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Public Management on the Ground

Clustering Managers Based on Their Behavior

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PUBLIC MANAGEMENT ON THE GROUND: CLUSTERING MANAGERS BASED ON THEIR BEHAVIOR

ABSTRACT

Public management research has identified a dizzying array of management variables that affect organizational performance. While scholars have learned much by analyzing one or a few specific behavioral dimensions of public management at a time, we argue for the value of a more holistic and inductive approach that uses data on several aspects of public management for identifying manager types. Such an approach accounts for both the cognitive processes of people affected by management and the reality that managers' individual behavioral decisions are interrelated. We examine the overlap of 21 aspects of public school management behavior using cluster analysis. We identify four different manager types ("firefighters," "laissez-faire managers," "administrators," and "proactive floor managers"), each reflecting a distinct constellation of managerial behaviors. The manager types we call "administrators" and "proactive floor managers" are associated with relatively better outcomes, while "firefighters" are associated with relatively worse outcomes.

INTRODUCTION

Researchers have explored the causes and consequences of public management behavior for more than a century. Beginning with the classic POSDCORB, public management research is mostly in agreement that public management behavior is not a simple unidimensional activity, but rather encompasses multiple aspects. Scholars offer different lists of important aspects or functions of management (Boyne and Walker 2006; Ingraham, Joyce, and Donahue 2003; Terry 2002), and theories often cluster these aspects to emphasize certain styles (Bass 1999; McGregor

1960; Miles and Snow 1978). Despite the lack of consensus on what management is, the literature is in agreement that managerial behavior matters to public service performance (Boyne and Walker 2006; Brewer 2006; Donahue et al. 2004; O'Toole and Meier 2011; Riccucci 2005).

Challenges to this picture remain. Sometimes, multivariate studies that include a relatively broad range of managerial behavior measures find few significant effects or at best minor influences (e.g., Andersen and Winter 2011; Meier et al. 2015). One potential explanation is that contextual factors minimize the managers' room to maneuver, thus making some managerial behavior more or less irrelevant (O'Toole and Meier 2015). Another possible explanation, however, is that even multivariate studies with long lists of independent measures of theoretically important aspects of management fail to capture sufficiently the complexity and interrelatedness of real-life managerial behaviors.

In contrast to the empirical findings, there is an extensive leadership and management literature arguing that certain management behaviors should cluster together in recognizable patterns. Transformational leadership and theory Y stress the use of normative incentives and goal commitment and discourage close supervision and negative reinforcement (Avolio and Yammarino 2002; Bass 1999; Burns 1978; McGregor 1960; Yukl 2010). Transactional leadership and the New Public Management stress the role of incentives, the creation of clear goals, and the delegation of means to subordinates (Burns 1978; Ferlie 1996; Hood 1995). Other theories of leadership and management take a contingency approach and argue that the bundle of appropriate management techniques depends on context. While the underlying theme of this literature is that effective management requires the selection of a set of compatible techniques/approaches/skills that might vary depending on context, the conceptual management definitions refer to clusters of particular management actions and behaviors. Miles and Snow

(1978), for example, contend that a prospecting strategy (which focuses on various behaviors relating to innovation and being the first adopter) should be the optimal approach in decentralized organizations operating in a highly turbulent environment with a consistent set of strategy processes. In contrast, a defending strategy (focusing on various behaviors relating to key products and emphasizing efficiency) works bests in centralized organizations, in stable environments, where clear standards and monitoring are possible.

Although a substantial body of work has investigated these theories and approaches to characterizing leadership and management (Boyne and Walker 2006; Fernandez 2005; Meier et al. 2010), the empirical results are mixed. In a study of their parsimonious model of management and performance, O'Toole and Meier (2011, 275) notice that there are virtually no correlations among their measures of different aspects of managerial behavior. Findings such as this suggest that real-life public management may deviate from the characterizations of management and leadership theory. Quite likely, public managers approach their jobs in an eclectic manner adopting select behaviors from various leadership and management ideals what they perceive will work or is allowed in their current organization. What we do not know, however, is how managers themselves create their own management style (or combinations of behaviors) and whether some constellations of managerial behaviors are more productive and associated with better outcomes than others. Three empirical tasks face us: (1) capturing the multidimensionality of public management, (2) determining how these multiple dimensions are combined into real-life managerial approaches (i.e., manager types), and (3) assessing the association of these manager types to outcomes. In practice public management involves an array of managerial behaviors, and the effects of public management may easily be a function of how these various behaviors manifest themselves in complex and highly interactive relationships. While public

management research provides valuable insights into key aspects of public management and their organizational consequences, most empirical studies fail to measure the combined impact of the multiple aspects of management behavior that a manager exhibits.

This article uses cluster analysis to untangle and identify systematic patterns in public school managers' combinations of managerial behaviors. In particular, the clustering approach allows us to examine how managers actually manage as they face the day-to-day challenges of their organizations. Managers in practice might pick among various management activities and group them differently than management theories do. Cluster analysis is a data analysis technique that determines the natural grouping of observations based on the observations' degree of similarity in scores on variables included in the analysis (Everitt 1993; Kaufman and Rousseeuw 1990). We use cluster analysis on a data set of school principals containing numerous management variables, each capturing distinct aspects of public management activities. We use this data set to identify manager types and the combinations of managerial behaviors characterizing each manager type. In addition, we examine how the manager types we identify are associated with differences in four outcome indicators (i.e., student performance, teacher absenteeism, teacher goal commitment, and teacher job satisfaction). Testing for associations between the manager types and these outcomes provides a means of probing the general applicability and validity of using cluster analysis in the study of management-performance relationships in public management research, since differences in managerial approaches are theoretically expected to be related to differences in outcomes, assuming that "management matters". In addition, such tests represent an important first step for identifying the real-life combinations of managerial behaviors that could result in positive organizational outcomes.[1]

In the following sections we first catalogue various aspects of public management from the existing literature. Next, we outline why it can be valuable to study clusters of managers based on similar behaviors rather than just placing individual management variables (and perhaps interaction terms) in a regression model. After discussing the context and data of our empirical study, we then examine the clusters of school principals that emerge when we group together those who exhibit similar sets of management behaviors. Finally, we show how the different manager types are associated with variation in outcomes.

KEY COMPONENTS OF PUBLIC MANAGEMENT

A key concern in cluster analysis for public managers is to include as broad a range of behaviors as possible and let managers themselves indicate what combinations of behaviors they are using. Limiting the potential activities to those endorsed by one prescriptive theory or another will likely bias the results. Although this expansive approach can seem somewhat ad hoc and ill-structured, this allows the managers to determine what sets of behaviors they employ and avoids forcing managerial behaviors into the theoretical predispositions of the analyst.

Generally the activities of public managers can be divided into two parts: managing within the organization (internal management) and managing the organization's relationships with the environment (external management). Both elements encompass numerous discrete activities and can be expected to have performance implications (Moore 1995; Thompson 1967; O'Toole and Meier 2011, xiii). A list of these activities and the indicators used to measure them are included in Table 1.

[INSERT TABLE 1 HERE]

Internal Management Activities

Internal management—or managing downward (Moore 1995)—consists of the activities that managers undertake in seeking to organize and coordinate people and resources to get things done, to reinforce and possibly enhance the routines and standard processes to generate the organization's results. For most managers internal management includes many POSDCORB functions, ranging from human resources management and financial management to overseeing internal decision-making structures (Rainey 2009). Still, the enactment of several aspects of internal management may differ across managers, particularly in how they prioritize their work time in relation to different management tasks. The management literature suggests several ways of listing the functions and activities of managers (Allison 1983; Barnard 1938; Blake and Mouton 1964; Drucker 1974; Elmore 2000; Gulick and Urwick 1937; Hersey and Blanchard 1982; Mintzberg 1973). Our list of activities in this study includes financial management, administrative management, professional/pedagogical management, human resources management, strategic management and management related to individual students. We gather information both on how much *time* managers spend on these tasks and how much they *delegate* these tasks to subordinates.

Human resources management is a particularly important function of managers, and we will focus on two subactivities: recruitment and motivating employees (O'Toole and Meier 2011; Rainey 2009; Yukl 2010). Attracting and developing skilled and motivated people at all levels is a core function in the management of public organizations' human resources (Light 2008). A classic distinction in managers' recruitment behavior is the difference between concern for production and concern for people (Blake and Mouton 1964). When hiring new employees, some managers might focus more on job applicants' social skills and fit with the organization's work culture than on their professional knowledge and skills. Managers may also differ in the use of

reward incentives. Tying extrinsic rewards to employee behavior and performance often poses greater challenges in public organizations than in private ones (e.g., Andersen and Pallesen 2008; Kellough and Lu 1993; Perry, Engbers, and Yun Jun 2009) because public organizations' extrinsic rewards are often small in size and take the form of salary supplements or paid overtime. Even so, public managers may vary in using such incentives to motivate employees.

