Management Theory and Occam's Razor:

How Public Organizations Buffer the Environment[*]

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Abstract

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Because organizations are open systems, environmental forces can both greatly benefit the organization and cause it major harm. With the recent focus on proactive leadership and liberation management, how organizations buffer the environment has received little scholarly attention. This paper provides a systematic assessment of organizational efforts to dampen environmental influences using a current empirical theory of public management presented by O'Toole and Meier. That theory suggests that buffering efforts will be related to organizational performance in nonlinear ways as buffering interacts with environmental forces, managerial networking, and organizational structures. By using a well established data set in public management, this paper examines the organization's history to generate an estimate of environmental buffering. This estimate of buffering is then used in a more contemporary data set with 8 years of data for over 500 organizations. The results show that buffering is systematically related to a variety of performance indicators and it has an especially strong influence on performance in regard to the organization's most disadvantaged clientele. The paper then assesses the functional form of the buffering relationship and the potential interaction with other variables. Although the logic of Occam's razor implies that the simple linear relationship best fits the data, significant research needs to be done on other measures of buffering and other data sets before definitive conclusions can be drawn.

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Public organizations operate in environments that offer both potential benefits and threats to the organization involved; these factors also influence management's effectiveness in achieving public policy objectives as well (For instance, Lynn 1987; Moore 1997; Rainey 2003). Successful public managers, we are told, can play a key role in exploiting opportunities that arise in the environment and in mitigating external dangers when they materialize.[1] These generalizations are supported by a rich, persuasive case-study literature regarding the importance of managerial functions that are directed, at least in part, outward from the organization. An incontrovertible proposition, therefore, is that public management encompasses far more than internal organizational housekeeping.

Just how such functions play out, however, is considerably less clear. Many specific questions in this regard could be posed, but few have been answered through systematic research. For instance, what is the appropriate balance between tapping environmental opportunities and protecting against environmental threats? How do managers apportion their efforts between these two activities and what difference does it make? Which tactics are especially effective in implementing a strategy of actively seeking out new opportunities ("prospecting," in the terms developed by Miles and Snow (1978)) or buttressing against possible disturbances (defending, in the Miles and Snow lexicon), and under what circumstances? How, if at all, do these efforts interact with a range of other relevant variables? And how much difference do these functions make for overall organizational performance? The questions are many – far more than can be addressed in a single paper, probably more than can be addressed in a single research program, but they indicate the scope of the broad research agenda lying ahead.

In a research program begun several years ago, O'Toole and Meier (1999) developed a formal model from the primarily inductive literature to specify some hypothesized answers to certain of these questions and others. Since then they have explored the operations of public management empirically and made some progress toward estimating impacts. Other researchers have contributed to the effort as well. Thus far, however, little of this work has been devoted to what might be called the buffering function of public management, despite its obvious importance. In the present paper we focus on this particular facet of public management and build on the earlier work of O'Toole and Meier to explore whether and how management's buffering function affects public organizational performance. In doing so, we also probe the functional form that such buffering efforts might take as they shape performance. We do so both because the question is important and also because O'Toole and Meier suggested a rather complex answer to it. The issue needs to be examined carefully if we are to clarify the role of this managerial function as well as others in the performance of government agencies.

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[1]Managers can also prevent some environmental threats from materializing by cultivating and coopting key portions of the environment. Such strategies have their drawbacks (see Selznick 1949; O'Toole and Meier 2004) and should be judged by whether the costs are outweighed by the benefits provided.

Buffering, Public Organizations, and Public Management:
A Perspective and a Model

From the extensive empirical work documenting cases of public organizations operating in often complex and turbulent environments – settings in which the organizations are charged with carrying out policy objectives as they face interdependence with other actors, including organizational and political ones – it seems clear that two broad classes of forces can contribute to protecting, insulating, or mitigating impacts on the organization from the external environment: structural or procedural elements that help secure an administrative system, on the one hand, and managerial contributions to protection, on the other (see O'Toole and Meier 2003a: 112).[2] As a shorthand, we refer to any of these influences that reduce the impacts of environmental forces on organizational or performance results as buffers, and we refer to the dynamic of reducing such influences as buffering.

Whether structural or managerial (or both), several types of buffering functions can be envisioned. The protective mechanism or effort could serve as a blockade insulating the administrative system from external shocks up to but not past a particular size (much like levees around New Orleans), or a selective filter allowing some but not all external influences through the apparatus, or a dampener reducing the amplitude of any external influences (O'Toole and Meier 2003a: 113-4). Modeling the impacts of such different forms of buffering would mean taking into account several rather distinct forms of insulation, each with its own somewhat different effect on the administrative systems in question. Indeed, some public organizations might employ simultaneously several different kinds of buffering devices or effort. Investigating all such buffers would be a useful task, but modeling and estimating the impacts of buffering across many such organizations requires some simplification.

In 1999 O'Toole and Meier provided a parsimonious model of public management that incorporated these environmental functions of public management, including a specification of the buffering function. Specifically, after reviewing the extensive case study and qualitative literature on public management, they posited the following model:

$$O_t = \beta_1(S+M_1)O_{t-1} + \beta_2(X_t/S)(M_3/M_4) + \epsilon_t \qquad [1]$$

where

O is some measure of outcome,

S is a measure of stability, denoting structural, procedural, and other elements that support unperturbed production,

M denotes management, which can be divided into three parts

M_1 management's contribution to organizational stability through additions to hierarchy/structure as well as regular operations,

M_3 management's efforts to exploit the environment,

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[2]Of course these two are related. Management can undertake actions that build or alter structural features of the organizations, for instance.

M_4 management's effort to buffer environmental shocks,
X is a vector of environmental forces,
ϵ is an error term,
the other subscripts denote time periods, and
β_1 and β_2 are estimable parameters.

Where does buffering, as we have defined it, appear in the model? It is present as the denominator of the second, or environmental, term:

$$\beta_2(X_t/S)(M_3/M_4) \quad [2]$$

or, after rearranging,

$$\beta_2(X_tM_3)/(SM_4) \quad [3]$$

This term models the impact of the set of environmental forces X_t on outcome O_t. The impact can be leveraged by managerial effort (M_3) or buffered by the combined impacts of stabilizing forces (S) like structure as well as managerial influences aimed at protecting the production system (M_4). Note that this model simplifies by treating the buffering function in mathematical terms solely as a dampener. Eventually, other functional forms can be formally specified and tested, drawing once more from the extensive case-study literature, but this particular version is a useful first step. It is the "SM_4" denominator as a whole, then, that serves as the model's term for buffering.[3]

O'Toole and Meier note that the two terms related to managing the environment could be combined where $M_2 = M_3/M_4$.[4] Thus M_2 incorporates all efforts to manage externally in the environment, in contrast to managing the organization, M_1:

$$O_t = \beta_1(S+M_1)O_{t-1} + \beta_2(X_t/S)(M_2) + \epsilon_t \quad [4]$$

Although much of their work has used this combined M_2 term in a series of papers that demonstrate that management matters and that its impacts can be nonlinear, as the model indicates, they have not addressed four fundamental elements of equation 1. They have not

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[3]As indicated below, we do not develop separate measures for each of the S and the M_4 terms of the model. The measure used in this paper is one for the entire buffering term, encompassing both elements. The model's incorporation of the buffering concept suggests that its impacts on performance are likely to be similar across outcomes. It may nonetheless be that some kinds of performance, affecting certain kinds of groups, are more or less sensitive to the impacts of organizational buffering. This notion is not included in the general theoretical argument being examined but is analyzed in the empirical portion of this paper.

