The Choice of Public, Private, or Home Schooling

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Abstract

Over two percent of school children are home schooled and eleven percent sent to private school. I estimate models of school choice using household-level data from three rounds of the National Household Education Survey merged to secondary data sets. Families are inclined to avoid low quality public schools. For families leaving the public school system, they are relatively more likely to exit to home schooling rather than private schools if the mother has abundant time but scarce income, and if the state public school finance system is centralized, making Tiebout sorting less efficient and private schooling more costly. These effects are especially strong among well-educated parents and younger children. The home schooling of older children is more sensitive to child-specific behavioral needs.

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1 Introduction

In 2003, 2.2% of school children, or 1,100,000 children, were home schooled.[1] This equals the number of students in charter schools and voucher programs combined, but relative to these school choice programs there has been little research on home schooling. Sociologists Van Galen (1991) and Stevens (2001) suggest that religious or pedagogical preferences motivate home schoolers. Bauman (2002) and Belfield (2002a) fit descriptive models of household characteristics on the probability a child is home schooled using the 1996 or 1999 National Household Education Survey (NHES). Belfield (2002b) presents results using Educational Testing Service data on SAT test-takers. Neither data set contains school characteristics, however, and in any case inference based on descriptive results is limited without an explicit economic model. Houston and Toma (2003) use school district level administrative data merged with aggregate demographic data but this approach can at best identify school effects but not household effects on school choice (Isenberg 2003).

My approach is to derive predictions from an economic model of the mother's time allocation decision and use pooled cross-sectional data from three rounds of the NHES to test them. I use a simulation technique to distinguish between income earned by the mother and other household members.[2] Using the restricted-use version of the NHES, I merge the household data to secondary data sets to test for the effects of local public and private schools. The results confirm that religious preferences are important, but preferences do not fully explain home schooling. Families are more likely to home school if local public

[1] During the 1970s and 1980s home schooling became legal in every U.S. state. Because most states do not keep records of home schooling, a precise estimate of the number of home schooled children is difficult. This estimate is derived from the 2003 National Household Education Survey (NHES). For details of estimating the number of home schooled children, see Isenberg (forthcoming).

[2] One of the chief shortcomings of the NHES data is that income is reported only for the household. Previous research on home schooling using the NHES data has not been able to distinguish between income earned by the mother, which is endogenous to the decision to home school, and other income.

school quality is poor and local private schools are more costly to form. Time and income constraints also affect home schooling. In choosing an alternative to public schools, mothers with much time and little income tend to choose home schooling; those with little time and much income tend to choose private schools.

2 Model

The existing evidence on the production of home schooling indicates that mothers are responsible for the bulk of home teaching (Stevens 2001).[3] The model assumes that mothers are the actual or potential home teachers. Consider households located in rural areas with one public school district, no private schools, and one school aged child in the family. Assume that the mother in family i residing in local area j maximizes a utility function

$$\max_{(t_{il},t_{iq},t_{ih})} u_{ij} = u\left(z_{il}, t_{il}, s_i\right) \tag{1}$$

subject to a budget constraint

$$z_{il} = w_i t_{iw} + y_i, \tag{2}$$

a time constraint

$$\bar{t} = t_{iw} + t_{ip} + t_{il} + t_{ih}, \tag{3}$$

[3]To supplement the thin sociological literature that peers inside the black box of home teaching, I interviewed a set of home schooling leaders in Florida, who were unanimous in affirming that mothers were responsible for home teaching. As a check, the National Household Education Survey data show no significant differences in the distribution of work hours between fathers of home schooled children and fathers of children attending conventional schools.

and a school production function:

$$\begin{aligned} s_i &= s_h\left(t_h\right), t_h > 0; \\ &= s_j, t_h = 0. \end{aligned} \tag{4}$$

The utility function (1) comprises composite consumption z_{il}, mother's pure leisure time t_{il}, and school quality $s_{i.}$ The income constraint (2) balances expenditure on consumption z_{il} with income, equal to the mother's wage w_i multiplied by time spent working t_{iw} plus other income y_i. The mother's time constraint (3) equates a fixed amount of available time $\bar{t}$ with its components: time spent at work t_{iw}, on household production t_{ip}, at pure leisure t_{il}, and, if she chooses, on home schooling t_{ih}. The school production constraint (4) asserts that school quality depends on whether the household chooses home schooling or the public school. If the child is home schooled, then school quality s_h depends on the mother's time input t_h. If she is not home schooling, then this time input equals zero, and school quality s_j depends on the local public school. To simplify, a fixed amount of household production is assumed. Working alone, it takes the mother t_{ip} to complete. The value of household production enters the utility function as a constant, and so is omitted from (1).

If the mother sends her child to the public school, then $t_{ih} = 0$, and she sets

$$\frac{\partial u}{\partial t_l^*} = \frac{\partial u}{\partial z_l^*}\left(w\right). \tag{5}$$

This is a familiar result (Becker, Chapter 1, 1991). She allocates her time so that the marginal utility of leisure equals the marginal utility of consumption multiplied by her wage. If the mother home schools her child, then at the optimum

$$\frac{\partial u}{\partial t_l^+} = \frac{\partial u}{\partial z_l^+}\left(w\right) = \left(\frac{\partial u}{\partial s_h^+}\right)\left(\frac{\partial s_h^+}{\partial t_h^+}\right). \tag{6}$$

The mother decreases time devoted to work and/or leisure in order to spend it home teaching, so that $t_l^+ \leqslant t_l^*$ and $z_l^+ \leqslant z_l^*$. The first two ratios are adjusted so that they equal the marginal utility of additional home school quality multiplied by the marginal increase in home school quality of additional time input. A mother will home school if $u_h\left(z_l^+\left(t_w^+\right), t_l^+, s_h\left(t_h^+\right)\right) > u_j\left(z_l^*\left(t_w^*\right), t_l^*, s_j\right)$. There are three cases. For simplicity, I adopt a separable utility function $u\left(u_z\left(z_l\left(t_w\right)\right), u_l\left(t_l\right), u_s\left(s_i\left(t_h\right)\right)\right)$:

I) $u_s\left(s_h\left(t_h^+\right)\right) > \left(u_z\left(z_l^*\left(t_w^*\right)\right) - u_z\left(z_l^+\left(t_w^+\right)\right)\right) + \left(u_l^*\left(t_l^*\right) - u_l^+\left(t_l^+\right)\right) + u_s\left(s_j\right)$;

II) $\left(u_z\left(z_l^*\left(t_w^*\right)\right) - u_z\left(z_l^+\left(t_w^+\right)\right)\right) + \left(u_l^*\left(t_l^*\right) - u_l^+\left(t_l^+\right)\right) + u_s\left(s_j\right) > u_s\left(s_h\left(t_h^+\right)\right) > u_s\left(s_j\right)$;

III) $u_s\left(s_j\right) > u_s\left(s_h\left(t_h^+\right)\right)$.

The mother home schools in Case I because the utility gained by home schooling exceeds the utility lost due to lost income, lost leisure, and foregone public schooling. In Case II, the mother does not home school because even though home schooling is preferable to public schooling, the "implicit tuition" of home schooling is too high, i.e. the utility lost due to lost income and leisure time exceeds the gain due to the difference between home and public school. Finally, in Case III, the mother does not home school because public schooling is more valuable then home schooling. I will focus on household characteristics and school attributes that differentiate between mothers in the first two cases.