The limits to monetary incentives in public organizations mean that managers often need to rely on normative appeals and gaining the trust and cooperation of employees. Different theoretical perspectives exist on how to manage the professional core of the organization. Le Grand (2010) differentiates between trust and mistrust (see also McGregor 1960). Trustful management is characterized by the delegation of discretionary autonomy to the employees. Mistrustful management is characterized by extended levels of command and control. In practice high levels of supervisory command and control are often difficult to obtain in public service agencies, effectively producing substantial employee discretion (Meyers and Nielsen 2012). A more subtle form of command and control that takes advantage of employee discretion is to establish clear task goals and monitor employee goal attainment. Similar aspects of management are emphasized by instructional leadership theory, but are also prevalent in general organization theory on managers' task-oriented behaviors (Halpin and Weiner 1957; Katz and Kahn 1952; Katz, Maccoby, and Morse 1950; Likert 1961) and in studies on managerial task relations in terms of clarifying objectives and roles, planning work activities, and monitoring operations and performance (Yukl 2010). According to these lines of research, managers differ in the degree to which they specify goals and means of goal achievement. Hallinger (2003), who focuses on school management, defines four behavioral aspects of instructional management behavior: (1) high expectations for employees (at schools: for teachers and students), (2) supervision of the

professional practice (at schools: of classroom instruction), (3) coordination of employees'

professional practice (at schools: coordination of the school's curriculum), and (4) monitoring of

goal attainment (at schools: student achievement and progress).

In sum, the literature on internal management suggests that the managerial behaviors of

individual public managers may differ in relation to the following key components: work time

priority in relation to managerial tasks, hands-on management versus delegation to middle

managers, recruitment focus (concern for people versus production), use of reward incentives,

trust (e.g., reflected in the degree of delegation to employees), and use of command and control

(e.g., setting clear task goals and monitoring employee goal attainment). We recognize, however,

that this list of internal management activity in Table 1 is not exhaustive. For example, internal

management may also involve managerial behavior that relates to a manager's supervisors within

the organization (Moore 1995).

External Management Activities

External management involves managerial interactions with outside individuals and

organizations. According to Thompson (1967), managers work in the organization's environment

to draw in resources and take advantage of opportunities for the agency and its mandated

programs while also protecting the core organizational tasks from disruption triggered by

external shocks. External management, therefore, can be divided into efforts to exploit

opportunities in the environment through network activities (networking) and efforts to buffer

the organization from threats that the environment might generate (buffering).

Organizations are open systems. The resources, opportunities, challenges, and constraints

emanating from their surroundings can greatly influence management and performance.

Managers' interaction with the world outside is thus an important aspect of public management.

Externally oriented networking reflects how much effort managers exert to tap and coordinate opportunities in the external world, attempt to fend off threats or disturbances from outside, or both (O'Toole and Pedersen 2011). In addition, many public organizations have some sort of board of either advisory or supervisory character. Organizations with such a board may vary in how proactively the manager involves the board in decision-making.

Moreover, protecting public organizations from disruption is a core managerial function (O'Toole and Meier 2011; Thompson 1967). Studies of strategic management explore a "defender" approach to dealing with the organizational environment (Miles and Snow 1978). The main purpose of defender (buffering) activities is to protect the core activity of the organization against interruptions from its environment. In public agencies, buffering might take place at two levels: upward (buffering interruptions from political and administrative principals) and downward (buffering interruptions from clients and users). Focus on both networking and buffering might very well differ from manager to manager.

Finally, public management research emphasizes proactive and entrepreneurial aspects of public management (Borins 1998, 2008; Light 1998; Linden 1990). Entrepreneurial initiatives often ask the employees to change behavior and may thus be seen as an internal management activity. On the other hand, proactivity and new initiatives may also be used for sending signals to the external environment or act as a buffer against other external initiatives. While proactive and entrepreneurial managerial behaviors cannot be clearly defined as either internal or external management, public managers may differ in the extent to which they exercise them.

In summary, the public management literature provides us with a long list of management behavior concepts. Measuring all aspects of internal and external management would be a Herculean task; we instead aim to select a list of behaviors that is relatively varied and

comprehensive. Based on our above review, we identify a set of behavioral dimensions outlined

in Table 1 as key components and include them in our study. Our cluster analysis thus relies on a

comprehensive—but not exhaustive—selection of management variables.

COMBINING ASPECTS OF PUBLIC MANAGEMENT

Our analysis sorts school managers into different types based on their behavior along a number

of dimensions of management. An obvious alternative approach would be to study the

independent effect of each aspect of management (by including all dimensions as independent

variables in a regression). We believe there is value in using cluster analysis to consider multiple

dimensions in concert for at least four reasons. First, organizational structures and processes may

often have complex interaction effects on performance. Interaction effects can take the form of

complementary behaviors, when one particular managerial action is ineffective unless it is

accompanied by another action. For example, affording substantial autonomy to middle

managers or street-level employees might yield higher organizational performance, but only if

adequate monitoring mechanisms are in place to discourage shirking. In addition to

complements, certain behaviors might serve as substitutes or be completely incompatible with

one another. Research suggests that incentivizing employees through pay for performance is

unlikely to be particularly effective if employees work in groups, if the organization hires

employees who are intrinsically motivated in their work, or if employees trust and feel respected

by their managers under certain conditions (Langbein 2010). The many opportunities for

organizational processes to serve as complements or substitutes suggest that managerial actions

may have important interaction effects. While our cluster analysis approach does not directly

estimate individual interaction effects, it does account for the joint effect (including any

interaction effects) of the various managerial dimensions when they exhibit a pattern characteristic of a given manager type.

Of course, examining managerial clusters is not the only means of accounting for complementary and substitutionary dimensions of management; individual interaction effects can be directly modeled with interaction terms. A second reason for examining managerial clusters is that it provides an alternative method that reduces the need to impose pre-existing assumptions on the study of management. Using interaction terms to account for all potential interaction effects is impractical and may at worst result in model specification error when there are a large number of management variables. For example, say that we operate with just four management variables (A-D). Regression analysis that accounts for all potential interaction effects would require the inclusion of 11 interaction terms (AB, AC, AD, BC, BD, CD, ABC, ABD, ACD, BCD, and ABCD)—and the required number of interaction terms would increase exponentially with each additional management variable. Including several interactions terms in a single model increases the risk of severe multicollinearity, which in turn can inflate the variance of the coefficient estimates and make the estimates very sensitive to minor changes in the model. Given the large number of potentially-interconnected management dimensions that could be examined, researchers must therefore adopt some means of identifying a limited set of relationships that can reasonably be tested. One approach is to rely on theory to guide selection of key dimensions of managerial behavior as well as identification of key interactions among dimensions (e.g., O'Toole and Meier 2011). Many theories of management such as transformational leadership identify broad behavioral patterns that some managers are believed to adopt. Theory-driven empirical research constitutes a crucial component of scholarly inquiry in the field of public management, but the strength of the approach in many ways depends on the

strength of the theory motivating the model. Managers in practice might well pick among various management activities and group them differently than management theories do. The cluster analysis-based approach that we employ is more inductive (in the sense that it relies less on the judgment of the researcher to choose which managerial dimensions to include and which to interact). The clustering approach will reveal how managers actually manage as they face the day-to-day challenges of their organizations. We advocate this approach as a complement to—not a replacement of—empirical research that employs more explicitly theory-driven model specification.

A third (and somewhat overlapping) reason to derive manager types based on combinations of managerial behaviors is that doing so reflects how humans within organizations naturally perceive management. The recipients of management behavior—primarily, but not exclusively, subordinates—do not perceive and react to individual aspects of managerial behavior, but rather consider the full set of interrelated managerial behaviors facing them. This argument becomes especially relevant when measuring results that are the product of multiple behavioral acts (such as student performance, student absenteeism, and teacher absenteeism) or multiple psychological states of mind (such as job satisfaction). Cognitive models of management performance appraisal (DeCotiis and Petit 1978; DeNisi 1996; DeNisi, Cafferty, and Meglino 1984; Feldman 1981; Ilgen and Feldman 1983) have focused on raters' (subordinates') cognitive processes. These models, borrowing heavily from social psychology research on social cognition and interpersonal perception, look at how raters recognize, attend to, and observe ratee (manager) behavior and subsequently represent, organize, and store this information in memory, retrieve the information from memory, and integrate the information to form a judgment of the ratee (manager). Among other things, the literature shows that raters'

psychological schemas shape what they attend to and that these schemas are built on prior and spillover effects among experiences (Fleenor et al. 2010). Subordinates may thus remember and combine multiple aspects of management behavior when forming their work behavior. One potential consequence is that employees may be able to forgive lack of skills on one dimension if the manager is "good" on others. Real-life managers have different strength and weaknesses; hardly anyone is omnipotent. Theoretically, we expect that employees respond to managers holistically rather than always responding to individual managerial behaviors in an additive manner.