[4]Their argument is theoretical rather than empirical, that is, they have not demonstrated that their measures of these concepts actually combine in this way nor have they demonstrated that their measures cover the full extent of the two concepts (see below).

proposed and validated a measure of M_4,[5] the efforts of managers to buffer the environment; they have not incorporated the structural elements of stability[6]; they have not addressed whether their M_2 measure contains the M_3 and M_4 elements or whether there might be other elements of say M_4 that have yet to be measured; and they have not addressed the hypothetical functional form specified in their model (that is, the reciprocal function).

This paper addresses three of these questions. First, we propose a behavioral measure of environmental buffering that encompasses both structural and managerial activities. Second, we incorporate this measure into an explanation of organizational performance that includes several other management and stabilizing factors as well as measures of resources and constraints. Third, we then brave Occam's razor[7] to determine if the complex nonlinear relationship specified by O'Toole and Meier is the most appropriate functional form, or if a simpler estimation will provide equally good results. In regard to the fourth question, we will assume that because previous measures of M_2 did not specifically address the buffering function, that prior analysis does not explicitly include buffering actions. The model can thus be expanded to contain both M_2, composed of actions seeking environmental opportunities and M_4, an explicit buffering function.

Measuring Buffering

An organization's effort to buffer environmental influences is likely to be effected through a complex combination of both structures (along with associated procedures[8]) and managerial actions. Faced with a turbulent (for a classic treatment see Lawrence and Lorsch 1967) or a relatively stable but hostile environment, organizational leadership has two options. First, decision makers could establish structures (S) that interact with the environment to absorb the environmental pulses and in the process shelter the organization's core technologies (Thompson 1967). In business firms, these structural elements would include organizational units that deal with inventory control for inputs or post-production marketing and distribution of outputs. In a public organization, such structural features might include special legislative affairs or public affairs units designed to handle requests from outside the organization, or an emergency response unit such as a SWAT team or Delta Force. Second, management itself could engage in a set of buffering activities. Management might decide that certain environmental events or

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[5]Nor have they proposed and validated a measure of M_3, the efforts of managers to tap or exploit the environment.

[6]They have estimated the impacts of personnel stability and develop results consistent with their model (O'Toole and Meier 2003b).

[7]*Entia non sunt multiplicanda praeter necessitatem*, or: No more things should be presumed to exist than are absolutely necessary. The principle is attributed to William of Ockham, 14th century philosopher and logician.

[8]For the remainder of the paper we refer to the combination simply as structure.

influences will be ignored, while others will require the intervention of top management, and still others should be programmed for response by specific units – say, an accounting office primed to handle external audits or other challenges regarding expenditures. This buffering component of management (which is termed M_4) might be an ancillary function of management's effort to interact with the environment (M_2); that is, while seeking positive opportunities, managers can also identify negative or threatening forces.

Because the buffering function is a combination of both structure and management, we opt for a behavioral measure of overall buffering, in lieu of trying to separate out the two processes, stipulate operational definitions of each, and then simultaneously test these concepts and the various ways they could combine. This simplification then allows as a first step a validation of the measure of buffering as dampening, and an effort to probe how it affects performance. If this effort is successful, future research will permit an examination of exactly how the buffering process is developed and operated.

If one starts with the basic principle that organizations are autoregressive systems – that what they do today reflects what they did yesterday – then an examination of how autoregressive processes respond to novel events should be useful. Consider the following simple autoregressive system:

$$O_t = \beta_1 O_{t-1} + \beta_2 X_t + \epsilon_t \quad [5]$$

where O is the organization's outcome[9] and X is some type of environmental shock, whether positive or negative from the standpoint of performance.

One unit of any X variable affects output by β_2 in the current year; but because this output then becomes part of the production base of the organization, the impact of one unit of X in the second year becomes $\beta_1\beta_2$. Subsequent years see additional impacts with the size of each year's impact declining in what is termed a geometrically distributed lag. Although a buffering process could operate either on the X term through β_2 or on the O_{t-1} term via β_1, in this assessment our attention will focus on the latter.[10]

Assume two organizations, one with an autoregressive parameter of 0.9 and another with an autoregressive parameter of 0.7. Further assume the occurrence of some environmental disturbance that has an impact of Y on the organization. The following illustrates the impact that this Y-level disruption has on the organization in future years:

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[9]The logic works whether the O variable is defined either as outputs or outcomes.

[10]Again, here we assume the buffering process operates as a dampener rather than as a barrier or a filter. This treatment fits the modeling simplification of O'Toole and Meier and is consistent with the empirical treatment in this paper.

Parameter	Year 0	Year 1	Year 2	Year 3	Year4	Year 5
.9	Y	.9Y	.81Y	.73Y	.66Y	.59Y
.7	Y	.7Y	.49Y	.34Y	.24Y	.17Y

Note how even five years later, all other thing being equal, the environmental disturbance still retains nearly 60% of its impact for the first organization but has fallen all the way to a 17% impact in the second.[11] In organization-theoretical terms, we think of the first unit as tightly coupled; any disturbance, however slight, will reverberate through the organization for a substantial period of time.[12] The second organization is more loosely coupled; events dissipate more quickly over time.[13] This is the pattern that one would expect to see if the organization had established structures and used managerial processes to buffer or reduce the impact of environmental events or forces over time.[14]

How might one get an estimate of the impact of such buffering or loosely-coupled structure on program performance? A simple autoregressive estimation will not work because this coefficient essentially uses a panel of this year's and last year's performance for many organizations; and one cannot, as a result, get an organization-specific estimate with only two points. Our solution is to use the historical data on each of the organizations to establish a baseline to incorporate in time-series estimation extending into a subsequent period. Since our analysis here investigates the years 1995-2002 (see below for the set of organizations analyzed), we use data from 1986 to 1994 for each organization to estimate this buffering process (incorporating therefore both structural and managerial aspects). This approach allows us to have

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[11]All things are not equal, of course, because new environmental events enter this system every year. More recent events could swamp the later-year impacts of this initial event, depending on their size.