Among observable variables, one school characteristic and three household characteristics affect the one-child rural case: public school quality, the number of adults in the household, household income not earned by the mother, and the mother's education level. Public school quality unambiguously has a negative effect on the likelihood of home schooling. For family size, $\frac{\partial t_{ip}}{\partial n_{adults}} < 0$, i.e. as the number of adults increases, the amount of time the mother must devote to household production decreases, in effect expanding her time budget. For a mother in Case II who adds a household member, the time gained could be devoted to work, leisure, or home teaching. Since home schooling is a time-intensive process, an expanded time budget will pull mothers toward Case I. Increasing income y_i will also increase $u_h - u_j$. Assuming

a decreasing marginal utility of income, more non-labor income will diminish the incentive of mothers to work, thereby expanding the time budget and pulling mothers toward Case I. Finally, mother's education is ambiguous because $\frac{\partial w_i}{\partial (ed_i)} > 0$ and $\frac{\partial s_{ih}}{\partial (ed_i)} > 0$, i.e. better educated mothers have both higher opportunity costs and a greater educational impact on their children (Datcher-Loury 1988). So there are two substitution effects of mother's education, one encouraging work and the other home teaching (cf. Leibowitz 1974, who proposes similar substitution effects for mothers returning to work after childbirth).[4]

The model can be extended by adding multiple preschool children, who cause a negative time effect: $\frac{\partial t_{ip}}{\partial n_{preschoolers}} > 0$, causing $\bar{t} - t_{ip}$ and $u_h - u_j$ to decrease. There is a second effect of preschool children, however. Since a working mother must arrange for day care of preschool children, they act as a tax on her wages (Browning 1992). This negative substitution effect for labor hours increases the potential amount of time for home schooling. The effect can be particularly strong either if there are fixed costs of working (Edwards and Field-Hendrey 2002) or if mothers perceive market day care options to be imperfect substitutes for their own time. Thus the effect of preschool children on home schooling is ambiguous.

If families live in urban areas that allow for school choice, rewrite the budget function as

$$z_{il} + z_{is} = w_i t_{iw} + y_i, \tag{2*}$$

and the school production function as

$$\begin{aligned} s &= s_h\left(t_h\right), t_h > 0; \\ &= s_j\left(z_s\right), t_h = 0; \end{aligned} \tag{4*}$$

[4]In extreme cases, income and substitution effects can generate ambiguous comparative statics for household variables. The text outlines the most plausible net effects.

so that school quality may be purchased either by paying private school tuition or paying implicitly for public schools through local taxes and/or housing costs that capitalize local school quality. Although parents are tied to local area j through a primary job, within this area they may substitute money for time to produce school quality. In this expanded model, the analyses of household size and mother's education remain virtually the same. Since school quality is now an endogenous function of expenditure, however, the analysis of income changes. As before, more income, by decreasing the marginal utility of income, will decrease the mother's labor supply, expand her disposable time, and thereby increase the likelihood of home schooling. On the other hand, since home schooling and conventional schooling are substitutes, an increase in income directly increases the quality of public or private schools that family i could afford, making home schooling less likely. In sum, the impact of income on home schooling is ambiguous and may change throughout the income range.

Finally, there is the impact of the average ($\overline{q}$) and variance ($\widetilde{q}$) of school quality in a local area. Rewrite the school production function as

$$\begin{aligned} s &= s_h\left(t_h\right), t_h > 0; \qquad (4^{**}) \\ &= s_j\left(z_s, \overline{q_j}, \widetilde{q_j}\right), t_h = 0. \end{aligned}$$

First, consider the direct effects of a mean-preserving spread in school quality ("greater school choice"). Holding constant average school quality in area j, increased variance in public school quality should decrease nonpublic (private plus home) schooling by wealthy families, who will sort into the higher quality public school districts, and increase nonpublic schooling by poor families, since average school quality in the lower half of the distribution will decrease. The net effect on home schooling will depend on the theoretically ambiguous effect of income on home schooling. For instance, if income varies directly with private

schooling and inversely with home schooling at every income level, then a wider variance of public school quality will cause wealthier families to move from private to public schools but cause poor families to opt out of public schools and into home schooling.

Now consider $\frac{\partial P(s_h)}{\partial(\overline{q_j})}$. Holding the variance constant, a decrease in the average quality of public schools will directly increase the demand for home schooling and private schooling. The net effect of average public school quality on home schooling will depend on the elasticity of substitution of private schools for public schools. Thus, to model home schooling one must identify a variable that affects this elasticity. Cross-state variation in systems of school finance provides such a variable. Nechyba (2003) shows how centralization of school finance *decreases* private schooling. Centralization is usually precipitated by a mandate to equalize expenditure across districts. Wealthy families will be more likely to exit public schools for private schools if expenditure on high-end public schools decreases, the "common sense" interpretation of the effect on private schools. Poor families, however, will be less likely to choose private schools under centralized school finance since public school expenditure in these areas will increase.

Centralization also decreases the ability of households to use Tiebout sorting to minimize their tax burden and choose private schools. In a system of local finance, it may be possible to find good housing in low-tax, low-school quality districts and send children to private schools. Under centralization, families owe the tax no matter where they live. Centralization thereby increases the cost of using private schools, decreasing private schooling. This effect is unlikely to influence home schooling, however. As the NHES data will show, families home schooling one child are likely to send other children to a school and some use public schools concurrently with home schooling. Therefore the impact of centralization on home schooling is most likely indirect: by decreasing the availability of private schools, centralization increases home schooling.

To review the basic theoretical predictions: larger family size will generally make home

schooling more likely through time effects, although the effect of preschool children is ambiguous; more income will make home schooling more likely in rural areas but has ambiguous effects in urban areas; better educated mothers may or may not be more likely to home school depending on conflicting substitution effects. Public school quality will negatively affect home schooling in rural areas; the magnitude of the effect in urban areas depends on the formation of private schools. Greater school choice has ambiguous effects that depend on how income affects home schooling. Greater centralization of the state school finance system will increase home schooling indirectly by discouraging the formation of private schools.

3 Data and Specification

The 1996, 1999, and 2003 National Household Education Survey (NHES) are nationally representative, random-digit dialing phone surveys of American households sponsored by the U.S. Department of Education (Collins and Chandler 1997, Nolin et al 2000, Hagedorn et al 2004). In each year, the NHES interviews a new cross-section of households. Parents are asked about participation in their children's education, including questions about home schooling. Isenberg (forthcoming) describes why the NHES data sets are the best available for studying home schooling.

Table 1 shows how the NHES data sets are used in this paper. Each NHES includes a survey centered on a focal child with extensive information collected on the composition of the household and the characteristics of the child's parents (row 1). These interviews ask questions about the reasons for home schooling discussed in Table 3. In 1996 and 1999, there are Screener data available on the schooling of other children in the household with information about public, private, and home schooling in 1996 and about home schooling and conventional schooling (public and private combined) in 1999. By merging these data with the focal child data, the number of students in the 1996 and 1999 data sets roughly

double (row 2). These data are used to compute Table 2 on within-family differences in school choice. In all NHES data sets, in order to explicitly test hypotheses about the time use of the mother, I have dropped households with no own schoolchildren, single fathers, or more than one mother with schoolchildren (row 3). These data are used in regression models of home schooling in Column 1 of Panel A of Table 5. A few observations are excluded due to missing school data (row 4). The resulting data set is used when the model is extended to include more school variables in Columns 2-4 of Panel A of Table 5 and Table 6. For private school models, observations from the 1999 NHES are dropped when children in private school can not be distinguished from children in public school. So for the regression results presented in Table 5, Panel B, Column 1, data from row 5 are used. With additional control variables added, some observations are excluded due to missing data. Columns 2-4 of Panel B of Table 5 and Table 7, which show results from a model with extended school variables, are based on row 6.

An initial look at data from the NHES reveal that home schooling is broader than the sociological accounts, which are based on interviews of families strongly attached to home schooling. Van Galen (1991) and Stevens (2001) distinguish between religious and secular groups. In these accounts, fundamentalist Protestants (frequently Baptists or Pentecostals) are driven to home schooling by their belief that local public schools teach a curriculum objectionable to their religion. For others, home schooling is a way to provide a superior education. In both groups, mothers believe that their main role is to nurture children, and home schooling is an outgrowth of this belief (Stevens 2001). The NHES data suggest that patterns that may describe the most dedicated home schoolers do not describe the average home schooling family nor the family on the margin between home schooling and conventional schooling. For instance, parents who home school one child will not necessarily home school

all their children.[5] See Table 2. For home schooling households with more than one child in school, at least one other child was sent to a school in 218 of 394 cases (55%).[6] Some children are home schooled part-time and attend school part-time. In combined results from the 1999 and 2003 NHES, 21% of home schooled children also attended a school.[7]

Table 3 summarizes the reasons given by home schooling families for why they home school their children, reported separately for children under and over twelve and categorized into three broad areas from the underlying NHES response categories: religious, educational, and behavioral/special needs. The 1996 and 1999 figures are upper bounds because in these surveys parents were allowed to name more than one reason for home schooling. The 2003 survey asked parents a yes/no question for a set of possible reasons for home schooling but required them to choose a primary reason. Religious and educational groups are well-represented in the data. Religion is more important for parents home schooling younger children. For older children, behavioral or special needs become increasingly important. Children of high school age are especially likely to be home schooled for these reasons. In the 2003 data, for children 14 to 17, almost half of home schooling parents cite behavioral reasons or special needs as a reason, 21% as the primary reason and another 27% as a contributing reason. In understanding the regression results, it will be helpful to keep in mind the three groups that home schoolers themselves identify.