A final reason to look at manager types derived on the basis of combinations of managerial behaviors is that managers face resource constraints, in turn forcing tradeoffs among competing priorities or activities. Cognitive and time constraints mean that managerial attention to one issue will sometimes come at the expense of other activities. For example, managers who devote more time to external networking may have less time available for internal management activities (Hicklin, O'Toole, and Meier 2008). Traditional regression procedures consider the effect of varying each independent variable while holding all other independent variables constant, even though it may not be practically feasible in many scenarios for managers to hold all other variables constant while increasing (or decreasing) one management variable. Cluster analysis allows us to identify sets of individuals who adopt similar holistic patterns of behavior across several variables. If the tradeoffs adopted by certain managers are more effective than the tradeoffs of other managers, the combinations of behaviors resulting from more effective tradeoffs should be associated with improved outcomes. For example, consider a world with four dimensions of management. Imagine there is a set of managers who exhibit high levels of external networking and internal goal-setting activity; since these two activities consume most of

their cognitive and time resources, these same managers exhibit low levels of external buffering and internal hands-on management activity. A second set of managers exhibits the exact opposite pattern of behavior (high levels of buffering and hands-on internal management; low levels of networking and goal-setting). Traditional regression approaches allow one to estimate the effect of varying each managerial dimension while holding the other three constant. But if we want to study which holistic managerial approach is more effective, we would first need to define the two sets of managers (using cluster analysis, for example) and then see which set of managers was associated with better performance.

EMPIRICAL CONTEXT AND DATA SOURCES

The empirical analyses proceed in two stages. First, we examine how public school managers group in relation to different manager types based on their management behaviors. As mentioned, the expectation is that individual school managers will exhibit different constellations of managerial behavior and, hence, form distinct manager types. Then we assess whether and how these clusters are associated with differences in outcomes.

The setting of public secondary schooling in Denmark provides a suitable context for a conservative test since the effect of management is expected to be relatively weak in this context. First, Denmark has a national culture denoted by a relatively small power distance (Hofstede 1983, 1980), and public schools have been marked by a tradition of "weak" management at the local level; e.g., school principals have been perceived as a *primus inter pares.* Historically, the teachers' extent of work autonomy has thus been very wide. Teachers in Denmark may thus be less susceptible to their school principal's instructions than teachers elsewhere—a factor potentially lessening the importance of management to school and teacher outcomes.

Second, Danish school principals have less authority than school principals in most other countries—mainly caused by corporatism in the policy formulation and implementation process. Teachers' unions are heavily involved in both the formulation of schooling legislation and the implementation of educational policy at the local level. Moreover, the school principals' authority is limited by substantial influences from formalized arrangements with local branches of the teachers' union, the teacher union representative at each school, or both (Meier et al. 2015). In addition, the public schools are governed by multipurpose municipalities. Within a few general constraints the municipal council may decide the annual school budgets. Local politicians may also set strategic objectives for the schools in the municipality and take initiatives in terms of the teaching methods used in those schools. Again, relatively low levels of decision-making authority among Danish school principals may work to lessen the role of management for explaining school and teacher outcomes.

The restraints and limits on Danish school principals thus suggest that management will not matter as much when compared to managers in other sectors or countries. In such cases, there will not be as much focus by organizations in having a consistent management style that is adapted to the organization simply because management will receive less attention compared to other organizational factors. Danish school principals are, therefore, a conservative test of the value of cluster analysis for examining public manager types and their associations with organizational outcomes. If various management clusters are linked to different levels of performance in Danish schools, we expect the approach will prove fruitful in a wide variety of other management contexts.

We also recognize that the features of the Danish setting may impose limitations on the generalizability of our results. The exact extent to which our findings can be extrapolated to

other sectors and countries is ultimately an empirical question for future research, but we think

that the characteristics of the Danish case (e.g., strong unions, lack of hierarchical control,

absence of pay for performance) may fit a lot of situations, such as New York city schools,

Korean schools, and police departments.

Data

We use a mix of different data sources, i.e., three separate survey data sets—comprising

information on school principals, schools, and teachers—and an administrative data set on

schools and students. The Danish National Centre for Social Research (SFI) provided the survey

data. The SFI conducted the school principal and school surveys in March 2011 and conducted

the teacher survey in May 2011. Statistics Denmark provided the administrative data, which

contains detailed information on all Danish schools for the 2010-2011 school year, including

student-level test scores from summer 2011 and background characteristics.

To test how public school managers cluster into different manager types, we use the SFI

school principal survey responses to questions about the principal's own management team's

behavior along each dimension we identified above in Table 1. All public lower secondary

school principals in Denmark (1,478) were invited to participate in a web-based survey. The

response rate was 50 percent, for a total of 742 respondents. The sample appears representative

of the total population of Danish public school principals: Two-group t-tests reveal no

statistically significant differences between respondents and non-respondents in terms of average

school performance (students' test score achievements at the final ninth-grade exams), ethnicity,

parental education, distribution of students, and school size (number of students at the school).

Still, we cannot reject that the respondents may differ from non-respondents in terms of

unobservable characteristics. While the issue of sampling bias presents a potential problem to

most survey-based research with less than a full response rate, our findings should be interpreted in perspective of this limitation. Specifically, it is possible that our results best describe mangers with personality traits (such as pro-social or ego-based traits that motivate them to tell us about their management practices) that make them inclined to respond to surveys.

In order to probe the general applicability and validity of using cluster analysis in the study of public management, we test the relationship between manager types and outcomes. We draw the outcome measures from different data sources that we merge onto the SFI school principal survey data using a national school identification system denoting each school by a unique six-digit number. By drawing our management variables and our outcome measures from separate data sources, we minimize concerns about common source bias (Favero and Bullock 2015; Meier and O'Toole 2013).

The key outcome we examine is student performance, since student learning is typically considered to be the primary objective of schools. Student performance is measured by the average student test score achievements on the ninth-grade final written exams for Danish and math in summer 2011 (i.e., after the collection of the SFI survey data).[2] The test scores are recorded in the administrative Statistics Denmark school data and come from nationally standardized written tests that 98 percent of all Danish ninth-grade students take (Andersen 2005). All scores are given by an external third party.

Though the primary objective of schools is to educate students, they have a number of other social goals—what might be termed intermediate management outcomes. Organizations often face tradeoffs between competing goals, and some managerial approaches may have differing effects on different dimensions of performance. Given the broader set of concerns that schools face, we examine three alternative measures of intermediate management outcomes that

reflect the experiences of the employees within the schools: teacher absenteeism, goal commitment, and job satisfaction. Teacher absenteeism is measured using the SFI school survey data.[3] We use the numerical responses (number of days) to a survey item capturing the average short-term absenteeism due to illness among the teachers in the school year of 2009-2010. While the management clusters are based on school principal data from 2011, the absenteeism measure refers to the previous school year. To the extent that managerial practices in 2011 are a good proxy for managerial practices in the prior year, this temporal ordering should be acceptable for a correlational (as opposed to causal) empirical study. Nonetheless, our findings concerning the association of management clusters to teacher absenteeism should be interpreted in light of this caveat.

Teacher goal commitment and job satisfaction are measured using the SFI teacher survey data.[4] We measure both variables with continuous scales comprising five (goal commitment) and three (job satisfaction) survey items. We generate each scale using the predicted factor scores of a principal component analysis, which produces indexes that are standardized (mean = 0, standard deviation = 1). School-level measures of goal commitment and job satisfaction were created by taking the mean of all survey responses within each school. Descriptive statistics on all four outcome measures appear in the Appendix, Table A-2. We focus on these four measures because they represent salient organizational outcomes and have been the subject of numerous public administration and management studies (e.g., see Bhatti et al. 2015; Favero et al. 2016a, 2016b; Jilke 2016; Latham et al. 2008; Pedersen 2015). Yet we recognize that other school performance goals may be equally important (e.g., student well-being and social mobility). Unfortunately, efforts systematically to gather data on these other goals did not occur until after 2011, the time of the survey.

