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The Strength of Corporate Culture and the Reliability of Firm Performance

Jesper B. Sørensen
Massachusetts Institute of Technology

Prevailing research claims that strong corporate cultures improve firm performance by facilitating internal behavioral consistency. This paper addresses an unexamined implication of this argument by analyzing the effect of strong corporate cultures on the variability of firm performance. This relationship depends on how strong cultures affect organizational learning in response to internal and external change. I hypothesize that strong-culture firms excel at incremental change but encounter difficulties in more volatile environments. Results of analyses of a sample of firms from a broad variety of industries show that in relatively stable environments, strong-culture firms have more reliable (less variable) performance. In volatile environments, however, the reliability benefits of strong cultures disappear.●

Much popular and scholarly attention has been focused on the hypothesis that strong cultures, defined as "a set of norms and values that are widely shared and strongly held throughout the organization" (O'Reilly and Chatman, 1996: 166), enhance firm performance. This hypothesis is based on the intuitively powerful idea that organizations benefit from having highly motivated employees dedicated to common goals (e.g., Peters and Waterman, 1982; Deal and Kennedy, 1982; Kotter and Heskett, 1992). In particular, the performance benefits of a strong corporate culture are thought to derive from three consequences of having widely shared and strongly held norms and values: enhanced coordination and control within the firm, improved goal alignment between the firm and its members, and increased employee effort. In support of this argument, quantitative analyses have shown that firms with strong cultures outperform firms with weak cultures (Kotter and Heskett, 1992; Gordon and DiTomaso, 1992; Burt et al., 1994).

The existing literature on the relationship between culture strength and performance focuses on the consequences of strong cultures for performance levels but has not examined how strong cultures affect performance variability, or the reliability of firm performance. This is surprising, since the arguments relating culture strength to performance draw particular attention to the benefits of having greater internal consistency in goals and behaviors. One should therefore expect strong-culture firms to exhibit less variable performance. This expectation is complicated, however, by the fact that the variability of a firm's performance depends not only on the ability to maintain consistency in internal processes but also on the firm's ability to adapt to environmental change. The relationship between culture strength and performance reliability, therefore, should depend on how strong-culture firms learn from and respond to both their own experiences and changes in their environment. Incremental adjustments to organizational routines should be easier in strong-culture firms, because participants have an agreed upon framework for interpreting environmental feedback and a common set of routines for responding to different signals from the environment. In relatively stable environments, firms with strong corporate cultures should therefore have less variable performance than firms with weak corporate cultures, in addition to performing at a higher average level.

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In more volatile environments, however, incremental adjustments to organizational routines may not be sufficient. This suggests that the variance-reducing benefits of strong cultures may attenuate as environmental volatility increases and may help explain why some strong-culture firms have encountered great difficulties in responding to changes in their environment (Carroll, 1993; Tushman and O'Reilly, 1997).

Studying the relationship between culture strength and performance variability therefore has the potential to shed light on the ability of strong-culture firms to adapt to change. Performance variability is also an important outcome in its own right, because it plays a central role in a variety of theoretical approaches to organizations. Behavioral theories of the firm suggest that risk taking by managers depends on firm performance relative to aspiration levels (Cyert and March, 1963; Bromiley, 1991); highly variable performance may increase the frequency of risk-taking behavior. Similarly, while organizations may attempt to buffer themselves from environmental variability in order to facilitate planning and decision making (Thompson, 1967) and increase organizational autonomy (Pfeffer and Salancik, 1978), this may be more difficult when performance is highly variable. Organizational ecologists have attributed causal importance to performance variability by arguing that external stakeholders typically attach value to predictable performance, giving reliable firms a survival advantage (Hannan and Freeman, 1984). For example, suppliers will generally prefer customers that generate predictable orders and reliably pay on time, and many employees value stable employment prospects. Investors should generally prefer to have less temporal variability in performance for a given return (Bodie, Kane, and Marcus, 1996). Performance variability also affects the chances of failure directly: a simple random-walk model of the accumulation and depletion of organizational resources suggests that for a given stock of resources, firms with more variable performance are more likely to exhaust their resources and fail (Levinthal, 1991a).