I estimate reduced-form logit models designed to test the implications of the theoretical

[5] Psychologist Walter Schumm (1994), in a small-scale study of home schooling in western Kansas, recognized that families mix home schooling with conventional schooling. Other than his study, the data presented here are the first to describe within-household home schooling patterns.

[6] Similar results are obtained for private school families. Many families send just one child to a private school.

[7] Mary Lou Carothers of the Florida Department of Education points out that some part-time home schooled children have special education plans (IEPs) at school.

model:

$$\begin{aligned} P\left(homeschool\right)_{cijk} &= F\left(X_c, X_i, X_j, X_k\right); \\ P\left(private_{cijk}\right) &= F\left(X_c, X_i, X_j, X_k\right). \end{aligned} \tag{5}$$

The probability that child c in household i in local area j in state k is home schooled or sent to private school is a function of child characteristics X_c, household characteristics X_i, local area characteristics X_j, and state characteristics X_k that affect local school quality and choice. In home schooling models, the discrete dependent variable equals one if a child is home schooled and zero if a child is sent to public or private school. In the private schooling models, the dependent variable equals one if the child is sent to private school and zero otherwise. The NHES data provide child characteristics (age, age squared, and gender) and household variables. Family composition variables are either counts of the number of family members in a particular group, e.g. number of children aged 0-2, or, for the number of school-aged siblings, a set of dummy variables with "only child" as the excluded category. Educational levels for the parents are specified as a set of dummy variables. The excluded category for the father is "no father present." For the mother the exclude category is "less than high school"; there is a mother in the household for every child in the data set. There are also dummy variables for whether a mother speaks a language other than English at home, whether the mother has a disability, whether she is African-American, and whether she is Hispanic. One specification includes a variable designating "very religious" families.[8]

Wage and non-labor income data are absent from the NHES. A common imputation

[8]Religiosity data were not collected for all observations. The 1996 NHES collected data on religiosity for a subsample of focal children in sixth grade and above, skewing the age distribution in this sample. The 1999 NHES did not collect religiosity data. The 2003 has religiosity data for all children. The "very religious" dummy variable is for the highest level of religious participation. Although the survey question differed in the two years in which these data were collected, about half of the sample is classified as "very religious" in both years.

method for missing wage data is to use predictive models to impute point estimates of wages. I use data from the 1996-2005 Current Population Survey (CPS) to obtain predictive models of the wages of married men and women based on covariates available in both CPS and NHES, but improve upon the usual technique in two ways. First, I make use of NHES data on both spouses' working hours and upper and lower bounds of total household income. These data constrain the joint wages of working spouses to lie in a small region of a plane that measures the wage of each spouse on a different axis. I simulate joint wages by choosing the wage of each spouse based on the predicted value and a normally distributed error term. An accept/reject algorithm accepts the joint wages if both wages fall in the acceptable region. By this method, the imputed joint wages are more accurate than the more common procedure, which does not make use of data on hours or joint income. From these joint wages, I compute the amount of household income not earned by the mother, i.e. exogenous to the mother's home schooling decision.[9] For working single mothers, I impute the income they would receive if they received AFDC or TANF payments. The second advantage of this method is that I account for the uncertainty in the imputation process by using multiple imputation. Ten simulated values are chosen for each household and the home schooling results are based on the combined output of ten regressions, one with each set of simulated values (Rubin 1987, 1996).[10]

Using the zip code provided by the restricted-use NHES data sets, I have merged variables from several external data sources to control for the effects of school quality and school choice. I assume that a primary job ties a household to a local area, but the household is free to choose a residence within that area. This is a common assumption in empirical work (Hoxby

[9] An initial step imputes non-labor income, also based on covariates available in both the CPS and NHES. This shifts the acceptable region for joint wages toward the origin. Then I simulate wages. An acceptable draw is one that finds that non-labor income plus the wife's earned income plus the husband's earned income is within the reported bounds for household income.

[10] Full details of the imputation process are available from the author on request.

2000, Figlio and Stone 2000, Fairlie and Resch 2002). Consistent with this approach, I merge local variables computed at the level of primary metropolitan statistical area (MSA) or non-MSA county for families living outside MSAs.

To evaluate the effects of public school choice on home schooling, I use 2000 census data from the School District Data Book to calculate two statistics for each MSA and each non-MSA county. I compute the weighted average of the within-district Gini coefficient. A higher Gini coefficient indicates more within-district income inequality. I also compute a within-district measure of heterogeneity of parents' educational attainment equal to one minus the Herfindahl index for five categories of parents' educational attainment (so that the resulting statistic varies from zero to 0.8 with a higher number indicating more heterogeneity.) In areas in which there is better Tiebout sorting to accommodate different preferences for school districts, districts will be more homogeneous, so both measures will be lower.[11]

To measure school quality, I compute an average of the state-level 4th and 8th grade 2003 National Assessment of Education Progress (NAEP) math score from the National Center for Education Statistics (NCES).[12] Of course, NAEP scores will reflect both the demographic characteristics of children and the quality of the schools. In the context of understanding school choice (rather than evaluating school quality), raw scores are preferable to value-added scores because parents choose schools based on average student outcomes rather than value-added (Brasington 1999).

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[11] As a robustness check, I also collect data on the average local per pupil expenditure and variance of per pupil expenditure within an area (MSA or non-MSA county) from the 1995-96 Common Core of Data. Using TIGER mapping files, I create a dummy variable for the presence of separate elementary and high school districts in the state, which corrects for the fact that some per pupil figures are averaged over grades K-8, some over grades 9-12, and some over grades K-12. Per pupil spending at the secondary school level tends to be higher than at the primary school level.

[12] I use the 2003 NAEP data for all years because this is the first year in which all states participated in the NAEP, following the passage of the No Child Left Behind Act. For states that had participated in the past, there is a high correlation between their past scores and the 2003 scores.

To model school finance centralization, I employ three state-level variables: the percent of school revenue generated at the local level and two dummy variables for the political economy in the state: one variable that equals one if citizens vote directly on operational expenditures through referenda, town meetings, etc., and the other equaling one if locally elected representatives vote on operational expenditures.[13] A full set of descriptive statistics for home, private, and public school children for data used in the regressions are presented in Table 4.

4 Results

Public School Quality If parents are driven to home school for educational reasons—as economic theory suggests and most home schooling parents claim—then measures of better local public school quality should decrease the probability of home schooling, all else equal. As Panel A of Table 5 shows, there is evidence that parents are more likely to exit the public schools as local public school quality deteriorates. I present four specifications of school variables. All specifications include control variables for a set of household characteristics and a dummy variable for year (i.e. 1996, 1999, or 2003). The specification in Column 1 of Panel A is the most parsimonious: apart from the household variables, there is a dummy variable for living inside a MSA and the state NAEP math score as a measure of public school quality. Column 1 shows a negative and significant effect of public school quality on the likelihood of home schooling. The coefficient implies that, all else equal, moving from Washington state or Indiana, states at the 75^{th}percentile of NAEP scores, to Arizona or Georgia, states at the 25^{th}percentile, increases the likelihood of home schooling by .030

[13]The data on percent of school revenue generated at the local level are from the Common Core of Data. One problem with this variable is that it reflects an accounting measure of local control rather than a political measure. For instance, in California, although roughly half of school funding is derived from local taxes, the level of school spending is completely determined at the state level, with the exception of contributions from parent booster clubs in wealthy communities. This measurement error imparts a downward bias to the estimate.

percentage points, an economically significant effect given that the unconditional probability of home schooling in these data is 1.9 percent. The specification in Column 2 adds two control variables for local public school choice: indexes for educational and income heterogeneity of parents within school districts in a local area. The coefficient for NAEP scores is similar in both its economic and statistical significance to Column 1.[14]

Column 3 adds a set of three state-level political economy variables to control for private school choice: the percentage of school revenue collected at the local level and two dummy variables for political participation in school spending decisions. Centralization of school finance, by making Tiebout sorting more difficult, decreases the number of private schools, all else equal. This effect is captured by these three variables. If public school quality is higher in states with more private schools because private competition spurs more efficient public schools, part of the apparent effect of NAEP scores on home schooling may include the effect of greater school choice through private schools. Column 3 shows that the regression coefficient for the effect of NAEP scores is halved by the inclusion of political economy variables.