[12]Coupling could actually be considered on two dimensions: extensiveness of the interdependent links within the organized system and reverberation through time. Here we focus on the latter and assume the former as constant. For the empirical part of the analysis in this paper, this assumption is reasonable, since the full sample of organizations are structurally alike and similarly specialized.

[13]Near the end of this continuum are networks of organizations, since in the typical case networked units are somewhat interdependent but more loosely coupled. The less autoregressive feature of networks, by comparison with organizations, is explicitly incorporated into the model developed by O'Toole and Meier (1999; see also 2003a).

[14]There can be both internal and external drivers of the autoregressive parameter. We assume the main source of influence over variations in the parameter, among organizations of similar structure and function, is the set of externally generated influences – the X's of the model – during the preceding cycles.

an a priori estimate of buffering that is independent of the actual data used in the study. The specific buffering measure correlates output at time t with output from time t+1 for the 1986-1994 period. This correlation coefficient is transformed into a buffering measure by subtracting it from 1.0 so that larger numbers indicate greater levels of buffering and lower levels indicate less buffering.[15]

Three aspects of this measure merit additional discussion. First, the measure is essentially a system component rather than an event component. It seeks to assess the organization's response to the environment in general rather than in relation to any one specific event or type of external event. It is quite likely that certain events event might generate much greater effort at buffering, depending on their salience and centrality for the organization in question. At the same time, a systematic buffering element is likely to play a role even in these one-time unique occasions, since systemic buffering obviously provides some of the experience and capacity to deal with the more idiosyncratic incidents.

Second, the measure is focused on outcomes. We are ultimately interested in explaining the policy performance of systems rather than, for instance, their internal operations. For that reason, the buffering measure directly taps how an administrative system is or is not protected from having its production – in terms of results – shaped over time by reverberations from earlier events.

Third, the measure opts for parsimony in the composition of the measurement – that is, it is a single measure generalized from past behavior and does not attempt to separate out the individual influences of structure and management. We use this strategy because we are interested in probing the complex functional forms in the O'Toole-Meier model of management. In essence we treat this buffering measure as operating similarly to the M_4 and S terms in the second term of the management model.

Our strategy of analysis is to make some simplifying assumptions in the model and proceed to test this notion of buffering-as-dampening and its various functional forms in a step-by-step process. We start with the base model in equation 1, and regroup the elements in the second term of the model to cluster structure and M_4 together in equation 6:

$$O_t = \beta_1(S+M_1)O_{t-1} + \beta_2(X_tM_3)/(SM_4) + \epsilon_t \quad [6]$$

We then simply this model by focusing solely on the second term of the model, thus eliminating

[15]This measure, it should be noted, is specific to a buffering function that takes on the dampening form. All the systems to be examined empirically, furthermore, are open systems rather than hermetically sealed ones, so systems buffered by dampening can be expected to experience fluctuations – but with the externally driven forces quickly losing their impact.

the autoregressive term as in equation 7.[16] The rationale is that the current investigation focuses entirely on how environmental influences (the X vector) shape performance and may be mitigated by buffering. These elements of the model all appear in the second term.[17]

$$O_t = \beta_2(X_tM_3)/(SM_4) + \epsilon_t \quad [7]$$

Because this is a highly nonlinear form, we first decompose and simplify it as a linear, additive model. Equation 8 displays a linear form that also that includes another term (M, operationalized below) to represent any other relevant management influences:

$$O_t = \beta_1M + \beta_2X_t + \beta_3M_3 + \beta_4(SM_4) + \epsilon_t \quad [8]$$

Equation 8 becomes the basis for the first model that we test. The exact model to be tested is based on measures developed earlier, particularly a measure of M_2 that we will use in place of M_3.

$$O_t = \beta_1M + \beta_2X_t + \beta_3M_2 + \beta_4(SM_4) + \epsilon_t \quad [9]$$

This model now contains a direct test of whether buffering, the last-listed term in [9], contributes to performance.[18] Then we add to this model in a series of incremental steps to determine if more complex forms of the relationships are warranted. First, we determine if including a reciprocal relationship for buffering adds any additional information to the analysis, by estimating equation 10:

$$O_t = \beta_1M + \beta_2X_t + \beta_3M_2 + \beta_4(SM_4) + \beta_5(1/SM_4) + \epsilon_t \quad [10]$$

Because a linear relationship is simpler and more direct, our approach to testing is to employ Occam's razor as a selection criterion – that is, of two competing explanations the simpler one is to be preferred unless the more complex explanation adds significantly to our knowledge. From this perspective, therefore, both the linear and the nonlinear estimations should be included in the same equation. Because the theoretical model contains not only a reciprocal function but also an

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[16]Some of our management and structural variables contain an element of this internal dimension. The choice is between leaving out management elements that are more general or including them even though they might operate within the organization.

[17]Meier and O'Toole (2004) have recently speculated that the first S term in the model may actually be composed of different elements than the second. This point also suggests caution in trying to treat both as identical, and therefore a focus on the second term absent the first is advised.

[18]We are including measures of management developed in other studies to build on the literature in the field. We could simplify the model by dropping all these management terms, but then we would need to add them back into the model to make sure buffering rather than some other factor influenced performance.

interaction, we also test equation 11 which includes an interaction of buffering with managerial networking (M_2) and equation 12 which interacts the reciprocal function with the environmental variables (X).

$$O_t = \beta_1 M + \beta_2 X_t + \beta_3 M_2 + \beta_4 (SM_4) + \beta_5 (M_2/SM_4) + \epsilon_t \quad [11]$$

$$O_t = \beta_1 M + \beta_2 X_t + \beta_3 M_2 + \beta_4 (SM_4) + \beta_5 (X/SM_4) + \epsilon_t \quad [12]$$

Data and Measurement

The empirical approach being used places heavy demands on a data set, especially when numerous alternative functional forms are incorporated into the modeling strategy. Our task is facilitated by using the Texas school district data set, an empirical source with a significant number of well-developed managerial concepts that has been used by a number of public management scholars (Hicklin 2004; Fernandez 2005; Goerdel 2005; Gonzalez Juenke 2005; Hill 2005; Pitts 2005). The data set includes considerable information regarding the more than 1000 school districts in the state of Texas that represent approximately one of every 14 school districts in the U.S. The districts range widely on a variety of dimensions, including student composition (race, ethnicity, etc.), resources, setting (urban, rural, suburban), and performance. Our analysis includes a survey administered in 2000 to the top managers in each unit to ask questions about various approaches to managing the organization. That survey had a 55% response rate; and respondents were no different from nonrespondents on key variables such as enrollment, enrollment growth, students' race, ethnicity and poverty, or test scores. To these survey responses, we added eight years of data (1995-2002) from the Texas Education Agency on organizational performance, resources, student composition and other relevant factors. Because this is a pooled time-series analysis, we included dummy variables for the individual years to deal with serial correlation. We then assessed the degree of heteroscedasticity with pooled diagnostics and found the levels well within acceptable limits.

