Alignment and Results:

Testing the Interaction Effects of Strategy, Structure, and Environment from Miles and Snow*

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Abstract

Miles and Snow (1978) argue that organizational performance is a function of managerial strategy, organizational characteristics, and the environment. They suggest that strategy's impact on organizational success will be greatest when external and internal factors are in alignment – when, for instance, managerial prospectors in decentralized organizations operate in a turbulent environment. Although many studies have included one or more of these sets of variables, to date no study has remained true to Miles and Snow's contention that optimal performance is a complex interaction of these factors. This study examines three of the Miles and Snow factors – strategy, structure, and the environment – with an appropriate set of statistical tests in several hundred public organizations over a six-year period. The results suggest that at least for this set of organizations, the contingency relationships proposed by Miles and Snow do not hold.

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A basic tenet of contingency theory is that organizational performance is dependent on the type of managerial effort and the context of the organization. One exemplary theory in this regard is offered by Miles and Snow (1978). They posit four managerial strategies – prospecting, defending, reacting, and analyzing – and trace out the basic expected contingencies for prospecting and defending. Strategies work best, they argue, when they are aligned with process, structure, and the environment. Essentially, this notion means that prospecting should be the most effective strategy for decentralized organizations using incremental processes in a turbulent environment, and defending should be the optimal approach for centralized organizations with rational planning approaches in a quiescent environment. To date, no study has taken the Miles and Snow variables and operationalized them in a model that can test whether the contingencies they posit in theory hold up in practice. Studies of private firms have investigated whether the effects of strategy are moderated by the environment (Davies and Walters, 2004; James and Hatten, 1994), organizational structures (Jennings and Seaman, 1994), and processes (Slater, Olson and Hult, 1996). None of these studies, however, has sought to capture the effects of the multiple contingencies postulated by Miles and Snow. The most recent public sector work using Miles and Snow in the UK (Andrews, Boyne, and Walker 2006) and the U.S. (Meier, O'Toole, Boyne and Walker 2007) tests individual elements but fails to investigate the intriguing contingencies of the theory. This study takes a first step in that direction and examines three of the four variables – strategy, structure and the environment – to determine if the contingencies sketched by Miles and Snow do indeed increase performance.

First, we introduce the ideas of Miles and Snow and trace the contingencies in their theory of management. Second, using the theoretical arguments, we demonstrate that the appropriate test of Miles and Snow is a complex set of interactions that generate specific testable hypotheses. Third, we test this model in a large sample of several hundred public organizations over a six-year period. Finally, we discuss the implications of our findings for public management theory and its empirical study.

Strategy Content and Organizational Performance

Strategy content is the Paris Hilton of Miles and Snow's theory; it gets far and away the greatest attention from scholars of management, primarily because the idea that strategy influences organizational performance is a central element of generic management theory. Strategy can be characterized as senior managers' response to the constraints and opportunities that they face (Miles and Snow 1978; Donaldson 1995). The better the fit that an organization achieves with external circumstances, the more likely it is to win financial and political support, and thereby improve its performance. Miles and Snow (1978) consolidated prior research by developing a typology of strategy content that contained four "ideal types." *Prospectors* are organizations that focus on innovation and explore new markets and services. They are often pioneers and "first movers" in their industry. *Defenders* are organizations that take a conservative view of new product development. They typically compete on price and quality rather than on new products or markets, and stick to their core business with a focus on improving efficiency. *Analyzers* represent an intermediate category, sharing elements of both prospector and defender. Analyzers closely monitor the actions of their rivals, evaluate what works, and modify their strategies accordingly. *Reactors* are organizations in which top managers frequently perceive change and uncertainty in their organizational environments but

typically lack an actual strategy. A reactor waits for cues or instructions from powerful stakeholders in its environment.

The central contention of Miles and Snow is that prospectors, defenders, and analyzers perform better than reactors, a finding supported in a number of private sector studies (e.g., Conant, Mokwa, and Varadarajan 1990; Hawes and Crittenden, 1984; Shortell and Zajac 1990). Boyne and Walker (2004) criticize the Miles and Snow framework because it places organizations in mutually exclusive boxes and assumes that each organization has only a single strategic stance. They argue that organizations' strategies are messy and complex rather than neat and simple. A mix of strategies is likely to be pursued at the same time, so it is inappropriate to categorize organizations as belonging solely to a single type (e.g. reactor or prospector). This logic also implies that the "analyzer" category is redundant because all organizations are both prospectors and defenders to some extent (although the balance will vary with the priority attached to these stances, and that attached to a reactor strategy).

This modified version of the Miles and Snow model of strategy content has subsequently been tested on English local authorities. Andrews, Boyne and Walker (2006) examine the relationship between strategy and organizational performance in a multivariate model that also controls for external constraints. The empirical results reveal a hierarchy of strategy types: the impact of prospecting is positive, defending neutral, and reacting negative. Thus, controlling for the presence of other strategic stances in an organization, prospecting is the best option and reacting is the worst. Meier et al. (2007) take the work of Miles and Snow and integrate it into a more general model of management theory. This theory is then applied to a large sample of Texas school districts. The findings suggest more complexity than previous work; prospecting is not always the most successful strategy. For some types of goals, defending is a preferred

strategy. Nevertheless, this evidence is consistent with the view that strategy matters not only in the private but also the public sector.

Strategies and Organizational Characteristics

Miles and Snow (1978) argue that strategy is a way of adjusting the relationship between an organization and its environment, and that internal structure in turn must fit the strategy if this adjustment is to be successful. Organizations face not only an "entrepreneurial" problem (which strategy to adopt), but also an "administrative" problem (the selection of structures that are consistent with the strategy). They argue that, over time, strategy and structure reinforce each other: organizations choose an administrative system that is consistent with their strategy and then find that this system continues to propel them in the same strategic direction. This perspective leads to the view that prospectors and defenders operate with distinctive structures – at least if their alignment is in order – whereas reactors, lacking a coherent and stable strategy, can be expected to have no consistent internal arrangements.