Column 4 adds a set of eight regional dummy variables to the variables in Column 3. The variation in NAEP scores and other variables in this specification is thus across regions rather than across the nation. For historical reasons, states within a region are likely to be similar in demographic and institutional characteristics that affect the number of private schools available. All seven school variables are individually insignificant in this specification, but they are jointly significant at the 10% level, indicating a possible role for school characteristics

[14] All regressions are weighted according to sampling weights provided by NHES and standard errors are corrected for clustering at the household level. In models in which the household was used as the unit of observation, correcting for clustering at the state level decreased the standard errors of most coefficients. So even though the standard error is not clustered at the state level in the models presented (with the child as the unit of observation), the standard errors are not artificially small.

within regions but a difficulty distinguishing the individual effects due to collinearity.[15]

In choosing whether to home school, better educated parents may be more responsive to public school quality, the result found by Figlio and Stone (2000) for private schools. I run the specifications in Table 5 with the sample restricted to children with mothers who have at least a bachelor's degree. In this subsample, the marginal effect of school quality on home schooling remains statistically significant at the 5% level using the specification in Column 3 and at the 10% level using the specification in Column 4. The magnitude is four times as great as for the entire sample, based on the specification in Column 3.[16]

The effect of NAEP scores on private schools is shown in Panel B. There appears to be a negative effect of public school quality on choosing private schools, especially for better educated mothers, consistent with much of the recent literature on private school choice.[17] In Column 4, with the fullest set of control variables including regional dummy variables, the effect is statistically significant. There is borderline significance in Column 3. There is a peculiar result in Column 2, showing a positive partial correlation of test scores with private

[15]Similar results are obtained if average per-pupil expenditure in area school districts is substituted for NAEP scores as a measure of school quality. Statistically significant negative results for the effect of per pupil expenditure on home schooling are obtained in specifications similar to columns 1 and 2 but become attenuated in specifications similar to columns 3 and 4. The variance of per pupil spending within an area replaces the educational and income heterogeneity indexes. The coefficient on the Percent Local variable is statistically significant in the specification similar to column 3 but not after adding regional dummy variables. The correlation between the two state-level variables "percent of school revenue collected at the local level" and NAEP score is a relatively strong 0.36.

[16]Not every specification discussed in the text is shown in Tables 5 to 7. All results are available from the author on request.

[17]Figlio and Stone (2000) use national child-level data from the National Educational Longitudinal Survey (NELS) to show that measures of public school quality negatively affect the probability that families send children to private school. Fairlie and Resch (2002), also using the NELS, find statistically insignificant results of individual public school quality measures but do not report a joint test. Lankford, Lee, and Wyckoff (1995) do not find statistically significant results of per pupil expenditure on private schooling using the Current Population Survey. Two analyses of private school choice within a single state—Downes and Schoeman (1998) and Murray and Wallace (1997)—have shown negative effects of public school quality on private school choice. Downes and Schoeman (1998) use per pupil expenditure and Murray and Wallace (1997) use test scores to measure public school quality.

school attendance. Like the home schooling results and consistent with Figlio and Stone (2000), however, the effect of NAEP scores on private schooling are strongly negative when the sample is limited to mothers with at least a bachelor's degree, including the specification in Column 2.

School Choice If home schooling were caused by a limited choice of public school districts, variables measuring the degree of local school choice ought to have significant effects on home schooling, all else equal. In Columns 2-4 in Panel A of Table 5, I include control variables for the average Gini coefficient and the educational diversity index within an area (MSA or non-MSA county). These variables are not individually or jointly significant in any model even at the 10% level. So it does not appear that public school choice has a direct effect on home schooling.[18] An alternate interpretation is that schools rather than districts are the appropriate unit of analysis for heterogeneity and size (cf. Alesina, Baqir, and Hoxby 2004), but data on income and educational attainment by school attendance area are not readily available.[19]

Another factor affecting home schooling is the degree of school choice between public and private schools. Families opting out of public schools must choose between home schools and private schools. State public school finance laws affect the formation of private schools in ways predicted by theory. Column 3 of Panel B of Table 5 shows that when a greater

[18]In alternate specifications that model school choice by using the variance of per pupil expenditure within an area and average per pupil expenditure as a measure of average school quality, the variance variable is never statistically or economically significant.

[19]In Isenberg (2003) I use district level data from Wisconsin to explain how religious heterogeneity affects the likelihood of home schooling. I find that as the local percentage of the population evangelical Protestant increase, the effect on percent home schooled is concave, indicating demographic externalities of evangelical Protestants on each other. In other words, an increase in the percentage evangelical Protestant causes an increase in the percentage home schooled, but as the population becomes increasingly evangelical Protestant, the exodus to home schooling slows, indicating that potential home schooling families either feel more satisfied with local public schools or join private schools.

percentage of school funds are collected at the local level and when citizens vote directly on public school operational expenditures, families are more likely to use private schools, all else equal, consistent with Nechyba (2003). Column 3 of Panel A shows that school finance laws affect home schooling in the opposite way: centralized school finance increases the likelihood of home schooling. The magnitude of the effect is moderate: all else equal, moving from California, at the 25^{th} percentile, to New York, at the 75^{th} percentile, decreases the likelihood of home schooling by .027 percentage points, an effect comparable to the change in NAEP scores between the 25^{th} and 75^{th} percentiles calculated by using the coefficient in Column 1.

Panel B shows results for private schooling. In addition to being more likely to use private schools in states with poorly performing public schools and more centralized school finance systems, families are more likely to use private schools if they live inside a metropolitan area and in areas that have more income heterogeneity by school district (although more heterogeneity in parents' educational attainment is negatively correlated with private school attendance.) As can be seen in Panel B, these results are fairly robust across different specifications.

In sum there is evidence that low academic school quality drives families out of public schools, especially when the parents are well-educated. For the one in eight children who do not attend a local public school, this leaves a choice between home schooling and private schools. By limiting the ability to avoid property taxes, centralization of school finance makes private schooling more expensive and thereby decreases private schooling and increases home schooling. The choice between public schools, private schools, and home schooling depends also on household characteristics, considered next.

Religion Self-reports of reasons for home schooling, shown in Table 3, indicate that many home schooling families claim to be motivated by religion. Table 4 shows that home

schooled children are more likely to be a part of religious families than children who attend school; 70% of home schooled children are in very religious families, compared to 61% of private school children and 45% of public school children. Column 1 of Tables 6 and 7 shows that, controlling for other factors, the marginal effect of religiosity is strong.[20] All else equal, children in very religious families are more likely to be home schooled by 1.3 percentage points. This is a large effect; the unconditional probability of home schooling is 1.9 percent. Children of very religious families are more likely to attend private school by 3.5 percentage points; the unconditional probability of private schooling is 11.0 percent. Since the NHES lacks data on faith or denomination, the religiosity variable is a crude measure of the effect of religion. Isenberg (2003) shows that evangelical Protestants are more likely to home school and Catholics more likely to use private schools. The NHES results confirm that religion motivates some families to home school.