Our measure of buffering as explicated in the preceding section was unity minus the correlation of school-district outcomes for the period of 1986-94. Given that the primary statewide standardized test (the TAAS) is the central outcome in the state's performance appraisal system, we calculated the buffering measure for that outcome and used it as a measure of buffering in equations using TAAS or other outcomes as the dependent variable. The final measure has a mean of .49 with a standard deviation of .20; it ranges from .03 (a very tightly-coupled system with reverberations important over time) to .999 (a school district well protected from the impacts over time of environmental disturbances).

O Outcome Measures

Although virtually all programs have multiple goals and thus are subject to multiple performance indicators, some objectives are defined by the political environment as more important than are others (O'Toole and Meier 2004). Buffering might well be a strategy used to protect some goals and not others. This study incorporates ten different performance indicators

in an effort to determine how public management affects a variety of organizational outcomes.

Although each performance indicator is salient to some portion of the educational environment, the most noticeable by far is the overall student pass rate on the Texas Assessment of Academic Skills (TAAS).[19] The TAAS was a standardized, criterion-based test that all students in grades 3 through 8 and 11 had to take. The grade 11 exam was a high-stakes test, and students were required to pass it to receive a regular diploma from the state of Texas. TAAS scores were used to rank districts, and the examination results were without question the most visible indicator of performance used to assess the quality of schools. Our measure is the percentage of students in a district who passed all (reading, writing, and math) sections of the TAAS.

Four other TAAS measures were also useful as performance indicators. The state accountability system assesses performance of subgroups of students, and districts must perform well on all these indicators to attain various state rankings. TAAS scores for Anglo, black, Latino and low-income students were included as measures of performance.[20]

Many parents and policy makers are also concerned with the performance of school districts regarding college-bound students. Four measures of college-bound student performance were used – the percentage of student who took either of the college board exams, the average ACT score, the average SAT score, and the percentage of students who score above 1110 on the SAT (or its ACT equivalent). Texas is one of a few states where both the ACT and the SAT are taken by sufficient numbers to provide reliable indicators of both. As with statewide samples where there is no correlation between these scores and the number of students taking them if the proportion of tested students is more than 30 percent of the total eligible to be tested (Smith 2003), Texas scores on the ACT and SAT are generally uncorrelated with the percentage of students taking the exams. The 1110 measure is defined by the state of Texas as an indicator of college readiness.

The final measure of performance might be termed a bottom-end indicator — attendance rates.[21] High attendance rates are valued for two reasons. Students are unlikely to learn if they are not in class, and state aid is allocated to the school district based, in part, on average daily

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[19]The TAAS was replaced in 2003 by the Texas Assessment of Knowledge and Skills.

[20]The various pass rates do not correlate as highly as one might imagine. The intercorrelations between the Anglo, black and Latino pass rates are all in the neighborhood of .6, thus suggesting the overlap is only a bit more than one-third.

[21]We considered using dropouts as a performance measure, but dropout data are very unreliable. In addition, the state of Texas made one significant change in the dropout measure during this time period so that early dropout rates are not comparable to later ones. Accordingly, we omitted this measure from the analysis.

attendance. Attendance, as a result, is a good indicator of low-end performance by these organizations; the measure is simply the average percentage of students who are not absent.

M Management Variables

Managerial networking. This measure (M_2) is intended to get at the reported behavior of school district top managers as they interact with the important parties in the district's environment. Because school districts operate within a network of other organizations and actors who influence their students, resources, programs, goals, and reputation, the extent to which a superintendent manages in the school district's interdependent environment is related to school district performance (Meier and O'Toole 2001; 2003).

To measure the behavioral networking activity of school superintendents, Meier and O'Toole (2001) selected four sets of actors from the organization's environment: local business leaders, other school superintendents, state legislators, the Texas Education Agency. In their mail survey, they asked each superintendent how often s/he interacted with each actor, on a six-point scale ranging from daily to never. Assuming that superintendents with a networking managerial approach should interact more frequently with all four actors than would a superintendent with an approach focused on internal management, a composite network management-style scale was created via factor analysis. All four items loaded positively on the first factor, producing an eigenvalue of 1.82; no other factors were statistically significant. Factor scores from this analysis were then used as a measure of managerial networking, with higher scores indicating a greater networking orientation.[22] This network measure may contain elements of buffering although it was designed to capture the extent of network action rather than buffering or exploiting. Because it does not explicitly ask about buffering behavior, it can be treated as conceptually distinct from our behavioral measure of buffering which is likely to also include a structural element (the correlation between the two measures is -.05).

Managerial quality (M_q) is a notoriously difficult concept to measure. Meier and O'Toole (2002) validated a measure based on the residual from a model explaining salaries of district superintendents. The salary-setting process in Texas school districts approximates a competitive labor market with full information. As a result, management skills should be positively rewarded by the market. To isolate this quality component, they predict logged superintendent salaries with 11 variables measuring job size, human-capital factors, personal characteristics, and prior school-district outputs similar to common salary models in the literature (see Ehrenberg, Chaykowski and Ehrenberg 1988).[23] We replicated that analysis for the years

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[22]O'Toole and Meier use this as a measure of M_2 rather than M_3, but their analysis seems to indicate that the behavior associated with networking is essentially seeking to exploit opportunities.

[23]District characteristics included as predictors are the district's total budget, tax rate, and average revenue per student; these district characteristics are logged. Four human-capital

2000-2002 and created a measure for 1995-2002.

The resulting model predicts 81 percent of the variance in salaries, thus comparing favorably to other models in the literature (and explaining three percent more than did the original Meier and O'Toole estimation). The objective was to remove as many "non-quality" factors as possible from the superintendent's salary. The remaining residuals were then standardized (converted to a mean of 0 and a standard deviation of 1) for use in the subsequent analysis as a rough indicator of management quality. This measure is clearly a messy one, since the residual contains all factors not included in the model. The impact of this measurement error, however, attenuates any relationships between a quality measure and other variables such as organizational outputs.

Managing Upward. In addition to managing in the environment and also on the internal operations of the organization, public managers also have to deal with political sovereigns. O'Toole, Meier and Nicholson-Crotty (2005) revealed that interactions between the superintendent and the school board were fundamentally different from interactions with other environmental actors. Interactions with the school board as an oversight body fit what Moore (1995) describes as managing upward. The measure is a six-point scale on the reported frequency of interactions with the school board, with responses ranging from daily to never.

