Coons & Sugarman, 1978; Coulson, 1999; for thoughtful theoretical discussions see essays in Wolfe, 2003; for theoretical models see Epple & Romano, 2003; Fernandez & Rogerson, 2003; Nechybya, 2003), mainly because only a very small percentage of students in the United States have had the opportunity to use a voucher.[1] The limited empirical work has either looked at programs in specific cities or relied upon indirect strategies to assess who would be most likely to exercise a voucher option, were it offered.

A few studies have examined participation in publicly and privately funded voucher programs established in Milwaukee, Cleveland, New York, Dayton, and Washington, DC (Howell, 2004; Howell et al., 2002; Metcalf et al., 2003; Witte, 2000). By comparing qualified applicants who used vouchers to enroll in private schools to applicants who remained in the public sector, these studies provide useful information on the determinants of voucher usage among families who applied for these programs. However, these pioneering studies are confined to a small number of cities, making it impossible to estimate effects on voucher usage of factors that vary across metropolitan areas, such as the percentage of minorities in local public schools or the supply of private schools.[2]

To obtain broader estimates of likely voucher usage, other scholars have examined the determinants of public and private school attendance under existing policy and market conditions (Betts & Fairlie, 2001; Buddin, Cordes, & Kirby, 1998; Chiswick & Koutroumanes, 1996; Figlio & Stone, 1999; Lankford & Wykoff, 2001; Long & Toma, 1988). Inferences from these patterns are inherently problematic, however, as the very motivation for a voucher system is to alter the economic constraints that characterize the status quo (Hoxby, 2003).

The factors shaping school choice have also been studied by looking at the process by which parents select among public schools when given the opportunity in districts offering open enrollment plans, magnet schools, or charter schools (Henig, 1994; Henig, 1996; Schneider, Teske, & Marschall, 2000). Though valu-

[1] In the 2002–2003 school year, publicly funded vouchers were used to attend private schools by 11,624 students in Milwaukee, Wisconsin; 4,948 students in Cleveland, Ohio; and 577 students in the state of Florida. In addition, Maine and Vermont paid private school tuition costs of some secondary school students residing in towns without a public school, while a number of states offer tax credits or deductions for some private-school tuition expenses (Education Commission of the States, 2003; Howell et al., 2002).

[2] The studies have other limitations as well. Witte's (1991, 2000) study is of a small voucher program that excluded the participation of religiously affiliated schools. Characteristics of the eligible population are estimated from a mail survey for which the response rate was 30 percent. Howell's (2004) study provides only bivariate correlations between eligible and applicant populations, and relies upon 1990 census data for estimates of the characteristics of the eligible population.

able, these studies leave open the question of whether their findings apply to situations in which families are given access to a private sector that contains a large number of religiously affiliated schools and students are required to pay a portion of tuition expenses.

Still a fourth approach has been to describe to survey respondents a hypothetical voucher plan, then ask whether they would be likely to switch their child from a public to a private school under such a system (Moe, 2001). While informative, this research strategy makes the strong assumption that parents' actual behavior will not diverge from stated expectations and ignores the possibility that interested families may be unable to obtain a place for their child in a suitable private school.

Our study goes beyond this existing literature by examining the actual behavior of a national sample of families who were offered a voucher opportunity. By combining data from multiple surveys and other data sources, we are able to conduct a multivariate analysis of the individual and contextual determinants of voucher application.[3] We also advance the discussion by providing separate analyses of two key stages in the process of using a voucher to move from a public to a private school: (1) an initial stage in which a family applied for a voucher opportunity (*application*) and (2) a second stage in which a subset of those families who won the lottery used their voucher to enroll in a private school, which, following convention, we will refer to as *take-up* (see, for example, Barnard et al., 2003). While the application stage involved a relatively limited commitment, take-up required the family to find a suitable private school and pay a significant portion of its tuition. The additional hurdles families must clear to use a voucher means that the take-up rate is roughly 30 percent. Although the factors affecting application for a voucher opportunity are likely to differ from those influencing take-up rates among those who applied, previous studies have not systematically compared selection into voucher programs at these distinct stages in the choice-making process.

INTRODUCING VOUCHERS INTO THE EXISTING CHOICE SYSTEM

In the absence of school vouchers, families in the United States can choose a school for their child in one of several ways. Approximately 1 percent of the population is home schooled. Another 11 percent of the population attends private schools, about 90 percent of which have a religious affiliation. Within the public sector, about 5 percent of students attend a charter school, magnet school, or other public school through some form of public-school choice initiative (U.S. Department of Education, 2002a). But for most students, the choice of school is made at the time the family chooses its place of residence. Generally speaking, higher-quality schools are found in more expensive neighborhoods (Black, 1999; Kane, Riegg, & Staiger, 2003). School choice is available, but at a considerable price.