All statistical models on the linkage between manager types and outcomes include a set of control variables capturing potentially confounding influences. These control variables are from the administrative Statistics Denmark school data and the SFI school principal survey. In particular, we control for between-school student heterogeneity using measures on the proportion of female students, average student age at the time of tests, proportion of non-ethnic Danish students, average age of students' parents at time of birth, proportion of students living with both parents, and average education of students' parents. Similarly, we include school variables capturing school size (number of students), number of teachers, number of middle managers, proportion of female teachers, and average age of teachers. Finally, we control for school principal heterogeneity in terms of gender, ethnicity, age, years of tenure, and years of prior experience as a school teacher.

CLUSTERING MANAGERS

Several cluster analysis techniques exist, each with many specific methods (Everitt et al. 2011; Gordon 1999). We employ *kmeans* cluster analysis. In *kmeans* clustering a predetermined number of clusters (*k*) are defined using an iterative process. Each sample observation is assigned to the group whose means (for the various variables) are the closest (using a Euclidean distance). Based on that categorization new group means are then determined. These steps continue until no observations change groups. We chose *kmeans* over alternative methods for several reasons. First, *kmeans* clustering is a well-established partition clustering method that has been successfully used with a range of topics (see Everitt et al. 2011; Gordon 1999). Second, the method is relatively easy to implement and can be applied even on large data sets—meaning that *kmeans* may be good choice for other researchers wishing to engage in cluster analysis research. Finally, *kmeans* appears well-suited for identifying manager types, as the method generates

clusters that are flat (non-hierarchical)[5] and globular (the members of the clusters typically bear resemblance to the mean of the cluster).

Our cluster analysis incorporates 21 management variables, each capturing distinct aspects of management activities. Using the SFI school principal survey data, we selected items that relate to key aspects of managerial behavior (see the previous section on key components of public management and Table 1). We transform our data when two or more survey items refer to the same underlying management activity to generate a single measure (the scaling method is described in the Appendix, Table A-1). We make this transformation so as to clarify the management characteristics of the individual manager types. In cases of missing values on a survey item constituting a multi-item measure, we use the mean of that respondent's answer(s) on the other item(s) relating to that management measure. To keep variables with high variability from dominating the analysis, we standardize all scale measures (mean = 0, standard deviation = 1). This standardization also aids the identification of general differences in management characteristics across clusters. An overview of the individual survey items appears in the Appendix, Table A-1.

We conduct the cluster analysis on an effective sample of 465 observations (the number of school principal observations not containing "missing values" in relation to any of the 21 management variables). Two-group t-tests suggest that the 465 school principals are not statistically different from the full population of Danish school principals in terms of average school performance, ethnicity, parental education, distribution of students, and school size.

We estimate the clustering of school principals in relation to four cluster groups. Determining the number of clusters (k) in *kmeans* cluster analysis is a much debated issue (Everitt et al. 2011; Gordon 1999). Essentially, the "true" k property of our data set is unknown,

yet it must be specified. In line with general practice, we decided on a four-group solution based on diagnostic checks (comparing Calinski-Harabasz (1974) pseudo-F estimates when k is set to two, three, four, and five) and the relevance of a clustering resolution allowing for a possible display of several manager types.[6]

Results

The cluster analysis on the 21 management variables estimates the clustering of each school principal in relation to one of four separate manager types. For the purpose of this article we refer to the four types as C1, C2, C3, and C4. The cluster analysis yields the following distribution of school principal observations: 157 (C1), 50 (C2), 131 (C3), and 127 (C4). In order to identify the characteristics of each manager type, we estimate the mean score for each manager type in relation to each of the 21 management variables. Because the management variables are all standardized (mean = 0, standard deviation = 1), a negative mean score indicates a relatively lower value for that particular management variable while a positive mean score signifies a relatively higher value.

For each management variable we use one-way analysis of variance (ANOVA) to test for significant differences in means across the manager types. We also use Bonferroni-Dunn multiple-comparison tests to check for significant mean differences for each pairwise constellation of manager types.

Table 2 shows the results. In each of the four manager type columns the first score shows the mean management variable score for that particular manager type. Standard deviations appear in parentheses. The brackets hold the results of Bonferroni-Dunn tests for mean differences at the five-percent significance level. The bracket notation should be decoded as follows. Take, e.g., the first management measure "Delegation of decision-making authority to

middle managers." For C1 the mean score is -.023 and the bracket notation is "<C2;>C3." This notation implies that the C1 mean score is significantly smaller than the mean score of C2 (.717), yet significantly larger than the mean score of C3 (-.503). Similarly, the bracket notation for C2 (">all") denotes that the C2 mean score is significantly larger than the mean score of the other three manager types. Column "p>F" shows the ANOVA results.

[INSERT TABLE 2 HERE]

The ANOVA results show significantly different mean scores across the four manager types for 19 of the 21 management variables. Only management activities relating to school board involvement in decision-making and use of reward incentives are statistically insignificant (at $p < .05$).

We use the Bonferroni-Dunn test results to describe and label the four manager types. First, we have the 157 school principals marked by membership in the C1 manager type. We label these managers "firefighters." Overall, these school principals spend much of their work time handling cases related to individual students and personnel management. And they do not hold high expectations regarding their students' academic performance, do not emphasize social skills or organizational culture in hiring, and express little trust that the teachers will exert their best work efforts. Despite particularly low confidence in their teachers, these managers do not place a greater-than-average emphasis on dialoguing with teachers about pedagogical practices. Instead, they appear to manage by objectives and written plans. As a result of spending their time on student and personnel matters, this type of manager is less focused on financial, administrative, and strategic management. Perhaps many of the managers adopting this combination of behaviors do so because they feel overwhelmed by the day-to-day problems that

arise within their organization and are simply trying to keep up by attending to the most pressing issue in front of them.

Second, we have the 50 school principals affiliated with the C2 manager type. These managers are best described as "laissez-faire managers." These managers embody a somewhat passive form of management. They exhibit extensive delegation to middle managers and a non-interventionist approach to personnel management: i.e., they are less preoccupied with setting goals, and using objectives and written plans; they are less guided by formal school legislation and rules; they are less engaged with "buffering" behavior when teachers experience conflicts with students' parents; and they do not express high expectations for the school's performance. At the same time, they are not particularly hesitant to provide general feedback to teachers (although they appear to shy away from becoming involved in detailed discussions of pedagogical practices). Their general non-interventionist approach does not appear to stem from an exceptionally strong confidence in the teachers' drive and expertise; these managers exhibit slightly below-average levels of trust in teachers and do not invite teachers to participate in hiring or goal-setting decisions. This small cluster of managers is overall unengaged in the details of school operations, which could be motivated by disillusionment, lack of self-confidence, laziness, or a principled belief in a hands-off philosophy of management.

Third, we have the 131 school principals of the C3 manager type. We refer to these managers as "administrators"—school principals who are best characterized as more traditional office desk managers. Specifically, these managers make most school decisions themselves (less delegation to middle managers), engage in little networking, and spend more time on financial and administrative management tasks and less on personnel management. They are less focused on strategic and proactive (innovation) management and on monitoring of school goal

achievement. They have high expectations for the school's performance, but provide less feedback to the teachers on teaching, teaching methods, and handling problems in specific classes—possibly because they have high trust that the teachers will exert their best work efforts. They are, however, engaged with "buffering" behavior early on when teachers experience conflicts with students' parents. These managers lack the laissez-faire manager's aversion to involving teachers in decision making, which may also be due to their greater trust in teachers. The overall pattern of behaviors exhibited by these managers may be motivated by an assertive technocratic approach that emphasizes process over strategy or outcomes.

Finally, we have the 127 school principals marked by membership in the C4 manager type. We categorize these managers as "proactive floor managers." These school principals invest less of their work time in financial and administrative management but are more focused on strategic and proactive (innovative) management. In contrast to the administrator type managers they employ more modern management techniques; i.e., they engage in goal-setting behavior, performance management (monitoring of goal accomplishment), and "management by objectives." They also delegate to middle managers and create written plans. Moreover, these managers have high expectations for the academic performance of the school and great trust that the teachers exert their best work efforts. They are involved in the teachers' teaching practices and methods but also appear to involve the teachers in the decision-making process to a wide extent. These managers might view their role first and foremost as that of a leader (as opposed to a decision maker) whose job it is to inspire and focus their employees on achieving desired outcomes (Favero, Meier, and O'Toole 2016a).