While these arguments from organizational theory suggest the importance of variability in overall firm performance, theory and evidence in corporate finance suggest that variability in specific aspects of firm performance affect organizational behavior. For example, firms with highly variable cash flows find themselves at a competitive disadvantage, for two reasons. First, highly variable cash flows imply that there will be periods when a firm will underinvest in worthwhile projects. Some projects that are attractive when there is sufficient internal capital will be unattractive during periods of internal cash-flow shortfall, if external capital is more expensive than internal capital. This is one reason why firms may wish to engage in risk-management activities, such as hedging (Lessard, 1990; Froot, Scharfstein, and Stein, 1993). Second, firms with more variable cash flows have higher costs of external capital than firms with more stable cash flows, which means that fewer projects will be attractive (from a capital budgeting perspective) in firms with variable performance. The increased cost of capital derives in part from greater information asymmetry in the external capital market,

because firms with highly variable cash flows are less likely to be followed by market analysts. Empirically, Minton and Schrand (1999) found that firms with highly variable cash flows have lower levels of capital investment, lower levels of analyst following, lower Standard & Poor's bond ratings, and higher weighted average costs of capital. Thus, if strong corporate cultures lower performance variability, strong-culture firms are less likely to suffer from underinvestment.

For all of these reasons, corporate culture strength has implications for organizational outcomes that go beyond their effects on mean performance levels. In this paper, I expand on the relationship between the strength of corporate culture, organizational learning processes, and firm performance and analyze the implications of this relationship for reliable performance by explicitly modeling the temporal variance in firm performance as a function of the strength of corporate culture in a sample of large, publicly held firms.

THE STRENGTH OF CORPORATE CULTURES AND FIRM PERFORMANCE

Interest in the concept of organizational culture has exploded in the past two decades. Researchers have approached the topic with a wide array of theoretical interests, methodological tools, and definitions of the concept itself. Debate over fundamental issues of theory and epistemology is intense (Martin, 1992; Trice and Beyer, 1993). While some see attempts to measure organizational cultures and their effects on organizations as highly problematic (e.g., Siehl and Martin, 1990; Martin, 1992; Alvesson, 1993), a large body of research starts from the assumption that culture is a measurable characteristic of organizations (O'Reilly and Chatman, 1996). These studies do not seek to interpret the meaning of different organizational cultures or cultural forms per se but, rather, focus on their consequences for organizational behavior and processes. Studies of the effects of strong corporate cultures for firm performance, including this paper, fall within this tradition. I adopt O'Reilly and Chatman's (1996: 160) definition of organizational culture as "a system of shared values (that define what is important) and norms that define appropriate attitudes and behaviors for organizational members (how to feel and behave)" (for similar definitions, see Rousseau, 1990; Kotter and Heskett, 1992; Gordon and DiTomaso, 1992). Moreover, a culture can be considered strong if those norms and values are widely shared and intensely held throughout the organization (O'Reilly and Chatman, 1996: 166; O'Reilly, 1989; Gordon and DiTomaso, 1992; Kotter and Heskett, 1992). This definition of culture strength, in contrast to some others, entails no assumptions about which values and norms might enhance organizational performance (e.g., Ouchi, 1981; Deal and Kennedy, 1982; Denison, 1990).

One of the key consequences of a strong corporate culture is that it increases behavioral consistency across individuals in a firm. Organizational culture defines a normative order that serves as a source of consistent behavior within the organization. In this sense, organizational culture is a social control mechanism (O'Reilly, 1989; O'Reilly and Chatman, 1996). At the same time, organizational cultures frame people's inter-

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pretations of organizational events and basic assumptions about organizational processes. Schein (1991: 15) emphasized that organizational cultures "provide group members with a way of giving meaning to their daily lives, setting guidelines and rules for how to behave, and, most important, reducing and containing the anxiety of dealing with an unpredictable and uncertain environment." Widespread agreement about basic assumptions and values in the firm should increase behavioral consistency (Gordon and DiTomaso, 1992) and thereby enhance organizational performance, which is a function of the potential return to an organization's activities and its ability to carry out those activities. The impact of consistency on execution is important, since firms with excellent strategies (high potential return) may perform poorly if they fail to execute well, and firms that execute their routines extremely well may compensate for suboptimal strategies.

While it is possible that strong-culture firms may be better (or worse) at choosing appropriate strategies, theories of the culture effect focus on the positive impact a strong culture has on the execution of routines. Theorists have put forward three interrelated explanations for the performance benefits of strong cultures (Kotter and Heskett, 1992). First, widespread consensus and endorsement of organizational values and norms facilitates social control within the firm. When there is broad agreement that certain behaviors are more appropriate than others, violations of behavioral norms may be detected and corrected faster. Corrective actions are more likely to come from other employees, regardless of their place in the formal hierarchy. Informal social control is therefore likely to be more effective and cost less than formal control structures (O'Reilly and Chatman, 1996). Second, strong corporate cultures enhance goal alignment. With clarity about corporate goals and practices, employees face less uncertainty about the proper course of action when faced with unexpected situations and can react appropriately. Goal alignment also facilitates coordination, as there is less room for debate between different parties about the firm's best interests (Kreps, 1990; Cremer, 1993; Hermalin, 2001). Finally, strong cultures can enhance employees' motivation and performance because they perceive that their actions are freely chosen (O'Reilly, 1989; O'Reilly and Chatman, 1996).