In 1999, the Children's Scholarship Fund (CSF) altered, in a small way, this system of educational choice. It offered an opportunity to participate in a nationwide voucher lottery to all families of low and moderate income, promising 40,000 school vouchers to lottery winners. Over one-half million families applied from across the United States. To be eligible, applicants had to have at least one child in grades K–8 and an annual household income of less than 270 percent of the feder-

[3] This paper thus goes well beyond a preliminary paper that simply reported bivariate relationships for the decision to apply for a voucher (Peterson, Campbell, & West, 2002).

ally determined poverty line for a family of their size. If a family won the lottery, each of their children in the eligible grade range was offered a voucher. The value of these vouchers was a function of recipients' income level, household size, and the tuition at the selected private school. Families awarded CSF vouchers could use them to send their children to either secular or religious schools.

The design of the CSF initiative resembles in important respects that of other voucher programs, both operating and proposed. The Cleveland and Milwaukee voucher programs, the two largest and longest-running government-funded voucher systems currently in existence, are also means-tested, as is the program for the District of Columbia that began in September 2004. Likewise, means-testing characterizes the program adopted by the Colorado state legislature in 2003, the subject of ongoing litigation. In each of these programs, voucher recipients may use them to attend private schools with a religious affiliation. All restrict the number of students who may participate to no more than 15 percent of the public-school population in the affected jurisdiction. Usually, participants represent no more than 5 percent of the eligible population.

However, the CSF program is likely to be even more selective than most publicly funded voucher programs: Unlike most public voucher initiatives, which cover most, if not all, tuition and require private schools to admit all students who apply (or to select students to admit at random, if oversubscribed), CSF covered no more (and usually much less) than 75 percent of tuition costs and imposed no constraints on private schools' admissions policies.

Ascertaining the impact of the CSF program on school choice is of particular interest in part because it is the only voucher program in the United States that is national in scope. In other ways, however, the intervention was modest. Importantly, the program made no ongoing commitments, so there was no guarantee to private schools of a continuing flow of incoming students. While individual lottery winners were promised vouchers for several years, the CSF did not commit to offering another round of scholarships in the future. Private school operators are unlikely to incur the heavy costs associated with opening a new school or adding on to an existing one in response to the announcement of a one-time voucher program—especially one whose participants are geographically dispersed. Thus, it is unlikely that the overall supply of private schooling increased dramatically as a result of the new program. In short, the impact of the CSF program should be understood as the short-term impact of a modest voucher initiative requiring parental co-payments.

FACTORS AFFECTING PARTICIPATION IN A VOUCHER PROGRAM

One of the most frequently repeated claims about school vouchers is that they will "skim the cream" from public schools (Fuller & Elmore, 1996; Wolfe, 2003). In a classic statement, Hirschman (1970) predicted that vouchers would lead families with the greatest likelihood of working to improve the public schools to exit into the private sector, rather than exercise voice to effect improvement. Without these students and their parents, it is assumed that public school performance will be locked in a downward spiral. However, in sharp contrast to the creaming argument, Hoxby (2003, p. 10) has emphasized that families who use vouchers will be those currently facing the greatest constraints on school choice. "[W]hat choice programs do is *relax constraints* on students' mobility among schools. Therefore, the students who will be most affected by choice are those for whom constraints are most binding." In other words, one prominent argument is that vouchers will be used by families

with the greatest social advantages, while the other is that vouchers will be used by the least advantaged.

We test these rival perspectives with multiple measures of social advantage. Under the status quo, perhaps the most significant constraint facing families as they decide on their children's schools is their income, and so we examine the impact of family income on participation in the CSF. Families with less income have fewer resources to purchase private education or obtain a residence in a desired public school district. Although this would suggest that low-income families are more likely to use vouchers, previous empirical results are inconsistent. Moe (2001) found lower-income respondents more likely to say they would switch to a private school if a voucher opportunity were available. Metcalf et al. (2003) found higher-income families more likely to use a voucher in Cleveland, but Witte (2000) found the opposite in Milwaukee. Howell et al. (2002) found higher-income families more likely to take a voucher when it was offered in New York City but low-income families more likely to do so in Dayton, with no difference observed in Washington, DC.

We also test whether the number of years of schooling received by a family's mother, another measure of social advantage, affects the use of vouchers. A widely accepted indicator of the value a family places on education (Coleman et al., 1966; Jencks, 1979; Phillips et al., 1998), mothers' educational attainment has also been identified as a key predictor of families' propensity to purchase private schooling and to take vouchers, when offered (Chiswick & Koutroumanes, 1996; Figlio & Stone, 1999; Howell et al., 2002; Witte, 2000).

The existing evidence also suggests that it may be particularly difficult for minority families to obtain a residence in a district with high-quality public schools. Independent of income, Hispanics and especially African Americans are less likely to be homeowners, more likely to live in segregated communities, and more likely to encounter resistance from lenders, brokers, and other institutions that determine access to the real estate market (Association of Community Organizations for Reform Now 2004; Boehm & Schlottmann, 2003; Farley, 1991). Consistent with the view that minority families face greater constraints on school choice within the public school system than nonminority families, Moe (2001) reports that African Americans are more likely than Whites to say they would move their child to a private school, if a voucher plan were established. Howell (2004) reports that in New York City African Americans offered vouchers were in fact more likely than other ethnic groups to use them initially, but less likely to remain in private schools over the following three years. Metcalf et al. (2003) report higher rates of voucher usage among Whites in Cleveland. Taken as a whole, these results suggest that African Americans have a high level of interest in vouchers, but may experience practical obstacles when using them to enroll in private schools.

