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Effects of Organic Management on Student Achievement

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Proponents of school restructuring often promote the purported benefits of professional forms of management that call for staff cooperation and collegiality, teachers' participation in school decision making, and supportive leadership by school principals. A theoretical perspective on organizations known as contingency theory refers to such management patterns as "organic management." This study examined the relationships between organic management and growth in student achievement in elementary and secondary schools. Two national databases were used to estimate a series of three-level growth models of student achievement at the elementary and secondary levels. Results suggested that organic forms of management are not a particularly powerful determinant of student achievement at either of these levels of schooling.

Keywords: educational administration, HLM growth models, organic management, student achievement, teacher empowerment, teacher professionalism

A great deal of research in educational administration focuses on what Rowan (1990) called "organic" forms of management in schools. In the broader literature on organizations, organic management is defined as a shift away from conventional, hierarchical patterns of bureaucratic control toward

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what has been referred to as a network pattern of control, that is, a pattern of control in which line employees are actively involved in organizational decision making, staff cooperation and collegiality supplant the hierarchy as a means of coordinating work flows and resolving technical uncertainties, and supportive (as opposed to directive) forms of administrative leadership emerge to facilitate line employees' work. Organizations staffed and managed by professionals often adopt this organizational form, as do organizations operating uncertain technologies in dynamic environments.

Many lines of research in education reflect an interest in organic management. There is, for example, a large body of research on teachers' participation in school decision making, as well as associated research on management innovations such as site-based management and teacher empowerment, which are designed to replace more centralized forms of decision making with more decentralized forms (e.g., see Conley, 1991; Conway, 1984; Duke, Showers, & Imber, 1981; Malen, Ogawa, & Kranz, 1990; Marks & Louis, 1997; Smylie, 1994; Smylie, Lazarus, & Brownlee-Conyers, 1996; Taylor & Bogotch, 1994). In addition, there is a growing body of literature on teachers' professional communities in schools. This literature highlights the role that networks of teacher collaboration and collegiality play in promoting instructional coordination, teachers' professional learning, and processes of instructional improvement (Bird & Little, 1986; Bryk, Camburn, & Louis, 1996; Grossman, Wineburg, & Woolworth, 2001; Little & McLaughlin, 1993; Louis, Marks, & Kruse, 1996; McLaughlin & Talbert, 2001). Finally, there is a long line of research in educational administration focusing on the role that supportive (as opposed to directive) forms of school leadership play in promoting instructional improvement in schools (Blase, 1993; Blase & Blase, 2002; Bossert, Dwyer, Rowan, & Lee, 1983; Rosenholz, 1989; Weiss & Cambone, 1994).

Educational researchers' interest in these elements of organic management has many sources. One is the historic American commitment to democratic forms of organizational governance. Another is the strong normative commitment on the part of educationists to the advancement of teacher professionalism and the professional control of schools (Tyack, 1974). In the research community, this ideological commitment is often accompanied by an additional argument—that organic forms of management are consistent with teacher professionalism and inexorably lead to better instruction and improved student learning in schools (Rosenholz, 1989; Rowan, 1990).

Surprisingly, however, research provides only mixed empirical support for the hypothesis that organic forms of management are positively related to increases in school effectiveness (e.g., Conway, 1984; Malen, Ogawa, & Kranz, 1990; Rowan, 1990; Smylie et al., 1996). Instead, research suggests that a variety of contextual factors in and around schools condition the effects of organic management on instruction and student learning (Mohrman & Wohlstetter, 1994; Newmann, 1996; Robertson, Wohlstetter, & Mohrman, 1995). As a result, the "main effects" of organic management on school effectiveness are weak, and positive effects appear to be contingent on many other conditions.

Moreover, almost all recent research on the effects of organic management on school effectiveness has been conducted in American high schools (cf. Bryk & Driscoll, 1988; Gamoran et al., 2003; Marks & Louis, 1997; Newmann, 1996; Rowan, Chiang, & Miller, 1997; Rowan, Raudenbush, & Cheong, 1993; Rowan, Raudenbush, & Kang, 1991; Talbert, McLaughlin, & Rowan, 1993). As a result, we know little from recent studies about whether and to what extent organic management has positive effects on teaching and learning in elementary schools. In addition, little research has compared the possible effects of organic management on teacher or student outcomes across different academic subjects, even though a great deal of current research shows that teachers' knowledge, task activities, and methods of resolving technical uncertainties vary greatly depending on the subject matter being taught (Grossman & Stodolsky, 1995; Rowan, 2002a; Spillane & Burch, in press).

Given the ambiguous state of research in the area, we sought to provide sound empirical evidence on the effects of organic management on what is perhaps the most pressing indicator of school effectiveness—students' growth in academic achievement. In this article, we first develop a theoretical perspective on organizations known as contingency theory to unify disparate streams of research on teacher empowerment, collegial cultures, and supportive leadership into a unified theoretical framework on school effectiveness. Second, we use this theoretical framework to derive an integrated set of hypotheses about the circumstances under which organic management can be expected to lead to accelerated growth in reading and mathematics achievement among students in elementary and secondary schools. Finally, we develop evidence from two large, nationally representative data sets to empirically test these hypotheses and provide sound evidence on one of the most common hypotheses in the field of education: the idea that organic forms of management are key to improving student learning in school settings.

Background

The present article grew out of a larger body of work conducted by Rowan and colleagues over the past decade. The purpose of this work was to apply a theoretical perspective on organizations known as contingency theory to research on school effectiveness (for a review of how contingency theory can be applied to the study of educational organizations, see Rowan, 1990, 2002a, 2002b). As a general theory of organizational effectiveness, contingency theory revolves around two basic assumptions: (a) that organizations develop managerial configurations in response to the technical and environmental circumstances they face and (b) that specific managerial configurations are effective only to the extent that they are appropriately matched to these technical and environmental circumstances. In particular, contingency theory suggests that organic forms of management (i.e., participatory forms of decision making, supportive forms of leadership, and network forms of collegial control) are more likely to emerge within, and be effective for, organizations that operate uncertain technologies in dynamic environments; conversely, "mechanistic" forms of management (i.e., centralized decision making, directive forms of leadership, and hierarchical forms of control) are more likely to emerge within, and be effective for, organizations operating more routine technologies in stable environments (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Perrow, 1965).

Rowan and colleagues used contingency theory as a framework for their research on teacher professionalism and school restructuring during the 1990s. At the time, many educationists promoting teacher professionalism were arguing that schools were overly bureaucratic (i.e., "mechanistic" in form) and that more "organic" forms of management were needed to improve the effectiveness of schools. Strikingly, this call for professional management forms was grounded in a variety of assumptions also held by contingency theorists. For example, advocates of school restructuring and teacher professionalism argued that teaching is a complex and uncertain task, and thus, like contingency theorists in the organizational sciences, they argued that instruction would best be managed through promoting increased teacher control over instruction, supporting increased collaboration among teaching staff, and promoting supportive (as opposed to directive) forms of administrative leadership in schools.

The similarities between contingency theory and research on teacher professionalism and school restructuring led Rowan (1990) to outline a systematic program of research on the basic tenets of contingency theory as it applies to the study of school effectiveness. In an initial statement on this program, Rowan (1990) called for educational researchers to examine the assumption that teaching is, in fact, a complex and nonroutine form of work; then to investigate whether nonroutine forms of teaching necessarily lead to increased levels of organic management in schools; and finally to study the effects of organic management on a variety of indices of school effectiveness. In this way, Rowan (1990) hoped to empirically test the logic of 1990s-style school reforms and build a systematic body of theory and research on school effectiveness.

The first study launched by Rowan and colleagues (Rowan et al., 1991), which examined differences in organic management across high schools, produced two main findings. One was that smaller, private high schools showed stronger patterns of organic management than did larger, public secondary schools. A second was that teachers *within* high schools had varied perceptions of organic management, largely as a result of their locations within schools' academic divisions of labor. In subsequent studies, Rowan and colleagues elaborated on these findings, explicitly testing additional hypotheses drawn from contingency theory. One goal of these later studies, for example, was to measure the extent to which teaching is a routine or nonroutine task. Another was to test a basic argument of contingency theory: that the level of task routinization experienced by teachers will vary across the different academic subjects and tracks within secondary schools and that this, in turn, will affect the extent to which teachers participate in or experience "organic" forms of management.

These later studies yielded two additional findings. First, it was found that many different instructional conditions—including teachers' disciplinary specializations and track assignments—affected secondary school teachers' perceptions of task routinization. Second, these studies supported an additional hypothesis from contingency theory: that teachers who face less routine task environments are more likely than teachers who face more routine task environments to report the presence of organic management in schools (Rowan, 2002a; Rowan et al., 1993). The effects of task characteristics on the emergence of organic management were quite small in these studies, however, suggesting that contingency theory might not be the most powerful explanation for differences among schools in organizational design (Rowan, 2002b).

In related work, Rowan and colleagues examined the relationship of organic management to several indicators of school effectiveness. In one set of studies, it was found that teachers who worked in schools characterized by stronger patterns of organic management were more likely than other teachers to have a higher sense of teaching efficacy, to report higher levels of workplace commitment, and to report greater professional learning (Raudenbush, Rowan, & Kang, 1992; Rowan, 2002b; Rowan et al., 1993). In another study Rowan et al. (1997), using data from the National Education Longitudinal Study of 1988 (NELS:88), conducted a cross-sectional analysis of the effects of organic patterns of management on the mathematics achievement of high school students. The results of this study showed that teacher participation in decision making (one element of organic management) had small, positive effects on students' 10th-grade mathematics achievement. However, two other elements of organic management (i.e., teacher collaboration/collegiality and supportive principal leadership) had *no* effects on this measure of student learning. Thus, once again, the logic of contingency theory received modest empirical support.

