The Effects of School Size on Parental Involvement and Social Capital: Evidence from the ELS:2002

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Recent state and federal policies designed to improve American public schools have generally focused on introducing standards (for example, No Child Left Behind) or choice (for example, charter schools and vouchers). However, another increasingly prominent approach to reform has emphasized the possible benefits of creating smaller schools as well as small, focused learning communities within schools, particularly at the high school level.[1] The growing national interest in the small-schools movement has been catalyzed largely by private foundations (most notably, the Bill and Melinda Gates Foundation) rather than by explicit state and federal action.[2] Regardless of its origin, this reform agenda has brought renewed attention to a long-standing research literature that examines the effects of school size on the organizational character and performance of schools.

This literature focuses on how school size influences both costs and outcomes (for example, test scores and educational attainment). However, it also emphasizes how school size may change the nature of educationally relevant social interactions among students, teachers, and administrators. In particular, the apparent consensus in this literature is that the increased formalization of interactions in larger schools harms school quality by fostering alienation and a loss of organizational focus among students and staff.[3] However, there appears to be little corresponding evidence on how school size influences patterns of parental involvement in schools. This is somewhat surprising in light of the fact that constructive parental engagement with schools is widely seen as an important determinant of school quality.[4]

Furthermore, the effects of school size on parents may also matter for an important reason that is wholly unrelated to the direct objectives of schools. Public schools are often viewed as vital community institutions that can deepen social networks and promote a variety of welfare-enhancing social norms (for example, trust and reciprocity). The role of public schools in promoting this broad group of outcomes, which researchers currently group under the heading "social capital," has important implications both for the optimal design of schools as well as for the proper division between the public and private sectors.[5] The size of a public school, for example, could quite conceivably influence the amount of social capital within a community through its effects on parental interactions.

In this study, we present new empirical evidence on whether the size of public high schools influences measures of parental involvement and social capital. This analysis is based on nationally representative data from the base year of the Education Longitudinal Study of 2002 (ELS:2002). In addition to examining novel measures of outcome based on recent data, our study also engages a substantive methodological concern. Any inferences about the causal effects of school size are likely to be complicated by the fact that the unobservable traits that influence a parent's pattern of civic engagement (for example, the enjoyment a parent derives from interacting with others) may also influence the size of the public school the family chooses. The conventional approach to addressing this concern is to exploit a plausible natural experiment that influences school size.[6] However, in the absence of a compelling experiment, we adopt an approach developed in a recent study by Altonji, Elder, and Taber on the effects of Catholic schools.[7] Following their lead, we attempt to establish bounds on the causal effects of school size by using the differences in observed traits across parents connected to smaller and larger schools as a guide to the size and direction of their potentially confounding unobserved traits.

The paper is organized as follows. The next section provides brief discussions of the school-size literature and the possible relationships between school size and the engagement of parents. This is followed by a discussion of the ELS:2002 data, a presentation of our baseline, multivariate analysis of these data, and a presentation of the results of our bounding exercise. A final section concludes.

School Size and Parents

Questions about the appropriate size of American public schools are far from new. In particular, the late nineteenth and most of the twentieth century witnessed a purposeful and aggressive consolidation movement, which increased the size of schools nationwide. This stunning reorganization of American education reflected a progressive-era impulse toward "scientific" management by experts. David B. Tyack characterizes the "administrative progressives" who promoted consolidation as business and professional elites who wanted to have the organization of schools emulate that of the modern business corporation and to delegate almost total administrative power to an expert superintendent and staff. These reformers saw in small, locally controlled schools "only corruption, parochialism, and vestiges of an outmoded village mentality."[8]

A more explicit argument made in favor of larger schools was that larger schools would improve school quality by facilitating a more diverse and targeted curriculum. For example, James B. Conant, a former president of Harvard University, wrote an influential report advocating the elimination of small high schools, which he characterized as unable to offer a sufficiently comprehensive curriculum.[9] Similarly, proponents of larger schools alleged that considerable cost savings would accrue from capturing economies of scale in school administration and facilities.

However, the current research literature indicates that the size of many larger public schools has negative consequences. In particular, recent reviews suggest that high schools of 600 to 900 students balance economies of size with the negative consequences of larger schools.[10] Some commentators argue that the distinct advantages of smaller, autonomous schools are rooted in their governance, student-faculty relations, parental involvement, and accountability.[11] In particular, drawing on basic sociological theory, Lee, Bryk, and Smith argue that the increased formalization of larger schools can harm group cohesion and create static roles that promote alienation and attenuate organizational focus.[12] A number of empirical studies have reported supporting evidence indicating that larger schools alienate teachers and students from educational goals.[13]

However, relatively little evidence examines how the size of public schools influences the prevalence and character of parental involvement.[14] Similarly, although local public schools are often viewed as vital community institutions, we know of no empirical evidence that assesses whether smaller schools are more effective than larger schools in this role.[15] However, anecdotal descriptions of the local opposition to forced school closures, which often stress concerns about civic identity and social cohesion, suggest that this is the case.

Similarly, in discussing anthropological evidence that community schools integrate people into social networks and civic and cultural life, Tyack writes, "Thus, they became institutions valued in themselves, quite apart from the goal of teaching students certain skills and knowledge."[16]

Contemporary scholars describe the social cohesion, trust, and civic engagement ostensibly promoted by smaller schools and districts as examples of "social capital." Over the last three decades, the concept of social capital has achieved a wide currency across the social sciences. The definitions used by researchers vary somewhat, but, in general, social capital refers to social norms (for example, trust) and social networks that are thought to provide strong complements to a variety of important social and economic outcomes.[17] One of the most prominent topics in the recent literature on social capital is the evidence that it has been declining in the United States. The influential work of Robert Putnam suggests that these declines are due to the isolating effects of television and the aging of the "civic" generations born between 1910 and 1940.[18] One prominent type of evidence for the decline in social capital is the decline of membership in local parent-teacher associations (PTAs).[19]

Should we expect larger public schools to discourage the involvement of parents in groups like the PTA or to reduce other types of social capital? Such an expectation would be consistent with some of the seminal, theoretical work on public goods. For example, James Buchanan argues that voluntary compliance with behavioral sanctions and the provision of public goods like social capital are more likely in small communities than in large ones.[20] Similarly, Mancur Olson hypothesizes a negative relationship between group size and the voluntary provision of public goods.[21] However, larger schools could conceivably increase the social capital in their communities by promoting expanded social networks and amplifying the rewards and sanctions for community engagement. Similarly, an expansion of social networks could also attenuate distrust of others. In light of these possibilities, the effects of school size on social capital should be viewed as an empirical question.