In addition to demographic characteristics, we examine how religion shapes voucher usage. Families within certain religious traditions may be particularly dissatisfied with the values education provided within public schools and therefore more interested in an alternative type of school. The supply of attractive private schools may also be greater for those of particular religious traditions. Previous studies confirm that religious affiliation is a significant determinant of the likelihood a child will attend a private school (Chiswick & Koutroumanes, 1998; Figlio & Stone, 1999). Similarly, Howell (2004) found that, among families in New York City offered vouchers, those with relevant religious affiliations were more likely to use them to enroll in a private school and to remain in that school over time. We therefore expect that Catholic and Evangelical Protestant families will have higher

rates of voucher usage, as over half of private-school students attend schools affiliated with the Catholic Church, while another 15 percent attend Christian schools within the Evangelical Protestant tradition (U.S. Department of Education, 2002a).[4] The disproportionately large number of private schools with these religious affiliations enhances the supply of desired schools available to parents sharing the tradition. It also indicates dissatisfaction with the type of education provided in the public sector.

A family's level of religious commitment may also increase the propensity to participate in a voucher program. We therefore account for religious commitment with a measure of attendance at religious services. Families with a higher rate of church attendance, regardless of religious tradition, are more likely to be dissatisfied with the values education provided in a public school, and are thus expected to have a higher rate of voucher usage than families with a lower rate of attendance at religious services.

We also examine the characteristics of the community, including the public school district, in which a family lives. Given the longstanding concern about racial integration in America's schools, we test whether voucher usage is affected by the percentage of minorities within a school district. Some researchers expect school vouchers to be used disproportionately by families—especially White families—to leave public school districts with heavily minority populations (Henig, 1996). Research on current private school enrollment patterns provides evidence consistent with this hypothesis (Fairlie & Resch, 2002; Lankford & Wykoff, 2001). Studies that have examined either public school choice or voucher programs directly, on the other hand, find little empirical evidence for the "White flight" hypothesis (Schneider, Teske, & Marschall, 2000; Howell et al., 2002). Importantly, though, none of these studies looks at voucher usage across multiple school districts with varying racial composition. With data from a national voucher program, we expect to find that parents are especially likely to apply for a voucher opportunity and to take a voucher when one is offered, if the public school district their child is attending has a higher percentage of minority students; these effects should be particularly pronounced among Whites.

Another relevant characteristic of the local school district is its perceived quality. If higher expenditures enhance school quality (and/or school quality generates support for higher expenditures), one would expect an inverse relationship between per-pupil expenditures in the school district and the demand for vouchers. Since many of the nation's low-performing urban school systems have high levels of spending, however, it could be that voucher application rates level off or even increase at the upper reaches of per-pupil expenditures. In addition to a measure of per-pupil expenditures, therefore, our analysis includes a squared term for per-pupil spending, to allow for the possibility of a curvilinear relationship between spending and voucher usage.

It is not only the public school environment that potentially affects the use of vouchers. The private school market likely matters, too, which is why the supply of private schooling plays a prominent role in normative debates concerning school choice. According to some, existing supply is far too limited for vouchers to have much of an effect on enrollment patterns (Buddin, Cordes, & Kirby, 1998; Fuller & Elmore, 1996). Empirically, variations in the density of private schooling across

[4] Note that the U.S. Department of Education uses the term "conservative Christian" instead of "Evangelical Protestant" to describe these schools. The latter term is used here, as we feel it better describes the religious tradition of these schools.

metropolitan areas affect the likelihood that families will choose a private school, as well as the relative importance of other factors that influence school choice (Betts & Fairlie, 2001; Long & Toma, 1988). However, because the demand for and supply of private education are jointly determined, these studies remain inconclusive. As a one-time, diffuse intervention, the CSF program is assumed to increase demand for private schooling right away but to have little immediate effect on its supply. We therefore expect that the density of private schooling in a respondent's community—operationalized as the zip code—will have a positive impact on voucher usage.[5]

To round out our models, we account for two other factors with a plausible influence on participation in a school voucher program. One is the size of the family.[6] The CSF formula for determining the voucher amount was a function not only of family income, but also the number of children in the home. If the CSF formula worked as intended, we should observe no effect for family size at either stage of the process. The CSF's formula notwithstanding, however, families with more children may simply not have the financial resources to pay even partial tuition for private schooling. Finally, we examine whether vouchers are attractive to families whose children have been diagnosed with learning disabilities. On the one hand, we might expect that families with learning disabled children are especially eager to explore new educational options. On the other hand, the large expansion of special education, coupled with special federal provisions that give families of disabled children a measure of choice in the design of services for their child (by means of an individualized education plan which specifically provides for parental involvement), suggests that the demand for vouchers will be lower among such families than among families without disabled children. Furthermore, most private schools designed to aid learning-disabled children are far more expensive than the CSF subsidy.