Stability. O'Toole and Meier (2003b) have developed and validated two aspects of personnel stability. They note in their study, however, that these measures are as much managerially driven as they are separate influences, so we interpret both as aspects of management (M). *Managerial stability* seeks to measure constancy in top leadership; it is simply the number of years the superintendent has been employed by the district *in any capacity*.[24] *Workforce stability* moves this concept down to the street level. It is measured as the percentage of teachers employed by the district during the preceding year who continue to work for the district. For both measures, then, higher scores mean more stability. Data on managerial stability were obtained from the survey respondents; data on teacher stability were provided by the Texas Education Agency. While these measures were initially designed as stability features, we consider them here as aspects of management: specifically, what is usually referred to as

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characteristics are included: experience as a superintendent, tenure in the current job, age, and possession of a doctorate. Personal characteristics included are whether the superintendent is female, black, or Latino. The adjustment for prior year's test scores is also included because we think managerial quality is affected by prior performance, and quality then affects future performance. Over time, in other words, there is reciprocal correlation. The adjustment for this endogeneity is handled via an instrumental variables technique. Six student characteristics and district resources are used as instruments; the purged measure of prior performance is then included in the model.

[24]The measure as a result taps both stability and capacity — the latter in the sense of knowledge about the organization.

personnel management. While not totally under the control of school district leaders, these variables are susceptible to influence by the individuals who make decisions about how such organizations are run.

X Environmental Factors

Any assessment of public program performance must control for both task difficulty and program resources. For school districts, neither of these types of elements is under the substantial control of the districts themselves, and therefore they can be considered key parts of the vector of environmental forces. Fortunately, a well-developed literature on educational production functions (Hanushek 1996; Hedges and Greenwald 1996) can be used for guidance. Eight variables, all commonly used, are included in our analysis – three measures of task difficulty and five measures of resources.

Schools and school districts clearly vary in how difficult it is to educate their students. Some districts have homogeneous student populations from upper middle-class backgrounds. Students such as these are quite likely to do well in school regardless of what the school does (see Burtless 1996). Other districts with a large number of poor students and a highly diverse student body will find it more difficult to attain high levels of performance because the schools will have to make up for a less supportive home environment and deal with more complex and more varied learning problems (Jencks and Phillips 1998). Our three measures of task difficulty are the percentages of students who are black, Latino, and poor. The last-mentioned variable is measured by the percentage who are eligible for free or reduced-price school lunch. All three measures should be negatively related to performance.

While the linkage between resources and performance in schools has been controversial (see Hanushek 1996; Hedges and Greenwald 1996), a growing literature of well-designed longitudinal studies confirms that like other organizations, schools with more resources generally fare better (Wenglinsky 1997). Five measures of resources are included. The average teacher salary, per student instructional spending, and class size are directly tied to monetary resources. The average years of teaching experience and the percentage of teachers who are not certified are related to the human resources of the school district. Class size and noncertified teachers should be negatively related to student performance; teacher experience and teacher salaries should be positively related to performance. The appropriate sign for percent state aid is not clear.

Findings

The linear model estimates for the specification in [9] with the dependent variable as the most prominent outcome measure – overall TAAS pass rate – are found in Table 1. The buffering variable is positively related to overall performance, even controlling for a series of management variables (M) as well as a set of variables covering a series of resources and constraints (X). Although the unstandardized coefficient looks large, the range of the buffering variable is between 0 and 1, so this slope indicates a maximum impact of 3.2 percentage points on the TAAS. In comparison, this size represents approximately half the possible impact of that

attributable to the managerial networking variable. Although our concern is with the buffering measure, the other relationships for the management variables are consistent with earlier research: Each variable is statistically significant and all of them except contact with the school board are positively associated with performance. The control variables are fairly collinear since there are five different measures of resources included. All of the variables except teacher experience, however, are statistically significant; and only the state-aid variable which had an ambiguous sign was not in the predicted direction.

[Table 1 about here]

Table 2 presents abbreviated information from nine additional regressions, each representing the model specified in [9] and one for each of the other dependent variables. The top four lines deal with the impact on TAAS scores for various subsets of students. In each case, greater buffering is associated with higher student scores. The pattern of these coefficients is interesting. Without question the greatest impact of buffering is for African American students, an impact five times larger than the relationship for Anglo students. Similarly, the impact for low-income students is substantially larger than that for all students; and the Latino impact, while only marginally larger, is still greater than that for Anglos. This pattern of results suggests that buffering is particularly valuable for the least advantaged of the organizations' clientele, a finding that is especially interesting given that managerial networking tends to be associated with gains for more advantaged groups (see O'Toole and Meier 2004).

[Table 2 about here]

Buffering also has additional impacts, as a glance at the other relationships in Table 2 attests. Attendance is a basic minimum performance indicator that is focused on disadvantaged rather than well-off students. Although attendance does not vary significantly and is difficult to affect, there is a strong relationship between buffering and higher rates of attendance. We suspect that if one analyzed attendance rates by race, some larger relationships would appear for non-Anglo groups. For the more elite measures, on the other hand, buffering does not do as well. It is associated with more students taking college boards, but it is also associated with *lower* scores on the ACT. Neither SAT scores nor the college-ready percentage is significantly related to buffering. Again, these relationships could be interpreted as consistent with the notion that buffering benefits the more disadvantaged clientele. Expanding the number of students who take the college boards is a policy that benefits students who would not otherwise go on to college. If an increase in the number of test takers is responsible for these declines, a slight drop in ACT scores is a modest price to pay for this greater access to educational opportunities.

Having established that buffering is associated with organizational performance, we turn to the next step: determining if the functional form specified by the theory is correct. Table 3 adds the reciprocal of the buffering variable to the ten equations represented in Tables 1 and 2, thus summarizing ten estimations for equation [10], one for each of the performance measures. If the reciprocal functional form were to add explanatory power, over and above a linear

specification, we should find that the coefficients for this reciprocal variable are statistically significant. In seven of the ten cases, the reciprocal relationship fails to attain the .05 level of statistical significance. Given the large number of cases, the .05 level is not an onerous test. If one dismisses the case of SAT scores with the negative relationship, there are only two cases for which the nonlinear form appears to contribute – low income pass rates and attendance. In both cases the relationship is not strictly linear, but the increase in the overall level of explained variation is minimal. Even in the face of the collinearity necessarily generated by including the variable and its reciprocal in the same equation, the linear coefficient holds up better than the nonlinear version. An overall conclusion, then, should be that – in trimming with Occam's razor – the relationship between buffering and organizational performance is linear rather than nonlinear.[25]

[Table 3 about here]

Table 3 tests a simple reciprocal relationship, while the full theory specifies that buffering as a reciprocal relationship interacts with managerial networking and/or environmental resources and constraints, as indicated in equations [11] and [12]. Table 4 shows abridged results from ten regressions that include an interaction term between the reciprocal and the managerial networking variable. Because that equation also includes linear terms for both networking and buffering, those coefficients are reported in the table as well, in case the interaction achieves statistical significance at the expense of inducing collinearity in the other parameter estimates. In only three cases – overall TAAS scores, the Latino TAAS rate, and SAT scores – is the interaction term statistically significant. In all three cases, the sign of the ratio interaction coefficient is the opposite of the two nonlinear terms (one indicator of collinearity),[26] the size of the coefficients is not large, and the coefficients of determination increase only marginally (not shown). A conservative interpretation of the results in Table 4 would generate the conclusion that the relationship between networking and buffering regarding performance is linear rather than a more complex nonlinear interaction.