The major aspect of organizational structure that Miles and Snow (1978) discuss is the extent of decentralization. They argue that, for defenders, "the solution to the administrative problem must provide management with the ability to control all organizational operations centrally" (1978, p. 41). This idea derives from the notion that a defender is attempting to maximize the efficiency of internal procedures. A defender thus resembles a classic bureaucracy in which "only top-level executives have the necessary information and the proper vantage point to control operations that span several organizational subunits" (1978, p. 44). By contrast, a prospector spreads power much more widely between parts of the organization, because it is encouraging flexible and innovative behavior that will allow it to locate and exploit opportunities for new ventures. The prospector's administrative system "must be able to deploy and

coordinate resources among many decentralized units and projects rather than to plan and control the operations of the entire organization centrally" (1978, p. 59). Power is devolved to middle managers and front-line staff so that they can apply their "expertise in many areas without being unduly constrained by management control . . . jobs are broadly defined in order to permit maximum autonomy" (1978, p. 62). The theory holds that reactors, unlike defenders or prospectors, have no predictable organizational structure: some may be centralized while others are decentralized.

Organizational processes are also worthy of systematic investigation along with the extent of organizational decentralization. As indicated below, however, we lack measures of strategy process in the dataset employed for the current research. Consequently, here we include process in the modeling sketched later, but omit process from the empirical portion of the analysis. Instead, we explore only the other elements of the argument, including that involving organizational structure, and whether their alignment with strategy as theorized by Miles and Snow is related in the predicted fashion to performance.

Strategies and Environmental Turbulence

Although the strategy-environment fit is an important element in the Miles and Snow model, it receives less attention than the alignment of strategy with internal structures. Nevertheless, it is clear that Miles and Snow have an "adaptationist" view of the link between strategy and environment, and believe that organizations have the discretion to adopt the strategy that is best suited to the circumstances that they face. Indeed, they argue that organizations must complete all stages of the "adaptive cycle" successfully – aligning strategy with the environment and the internal "administrative system" – in order to achieve high performance. They follow Burns and Stalker (1961) in arguing that an organic structure is required in an uncertain

environment, whereas a mechanistic structure is appropriate in a predictable and stable environment. By extension, prospecting is likely to be advantageous in an unpredictable and fluid environment, because this strategy involves external scanning for new opportunities and flexible structures and processes that facilitate responses to new circumstances. By contrast, prospecting can be a liability in a placid environment, because extensive investment in scanning the market and developing new services is likely to be wasteful and inefficient. Miles and Snow argue that defending is likely to bring benefits in an environment that changes little from year to year, because existing internal arrangements can be fine-tuned to meet known needs and to maximize the efficiency of procedures that are "tried and tested." Defenders tend to look inward at their own processes, so they may be taken by surprise by environmental change, and lack the capacity and skills to deal with turbulence.

Miles and Snow provide little discussion of the impact of environmental turbulence on a reactor strategy. They argue that "reactors are unstable organizations because they do not possess a set of mechanisms which allows them to respond consistently to their environments over time" (Miles & Snow, 1978, 93). This suggests that reacting will not be consistently linked to any set of external circumstances, including turbulence. Since Miles and Snow's (1978) overall theoretical expectations are sketched most fully for prospectors and defenders, we concentrate on these strategies in the modeling and testing in this study.

Appropriate Models

The best way to illustrate the limitations of previous research on this subject is with a series of equations. Let us start with a simple model in which organizational performance (O) is a function of strategy (S) and a set of environmental factors that encompasses both resources and constraints (X):

$$O = \beta_1 S + \beta_2 X + \varepsilon \quad [1], \text{ where } \varepsilon \text{ is a error term.}$$

The most basic way to include more of Miles and Snow's full[1] theoretical argument in this formulation is to simply include measures of decentralization (D), incremental processes (P), and environmental turbulence (T) into the model in a linear additive way (note this transforms the X variable into environmental factors minus the turbulence of those factors, or X'):

$$O = \beta_1 S + \beta_2 D + \beta_3 P + \beta_4 T + \beta_5 X' + \varepsilon \quad [2]$$

One might even add other aspects of management (M) to this equation such as managing in the networked surroundings of the organization or managerial efforts to enhance organizational stability:

$$O = \beta_1 S + \beta_2 D + \beta_3 P + \beta_4 T + \beta_5 X' + \beta_6 M + \varepsilon \quad [3]$$

Equation [3], however, is not a test of Miles and Snow. It can show whether strategy is related to performance but not whether a given strategy is the optimal one in the context of the environment, structures, and process. For the sake of simplicity, let us take this theoretical issue in somewhat smaller steps for modeling and simply start with the idea that strategy should be contingent on environmental turbulence, thus including an interaction term for strategy and turbulence (S*T, or ST) in equation [4]:

$$O = \beta_1 S + \beta_2 D + \beta_3 P + \beta_4 T + \beta_5 ST + \beta_6 X' + \beta_7 M + \varepsilon \quad [4]$$

Estimating this equation and then calculating the impact of strategy at different levels of organizational turbulence can then answer the question of whether the effectiveness of strategy is contingent on the environment. To illustrate, if we measure strategy as being a prospector, then

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[1]In the modeling offered in this section, we begin by including also the organizational processes that Miles and Snow consider as an element of the "alignment" idea. The current paper does not test this aspect, however, so we have omitted it in the subsequent empirical analysis.

we would expect a positive relationship between prospecting and performance when turbulence is high. This reasoning suggests that the coefficient β_5 should be positive (and that the addition of the interaction term improves the fit of the model over the same model without the interaction term). Determining the contingent impacts and their significance is simply a matter of some algebra calculations and the adjustment of standard errors.[2]