DATA

Two surveys—one of CSF applicants and another of all eligible families—provide the primary sources of data for the analysis. For CSF applicants, a telephone survey was administered to a random sample of those eligible for the program whose children were enrolled in public school in grades 1 through 8. Applicants were surveyed in the summer of 2000, following the first school year after CSF scholarships were awarded. One parent in each family was interviewed. In families with more than one child in kindergarten through eighth grade, the interviewer specified that the questions should be answered in regards to the child with the next birthday, a standard method of randomizing within families. The telephone survey was conducted by a professional survey research firm (Taylor Nelson Sofres International) using a list of applicants provided by CSF program operators. The adjusted response rate for the telephone survey, calculated using the standards of the American Association for Public Opinion Research (2000), is 46 percent, a characteristic response rate for a highly mobile, low-income population.

The national survey of all those eligible for participation in the CSF program was administered by Knowledge Networks (KN) in the summer of 2000 (again, excluding those families whose children were in private schools). KN surveys a random

[5] The zip code is an approximation of the area in which most families would be able to provide transportation for their child to attend a private school, most of which do not provide busing.
[6] Family size is also of interest because extant research suggests that the number of children in a family is negatively correlated with educational outcomes (see, for example, Sacerdote, 2004).

sample of the U.S. population via Web TV, a device that provides access to the Internet through a television. KN's respondents are identified by using a probability sample of the U.S. population who are initially contacted by telephone, and data are weighted to account for nonresponse (either to the initial invitation to join the panel or the request to complete a particular survey). The response rate among the KN panel members was 72 percent. Other research indicates that results from conventional RDD telephone and Knowledge Networks surveys are substantively similar (Chang & Krosnick, 2003).

Comparing CSF applicants to eligible nonapplicants (eligibles) required surveying a national sample of parents whose households fit the program's parameters. This sample was defined as families with children attending public school in grades 1 through 8 who have low-to-moderate incomes (less than $40,000), and live in cities with a population of 200,000 or more. These criteria closely match those used by the CSF, except that CSF families could live in nonurban areas and, if they had a sufficient number of children living at home, could have incomes above $40,000. To permit a fair comparison between applicants and eligibles, we exclude applicants not living in a city with a population of more than 200,000 and those with household incomes above $40,000 from the analysis. Note that the survey of eligibles asked whether the family had applied to the CSF (which a tiny handful did), and so CSF applicants were excluded from this portion of the data. Because we are interested in who uses vouchers to switch from the public to private sector, we also excluded CSF applicants who were in private school at the time of application. The zip codes of respondents to both surveys allowed for the collection of contextual information about the communities and school districts in which the respondent lived.[7]

Two surveys were necessary because CSF participants represent only a small fraction of the eligible population. Obtaining an adequate number of them in a single random draw of the eligible urban population would have required a prohibitively large sample. We estimate that about 4 percent of the eligible population applied for a CSF voucher. Had we simply surveyed the eligible population, therefore, we would have needed roughly 25,000 completed interviews to obtain the sample size of CSF applicants we employ here.[8] A survey of that size for a low-income and thus transient population would be hugely expensive. The more efficient data-collection strategy employed here is a choice-based or endogenous stratified sample—or what epidemiologists call a case-control research design. Essentially, the families that applied to the CSF, as compared to all those eligible, were oversampled.

The combined dataset includes three groups of families to which we will refer throughout our discussion:

1. *Eligible nonapplicants:* Families who were eligible for the CSF, but did not apply to the program. We also refer to them with the short-hand term *eligibles*.
2. *Applicants:* Families who applied to the CSF.

[7] Data about expenditures and minority populations within school districts are drawn from the Common Core of Data (U.S. Department of Education, 2002b). Private school enrollment is based on U.S. Census data compiled by a private vendor (Geolytics, 2002).

[8] Actually, the projected N would have had to be much larger than that for our overall dataset, since our analysis excludes families outside urban areas, with family incomes of more than $40,000, who have children in private schools, and did not win the lottery. To replicate the sample we have, we would have needed roughly 60,000 completed interviews.

3. *Voucher users:* Applicants who (a) applied for a CSF voucher; (b) won the lottery and were thus offered a voucher; and (c) took the voucher and enrolled their child in a private school.

The term *voucher usage* is used to refer to the ultimate outcome of the choice process, the combination of application and take-up.

Our analysis proceeds in two parts. We begin with a simple bivariate comparison, examining how the population of voucher users compares to the population of eligibles—who, among the relevant population, utilizes vouchers to switch from the public to the private sector? We then employ a nested logit model to separate the decision to use a voucher into its two distinct stages: application and take-up.