[Table 4 about here]

The other possible nonlinear interaction is with the X variables representing external resources and constraints (equation [12]).[27] Because there are eight such X variables, and a set of

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[25]We also experimented with a quadratic estimation and got similar results.

[26]As an illustration, Table 2 shows that networking is positively and significantly related to SAT scores while Table 4 produces a negative and insignificant coefficient.

[27]Meier and O'Toole (2003) have already shown evidence of nonlinearity between managerial networking and certain resources variables, thus supporting the notion that at least some complex relationships indicated in the full specification of the model are supported by evidence.

eight interaction terms would generate an excessive number of coefficients, we converted and simplified the interaction term by first regressing performance on the eight environmental factors and saving the predicted values. This step creates a vector that contributes the full amount of explained variation to the dependent variable. Then we ran ten regressions, one for each of the dependent variables, with the complete set of independent and control variables and included an interaction term between this new resources vector and the reciprocal of the buffering measure. Those results are reported in Table 5. Again the findings are not impressive enough to conclude that the nonlinear interaction term is a superior specification to the linear additive specification, at least for this set of data. Only three of the interaction terms meet the minimum level of statistical significance, and only one of these, for attendance, appears to add anything more than a minimum level of explained variation.

[Table 5 about here]

By examining the functional form of the buffering relationships in comparison with a linear additive model, we find that the nonlinear estimations produce some interesting individual results but are not demonstrably superior to the linear additive ones. In such a circumstance, the principle of Occam's razor holds that the simpler linear models are to be preferred. This finding does not mean that these relationships are linear or noninteractive in all circumstances. For instance, in this analysis we have not probed subsets of the sample to determine if high performers or low performers operate in a manner different from the median organization.[28] Nor have we examined different or unusual combinations of the resources and constraints provided or imposed by the environment to see if selected configurations might produce different results regarding the functional form among these variables. Still, the results here do indicate that the rather more complicated specification entailed in the full model is not necessary in at least some important empirical cases.

Conclusion

In the last few years, increasing evidence has buttressed the proposition that public management matters positively for performance, that multiple functions entailed by management can contribute, and that some of the ways that management shapes performance indeed function in complex (that is, nonlinear) fashions. Further, the evidence has shown that "management" can be construed quite broadly, to entail not merely its operational and short-term manifestations but also stabilizing features of the institutional setting like personnel constancy that are shaped in part by the actions of management, and also the strategy content of public organizations as they operate in their context (Meier et al. 2005).

These findings, and the theoretical arguments on which they are developed, suggest the wisdom of exploring more broadly for the impacts of additional managerial influences on what

[28]In published work, Meier and O'Toole (2003) show that segmenting a sample into slices by performance does demonstrate potentially important differences.

public organizations do. The results also suggest that protecting such an organization's operations, whether directly by management action or indirectly via structural design, can provide performance payoffs. In this light, therefore, an examination of the performance impacts of buffering seems sensible – indeed overdue, in that organizational buffering has been a conceptual and theoretical staple for decades but has not until now been analyzed systematically.

In this study, we have treated buffering as a combination of managerial efforts and structural features that limit the impact of environmental forces on public organizations' performance over time. Rather than differentiating the micro-details of managerial buffering activities, which could be quite subtle and varied, or the structural forms that buffers might take, we have developed a buffering measure that is designed to tap all of these by encompassing results of buffering over a several-year period *prior to* the empirical period under direct examination. Developing such a measure is particularly helpful, in that it does not rely on the details of structural form or managerial action, but instead gathers their accumulated influences into a single measurable term – one that can be tapped for many organizations. We have used the measure to estimate the impacts of buffering, and also to explore some theoretical expectations about the functional form of its influence.

Rather than adopt a heavily inductive approach to these research questions, we have been guided by, and have sought to test, promising modeling ideas offered in recent years in the research literature. The work of O'Toole and Meier has provided the grounding for this effort. Their model offers a fairly direct specification of buffering and its functional form, although it does obviously oversimplify somewhat by including only one buffering variant – the buffer as dampener – while other possibilities are clearly both plausible and extant in at least some organizational circumstances.

The results provide some support for the model's assertions but also some Occam-guided negative findings. A key bottom line is that buffering can help performance. In seven of the ten linear estimations, this conclusion is supported. In only one of the ten equations does buffering have a statistically significant impact in the direction of impairing performance. This general support for the buffering function, it is important to note, appears in a set of well-specified models that contain five other management influences and eight controls for resources and constraints. It seems clear, therefore, that protection of organizational production from potentially disturbing influences can be an important function for those who care about performance, even if "protection" sometimes comes at the price of missed opportunities to tap new resources or acquire new support or jurisdiction. To put the point another way, public organizations can benefit both from protecting their operations internally – for instance, by stabilizing their personnel in front-line and managerial positions (note the full estimation sketched in Table 1, as an example), and also by insulating internal operations from externally generated perturbations.

The results of these analyses offer more than a simple brief for the advantages of buffering, however. For school districts in Texas, buffering clearly helps improve performance

as measured by criteria pertaining, or of most interest, to disadvantaged students. It helps little or not at all for those who are advantaged. This distributional dimension of the results is striking and also highly interesting. In an earlier study, O'Toole and Meier (2004) showed that managerial networking also carries distributional consequences, but with a pattern opposite to that found here for buffering. Networking by top managers in school districts benefits the most advantaged students and does little for those at the other end.

One implication here is that different functions of management, and the various organizational features (like structure) that support management's efforts, can have quite different influences on performance, even if they generally add to outcomes – at least in some aggregate sense. Another has to do with the specifics of these patterns. The results of the earlier study on networking, when combined with the evidence in this paper on buffering, buttress the notions that tapping the external environment can help provide benefits to more advantaged clientele, but stabilizing and protecting the organization from that environment can assist the less advantaged and the most vulnerable. These results in turn offer further evidence on behalf of another finding reported in earlier work: organizational strategy aimed at tapping or exploiting new tasks and territory (in the terms of Miles and Snow (1978), prospecting) can boost outcomes that matter to more advantaged groups, whereas focusing on the now-core task instead (or defending) can produce the most gains for the others (Meier et al. 2005). It would seem that there is no one-size-fits-all production function in public education.