Education Longitudinal Study of 2002

The ELS:2002 is the most recent in a series of nationally representative, longitudinal studies of secondary school students sponsored by the National Center for Education Statistics (NCES). The target for the baseline sample in ELS:2002 consisted of high school sophomores in the spring of 2002. The sample design reflected a two-stage selection process.[22] In the first stage, schools were selected with probabilities proportional to their size and within strata defined by census region, urbanicity, and control of the school (that is, public, Catholic, other private). Within participating schools, approximately twenty-six sophomores were selected within strata defined by race and ethnicity.[23] This procedure oversampled private schools and students who were Asian or Hispanic.

The base-year respondents consisted of 15,362 high school sophomores from 752 schools. In addition to surveying students, ELS:2002 gathered information from a number of other sources, including school records, teachers, parents, and administrators. The parent survey elicited a variety of information about the student's family background. However, it also included questions, which are discussed in more detail below, about the parents' interactions and engagement with their school and their community. Initially, the parent survey, which was available in both English and Spanish, was mailed to the student's home with instructions that it should be completed by the parent or guardian who was most familiar with the student's educational experiences. Follow-up requests allowed parents to respond to either a written questionnaire or a computer-assisted telephone interview (CATI).

Our analytical sample consists of approximately 8,000 individual respondents (see table 1). The reduction in sample size is due, in part, to the exclusion of private and Catholic schools (more than 3,323 observations), public schools with unusual grade spans (those that did not begin with the ninth or tenth grade, 1,470 cases), and students who had completed ninth grade in a foreign country (89 cases). The restricted-use version also includes a variable that distinguishes between comprehensive schools and other types of schools, such as magnets, charters, and other schools that may be small by design. Unfortunately, very few schools are not classified as comprehensive, making a separate analysis of them infeasible. However, as a robustness check, we estimated models including only comprehensive schools and found results comparable to those reported here.

The remaining reductions to our sample reflect both the unwillingness of some parents to complete the survey and, to a lesser extent, the fact that some schools were unwilling to provide home addresses for some or all of the sampled students.[24] To assess whether the patterns of nonresponse to each question vary with school size, we examine auxiliary regressions in which a dummy variable for a missing response to a particular question is the dependent variable.[25] Our results suggest that, conditional on our other controls, nonresponse is not related to school size for ten of our eleven dependent variables. However, smaller schools are 1 percentage point more likely to have nonresponders to a question about volunteering in school.

Table 1. Summary Statistics[a]

Variable	Number of observations	Mean	Standard deviation
Dependent variables			
Belong to PTA	8,248	0.231	0.422
Attend PTA meetings	8,256	0.327	0.469
Take part in PTA activities	8,202	0.251	0.434
Act as a volunteer at the school	8,197	0.249	0.434
Belong to other organization with parents from school	8,268	0.284	0.451
Parent knowledge about child's friends' parents	7,823	2.327	0.674
Friends' parent gave advice	8,183	0.302	0.459
Friends' parent did favor	8,169	0.638	0.481
Friends' parent received favor	8,148	0.691	0.462
Friends' parent supervised on field trip	8,132	0.307	0.461
Feelings of connectedness in the community	8,279	0.754	0.431
Independent variables			
Whether enrolled in a small school (enrollment fewer than 800)	8,431	0.168	0.374
School enrollment			
1–399	8,431	0.043	0.203
400–799	8,431	0.125	0.331
800–1,199	8,431	0.176	0.381
1,200–2,199	8,431	0.42	0.494
More than 2,200	8,431	0.236	0.425

Source: Authors' calculations based on ELS:2002 data.
a. This extract is based on high-school sophomores in the spring of 2002 who attended public schools, whose lowest grade was ninth or tenth, who did not complete ninth grade in a foreign country, and whose parents had valid responses to the parent survey.

Our measures of school size are based on an enrollment question from the survey of school administrators. In particular, we rely on the administrator's report about the tenth-grade enrollment rather than total school enrollment because the latter question was not included on an abbreviated questionnaire to which some administrators responded. Regardless, the reported grade-level enrollments correspond quite closely to the school-level reports. We use the enrollment data to characterize each school as belonging to one of five categories of size. In some specifications, our measures of school size are dummy variables representing each of these categorical responses. However, in other specifications, our measure is a "small-school" dummy variable, which is equal to 1 for schools where the administrator reported tenth-grade enrollment of 799 students or fewer. This small-school indicator effectively identifies schools with fewer than 600 to 800 students. This margin is of interest given the prior evidence suggesting that this is the optimal size of enrollments.

Our dependent variables reflect parents' responses to four questions about their involvement in their child's high school as well as seven questions related to social capital. More specifically, the first two parental-involvement questions involve whether the parent (or their spouse or partner) attends or belongs to the school's parent-teacher organization. The remaining two parental-involvement questions address more intensive involvement with the school (that is, taking part in PTA activities and volunteering at the school).

The first social capital question asks whether the parent belongs to any neighborhood or religious organizations with other parents from the child's school. The second social capital variable is based on the parent's knowledge of three of their child's close friends and their parents. Specifically, for each of the student's three close friends, the questionnaire inquires whether the parent knows the friend, the friend's mother, and the friend's father (yes = 1, no = 0). We sum the three binary responses (1 = yes) for each of the three friends and then average the variables across friends to create a measure that varies from 0 to 3.