COMPARING ELIGIBLES AND VOUCHER USERS

Table 1 presents a bivariate comparison of the population eligible to apply for a CSF voucher (public school families only), and those families who used a voucher to switch from the public to private sectors (that is, they applied for a voucher, won the lottery, and moved their children from the public to private sector). As will be the case throughout our discussion, any references to statistical significance are based on a two-tailed test. There is no gap in family income between eligibles and voucher users,[9] although mothers in taker families have twice the rate of college education as the eligible population (24 percent versus 12 percent). Users were far more likely to be African American (41.7 percent versus 27.7 percent) and less likely to be White (38.8 percent versus 55.3 percent), with no statistically significant difference in Hispanic ethnicity. Religion also matters, both in terms of affiliation and attendance at religious services. While the difference in the percentage of Catholics among eligibles and voucher users is statistically insignificant, users are far more likely than eligibles to be Evangelical Protestants (40.5 percent versus 9.8 percent).[10] Voucher users also have a higher rate of attendance at religious services: 70.2 percent attend weekly, compared to 38.8 percent for the eligibles. Eligibles and voucher users do not differ regarding the percentage of minorities in their districts nor in the density of private schools within their community, although voucher users live in public school districts with higher per-pupil expenditures than do eligibles ($7,021 versus $6,600). Finally, there is no statistically significant difference in family size[11] nor the frequency in learning disabilities between the two groups.

These bivariate results reveal who ended up in private schools when given the opportunity to apply for and use a voucher. Of course, a multivariate analysis is required to see the impact of each factor net of all the others. The bivariate results, however, also obscure the distinction between the factors that lead families to apply for a voucher, and those that lead them to switch their children from public to private schools upon receiving a voucher opportunity (take-up). We thus turn to an analysis that enables us to model these two distinct stages of the choice-making process.

[9] Based on self-reports, divided into the following categories: (1) less than $10,000; (2) $10,000–$20,000; (3) $20,000–$30,000; (4) $30,000–$40,000.

[10] Note that Evangelical Protestants are identified as those parents who, upon indicating an affiliation with a Protestant religious denomination, also reported considering themselves "a born-again Christian."

[11] Family size indicates the number of children in the household in grades 1 through 8: (1) one; (2) two; (3) three; (4) four or more.

Table 1. Comparing eligible nonapplicants and voucher users.

	Eligible Nonapplicants	Voucher Users	N
Family income (1–4 scale)	2.9	2.8	759
Mother's education (% college graduate)	12%	24%***	754
Ethnicity			
African American	27.7%	41.7%***	715
White	55.3%	38.8%***	715
Hispanic	18.0%	15.3%	715
Religious affiliation			
Catholic	26.7%	30.6%	755
Evangelical Protestant	9.8%	40.5%***	753
Weekly religious service attendance	38.8%	70.2%***	745
Percentage of minorities in school district	51.5%	54.9%	754
Per-pupil expenditure in school district	$6,600	$7,021***	755
Private school density, zip code	11.6%	12.2%	722
Learning disability	14.2%	11.8%	746
Family size (number of children)	1.7	1.6	754

* $p < .10$; ** $p < .05$; *** $p < .01$ (two-tailed test).

STAGES OF SCHOOL CHOICE: APPLICATION AND TAKE-UP

In the CSF program, families expressed an interest in receiving a voucher by filling out an application form that enabled them to participate in the voucher lottery if they met the eligibility criteria for the program—a relatively low-commitment act that nonetheless indicates some degree of interest in the voucher opportunity. If they did apply and win the lottery, then they were faced with the second stage of finding an appropriate school for their child.[12] The challenges families faced at the second stage were multiple. Parents had to identify a private school they believed to be a good fit for their child and gain admission. In many cases, parents also had to arrange for their child's transportation to and from school, as most private schools do not provide busing. And the limited size of CSF vouchers meant that parents had to come up with enough money to cover the remainder of the tuition. Such obstacles kept the take-up rate for CSF vouchers relatively low: About one-third of CSF applicants who won the lottery actually enrolled their child in a private school.

The complication of modeling the two stages of the decisionmaking process is that the two stages are not independent of one another: Families are only in a position to decide to take a voucher if they have first applied for one. In other words, the second decision is nested within the first. Consequently, we employ[13] a nested logit model to estimate the two stages of the process, an appropriate estimator for modeling decisions that are contingent upon previous choices. At the first stage, families decide whether to apply (or not) to the CSF program. If they do not apply, there is no subsequent decision to make. If they do apply, then they are faced with

[12] If a family won the lottery, each of their children in the applicable grade range was offered a scholarship.

[13] The survey of CSF applicants also included families who did not win the lottery, but they have been excluded from the analysis. Since they were selected randomly, this does not introduce any bias. A comparison of lottery winners and losers confirms that the selection process was random, as no statistically significant demographic differences are observed.

the choice of whether to make use of the voucher or not. A nested logit model accounts for the interdependency of these decisions, by adjusting for the correlated error terms across the two equations.

Models for both stages of the choice-making process include each potential factor mentioned thus far, and are thus virtually identical. The sole exception is that only the equation for application includes a variable indicating whether the respondent lives in a metropolitan area targeted for promotional efforts by the CSF program operators, owing to the likelihood that CSF marketing was a positive influence on whether families applied for a voucher. Since marketing efforts ended once the application deadline passed, we do not include it in the model of voucher take-up. Results are displayed in Table 2.