Equation 4 contains the interaction of only two variables, strategy and environmental turbulence. As one adds more contingencies, the models get dramatically more complex. To illustrate, let us set up the model for strategy as contingent on both environmental turbulence and structure (or decentralization). Initially, one might start out with the only slightly more complex model in equation [5] that includes the strategy and structure interaction (SD):

$$O = \beta_1 S + \beta_2 D + \beta_3 P + \beta_4 T + \beta_5 ST + \beta_6 SD + \beta_7 X' + \beta_8 M + \varepsilon \quad [5]$$

This model, however, does not allow for the possibility that environmental turbulence and structure together have more influence on the context of strategy than they do separately. A more complete model requires a three-way interaction of strategy, structure, and the environment:

$$O = \beta_1 S + \beta_2 D + \beta_3 P + \beta_4 T + \beta_5 ST + \beta_6 SD + \beta_7 SDT + \beta_8 X' + \beta_9 M + \varepsilon \quad [6]$$

At this point, interpreting the models becomes more complex. To illustrate, the slope for strategy becomes the following:

$$\beta_1 + \beta_5 T + \beta_6 D + \beta_7 DT \quad [7]$$

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[2]The individual coefficients by themselves can often be very misleading. The coefficient for strategy also is now the marginal effect of strategy on performance when turbulence is equal to zero and the other factors in the model are held constant. Because the situation where turbulence is zero might be well outside the range of the data, the zero order coefficient might be meaningless.

In other words, the impact of strategy on the performance of the organization is a function of the value of decentralization, the value for environmental turbulence, the product of the values of decentralization and environmental turbulence, and a constant. This complex relationship can be illustrated either via graphs or with the use of representative values of the variables in question. If the variables are coded in a consistent direction (that is, strategy is a measure of prospecting, decentralization takes on higher numbers as the organization decentralizes, and turbulence takes on higher numbers as the environment gets more turbulent), then the sign for the three-way interaction (β_7 in equation 6) must be positive to be consistent with Miles and Snow's hypotheses.

The models needed for assessing all four aspects of Miles and Snow (strategy, structure, process, and the environment) become even more complex. In addition to a four-way interaction term, they would also include three three-way interaction terms so that all possibilities would be covered. Miles and Snow present precise arguments amenable to clear mathematical representation, and one contribution of theory is to provide precise predictions that are capable of empirical assessment. To test the alignment notion with respect to strategy, structure, and the environment – the goal of this paper – we work from the specification provided in equation [6].

Sample and Measures

Testing Miles and Snow in this fashion places heavy demands on a data set; estimation will inevitably generate a high degree of collinearity among the predictor variables, given the several interaction terms included in the model. In addition, testing the theory requires that we be able to measure the concepts included in the Miles and Snow theory within a single data set. 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 large number

of public management scholars (Hicklin 2004; Goerdel 2006; Pitts 2005; Fernandez 2005; Gonzalez Juenke 2005, Hill 2005). This data set contains measures of strategy, structure, and environmental turbulence. Unfortunately, it does not contain a measure of process (rational planning v. incrementalism), so we are able to test only three of the Miles and Snow contingencies.

Our data are drawn from two sources. In 2000 and 2002 Meier and O'Toole surveyed the 1000+ Texas school district superintendents on management styles, goals, and time allocations. Their return rates were 55 percent in 2000 and 60 percent in 2002.[3] Pooling six years (2000-2005) of data on performance and control variables produces a total of 3041 cases for analysis. Missing data on individual items reduces this number somewhat in individual equations. All nonsurvey data were from the Texas Education Agency.

All management studies need to be set in context to permit comparisons across investigations. Although schools and school districts are the most common public organizations in the United States, they have some distinct characteristics. School districts are highly professionalized with elaborate certification processes for various occupations. The organizations themselves are fairly decentralized with substantial discretion vested at the street (classroom) level, albeit with some variation on this dimension. Despite these common features, districts themselves are highly diverse. They range from urban to rural, rich to poor, and homogeneous to heterogeneous, as one would expect given that Texas contains eight percent of all school districts in the United States.

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[3]Districts responding to the surveys were no different from nonrespondents on key variables such as enrollment, enrollment growth, students' race, ethnicity and poverty, or test scores.

School districts in the United States are generally independent[4] local governments with their own taxing powers; all districts in the sample are organized in this way. The state of Texas, the locus from which our sample is drawn, operates a relatively decentralized system, with most authority residing with the local school districts. Each district determines its own curriculum and makes all its own personnel decisions.

Strategy Measures

We tap the strategy content of school districts by asking the districts' top managers about their perspectives on the crucial distinguishing features of the Miles and Snow types. The measures used are designed to capture an important portion of top managers' strategic approaches. They are not perfect but do provide reasonable operational meanings for the complex perspectives apparent in managerial and organizational decision making.

A *defender* is a manager who focuses the organization on its key tasks and seeks to be more efficient/effective in those tasks. The superintendents were asked to rate the priority given to five different tasks (improving Texas Assessment of Academic Skills (TAAS) scores, focusing on college-bound students, emphasizing vocational education, improving bilingual education, supporting extracurricular activities). While all of these goals have some support, the primary method of assessing school district performance and the most salient of the goals is performance on the TAAS, a standardized academic skills test. Superintendents were also asked to rate seven factors in terms of their influence on decisions, including efficiency. We created a measure of defender strategy with a factor scale that taps the importance of TAAS and also the

[4]Independent means that the school district is not subordinate to another unit such as a city. Independent districts have their own elected board, have the ability to tax and set budgets, and acquire bonding authority by a vote of the residents.

stress on efficiency.[5]