Tapping the opportunities and potential payoffs in the environment certainly has its merits, but it is also clear that the theoretical expectation that buffering can be an important organizational function with performance implications is also valid. Further, it is not surprising that the benefits are particularly apparent for the less advantaged, at least so far as public education is concerned. Poor, minority, and at-risk students typically have precious little in their own personal environments to provide direction, support, and constancy. They and their educational performance should be particularly responsive to the benefits provided by a relatively insulated organizational context for their efforts to achieve. This point in turn carries practical implications for such salient policy questions as whether the apparent mobility (and dynamism) offered by voucher systems is likely to carry costs for the least advantaged, ceteris paribus, and whether the politicization of educational issues like financing and curriculum (as with intelligent design) create distributional negative consequences affecting the least advantaged.

The results of this study also raise questions about the functional form through which buffering operates. The model tested here includes complexity: a reciprocal for buffering, plus interactions with both managerial behavior (networking) and external forces (resources and constraints). The empirical results, however, show only limited and sporadic support for these features over the considerably more straightforward linear form. The latter represents the notion that buffering serves as a simple input to production. In a sense, this set of findings is surprising, since it seems reasonable to hypothesize that buffering elements do more than dampen; one might expect that at least some aspects interact directly with external forces. There is little direct evidence of such interaction in this empirical analysis, however, and Occam's razor, in this

circumstance, calls for trimming to the simpler explanation as the preferred one. We should therefore critically appraise the complex specification offered by O'Toole and Meier. If a linear functional form can be regularly shown to be just as efficient in explanation as one involving the nonlinearities and reciprocal they had incorporated, these features of the model should be rejected. Indeed, those authors indicated early in their research program that they expected their model to be eventually proven incorrect in at least some respects, but they opted explicitly for clear and precise theorizing that could indeed be tested.

This paper has offered such tests of certain portions of that model and has raised questions regarding functional form. But we are a long way from clearly rejecting – or accepting – such theoretical expectations in toto. For one thing, Meier and O'Toole (2003) have shown evidence of other nonlinearities supportive of certain complexities in functional form – interactions between managerial networking and some external influences, to be precise. A prudent additional step, therefore, would be to concentrate on additional analysis of selected resources in the environment, those showing nonlinear relationships with managerial networking, to see if these also interact with buffering. For another, as suggested earlier, different portions of the sample may behave differently (high or low performers, for instance), and interactions can be probed systematically in this regard as well.

In addition, although the measure of buffering developed here holds considerable promise and is validated by the empirical results, the complex functional form specified for testing represents but one among several fashions through which buffering might have its influence. The one studied here is consistent with the mathematics of the model tested, but it may be that other buffering forms both operate in some organizations of interest and also have nonlinear impacts. The tests conducted here do not allow us to sort through these possibilities but instead commingle all school districts into a common data set analyzed via a common specification. So caution is advised. Finally, it is useful to remember that despite the value and richness of the Texas school district data set, it does represent but one public organizational form in one policy domain in one U.S. state. The results of such analysis can be valuable and suggestive, but surely not definitive.

Still, this analysis pushes our understanding of public management and performance forward, and in nontrivial ways. Buffering matters, it matters differently for different performance criteria and constituencies, and it may matter in a linear fashion rather than a more complex one. Additional research is needed to clarify these and related questions, as we have just suggested, but we are now further along the road to a systematic understanding of the determinants of public organizational performance.

References

Burtless, Gary. 1996. *Does Money Matter?* Washington, DC: Brookings.

Ehrenberg, Ronald G., Richard P. Chaykowski, and Randy A. Ehrenberg. 1988. "Are School Superintendents Rewarded for Performance?" In David H. Monk, *Micro-Level School Finance: Issues and Implications for Policy*. Cambridge MA: Ballinger: 337-64.

Fernandez, Sergio. 2005. "Developing and Testing an Integrative Framework of Public Sector Leadership: Evidence from the Public Education Arena." *Journal of Public Administration Research and Theory* 15, 2 (April): 197-217.

Gonzalez Juenke, Eric. 2005. "Management Tenure and Network Time: How Experience Affects Bureaucratic Dynamics." *Journal of Public Administration Research and Theory* 15, 1 (January): 113-31.

Goerdel, Holly T. 2006. "Taking Initiative: Proactive Management in Networks and Program Performance." *Journal of Public Administration Research and Theory* (forthcoming).

Hanushek, Erik.1996. "School Resources and Student Performance." In Gary Burtless, ed., *Does Money Matter?* Washington, DC: Brookings.

Hedges, Larry V., and Rob Greenwald. 1996. "Have Times Changed? The Relation between School Resources and Student Performance." In Gary Burtless, ed., *Does Money Matter?* Washington, DC: Brookings.

Hicklin, Alisa K. 2004. "Network Stability: Opportunity or Obstacle?" *Public Organization Review* 4:121-133.

Hill, Gregory. 2005. "The Effects of Managerial Succession on Organizational Performance." *Journal of Public Administration Research and Theory* 15, 4 (October): 585-98.

Jencks, Christopher, and Meredith Phillips, eds. 1998. *The Black-White Test Score Gap*. Washington, DC: Brookings.

Lawrence, Paul R., and Jay W. Lorsch. 1967. *Organization and Environment*. Cambridge: Harvard University Press.

Lynn, Laurence E., Jr. 1987. *Managing Public Policy*. Boston: Little, Brown.

Meier, Kenneth J., and Laurence J. O'Toole, Jr. 2001. "Managerial Strategies and Behavior in Networks: A Model with Evidence from U.S. Public Education," *Journal of Public Administration Research and Theory* 11(July), 271-295.

Meier, Kenneth J., and Laurence J. O'Toole, Jr. 2002. "Public Management and Organizational Performance: The Impact of Managerial Quality" *Journal of Policy Analysis and Management* 21 (Fall), 629-643.

Meier, Kenneth J., and Laurence J. O'Toole, Jr. 2003. "Public Management and Educational Performance: The Impact of Managerial Networking," *Public Administration Review* 63 (November/December), 675-85.

Meier, Kenneth J., Laurence J. O'Toole, Jr., George A. Boyne, and Richard M. Walker. 2005. "Strategic Management and the Performance of Public Organizations: Testing Venerable Ideas against Recent Theories." Unpublished paper presented at the annual meetings of the American Political Science Association, Washington, DC.

Miles, Robert E., and Charles C. Snow. 1978. *Organizational Strategy, Structure, and Process*. New York: McGraw-Hill.

Moore, Mark H. 1995. *Creating Public Value: Strategic Management in Government*.