Family Composition Theory predicts that there will be more home schooling but not private schooling among larger households, because mothers will have a larger time budget to distribute between market work, household work, and, if desired, home teaching. The empirical results confirm this. The descriptive statistics in Table 3 show that on average home schooled children live in households with slightly more extra adults (i.e. other than the parents), averaging .33 extra adults per household compared to .27 per household for other children. Column 2 in Table 6 shows the marginal effect of an extra adult. There are control variables for mother's log-wage (multiply imputed), mother's education, father's education, non-mother's labor log-income and log-income squared (multiply imputed), other household variables, and controls for school quality, school choice, and state public finance

[20] Because the collection of religiosity data is incomplete and skewed toward older children in the 1996 NHES, it is difficult to meaningfully compare the other regression coefficients to the coefficients in the other columns.

laws.[21] The coefficient on "number of other adults in the household" is positive and highly significant. The marginal effect of adding another adult to the household is to increase the likelihood of home schooling by .048 percentage points. By contrast, as Column 2 in Table 7 shows, extra adults have no effect on the likelihood of private schooling. Together the home and private school results suggest that by expanding the time budget, extra adults increase the likelihood of home schooling, but not private schooling, which depends on income rather than time. Direct tests of mother's time use confirm that extra adults expand a mother's disposable time use. Kimmel and Connelly (2006) use the American Time Use Survey to show that the presence of another adult in the household increases a mother's leisure time by 29 minutes per day, decreases child care time by 31 minutes, and decreases employment by 33 minutes during weekdays.[22]

As theory predicts, fathers also make home schooling more likely, even after controlling for their pecuniary contributions to the household. A specification with a dummy variable for the presence of a father in the household shows that married women are more likely to home school by .045 percentage points, a statistically significant result similar in magnitude to the effect of an extra adult. A married women may be more likely be a home teacher because her husband expands her time budget by specializing in some household production tasks or even helping to home teach by specializing in some subjects. Column 2 in Table 6 controls for the effect of a father by including a set of dummy variables for the father's level of education; the excluded category is "no father present." In general, the better educated the father, the more likely home schooling. A child whose father has a bachelor's degree is

[21] This is identical to the specification in Column 3 of Table 5. The coefficients on household variables are robust to changes in the specification of school variables and to whether a logit model or a probit model is used.

[22] The coefficients are significant at the 5 percent level except for leisure, which is significant at the 10 percent level. See Table 4a of Kimmel and Connelly (2006). On weekend days, shoen in Table 4b, the effect of other adults is to decrease leisure by a statistically insignificant 13 minutes, decrease child care time by 20 minutes, and increase employment by 22 minutes, which decreases the magnitude of the total effect on employment by about a quarter.

more likely to be home schooled by 1.3 percentage points compared to a child whose father has a high school degree.

Net of a father's pecuniary contributions to a household, the presence of a father does not significantly increase the likelihood that a child attends private school. As Column 2 of Table 7 shows, however, children of better educated fathers are more likely to be sent to private school. Since father's education is related to both home and private schooling, even controlling for income, it may be that well-educated fathers have different preferences for education: they are more likely to look outside the public school system.

A mother's time budget is also expanded by school-aged siblings, at least if the children are older and contribute to household production. This predicts more home schooling in larger families.[23] Alternatively, there may be economies of scale in home schooling. Table 4 shows that home schooled children are more likely to have 2 or more school-aged siblings than children in conventional schools. Column 2 of Table 6 shows that school-aged siblings increase the likelihood of home schooling. Although a child with one school-aged sibling is no more likely to be home schooled, a child with two siblings is 1.2 percentage points more likely to be home schooled than an only child and a child with three or more siblings is 2.9 percentage points more likely to be home schooled.

The results for private schooling are opposite from the home schooling results. Column 2 of Table 7 shows that a child with two or more school-aged siblings is less likely to be sent to private school. Unlike home schooling, private school tuition costs are an increasing function of the number of children in private school.[24] Although parents sometimes send one child to

[23]Kimmel and Connelly (2006) find that a child aged 10-12 increases the time spent on child care on weekdays by 15 minutes but decreases it by 16 minutes per day on weekends, a net gain of only 44 minutes per week. Children aged 13 to 17 have little effect on child care time on weekdays but decrease child care time by 21 minutes per day on weekends. Only children aged 6 to 9 have positive effects on child care time throughout the week, and some of these children are not enrolled in school.

[24]Tuition increases when more children are sent to private school but the increase is not

a private school and others to public school, there are fixed costs of using multiple school systems that discourage this.[25]

Preschool children have a theoretically ambiguous effect on home schooling. Small children decrease a mother's time budget—it is time-consuming to look after them—but may expand her leisure time by imposing an implicit tax on earnings: when at work, someone must be paid to watch the children. Empirically, the effect of preschool children is modeled by two count variables, "number of own children, ages birth-two years," and "number of own children not enrolled in school, ages 3-6." Table 4 shows that home schooling families are over twice as likely to include an infant and significantly more likely to have a toddler. All else equal, both variables significantly increase the likelihood of home schooling. For infants, the effect is to increase the likelihood of home schooling by 1.2 percentage points and for toddlers by .054 of a percentage point. The "implicit tax" substitution effect outweighs the negative time effect. The number of pre-school children does not affect the probability of private schooling.[26]

In sum, larger households increase the likelihood of home schooling and either decrease or have no effect on private schooling. The cumulative effects can be especially strong: for example, a girl who lives with two college-educated parents, a grandmother, a one-year old brother, and two school-aged sisters is 4.2 percentage points more likely to be home schooled

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linear for private schools offering discounts to families who send multiple children to the school.

[25] The fixed costs include having to learn how to negotiate the rules and regulations of a second school system. There also may be increased transportation costs if children would otherwise have attended the same school building, and costs associated with different academic calendars kept by public and private schools.

[26] One may be concerned that the household composition variables are spuriously correlated with home schooling if evangelical Protestant families are larger than other families and evangelical Protestants are more likely to home school. The NHES lacks data on religious adherence with which to test this directly but the data on religious participation in 2003 casts doubt on this alternative explanation. When the data set is divided into families who are "very religious" and families who are not, the family composition coefficients for home schooling are larger for the not-very-religious group.

than a girl who lives only with her mother, an increase of over 200% in the probability of home schooling. The results for family composition are universally consistent with a model that predicts that mothers with more disposable time are more likely to spend it as a home teacher but no more likely to send children to private school.[27] In addition, there is evidence suggesting economies of scale in home schooling, contributions to home teaching by the father, and/or an increased preference for nonpublic schooling by well-educated fathers.

Income Income that is not earned by the mother has theoretically ambiguous effects on home schooling; more income decreases the incentive for women to work and thereby increases the likelihood of home schooling but more income could also be used to purchase school quality. Empirically modeling the effect of income on home and private schooling is possible due to the simulation/multiple imputation technique which distinguishes mother's earned income from other household income. Due to the ambiguous theoretical prediction for the effect of income, it is specified using two variables: log-income and log-income squared.

Column 2 of Table 6 shows that the effect of income on home schooling is statistically significant and nonlinear. Below approximately $13,000, income increases the likelihood of home schooling; above $13,000, it decreases it. The first effect—more income decreases the incentive for mothers to work—dominates at low incomes; the second—the ability to use income to purchase school quality—dominates in the rest of the range. As income increases, families are able to either afford houses in better school districts or pay private school tuition. The effects are moderate: an increase in income from $25,000 to $75,000 decreases the probability of home schooling by 0.3 percentage points. Table 7 shows that

[27] A complementary explanation is that mothers with high fixed costs of working are deterred from entering the labor force and therefore are more likely to home school. In a reduced-form regression, Edwards and Field-Hendrey (2002) find that "being married, having children. . . being disabled. . .having an elderly person in the household, and living in a rural area" increase the likelihood of home-based work relative to on-site work. They interpret these variables as evidence of either greater fixed costs of working or higher household productivity.

more income increases the likelihood of private schooling.[28]

Mother's Education and Child's Age Better educated mothers have both higher opportunity costs and a better educational impact on their children so there is no strong *a priori* prediction for the effect of mother's education on home schooling. Theoretically, conditional on (potential) wage, better educated mothers ought to be more likely to home school. Mother's education is specified by a set of dummy variables for different levels. The excluded category is a mother with less than a high school degree. Column 2 of Table 6 shows that the coefficient on mother's (potential) log wage is close to zero and insignificant. The coefficients are not significant either individually or jointly. Omitting mother's log wage does not qualitatively affect the results. These results seem to suggest that the two substitution effects cancel each other.[29]

For younger children, however, there is evidence that their mothers weigh their ability to home school a child against conventional schooling alternatives. Results for children 11 years old and younger are shown in Column 3 of Table 6. Younger children are more likely to be home schooled when their mother is better educated. A woman with a bachelor's degree is 1.3 percentage points more likely to home school her children than a woman with less than a high school degree. A child's age also affects the likelihood of home schooling. There is a positive coefficient on child age and negative coefficient on age squared in Column 2 (which includes children of all ages). The implied minimum of this U-shaped function is at age 11. In other words, until age 11, all else equal, the older the child, the less likely

[28] Although the coefficient on log-income is negative and log-income squared positive, the minimum income implied by this quadratic function is $200, outside the range of the data. Therefore the effect is always positive.