Reactors essentially have no strategy in regard to the environment but rather wait until something happens. In many cases, both cues from the environment and decisions about what to do in response to these cues can be taken from regulatory agencies, in this case the Texas Education Agency. Superintendents were asked to rank seven factors in regard to their influence on policies adopted by the district (parents, the school board, desire for efficiency, etc.) including the Texas Education Agency. The actual measure was the ranking given the TEA with highest ranking assigned a value of 7.[6]

Prospectors are managers who seek opportunities to exploit the environment. We expect prospectors to both value change *and* take action. To tap the change orientation, we use the superintendent's agreement (4-point scale) with the statement "A superintendent should advocate major changes in school policies." To incorporate the action component, we use additional information about our management networking measure, discussed below, which deals with the frequency with which superintendents interact with key stakeholders in the environment. Prospectors are expected to be more aggressive in these environmental efforts, so we asked the

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[5]The TAAS measure gives the highest ranking goal a measure of 5, the next highest 4, and so on. The score for the TAAS is then divided by the average score for the other four goals. Because the respondents omitted some ranks and coded some ties, the measure is not merely a linear transformation of the ranks. The efficiency measure is a scale from 1 = most important to 7 = least important. The indicators are essentially uncorrelated with each other.

[6]At the suggestion of an earlier anonymous reviewer, we tried using the school board as the institution that drives reactors. When we did, the regressions produced ten insignificant relationships out of ten. One might also think that reactors might respond to all elements of the environment, and a more general measure might be valuable, but because the question asks for rank order, using all seven items creates a set of perfectly collinear variables. In addition, TEA was ranked as most important influence on decisions by 57.8% of the superintendents, far greater than those who ranked the school board (15.6%), parents (4.8%), or teachers associations (0.2%) as number one.

superintendents which party – the top manager or the external actor – initiated the most recent contact involving the specific environmental actor in question. Managers were queried in this fashion regarding each of seven different environmental actors – local business leaders, parent groups, teachers' associations, other superintendents, state legislators, the Texas Education Agency, and federal education officials. Prospectors are more likely to initiate contacts as they aggressively seek opportunities to exploit. The prospector measure is an index that combines the number of times the interaction was initiated by the superintendent (for an alternative interpretation see Goerdel 2006) with the superintendent's endorsement of change. This behavior should be considered initiating behavior rather than reacting behavior because the superintendent does not wait for stakeholders to contact him or her but rather takes the initiative in such interactions. Including a behavioral element in this measure also ties the measure to *activities* by the superintendent rather than simply tapping an attitudinal preference that may or may not result in any activity.

Environmental Turbulence

Miles and Snow argue that prospecting is a strategy that will be more effective when environments are turbulent – that is, rapidly changing. Similarly, they suggest that defenders might do well in a placid environment. For school districts, we think the key elements of the environment are resources, along with the number and types of students. We use five measures to tap the district's environment: the total revenues of the district, the total number of students in the district, and the percentages of black, Latino and low income students in the district. The number of students indicates the size of task the organization faces; the composition of the student body is an indicator of how difficult it will be to educate the students; and the revenues are the resources that can be used in this pursuit.

To measure turbulence, we take the log of each of the five variables and regress it on the log of last year's values. This autoregressive estimation was proposed by Rattsø (1999) as the way to estimate exogenous shocks to European budgeting systems. The residuals from this equation essentially estimate in proportional terms how much current resources, task size, and task difficulty are different from what would have been expected based on experience from the past. In short, this approach deals with the unexpected aspect of the change in resources from year to year. Because we are interested in turbulence rather than whether or not the environment gets more munificient, we take the absolute value of these residuals and sum them over the five indicators. The measure has a mean of .378 and a standard deviation of .308. A mean of .378 suggests that the average school district experiences a change of 7.56% on average over the five indicators. The turbulence measure ranges from 0 to 2.97, thus suggesting that these districts face a wide range of environments in terms of turbulence.

Decentralization

Decentralization is a structural component; it represents the degree to which functions, processes and decisions are carried out centrally or in more dispersed locations. Within the education policy literature, there are strong arguments for a version of reform called "school-based management," where responsibilities are moved from the central office and pushed down to school level. Our indicator of decentralization is the proportion of all employees who are not located in the central office (we measure decentralization rather than centralization to keep the direction of the variable consistent with the theory). School districts are generally decentralized organizations; in this sample they have a mean of .93 (the average district has seven percent central office staff) with a standard deviation of .054. Table 1 shows the correlations among these key independent variables.

[Table 1 about here]

Performance Indicators

Although virtually all programs have multiple goals and thus are subject to multiple performance indicators, some objectives are defined as more important by the political environment than are others (O'Toole and Meier 2004). This study incorporates two different performance indicators that are linked to two somewhat separate objectives in an effort to determine how strategic management affects organizational outcomes.

Clearly the most salient performance indicator in Texas is the overall student pass rate on the Texas Assessment of Academic Skills (TAAS) and its successor the Texas Assessment of Knowledge and Skills (TAKS). The TAAS/TAKS is a standardized, criterion-based test that all students in grades 3 through 8 and 11 have to take. The grade 11 exam is a high-stakes test, and students are required to pass it to receive a regular diploma from the state of Texas. TAAS/TAKS scores are used to rank districts, and the examination results are 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.

Many parents and policy makers are also concerned with the performance of school districts regarding college-bound students. Although a large percentage of high school students go on to college, we focus on the very top end of students since these are the students least likely to be affected by emphasis on standardized tests and the most likely not to get the special attention they need if districts focus too much on the TAAS/TAKS. Our measure is the percentage of students who score above 1110 on the SAT (or its ACT equivalent). This score is equivalent to scoring in the top 20 percent of all students nationwide and is used by the Texas

Education Agency as a measure of college readiness.