Early studies reported mixed evidence of a positive relationship between culture strength and performance (Siehl and Martin, 1990) but generally defined culture strength in terms of the content of organizational values and norms. More recent studies, which defined culture strength in terms of the degree of agreement and commitment to organizational values and norms, found evidence in favor of the linkage. For example, Kotter and Heskett (1992) related mean performance over a ten-year period to measures of the strength of corporate culture and found that, across industries, firms perceived to have strong cultures generally had greater average levels of return on investment, net income growth, and change in share price. Gordon and DiTomaso (1992) found that the performance of insurance companies increased to the extent that there was consensus surrounding cultural val-

ues. Denison (1990), using both qualitative and quantitative evidence, also suggested that consensus surrounding organizational values increases organizational effectiveness. Burt and his coauthors (1994) reanalyzed Kotter and Heskett's data and found that the effect of corporate culture strength was contingent on market context, with the performance benefit of strong cultures being enhanced in highly competitive markets. They reasoned that when firms in an industry are highly constrained by the structure of their markets, differences in organizational performance are more likely to be due to differences in the efficiency of organizational routines.

While prior research has focused on the relationship between culture strength and mean performance, strong cultures can also enhance the reliability of firm performance under the right environmental conditions. Performance reliability depends on two factors: the consistency with which a firm performs its organizational routines and the degree to which those routines are well adapted to changing environmental conditions. A key factor influencing performance reliability is therefore the nature of change in organizational routines in response to experience. In other words, reliability is a function of organizational learning processes (Levitt and March, 1988; March, 1991; Levinthal, 1991b). The link between the strength of corporate culture and reliability therefore lies in the consequences of strong cultures for organizational learning processes.

Culture, Learning, and Performance Variability

Organizational cultures and organizational learning are closely related. In fact, several authors have conceptualized organizational cultures as the product of histories of organizational learning. Weick (1985) characterized organizational culture as the product of attempts by the organization to impose coherence, order, and meaning on its experiences. Similarly, Schein (1992: 68) suggested that "culture ultimately reflects the group's effort to cope and learn and is the residue of learning processes." Schein further argued that organizational cultures are strongly influenced by shared experiences in the firm's early history and that, once established and taken for granted, the firm's basic assumptions are difficult to change. This suggests that organizational cultures reflect the imprinting of a firm's early environmental conditions (Stinchcombe, 1965) and that they are subject to inertial pressures (Hannan and Freeman, 1984).

While organizational cultures reflect past learning, they also define the context for future organizational learning, which, in turn, has consequences for performance reliability. Environmental change poses dual threats to reliable performance. First, environmental change can create internal problems by increasing the likelihood of failures in communication, coordination, and control. Second, environmental change can render existing organizational routines inadequate or inappropriate. Such environmental shifts demand learning and modifications in organizational routines that take the new conditions into account. Unless the organization discovers such solutions rapidly, it will perform haphazardly.

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Strong-culture firms should generally be better than firms with weak cultures at avoiding internal threats to reliable performance, or breakdowns in coordination and control. Efficient and consistent firm functioning in the face of environmental change depends on both appropriateness and coordination: employees must respond to events by deploying the right routines at the right times and in the right sequence. Employees are more likely to take actions consistent with a firm's goals if they understand those goals and agree with them (Levinthal, 1991b). If employees lack a clear understanding of the organization's goals, coordination will also be more difficult, as they are more likely to take actions that conflict with what is happening in other parts of the organization (Cremer, 1993). Thus, heterogeneity in beliefs within the organization makes performance more haphazard. If employees differ in their understandings of the environment, they will either spend more time debating alternatives or behave inconsistently and, therefore, be more likely to carry out routine tasks poorly.