We present two nested logit models in order to simplify the test of "White flight." In Model 1 (first two columns), White is the baseline category for the other three ethnicity variables: *African American*, *Hispanic*, and *Other Minority*, a residual category consisting mainly (but not entirely) of Asian Americans.[14] Thus, the coefficients for each are interpreted relative to Whites. In order to test for "White flight," specifically whether Whites are more likely to either apply for or use a voucher when living in public school districts with a greater percentage of minorities, we employ an interaction term between *White* and *% Minority in District* in Model 2 (the last two columns). To make the interpretation of the interaction as transparent as possible, we include the main effect for *White* and exclude the other three ethnicity variables in the model. As expected, the remaining coefficients and standard errors in the first and the second models are virtually identical.

Before turning to a discussion of the results, note that the final row of the table includes a likelihood-ratio test for homoskedasticity, a diagnostic to determine whether error terms are correlated between the two stages of the model, in which case a nested structure for the model is appropriate. The chi square test confirms that a nested model does indeed fit the data. In Table 2, we display the results of each stage of the model side-by-side, in order to facilitate the comparison of its impact on each step of the choice-making process.

Table 2 presents the nested logit results, which provide a rough sense of how each variable affects application and take-up, although the coefficients themselves do not lend themselves to an intuitive interpretation of their substantive magnitude. Therefore, in Table 3 we present the results using a different, and more intuitive, metric. For each variable that reaches or approaches statistical significance at either stage in Table 2, we present that variable's impact on either application or take-up by calculating its odds ratio. The method is best explained through an example. If a child has a learning disability, we calculate its estimated effect on application by, first, setting every other variable to its mean or the discrete category closest to the mean. We then calculate the estimated probability of application for a family with and without a learning-disabled child and divide the former by the latter. Continuous or ordinal variables were increased from their 25th to 75th percentiles. A value greater than 1.00 means that variable increases the probability, or odds, of application (and thus has a positive coefficient in Table 2), while a value of less than 1.00 means a lower probability (and a negative coefficient in Table 2). In the case of a learning disability, the odds ratio is 0.96, meaning that in substantive terms having a learning-disabled child reduces the odds of application by 0.04 or 4 percent (*all things being*

[14] Because "other minority" is a residual category and thus combines a number of disparate groups that, if they were represented in larger numbers, would be treated separately, we do not discuss results for this variable in the text.

Table 2. Modeling application and take-up. Results from nested logit models (2 levels).

	Model 1		Model 2	
	Application (Level 1)	Take-up (Level 2)	Application (Level 1)	Take-up (Level 2)
Family income	–0.212**	–0.091	–0.177**	–0.107†
	(0.099)	(0.075)	(0.090)	(0.077)
Mother's education	0.395***	0.055	0.391***	0.053
	(0.111)	(0.079)	(0.098)	(0.079)
African American	0.605*	–0.663***		
	(0.387)	(0.226)		
Hispanic	0.686*	–0.817***		
	(0.387)	(0.270)		
Other minority	0.654†	–0.918**		
	(0.488)	(0.389)		
Catholic	1.113***	0.321†	1.114***	0.324*
	(0.283)	(0.216)	(0.226)	(0.193)
Evangelical	2.287***	0.234	2.262***	0.225
	(0.291)	(0.188)	(0.266)	(0.188)
Religious service attendance	1.072***	0.227†	1.003***	0.287*
	(0.209)	(0.171)	(0.190)	(0.172)
% minorities in district	–0.590†	–0.533*	–0.291	–0.863**
	(0.421)	(0.300)	(0.480)	(0.353)
White X % minorities			–0.524	0.367
			(0.735)	(0.618)
Per-pupil expenditures	–0.0004**	–0.0002*	–0.0003*	–0.0003**
	(0.0002)	(0.00009)	(0.0001)	(0.0001)
Per-pupil expenditures squared	0.038***	0.019***	0.031***	0.026***
	(0.011)	(0.006)	(0.011)	(0.008)
Private school density	0.037***	0.027***	0.029	0.026***
	(0.015)	(0.008)	(0.013)	(0.008)
Learning disability	–0.467*	–0.447**	–0.410†	0.504**
	(0.280)	(0.224)	(0.260)	(0.228)
Family size	–0.182†	–0.183**	–0.101	–0.199**
	(0.117)	(0.087)	(0.122)	(0.103)
CSF marketing	0.977***		0.944***	
	(0.175)		(0.174)	
Inclusive value				
No apply	1.000	.	1.000	.
Apply	–2.585	0.734	–1.830	0.689
N	1249.000		1249.000	
Log likelihood	–1072.4025		–1080.4902	
LR test of	32.380		25.800	
Homoskedasticity	Prob. > Chi square 0.000		Prob. > Chi square 0.000	

† $p < .20$; * $p < .10$; ** $p < .05$; *** $p < .01$ (two-tailed test).

equal). Calculating the probability of taking a voucher is done the same way, although recall that, owing to the nested nature of the model, this probability is conditional on application. In the case of learning disability, it sharply reduces the probability of taking a voucher: 0.64. Thus, conditional upon application, families with learning-disabled children are 36 percent less likely to take a voucher. The final col-

umn reports the odds ratio for *overall usage*, which as the outcome of both application and take-up is simply the product of the first two columns.