Control Variables

We control for a series of management variables that Meier et al. (2007) included in their assessment of Miles and Snow. *Managerial networking* is a measure of how frequently the school district top managers interact with the important parties in the district's environment (Meier and O'Toole 2001; 2003). Meier and O'Toole (2001) created this measure by asking school superintendents how frequently they interacted with four sets of actors from the organization's environment: local business leaders, other school superintendents, state legislators, and the Texas Education Agency (using a six-point scale from daily to never). 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.[7]

Managerial quality is a measure based on the residual from a model explaining salaries of district superintendents. Because the salary-setting process in Texas school districts

[7]The networking measure is from the 2000 survey while the prospecting measure is from the 2002 survey. This was done to reduce the potential overlap between the two concepts; the prospecting measures were asked only on the 2002 survey. Because not all respondents in the 2000 survey also responded to the 2002 survey, we coded the missing prospector values as equal to the mean. This coding means the imputed missing values will have no influence on the relationships in the regression but at the same time allow us to retain as many cases as possible. Using a network measure based on the 2002 survey produced generally similar results (this occurred whether the analysis used a network measure based on four nodes or seven nodes). The measures developed for initiating and for managerial networking, therefore, tap quite different features of managerial action. The former, as measured in this analysis, includes only the self-initiation aspect of managers' external efforts; the latter includes only the extent and frequency of managers' networking behavior and ignores the question of who initiates the interactions (see Goerdel 2006). This distinction is essential to avoid confusing attention to the networked environment, which could be defensive or reactive in nature, with efforts to exploit new opportunities. Both measures are included in the analyses that follow.

approximates a competitive labor market with full information, management quality should be positively rewarded by the market. Meier and O'Toole (2002) isolated this quality component by predicting 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).[8] 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.

Managing Upward considers how managers interact with political sovereigns. As proposed by O'Toole, Meier and Nicholson-Crotty (2005), the measure is a six-point scale on the reported frequency of interactions with the school board, with responses ranging from daily to never. O'Toole and Meier (2003) also have developed and validated two aspects of personnel *stability* that are linked to management. *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*.[9] *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.

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[8]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 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.

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

Any assessment of public program performance must also 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

We begin our analysis by replicating the base findings of Meier et al. (2007) but with the addition of environmental turbulence and decentralization as explanatory variables. Because our concern is the interaction of strategy with turbulence and decentralization, we limit our discussion to those relationships. The other relationships are generally similar to those found in the extant literature. The first two columns of Table 2 show the results for the TAAS/TAKS pass rate. Similar to the findings of Meier et al. (2007), we show that defending rather than prospecting is the better strategy. An increase of one standard deviation in defending as a strategy (the measure is standardized) is associated with an increase in TAAS/TAKS pass rate of a third of a point, all other things being equal. Prospecting as a strategy is not related to performance on this outcome in a statistically significant manner. Because this model also includes decentralization and turbulence, these relationships should be briefly noted. Both turbulence and decentralization are negative factors. Organizations facing a turbulent environment are likely to do less well, a finding consistent with much of organization theory. Decentralized organizations also are likely to do less well, a finding that might be troublesome to the education policy literature. The size of the coefficient for decentralization looks large, but bear in mind that this variable is measured as a proportion, and so a 5.4 percentage point increase in decentralization (about one standard deviation) would decrease TAAS/TAKS pass rates by only about one half of a point.

[Table 2 about here]

The other two columns of Table 2 present the results for high scores on the SAT or ACT.

The results again mirror closely those found in Meier et al. (2007). Prospecting is clearly a superior strategy to defending. Prospecting is positively and significantly related to high college board scores while defending is negative but insignificant. Reacting appears also to be a positive strategy, an anomaly similar to that found in Meier et al. Turbulence, as predicted by the literature, has a negative and statistically significant impact on student performance. Unlike the relationship for TAAS/TAKS, however, decentralization is positively associated with high scores for college-bound students. One reason for this relationship might well be that decentralization allows schools in high socioeconomic-status areas to adjust their curricula and resources to focus on college-bound children and not worry about failing to meet standards on the less ambitious TAAS/TAKS.

Table 3 provides the relevant coefficients when the interaction of strategy with turbulence is added to the equations in Table 2. The coefficients and t-scores by themselves often do not have a substantive interpretation, but rather provide the raw material to calculate the marginal effects of strategy contingent on turbulence (other coefficients could calculate the marginal effects of turbulence on performance contingent on strategy). Column 1 of Table 3 shows that, in the case of pass rates on the standardized exam, the slope for prospecting for any value of turbulence is represented by the following formula:

$$\text{Slope} = -.3295 + 1.0669 \times \text{Turbulence}$$

One good way to illustrate this contingent impact is to calculate the slope for prospecting when turbulence is equal to its mean value (0.378), its mean value minus one standard deviation (0.070), and its mean value plus one standard deviation (0.686). This provides good representation of the slope values, since in the case of turbulence approximately 85% fall with in this range.

[Table 3 about here]

The top portion of Table 4 presents these marginal-effect calculations for TAAS/TAKS scores. At low values of turbulence, being a prospector is actually negatively related to performance (and that negative coefficient is statistically significant). This finding is consistent with Miles and Snow's argument that prospecting is likely to be harmful to performance in a placid environment, because resources are wasted on unnecessary research and development. At average levels of turbulence, prospecting has no impact on TAAS/TAKS scores; but at high levels of turbulence, prospecting has a significant positive impact. This finding is consistent with the arguments of Miles and Snow that a dynamic environment requires a dynamic strategy.. The impact of prospecting increases as the environment gets more turbulent. Perhaps the best systematic test of this hypothesis is that the slope for high and low turbulence are statistically different from each other.

[Table 4 about here]

The remainder of the table, however, does not support Miles and Snow. The second column in the top half of the table indicates that defenders also have a larger impact on TAAS/TAKS scores when environments get more turbulent and the difference is significant. Miles and Snow would contend that defending becomes less effective in this situation, because fit can be retained only if environmental change is accompanied by strategic change.