Strong cultures minimize heterogeneity in beliefs about the state of the environment and should thereby enhance internal reliability. Organizational cultures codify the organization's understanding of itself and its environment and thus clarify the organization's beliefs and goals for members (Weick, 1985; Schein, 1992). In strong-culture firms, most members work from a shared knowledge base and common beliefs, which enhances organizational reliability. As March (1991: 83) argued, "Knowledge makes performance more reliable. As work is standardized, as techniques are learned, variability, both in the time required to accomplish tasks and in the quality of task performance, is reduced." Furthermore, strong culture organizations socialize new members faster, in part due to the explicit codification of beliefs and to greater normative pressures (Harrison and Carroll, 1991). This enhances reliability by limiting the length of time new members hold discrepant views and pose threats to the smooth execution of organizational routines. This suggests the following hypothesis:

Hypothesis 1: Firms with strong corporate cultures will exhibit more reliable (less variable) performance.

Culture, Environmental Volatility, and Performance

In the absence of environmental change, reliability, and performance more generally, is simply a function of internal organizational processes. Environments do change, however, both incrementally and more discontinuously. Organizational performance in changing environments depends on the ability of the firm to modify its routines in response to changes in conditions. The nature of environmental change therefore affects the relationship between culture strength and performance, since organizational routines embody assumptions about the state of the environment and the expected path of change in external conditions.

When environmental change is incremental, and therefore consistent with the basic assumptions underlying the organization's routines, organizations achieve reliable performance

through corresponding incremental adjustments to routines. March (1991) termed this exploitation; Lant and Mezias (1992) used the term first-order learning. The consequences of strong cultures—enhanced coordination and control, goal alignment, and increased motivation—should all increase the speed and accuracy with which organizations adapt to incremental changes in their environments. In relatively stable environments, strong-culture organizations should exhibit more reliable performance than organizations with weak cultures because they are more adept at refining and improving established competencies. But excellence at exploitation comes at a cost.

When environmental change is radical or discontinuous, successful adaptation cannot come about through incremental improvements in organizational routines (Tushman and Anderson, 1986; Henderson and Clark, 1990). Rather, successful adaptation depends on the ability to discover alternative routines, technologies, and purposes. In short, adaptation to discontinuous change requires exploration (March, 1991) or second-order learning (Lant and Mezias, 1992). Such exploratory learning demands an ability to perceive environmental shifts and a willingness to accept the possible failure and uncertain returns that accompany fundamental change in organizational processes.

Strong-culture organizations will, in general, be ill-suited to exploratory learning, for several reasons. First, strong culture organizations may have greater difficulty recognizing the need for change. Lant and Mezias (1992) suggested that second-order learning is triggered by suboptimal experiences that the organization can no longer ignore and cannot handle within its existing interpretive frameworks. Because members of strong-culture organizations have a greater commitment to a particular understanding of the world than weak-culture organizations, they may be slower to detect fundamental changes in environmental conditions. Second, the elements of strong cultures that facilitate first-order learning may simultaneously impede second-order learning. One source of exploratory learning is the presence of individuals whose beliefs contradict the organization's dominant beliefs. For a firm to learn from such individuals, it must both allow them to maintain their deviant beliefs and be willing to incorporate potential insights into the organization's procedures. In simulations, March (1991) found that organizations that are good at learning from their members and exhibit weak socialization pressures will have the most accurate understanding of a changing environmental reality. Strong-culture organizations exhibit the opposite characteristics. As Denison (1984: 18) noted, in a strong culture, "the lack of variety . . . limits the organization's ability to adapt to changes in the environment."

Finally, strong-culture organizations may be less likely to reap the benefits of any exploration that does occur. Innovation and change in organizational routines can be fostered by viable countercultures (Martin and Siehl, 1983), but countercultures may be less likely to emerge and persist in strong-culture firms. Moreover, even when countercultures can be sustained in strong-culture firms, the transfer of new ideas

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and knowledge to the dominant culture is fraught with difficulty (Martin and Siehl, 1983; Tushman and O'Reilly, 1997). In this respect, Weick (1985: 385) captured the dilemma of strong culture organizations succinctly: "A coherent statement of who we are makes it harder for us to become something else."

This reasoning suggests that, other things being equal, strong-culture organizations should have greater difficulty responding to environmental volatility than weak-culture organizations. If environmental change sharply reduces the value of the organization's existing routines, strong-culture firms should have greater difficulty regaining their footing. Short of such radical environmental change, however, strong-culture firms should still maintain the internal organizational benefits identified by culture researchers: greater goal alignment, superior coordination and control, and higher motivation levels than weak-culture firms. In general, therefore, environmental volatility should diminish the performance benefits of strong corporate cultures:

Hypothesis 2: As industry volatility increases, the positive effect of culture strength on mean performance declines.

Hypothesis 3: As industry volatility increases, the positive effect of culture strength on performance reliability declines.