The next four social capital variables are binary responses to questions about the parent of a child's friend giving advice about teachers and courses, giving and receiving favors from such a parent, and whether such a parent has supervised an educational outing or field trip. The final social capital variable directly captures the responding parent's perception of his or her community. More specifically, it identifies whether the parent feels that he or she is part of a neighborhood or community or that it is "just a place to live."

Our analysis exploits as controls the detailed variables that are available in ELS:2002 on the observable traits of students, parents, families, and their high schools. Our most parsimonious specification simply includes as controls eleven dummy variables for interactions between each school's census region and its urbanicity (that is, urban, suburban, and rural), where suburban-Northeast is the omitted category. However, in a second specification, we introduce a broad array of controls for observables at the student, family, and school levels, which could be reasonably viewed as exogenous. These include separate demographic controls for the student and the reporting parent (race-ethnicity, gender, age, and English as a native language). Other variables in this group reflect the educational attainment of the parent, the marital structure of the student's family, family size (number of dependents and its square), labor force status of the parent (full-time, part-time, not working), parental occupation (six categories), and family income (linear, quadratic, and cubic terms along with a dummy variable for top-coded income).

This group also includes nine separate variables that identify (on a scale of 1 to 4) the amount of time the parent spends with the child in various, non-school activities (for example, talking, attending religious services, concerts, sporting events). At the parent level, we also include interactions of educational attainment with gender and with native-language status. School-level controls include a dummy variable indicating whether the school begins at grade nine, the number of days in the school's academic year, the lowest and highest salaries paid to full-time teachers, the percentage of full-time and part-time teachers who teach "out of field," three dummy variables for the level of crime in the school's neighborhood, and linear and quadratic terms for the percentage of the school's students on free or reduced-price lunch. We also set the values of all the variables described here to 0 when missing and include separate dummy variables that identify whether each variable is missing among our control variables. Furthermore, we experimented with additional controls that are more likely to be viewed as possibly endogenous with respect to school size and quality (for example, controls for students who have repeated a grade, have learning disabilities, or have behavior problems). We found that the results conditioned on these variables are similar to those reported here.

Baseline Results

The conventional approach to evaluating the effects of school size has been to construct regression-adjusted comparisons that exploit the cross-sectional variation in school size. In table 2, we characterize the geographic distribution of school size in ELS:2002 across twelve categories defined by interacting census region (West, South, Northeast, and Midwest) with urbanicity (urban, suburban, and rural). The results indicate that smaller high schools (those with fewer than 800 students) are particularly uncommon in urban areas. Furthermore, while small high schools are more common in rural and suburban communities, rural communities are particularly likely to have the very smallest high schools (those with fewer than 400 students). Because the communities within these region-urbanicity categories are likely to have distinct and unobserved cultural and economic traits that influence parental involvement and social capital, our results condition on dummy variables unique to each of these categories.

This baseline specification implies that our inferences are based effectively on comparing outcomes among respondents who are *within* a given region-urbanicity cell but involved with schools of different sizes. Nonetheless, the nonrandom sorting of families across schools within these areas could still complicate the inferences based on this approach. The notion that parents "vote with their feet" in response to the quality of local public schools is well docu-

Table 2. Distribution of Respondents, by School Size, Urbanicity, and Census Region

		School size (number of students enrolled)				
Urbanicity and region	*Percent of respondents*	*Fewer than 400*	*400–799*	*800–1,199*	*1,200–2,199*	*More than 2,199*
Urban						
West	7.8	0.00	0.00	8.11	35.35	56.54
South	10.2	0.54	6.59	10.88	52.06	29.93
Northeast	3.3	5.62	1.60	12.87	26.79	53.12
Midwest	5.4	0.00	4.58	15.13	64.75	15.55
Rural						
West	2.8	27.71	0.00	6.19	46.59	19.50
South	8.9	10.31	25.90	21.70	31.01	11.08
Northeast	3.0	6.68	10.71	32.83	49.79	0.00
Midwest	3.8	35.57	29.02	14.41	8.79	12.22
Suburb						
West	13.9	1.01	10.38	12.85	39.03	36.73
South	15.5	1.80	15.24	18.86	44.61	19.48
Northeast	11.4	1.65	22.03	26.78	40.96	8.58
Midwest	14.1	1.52	10.57	22.72	47.57	17.62

Source: Authors' calculations based on ELS:2002 data.

mented. This raises the concern that the unobserved characteristics associated with school selection may also be associated with outcomes such as parental involvement or community attachment.

To explore the relationship between observed characteristics and attendance at a small school, we regress a binary indicator for schools with fewer than 800 students on dummy variables specific to each region-urbanicity cell as well as the student-, parent-, and school-level controls described in the previous section. While no obvious patterns emerge, several of the control variables have a statistically significant effect associated with small-school attendance. For example, the children of skilled and unskilled laborers are more likely than the children of professionals to attend small schools. However, Hispanic students and those from larger families are less likely to attend small schools. Interestingly, the R^2 for this regression is 0.24, which indicates that a substantial amount of the variation in small-school attendance is not explained by the extensive set of controls.

Nonetheless, the partial correlation between some observables and small-school attendance suggests that omitted variables could lead to inconsistent estimates of the school-size effect. The following set of equations formalizes these fundamental concerns:

$$y_{ij} = \alpha\left(small_j\right) + \mathbf{X}_{ij}\gamma + e_{ij}, \tag{1}$$

$$small_j = \mathbf{X}_{ij}\beta + u_{ij}, \tag{2}$$

where i indexes parents and j indexes schools. Most empirical studies of school size estimate single-equation models that resemble equation 1. In these studies, the identifying assumption is that $\text{corr}(e, u \mid \mathbf{X}) = 0$. Researchers typically hope that the vector of control variables, $\mathbf{X}$, is sufficiently detailed that the assumption is largely correct.