Study Rationale and Hypotheses

We sought to extend this line of work further. In all of the studies just cited, Rowan and colleagues measured "organic management" using a standard set of survey measures that reflected teacher control over instructional decision making, staff collegiality and cooperation, and administrative support (for empirical evidence that these separate measures reflect a single, underlying dimension of organic management, see Raudenbush, Rowan, & Kang, 1991). We used these same measures in an empirical analysis of two large-scale, nationally representative data sets to investigate the effects of organic management on growth in students' reading/language arts and mathematics achievement at both the elementary and secondary school levels.

One goal of our analyses was to test what might be called the "naive" or prevailing assumption about the effects of organic management on patterns of student achievement in schools. As discussed earlier, many educational researchers assume that all teaching is complex and nonroutine and that, as a result, organic forms of management have generally positive effects on student achievement in both elementary and secondary schools, no matter the subject being taught. This leads to the initial hypothesis tested in the present study: All else equal, the effects of organic management on student achievement growth will be positive in both reading and mathematics at both elementary and secondary levels of schooling.

Although this hypothesis is consistent with a great deal of thinking in research on schools, it is not especially faithful to the logic of contingency theory. This is because previous research (e.g., Miller & Rowan, 2003; Rowan, 2002a) strongly suggests that the "core technology" of schooling (i.e., classroom instruction) can differ in fundamental ways across elementary and secondary schools and that, within schools, the core technology of schooling differs across the academic subjects of reading/language arts and mathematics. For example, Miller and Rowan (2003), following Firestone and colleagues (Firestone, Herriot, & Wilson, 1984; Herriot & Firestone, 1984), showed that elementary schools are less structurally differentiated than high schools, suggesting that the task of teaching at the elementary level is both more complex and more holistic than it is in academically centered high schools. Following contingency theory, we should therefore expect that organic forms of management will be especially effective in improving instruction in elementary schools and that they will be less effective in high schools.

In addition, Rowan (2002a) showed that teachers of mathematics were more likely than teachers of English/language arts to report the task of teaching to be routine. Again, following contingency theory, this leads us to expect that organic management will have more payoffs in regard to improving student achievement in the more complex and nonroutine subject area of reading than in the more routine subject area of mathematics. These considerations therefore lead to the following modifications of the "naive" hypothesis: (a) All else equal, the more complex instructional tasks of elementary schooling should result in the effects of organic management on student achievement being greater in elementary school settings than in secondary school settings, and (b) all else equal, the effects of organic management on student achievement should be greater in reading (wherein the task is relatively nonroutine) than in mathematics (wherein the task is more routine).

Overall, then, hypotheses derived from contingency theory suggest that organic management should have the following effects on achievement: The largest positive effects should be found for elementary school reading (the task that is most complex and nonroutine), and the effects should become progressively smaller for elementary school mathematics, high school reading, and, finally, high school mathematics. Such a series of predictions is consistent with the general thrust of contingency theory, according to which the effects of organic forms of management are greatest when tasks are complex and uncertain (i.e., nonroutine) and are much smaller as tasks become more routine.

Method

Data Sources

We used two large-scale data sets to test these hypotheses: *NELS:88* and *Prospects: The Congressionally-Mandated Study of Educational Opportunity.* Both data sets contain longitudinal information on student achievement in reading and mathematics, and both contain exactly parallel measures of organic management identical to those used in previous research by Rowan and colleagues.

The Prospects data were collected from three cohorts of elementary school students who were tracked from 1991 to 1994 as they passed through a large and nationally dispersed sample of schools under study. In this investigation, we used only the two elementary-aged cohorts to estimate the effects of organic forms of management on student achievement. The Cohort 1 sample included students entering the first grade in the fall of 1991 who completed the third grade in the spring of 1994. The Cohort 3 sample included data on students in these same schools as they passed from their third-grade year (spring 1991) through completion of the sixth grade in spring 1994, although in the current study we followed students only to the end of their fifth-grade year (spring 1993) because large numbers of Cohort 3 students transferred from their elementary school sites to junior high/middle schools at the end of fifth grade.

At the initiation of our analysis of the Prospects data, we had a study sample of approximately 10,800 students from Cohort 1 and about 10,300 students from Cohort 3. These students were enrolled in about 250 schools located across the country. As is common in longitudinal data collection, however, student mobility, noncooperation, and other forms of attrition caused a reduction in sample size. An essential requirement of the samples drawn for the present study, for example, was that all eligible students remained at the same school site for all phases of data collection. With this precondition, Cohort 1 included data on 7,052 eligible students enrolled in 186 schools, and Cohort 3 included data on 8,155 eligible students enrolled in 153 schools.

Not surprisingly, application of a number of data filters produced a final analytic sample for the present study that was smaller than this study sample. First, from the study sample, we selected only students for whom at least one time point of achievement data was present, along with data on social and academic background and teacher assessments of students' motivation and academic engagement. Then we dropped students who attended schools with insufficient school-level data. After this filter had been applied, the Cohort 1 mathematics sample included 5,463 students in 143 schools, while the reading sample included 5,561 students in 146 schools. The Cohort 3 mathematics sample consisted of 5,250 students in 137 schools, and the reading sample consisted of 5,314 students in 138 schools. On average, the first-grade cohort had 39.72 (SD = 16.54) participants per school, while the third-grade cohort averaged 38.51 (SD = 21.49) participants per school.

We conducted a series of t tests to determine whether the missing data significantly changed the demographic compositions between the study samples and the original samples. These analyses showed that the study samples used in the current research were somewhat less diverse in social composition and slightly higher achieving than the samples originally drawn. However, these changes did not necessarily result in the current study samples being less representative of schools in general. The Prospects study design and study objectives required the sampling of large numbers of students enrolled in compensatory programs, in addition to sampling large numbers of regular classroom students (Puma, Karweit, Price, Ricciuti, & Vaden-Kiernan, 1997). As such, Prospects included a disproportionate number of disadvantaged students, and these were precisely the types of students lost as a result of the implemented filtering procedures. Moreover, school-level demographic composition was unchanged by the student-level sample reduction. Recall that this research focused on school-level organizational effects on student achievement.

The point of gathering student data and nesting these data within schools was to test the effects of school-to-school variations in organic management on patterns of student growth in achievement. In the Prospects data, measures of organic management were constructed at the school level from teacher survey responses collected during the second year (or midpoint) of the study. As a means of constructing these measures, teacher information was pooled across both grade cohorts via data collected from regular classroom teachers, Chapter 1 teachers, and English-as-a-second-language teachers where applicable. This procedure maximized the number of teacher reports available per school for the purpose of creating measures of organic management and resulted in a teacher-level file consisting of 1,940 respondents across 252 schools, with an average of 7.70 ($SD = 4.42$) teachers reporting per school.

The high school analysis involved the use of data from NELS:88 on a single cohort of students tracked at three data collection points over a 5-year period (1988–1992). The NELS:88 base-year data included 24,599 eighth graders in 1,052 middle/junior high schools, which constituted a nationally representative sample of students attending public and private schools in eighth grade. To maintain a strictly parallel analysis across the elementary and secondary school samples, however, we limited the NELS:88 sample to public-sector institutions in this study, and we limited the student samples to respondents attending the same high school during their 10th- through 12th-grade years. With these criteria in place, the NELS:88 study sample included 13,065 students attending 971 public secondary schools.

We next applied data filters to the study sample, thereby incurring additional case reduction. The analytic sample for this study, for example, included only students with sufficient achievement data, high school transcript information, social background information, and relevant teacher reports who also attended schools where sufficient school-level data had been collected. This data filtering procedure yielded an analytic sample for mathematics that included 9,656 students in 806 schools and an analytic sample for reading that included 9,655 students in 806 schools. In the case of both reading and mathematics, the average number of participants per school was 11.98 ($SD = 5.93$).

Following the same procedures used for Prospects, we found that the students filtered from the NELS:88 data were more likely to represent a minority race or ethnic group, but this reduction was not associated with a commensurate change in socioeconomic status (SES). However, the analysis did show that the study samples were generally higher achieving in both mathematics and reading. The original base-year sample included under-performing students who dropped-out of school, fell significantly behind grade, or exhibited a pattern of mobility making it impractical for the National Center for Education Statistics (NCES) to trace them. Nonetheless, these changes occurring at the student level do not compromise the composition of the school level sample, and it is school-level organizational effects on student achievement that are the most critical to the hypotheses tested in this study.

As with the Prospects data set, our measures of organic management were based on teacher data taken from the second NELS:88 administration of teacher surveys (1990). This data collection period marked the first year of the study in which high school teachers responded to questions about their school's climate and working conditions, and it corresponded to the midpoint in the study design. The resulting teacher-level file consisted of 8,993 public school teachers employed at 1,006 public school sites, with an average of 8.88 ($SD = 5.63$) teachers reporting per school.

Measures of Organic Management and Supporting Conditions

Using data from both Prospects and NELS:88, we developed identical measures of organic management based on common survey items used in the teacher questionnaires from both studies. These measures, it should be noted, were constructed to be as similar as possible to those used by Rowan and colleagues in previous studies of organic management, although the measures used in the present study generally contain fewer items than those from previous studies (e.g., Raudenbush, Rowan, & Kang, 1991; Rowan et al., 1991, 1993, 1997). The three measures of organic management were (a) a measure of supportive leadership by school administrators, (b) a measure of teachers' control over key instructional decisions, and (c) a measure of the amount of staff collaboration present in the school. Next, we discuss specific items included in these measures.

Both databases allowed us to develop an eight-item scale measuring *administrative support,* a measure focused primarily on the leadership role of school principals. The items included in the scale correspond to items used in many previous studies and reflect the construct of supportive principal leadership found in both the effective schools research and the transformational leadership literature (Leithwood, 1992; Rosenholz, 1989). The items, shown in Appendix A (Prospects) and Appendix B (NELS:88), were rated on a 6-point Likert-type scale ranging from *strongly agree* to *strongly disagree.* The internal consistency (Cronbach alpha) coefficients of the items were .91 in Prospects and .89 in NELS:88.