Moving to the bottom half of Table 4, one can see that the evidence for both strategies is consistent but not supportive of Miles and Snow. On the college boards measure, prospecting's impact is unrelated to the level of turbulence as is defending's impact in the same situation. The coefficients do not change appreciably as the environment gets more turbulent. These null findings are inconsistent with the logic of Miles and Snow and should be taken as evidence to the

contrary. Thus only one of the four sets of coefficients in table 4 supports Miles and Snow's model: the impact of prospecting on TAAS/TAKS is stronger in a more turbulent environment.

The final comparison that can be made in Table 4 is the bottom-line comparison. Because the two measures of strategy are both standardized scores, they have the same mean and variance and thus can be compared for relative size of impact. The result of this comparison shows that it is not turbulence that is the key factor but rather the policy outcome. In support of this finding, the joint f-tests show that the interactions are borderline significant for TAAS/TAKS and insignificant for the college boards. For TAAS/TAKS, defending is always the preferred strategy regardless of the level of turbulence. For college boards, prospecting is the preferred strategy, regardless of the level of turbulence. The joint f-tests are also directly relevant to Miles and Snow since their theory predicts these tests will be statistically significant; however, that is not the case for the SAT/ACT indicator and only marginally the case for the TAAS/TAKS.

The marginal-effect coefficients for the impact of strategy on performance contingent on decentralization are found in Table 5. Recall that decentralization should benefit prospectors but hinder defenders. The prospector's coefficients for TAAS/TAKS in column 1 of the top half of the table indicate just the opposite. Prospecting is an effective strategy when decentralization is low; as decentralization increases, prospecting has a negative and significant relationship with performance. The bottom half of the table further indicates that decentralization has no impact on the relationship between prospecting and performance for the college boards. Neither set of findings supports the theoretical claims of Miles and Snow, and one set of findings concludes the exact opposite.

[Table 5 about here]

In contrast to prospectors, defenders have relationships that are as expected in Miles and

Snow. Defenders do best in centralized organizations in terms of the TAAS/TAKS. The relationship remains positive for all values of decentralization but gradually declines to insignificance as the organizations become highly decentralized. For college board scores, the findings are much more dramatic. Defending has a strong positive relationship with college board scores in centralized organizations and a strong negative relationship in highly decentralized organizations. In sum, only two of the four sets of coefficients in table 5 are consistent with Miles and Snow's arguments on the benefits of a fit between strategy and structure.

Again in comparing the two strategies, we get mixed results. In centralized organizations, prospecting is a better strategy for the TAAS/TAKS but defending is the better strategy for college boards. In highly decentralized organizations, neither strategy works for the TAAS/TAKS (although defending is positive but not significant) and prospecting is to be preferred on the college boards. Again, it appears the goal rather than structure is driving the results. Although the joint-f test for TAAS/TAKS is significant, it provides no support for Miles and Snow because the relationships are not in the predicted direction.

Tables 4 and 5 show the impacts of turbulence and decentralization in isolation, and Miles and Snow could argue that in combination they produce the predicted results. Although it is unlikely that such partial effects as found in Tables 4 and 5 will combine in ways that suddenly reverse directions and support the theory, the most appropriate test is to examine the full three-way interactions. Table 6 provides these contingent slopes for the TAAS/TAKS equation. Note that with low, medium and high values for both turbulence and decentralization, nine different contingent slopes are calculated for each variable. In examining the pattern of relationships for prospecting, we should keep in mind that Miles and Snow contend that prospecting pays off best

when turbulence is high and organizations are decentralized. Such a pattern would generate higher slope values as one moved from left to right on the table and from top to bottom with the highest slope in the lower right hand corner. Two things are apparent. Decentralization always detrimentally affects the impact of prospecting on TAAS/TAKS. Turbulence interacts with prospecting to produce positive benefits only in highly *centralized* organizations; in highly decentralized organizations it produces the opposite result.

[Table 6 about here]

The bottom half of Table 6 presents the coefficients for defenders. According to Miles and Snow, defenders should do better as one moves to the top left hand corner of the table, in low turbulence environments with centralized organizations. The pattern in fact shows that defenders do better as environments get more turbulent, regardless of the level of decentralization. The highest slopes, in fact, appear where they are least expected–highly decentralized organizations in turbulent environments. Even more troubling for the Miles and Snow theory, if we compare the cells of the top and bottom halves of the table, we find that defenders outdo prospectors, usually by large margins in decentralized organizations with turbulent environments. Prospectors outdo defenders only in centralized structures with medium levels of turbulence (and then only marginally), and centralized settings are precisely those in which, Miles and Snow would argue, defenders might have an advantage.

Given the previous findings of differences based on outcome measure, we probably should not expect the same findings for college board scores – although the theoretical expectations that prospectors will shine in the lower right and defenders will shine in the upper left remain the same. The actual pattern, as summarized in Table 7, only somewhat fits the theory. The pattern for prospectors is unusual. They improve with decentralization, but only

when turbulence is low. The sole case for which their performance increases as turbulence increases is when decentralization is low. While the variables individually make some sense, in combination the result is a pattern that does not fit Miles and Snow particularly well.

[Table 7 about here]

Defenders have a clear pattern, and it generally fits the theory. At all levels of turbulence, defenders do best when they are centralized. The pattern for turbulence, while holding decentralization constant, is less clear; turbulence has little impact on the coefficient except when organizations are highly decentralized. The base finding, that defenders do best in low turbulent environments with centralized organizations, is consistent with the theory of Miles and Snow, but that finding is essentially based on only three of the nine cells in the table.