In our analysis, we start by following this standard practice in the literature. The tables below present weighted estimates that reflect the sampling design in the ELS. The standard errors shown account for arbitrary correlation within schools. Unless otherwise noted, the estimates presented come from ordinary least squares (OLS) models. In the case of binary outcome variables, probit estimates yield comparable results, and so OLS estimates are presented for ease of interpretation. In the following section, we conduct additional analyses to bound the potential selection bias following the strategy outlined in Altonji, Elder, and Taber.[26]

Table 3 presents the main results for parental involvement. Several interesting patterns emerge across the four outcomes. For example, the results in the first column suggest that parents affiliated with the largest high schools are significantly *more* likely to belong to a PTA. One explanation for this counterintuitive result is that larger schools are more formal and highly organized institutions, which are simply more likely to have a PTA and to have effective recruiting practices. Regardless, these estimates are much smaller and statistically insignificant in the second specification, which conditions on the student, teacher, and school observables. The results for the next dependent variable indicate that parents whose children attend a larger high school are *less* likely to take part in PTA activities. However, while the estimated effects associated with larger schools are almost uniformly negative, the only statistically significant effect occurs in schools that have 1,200 to 2,199 students. The parents associated with those schools are 4.6 to 6.8 percentage points less likely to attend PTA meetings than the parents affiliated with the smallest schools.

The remaining results in table 3 focus on more intensive forms of parental involvement: taking part in PTA activities and volunteering at the school. The results from these regressions indicate that these forms of parental involvement are significantly less likely to occur in larger schools. For example, parents whose children attend schools with 800–1,199 students are 6.9 percentage points, or nearly 24 percent, less likely to take part in PTA activities when compared with parents whose children attend schools with fewer than 400 students. Overall, these results imply that smaller schools may not enhance formal PTA membership, but they do foster a more intensive type of involvement. The estimated effects of larger schools on intensive parental involvement become larger (in absolute value) in the second specification with the student, parent, and school controls. This pattern suggests that the observables predicting attendance at a smaller school are also associated with reduced parental involvement.

The results in table 3 also provide fairly consistent evidence that intensive parental involvement declines monotonically as school size increases. For example, parents in schools with 400–799 students are 8.6 percentage points less likely to volunteer than parents associated with the smaller schools. However, parents in schools with more than 2,200 students are 12.3 percentage points less likely to volunteer. While the magnitude of some of the difference in point estimates between moderately and extremely large schools is not trivial, the estimates for most indicators of school size for categories above 400 students are not statistically distinguishable from each other.

Table 4 presents the main results for the social capital outcomes. Mirroring the parental involvement results, these results indicate that school size is negatively associated with social capital among parents. Specifically, parents whose children attend larger high schools are less likely to report that they belong to an organization with other parents from the school or to know the parents of their child's friends; they also are less likely to report that these parents ever gave them advice or supervised their child on a field trip. Moreover, those parents whose children attend larger high schools are roughly 6–9 percentage points (that is, 7–11 percent) less likely to report that they feel connected to their community, relative to parents whose children attend schools with fewer than 400 students.

In general, these results are highly statistically significant. However, the effect of size varies across the outcome measures. For example, the estimated effect of the largest schools on the probability of belonging to a neighborhood or religious organization with another parent is approximately 19 percent of the mean in the control group. Parents whose children attend the largest schools have knowledge of the parents of their child's friends that is 0.22 of a standard deviation lower than that of parents whose children attend schools with fewer than 400 students. Finally, while there is some indication that the negative effects increase with school size, the difference between categories of schools with more than 400 students is not always statistically distinguishable.

Table 3. Estimated Effects of School Size on Parental Involvement

	Belong to PTA		*Attend PTA meetings*		*Take part in PTA activities*		*Volunteer at the school*	
Independent variable	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*
School enrollment								
400–799	0.034	-0.024	-0.019	-0.037	-0.026	-0.057**	-0.053	-0.086**
	(0.032)	(0.026)	(0.026)	(0.027)	(0.030)	(0.028)	(0.032)	(0.028)
800–1,199	0.055*	-0.024	-0.013	-0.033	-0.045	-0.069**	-0.042	-0.080**
	(0.033)	(0.026)	(0.024)	(0.024)	(0.030)	(0.027)	(0.032)	(0.027)
1,200–2,199	0.125**	0.012	-0.046**	-0.068**	-0.046*	-0.079**	-0.054*	-0.108**
	(0.033)	(0.027)	(0.022)	(0.024)	(0.027)	(0.026)	(0.031)	(0.027)
More than 2,200	0.137**	0.022	0.036	-0.011	-0.061**	-0.096**	-0.087**	-0.123**
	(0.040)	(0.029)	(0.026)	(0.027)	(0.029)	(0.028)	(0.036)	(0.030)
Control group mean	0.134		0.300		0.293		0.322	
(standard deviation)	(0.341)		(0.459)		(0.456)		(0.468)	
p value for F statistics	0.000	0.218	0.002	0.003	0.243	0.019	0.145	0.001
Number of observations	8,248	8,248	8,256	8,256	8,202	8,202	8,197	8,197
R^2	0.029	0.176	0.023	0.114	0.004	0.119	0.012	0.139

Source: Authors' calculations based on ELS:2002 data.

* Significant at 10 percent.

** Significant at 5 percent.

a. Standard errors, adjusted for school-level clustering, are reported in parentheses. All regression estimates are weighted. The p value refers to an F test of the null hypothesis that the four school-size coefficients are equal. Specification 1 includes eleven dummy variables unique to each region-urbanicity cell. Specification 2 adds to the prior model more than eighty controls reflecting the observed characteristics of students, parents, families, and schools. See the text for a more detailed description.