In both data sets, a measure of *teacher control* was constructed as a four-item scale assessing teachers' influence over school and classroom policy. This scale's items covered a range of policy areas, including student disciplinary regulations, in-service program content, school curriculum, and ability grouping practices. Scholars of teacher professionalism often advocate teacher control over these dimensions of school governance as part of their reform platforms (see Bryk & Driscoll, 1988; Darling-Hammond & McLaughlin, 1996; Lee, Bryk, & Smith, 1993; Lee, Smith, & Croninger, 1997; Marks & Louis, 1997; Rowan, 1990; Sweetland & Hoy, 2000). The items (see Appendixes A and B) used here were rated on a 6-point Likert-type scale ranging from *no influence* to *a great deal of influence.* The scales had alpha reliabilities of .78 in the Prospects data and .77 in the NELS:88 data.

In both data sets, *staff cooperation* was measured with a four-item scale indexing teachers' reports of cooperation and collaboration among school staff. The items assessed the extent to which staff members shared beliefs about the central mission of the school and whether teachers cooperated with fellow staff members. The items (see Appendixes A and B) closely indexed ideas about teacher collegiality and collaboration contributing to school effectiveness (Little, 1982; Rosenholz, 1989). Items were rated on a 6-point Likert-type scale ranging from *strongly agree* to *strongly disagree,* and alpha reliabilities were .87 in the Prospects data and .85 in the NELS:88 data.

The general organizational science literature suggests that organic management might not be effective unless organizations also adopt the necessary structures to implement this control strategy (Powell, 1992; Rouleau & Seguin, 1995). The education literature similarly suggests that, to promote teacher involvement and collaboration in school decision making, schools must be restructured to provide teachers scheduled time to plan and coordinate with staff colleagues (Raywid, 1993). Common planning time, flexible scheduling, and interdisciplinary teams are three types of restructuring reforms that meet this need, and there is some evidence suggesting that these structures improve student achievement in high schools (Lee & Smith, 1993, 1995; Rowan et al., 1997). As a result, we included several additional measures of organizational conditions supporting organic management.

Both the NELS:88 and Prospects databases contain items measuring different scheduling arrangements, but these items are not presented in precisely the same manner. As a result, it was necessary to develop items for the current study that were similar measures of the same construct. In Prospects, a dichotomous variable was coded from principals' reports of scheduling practices within their schools. The first-grade cohort variable was coded as either 1 (schools reported common planning time for at least three data collection periods) or 0 (all other arrangements), as was the third-grade cohort variable (1 = schools reported common planning time for at least two data collection periods, 0 = all other arrangements). "Other arrangements" included traditional scheduling structures, flexible time schedules, and interdisciplinary teams without a common planning period for teachers. From the NELS:88 data, we were able to develop a four-item dummy-coding scheme to measure various types of scheduling structures. This dummy coding system indexed the presence of common planning time (coded as 1) versus all other arrangements (coded as 0); we also included a dummy code to account for missing scheduling information.

Other Variables

Reading and Mathematics Test Scores

A central purpose of this study was to estimate the effects of organic management on students' achievement growth. To do this, we used the reading and mathematics achievement scores included in the Prospects and NELS:88 data sets. In Prospects, there were four data collection points for students in the first-grade cohort and three data collection points for students in the third-grade cohort. The achievement data used in our analysis of Prospects data were students' item response theory–scaled (IRT-scaled) scores on the Comprehensive Test of Basic Skills (CTBS) reading and mathematics batteries administered as part of the survey. In NELS:88, achievement data were gathered at three time points and reported as IRT-scaled scores on the achievement tests especially designed for the study.

Control Variables

We developed a parallel set of control measures for use in both the Prospects and NELS:88 data analyses. These measures were entered into the models to control for potential specification errors in estimating the effects of organic management on student achievement. In many instances, the Prospects and NELS:88 data sets provided the same items for use as control variables, but in other instances roughly similar items were used to represent these variables. At the individual level, the control variables included students' race/ethnicity, gender, family SES, educational expectations or engagement (motivation), ability grouping, and course taking. At the school level, control variables included students' average SES, the dispersion of family SES among students, and total school enrollment.

Statistical Models

The analyses reported here involved estimation of six separate, three-level hierarchical linear modeling (HLM) growth models of the sort described by Raudenbush and Bryk (2002, chap. 8). Separate models were used to estimate the effects of organic management on (a) growth in Cohort 1 elementary school students' reading achievement, (b) growth in Cohort 1 elementary school students' mathematics achievement, (c) growth in Cohort 3 elementary school students' reading achievement, (d) growth in Cohort 3 elementary school students' mathematics achievement, (e) growth in high school students' reading achievement, and (f) growth in high school students' mathematics achievement.

Readers interested in a detailed discussion of the estimation strategy used in this research, along with a discussion of the variance components for both the unconditional and fitted models, are urged to consult Miller (2004). Here we present only the most parsimonious description of these HLM analyses. For each data set under consideration, we formulated a basic model of achievement growth for students in the sample. This model assumed that student growth in achievement could be modeled as a function of an intercept (set at the midpoint of a given time series), a linear rate of growth, and a deceleration term. Thus, at Level 1 in each model of achievement growth, we had

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}(\text{Time}) + \pi_{2ij}(\text{Time})^2 + e_{tij}, \tag{1}$$

where Y_{tij} represents the achievement score of student i in school j at time t; the variable "time" is measured in months elapsed since the beginning of the time series for Prospects data and in 2-year intervals for NELS:88 data; and the coefficient π_{0ij} is the achievement status of student i in school j in the spring of 2nd grade for Cohort 1, the spring of 4th grade for Cohort 3, and the spring of 10th grade for NELS:88 students. In this model, the coefficient π_{1ij} is the linear rate of growth in achievement for student i in school j during the study period; the coefficient π_{2ij} is the quadratic growth rate for student i in school j during the study period; and e_{tij} is the error term assumed to be normally distributed with a mean of 0 and a constant variance σ^2 across schools. Note that the model assumes that student achievement is increasing over time, but at a decelerating rate.

At Level 2, we modeled growth in achievement among students within schools as a function of student-level random effects (r_{0ij} and r_{1ij}), student characteristics such as SES, ethnicity, motivation, and other student-level variables. In general, across all data analyses, the Level 2 model was follows:

$$\pi_{0ij} = B_{00j} + \sum_{q=1}^{Q} \beta_{0qk} X_{qjk} + r_{0ijk}$$

$$\pi_{1ij} = B_{10j} + \sum_{q=1}^{Q} \beta_{1qk} X_{qjk} + r_{1ijk}$$

$$\pi_{2ij} = B_{20j} + \sum_{q=1}^{Q} \beta_{2qk}, \tag{2}$$

where β_{00j} is a coefficient representing the achievement status of the average student in school j at the midpoint in the time series; β_{10j} is the average rate of linear growth for students in school j; and β_{20j} is the average rate of quadratic growth for students in school j. In this model, the term X_{qjk} signals that we included a number (Q) of student-level variables to predict differences among students in their achievement status, linear rate of achievement growth, and rate of deceleration. The coefficients β_{pqk} represent the direction and strength of association among each of these independent variables and the respective student-level growth parameters in the model.

At Level 3, the model examined how students' achievement status and achievement growth varied across schools as a function of school-level random effects (u_{00j} and u_{10j}) as well as school conditions such as extent of organic management or presence of supportive conditions. The model at this level was as follows:

$$B_{00j} = \gamma_{000} + \sum_{s=1}^{S_q} \gamma_{0qs} W_{sk} + u_{00i}$$

$$B_{10j} = \gamma_{100} + \sum_{s=1}^{S_q} \gamma_{1qs} W_{sk} + u_{10j}$$

$$B_{20j} = \gamma_{200} + \sum_{s=1}^{S_q} \gamma_{2qs} W_{sk}, \quad (3)$$

where γ_{000} is the grand mean for achievement status in the sample, γ_{100} is the grand mean for the linear rate of achievement growth in the sample, and γ_{200} is the grand mean of the quadratic growth (or deceleration) in the sample; the error terms u_{00j} and u_{10j} indicate that we assume schools vary around the grand means for achievement status and achievement growth, with random effects assumed to be normally distributed with a mean of 0 and variance σ^2. Equation 3 also includes a number (S_q) of school-level independent variables, W_{sk}, where the coefficients γ_{psk} represent the direction and strength of association among each of these independent variables and β_{00j}, β_{10j}, and β_{20j}, respectively. In particular, we were interested in the extent to which our three measures of organic management affected average rates of linear growth and acceleration or deceleration in achievement growth across schools in the sample.

Across all of the statistical models described subsequently, continuous independent variables were standardized to have a mean of 0 and a standard deviation of 1. However, dichotomous items and achievement scores (outcome variables) were left in their original scales. As such, coefficients representing the effects of continuous independent variables on achievement can be interpreted as "half-standardized" effect sizes, that is, the unit change in the dependent variable produced by a standard deviation change in the continuous independent variable. Also note that, in the elementary school models, the effect of time was represented as unit change in achievement per month, while in the high school models the effect of time was represented as unit change in achievement per 2-year interval.