[29] The log-wage variable for working mothers is measured with error because it is simulated. The multiple imputation of log-wage helps to decrease measurement error caused by the simulation. For non-working mothers, however, the log-wage variable is based on predicted earnings, which is subject to far more measurement error. A disproportionate number of home schooling mothers do not work.

(s)he is to be home schooled. Since it is more difficult for home teaching mothers to surpass the education offered by a school as their children age, this provides further evidence that mothers make a cost/benefit assessment of home schooling against conventional schools. In sum, a mother is more likely to home school her children if she is well-educated and her child is young. Comparing Column 3 of Table 6 to Column 4 (for older children) shows that time and income effects on home schooling are also particularly strong for young children.

The relationship between mother's education and home schooling is absent among children 12 and older. The results for this group, shown in Column 4, indicate no relationship. The dummy variables for mother's education are neither individually nor jointly significant. Nor are the father's education dummy variables significant, as they are for younger children. It appears that starting in middle school, parents no longer make the same calculation that compares their teaching ability to that of a school.

There is some evidence of time effects in Column 4: children with pre-school aged siblings and extra adults in the household are more likely to be home schooled, but otherwise the results do not confirm the theoretical predictions for home schooling. The home schooling of older children seems to depend more on disability and behavioral issues than on an assessment of educational trade-offs. The self-reported reasons for home schooling shift toward these issues for older children.

By comparison, Table 7 shows that better educated mothers and, even controlling for education, mothers with more wage-earning potential are more likely to send their children to private school. A comparison of younger to older children in Columns 3 and 4 shows that for private schooling the effects of mother's education and earning potential as well as father's education and income are qualitatively similar although the magnitudes are a bit stronger for younger children. The age and age squared coefficients in Column 2 show that

the younger a child is, the more likely to be sent to a private school.[30] Higher tuition for high school helps explain the relationship between children's age and private schooling.

5 Conclusion

I investigate how parents choose among home schooling, private schools, and public schools using a theoretical model of school choice tested with data from three rounds of the National Household Education Survey merged with secondary data sets. To overcome a problem of missing wage data in the NHES I utilize a unique simulation/multiple imputation method. The results confirm that religious families are more likely to choose home or private schooling. Older children are more likely than younger children to be home schooled due to a disability or other behavioral needs. Preferences and special needs are not the only factors, however.

Families are inclined to avoid low-quality public school systems, especially if the parents are well-educated or their children are young. By exiting the public school system, parents choose between private schooling and home schooling. Centralized school finance systems discourage Tiebout sorting, thereby increasing the likelihood that families choose home schooling over private schooling. Families also must choose between private and home schooling under constraints of time and income. All else equal, the more income a family earns, the more likely they are to send their children to private schools. To the contrary, in larger families mothers have more disposable time due to division of labor for household production. Children in these families are relatively more likely to be home schooled. In sum, the internal constraints of the household and external constraints of the local education market affect school choice in ways predicted by economic theory.

[30] The age squared variable is positive, but the implied minimum of the quadratic function is outside the range of the data (33 years old), indicating a monotonic decline in the likelihood of private schooling as children age.

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Row	NHES	1996			1999			2003			Total		
		Public	Private	Home	Public	Private	Home	Public	Private	Home	Public	Private	Home
1	Focal Children grades K-12 attending School (PFI)	15,406	2,130	244	14,801	2,022	285	10,608	1,488	254	40,815	5,640	783
2	Total Children K-12 with home school data (Screener Data)	29,009	3,359	482	23,698		477	10,608	1,488	254	68,162		1,213
3	Own children with complete household-level data	21,547	2,937	411	22,014		459	9,820	1,406	242	57,724		1,112
4	Category 3 plus Complete MSA/County-Level Data	21,205	2,900	408	21,973		459	9,818	1,406	242	57,302		1,109
5	Own children with private school data and complete household data	21,547	2,937	411	13,329	1,871	280	9,820	1,406	242	44,696	6,214	933
6	Category 5 plus Complete MSA/County-Level Data	21,305	2,900	408	13,304	1,869	280	9,818	1,406	242	44,427	6,175	930

Figure 1: Number of Observations in Home Schooling Data

		Number of school children in household							
		1	2	3	4	5	6	7 or more	Total
Number of school children home schooled	0	16,058	11,034	3,693	904	183	54	18	31,944
	1	224	108	60	15	3	1	1	412
	2		104	16	2	1	0	0	123
	3			43	8	0	0	0	51
	4				19	0	0	0	19
	5					4	1	1	6
	6						6	1	7
	Total	16,282	11,246	3,812	948	191	62	21	32,562

Figure 2: Number of Home Schooled Children by Number of Children in Household (Pooled Unweighted NHES 1996, 1999)

Panel A (Children Ages 5-11)	1996 NHES (Upper Bound)	1999 NHES (Upper Bound)	2003 NHES (Point Estimate)
Religion ("Religious Reasons," ""Develop Character/Morality," or "Object to What the School Teaches" for 1996-99/ "Religious or Moral Instruction" most important reason for 2003)	39% (4.8%)	57% (4.0%)	41% (4.6%)
Education ("Give Child a Better Education at Home," "Poor Learning Environment at School," or "School Does Not Challenge Child" for 1996-99; "Dissatisfied with Academic Instruction at Schools" or "Concerned about School Environment" most important reason for 2003)	71% (3.9%)	69% (3.8%)	41% (4.6%)
Behavioral or Special Need ("Child Has Special Needs/Disability" or "Student Behavioral Problems" in 1996-99; "Child Has Physical or Mental Health Problem" or "Special Needs that You Feel the School Can't or Won't Meet" most important reason for 2003)	11% (2.3%)	9.4% (2.4%)	7.7% (2.5%)
None of These Reasons	8.6% (2.6%)	11% (2.6%)	10% (2.8%)
Number of Observations	114	153	117
Panel B (Children Ages 12-17)	1996 NHES (Upper Bound)	1999 NHES (Upper Bound)	2003 NHES (Point Estimate)
Religion ("Religious Reasons," ""Develop Character/Morality," or "Object to What the School Teaches" for 1996-99/ "Religious or Moral Instruction" most important reason for 2003)	26% (4.0%)	47% (4.5%)	24% (3.8%)
Education ("Give Child a Better Education at Home," "Poor Learning Environment at School," or "School Does Not Challenge Child" for 1996-99; "Dissatisfied with Academic Instruction at Schools" or "Concerned about School Environment" most important reason for 2003)	64% (4.4%)	64% (4.3%)	53% (4.3%)
Behavioral or Special Need ("Child Has Special Needs/Disability" or "Student Behavioral Problems" in 1996-99; "Child Has Physical or Mental Health Problem" or "Special Needs that You Feel the School Can't or Won't Meet" most important reason for 2003)	16% (3.3%)	21% (3.7%)	16% (3.2%)
None of These Reasons	18% (3.5%)	12% (2.9%)	6.5% (2.2%)
Number of Observations	121	123	123

Figure 3: Reasons Given for Home Schooling (Unweighted NHES 1996, 1999, 2003)