METHOD

Data

I investigated the effects of corporate culture strength on the reliability of firm performance using Kotter and Heskett's (1992) data on the strength of corporate culture among a sample of large, publicly traded firms in 18 markets. Kotter and Heskett (1992) began with 21 markets defined according to their own criteria. In general, these markets are analogous to the market categories used in *Fortune* magazine. Missing data problems led Burt et al. (1994) to reduce the number of industries to 19 by eliminating the life insurance industry and combining savings and loans and commercial banking. In the current analyses, missing data on the banking industry resulted in the further exclusion of that industry from the analyses.

Kotter and Heskett asked the top six officers in the firms selected for the study to complete a short, mailed questionnaire. The respondents were asked to assess the strength of the corporate culture in each of the other sampled firms that were in the same industry as their own firm. Respondents were asked to assess the strength of corporate culture in the late 1970s and early 1980s by judging the degree to which managers at a firm were influenced in their decision making by a strong corporate culture (Kotter and Heskett, 1992: 161). The survey provided respondents with three indicators of a strong corporate culture: (1) managers in the firm commonly speak of their company's style or way of doing things; (2) the firm has made its values known through a creed or credo and has made a serious attempt to get managers to follow them; and (3) the firm has been managed according to long-standing policies and practices other than those just of the current chief executive officer. Respondents were asked to rate each

firm on a scale of one to five, and an average score across respondents was computed for each firm. While Kotter and Heskett (1992) used an inverse coding of culture strength, with 1 indicating a strong culture, I have reversed their coding to ease interpretation.

A strong advantage of this measurement strategy is that it measures culture strength across a very broad range of firms and competitive contexts without requiring extensive culture surveys within firms. Data on a variety of industries is critical to testing the claim that the relationship between culture strength and reliability is contingent on industry volatility. Kotter and Heskett's measurement strategy leads a firm to be characterized as having a strong culture if other actors in its industry associate the firm with a unique and common way of doing things, relative to other firms in the industry. Moreover, this distinctive behavior must be codified and have persisted over time. This culture strength variable does not directly measure the extent to which there is consensus within the firm, however, and an external assessment of culture strength is suboptimal in certain respects. It is possible, for example, that some strong-culture firms identified in the sample are highly fragmented but manage to project an aura of cohesion and consensus. It is important to keep in mind, however, that Kotter and Heskett's questionnaire asked respondents to characterize firms according to different specific behavioral characteristics, not simply to generate a global culture ranking that might be more subject to image manipulation. It seems less likely that weak-culture firms will be able to exhibit behavioral consistency over time.

Furthermore, surveying organizational members about their firm's culture may be problematic when studying variability in performance. As Weick (1985: 386) suggested, people may be more likely to attend to culture when their daily routines break down and they are presented with unfamiliar situations. The reliability of firm performance may thereby affect the measurement of culture strength. While this type of response effect may affect external evaluators as well, it arguably has the greatest impact on internal informants.

Kotter and Heskett (1992) checked the validity of their measure in several ways. Most importantly, they conducted interviews with managers of a selected subsample of firms in which they asked respondents a series of questions about the strength of corporate culture. The resulting scores correlated well with the external measures. Ultimately, however, their measure assumes that firms with widely shared and deeply held norms and values will exhibit these externally observable characteristics and that firms characterized by dissonance will be unlikely to exhibit the same characteristics.

An additional concern, as Burt et al. (1994) noted, is that the culture scores generated by Kotter and Heskett's design might reflect a response effect. Respondents may make inferences about a firm's strength of corporate culture based on its performance or size. Firms that are more visible or salient to a respondent may receive higher culture scores. In fact, a regression of culture strength on a firm's average market capitalization between 1979 and 1984 (controlling for

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industry differences in both variables) yields a positive and significant effect of firm size ($t = 6.51, p < .01$). Market capitalization explains 24 percent of the within-industry variance in culture strength, suggesting that it is an important factor but that there is substantial independent variation in the culture scores. I therefore included firm size in the models described below.

Performance data come from the COMPUSTAT database. I measured corporate performance in two ways: by the yearly return on invested capital (ROI) and the yearly operating cash flow for the six years from 1979 to 1984. The first half of this period is the same as the period about which respondents were asked to rank the corporate culture of firms. I extended this period for an additional three years to allow for sufficient variability in firm performance. Return on invested capital (ROI) is computed as yearly net income divided by invested capital (stockholders' equity minus current liabilities). ROI, an accounting measure of how profitably the firm's managers put invested capital to use, is commonly used in studies of corporate performance (e.g., Smith et al., 1994) and was also used by Kotter and Heskett (1992). Operating cash flow was operationalized as annual sales less the sum of costs of goods sold, selling, general and administrative (SG&A) expenses, and the annual change in working capital and was measured in constant 1984 dollars. I used operating cash flow as a dependent variable because this is the measure used in the finance literature to examine the consequences of performance volatility (Minton and Schrand, 1999). These performance measures are well suited for testing the hypotheses in this paper, which concern the ability of firms to execute their routines consistently. Analyses using two additional measures of performance, return on sales and net income growth, supported the same conclusions.