ASSOCIATION OF CLUSTERS WITH OUTCOMES

If the manager types we generated reflect meaningful differences in managerial approaches, we expect them to be related to differences in outcomes, assuming that "management matters." Based on the cluster analysis results we compute a set of dummy variables denoting the manager type affiliation of each school principal. We use these variables to test the relationship of manager types with outcomes. Specifically, we estimate the following equation by OLS regression:

$$Y_i \ = \ c + M'_i\beta_1 + X'_i\beta_2 + \epsilon_i$$

The outcome (Y) of school i is a function of manager type (M) and a vector of student, school, and school principal characteristics (X). β_1 signifies the association of manager type to outcome Y. As previously discussed, we test the association of manager types with student performance as well as three other intermediate managerial outcome measures (which are only weakly correlated with one another):[7] teacher absenteeism, goal commitment, and job satisfaction.

The OLS regression analyses are performed at the school level with robust standard errors. As a result, schools with a larger number of respondents allow for a more precise estimate of the true level (mean) of goal commitment or job satisfaction among all teachers within the school. In order to account for this variance in the precision of our measures, the individual observations in our regressions are weighted by the number of respondents when the dependent variable is goal commitment or job satisfaction ("aweight" option in Stata). Because our dependent variables come from data sources other than the SFI school principal survey, the regression analyses are based on subsamples (i.e., the effective n is lower than 465).

Results for the Impact of Clusters

Table 3 summarizes the results of the OLS regressions. The first column displays estimates for our main model, which predicts student performance. We made the first manager type

("firefighters") the reference group, so the coefficients for the other three manager types indicate their effect relative to the first cluster manager type. The student performance measure has a standard deviation of about one. The manager type coefficients thus reflect the strength of association in terms of standard deviations. For example, schools with "administrators" are associated with student performance that is .318 of a standard deviation higher than schools with "firefighters." A joint F-test finds that the three manager type dummy variables are jointly significant (F[3, 295] = 2.94; p>F = .0335), meaning that we can reject the null hypothesis that none of the manager types are related to student performance (after controlling for the various other factors included in our model). The positive and significant coefficients for manager types C2 through C4 indicate that C1 "firefighters" are associated with lower levels of student performance than each of the other three manager types. Of the three manager type coefficients the one for C3 "administrators" is the largest; however, it is not readily apparent from looking at Table 3 whether or not we can reliably conclude that the effect of C3 is more favorable than the effects of C2 and C4. We can easily determine whether there are significant differences between the other manager types by changing the reference (omitted) category and then re-estimating the equation, as we have done in Table A-3 in the Appendix. We find that there are no significant differences in effects between C2, C3, and C4, even though all three are associated with significantly more favorable student performance than C1 "firefighters."

[INSERT TABLE 3 HERE]

In order to investigate further the ability of the manager type variables uniquely to explain variation in student performance, we ran a regression (not shown) that was identical to the one shown in the first column of Table 3, except that we also included all of the individual management variables used in the cluster analysis as independent variables. This is a particularly

tough test of the association between manager types and outcomes given the multicollinearity that is likely to be present after including the large number of management variables used to construct the manager types. Even after controlling for the linear effects of all of the individual management variables, the types contribute significantly to our ability to explain student performance; an F-test demonstrates that the three manager type dummies are jointly significant (F[3, 274] = 3.49; p>F = .0161). This suggests that the individual management variables do not contribute to student performance in a strictly linear, additive manner. The manager types explain variation in the school outcome measure beyond what the raw management variables used to form the clusters can explain individually in a simple linear regression. In sum, the results for the student performance models support the convergent validity of the manager clusters since they confirm expectations that the clusters would be uniquely associated with student outcomes.

Table 3 also shows results from models drawing on our three measures of intermediate managerial outcomes as dependent variables. The coefficients relating to teacher absenteeism show the strength of association in terms of average number of days of short-term absenteeism per teacher. As with the student performance measure, the coefficients relating to teacher goal commitment and satisfaction reflect the strength of association in terms of one standard deviation. F-tests indicate that the manager types dummies are jointly significant in the teacher absenteeism model (F[3, 225] = 3.34; p>F = .0202) and the goal commitment model (F[3, 176] = 3.97; p>F = .0091), but not the job satisfaction model (F[3, 176] = 1.80; p>F = .1487). The F-tests thus offer no support for the notion that teacher job satisfaction is a mediating factor in the link between manager type and student performance. When all of the individual management

variables are added to these models (not shown), the manager cluster dummies retain their joint significance only in the goal commitment model (F[3, 155] = 4.44; p>F = .0050).

The full set of binary comparisons among manager types for each model is again reported in Table A-3 of the Appendix. Teacher absenteeism is significantly higher (worse) in schools where there is a C1 "firefighter" than those headed by a C3 "administrator." The C2 "laissez-faire managers" see higher levels of absenteeism than C3 "administrators" or C4 "proactive floor managers." Teacher goal commitment also appears to suffer under the C1 "firefighter." The other three manager types are all associated with higher levels of goal commitment. Among those three there are no significant differences. There is also some evidence at the binary comparison level that teachers are less satisfied under C1 "firefighters" (relative to C3 "administrators" or C4 "proactive floor managers"), although the manager type variables are not jointly significant in this model (as noted above).

The magnitudes of these associations are modest but meaningful. For student performance, teacher goal commitment, and teacher job satisfaction, a school with a C3 "administrator" is expected to be approximately a third of a standard deviation above a school with a C1 "firefighter" (these two types provide the largest difference in predicted values for all three of these dependent variables). The effects for teacher absenteeism are slightly larger. The average teacher in the average school is absent five days a year (for short-term reasons), and the school-level average has a standard deviation of three days. C2 "laissez-faire managers" are associated with 1.8 additional absent days per teacher relative to C3 "administrators" and C4 "proactive floor managers."

The results for the three managerial intermediate outcome models provide further support for the general applicability and validity of using cluster analysis in the study of public

management. Across all four outcomes C3 "administrators" and C4 "proactive floor managers" appear to be associated with the most success. Their schools have better student performance, lower rates of employee absenteeism, stronger employee goal commitment, and higher job satisfaction than at least one other manager type on each dimension. C1 "firefighters," on the other hand, are associated with the worst outcomes. C2 "laissez-faire managers" land somewhere in between. They are associated with better student performance and stronger teacher goal commitment than C1 "firefighters," but their schools also have higher rates of teacher absenteeism than C3 "administrators" or C4 "proactive floor managers."[8]

CONCLUSION

The complexity and interconnectedness of the many decisions made by public managers demand that empirical researchers make simplifying assumptions regarding how to measure and classify managerial behavior. In this article, we employ cluster analysis to identify manager types reflecting patterns in public school managers' combinations of managerial behaviors. This novel approach to the empirical study of public management is useful for expanding and complementing findings from studies using other sets of simplifying empirical assumptions. The analysis reveals four school principal manager types: "firefighters," "laissez-faire managers," "administrators," and "proactive floor managers." The "firefighters" are preoccupied with cases related to individual service user problems and personnel management, and they are less focused on building organizational culture. "Laissez-faire managers" embody a somewhat passive form of management, while the "administrators" are best characterized as more traditional office desk managers. Finally, the "proactive floor managers" invest less of their time in financial and administrative management and employ more modern management techniques; i.e., they engage in goal-setting behavior, performance management (monitoring of goal accomplishment), and

"management by objectives," and they are involved in the teachers' teaching practices/methods while involving the teachers in decision-making process to a wide extent.

The results of the cluster analysis (a fairly inductive approach) do not match the patterns of behavior advocated by prescriptive theories of management. Contrasting the managerial clusters found here with those advocated by Miles and Snow (1978) serves to illustrate this point. Superficially our "proactive floor managers" resemble Miles and Snow prospectors. Similar to prospectors, proactive managers are interested in innovation and strategic issues. Unlike prospectors, however, they do not favor decentralization as much as the laissez-faire administrators and their levels of buffering the environment are below average. "Administrators" also share some superficial behaviors with defenders (concern with financial management, centralization/lack of delegation, and buffering). However, they do not appear to focus on efficiency and core tasks; in fact, they appear to avoid involvement in teaching or monitoring teaching at all. "Firefighters" are indeed reactors, but they do not wait for the environment to force them to react as Miles and Snow would contend, rather they react to immediate problems within the organization and actually spend a bit more time in buffering the environment rather than just reacting. "Laissez-faire managers," who might be managers in name only, have no counterpart in Miles and Snow; they clearly are not analyzers (the Miles and Snow mixed fourth type).