	Home Schooling		Public Schooling		Private Schooling	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
School Variables						
Family lives inside a Metropolitan Area (MSA)	0.72	0.45	0.76	0.43	0.88	0.33
NAEP State Average of 4^{th} and 8^{th} Grade Math Score/1,000	0.26	0.01	0.26	0.01	0.26	0.01
Average School District Gini Coefficient	0.38	0.03	0.38	0.04	0.38	0.04
Average Heterogeneity Index for Parents' Educational Attainment	0.71	0.03	0.71	0.03	0.71	0.03
Percent of School Revenue funded at local level in state	0.42	0.13	0.44	0.12	0.46	0.13
Direct citizen voting on public school operational expenditures in state	0.56	0.50	0.55	0.50	0.59	0.49
Citizen representatives vote on operational expenditures in state	0.48	0.50	0.52	0.50	0.54	0.50
Elementary school district	0.55	0.50	0.59	0.49	0.58	0.49
Household Variables						
Very religious (based on subset of data)	0.70	0.46	0.45	0.50	0.61	0.49
African-American	0.07	0.25	0.13	0.34	0.09	0.29
Hispanic	0.08	0.28	0.14	0.35	0.10	0.30
Mother speaks language other than English at home	0.03	0.16	0.10	0.29	0.06	0.24
Mother has disability	0.02	0.12	0.02	0.13	0.01	0.11
Number of other children in household	0.04	0.21	0.04	0.25	0.02	0.17
Number of other adults in household	0.33	0.64	0.27	0.59	0.24	0.56
Father's education: Less than a High School diploma	0.08	0.27	0.10	0.31	0.04	0.20
Father's education: High School diploma or GED	0.17	0.38	0.24	0.43	0.17	0.37
Father's education: Associate's Degree or Some College	0.26	0.44	0.20	0.40	0.19	0.39
Father's education: Bachelor's Degree	0.22	0.42	0.13	0.34	0.24	0.43
Father's education: Advanced Degree	0.12	0.32	0.09	0.28	0.20	0.40
1 school aged sibling	0.31	0.46	0.41	0.49	0.39	0.49
2 school aged siblings	0.26	0.44	0.19	0.39	0.17	0.38
3 or more school aged siblings	0.20	0.40	0.08	0.27	0.07	0.26
Number of own Preschool children ages 0-2	0.26	0.50	0.11	0.34	0.12	0.35
Number of own Preschool children ages 3-6	0.24	0.49	0.15	0.39	0.17	0.40
Year is 1999	0.40	0.49	0.30	0.46	0.31	0.46
Year is 2003	0.23	0.42	0.22	0.42	0.22	0.41
Mother's Log Wage/Potential Log Wage (multiple imputation)	2.33	0.59	2.26	0.59	2.50	0.61
Log(Non-Mother's Labor Income) (multiple imputation)	10.27	0.99	9.99	1.19	10.48	1.08
Mother's education: High School diploma or GED	0.25	0.43	0.32	0.47	0.20	0.40
Mother's education: Associate's Degree or Some College	0.37	0.48	0.31	0.46	0.30	0.46
Mother's education: Bachelor's Degree	0.23	0.42	0.16	0.37	0.30	0.46
Mother's education: Advanced Degree	0.07	0.25	0.07	0.26	0.15	0.35
Child's age	11.00	3.82	11.21	3.67	10.57	3.70
Child's age squared	135.58	85.63	139.13	83.88	125.37	82.52
Child is male	0.50	0.50	0.51	0.50	0.51	0.50
Number of Observations	1,141		44,936		5,663	

Figure 4: Summary Statistics (Pooled Weighted NHES 1996, 1999, 2003)

Panel A	Home Schooling			
	(1)	(2)	(3)	(4)
Family lives inside a Metropolitan Area	-0.0033	**-0.0039**	-0.0033	-0.0021
(MSA)	(-1.97)	**(-2.05)**	(-1.65)	(-1.04)
NAEP State Average of	**-0.3157**	**-0.3079**	-0.1577	-0.0596
4^{th} and 8^{th} Grade Math Score/1,000	**(-2.80)**	**(-2.47)**	(-1.13)	(-0.35)
Average School District Gini Coefficient		0.0001	-0.0006	-0.0266
		(0.00)	(-0.03)	(-1.22)
Average Heterogeneity Index for Parents'		0.0155	0.0088	-0.0106
Educational Attainment		(0.69)	(0.39)	(-0.45)
Percent of School Revenue collected at			**-0.0142**	-0.0108
local level in state			**(-2.16)**	(-1.44)
Direct citizen voting on public school			-0.0015	0.0003
operational expenditures in state			(-1.00)	(0.15)
Citizen representatives vote on operational			-0.0010	-0.0028
expenditures in state			(-0.65)	(-1.40)
Region dummies?	NO	NO	NO	YES
Number of Observations	58,836	58,511	58,511	58,511
Pseudo R-squared	0.067	0.068	0.070	0.073

Panel B	Private Schooling			
	(1)	(2)	(3)	(4)
Family lives inside a Metropolitan Area	**0.0445**	**0.0462**	**0.0446**	**0.0375**
(MSA)	**(10.20)**	**(10.03)**	**(9.47)**	**(7.75)**
NAEP State Average of	-0.2924	**0.6023**	-0.4659	**-1.8402**
4^{th} and 8^{th} Grade Math Score/1,000	(-0.92)	**(2.07)**	(-1.44)	**(-4.63)**
Average School District Gini Coefficient		**0.3919**	**0.4170**	**0.4819**
		(6.58)	**(7.22)**	**(8.25)**
Average Heterogeneity Index for Parents'		**-0.1936**	**-0.1680**	0.0260
Educational Attainment		**(-3.53)**	**(-2.92)**	(0.41)
Percent of School Revenue collected at			**0.0775**	0.0171
local level in state			**(5.08)**	(1.01)
Direct citizen voting on public school			**0.0191**	0.0054
operational expenditures in state			**(5.56)**	(1.04)
Citizen representatives vote on operational			0.0048	0.0070
expenditures in state			(1.36)	(1.39)
Region dummies?	NO	NO	NO	YES
Number of Observations	51,843	51,532	51,532	51,532
Pseudo R-squared	0.077	0.079	0.082	0.089

Dependent Variable: Child Home Schooled (Panel A); Child Sent to Private School (Panel B).
Other variables: Constant, African-American, Hispanic, Mother Speaks Language Other Than English At Home, Mother Has Disability, Child's Age, Child's Age Squared, Child Is Male (Dummy Variable), Number of other adults in household, Number of other children in household, Dummy Variables for Father's Education, Dummy Variables for number of school-aged siblings, Dummy Variables for Number of Preschool Siblings, Mother's Log Wage/Potential Log Wage, Log(Non-Mother's Labor Income), Log(Non-Mother's Labor Income) Squared, Dummy Variables for Mother's Education, Year Dummy Variables.
Standard errors computed with clustering at household level.
Coefficients statistically significant at the 5% level are in **boldface.**
Coefficients are change in probability of this schooling choice for a one-unit change in independent variable, computed at means of the data.
The t-statistics are given in parentheses.

Figure 5: Logit Regressions for Home Schooling and Private Schooling: School Variables