I included a number of control variables measuring the firm's size and financial position. Operating leverage was measured as the ratio of fixed assets to total assets for each year. Financial leverage was measured using the debt-to-asset ratio. Finally, I controlled for size in most models by including the firm's market capitalization. Descriptive statistics and correlations are in table 1.

I measured industry volatility using estimates from a Capital Asset Pricing Model (Sharpe, 1964). This model relates the return on an individual security to the return on a value-

Table 1

Descriptive Statistics*								
Variable	Mean	σ	1	2	3	4	5	6
1. ROI	.09	.08						
2. Operating cash flow	1342.27	2895.10	.02					
3. Debt-to-asset ratio	.41	.18	-.59*	.03				
4. Operating leverage	.42	.17	-.26*	.34*	.19*			
5. Culture strength	3.29	.79	.30*	.29*	-.40*	.06		
6. Log market capitalization	7.22	1.42	.25*	.58*	-.42*	.21*	.38*	
7. Log market constraint	-1.49	.72	-.26*	-.21*	.33*	-.11*	-.14*	-.43*

* $p < .05$.

* Culture strength ranges from 1 to 5, with higher scores indicating a stronger corporate culture.

weighted portfolio of securities in the entire market (in this case, the NYSE/AMEX and NASDAQ):

$$r_i = \alpha_i + \beta r_m + \varepsilon$$

Here, β measures the systematic risk of the security, or the extent to which it covaries with the market. The returns of firms with $\beta < 1$ are less volatile than the returns of the market as a whole, while firms with $\beta > 1$ are more volatile than the market as a whole. Yearly β parameters are estimated separately for each firm in Kotter and Heskett's (1992) data using OLS. Daily returns over the period from 1979 to 1984 come from the CRSP database. The industry volatility measure used below is the yearly mean of the β 's for all of the sampled firms in an industry. Generally, industries undergoing fundamental change are likely to be characterized by greater uncertainty among investors and hence greater than average volatility in stock-market returns. These scores are summarized in table 2.¹

Analysis

I operationalized the reliability of firm performance in terms of the degree of variation about a predicted mean performance level; the greater the variation, the lower the reliability. This definition is consistent with previous studies of risk (e.g., Armour and Teece, 1978; Bowman, 1980). Past studies, however, have typically measured variance about the sample mean, which is an unsatisfactory measure of reliability for a simple reason. If one uses the simple variance, firms that have improved their performance over time will appear to have unreliable performance simply because the mean is a poor estimate of the time trend in performance. The same will be true of firms whose performance has consistently declined. A measure of reliability in performance should also

Table 2

Industry Volatility Measures

Industry	β		N firms
	Mean	σ	
Aerospace	1.201	.127	10
Airlines	1.266	.196	10
Apparel	.694	.120	8
Automotive	1.096	.304	9
Beverages	.823	.099	8
Chemicals	1.050	.080	9
Computers & Office Equipment	1.317	.181	10
Packaged Food	.741	.053	11
Forest Products/Paper	.971	.095	10
Personal Care	.844	.095	8
Petroleum Refining & Marketing	1.208	.191	10
Pharmaceuticals	.951	.142	9
Printing & Publishing	.810	.229	9
Retail—Food & Drug	.617	.170	8
Retail—Non-Food & Drug	1.013	.244	10
Rubber	.789	.108	7
Telecommunications	.620	.224	6
Textiles	.743	.105	8

¹

I also conducted analyses using a different measure of industry volatility, namely, the coefficient of variation in firm sales growth for each industry. The results of those analyses parallel those below using the ROI measure, but not the cash flow measure. This may be because the cash flow measure is a direct function of sales.

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allow for changes in performance levels due to changes in firm characteristics. I therefore first tried to account for firm differences in the mean performance level using firm characteristics. The variability in performance was then defined as the residual variance about the predicted regression line.