Results

Prospects

Cohort 1

Tables 1 and 2 show the results of the three-level HLM analyses for Cohort 1 of the Prospects data set, that is, for students passing from Grade 1 to Grade 3 over the course of the study. Table 1 shows the average growth trajectory for students in the sample and how growth trajectories varied within schools as a result of student characteristics. As can be seen, the average student in Cohort 1 had an IRT achievement scale score in mathematics of 592.33 in the spring of second grade and was increasing about 6.16 mathematics scale score points per month at a very small rate of deceleration (–0.02 scale score points

Table 1

Data for Prospects (Cohort 1): Effects of Student-Level Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (N = 5,463)		Reading (N = 5,561)	
Dependent variable and predictor[a]	Coefficient[b]	*SE*	Coefficient[b]	*SE*
Intercept: second-grade school achievement				
Intercept	592.326***	2.601	639.091***	2.761
Socioeconomic status	9.103***	0.872	11.633***	0.873
Male	11.285***	1.370	−3.958**	1.358
Black	−15.607***	2.438	−13.787***	2.442
Hispanic	−14.138***	2.723	−11.222***	2.688
Asian	17.257	4.214	−4.963	4.136
Other race/ethnicity	−6.731	4.890	−15.755**	4.890
Gifted and talented program	26.152***	4.443	20.457***	4.420
Compensatory program (non–Title 1)	−19.430***	2.640	−21.922***	1.844
Teacher's report of student academic engagement	31.666***	0.736	34.082***	0.741
Linear slope: monthly change in mean achievement first through third grade (1991–1994)[c]				
Intercept	6.156***	0.098	4.715***	0.096
Socioeconomic status	−0.101*	0.041	−0.054	0.040
Male	−0.429***	0.063	−0.053	0.063
Black	0.031	0.108	−0.341**	0.107
Hispanic	0.653***	0.124	0.291*	0.122
Asian	0.140	0.206	0.279	0.201
Other race/ethnicity	0.298	0.230	−0.160	0.232
Gifted and talented program	−0.704**	0.194	−0.500**	0.192
Compensatory program (non–Title 1)	−0.069	0.117	0.090	0.085
Teacher's report of student academic engagement	−0.072*	0.034	−0.045	0.034
Quadratic slope: monthly change in mean achievement first through third grade (1991–1994)[c]				
Intercept	−0.020**	0.005	−0.189***	0.006
Socioeconomic status	−0.003	0.004	−0.008*	0.004
Male	−0.023***	0.006	0.010	0.005
Black	−0.023**	0.008	−0.019*	0.007
Hispanic	0.010	0.009	−0.035***	0.009
Asian	−0.070***	0.015	0.012	0.019
Other race/ethnicity	0.011	0.020	0.008	0.015
Gifted and talented program	0.006	0.015	0.008	0.015

(*continued*)

Table 1 (Continued)

Dependent variable and predictor[a]	Math (N=5,463)		Reading (N=5,561)	
	Coefficient[b]	SE	Coefficient[b]	SE
Compensatory program (non–Title 1)	−0.020*	0.008	0.010	0.006
Teacher's report of student academic engagement	−0.018***	0.003	−0.043***	0.003

[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
[c]Cohort 1 was measured at four time points: fall 1991 (first grade), spring 1992 (first grade), spring 1993 (second grade), and spring 1994 (third grade). The time metric was set at months to account for differences in elapsed time between test administrations across school sites. Total longitudinal time was approximately 32 months.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

per month). The table shows a similarly decelerating growth trajectory for the average student's reading achievement. Here the average student had an IRT achievement scale score in reading of 639.09 in spring of second grade and was increasing about 4.75 reading scale score points per month with a considerable rate of deceleration (−0.189 scale score points per month).

In Table 1, the effects of student characteristics on student achievement were in the expected direction in both reading and mathematics. Higher SES students showed generally higher levels of reading and mathematics achievement at the end of second grade, while non-White students (other than Asians) showed generally lower levels of achievement. Students in gifted and talented programs, and those more engaged in schooling, generally exhibited much higher achievement at the end of second grade, while students in compensatory programs had much lower levels of achievement. Note also that the effects of these and other background characteristics on growth in student achievement were often present, with a general tendency for student characteristics that positively affected achievement status to be negatively associated with achievement growth, the most notable exception being the negative difference in reading growth for Black students. These students not only exhibited lower achievement but also were gaining about 4 IRT scale score points *less* per year on the reading achievement test (i.e., −0.341 × 12 months) than were comparable White students.

The point of the analysis of the Cohort 1 data, however, was not to examine closely differences among students within schools in achievement status and growth. Rather, our interest was in estimating the effects of organic management on achievement growth in the elementary schools under study. These effects are reported in Table 2. The findings here provide remarkably little support for the main hypotheses guiding this study. For example, after control for all of the student-level variables shown in Table 1 and for the array of school characteristics included in Table 2, *none* of the measures of organic

Table 2

Data on Prospects (Cohort 1): Effects of School Organization Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (N= 138)		Reading (N= 140)	
Dependent variable and predictor[a]	Coefficient[b]	*SE*	Coefficient[b]	*SE*
Intercept: second-grade school achievement				
Intercept	592.326***	2.899	639.090***	2.761
Average SES	8.095**	2.708	8.825***	2.210
SD of average SES	−1.291	2.269	−4.468*	2.112
School size	−0.834	2.177	−3.384	2.000
Staff cooperation	1.450	3.133	3.863	2.644
Administrative support	1.130	2.984	−3.334	2.443
Teacher control	−4.637	2.720	−3.147	2.450
Common planning time	−1.815	4.401	−5.436	4.055
Linear slope: monthly change in mean achievement first through third grade (1991–1994)[c]				
Intercept	6.156***	0.095	4.715***	0.096
Average SES	0.050	0.073	−0.004	0.073
SD of average SES	−0.044	0.067	−0.019	0.067
School size	0.012	0.070	0.110	0.063
Staff cooperation	−0.047	0.068	0.006	0.083
Administrative support	0.091	0.074	0.006	0.086
Teacher control	−0.162	0.087	0.028	0.077
Common planning time	0.197	0.131	0.176	0.127
Quadratic slope: monthly change in mean achievement first through third grade (1991–1994)[c]				
Intercept	−0.020*	0.010	−0.189***	0.006
Average SES	0.002	0.007	0.001	0.004
SD of average SES	−0.007*	0.007	0.011***	0.003
School size	−0.014	0.008	0.002	0.003
Staff cooperation	0.000	0.010	0.004	0.004
Administrative support	0.001	0.009	0.008*	0.004
Teacher control	0.005	0.007	0.002	0.003
Common planning time	0.017	0.013	0.024***	0.006

Note. SES = socioeconomic status.
[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
[c]Cohort 1 was measured at four time points: fall 1991 (first grade), spring 1992 (first grade), spring 1993 (second grade), and spring 1994 (third grade). The time metric was set at months to account for differences in elapsed time between test administrations across school sites. Total longitudinal time was approximately 32 months.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

management (i.e., staff cooperation, teacher control, or supportive leadership) had any effects on achievement status, linear rates of achievement growth, or the deceleration term, either with respect to mathematics achievement or with respect to reading achievement. In fact, after the characteristics of students in attendance at the schools under study had been taken into account, differences among schools in achievement status were largely a function of school SES and school-level random effects, while differences in academic growth rates among schools were largely a function of school-level random effects.

Cohort 3

Tables 3 and 4 show the results of the three-level HLM analyses for Cohort 3 of the Prospects data set, that is, for students passing from Grade 3 to Grade 5 over the course of the study. Table 3 shows the average growth trajectory for students in the sample and how growth trajectories varied within schools as a result of student characteristics. As can be seen, the average student in Cohort 3 had an IRT achievement scale score in mathematics of 691 in spring of fourth grade and was increasing about 1.78 mathematics scale score points per month at a very small rate of deceleration (–0.04 scale score points per month) around this time period. The table shows a similar decelerating growth trajectory for the average student's reading achievement. Here the average student in Cohort 3 had an IRT achievement scale score in reading of 693.70 in spring of fourth grade and was increasing about 1.23 reading scale score points per month at a very small rate of deceleration (–0.013 scale score points per month) around this time period.

In general, Table 3 shows the expected effects of student characteristics on achievement in both reading and mathematics. In particular, higher SES students showed generally higher levels of reading and mathematics achievement at the end of second grade, while non-White students (other than Asians) showed generally lower levels of achievement. Students in gifted and talented programs and those more engaged in schooling generally exhibited much higher achievement at the end of fourth grade, while students in compensatory programs had much lower levels of achievement. Note also that the effects of these and other background characteristics on growth in student achievement were often present, with a general tendency for student characteristics that positively affected achievement status to be negatively associated with achievement growth, a notable exception being the positive effect of student engagement on academic growth. Another notable exception was the surprisingly large, positive boost in reading growth experienced by Hispanic students, who were gaining about 4 IRT scale score points more per year on the reading achievement test (i.e., 0.342 × 12 months) than were comparable White students.

Once again, however, the point of the analysis was not to examine differences among students within schools in achievement status or growth. Instead, our interest was in estimating the effects of organic management on achievement growth in the elementary schools under study. These effects are

Table 3

Data for Prospects (Cohort 3): Effects of Student-Level Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (*N* = 5,463)		Reading (*N* = 5,561)	
Dependent variable and predictor[a]	Coefficient[b]	*SE*	Coefficient[b]	*SE*
Intercept: fourth-grade school achievement				
Intercept	691.242***	1.987	693.704***	1.723
Socioeconomic status	4.250***	0.639	6.286***	0.690
Male	1.967	1.019	−3.329**	1.104
Black	−8.533***	1.880	−7.915***	2.003
Hispanic	−5.909**	1.949	−9.690***	2.070
Asian	12.423***	2.892	−1.744	3.068
Other race/ethnicity	−3.744	3.613	−8.626*	3.888
Gifted and talented program	25.346***	1.922	28.765***	2.073
Compensatory program (non–Title 1)	−18.467***	1.4311	−22.020***	1.601
Teacher's report of student academic engagement	19.795***	0.557	19.003***	0.599
Linear slope: monthly change in mean achievement third through fifth grade (1991–1993)[c]				
Intercept	1.777***	0.087	1.227***	0.075
Socioeconomic status	0.065*	0.028	0.035	0.028
Male	−0.218***	0.044	0.008	0.045
Black	0.150	0.084	−0.017	0.084
Hispanic	0.185*	0.088	0.093	0.087
Asian	0.101	0.126	0.156	0.125
Other race/ethnicity	0.006	0.157	−0.138	0.160
Gifted and talented program	−0.365***	0.084	−0.070	0.085
Compensatory program (non–Title 1)	0.341***	0.064	0.155*	0.068
Teacher's report of student academic engagement	0.070**	0.024	0.100***	0.025
Quadratic slope: monthly change in mean achievement third through fifth grade (1991–1993)[c]				
Intercept	−0.037***	0.007	−0.013*	0.006
Socioeconomic status	−0.002	0.004	0.004	0.004
Male	−0.008	0.006	0.000	0.006
Black	0.011	0.010	−0.023*	0.010
Hispanic	0.018	0.010	0.005	0.010
Asian	−0.020	0.015	−0.025	0.014
Other race/ethnicity	−0.018	0.022	0.001	0.021
Gifted and talented program	0.019	0.011	0.024*	0.011