Table 4. Estimated Effects of School Size on Social Capital[a]

Independent variable	*Belong to other organization with parents from school*		*Parent knowledge about child's friends' parents*		*Friends' parent gave advice*		*Friends' parent did a favor*		*Friends' parent received a favor*		*Friend's parent supervised a field trip*		*Feelings of connectedness in community*	
	(1)	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*
School enrollment														
400–799	-0.025	-0.059**	-0.069	-0.098**	-0.025	-0.042	0.024	-0.005	0.015	-0.016	-0.067**	-0.080**	-0.046*	-0.062**
	(0.035)	(0.026)	(0.043)	(0.042)	(0.031)	(0.028)	(0.031)	(0.026)	(0.031)	(0.028)	(0.029)	(0.028)	(0.026)	(0.025)
800–1,199	-0.015	-0.050**	-0.095**	-0.113**	-0.012	-0.031	0.033	-0.000	0.018	-0.015	-0.081**	-0.082**	-0.065**	-0.079**
	(0.033)	(0.024)	(0.045)	(0.042)	(0.029)	(0.027)	(0.030)	(0.026)	(0.031)	(0.027)	(0.029)	(0.029)	(0.026)	(0.025)
1,200–2,199	-0.006	-0.054**	-0.148**	-0.170**	-0.035	-0.069**	0.019	-0.034	0.027	-0.027	-0.113**	-0.120**	-0.062**	-0.080**
	(0.033)	(0.024)	(0.042)	(0.043)	(0.027)	(0.026)	(0.029)	(0.026)	(0.030)	(0.028)	(0.027)	(0.028)	(0.025)	(0.026)
More than 2,200	-0.045	-0.062**	-0.149**	-0.149**	-0.066**	-0.087**	0.004	-0.016	-0.003	-0.019	-0.141**	-0.142**	-0.102**	-0.094**
	(0.038)	(0.027)	(0.046)	(0.047)	(0.029)	(0.028)	(0.031)	(0.028)	(0.033)	(0.030)	(0.028)	(0.031)	(0.027)	(0.028)
Control group mean	0.323		2.474		0.335		0.647		0.698		0.394		0.832	
(standard deviation)	(0.468)		(0.577)		(0.472)		(0.478)		(0.460)		(0.489)		(0.374)	
p value for F statistics	0.451	0.164	0.002	0.001	0.056	0.006	0.712	0.210	0.653	0.848	0.000	0.000	0.004	0.018
Number of observations	8,268	8,268	7,823	7,823	8,183	8,183	8,169	8,169	8,148	8,148	8,132	8,132	8,279	8,279
R^2	0.014	0.201	0.013	0.124	0.006	0.091	0.010	0.124	0.009	0.133	0.009	0.067	0.018	0.123

Source: Authors' calculations based on ELS:2002 data.

* Significant at 10 percent.

** Significant at 5 percent.

a. Standard errors, adjusted for school-level clustering, are reported in parentheses. All regression estimates are weighted. The p value refers to an F test of the null hypothesis that the four school-size coefficients are equal. Specification 1 includes eleven dummy variables unique to each region-urbanicity cell. Specification 2 adds to the prior model more than eighty controls reflecting the observed characteristics of students, parents, families, and schools. See the text for a more detailed description.

All of the results in tables 3 and 4 control for the unobservable determinants unique to the rural, suburban, and urban communities within each census region. Nonetheless, the vast majority of small high schools (that is, those with fewer than 800 students) are located in rural areas, and very few small, public high schools are located in urban areas. This means that the small-school effects discussed above are likely to be driven by rural and, to a lesser extent, suburban location. Yet the policy interest currently surrounding small schools focuses overwhelmingly on poor urban districts. In table 5, we examine the extent to which the estimated effects of small schools are similar across urban, suburban, and rural communities. More specifically, table 5 reports the estimated effects of small schools (fewer than 800 students) on each of the eleven outcomes for separate urban, suburban, and rural samples.

The results in table 5 indicate that the beneficial effects of smaller schools on parental involvement and social capital appear to be almost exclusively concentrated in rural communities. Given that only about 6.1 percent of urban students in the ELS:2002 attend schools with fewer than 800 students, we do not have much statistical precision for this sample. In suburban communities, roughly 15–20 percent of students attend schools with fewer than 800 students, providing a reasonable amount of variation in school size. However, the results in table 5 indicate that parental involvement and social capital are no different in small suburban schools than in larger suburban schools. With only one exception, the point estimates are very close to zero and statistically insignificant.

Selection on Observables

The estimates suggest that school size has modest effects on parental involvement and social capital in rural schools, but no significant or substantial effects in urban or suburban schools. It is still the case, however, that selection on unobservables may be present, leading us to misestimate the impact of school size. In the absence of a randomized experiment or other source of exogenous variation in school size, one can never be certain to have eliminated all omitted variables. In recent work, however, Altonji, Elder, and Taber (hereafter referred to as AET) have developed a strategy for examining the extent of selection on unobservables using information on the selection on observables.[27]

The basic intuition is that the degree of selection on observables can serve as a measure of the extent to which there may be selection on unobservables. Recall that the potential selection bias stems from the fact that the unobserved components of equations 1 and 2 may be correlated. Hence one can determine

Table 5. Estimated Effects of Small School, by Urbanicity

Dependent variable	*Urban*	*Suburban*	*Rural*
Parental involvement			
Belong to PTA	0.100*	-0.027	0.001
	(0.051)	(0.027)	(0.025)
	[0.224]	[0.237]	[0.270]
Attend PTA meetings	0.009	0.009	0.038
	(0.038)	(0.024)	(0.025)
	[0.392]	[0.321]	[0.290]
Take part in PTA activities	0.056*	0.012	0.079**
	(0.032)	(0.023)	(0.025)
	[0.234]	[0.249]	[0.243]
Volunteer at the school	0.061	0.005	0.094**
	(0.076)	(0.022)	(0.031)
	[0.193]	[0.254]	[0.251]
Social capital			
Belong to other organization with parents from school	-0.077**	0.006	0.071**
	(0.035)	(0.022)	(0.029)
	[0.211]	[0.286]	[0.308]
Parent knowledge about child's friends' parents	-0.106	0.063**	0.173**
	(0.071)	(0.026)	(0.043)
	[2.209]	[2.314]	[2.356]
Friends' parent gave advice	0.001	0.005	0.042
	(0.061)	(0.021)	(0.036)
	[0.259]	[0.306]	[0.298]
Friends' parent did favor	-0.014	0.002	0.039*
	(0.047)	(0.020)	(0.023)
	[0.559]	[0.640]	[0.658]
Friends' parent received favor	-0.040	-0.012	0.058**
	(0.048)	(0.019)	(0.028)
	[0.625]	[0.687]	[0.701]
Friends' parent supervised on field trip	-0.018	0.021	0.099**
	(0.032)	(0.020)	(0.033)
	[0.296]	[0.303]	[0.310]
Feelings of connectedness in community	0.007	0.016	0.112**
	(0.035)	(0.017)	(0.025)
	[0.670]	[0.752]	[0.770]