I first used multiplicative heteroscedasticity or variance function models (Davidian and Carroll, 1987; Greene, 1997; Sorenson and Sørensen, 2001) to estimate the effects of culture strength on reliability. These models involve extending the standard linear regression model of the expected value of the dependent variable to include a model of the variance of the residual (or equivalently the dependent variable):

$$y_i = \mu_i + \sigma_i \varepsilon_i$$

$$\mu_i = E(y_i) = \beta' X_i$$

$$\sigma_i = \text{Var}(y_i) = \exp(\gamma' Z_i)$$

where y_i is the dependent variable with mean μ_i and variance σ_i . This produces a linear model for the mean of the dependent variable and a log-linear model for the variance of the dependent variable, conditional on a set of covariates predicting the mean and variance. The γ parameters capture the effect of covariates on the variance in the dependent variable. Factors that increase the reliability of performance should have $\gamma < 0$. This model is estimated using maximum likelihood methods (Greene, 1997; Weesie, 1998).

This modeling approach has a methodological shortcoming, in that the pooled cross-section time series data raise concerns about autocorrelation within firms, possibly due to unobserved, time-invariant characteristics of the firms (Greene, 1997). A prominent candidate for such an unobserved characteristic is the content of the corporate cultures in the sample firms. If, for example, the corporate culture strength is correlated with a particular (unobserved) constellation of values and beliefs that encourage reliable performance, inferences about the effects of culture strength may be faulty. Adjusting for autocorrelation in the context of the multiplicative heteroscedasticity model did not seem straightforward. I therefore adopted the following approach. For each firm, I estimated a separate regression of ROI or operating cash flow on the firm's debt-to-asset ratio and operating leverage; since a firm's culture score is constant, its effects cannot be estimated.² These analyses should help remove the potentially confounding influence of unobserved, firm-specific characteristics. Using this approach, I measured the reliability of firm performance as the mean squared error (i.e., average squared residual) from each firm's regression equation. If a firm experiences alternating periods of high and low performance, net of the values of the independent variables, the residuals about its regression line will be greater, on average, than if the firm performs consistently. Firms with more reliable performance will have smaller mean squared errors. I then pooled the mean squared errors across firms and

2

The firm-specific models have to be parsimonious, since there are at most six observations per firm. I experimented with alternative specifications and found the same results when regressing the performance measures on operating leverage and a time trend and when regressing the performance measures on the debt-to-asset ratio and a time trend. When regressed on all three independent variables (operating leverage, debt-to-asset ratio, and year), the results were the same for the ROI measure but not for operating cash flow, for which the effect of culture strength was insignificant.

regressed them on each firm's culture score and dummy variables for industry.

RESULTS

Table 3 presents estimates from the multiplicative heteroscedasticity models of corporate performance. The effects of the covariates in this table are expressed relative to the mean levels of the covariates in a firm's industry. This is also true for the effects on the log variance; this is important because it removes industry differences in performance variability. One question addressed by the results for mean performance levels in table 3 is whether the performance benefits of a strong culture persist once the differences in variance have been modeled. This appears to be the case for the ROI measure. In models 1 and 2, the measure of corporate culture strength has a positive and significant effect on ROI, even when controlling for firm size. Model 3 includes an interaction effect between corporate culture strength and the measure of market constraint used by Burt et al. (1994); since the models include dummies for industries, the main effect of market constraint is not identified. Industries with higher market constraint scores are internally fragmented and face well-organized suppliers and buyers; Burt et al. (1994) showed that these markets are more competitive and have lower profit margins (see also Burt, 1992). Consistent with what Burt and his coauthors found, the performance benefits of strong cultures increase with industry competitiveness. In none of the models, however, does corporate culture

Table 3

Multiplicative Heteroscedasticity Models of Firm Performance Measures, 1979–1984*

Variable	ROI			Operating cash flow		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Mean:</i>						
Debt-to-asset ratio	-.170** (.012)	-.170** (.012)	-.164** (.012)	-3.301 (31.645)	2.200 (31.496)	45.732 (28.424)
Operating leverage	-.082** (.014)	-.080** (.014)	-.072** (.014)	301.249** (7.056)	-42.230 (46.591)	-59.631 (37.732)
Corporate culture strength	.006** (.002)	.006** (.002)	.017** (.010)	14.575 (1.559)	-.563 (5.887)	19.495 (16.057)
Log market capitalization		-1.E-04 (.001)	-2.E-04 (.001)		14.009 (6.902)	15.188† (5.883)
Culture strength x Log market constraint			.006** (.002)			5.014 (11.072)
<i>Log variance:</i>						
Corporate culture strength	-.418** (.079)	-.437** (.086)	-.683** (.167)	.940** (.096)	-.277** (.116)	-1.790** (.198)
Log market capitalization		.073 (.062)	.086 (.062)		1.454** (.085)	1.485** (.086)
Culture strength x Log market constraint			-.182 (.111)			-.927** (.110)
χ^2	1038	1019	1031	3339	3589	3646
D.f.	38	40	42	39	41	43
Firm-year spells	806	800	800	703	703	703

* $p < .05$; ** $p < .01$; two-sided tests.