(*continued*)

Table 3 (Continued)

Dependent variable and predictor[a]	Math (N = 5,463) Coefficient[b]	SE	Reading (N = 5,561) Coefficient[b]	SE
Compensatory program (non–Title 1)	−0.019*	0.008	−0.002	0.008
Teacher's report of student academic engagement	−0.016***	0.003	−0.012***	0.003

[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
[c]Cohort 3 was measured at three time points: spring 1991 (third grade), spring 1992 (fourth grade), and spring 1993 (fifth grade). The time metric was set at months to account for differences in elapsed time between test administrations across school sites. Total longitudinal time was approximately 24 months.
*$p \le .05$. **$p \le .01$. ***$p \le .001$.

reported in Table 4. Once again, the findings provide virtually no support for the main hypotheses guiding this study. For example, after control for all of the student-level variables shown in Table 3 and for the array of school characteristics included in Table 4, we found that only one of our measures of organic management (i.e., teacher control) had an effect on the average mathematics achievement of students at the end of fourth grade and that the effect was *negative* in direction. Moreover, none of the organic management variables had any effects on linear rates of achievement growth, either with respect to mathematics achievement or with respect to reading achievement. In fact, after the characteristics of students in attendance at the schools under study had been taken into account, the only difference in rates of academic growth among schools with different levels of organic management was a very small effect of staff cooperation on the deceleration term ($\beta = .008$), suggesting that around the end of fourth grade, students in schools with higher levels of organic management were experiencing slightly higher rates of academic growth in mathematics (but not in reading).

NELS:88

Tables 5 and 6 show the results of the three-level HLM analyses for the NELS:88 data set, that is, for students passing from Grade 8 to Grade 12 over the course of this study. Table 5 shows the average growth trajectory for students in the sample and how growth trajectories varied within schools as a result of student characteristics. As can be seen, the average student in the NELS:88 sample had an IRT achievement scale score in mathematics of 40.84 in spring of 10th grade and was increasing about 4.15 mathematics scale score points every 2 years at a considerable rate of deceleration (−2.6 scale score points per 2-year interval) around this time period. The table shows a similar decelerating growth trajectory for the average student's reading achievement. Here

Table 4

Data for Prospects (Cohort 3): Effects of School Organization Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (N = 137)		Reading (N = 138)	
Dependent variable and predictor[a]	Coefficient[b]	*SE*	Coefficient[b]	*SE*
Intercept: fourth-grade school achievement				
Intercept	691.243***	1.987	693.704***	1.723
Average SES	5.693***	1.494	8.299***	1.270
SD of average SES	−1.234	1.360	0.317	1.116
School size	−1.357	1.297	−1.026	1.073
Staff cooperation	−1.279	1.716	0.455	1.418
Administrative support	2.880	1.785	0.046	1.471
Teacher control	−3.412*	1.676	−2.322	1.384
Common planning time	3.569	2.597	0.678	2.129
Linear slope: monthly change in mean achievement third through fifth grade (1991–1993)[c]				
Intercept	1.777***	0.087	1.227***	0.075
Average SES	−0.070	0.066	−0.050	0.056
SD of average SES	−0.077	0.060	0.075	0.049
School size	−0.044	0.057	−0.013	0.048
Staff cooperation	0.097	0.075	0.107	0.063
Administrative support	−0.008	0.078	−0.047	0.065
Teacher control	0.046	0.075	0.101	0.062
Common planning time	−0.025	0.114	−0.052	0.095
Quadratic slope: monthly change in mean achievement third through fifth grade (1991–1993)[c]				
Intercept	0.037***	0.007	−0.013*	0.006
Average SES	−0.002	0.004	−0.001	0.004
SD of average SES	0.003	0.003	−0.000	0.003
School size	−0.007*	0.003	−0.003	0.003
Staff cooperation	0.008*	0.004	0.005	0.004
Administrative support	−0.004	0.005	−0.010	0.005
Teacher control	−0.007	0.004	−0.001	0.004
Common planning time	−0.003	0.007	0.008	0.006

Note. SES = socioeconomic status.
[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
[c]Cohort 3 was measured at three time points: spring 1991 (third grade), spring 1992 (fourth grade), and spring 1993 (fifth grade). The time metric was set at months to account for differences in elapsed time between test administrations across school sites. Total longitudinal time was approximately 24 months.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Table 5

Data for NELS:88: Effects of Student-Level Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (N = 9,656)		Reading (N = 9,655)	
Dependent variable and predictor[a]	Coefficient[b]	*SE*	Coefficient[b]	*SE*
Intercept: 10th-grade school achievement				
Intercept	40.840***	0.334	26.958***	0.322
Socioeconomic status	1.205***	0.124	1.049***	0.101
Male	1.441***	0.193	−1.048***	0.156
Black	−5.795***	0.385	−3.553***	0.300
Hispanic	−2.792***	0.376	−1.924***	0.294
Asian	0.607	0.435	−1.051**	0.345
Other race/ethnicity	−2.620**	0.818	−2.342**	0.653
8th-grade student educational expectations	3.513***	0.237	2.518***	0.191
10th-grade teacher educational expectations	3.608***	0.117	2.674***	0.092
Advanced academic track	3.379***	0.345	3.995***	0.260
Academic track	1.232***	0.258	1.896***	0.201
Carnegie units	3.732***	0.135	0.741***	0.087
12th-grade subject area enrollment	−0.145	0.223	1.677***	0.266
Linear slope: bi-yearly change in mean achievement 8th, 10th, and 12th grade (1988–1992)				
Intercept	4.148***	0.129	1.766***	0.140
Socioeconomic status	−0.034	0.048	−0.028	0.044
Male	0.482***	0.075	−0.062	0.068
Black	−0.612***	0.150	−0.424**	0.130
Hispanic	−0.094	0.146	−0.001	0.128
Asian	−0.178	0.169	0.451**	0.149
Other race/ethnicity	−0.285	0.318	−0.031	0.283
8th-grade student educational expectations	0.386***	0.092	0.113	0.083
10th-grade teacher educational expectations	0.325***	0.046	0.205***	0.040
Advanced academic track	0.760***	0.134	0.574***	0.113
Academic track	0.567***	0.100	0.450***	0.087
Carnegie units	0.863***	0.052	0.144***	0.038
12th-grade subject area enrollment achievement	0.735***	0.087	0.591***	0.115
Quadratic slope: bi-yearly change in mean 8th, 10th, and 12th grade (1988–1992)				
Intercept	−2.599***	0.157	−0.504*	0.197
Socioeconomic status	0.068	0.065	0.010	0.064
Male	0.160	0.099	−0.289**	0.099
Black	0.463*	0.183	0.040	0.182
Hispanic	0.329	0.180	0.275	0.178

(continued)

Table 5 (Continued)

Dependent variable and predictor[a]	Math (N = 9,656) Coefficient[b]	SE	Reading (N = 9,655) Coefficient[b]	SE
Asian	−0.259	0.215	0.046	0.214
Other race/ethnicity	0.096	0.408	0.146	0.406
8th-grade student educational expectations	−0.471***	0.122	−0.258*	0.121
10th-grade teacher educational expectations	−0.453***	0.060	−0.413***	0.058
Advanced academic track	−0.071	0.173	−0.627***	0.162
Academic track	0.118	0.131	−0.161	0.126
Carnegie units	−0.315***	0.067	0.059	0.054
12th-grade subject area enrollment	1.013***	0.113	0.049	0.166

[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
$^{*}p \leq .05$. $^{**}p \leq .01$. $^{***}p \leq .001$.

the average student in the NELS:88 analytic sample had an IRT achievement scale score in reading of 26.96 in spring of 10th grade and was increasing about 1.77 reading scale score points per 2-year interval at a very small rate of deceleration (−0.504 scale score points per 2-year interval) around this time period.

In general, Table 5 shows the expected effects of student characteristics on achievement in both reading and mathematics. In particular, higher SES students showed generally higher levels of mathematics and reading achievement at the end of 10th grade, while non-White students (including Asians) showed generally lower levels of achievement at this time point. Students who were in advanced academic tracks and those who expected (and were expected by teachers) to go to college also exhibited generally higher achievement at the end of 10th grade, as did students in more advanced tracks taking an academic curriculum. Note also that the effects of these and other background characteristics on growth in student achievement were often present, with a general tendency for student characteristics that positively affect achievement status to also be positively associated with achievement growth and student characteristics negatively associated with achievement status to be negatively associated with academic growth.