Comparing the strategies across the tables yields similar mixed results. In comparison to defenders, prospectors do best in the upper right hand corner – situations involving low turbulence with decentralized organizations (not the lower right hand side). Defenders do best in the upper left-hand portion of the table (as predicted), centralized organizations in low turbulent environments. Comparing Tables 6 and 7, it appears that more leverage might be gained by theorizing about how organizations seek primary versus secondary goals or how they seek goals that vary in task difficulty. The patterns across the tables are less similar than one would expect if Miles and Snow were correct about how structure interacts with the environment to determine the most effective strategy.

Implications

The foregoing sets of findings do not constitute a complete test of the theoretical argument regarding alignment as developed by Miles and Snow. Three of the four key variables are incorporated into this analysis, but organizational processes are omitted due to lack of available

data. Still, this paper offers the most thoroughgoing empirical test of the Miles and Snow model available to date in the research literature. It is highly unlikely, furthermore, that the general conclusions following from the current study would be reversed with the inclusion of additional interactions involving organizational processes. Further investigation is surely warranted, but the broad implications of the present effort are likely to stand – at least in the empirical contexts examined in this paper. Accordingly, we concentrate here on the general implications of these findings rather than the details of the various estimations.

The most sensible approach to testing the Miles and Snow theoretical formulation is with a series of interaction terms that allow for estimations of the impact of managerial strategy – at least the prospecting and defending varieties of strategy – on performance, contingent on structure (degree of decentralization) and environmental turbulence. This approach to modeling the theoretical argument formalizes and clarifies the kinds of relationships at the heart of the well-known argument of Miles and Snow concerning organizational strategy. The results of such testing, however, as displayed in Tables 4 and 5 and especially Tables 6 and 7 of this paper, show patterns and contingencies that do not easily or consistently fit the influential theoretical argument. We should expect a prospecting strategy to contribute more to organizational performance when the environment is turbulent and the organizational structure is relatively decentralized, and we should expect a defending strategy to be especially important for results in more placid environments with organizations that have adopted more centralized structural forms. The results reported here, however, are not consistently supportive of these ideas, nor are they consistently in direct opposition to them. The elements of contingency about which Miles and Snow theorized often do affect the extent to which strategy shapes performance, but not in a clear, consistent, and easily interpretable fashion.

Certain relationships, taken in isolation, may seem partially supportive of the theory – for example, some features of the contingencies shaping the impact of school districts' use of a defending strategy on college-bound performance – but only when viewed selectively and thus only by ignoring relationships that are clearly contrary to the theoretical notions being tested – for instance, the patterns evident for prospecting and defending with pass rates on the state's standardized examination.

Nor does the fact that these models exhibit substantial collinearity detract from the reported results or the implications drawn from them regarding the strategy-and-alignment theoretical argument. Collinear estimations offer inflated standard errors, and thus make it more difficult to demonstrate statistical significance, but the models themselves are unbiased. The findings reported here include numerous statistically significant findings that do not fit the Miles and Snow expectations, and in addition the pattern across cells in the tables, meant to explore the contingencies, frequently show nonlinearities that run counter to the theoretical expectations. In short, collinearity is essentially irrelevant to the core of this test and to the conclusions that can be derived from it.

With regard to the findings themselves, additional features can be noted. In particular – and strikingly, given the magnitude of the relationships and the divergence in patterns – the relationships (and extent of support for the alignment argument) vary greatly by the organizational outcome, or goal, being examined. This variation across outcomes is important, and would not be expected from a narrow reading of the Miles and Snow formulation. If we had examined only one dependent variable, for example performance as tapped by the college-bound metric – we might have drawn considerably more encouraging conclusions about the theory. Including two rather different dependent variables, each offering a measure of an important but

distinctive goal that clearly is shared across most of not all these organizations, allows for a broader assessment of the theoretical argument. The fact that the alignment patterns differ so dramatically as between these two goals, as demonstrated in the results compared across Tables 6 and 7, should provide an important note of caution. The validity of the alignment notion generally, it would seem, is itself contingent – at least on organizational goal examined, or possibly salience or centrality of the goal in a particular organization, and perhaps on other organizational or contextual features as well.

The relationships among these variables, in short, are clearly contingent. Answering the question of whether, properly specified, a general alignment formulation can be validated must await further work of several sorts. First, systematic data gathering and testing of the full set of Miles and Snow-inspired interactions, including organizational processes, is clearly in order. Given the complexity of the fully specified model and the number of interaction terms, including one that expresses a four-way interaction, the ideal design would include a large-N empirical test. Second, the specifics of the Miles and Snow logic deserve critical review and perhaps revision. Earlier research efforts as well as the present study have already shown that prospecting may trump defending in certain settings, and on certain goals, while defending may be superior elsewhere, or for other purposes. Whether the alignment argument claiming, for instance, that prospecting is best accomplished via decentralized structures should be substantially revised can be an issue on the agenda of theorists of organizational strategy. In addition, it would be appropriate to consider additional organizational and/or contextual features in any sort of alignment formulation. Task difficulty, for example, may hold part of the answer to the theoretical puzzle.

Third, beyond task difficulty, the place of organizational goal(s) in research on strategic

management deserves careful theory building and also testing. The findings from the present study certainly indicate that patterns vary substantially, depending on the organizational output or outcome considered – indeed, for the large sample of school districts examined here, outcomes appear to matter more than do the contingent relationships highlighted in the theory. Even with the sample examined in this paper, the theory could be examined in connection with still other output and outcome measures. We have begun here with two dependent variables, but data are available on others – and these others can be foci of investigation as well.

Finally, the results reported here are drawn from a set of organizations that vary widely on a number of contextual and organizational features, but we should be especially cautious in generalizing to other policy fields, other contexts – especially other national contexts with quite different regime characteristics –, and other public organizational forms. So additional systematic work on this subject needs to be undertaken in public management settings that are quite different from Texas school districts.