The contrast of the managerial types from Miles and Snow with our four clusters could be repeated with other prescriptive theories of management. For example, the clustering does not produce a clear theory X or theory Y manager; there are no obvious transformational leaders, and no pure management by objectives managers. In sum, our results suggest that managers tend to pick and choose from a range of managerial behaviors and borrow activities from different

theoretical approaches. Managers do not exhibit patterns of behavior that match with existing prescriptive theories of management. The clustering suggests that scholars should exercise caution in imposing patterns of behavior on managers whose view of what works is likely affected by their personal experiences with the organization that they manage.

As expected, there are some differences in outcomes among the four identified manager types. "Administrators" and "proactive floor managers" are generally associated with better outcomes than "firefighters." "Laissez-faire managers" fall somewhere in between—their schools have higher levels of academic performance and teacher goal commitment than schools with "firefighters," but "laissez-faire managers" are also associated with high levels of teacher absenteeism. That the very passive "laissez-faire managers" are associated with more success than "firefighters" on two outcome measures is somewhat surprising. Perhaps the extremely low levels of trust in teachers among "firefighters" reflect a particularly dysfunctional relationship between management and personnel (that may include micromanagement). What appears to be passivity among "laissez-faire managers" could, in fact, be the implementation of a principled division of responsibility between management and the front-line professionals in the school. In addition, the observed associations between manager type and outcome could partially be a function of path dependency or the organization's environment. Managers are not necessarily completely free to choose their management style. For example, external factors may force some managers to become "firefighters"—or entail that "firefighters" do not have the time to be, say, "proactive floor managers."

It is somewhat striking how similar the results for "administrators" and "proactive floor managers" are across all four outcomes (there are no significant differences) given how different the two managerial clusters are. While both types have high expectations and high levels of trust

in teachers, "administrators" put a much smaller emphasis on managing through goals and on dialoguing with teachers about their practices, instead focusing on financial and administrative management. To whatever extent these associations reflect causal relationships, they suggest that there may be more than one "right way" to manage an organization.

In relation to the latter, we wish to emphasize that the associations between manager type and outcome that we identify are correlational. Because our data is observational (non-experimental), our results do not allow a direct causal interpretation. For example, the data show that "firefighters" are associated with relative poor performance, but we cannot disentangle whether this association is a product of "firefighting" causing poor performance or poor performance causing "firefighting." In theory, "firefighting" may be the most effective management approach for the schools where the managers exhibit this management style. While our findings are insightful, consistent with existing theory, and support the value and usefulness of cluster analysis to the study of public management, we thus strongly encourage further research that may complement our cluster analysis and findings with causal evidence. For example, future research could invite a sample of "firefighters" to participate in a management training program involving key components of "proactive floor" management. Effects could be identified in an experimental setting with random assignment of treatment (training) and control (no training) or via a quasi-experimental difference-in-differences design (comparing changes in performance for "firefighter" training recipients relative to other types of managers not receiving any training).Our findings are based on Danish school management data. This empirical focus is suitable for showing how cluster analysis is a useful technique for identifying manager types, not least as it provides the setting for a conservative test. We recognize, however, the limitations to external validity of this choice of data. School management may retain characteristics different

from other fields of public management. Moreover, the behavioral characteristics of Danish

school principals may differ from those of school principals in other countries. Future research

should thus use cluster analysis to identify manager types in areas of public service other than

schooling and in other countries. As previously mentioned, we suggest that the characteristics of

the Danish case (e.g., strong unions, lack of hierarchical control, the absence of pay for

performance) may fit a lot of situations, such as New York City schools, Korean schools, and

police departments. At the same time, some managerial clusters such as proactive management

appear to have much stronger support in the theoretical literature than either laissez faire

managers or firefighters. In addition, future research should also examine how the manager

types, identified via cluster analysis, relate to other outcomes than the ones that we examine.

In sum, this article demonstrates a novel means of accounting for the multidimensionality

of managerial behavior. We argue that cluster analysis is a useful tool for research on the causes

and consequences of interconnected managerial behaviors, with a view to how various behaviors

combine in real-life public organizations. Having said that, we are well aware of the limitations

of cluster analysis. Empirical analysis of all aspects of public management is a Herculean feat.

This article focuses on key components of internal and external management, but we recognize

that our selection of management variables is not exhaustive. That the results of cluster analysis

are a derivative of the selected number of cluster groups and variables included is a substantial

caveat that makes replication and cross-country comparisons difficult. For these reasons we

mainly see cluster analysis as a first—but nevertheless important—step to untangle and identify

systematic patterns in managers' combinations of behavioral dimensions.

NOTES

1 Cluster analytical findings are sensitive to the variables included. Adding a new variable, such

      as another management variable, might make respondents at the edge of one cluster move

to another. For this reason we do not use (and do not suggest that others use) cluster analysis to make claims about the frequency with which managers adhere to the practices of particular clusters. The main value of cluster analysis relates to its ability to identify manager types, each marked by distinct constellations of managerial behaviors. We acknowledge the limitations of cluster analysis, but we argue that the method is useful for taking a holistic approach to studying public management that accounts for the complexity and interrelatedness of managerial behaviors.

2 The students' achievements in Danish are measured by the mean product of three test scores (reading, writing, and spelling); their math achievements by the mean of two test scores (arithmetic and mathematical problem-solving). The subjects are given equal weight in the final student performance measure.

3 As with the SFI school principal survey all public lower secondary schools in Denmark were surveyed (1,478). The response rate was 52 percent, for a total of 767 respondents.

4 A total of 1,998 teachers teaching one or more ninth-grade classes in Danish or math in the school year of 2010-2011 were surveyed. The response rate was 57 percent, yielding 1,130 teacher respondents.

5 As we are not interested in the hierarchical relations of clusters, we use *kmeans* as opposed to hierarchical clustering methods, e.g., single-linkage, average-linkage, complete-linkage, Ward's method.

6 We ran four *kmeans* cluster analyses, respectively specifying k at two, three, four, and five. For each cluster solution a Calinski-Harabasz pseudo-F index score was computed (with larger values indicating a more empirically distinct cluster structure). Increasing k was associated with decreasing index scores. However, the score differences were relatively small. Given the relevance of a clustering resolution exceeding a binary distinction we thus decided on a four-group solution similar to existing typologies (e.g., Miles and Snow 1978).

7 Analysis of the pairwise correlations among the four outcome measures reveals the following: Teacher absenteeism is negatively related to student performance (-.20, $p<.1$) while teacher goal commitment and job satisfaction are positively associated with one another (.33, $p<.001$).

8 We conducted a robustness test in which we excluded managers at edges of the clusters from the sample. To identify these managers, we estimated the (Euclidean) distance between

each manager's responses and the mean responses for the manager's own cluster. We then dropped the five percent of managers with the largest distances (between themselves and their own clusters' means) and reran the regression models. The results are very similar to those reported in Table 3. The robustness test thus indicates that our findings are not driven by managers who do not fit particularly well into any one cluster.

APPENDIX

[INSERT TABLE A-1 HERE]

[INSERT TABLE A-2 HERE]

[INSERT TABLE A-3 HERE]

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TABLE 1
Overview of Key Components of Public Management and their Measures.

Focus of activity	Key components	Measures of school management
Internal management	Hands-on management vs. delegation to middle managers	• Delegation of decision-making authority to middle managers
	Task priority	• Task priority: financial and administrative management • Task priority: professional management and managerial tasks related to individual students • Task priority: personnel management • Task priority: strategic management
	Recruitment	• Focus on people (vs. production)
	Motivation	• Use of reward incentives
	Delegation to employees (trust)	• Trust in personnel • Involvement in decision-making, teachers
	Use of professional instructions/directions Monitoring	• High expectations for teachers and students • Goal-setting • Involvement in teaching practices and methods • Feedback on teaching • Use of written plans • Monitoring of goal accomplishment • Use of objectives ("management by objectives")
External management	Networking	• Networking
	Buffering	• Buffering 1 (pressure from above) • Buffering 2 (pressure from below)
	Involvement of board	• Involvement of school board in decision-making
Both internal and external	Proactivity and innovation	• Proactive management (innovation)

TABLE 2

Cluster Analysis. Mean, Standard Deviation (in Parentheses), and Bonferroni-Dunn Test Results (in Brackets).