Again, the point of analyzing NELS:88 data was not to examine differences among students within schools in achievement status or growth. Instead, our interest was in estimating the effects of organic management on achievement growth in the high schools under study. These effects are reported in Table 6. Again, the findings provide very little support for the main hypotheses guiding this study. After control for all of the student-level variables shown in Table 5 and for the array of school characteristics included in Table 6, there was an association of one of the measures of organic management (teacher

Table 6

Data for NELS:88: Effects of School Organization Variables on Mean Achievement and Growth Rates in Mathematics and Reading

	Math (N = 806)		Reading (N = 806)	
Dependent variable and predictor[a]	Coefficient[b]	SE	Coefficient[b]	SE
Intercept: 10th-grade school achievement				
Intercept	40.840***	0.334	26.958***	0.322
Average SES	1.312***	0.174	0.664***	0.123
SD of average SES	0.134	0.161	−0.019	0.111
School size	−0.134	0.156	0.006	0.107
Staff cooperation	−0.087	0.194	0.082	0.131
Administrative support	−0.357	0.200	−0.263	0.135
Teacher control	0.929***	0.166	0.297***	0.112
Common planning time	0.893	0.444	0.827***	0.299
Missing structure information	−0.328	0.390	0.058	0.264
Linear slope: bi-yearly change in mean achievement 8th, 10th, and 12th grade (1988–1992)				
Intercept	4.148***	0.157	1.766***	0.140
Average SES	0.050	0.068	−0.009	0.053
SD of average SES	−0.009	0.060	−0.031	0.048
School size	0.003	0.058	0.123**	0.046
Staff cooperation	−0.015	0.069	0.031	0.057
Administrative support	−0.082	0.071	−0.042	0.058
Teacher control	−0.037	0.059	−0.006	0.048
Common planning time	0.124	0.157	−0.054	0.130
Missing structure information	−0.045	0.139	−0.154	0.114
Quadratic slope: bi-yearly change in mean achievement 8th, 10th, and 12th grade (1988–1992)				
Intercept	−2.599***	0.157	−0.504*	0.197
Average SES	−0.171*	0.068	−0.086	0.068
SD of average SES	−0.118	0.060	0.008	0.059
School size	0.010	0.058	−0.176**	0.057
Staff cooperation	0.098	0.069	−0.006	0.068
Administrative support	0.040	0.071	0.043	0.071
Teacher control	0.036	0.059	0.096	0.059
Common planning time	−0.075	0.157	−0.180	0.156
Missing structure information	−0.033	0.139	0.078	0.138

Note. SES = socioeconomic status.
[a]Both continuous and interval variables were standardized with a mean of 0 and a standard deviation of 1; dichotomous variables remained coded as 0, 1.
[b]Hierarchical linear modeling gamma coefficients.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

control) with achievement status in mathematics and in reading at the end of 10th grade in the high schools under study. But this effect could arise if higher achieving high schools tended to adopt organic forms of management and thus might not indicate the presence of a causal relationship (note also the positive effect of common planning time on high school reading achievement status, which involves a similar interpretation). Apart from these effects, however, none of the organic management variables had any effects on linear rates of achievement growth or achievement deceleration, either with respect to mathematics achievement or with respect to reading achievement. In fact, after the characteristics of students in attendance at the schools under study had been taken into account, the only difference in rates of academic growth among schools was due largely to random school effects.

Discussion

The analyses just reported focused on the effects of organic management on student achievement as assessed via three measures of organic design in two academic subjects and three student cohorts that spanned different elementary and secondary grade spans. Examining these statistical analyses as a single body of research, we included 54 tests of the effects of organic management on student achievement, assuming that equal consideration is given to effects on achievement status, linear growth, and deceleration in achievement. Arguably, this provided a full and fair (if not exhaustive) opportunity to find evidence supporting the hypotheses stated at the outset of this article. Of these 54 tests, only 5 statistically significant effects of a measure of organic management on student achievement were found, and one of these effects was not in the hypothesized direction. This lack of positive relationships between measures of organic management and measures of student achievement could not have been due to a lack of statistical power, in that each analysis included a more than adequate number of schools to ensure strong power in terms of detecting even small substantive effects. Nor is it likely that the lack of positive relationships was due to measurement unreliability in the independent variables, given that each scale score measuring a dimension of organic management had strong internal consistency.

In this light, the limited evidence in support of the hypothesis that organic management has positive effects on student achievement strongly suggests that organic forms of school management are not an especially powerful determinant of patterns of student achievement in elementary or secondary schools. Recalling the stated hypotheses of this study, not only is there almost no evidence that organic design features have positive effects on student achievement in general, but there is little evidence to support the notion that organic management effects are more prevalent at the elementary school level or that such effects are greater in the domain of reading. The minor exception was the effect of common planning time on achievement; partial effects were observed across both schooling levels, and there were slightly larger effects in reading achievement than in mathematics achievement (at the elementary level).

Limitations of the Study

A possible limitation of this study is that it was based on relatively weak measures of organic management. However, the properties of these scales matched well with previous research conducted by Rowan and colleagues that produced considerable support for hypotheses regarding the effects of task and environmental factors on the emergence of organic management within and among schools (e.g., Rowan, 2002a; Rowan et al., 1991, 1993). Moreover, in this study, the number of items, the internal consistencies (as assessed with Cronbach alpha coefficients), and the magnitudes of the conditional intraclass correlations for the independent variables mirrored results previously reported by Rowan and colleagues. With both the NELS:88 and Prospects data, considerable care was taken to gather information from all available teachers reporting at each school site. Finally, the measurement properties of the parallel variables used across the two studies coincided with similar measures used in previous research.

Even if the measures of organic management used in this study showed strong reliability and convergent validity on the basis of previous work, it might be argued that the presence of organic management in the schools under study was mismeasured because our measures were based on teacher-level data gathered at a single point in time (the midpoint of the time series). However, it is worth noting that this procedure was also used for selecting measures of all of the other student- and school-level independent variables included in the analyses, and many of these variables had relationships to student achievement consistent with past research. Furthermore, preliminary analyses showed that correlations between the same or like items across years of survey administration were reasonably strong; however, the items used to scale the organic management indices were not consistently available across time points, preventing the use of better summary measurement procedures.

In terms of design, this study represents an improvement over previous research in that longitudinal methods for studying contingency theory were incorporated; however, the study does not fully meet the experimental design criteria established by Donaldson (1995). A stronger research design would randomly assign organizations to structural change in the direction of increased organic management and would compare organizations in an adaptive mode of fit over a sustained time period with a randomly assigned group of control schools. In the present study, schools were not randomly assigned to strong "treatments," and there is no way to know whether the sampled schools were in the appropriately matched organizational structure (or for how long) over the course of the study.

Given this nonexperimental design, it is possible that confounding and the effects of endogenous processes of change affected the results of the study. With respect to the problem of endogeneity; for example, the student motivation and academic placement variables included as independent variables in the analyses could have been influenced by the presence or absence of organic management in a school. If that is the case, then we have underestimated the effects of organic management on achievement outcomes. To examine whether this was a problem, we conducted a series of analyses at both the elementary and high school levels without the student motivation and placement variables included in the statistical models, and the results of these analyses showed no substantive changes in the effects of organic management on the achievement measures. With respect to confounding, we simply note that our statistical models were very well specified and included most variables shown in previous research to affect students' academic achievement. Moreover, if the results of this study are due to confounding, the unmeasured covariates creating such confounding would have to be suppressor variables, that is, unmeasured conditions in and around schools that generally decrease the effects of organic management on student achievement. No such variables come readily to mind, and, as a result, we are quite comfortable with the conclusion that organic forms of management have few "main" effects on student achievement.

Another potential problem involving statistical validity was the presence of missing data. However, patterns of missing data would bias the results of this study only to the extent that the effects of organic management on student achievement varied across factors accounting for the missing data (e.g., SES, ethnicity, entry levels of achievement). But this is the equivalent of arguing that organic management does not have stable "main" effects on student achievement and instead varies across different schools and among different students. Our data are perfectly consistent with this conclusion, and demonstrations of varying effects of organic management on student achievement in different populations of students and schools await future research.

Finally, critics might argue that it is not sensible to generalize results from the Prospects database to the general population of elementary schools as a result of the oversampling in this study of schools serving large numbers of disadvantaged students. If anything, however, contingency theory would suggest that such a sample would bias results in favor of, rather than against, finding effects of organic management on instructional effectiveness. The academic needs and services required of such a population of students would probably result in a more dynamic and complex school environment, and this is precisely the type of task environment postulated to give rise to organic forms of management. Furthermore, in the present study, the NELS:88 (representative) sample and the Prospects sample did not differ in terms of the sporadic appearance of positive effects.

Implications and Future Research

Scholars who dogmatically believe that supportive forms of administrative leadership, teacher empowerment, and staff collegiality—whether expressed in terms of "organic" management or some other theoretical or policy perspective—are powerful means of school improvement will no doubt be quite troubled by the results of this study. However, the work presented here should not be dismissed simply on the basis of deviation from conventional wisdom. For instance, we have already discussed the fact that research on teacher empowerment and staff collegiality suggests that there are few main effects of these dimensions of organic management on student achievement, although organic management patterns might have effects on student achievement when other conditions are present (see, e.g., Marks & Louis, 1997; Newmann, 1996; Robertson et al., 1995).

The conditions under which teacher empowerment and staff collaboration improve student achievement typically have been found to occur when teachers are involved in the development of curriculum and instruction (e.g., Smylie, 1994; Smylie et al., 1996). It could be argued, therefore, that measures of organic management better than the ones included here would show stronger effects on achievement. This point is worth considering, especially given the nature of the items used to measure these constructs in the present study. Thus, those interested in pursuing further research on the effects of organic management on student achievement might need to construct better measures of such constructs as teacher empowerment and collegiality.

The measure of supportive leadership included in this study also might have been problematic. For example, Hallinger, Bickman, and Davis (1996) found that instructional leadership positively affects students' achievement when principals' attention is especially devoted to the organization and evaluation of instruction. In contrast, the indices constructed for this study captured teachers' reports of *generalized* management styles of school leaders. The evidence reported here suggests that such a generalized disposition or style has little effect on student achievement. Conversely, Hallinger and colleagues developed scales based on *specific* aspects of principals' supportive roles and involvement in schools' instructional programs that yielded improved student academic performance.