The overall odds ratios for usage can be usefully compared to the bivariate results in Table 1. For example, we see that even though the bivariate results indicate there is not a statistically meaningful difference in the rate of learning disabilities among voucher users and the eligible population, our nested logit results paint a different picture. Controlling for their other characteristics and the interdependency of the decisions to apply and take, families whose children have a learning disability have a much lower probability of switching their children from public to private school using a CSF voucher (0.67).

The results in Table 3 reveal some interesting patterns. As expected, family income is negatively related to application for a voucher, and also has a negative impact on take-up, although the coefficient only has a p value of 0.22. As income shifts from the 25th to the 75th percentile, families are 5 percent less likely to apply for a voucher, and 13 percent less likely to take one if it is offered. The odds ratio for overall usage is therefore 0.83—a drop-off of 17 percent. This result may reflect the fact that the vouchers awarded families with higher incomes were smaller. In contrast to family income, mother's education has a positive and statistically significant impact on the decision to apply; its impact on voucher take-up is also positive but falls well short of statistical significance. Moving from the 25th to 75th percentile of mother's education increases the odds of usage by 12 percent.

Regarding ethnicity, African-Americans and Hispanics both have an increased probability of applying (relative to Whites). However, their probability of take-up is lower. Interestingly, however, both groups have an overall probability of switching from public to private school (usage) that is less than one, even though the bivariate results show that African Americans have a greater share of CSF users than in the eligible population as a whole.

Table 3. Impacts on application and take-up.

	Odds Ratio Application	Odds Ratio Take-up	Odds Ratio Overall Usage
Family income	0.95	0.87	0.83
Mother's education	1.08	1.04	1.12
African American	1.37	0.64	0.87
Hispanic	1.41	0.56	0.80
Catholic	1.11	1.26	1.40
Evangelical	1.18	1.19	1.40
Religious service attendance	1.27	1.19	1.51
% minorities in district	0.98	0.82	0.73
Per-pupil expenditures (incl. squared term)	1.03	1.11	1.14
Private school density	1.03	1.21	1.25
Learning disability	0.96	0.70	0.67
Family size	0.99	0.87	0.87

Values are calculated by dividing probabilities estimated from the nested logit model displayed in Table 2. Values greater than one indicate variables that have a positive impact on that stage of the decisionmaking process, while values less than one indicate variables with a negative impact. The final column indicates each variable's overall impact on voucher usage, equaling the product of the previous two columns (with slight deviations because of rounding). In calculating probabilities, all control variables have been set to their mean or the ordinal category closest to the mean.

Religion matters at both stages of the choice-making process, although we can have more confidence in its impact on application than take-up. Catholics, for instance, are more likely to apply and more likely to take a voucher, although the significance level for take-up is only $p < 0.20$. The story is the same for Evangelical Protestants—they are clearly more likely to apply for vouchers and probably more likely to take them, as the coefficient for take-up does not reach a conventional level of statistical significance ($p < 0.21$). The same pattern appears yet again for weekly attendance at religious services. Underscoring the importance of religious factors, the largest boost in the overall probability of switching from a public to private school is the result of weekly attendance at religious services, which has an odds ratio of 1.27 at the application stage and 1.19 for take-up, producing an overall odds ratio for usage of 1.51.

The percentage of minorities in a family's public school district has a negative impact on both application ($p < 0.20$) and take-up—precisely the opposite of what we expected. We emphasize, however, that the interaction term between *White* and *percent Minorities in District* in Model 2 of Table 2 indicates that Whites in particular neither apply for nor take vouchers at a higher rate when located in a district with a higher percentage of minorities. In other words, we find no evidence for White flight.

Both the per-pupil expenditures and private school density have a positive impact on both application and take-up. The estimated odds ratios for per-pupil expenditures in a family's public school district include the impact of both the linear and squared term simultaneously. Even though the coefficient for per-pupil expenditures has a negative sign at both stages, because of the squared term's positive sign, higher per-pupil expenditures actually result in a slightly higher rate of application, take-up, and overall usage.

Families with a child diagnosed as having a learning disability were both less likely to apply for and take a voucher. Similarly, family size is negatively related to both application and take-up, although its estimated impact on take-up is only significant at $p < 0.20$. It would appear that even though the CSF program operators sought to negate the relevance of family size as a factor in voucher usage, it nonetheless influences the decisions both to apply and to take a voucher when one is made available.

CONCLUSIONS AND POLICY IMPLICATIONS

Our analysis sheds light on one of the most significant questions embedded within the debate over school vouchers: Who would use them? Would vouchers siphon the most advantaged students from the public schools? Or would they release the pent-up demand for greater school choice among the least-advantaged? Will vouchers exacerbate racial segregation in public schools by contributing to White flight? Are vouchers especially attractive to families within particular religious traditions?