Source: Authors' calculations based on ELS:2002 data.
* Significant at 10 percent.
** Significant at 5 percent.
a. Standard errors, adjusted for school-level clustering, are reported in parentheses. All regression estimates are weighted and based on specification 2 from tables 3 and 4. The bracketed number is the mean of the dependent variable in the control group.

the extent of the bias under various assumptions regarding $\rho = \text{corr}(e, u)$. More important, AET develop a model whereby, under a set of explicit assumptions, the maximum possible correlation is calculated as

$$0 \leq \rho \leq \frac{\text{Cov}(\mathbf{X}'\beta, \mathbf{X}'\gamma)}{\text{Var}(\mathbf{X}'\gamma)}. \tag{3}$$

Three key assumptions underlie this model: first, the observable covariates, **X**, are chosen at random from the full set of factors that determine the outcome, *y*; second, the number of observable and unobservable factors is large; and third, the part of the outcome variable that is related to the observables has the same relationship to the endogenous variable as the part of the outcome that is related to the unobservables. While these are strong assumptions that will not be met fully in any empirical application, AET provide a compelling case that they are at least as plausible as the standard assumptions underlying regression analysis.

Table 6 presents the results of an AET-inspired bounding exercise for the relationship between school size and our outcomes. To simplify the analysis and presentation, we consider a single indicator of school size that takes on a value of 1 for all schools with fewer than 800 students. We choose 800 since it coincides with the optimal high school size, although, as the results from tables 3 and 4 suggest, our results are not particularly sensitive to choosing another cutoff for our definition of small schools. Moreover, to facilitate the comparison between our baseline estimates and the bounding exercise, we estimate unweighted OLS regressions that make no adjustment for heteroskedasticity. This does not change the results in any meaningful way (comparison tables are available upon request). Finally, for the sake of parsimony, we present a limited set of outcome variables.

We conduct this exercise separately for rural, suburban, and urban schools, and our baseline specification conditions on dummy variables for each census region. In effect, we acknowledge that region and urbanicity act as proxies for relevant structural factors that influence both school size and the outcome variables. But we rely on the detailed student, parent, and school observables as a guide to the possibly confounding influence of the unobservables in this analysis.

The top panel presents the results for rural schools. Comparing the first and second rows, we see that the estimated impact of small schools actually becomes more positive when one controls for the detailed set of student, family, and school variables. This suggests that the simple OLS estimates are biased downward, unlike what one would expect if parents who were more inclined to become involved in their child's school sought out smaller learning environments. When the OLS estimates appear to be biased downward, the magnitude of this bias seems relatively small given the slight differences between these estimates. This is reflected in the small maximum correlations for this panel, which range from –0.054 to –0.099.

Despite the relatively small degree of selection on observables, the range of estimates shown in the bottom two rows of table 6 can be somewhat large. For example, if one assumes the maximum potential selection on unobservables,

Table 6. Sensitivity of Small-School Estimates to Various Assumptions Regarding the Degree of Selection on Unobservables

Assumption	*Take part in PTA activities*	*Act as volunteer at the school*	*Parent knows parents of child's friends*	*Feelings of connectedness to the community*
Rural				
Small-school estimate with region-urbanicity controls	0.055**	0.081**	0.127**	0.078**
	(0.024)	(0.024)	(0.035)	(0.022)
Small-school estimate with region-urbanicity indicators and parent and student controls	0.077**	0.105**	0.150**	0.088**
	(0.028)	(0.029)	(0.042)	(0.026)
Implied direction of bias	Downward	Downward	Downward	Downward
max ρ = corr (e, u)	-0.090	-0.099	-0.072	-0.054
R^2 from regression of outcome on all covariates	0.167	0.171	0.157	0.139
Control group mean	0.243	0.251	2.356	0.770
(standard deviation)	(0.429)	(0.434)	(0.650)	(0.421)
Small-school estimate assuming				
ρ = 0.5 * max ρ	0.126**	0.161**	0.209**	0.116**
	(0.027)	(0.028)	(0.041)	(0.025)
ρ = max ρ	0.176**	0.217**	0.267**	0.144**
	(0.027)	(0.028)	(0.041)	(0.025)
Suburban				
Small-school estimate with region-urbanicity controls	0.021	0.005	0.111**	0.040**
	(0.018)	(0.018)	(0.028)	(0.017)
Small-school estimate with region-urbanicity indicators and parent and student controls	0.019	0.009	0.063**	0.022
	(0.018)	(0.018)	(0.029)	(0.018)
Implied direction of bias	Upward	Downward	Upward	Upward
max ρ = corr (e, u)	0.010	-0.021	0.201	0.112
R^2 from regression of outcome on all covariates	0.119	0.131	0.113	0.123
Control group mean	0.249	0.254	2.313	0.752
(standard deviation)	(0.432)	(0.435)	(0.686)	(0.432)
Small-school estimate assuming				
ρ = 0.5 * max ρ	0.013	0.021	-0.125**	-0.044**
	(0.018)	(0.018)	(0.029)	(0.018)
ρ = max ρ	0.008	0.034*	-0.320**	-0.110**
	(0.018)	(0.018)	(0.029)	(0.018)
Urban				
Small-school estimate with region-urbanicity controls	0.073*	0.028	-0.162**	-0.058
	(0.039)	(0.036)	(0.071)	(0.043)
Small-school estimate with region-urbanicity indicators and parent and student controls	0.066	0.068*	-0.075	-0.008
	(0.041)	(0.037)	(0.075)	(0.045)
Implied direction of bias	Upward	Downward	Downward	Downward
max ρ = corr (e, u)	0.026	-0.143	-0.168	-0.169
R^2 from regression of outcome on all covariates	0.147	0.154	0.139	0.124
Control group mean	0.234	0.193	2.209	0.670
(standard deviation)	(0.424)	(0.395)	(0.745)	(0.470)
Small-school estimate assuming				
ρ = 0.5 * max ρ	0.041	0.191**	0.202**	0.167**
	(0.040)	(0.037)	(0.074)	(0.044)
ρ = max ρ	0.017	0.315**	0.486**	0.345**
	(0.040)	(0.037)	(0.074)	(0.045)