It could be argued that better measures of leadership, such as the measures of instructional leadership developed by Hallinger and colleagues, would have positive effects on student achievement and, if used in the current analysis, would have provided better evidence of leadership effects on student achievement. Similar arguments could be made about the measures of teacher control over decision making and staff collaboration used in the current analyses. Perhaps the instruments developed here failed to tap important dimensions of these constructs and were thus invalid measures of the underlying theoretical constructs. This is possible, of course, but again it is worth noting that a substantial body of previous research is consistent with the findings presented here.

Finally, it is worth considering the utility of contingency theory as a theoretical framework for investigating issues of school effectiveness. Throughout the series of analyses presented here, the findings tended to undermine the central tenets of this approach. In particular, the large scope of the current research suggests that we may have reached the limits of contingency theory's usefulness as an analytic model of school organization and effectiveness. As we look back at the accumulated evidence provided by Rowan and colleagues over the past decade, we find that contingency theory calls attention to a set of explanatory variables that have only very small effects on both the organizational design and the effectiveness of schools. In particular, the results of all of this work show that dimensions of "organic" management in schools do vary as a consequence of the task and environmental conditions discussed by contingency theorists, but the effects of these factors on the development of organic management in schools are very small (Rowan, 2002b). Moreover, the results of the present study call into question the idea that patterns of organic management have straightforward main effects on student achievement. As such, the contingency framework appears to fall far short of being a useful "master theory" of school effectiveness.

This does not mean, of course, that policymakers and practitioners should abandon reform efforts aimed at increasing teacher professionalism. In arguing that "organic" forms of management (as conceptualized here) have few main effects on student achievement, we cannot dismiss all arguments in favor of school restructuring. After all, the data presented here show that a normative commitment to teacher professionalism—to the extent that it results in increased teacher collegiality and control over instruction and is accompanied by supportive forms of administrative leadership—will not decrease student achievement, and, as previous research shows, it might have many positive effects on teacher outcomes (Rowan, 2002a; Rowan et al., 1993).

Moreover, the research reported here does not undermine all arguments about the need for school restructuring. Indeed, we are especially intrigued by a body of research on "schools as communities" (Bryk & Driscoll, 1988) that supports restructuring along other dimensions. This approach to restructuring centers around the building of a caring community for students through simplification of school organizational structures. These "communal" schools achieve their most important effects on student achievement by enhancing students' general feelings of motivation or by changing patterns of instructional grouping, both of which, in the current analyses, showed large effects on achievement. As a result, we suggest that the time has come for educational researchers to turn their attention away from simplistic conceptions of organic management as a means of improving school effectiveness and instead examine other dimensions of school organization known to influence student achievement in both elementary and secondary schools.

References

Bird, T., & Little, J. W. (1986). How schools organize the teaching occupation. *Elementary School Journal, 86,* 493–511.

Blase, J. (1993). The micro-politics of effective school-based leadership: Teachers' perspectives. *Educational Administration Quarterly, 29,* 142–163.

Blase, J., & Blase, J. (2002). The micro-politics of instructional supervision: A call for research. *Educational Administration Quarterly, 38,* 6–44.

Bossert, S., Dwyer, D., Rowan, B., & Lee, G. (1982). The instructional management role of the principal. *Educational Administration Quarterly, 18,* 34–64.

Bryk, A. S., Camburn, E., & Louis, K. S. (1999). Professional community in Chicago elementary schools: Facilitating factors and organizational consequences. *Educational Administration Quarterly, 35,* 751–781.

Bryk, A. S., & Driscoll, M. E. (1988). *An empirical investigation of school as community.* Unpublished manuscript, University of Chicago.
Burns, T., & Stalker, G. M. (1961). *The management of innovation.* London: Tavistock.
Conley, S. (1991). Review of research on teacher participation in school decision making. In C. Grant (Ed.), *Review of research in education* (Vol. 17, pp. 225–266). Washington, DC: American Educational Research Association.
Conway, J. M. (1984). The myth, mystery, and mastery of participative decision making in education. *Educational Administration Quarterly, 20,* 21–53.
Darling-Hammond, L., & McLaughlin, M. W. (1996). Policies that support professional development in an era of reform. In M. W. McLaughlin & I. Oberman (Eds.), *Teacher learning: New policies, new practices* (pp. 202–218). New York: Teachers College Press.
Donaldson, L. (1995). *History of management thought: Contingency theory.* Cambridge, England: Cambridge University Press.
Firestone, W. A., Herriott, R. E., & Wilson, B. L. (1984). *Explaining differences between elementary and secondary schools: Individual, organizational, and institutional perspectives.* Philadelphia: Research for Better Schools.
Gamoran, A., Anderson, C. W., Quiroz, P., Secada, W. G., Williams, T., & Ashmann, S. (2003). *Transforming teaching in math and science: How schools and districts can support change.* New York: Teachers College Press.
Grossman, P. L., & Stodolsky, S. S. (1995). Content as context: The role of school subjects in secondary school teaching. *Educational Researcher, 24*(8), 5–11.
Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *Teachers College Record, 103,* 942–1012.
Hallinger P., Bickman, L., & Davis, K. (1996). School context, principal leadership, and student reading achievement. *Elementary School Journal, 96,* 527–549.
Herriot, R. E., & Firestone, W. A. (1984). Two images of schools as organizations: A refinement and elaboration. *Educational Administration Quarterly, 20,* 41–57.
Lawrence, P., & Lorsch, J. (1967). *Organization and environment.* Cambridge, MA: Harvard University Press.
Lee, V. E., Bryk, A. S., & Smith, J. B. (1993). The organization of effective secondary schools. In L. Darling-Hammond (Ed.), *Review of research in education* (Vol. 19, pp. 171–268). Washington, DC: American Educational Research Association.
Lee, V. E., & Smith, J. B. (1993). Effects of school restructuring on the achievement and engagement of middle-grade students. *Sociology of Education, 66,* 164–187.
Lee, V. E., & Smith, J. B. (1995). Effects of high school restructuring and size on gains in achievement and engagement for early secondary school students. *Sociology of Education, 68,* 241–270.
Lee, V. E., Smith, J. B., & Croninger, R. G. (1997). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education, 70,* 128–150.
Leithwood, K. (1992). Images of future school administration: Moving on from instructional leadership to transformational leadership. *Educational Leadership, 49*(5), 8–12.
Little, J. W. (1982). Norms of collegiality and experimentation: Workplace conditions of school success. *American Educational Research Journal, 19,* 325–340.
Little, J. W., & McLaughlin, M. W. (Eds.). (1993). *Teachers' work: Individuals, colleagues, and contexts.* New York: Teachers College Press.
Louis, K. S., Marks, H. M., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal, 33,* 757–798.
Malen, B., Ogawa, R. T., & Kranz, J. (1990). What do we know about school-based management? A case study of the literature—A call for research. In W. H. Clune &

J. F. Witte (Eds.), *Choice and control in American education: Vol. 2. The practice of choice, decentralization, and school restructuring* (pp. 289–342). London: Falmer.

Marks, H. M., & Louis, K. S. (1997). Does teacher empowerment affect the classroom? The implications of teacher empowerment for instructional practice and student academic performance. *Educational Evaluation and Policy Analysis, 19,* 245–275.

McLaughlin, M. W., & Talbert, J. (2001). *Secondary school teaching in context.* Chicago: University of Chicago Press.

Miller, R. J. (2004). *The sources and consequences of organic management in elementary and secondary schools* (Doctoral dissertation, University of Michigan, 2004). (Proquest No. AAT 3122002)

Miller, R. J., & Rowan, B. (2003). Sources and consequences of organic management in elementary and secondary schools. In W. Hoy & C. G. Miskel (Eds.), *Theory and research in educational administration* (Vol. 2, pp. 51–89). Greenwich, CT: Information Age.

Mohrman, S. A., & Wohlstetter, P. (1994). *School-based management: Organizing for high performance.* San Francisco: Jossey-Bass.

Newmann, F. M. (1996). Introduction: The School Restructuring Study. In F. M. Newmann & Associates (Eds.), *Authentic achievement: Restructuring schools for intellectual quality* (pp. 1–16). San Francisco: Jossey-Bass.

Perrow, C. (1965). A framework for the comparative analysis of organizations. *American Sociological Review, 32,* 194–208.

Powell, T. C. (1992). Organizational alignment as competitive advantage. *Strategic Management Journal, 13,* 119–134.

Puma, M., Karweit, N., Price, C., Ricciuti, A., & Vaden-Kiernan, M. (1997). *Prospects: Final report on student outcomes. Vol. II technical report.* Cambridge, MA: Abt Associates.

Raudenbush, S. W., Rowan, B., & Kang, S. J. (1991). A multilevel, multivariate model for studying school climate with estimation via the EM algorithm and application to U.S. high school data. *Journal of Educational Statistics, 16,* 295–330.

Raywid, M. A. (1993). Finding time for collaboration. *Educational Leadership, 51*(1), 30–34.

Robertson, P. J., Wohlstetter, P., & Mohrman, S. A. (1995). Generating curriculum and instructional innovations through school-based management. *Educational Administration Quarterly, 31,* 375–404.

Rosenholz, S. (1989). *Teachers' workplace: The social organization of schools.* New York: Longman.

Rouleau, L., & Seguin, F. (1995). Strategy and organization theories: Common forms of discourse. *Journal of Management Studies, 32,* 101–117.

Rowan, B. (1990). Commitment and control: Alternative strategies for the organizational design of schools. In C. Cazden (Ed.), *Review of research in education* (Vol. 16, pp. 353–389). Washington, DC: American Educational Research Association.

Rowan, B. (2002a). Teachers' work and instructional management, Part I: Alternative views of the task of teaching. In W. Hoy & C. G. Miskel (Eds.), *Theory and research in educational administration* (Vol. 1, pp. 129–149). Greenwich, CT: Information Age.

Rowan, B. (2002b). Teachers' work and instructional management, Part II: Does organic management promote expert teaching? In W. Hoy & C. G. Miskel (Eds.), *Theory and research in educational administration* (Vol. 1, pp. 151–168). Greenwich, CT: Information Age.