In drawing conclusions from our study, we stress that while the CSF intervention resembles many other means-tested school voucher programs, CSF was a small, one-time intervention that stimulated demand more than supply. The size of the voucher was small, and families were asked to pay a sizeable share of the private-school tuition. Generalizations to interventions where vouchers cover most private-school costs and are made available continuously to a larger share of the population should therefore be made cautiously, taking into account the characteristics of this particular program.[15]

[15] Chakrabarti's (2004) analysis of how existing voucher programs alter the incentives facing public schools illustrates the importance of program design.

It is also important to note that these data do not permit us to determine the extent to which factors influencing the decision to use a voucher are the result of practices on the part of the private schools. Other evidence suggests that private schools within the tuition range of CSF vouchers have few restrictions on admission, especially in the lower grades (Howell et al., 2002), but they nonetheless have the prerogative to be selective. These caveats remind us that the CSF is only one piece of the puzzle to estimating what we could expect from publicly funded voucher programs. But the program's size and scope make it an important piece, as the CSF offers one of the best available opportunities to examine the real-world implementation of a voucher program.

Do vouchers "skim the cream" from the public schools? Not when we look at family income. In fact, families with lower incomes are more likely to both apply for and take vouchers when given the opportunity, consistent with the argument that vouchers are most attractive to those families who face the greatest constraints on their ability to exercise school choice under the status quo. Similarly, application rates are high for ethnic minorities, suggesting that their choice within the public school system is especially constrained.

Upon receiving a voucher, however, these same minorities still face constraints on their exercise of choice in the private sector, as the take-up rates of minorities are lower than for Whites. This could be because minority families are less likely to find a private school that matches their preferences, or because private schools may discriminate on the basis of ethnicity in their admissions. In other words, for minorities' interest in vouchers to translate into comparable usage rates, special efforts will need to be made to ensure the effective supply is adequate to meet the initial demand. Future research should focus on the precise explanations for why minorities have a lower rate of voucher usage.

We find mixed evidence for skimming on the basis of educational status. To take a voucher, conditional on applying, is not affected by mother's education, even when the voucher intervention imposes no restrictions on private-school admissions policies. Any education-based skimming, therefore, is the result of self-selection into the program, an indication that choice interventions (like most policy innovations) will attract the better-educated, at least at their inception and when they are on a modest scale

Do vouchers contribute to White flight? Here, the answer is unequivocal. We find no evidence that Whites in districts with a high concentration of minorities are especially likely to be voucher applicants or takers.

Are vouchers especially attractive to families of particular religious traditions? Both Catholics and Evangelical Protestants are more likely to apply for and take vouchers. The family's level of religious commitment also matters, as frequent church attendance also has a significant impact on both stages of voucher usage. Our results thus complement Howell's (2004) analysis of a CSF-affiliated voucher program in New York City, in which he finds that those families most likely to enroll in and then stick with a voucher program over three years were those whose children were in schools sponsored by their own religious faith.

The significance of religion as a factor shaping participation in voucher programs underscores that, under the status quo, private education is especially appealing to Catholic and Evangelical Protestant families. This fact should reframe the discussion over whether vouchers "skim the cream" from the public schools. The debate over skimming has focused primarily on voucher usage by social class or ethnicity. But in practice, families who used vouchers differed from the eligible population less in their income or education as in their religious practice. Those active in particular faith traditions may well find something lacking in the secular education provided by

public schools. As long as private schools are provided primarily by religious organizations, one must expect that any voucher program will, in the first instance, be particularly attractive to such families. Since religious engagement does not vary sharply by social classes or ethnic groups, this propensity probably attenuates any skimming effects that might otherwise occur. Vouchers, therefore, might lead to greater social mixing in school. While a few studies have found some positive social benefits from vouchers, the subject nonetheless requires more scholarly attention (Campbell, 2001; Wolf et al., 2001; Greene, 1998; Godwin & Kemerer, 2002; Wolf et al., 2004).

Much of the discussion over school vouchers has proceeded in a vacuum of data, leading to speculative claims by both those who oppose and support the policy. Our analysis, however, indicates that there is merit in some claims made on both sides of the issue. The factors affecting school choice are plural, not singular. We have also shown that it is important to distinguish between the factors that lead families to apply for a voucher versus those that lead them to take a voucher when it is offered—some factors matter at one stage of the process, some at the other, still others at both. In the wake of *Zelman*, proposals for voucher programs will likely proliferate, inevitably accompanied by heated debate. While this study is not the final word on the subject of who would use vouchers, we nonetheless hope that it offers some empirical ballast to the rhetoric surrounding school choice.

ACKNOWLEDGMENTS

The authors would like to thank the Center on School Choice, Competition, and Achievement, the BASIC Fund, and the Gordon and Laura Gund Foundation for their financial support. We are also grateful for the assistance of Douglas Dewey, Richard Hough, and Darla Romfo of the Children's Scholarship Fund. Thanks to Jane Hannaway, William Howell, Helen Ladd, Michael Mintrom, and Mark Schneider for their thoughtful comments on earlier versions of this paper, and to Antonio Wendland and Mark Linnen for their administrative support. The paper also benefited greatly from four anonymous reviewers. The methodology, data analyses, reported findings, and interpretations of findings are the sole responsibility of the authors and are not subject to the approval of any of the program operators or of any foundation providing support for this research.

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