	C1 (*n* = 157)	C2 (*n* = 50)	C3 (*n* = 131)	C4 (*n* = 127)	*p*>F
Delegation of decision-making authority to middle managers	-.023 (.807) [<C2;>C3]	.717 (.747) [>all]	-.503 (1.103) [<all]	.266 (.930) [<C2;>C3]	<.001
Task priority: financial and administrative management	-.374 (.702) [<C2&C3]	.051 (.881) [>C1&C4;<C3]	.849 (1.045) [>all]	-.433 (.728) [<C2&C3]	<.001
Task priority: professional management and managerial tasks related to individual students	.564 (1.056) [>all]	-.544 (.650) [<C1]	-.329 (.854) [<C1]	-.144 (.858) [<C1]	<.001
Task priority: personnel management	.383 (1.054) [>C3&C4]	.053 (.894) [>C3]	-.566 (.740) [<all]	.090 (.952) [<C1;>C3]	<.001
Task priority: strategic management	-.249 (.716) [<C2&C4;>C3]	.366 (1.154) [>C1&C3;<C4]	-.628 (.584) [<all]	.811 (.986) [>all]	<.001
Recruitment: focus on people	-.269 (1.100) [<C3&C4]	-.020 (.970) -	.065 (.925) [>C1]	.258 (.880) [>C1]	<.001
Motivation: use of reward incentives	.013 (.993) -	-.349 (.971) [<C4]	.014 (1.015) -	.107 (.986) [>C2]	.055
Trust in personnel	-.707 (.767) [<all]	-.136 (.943) [>C1;<C3&C4]	.383 (.910) [>C1&C2]	.533 (.828) [>C1&C2]	<.001
Involvement in decision-making, teachers	-.125 (1.039) [>C2;<C4]	-.642 (.946) [<all]	.131 (.876) [>C2]	.272 (.965) [>C1&C2]	<.001
High expectations for teachers and students	-.299 (.859) [<C3&C4]	-.323 (1.096) [<C3&C4]	.105 (.982) [>C1&C2]	.389 (.995) [>C1&C2]	<.001
Goal-setting	.054 (.954) [>C2]	-.364 (1.198) [<C1&C4]	-.243 (1.052) [<C4]	.327 (.794) [>C2&C3]	<.001
Involvement in teaching practices and methods	-.040 (.942) [<C4]	-.255 (.883) [<C4]	-.230 (1.000) [<C4]	.460 (.957) [>all]	<.001
Feedback on teaching	-.020 (.982) [>C3]	.269 (1.027) [>C3]	-.346 (.903) [<all]	.277 (1.003) [>C3]	<.001
Use of written plans	.191 (.825) [>C2&C3]	-.797 (1.027) [<all]	-.380 (1.145) [<C1&C4;>C2]	.470 (.639) [>C2&C3]	<.001
Monitoring of goal accomplishment	.132 (.895) [>C3; <C4]	.098 (1.136) [>C3;<C4]	-.703 (.867) [<all]	.524 (.773) [>all]	<.001
Use of objectives ("management by objectives")	.243 (.799) [>C2&C3]	-1.182 (.847) [<all]	-.258 (1.092) [<C1&C4;>C2]	.431 (.705) [>C2&C3]	<.001
Networking	.393 (.816) [>C3]	.110 (.804) [>C3]	-.635 (1.032) [<all]	.126 (.935) [>C3]	<.001
Buffering 1 (pressure from above)	.088 (.895) [>C2]	-.643 (.973) [<all]	.206 (1.026) [>C2]	-.069 (1.001) [>C2]	<.001
Buffering 2 (pressure from below)	.184 (.786) [>C2]	-1.014 (1.308) [<all]	.240 (.814) [>C2&C4]	-.076 (1.026) [>C2; <C3]	<.001
Involvement in decision-making, school board	-.099 (.991) -	-.037 (.886) -	.127 (1.082) -	.006 (.961) -	.295
Proactive management (innovation)	-.086 (.833) [>C3;<C4]	-.121 (1.010) [<C4]	-.406 (.750) [<C1&C4]	.574 (1.153) [>all]	<.001

TABLE 3

TABLE 3
OLS Regression. Coefficients and Robust Standard Errors.

	Student performance		Teacher absenteeism		Teacher goal commitment		Teacher job satisfaction	
	b	se	b	se	b	se	b	se
C1 ("firefighters")	ref		ref		ref		ref	
C2 ("laissez-faire managers")	.210*	(.122)	.896	(.715)	.323**	(.143)	.135	(.169)
C3 ("administrators")	.318***	(.115)	-.906*	(.479)	.405**	(.156)	.304*	(.176)
C4 ("proactive floor managers")	.151*	(.090)	-.899	(.554)	.272**	(.108)	.267*	(.136)
Students, females (%)	.223	(.354)	-3.131	(2.035)	.791	(.504)	-.216	(.703)
—, age at time of tests (av.)	-1.536**	(.643)	-1.438	(2.294)	-.476	(.547)	-.292	(.751)
—, non-ethnic Danish (%)	-.283	(.402)	6.536**	(2.805)	.068	(.502)	-.203	(.593)
—, mother's age at birth (av.)	.151**	(.065)	.508*	(.302)	.203***	(.078)	.227**	(.104)
—, father's age at birth (av.)	-.045	(.049)	-.438	(.304)	-.081	(.058)	-.094	(.077)
—, living with both parents (%)	.715	(.439)	-6.226*	(3.508)	-.112	(.660)	-.507	(.655)
—, mother's education, years (av.)	.471***	(.118)	.381	(.625)	-.209	(.127)	-.114	(.139)
—, father's education, years (av.)	.161	(.106)	-.329	(.475)	.126	(.126)	-.045	(.129)
School, size (number of students/100)	.098**	(.045)	-.318	(.003)	-.001	(.001)	-.000	(.001)
—, number of teachers (full-time eq.)	-.010*	(.006)	.040	(.046)	.008	(.008)	-.002	(.010)
—, number of middle managers	.024	(.046)	.473	(.335)	-.117*	(.065)	.009	(.078)
—, female teachers (%)	.619	(.599)	.224	(2.113)	1.120*	(.645)	.845	(.705)
—, age of teachers (av.)	.027	(.020)	-.017	(.062)	.042*	(.023)	-.030	(.024)
School principal, gender (female)	-.113	(.407)	-.276	(.422)	-.118	(.110)	-.188	(.117)
—, ethnicity	-1.814***	(.565)	-.246	(1.330)	-.267	(.263)	.274	(.312)
—, age	.663***	(.151)	.072*	(.042)	-.016*	(.009)	.016	(.013)
—, tenure (years)	.438	(.284)	-.062	(.040)	.019**	(.009)	.012	(.010)
—, teacher experience (years)	.013	(.138)	.053*	(.039)	-.004	(.010)	-.022**	(.011)
Constant	17.413	(10.616)	29.000	(39.337)	3.458	(9.489)	4.010	(12.350)
R^2	.63		.24		.19		.13	
N	322		252		203		203	

Notes: *$p<.1$, **$p<.05$, ***$p<.01$.

Management Measures. Survey Items, Score Range, Scale Construction, and Reliability.

Management measures (no. of survey items)	Survey items	Score range	Scale constru-c-tion	Cro-n-bach's alpha	PCA factor loadi-ngs	Kurto-sis (skew-ness)
Delegation of decision-making authority to middle managers (6)	How much responsibility have you delegated to middle managers regarding the following work tasks? (1) Financial management (2) Administrative management (3) Professional/pedagogical management (4) HR management (5) Strategic management (6) Managerial tasks related to individual students	1 (no delegation of responsibil ity) to 5 (very wide delegation of responsibil ities)	Predict ed factor scores	.79	.51 .67 .84 .74 .71 .74	.07 (-.27)
Task priority: financial and administrative management (2)	What percentage of your total work time is spent on the following job tasks on average? (1) Financial management (2) Other administrative management	0 to 100	Rowtot al	-	-	1.75 (1.00)
Task priority: professional management and managerial tasks related to individual students (2)	What percentage of your total work time is spent on the following job tasks on average? (1) Professional/pedagogical management (2) Managerial tasks related to individual students	0 to 100	Rowtot al	-	-	1.80 (.78)
Task priority: personnel management (1)	What percentage of your total work time is spent on the following job tasks on average? (1) HR management	0 to 100	Item score	-	-	1.96 (1.03)
Task priority: strategic management (1)	What percentage of your total work time is spent on the following job tasks on average? (1) Strategic management	0 to 100	Item score	-	-	2.03 (1.18)
Recruitment: focus on people (vs. production) (2)	How much emphasis do you place on the following items when hiring new teachers? (1) That the applicant seems to fit the school's work culture (2) That the applicant is extrovert and seems to have good social skills	1 (no emphasis) to 5 (very great emphasis)	Rowm ean	-	-	.36 (-.97)
Motivation: use of reward incentives (5)	I recognize particularly good teachers by… (1) …recommending them for function-based salary supplements (2) …recommending them for qualification-based salary supplements (3) …granting specific supplementary training requests (4) …paying them for overtime for exerting an extra effort	1 (fully disagree) to 5 (fully agree)	Predict ed factor scores	.74	.85 .85 .50 .77 .50	-.80 (.07)