Rowan, B., Chiang, F. S., & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education, 70,* 256–284.

Rowan, B., Raudenbush, S. W., & Cheong, Y. F. (1993). Teaching as a non-routine task: Implications for the management of schools. *Educational Administration Quarterly, 29,* 479–500.
Rowan, B., Raudenbush, S., & Kang, S. J. (1991). Organizational design in high schools: A multilevel analysis. *American Journal of Education, 99,* 238–266.
Smylie, M. A. (1994). Redesigning teachers' work: Connections to the classroom. In L. Darling-Hammond (Ed.), *Review of research in education* (Vol. 20, pp. 129–177). Washington, DC: American Educational Research Association.
Smylie, M. A., Lazarus, V., & Brownlee-Conyers, J. (1996). Instructional outcomes of school-based participative decision making. *Educational Evaluation and Policy Analysis, 18,* 181–198.
Spillane, J., & Burch, P. (in press). The institutional environment and instructional practice in K–12 schools: Changing patterns of instructional guidance in American education. In H. Meyer & B. Rowan (Eds.), *The new institutionalism in education: Advancing research and policy.* Albany: State University of New York Press.
Sweetland, S. R., & Hoy, W. K. (2000). School characteristics and educational outcomes: Toward an organizational model of student achievement in middle schools. *Educational Administration Quarterly, 36,* 703–729.
Talbert, J. E., McLaughlin, M. W., & Rowan, B. (1993). Understanding context effects on secondary school teaching. *Teachers College Record, 95,* 45–68.
Taylor, D. L., & Bogotch, I. E. (1994). School-level effects of teachers' participation in decision making. *Educational Evaluation and Policy Analysis, 16,* 302–319.
Tyack, D. (1974). *The one best system: A history of American urban education.* Cambridge, MA: Harvard University Press.

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APPENDIX A

Variables Used in Prospects Data Analysis

Achievement Scale Scores (CTBS/Spanish Assessment of Basic Education)

SSTR: Scale Score—Total Reading (Cohort 1: fall 1991, spring 1992, spring 1993, spring 1994; Cohort 3: spring 1991, spring 1992, spring 1993).

SSTM: Scale Score—Total Math (Cohort 1: spring 1992, spring 1993, spring 1994; Cohort 3: spring 1991, spring 1992, spring 1993).

SSMCA: Scale Score—Math Concepts and Applications (Cohort 1: fall 1991).

Student Background Variables

SES: Socioeconomic status composite based on NCES procedures. All variables used in this measure were extracted from the Parent File (year 2), unless the necessary information was missing. In these instances, parent data from other administrations were substituted (when available). The five variables included in the composite were as follows:

BP376: Respondent's level of education
BP380: Respondent's occupation

BP396: Spouse's level of education
BP382: Spouse's occupation
BP3100: Total family income

Race/Ethnicity: This variable was recoded from RACE as a five-code dummy scheme wherein Black, Hispanic, Asian, and Indian/Alaskan Native teachers are each coded separately as 1 with White as 0 (comparison group).

MALE: Recoded variable constructed from the School Control File.

SEX: coded 1 = male, 0 = female.

GTPROG: Gifted and talented program (recoded variable constructed from student abstract records (S23J); coded (1 = 1) (2, 3 = 0).

COMP_M: Participation in any non–Title 1 math programs (S23B1, S23B2, S23B3); coded (1 = 1) (0 = 0).

COMP_R: Participation in any non–Title 1 reading/language arts/bilingual programs (S23A1, S23A2, S23A3, S23C1, S23C2, S23C3, S23D1, S23D2, S23D3, S23E1, S23E2, S23E3); coded (1 = 1) (0 = 0).

ENGAGE: Teacher's report of student engagement (student profile) (Cohort 1: alpha reliability = .89; Cohort 3: alpha reliability = .91):

Q10L: Student can work independently
Q8C: Student's motivation to learn
Q9A: Student completes homework assignments
Q9B: Student completes seatwork
Q9C: Student pays attention

(3-point reversed scale ranging from *not at all* [1] to *very much* [3])

Organic Management Measures

Data from teachers at *all* grade levels within the same school were used in creating these measures.

Supportive Leadership (alpha reliability = .91):

ME1C/EE1C: Principal deals with outside pressures
ME1D/EE1D: Principal makes plans and carries them out
ME1E/EE1E: Goals/priorities for the school are clear
ME1G/EE1G: Administration knows problems faced by staff
ME1H/EE1H: Encouraged to experiment with teaching
ME1J/EE1J: Administrative behavior is supportive
ME1O/EE1O: Principal is interested in innovation
ME1P/EE1P: Rules for student behavior are enforced

(Responses ranged from 1 [*strongly disagree*] to 6 [*strongly agree*].)

Teacher Control (alpha reliability = .78):

ME5A/EE5A: Influence over discipline policy
ME5B/EE5B: Influence over in-service programs
ME5C/EE5C: Influence over grouping students by ability
ME5D/EE5D: Influence over establishing curriculum

(Responses ranged from 1 [*none*] to 6 [*great deal*].)

Staff Cooperation (alpha reliability = .87):

ME1A/EE1A: Colleagues share beliefs about mission
ME1K/EE1K: Teachers at this school are continually learning
ME1L/EE1L: Great deal of cooperative effort among staff
ME1M/EE1M: Broad agreement among faculty about mission

(Responses ranged from 1 [*strongly disagree*] to 6 [*strongly agree*].)

School-Level Controls

AVGSES: The present study included a measure of the average SES of students in a school. The measure was simply the average SES of *all* Prospects-selected students in the same school.

SD_AVG: Measure of SES dispersion within schools aggregated to school level.

SIZE: Total school enrollment treated as a continuous variable (B1) in School Characteristics and Programs data file.

COMMON: Schools report use of common planning. It is possible that this arrangement is used in conjunction with another form of restructuring (Cohort 1: Q23C_1, Q23C_2, Q23C_3; Cohort 3: Q31C_3, Q23C_3, Q23C_4, Q23C_5).

APPENDIX B

Variables Used in NELS:88 Data Analysis

Achievement Scale Scores

BY2XMIRR: Base-year mathematics IRT estimated number correct.
BY2XRIRR: Base-year reading IRT estimated number correct.
F12XMIRR: First follow-up mathematics IRT estimated number correct.
F12XRIRR: First follow-up reading IRT estimated number correct.
F22XMIRR: Second follow-up mathematics IRT estimated number correct.
F22XRIRR: Second follow-up reading IRT estimated number correct.

Student Background Variables

F1SES: Student SES composite.

Race/Ethnicity: This variable was recoded from F1RACE as a five-code dummy scheme wherein Black, Hispanic, Asian, and Indian/Alaskan Native teachers are each coded separately as 1 with White as 0 (comparison group).

MALE: Recode of F1SEX (male = 1, female = 0).

STUEDEXP (Student Educational Expectation): Recode of BYS45 (4, 5, 6 = 1, else = 0).

TCHEDEXP (Teacher Educational Expectation of Student): Sum of teacher responses from variables F1T1_4 and F1T5_4.

ADVTRCK: Advanced academic track (ACADMPRG) recode (1 = 1, else = 0).

ACATRCK: Academic track (ACADMPRG) recode (2 = 1, else = 0).

GENVOC: General/vocational track (ACADMPRG) recode (3, 4, 5, 6 = 1, else = 0.

CARN_M: Carnegie units in mathematics (F2RHMA_C).

CARN_R: Carnegie units in English/language arts (F2RHEN_C).

F2MENRL: Enrolled in mathematics class during 12th-grade year (F2S22A) recode (1, 2 = 1, else = 0).

F2RENRL: Enrolled in English class during 12th-grade year (F2S25C2) recode (1 through 7 = 1, 8 = 0).

Organic Management Measures

All school-level measures were extracted from the NELS:88 10th-grade teacher survey administration (1990).

Supportive Leadership (alpha reliability = .88):

F1T4_1G: Principal deals with outside pressures
F1T4_1H: Principal makes plans and carries them out
F1T4_1J: Goals/priorities for the school are clear
F1T4_1P: Administration knows problems faced by staff
F1T4_1Q: Encouraged to experiment with teaching
F1T4_2B: Administrative behavior is supportive
F1T4_2K: Principal is interested in innovation
F1T4_2L: Rules for student behavior are enforced

(Responses ranged from 1 [*strongly disagree*] to 6 [*strongly agree*].)

Teacher Control (alpha reliability = .77):

F1T4_9A: Influence over discipline policy
F1T4_9B: Influence over in-service programs
F1T4_9C: Influence over grouping students by ability
F1T4_9D: Influence over establishing curriculum

(Responses ranged from 1 [*no influence*] to 6 [*great deal of influence*].)

Staff Cooperation (alpha reliability = .85):

F1T4_1C: Colleagues share beliefs about mission
F1T4_2C: Teachers at this school are continually learning
F1T4_2E: Great deal of cooperative effort among staff
F1T4_2F: Broad agreement among faculty about mission

(Responses ranged from 1 [*strongly disagree*] to 6 [*strongly agree*].)

School-Level Controls

AVGSES: The present study included a measure of the average SES of students in a school. The measure was simply the average F1SES of *all* 1990 NELS-selected students in the same school.

SD_AVG: Measure of F1SES dispersion within schools aggregated to school level.

SIZE: Total school enrollment (F1C2).

COMMON: Common planning time structure recode (F1C73F3) (1 = 1, else = 0).

OTHRSTR: Includes interdisciplinary teams and flex time schedule recode (F1C73E3 or F1C73J3) (1 = 1, else = 0).

TRDNTL: No school restructuring reported—composite (F1C73F3, 1C73E3, F1C73J3) (1 = 1, else = 0).

MISS_STR: School is missing restructuring information (1 = 1, else = 0).