Source: Authors' calculations based on ELS:2002 data.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

a. In all models, small schools are defined as those with fewer than 800 students. In order to facilitate comparison with the bounding exercise, all estimates in this table are based on unweighted regressions with standard errors that have not been adjusted to account for heteroskedasticity. Weighting the estimates introduces only minor changes in the small-school estimate. Weighted estimates are available from the authors upon request. The student and parent controls included in the models above are from the middle specifications in tables 3 and 4. The maximum correlation is calculated using the formulas outlined in AET and is described in the text.

the impact of small schools on taking part in PTA activities would be 17.6 percentage points, which is more than twice as large as the OLS estimate of 7.7 percentage points and large relative to the baseline mean of 24.3 percent. The primary reason for this is that the available covariates explain a relatively small fraction of the variation in our outcome measures. The R^2 terms, for example, range from 0.139 to 0.171. Given the same degree of correlation with the unobservables, the higher the R^2, the lower the selection bias in the outcome equation. The intuition for this result is that a larger amount of residual variation means that a relatively small degree of selection can have larger effects on the coefficient estimates.

Despite the imprecision of the bounding exercise, the direction of selection suggests that small schools in rural communities have a strong positive effect on parental involvement and social capital. In contrast, the results for suburban schools, shown in the second panel, suggest that small schools in these areas have no positive effects on our outcomes. For three of the four outcomes shown in table 6, the OLS estimates appear to be biased upward, although the maximum implied correlation is modest in each case. Given the low explanatory power of our covariates, however, the AET bounds indicate that the true effect of size on the two social capital measures might even be negative. For the one outcome where there appears to be some downward bias (whether parents volunteer at the school), the magnitude of the bias is so small that even the most extreme assumption about correlated errors implies only a marginally significant 3.4 percentage point effect, or less than 10 percent given the baseline of 25.4 percent.

The urban school results, shown in the third panel, are mixed and, as indicated above, not very precise. For example, the naïve OLS estimate for perceived connectedness to the community is 0 (–0.008). However, the AET bound based on $\rho = -0.169$ is 34.5 percentage points, an effect that is nearly half of the baseline mean of 67.0 percent. We do not view the results of this bounding exercise as suggesting that small schools clearly have such large effects. Instead, taken together, we view these results as underscoring the uncertainty about the effects of small schools in urban communities.

Discussion

Proponents of the small-school movement argue that autonomous and appropriately sized schools are more effective than large schools at promoting student achievement. In particular, the literature on school size suggests that small schools are better because they have positive effects on the engagement and social interactions of students and staff. The analysis presented here explores another area in which small schools may influence children—namely, the enhanced involvement of their parents in the school and the promotion of social capital in the larger community.

The results presented here provide tentative evidence that small schools are more effective in promoting parental involvement in schools as well as engagement with the broader community. Specifically, we find that in rural communities smaller high schools not only increase the probability that parents take part in PTA activities and volunteer at the school, but also promote some measures of social capital (for example, knowledge of other parents and community identification). The policy relevance of this evidence turns, in part, on the contributions that parental involvement may make to school quality. But, given the widely held view that social capital provides a vital complement to economic advancement, these results also suggest that smaller schools can benefit at-risk communities in ways that extend beyond the schoolhouse door.

However, several important qualifications to these conclusions should be noted. For example, while we find consistent, strong, and positive impacts of small schools in rural communities, we find no such evidence in suburban communities. Although this may be due, in part, to the lower precision in suburban communities, the effects associated with school size seem to be noticeably larger in rural communities. Unfortunately, there are so few small schools in the urban communities in our data that we cannot say much about the influence of school size in these contexts. Taken as a whole, our results suggest that there may be some beneficial effects of small schools on the outcomes we consider, but there may also be cultural or economic features unique to rural communities that limit the external validity of these results for other areas.

A final caveat is that the literature on school size appears to have paid relatively little attention to the thorny problem of identifying the causal effects of smaller schools. This perennial empirical problem is exacerbated in this setting by the general lack of compelling natural experiments. With respect to some of our results, we have tentatively expressed more confidence in some causal interpretations by using the evidence from bounding exercises that rely on how the selection into small schools relates to the selection on other observables that influence parental involvement and social capital. However, more definitive evidence on the true effects of small schools is likely to emerge from ongoing randomized experiments. Our results suggest that a fruitful direction for future research would be to consider how small schools influence the engagement of parents both in and outside their child's school.

Notes

1. Nahal Toosi, "Small Schools Changing Shape of Nation's Largest School System," Associated Press, May 13, 2006.

2. Anne D. Lewis, "Washington Commentary: High Schools and Reform," *Phi Delta Kappan* 85, no. 8 (April 2004): 563; Tom Vander Ark, "The Case for Small High Schools," *Educational Leadership* 59, no. 5 (February 2002): 55–59.

3. Valerie E. Lee, Anthony S. Bryk, and Julia B. Smith, "The Organization of Effective High Schools," in *Review of Research in Education*, edited by Linda Darling-Hammond (Washington: American Educational Research Association, 1993), pp. 171–267; Mark A. Royal and Robert J. Rossi, "Schools as Communities," *ERIC Digest* 111 (March 1997).