	(5) …granting holiday requests outside of normal holiday seasons					
Trust in personnel (1)	(1) To what extent do you trust teachers at your school to exert their best efforts?	1 (not at all) to 5 (to a very wide extent)	Item score	-	-	-1.00 (-.31)
Involvement in decision-making, teachers (2)	How much actual influence do you assess that the teachers have on decisions that apply to your school in the following areas? (1) Hiring teachers (2) Establishing academic performance goals for students	1 (no influence) to 5 (very wide influence)	Rowmean	-	-	.31 (-.27)
High expectations for teachers and students (2)	Here are sets of opposite statements. How would you characterize your style of leadership at your school? (1) A: School management places very high demands on the teachers' classroom teaching at our school B: School management hardly places any demands on the teachers' classroom teaching at our school. It is their own responsibility (2) A: Concerning their marks, I and the other managers expect that students at our school perform better at the final exams than similar students at other schools B: Concerning their marks, I and the other managers have no expectations with regard to the performance of students at this school compared to other similar students at other schools	5 (fully agree with A) to 1 (fully agree with B)	Rowmean	-	-	.44 (-.38)
Goal-setting (4)	Has the school established goals for the following issues? (1) The academic level that the school should attain (2) What students should learn in each subject (3) How many students should subsequently participate in upper secondary education or vocational training (4) The well-being and social development of students	0 (no); 1 (yes)	Rowmean	-	-	.76 (-1.33)
Involvement in teaching practices and methods (6)	To what extent has your school management actively been involved in discussions concerning teachers' methods and organization of their teaching in the following ways? (1) …participated in a dialogue with teachers about teaching methods and organization (2) …acted as a sparring partner for the teachers regarding their teaching	1 (not at all) to 5 (to a very wide extent)	Predicted factor scores	.78	.72 .71 .76 .71	.25 (.20)

	methods and organization of the teaching					
	(3) …told teachers of research results concerning more effective teaching methods				.75	
	(4) …initiated pilot schemes with new teaching methods or ways of organizing the teaching with the intention of inspiring teachers to use them				.52	
	(5) …attempted (in group meetings or meetings with individual teachers) to persuade/inspire teachers to use specific teaching methods or ways of organizing the teaching					
	(6) …attempted to influence teachers' teaching methods or the organization of the teaching through the purchase of new textbook systems					
Feedback on teaching (4)	Please consider the school year of 2009/2010. How often did the school management do the following? (1) …gave feedback to teachers concerning their classroom teaching (2) …discussed teachers' classroom teaching with teachers (3) …attended class conferences or similar discussions regarding how much the individual students benefit from your school's teaching (4) …discussed specific problems concerning specific classes with one or more teachers	1 (never) to 6 (more than 50 times)	Predicted factor scores	.80	.82 .86 .76 .72	-.50 (.11)
Use of written plans (3)	Are the following management instruments used at your school? (1) School plan regarding measures for achieving the goals of the school (2) Plans for the development of the individual students in most of the classes (3) Plans for supplemental teacher training	0 (no); 1 (yes)	Rowmean	-	-	.07 (-.92)
Monitoring of goal accomplishment (10)	Is the achievement of the school's goals monitored by using any of the following tools? (1) Analyses comparing the students' GPA over time or among schools (2) National tests (before the ninth grade) (3) Standardized tests (e.g., in Danish and math) (4) Analyses of students' participation in subsequent upper secondary education or vocational training (5) Evaluation surveys among students (6) Evaluation surveys among teachers (7) Evaluation surveys among parents (8) Statistics on student absenteeism	0 (no); 1 (yes)	Rowmean	-	-	1.31 (-.95)

	(9) Statistics on teacher absenteeism due to illness (10) Individual teacher appraisal interviews						
Use of objectives ("management by objectives") (2)	Are the following management instruments used at your school? (1) Written objectives specifically for your school (2) Performance-based management of teaching in most of the classes	0 (no); 1 (yes)	Rowmean	-	-		-.76 (-.76)
Networking (5)	How frequently do one or more members of your school management meet with the following parties? (1) Educational psychological counseling center (PPR) (2) Local education authority (3) Social services department or social services for children with special needs (4) The local teachers' union or trade union representative (5) School principals at other primary and lower secondary education schools	5 (weekly) to 1 (annually or never)	Predicted factor scores	.76	.66 .85 .79 .54 .76		-.45 (-.65)
Buffering 1 (pressure from above) (1)	Here are sets of opposite statements. How would you characterize your style of leadership at your school? (1) A: I and the other managers always follow the school legislation and rules B: I and the other managers sometimes apply a broad interpretation of the school legislation and rules	5 (fully agree with A) to 1 (fully agree with B)	Item score	-	-		-.91 (-.19)
Buffering 2 (pressure from below) (1)	Here are sets of opposite statements. How would you characterize your style of leadership at your school? (1) A: If a teacher experiences a conflict with a student's parents, our school management is usually involved early on in the process B: If a teacher experiences a conflict with a student's parents, the teacher usually handles it herself	5 (fully agree with A) to 1 (fully agree with B)	Item score	-	-		.33 (.92)
Involvement in decision-making, school board (2)	How much actual influence do you assess that the school board has on decisions that apply to your school in the following areas? (1) Hiring teachers (2) Establishing academic performance goals for students	1 (no influence) to 5 (very wide influence)	Rowmean	-	-		-.20 (.02)
Proactive management (innovation) (1)	(1) How many pilot or development projects have been initiated at your school with the objective of raising the academic level of the school within the last four years?	1 (zero) to 11 (10 or more)	Item score	-	-		.97 (1.01)

Table A-2

45

Outcome Measures. Descriptive Statistics and Survey Items and Reliability.

	Survey items	Mean (standard deviation)	Min	Max	Cron-bach's alpha	PCA factor loadings	Kurtosis (skew-ness)
Student performance	-	6.129 (1.010)	1.93	10	-	-	-.53 (1.86)
Teacher absenteeism (1)	(1) What was the average level of absenteeism due to illness among the teachers in the school year of 2009/2010 (average number of days of short-term absenteeism per teacher, i.e., excluding long-term absenteeism and maternity leave)	5.516 (3.065)	0	17	-	-	1.05 (1.38)
Teacher goal commitment (5)	To what extent do you agree or disagree with the following statements? (1) I know the specific content of the school's goals and values (2) My school's established goals and values are concrete and tangible (3) I agree on the established school goals and values (4) In decisions on teaching planning and methods I put emphasis on the goals and instructions established by the school management (5) I try hard to meet the school goals and values	0 (1)	-3.58	1.68	.86	.81 .85 .90 .51 .91	-.98 (2.55)
Teacher job satisfaction (3)	To what extent do you agree or disagree with the following statements? (1) My work is always really exciting and interesting (2) I like performing all of my work tasks (3) I am very satisfied with working at the school	0 (1)	-3.43	1.23	.76	.85 .83 .80	-.84 (1.66)

TABLE A-3
Rotating the Omitted Category. Coefficients and Robust Standard Errors (in Parenthesis).

	Student performance				Teacher absenteeism				Teacher goal commitment				Teacher job satisfaction			
	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)
C1 ("firefighters")	ref.	-.210* (.122)	-.318*** (.115)	-.151* (.090)	ref.	-.896 (.715)	.906* (.479)	.899 (.554)	ref.	-.323** (.143)	-.405** (.156)	-.272** (.108)	ref.	-.135 (.169)	-.304* (.176)	-.267* (.136)
C2 ("laissez-faire managers")	.210* (.122)	ref.	-.107 (140)	.060 (.119)	.896 (.715)	ref.	1.802** (.693)	1.795** (.750)	.323** (.143)	ref.	-.081 (.185)	.051 (.143)	.135 (.169)	ref.	-.169 (.203)	-.132 (.176)
C3 ("administrators")	.318*** (.115)	.107 (140)	ref.	.167 (.120)	-.906* (.479)	-1.802** (.693)	ref.	-.006 (.564)	.405** (.156)	.081 (.185)	ref.	.132 (.169)	.304* (.176)	.169 (.203)	ref.	.037 (.190)
C4 ("proactive floor managers")	.151* (.090)	-.060 (.119)	-.167 (.120)	ref.	-.899 (.554)	-1.795** (.750)	.006 (.564)	ref.	.272** (.108)	-.051 (.143)	-.132 (.169)	ref.	.267* (.136)	.132 (.176)	-.037 (.190)	ref.

Notes: *p<.1, **p<.05, ***p<.01.