	(1) NHES 1996 (part), 2003 With Religion Variable	(2) NHES 1996, 1999, 2003 All Students	(3) NHES 1996, 1999, 2003 Children 11 and younger	(4) NHES 1996, 1999, 2003 Children 12 and older
Very religious	**0.0132**	--	--	--
	(6.45)			
Number of other adults in household	**0.0045**	**0.0048**	**0.0051**	**0.0040**
	(3.20)	**(4.81)**	**(4.54)**	**(3.32)**
Father's education: Less than a High School diploma	0.0067	0.0045	0.0074	0.0028
	(1.39)	(1.30)	(1.49)	(0.69)
Father's education: High School diploma or GED	-0.0013	-0.0002	0.0033	-0.0028
	(-0.40)	(-0.07)	(0.92)	(-0.96)
Father's education: Associate's Degree or Some College	0.0066	**0.0079**	**0.0126**	0.0038
	(1.70)	**(2.70)**	**(2.92)**	(1.16)
Father's education: Bachelor's Degree	**0.0102**	**0.0128**	**0.0191**	0.0064
	(2.26)	**(3.41)**	**(3.43)**	(1.56)
Father's education: Advanced Degree	0.0084	**0.0105**	**0.0188**	0.0021
	(1.65)	**(2.59)**	**(3.10)**	(0.49)
1 school age sibling	-0.0007	0.0014	**0.0046**	-0.0027
	(-0.30)	(0.95)	**(2.47)**	(-1.29)
2 school age siblings	**0.0083**	**0.0119**	**0.0200**	0.0021
	(2.68)	**(5.07)**	**(6.61)**	(0.78)
3 or more school age siblings	**0.0223**	**0.0288**	**0.0428**	**0.0142**
	(4.95)	**(7.49)**	**(8.53)**	**(3.62)**
Number of own Preschool children ages 0-2	**0.0102**	**0.0119**	**0.0113**	**0.0077**
	(4.63)	**(8.81)**	**(9.24)**	**(3.09)**
Number of own Preschool children ages 3-6	**0.0048**	**0.0054**	**0.0042**	**0.0079**
	(2.02)	**(3.55)**	**(3.21)**	**(3.17)**
Mother's Log Wage/Potential Log Wage (multiple imputation)	-0.0006	-0.0001	0.0006	-0.0015
	(-0.25)	(-0.05)	(0.35)	(-0.64)
Log(Non-Mother's Labor Income) (multiple imputation)	0.0225	**0.0208**	**0.0289**	0.0115
	(1.52)	**(2.00)**	**(2.04)**	(1.05)
Log(Non-Mother's Labor Income) Squared (multiple imputation)	-0.0012	**-0.0011**	**-0.0015**	-0.0006
	(-1.61)	**(-2.09)**	**(-2.11)**	(-1.11)
Mother's education: High School diploma or GED	0.0010	0.0031	0.0067	-0.0004
	(0.23)	(1.03)	(1.71)	(-0.13)
Mother's education: Associate's Degree or Some College	-0.0006	0.0062	**0.0107**	0.0015
	(-0.13)	(1.95)	**(2.61)**	(0.41)
Mother's education: Bachelor's Degree	-0.0003	0.0065	**0.0131**	-0.0002
	(-0.06)	(1.71)	**(2.51)**	(-0.04)
Mother's education: Advanced Degree	-0.0049	0.0016	0.0111	-0.0059
	(-0.99)	(0.38)	(1.80)	(-1.33)
Child's age	-0.0012	**-0.0024**	**-0.0045**	0.0041
	(-0.93)	**(-2.75)**	**(-3.66)**	(0.81)
Child's age squared	0.0001	**0.0001**	**0.0002**	-0.0001
	(1.14)	**(2.93)**	**(3.26)**	(-0.71)
Child is male	-0.0008	-0.0005	0.0005	-0.0019
	(-0.55)	(-0.47)	(0.43)	(-1.14)
Number of observations	27,546	58,511	30,539	27,972
Pseudo R-squared	0.085	0.070	0.111	0.048

Dependent Variable: Child Home Schooled.
Other variables: Constant, African-American, Hispanic, Mother Speaks Language Other Than English At Home, Mother Has Disability, Number of Other Children in Household, Family Lives In Metropolitan Area, Average School District Gini Coefficient, Average Heterogeneity Index For Parents' Educational Attainment, NAEP State Math Score, Percent Of School Revenue Funded At Local Level In State, Direct Citizen Voting On Public School Operational Expenditures In State, Citizen Representatives Vote On Operational Expenditures In State.
Standard errors adjusted for clustering at household level.
Coefficients statistically significant at the 5% level are in **boldface.**
Coefficients are change in probability of home schooling for a one-unit change in independent variable, computed at means of the data.
The t-statistics are given in parentheses.

Figure 6: Logit Regressions for Home Schooling: Household Variables

	(1) NHES 1996 (part), 2003 With Religion Variable	(2) NHES 1996, 1999, 2003 All Students	(3) NHES 1996, 1999, 2003 Children 11 and younger	(4) NHES 1996, 1999, 2003 Children 12 and older
Very religious	**0.0353**	--	--	--
	(8.09)			
Number of other adults in household	-0.0001	0.0016	0.0010	0.0032
	(-0.04)	(0.58)	(0.23)	(1.08)
Father's education: Less than a High School diploma	-0.0212	**-0.0172**	-0.0211	-0.0130
	(-1.91)	**(-2.01)**	(-1.87)	(-1.32)
Father's education: High School diploma or GED	-0.0046	-0.0042	0.0057	-0.0104
	(-0.55)	(-0.69)	(0.12)	(-1.42)
Father's education: Associate's Degree or Some College	0.0002	0.0008	0.0057	-0.0039
	(0.02)	(0.13)	(0.63)	(-0.54)
Father's education: Bachelor's Degree	0.0187	**0.0255**	**0.0241**	**0.0278**
	(1.92)	**(3.53)**	**(2.32)**	**(3.19)**
Father's education: Advanced Degree	0.0155	**0.0342**	**0.0383**	**0.0303**
	(1.42)	**(4.10)**	**(3.17)**	**(3.12)**
1 school age sibling	**-0.0179**	**-0.0199**	**-0.0294**	**-0.0101**
	(-3.83)	**(-5.82)**	**(-5.91)**	**(-2.31)**
2 school age siblings	**-0.0187**	**-0.0200**	**-0.0326**	-0.0066
	(-3.18)	**(-4.24)**	**(-5.03)**	(-1.16)
3 or more school age siblings	-0.0111	-0.0088	-0.0150	-0.0031
	(-1.25)	(-1.09)	(-1.48)	(-0.35)
Number of own Preschool children ages 0-2	-0.0054	-0.0010	-0.0039	0.0018
	(-0.72)	(-0.22)	(-0.70)	(0.21)
Number of own Preschool children ages 3-6	0.0124	-0.0010	-0.0058	0.0073
	(1.89)	(-0.23)	(-1.14)	(1.00)
Mother's Log Wage/Potential Log Wage (multiple imputation)	0.0112	**0.0164**	**0.0214**	**0.0110**
	(1.92)	**(3.92)**	**(3.47)**	**(2.42)**
Log(Non-Mother's Labor Income) (multiple imputation)	-0.0256	-0.0315	-0.0356	-0.0271
	(-1.10)	(-1.68)	(-1.34)	(-1.16)
Log(Non-Mother's Labor Income) Squared (multiple imputation)	0.0021	**0.0025**	**0.0029**	0.0021
	(1.77)	**(2.58)**	**(2.15)**	(1.74)
Mother's education: High School diploma or GED	**0.0357**	**0.0405**	**0.0497**	**0.0308**
	(2.77)	**(4.32)**	**(4.11)**	**(2.79)**
Mother's education: Associate's Degree or Some College	**0.0616**	**0.0677**	**0.0733**	**0.0607**
	(4.41)	**(6.90)**	**(5.89)**	**(5.09)**
Mother's education: Bachelor's Degree	**0.1028**	**0.1165**	**0.1389**	**0.0896**
	(5.89)	**(9.44)**	**(8.70)**	**(6.09)**
Mother's education: Advanced Degree	**0.1244**	**0.1247**	**0.1462**	**0.1008**
	(5.93)	**(8.58)**	**(7.44)**	**(5.91)**
Child's age	-0.0030	**-0.0058**	-0.0069	-0.0069
	(-1.01)	**(-2.52)**	(-0.95)	(-0.39)
Child's age squared	0.0001	0.0001	0.0001	0.0001
	(0.44)	(0.88)	(0.28)	(0.24)
Child is male	0.0003	-0.0020	-0.0069	0.0035
	(0.09)	(-0.78)	(-1.85)	(1.01)
Number of observations	27,546	51,532	26,868	24,664
Pseudo R-squared	0.094	0.082	0.082	0.082

Dependent Variable: Child Sent to Private School.

Other variables: Constant, African-American, Hispanic, Mother Speaks Language Other Than English At Home, Mother Has Disability, Number of Other Children in Household, Family Lives In MSA, Average School District Gini Coefficient, Average Heterogeneity Index For Parents' Educational Attainment, NAEP State Math Score, Percent Of School Revenue Funded At Local Level In State, Direct Citizen Voting On Public School Operational Expenditures In State, Citizen Representatives Vote On Operational Expenditures In State.

Standard errors adjusted for clustering at household level.

Coefficients statistically significant at the 5% level are in **boldface.**

Coefficients are change in probability of private schooling for a one-unit change in independent variable, computed at means of the data.

The t-statistics are given in parentheses.

Figure 7: Logit Regressions for Private Schooling: Household Variables