The theoretical argument offered by Miles and Snow has been deservedly influential, but comprehensive and systematic tests have been slow to develop. Proper testing requires incorporating the interactions, as has been done here, and doing so has served to demonstrate that the world of organizations and their strategies does not sort itself out quite so neatly as the theory seems to suggest. The results are mixed, with hints of contingencies and complications that deserve much more investigation, and these directions for future research offer some possible routes toward a more complete understanding. Let the games begin.

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Table 1. Correlations Among Strategy, Structure, and Environment

	Reactor	Prospector	Decentralization	Turbulence
Defenders	-.05	.04	-.12	.04
Reactors	X	-.08	-.05	.02
Prospectors	X	X	.09	-.08
Decentralization	X	X	X	-.29

Table 2. The Impact of Management and Management Strategy on Organizational Performance

Dependent Variables =	TAAS/TAKS Pass Rate		Percent Above 1110	
Independent Variables	Slope	t	Slope	t
Managerial Strategy				
Defender	.3333	2.49	-.1508	0.75
Reactor	.1300	1.03	.6486	3.61
Prospector	.0929	0.85	.5482	3.65
Turbulence	-.8793	1.84	-1.8884	2.43
Decentralization	-9.9748	3.50	17.1670	2.76
Management Controls				
Managerial Networking	.5105	3.65	.6695	3.29
School Board Contact	-.6367	4.07	-.1769	0.78
Management Quality	.6549	4.74	.7446	3.65
Management Experience	.0419	3.01	.0101	0.51
Personnel Stability	.1368	7.54	.0403	1.34
Control Variables				
Teacher’s Salaries (000s)	.4639	6.72	.2982	2.59
Class Size	-.3167	3.07	.1815	1.01
Teacher Experience	.1237	1.89	.4164	3.79
Non Certified Teachers	-.1048	4.20	-.0786	1.97
Instructional Funds	-.5430	2.39	.0002	0.00
Percent Black Students	-.1913	13.62	.0184	0.88
Percent Latino Students	-.0608	7.12	.0158	1.19
Low Income Students	-.2057	17.86	-.3329	17.93
R-squared	.72		.32	
Standard Error	6.90		9.60	
F	344.04		55.20	
N of Cases	3036		2774	

Dummy variables for individual years not reported

Table 3. Relevant Coefficients for Marginal Effects of Strategy Content on Turbulence

Variable	TAAS/TAKS Slope	TAAS/TAKS t-score	SAT/ACT 1110+ Slope	SAT/ACT 1110+ t-score
Prospector	-.3295	1.96	.6178	2.43
Prospector x Turbulence	1.0669	3.57	-.0762	0.14
Defender	-.0142	0.07	-.1832	0.54
Defender x Turbulence	.9351	2.98	.0987	0.12
R-Squared	.73		.32	
Standard Error	6.89		9.60	
F	306.30		48.86	
N	3036		2774	

All equations control for all variables in table 2

Table 4 The Marginal Impacts of Strategy at Various Levels of Turbulence

Dependent Variable = TAAS/TAKS Pass Rate		
Level of Turbulence	Prospectors	Defenders
Low (Mean - S)	-.2548*@	.0513@
Medium (Mean Level)	.0738	.3393*
High (Mean + S)	.4024*	.6273*
Dependent Variable SAT > 1110		
Low (Mean - S)	.6124*	-.1763
Medium (Mean Level)	.5890*	-.1459
High (Mean + S)	.5566*	-.1155

*Coefficient different from zero p < .05
@High value coefficient significantly different from low value p < .05

Joint f-test for added variables for TAAS/TAKS = 5.40 p = .09

Joint f-test for added variables for College Boards = 0.48 p = .90

Table 5. The Marginal Impacts of Strategy at Various Levels of Decentralization

Level of Decentralization	Prospectors	Defenders
Dependent Variable = TAAS/TAKS Pass Rate		
Low (Mean - S)	.5402*@	.3490*
Medium (Mean Level)	.0531	.2796*
High (Mean + S)	-.4340*	.2103
Dependent Variable SAT > 1110		
Low (Mean - S)	.5091*	.9586*@
Medium (Mean Level)	.5698*	.0402
High (Mean + S)	.6305*	-.8782*

*Coefficient different from zero p < .05
@High value coefficient significantly different from low value p < .05

Joint f-test for added variables for TAAS/TAKS = 10.00 p = .04

Joint f-test for added variables for College Boards = 4.03 p = .14

Table 6. The Marginal Impacts of Strategy at Different levels of Decentralization and Turbulence: TAAS/TAKS Pass Rate

Slopes for Prospectors

	Decentralization		
Turbulence	Low	Medium	High
Low	.0860	-.0544	-.1947#
Medium	.2844*	-.0158	-.3161*
High	.4829*	.0228	-.4374*

Slopes for Defenders

	Decentralization		
Turbulence	Low	Medium	High
Low	-.1190	-.1052	-.0913
Medium	.2349#	.3130*	.3911*
High	.5888*	.7312*	.8736*

*Coefficient different from zero p < .05
#Coefficient different from zero p < .10

Joint f-test for added variables = 5.54 p = .004

Table 7. The Marginal Impacts of Strategy at Different levels of Decentralization and Turbulence: SAT Scores Above 1110

Slopes for Prospectors

	Decentralization		
Turbulence	Low	Medium	High
Low	-.3520*	.5064*	1.3648*
Medium	.0740	.4042*	.7343*
High	.5000*	.3019*	.1038

Slopes for Defenders

	Decentralization		
Turbulence	Low	Medium	High
Low	1.3187*	.1774	-.9638*
Medium	.9666*	.0461	-.8742*
High	.6144*	-.0853	-.7850*

Joint f-test for added variables = 2.78 p = .047