4. See Lee, Bryk, and Smith, "The Organization of Effective High Schools." When asked about serious problems at their school, public school teachers participating in the 1999–2000 Schools and Staffing Survey chose "lack of parental involvement" more frequently than all problems other than "students come unprepared to learn." See Thomas D. Snyder, Alexandra G. Tan, and Charlene M. Hoffman, *Digest of Education Statistics 2005,* NCES 2006-030 (Government Printing Office, 2006) , especially table 71.

5. For example, in a recent study, William A. Fischel argues that voters consistently reject voucher plans because they recognize that local public schools promote the development of community-specific social capital. See William A. Fischel, "An Economic Case against Vouchers: Why Local Public Schools Are a Local Public Good," Working Paper 02-01 (Dartmouth College, Economics Department, October 20, 2002).

6. For example, a recent study by Ilyana Kuziemko on the achievement consequences of school size exploits the variation in school size generated by school openings, closings, and mergers in Indiana. See Ilyana Kuziemko, "Using Shocks to School Enrollment to Estimate the Effect of School Size on Student Achievement," *Economics of Education Review*, vol. 25, no. 1 (2006): 63–75.

7. Joseph G. Altonji, Todd E. Elder, and Christopher R. Taber, "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools," *Journal of Political Economy* 113, no. 1 (2005): 151–84.

8. David B. Tyack, *The One Best System: A History of American Urban Education* (Harvard University Press, 1974), p. 127.

9. James Bryant Conant, *The American High School Today* (New York: McGraw-Hill, 1959).

10. Karen Irmsher, "School Size," *ERIC Digest* 113 (July 1997); Matthew Andrews, William Duncombe, and John Yinger, "Revisiting Economies of Size in American Education: Are We Any Closer to a Consensus?" *Economics of Education Review* 21, no. 3 (June 2002): 245–62. The average enrollment of regular, public high schools during the 2002–03 school year was 813 students. National Center for Education Statistics (NCES), *2004 Digest of Education Statistics* (Department of Education, 2004), table 94.

11. Deborah Meier, "The Big Benefits of Smallness," *Educational Leadership* 54, no. 1 (September 1996): 12–15.

12. See Lee, Bryk, and Smith, "The Organization of Effective High Schools"; Max Weber, *The Theory of Social and Economic Organization,* translated by A. M. Henderson and T. Parsons (Glencoe, Ill.: Free Press, 1947).

13. Anthony S. Bryk and Mary Erina Driscoll, "The High School as Community: Contextual Influences and Consequences for Students and Teachers," ED 302 539 (University of Wisconsin, National Center on Effective Secondary Schools, 1988); Valerie E. Lee and Susanna Loeb, "School Size in Chicago Elementary Schools: Effects on Teachers' Attitudes and Students' Achievement," *American Educational Research Journal* 37, no. 1 (Spring 2000): 3–31; Robert Crosoe and Monica Kirkpatric Johnson, "School Size and the Interpersonal Side of Education: An Examination of

Race-Ethnicity and Organizational Context," *Social Science Quarterly* 85, no. 5 (December 2004): 1259–74.

14. For example, James Griffin presents evidence that larger elementary schools are associated with lower levels of parental involvement. However, these inferences are based on only one suburban school district. See James Griffin, "The Relation of School Structure and Social Environment to Parent Involvement in Elementary Schools," *Elementary School Journal* 99, no. 1 (September 1998): 53–80.

15. However, Fischel presents a cross-state regression ($N = 48$), which indicates that an index of "social capital" is lower in states where more students are in "big" school districts. See Fischel, "An Economic Case against Vouchers," table 1.

16. See Tyack, *The One Best System*.

17. See Steven N. Durlauf and Marcel Fafchamps for a comprehensive and critical review of the theoretical and empirical literature on social capital. See Steven N. Durlauf and Marcel Fafchamps, "Social Capital," Working Paper 10485 (Cambridge, Mass.: National Bureau of Economic Research, May 2004).

18. See Robert Putnam, *Bowling Alone: The Collapse and Revival of American Community* (New York: Simon and Schuster, 2000). A recent study by Costas and Kahn suggests that the declines in social capital are overstated and that much of the decline since 1970 is due to increases in female labor force participation and growing income inequality. See Dora Costas and Matthew E. Kahn, "Understanding the American Decline in Social Capital, 1952–1988," *Kyklos* 56, no. 1 (2003): 17–46.

19. See Putnam, *Bowling Alone*, p. 55.

20. See James M. Buchanan, "Ethical Rules, Expected Values, and Large Numbers," *Ethics* 76 (October 1965): 1–13.

21. Mancur Olson Jr., *The Logic of Collective Action* (Harvard University Press, 1965). However, Sandler notes that this relationship depends on a number of modeling assumptions (for example, the utility function, the technology of the public good supply, and the nature of strategic interactions). See Todd Sandler, *Collective Action: Theory and Applications* (University of Michigan Press, 1992).

22. See Steven J. Ingels, Daniel J. Pratt, James E. Rogers, Peter H. Siegel, and Ellen S. Stutts, *Education Longitudinal Study of 2002: Base Year Data File User's Manual,* NCES 2004.405, project officer: Jeffrey A. Owings (Department of Education, National Center for Education Statistics, 2004).

23. Ibid.

24. Ibid.

25. The econometric specification is described in more detail in the next section.

26. Altonji, Elder, and Taber, "Selection on Observed and Unobserved Variables."

27. Wei Pan and Kenneth A. Frank present a related procedure that uses observables to identify a reference distribution that can be used to estimate the probability of "retaining causal inference" (that is, rejecting the null hypothesis of no effect) in the presence of an omitted variable. Wei Pan and Kenneth A. Frank, "A Probability Index of the Robustness of a Causal Inference," *Journal of Educational and Behavioral Statistics* 28 (2003): 315–37.