Cambridge: Harvard University Press.
Moore, Mark H. 1997. *Creating Public Value: Strategic Management in Government*. Cambridge: Harvard University Press.
O'Toole, Laurence J., Jr., and Kenneth J. Meier. 1999. "Modeling the Impact of Public Management: The Implications of Structural Context," *Journal of Public Administration Research and Theory* 9 (October), 505-526.
O'Toole, Laurence J., Jr. and Kenneth J. Meier. 2003a. "Bureaucracy and Uncertainty," in Barry C. Burden, ed., *Uncertainty in American Politics.* New York: Cambridge University Press, 98-117.
O'Toole, Laurence J., Jr. and Kenneth J. Meier. 2003b. "*Plus ça Change*: Public Management, Personnel Stability, and Organizational Performance," *Journal of Public Administration Research and Theory* 13 (January), 43-64.
O'Toole, Laurence J., Jr. and Kenneth J. Meier. 2004. "Desperately Seeking Selznick: Cooptation and the Dark Side of Public Management in Networks," *Public Administration Review* 64 (November/December), 681-693
O'Toole, Laurence J., Jr., Kenneth J. Meier, and Sean Nicholson-Crotty. 2005. "Managing Upward, Downward, and Outward: Networks, Hierarchical Relationships and Performance," *Public Management Review* 7, 1: 45-68.
Pitts, David W. 2005. "Diversity, Representation, and Performance: Evidence about Race and Ethnicity in Public Organizations." *Journal of Public Administration Research and Theory* 15, 4 (October): 615-31.
Rainey, Hal G. 2003. *Understanding and Managing Public Organizations* 3d ed. San Francisco: Jossey-Bass.
Selznick, Philip. 1949. *TVA and the Grass Roots*. Berkeley: University of California Press.
Smith, Kevin B. 2003. *The Ideology of Education: The Commonwealth, the Market and America's Schools*. Albany, NY: SUNY Press.
Thompson, James D. 1967. *Organizations in Action*. New York: McGraw-Hill.
Wenglinsky, Harold. 1997. *How Educational Expenditures Improve Student Performance and How They Don't*. Princeton, NJ: Educational Testing Service.

Table 1. The Impact of Buffering on Organizational Performance

Dependent Variable = Student Exam Pass Rates			
Independent Variables	Slope	t	p
Managerial Buffering	3.2223	5.25	.0001
Managerial Networking	1.1810	9.58	.0001
School Board Contact	-.7912	5.79	.0001
Management Quality	.6939	5.73	.0001
Management Experience	.0571	4.64	.0001
Personnel Stability	.1532	8.98	.0001
Control Variables			
Teacher's Salaries (000s)	.3186	4.09	.0001
Class Size	-.2391	4.62	.0001
Teacher Experience	-.0087	0.13	.8991
Non Certified Teachers	-.1347	5.54	.0001
Percent State Aid	-.0319	5.30	.0001
Percent Black Students	-.2073	17.01	.0001
Percent Latino Students	-.0922	12.24	.0001
Low Income Students	-.1418	13.45	.0001
R-squared	.64		
Standard Error	7.10		
F	345.04		
N of Cases	4114		

Dummy variables for individual years not reported

Table 2. Impact of Buffering on Alternative Indicators of Performance

Performance Measure	Slope	T-score	R-Square	N
Black TAAS Pass Rate	13.0681	7.23	.48	2503
Latino TAAS Pass Rate	2.9283	2.73	.45	3745
Anglo TAAS Pass Rate	2.5750	4.26	.50	4068
Low Income Pass Rate	4.8122	6.08	.58	4087
Attendance	.3847	5.94	.25	4114
Taking College Boards %	4.8069	3.38	.12	3776
ACT Scores	-.3265	2.60	.39	3522
SAT Scores	-10.9686	1.54*	.48	2902
College Ready %	1.5563	1.72*	.32	3798

All equations control for the five management variables, teacher's salaries, per student instructional funds, class size, teacher experience, percent of teachers not certified, percentage of black, Latino and low income students and yearly dummy variables.

*not significant $p < .05$, two tailed test

Table 3. Buffering: Is the Relationship Linear or Reciprocal?

	Linear		Reciprocal	
Performance Measure	Slope	T-score	Slope	T-score
Overall TAAS Pass Rate	2.2877	2.13	-.1934	1.06*
Black TAAS Pass Rate	13.3745	3.51	.0591	0.09*
Latino TAAS Pass Rate	4.4454	2.00	.3307	0.78*
Anglo TAAS Pass Rate	.9695	0.92*	-.3294	1.85*
Low Income Pass Rate	7.1709	5.18	.4855	2.07
Attendance	.9084	8.03	.1084	5.64
Taking College Boards %	6.5834	2.27	.3805	0.70*
ACT Scores	-.3426	1.32*	-.0034	0.07*
SAT Scores	-52.1820	3.58	-8.1818	3.23
College Ready %	1.4133	0.76*	-.0305	0.09*

All equations control for the five management variables, teacher's salaries, per student instructional funds, class size, teacher experience, percent of teachers not certified, percentage of black, Latino and low income students and yearly dummy variables.

*not significant $p < .05$, two tailed test

Table 4. Does the Interaction with M2 Add Explanation to a Linear Model?

Performance Measure	Networking	Buffering	Ratio	T-score
Overall TAAS Pass Rate	1.9468	3.1950	-.3199	2.88
Black TAAS Pass Rate	.0948*	13.1852	.2337	0.78*
Latino TAAS Pass Rate	1.7959	2.9230	-.5877	3.03
Anglo TAAS Pass Rate	1.6782	2.5435	-.1876	1.73*
Low Income Pass Rate	1.2212	4.7917	-.1714	1.20*
Attendance	.0908	.3841	-.0067	0.57*
Taking College Boards %	.3583*	4.8161	.0971	0.39*
ACT Scores	.1893	-.3369	-.0315	1.45*
SAT Scores	-.6654*	-10.4876*	3.1806	2.69
College Ready %	.3205*	1.5781*	.1927	1.20*

All equations control for the five management variables, teacher's salaries, per student instructional funds, class size, teacher experience, percent of teachers not certified, percentage of black, Latino and low income students and yearly dummy variables.

*not significant $p < .05$, two tailed test

Table 5. Does Buffering Interact with Resources in a Reciprocal Manner?

Performance Measure	Resources	Buffering	X/M4	T-score
Overall TAAS Pass Rate	1.1810	3.1165	-.0003	0.13*
Black TAAS Pass Rate	.7132	14.0069	.0023	0.29*
Latino TAAS Pass Rate	.3863*	5.3821	.0069	1.30*
Anglo TAAS Pass Rate	1.2284	1.6955*	-.0023	1.06*
Low Income Pass Rate	.8097	7.5907	.0073	2.59
Attendance	.0749	.9529	.0015	6.46
Taking College Boards %	.6006	7.1153	.0063	0.95*
ACT Scores	.1124	-.4044*	-.0002	0.35*
SAT Scores	7.2452	-50.9109	-.1011	3.25
College Ready %	.7871	1.8649*	.0008	0.20*

All equations control for the five management variables, teacher's salaries, per student instructional funds, class size, teacher experience, percent of teachers not certified, percentage of black, Latino and low income students and yearly dummy variables.

*not significant $p < .05$, two tailed test