* Models include industry dummies in the prediction equations for both the mean and log variance; thus, all covariates are relative to the market averages. The model for operating cash flow includes a control for the operating cash flow level in 1978. Standard errors are in parentheses.

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strength appear to affect the firm's operating cash flow significantly.

The evidence in favor of hypothesis 1, on the effect of culture strength on reliability, is very strong, as seen in the lower panel of table 3. Firms perceived to have a unique and coherent culture relative to other firms in their industry have less variable performance. This is true for both performance measures. The culture effect is sizable: increasing the strength of corporate culture by one standard deviation, for example, leads to an almost 30-percent reduction in the variance of the return on invested capital [$\exp(.794 \times -.437) = .71$]. Furthermore, there is evidence that the reliability benefits of strong cultures are enhanced in more competitive environments, as measured by Burt's market constraint measure: the interaction effect is highly significant for operating cash flow and marginally significant (at the .10 level) for ROI.

The alternative analysis strategy also supports the claim that strong cultures lead to more reliable performance. Table 4 reports an analysis of the mean squared error from the firm-specific regressions of ROI and operating cash flow, respectively, on operating leverage and the debt-to-asset ratio. Since the mean squared error is bounded by zero and highly skewed, the dependent variable in table 4 is logged. Higher levels of the mean squared error indicate less reliable performance, so effect of culture strength should be negative. The first three columns of both panels of table 4 show a pattern similar to the estimates in table 3. Again, firms perceived to have strong cultures relative to other firms in their markets

Table 4

OLS Regression of Firm-specific Mean Square Error on Culture Strength*				
ROI				
Variable	(1)	(2)	(3)	(4)
Culture strength	-.265** (.096)	-.275* (.113)	-.472* (.213)	-1.399** (.458)
Mean market capitalization (log)		.053 (.088)	.049 (.088)	.015 (.088)
Culture strength x Log market constraint			-.144 (.132)	-.187 (.131)
Culture strength x Industry volatility				.906* (.398)
R ²	.06	.05	.06	.11
N	135	134	134	134
Operating cash flow				
Variable	(5)	(6)	(7)	(8)
Culture strength	.245 (.131)	-.242* (.112)	-.738** (.219)	-1.596** (.455)
Mean market capitalization (log)		.830** (.092)	.817** (.090)	.794** (.089)
Culture strength x Log market constraint			-.340* (.131)	-.340** (.129)
Culture strength x Industry volatility				.911* (.425)
R ²	.03	.46	.49	.51
N	123	123	123	123

* $p < .05$; ** $p < .01$; two-sided tests.

* The dependent variable has been logged. Models include industry dummies; thus, all covariates are relative to the market averages. Standard errors are in parentheses.

have more reliable performance, as evidenced by the statistically significant, negative effect of the culture-strength variable. The support for the reliability hypothesis from these estimates is particularly reassuring, since the models in table 4 account for any unobserved firm-specific factors that might influence variability, including differences in the content of corporate cultures.

I tested hypotheses 2 and 3, that the association between culture strength and performance depends on industry volatility, by interacting the culture-strength measures with the yearly measures of industry volatility described in table 2. Hypothesis 2 implied that the interaction effect between culture strength and industry volatility should have a negative effect on mean performance. As shown in table 5, there is no statistical support for hypothesis 2 in any of the models estimated, although the coefficient estimates are in the expected direction. There is substantial support for hypothesis 3, however, as evidenced by the positive and significant effects on the log variance of the interaction between culture strength and industry volatility. This pattern is found using both estimation strategies: the multiplicative heteroscedastic-

Table 5

Contingent Effects of Culture Strength on Firm Performance, 1979–1984*

Variable	ROI		Operating cash flow	
	(1)	(2)	(3)	(4)
<i>Mean:</i>				
Debt-to-asset ratio	-.169** (.012)	-.166** (.012)	71.801** (32.515)	83.023** (28.749)
Operating leverage	-.080** (.014)	-.073** (.014)	-81.142 (41.260)	-73.242* (34.926)
Corporate culture strength	.003 (.006)	.021* (.009)	51.027 (29.767)	66.070** (29.162)
Log market capitalization	-.001 (.001)	-4.E-04 (.001)	2.539** (6.495)	18.458** (5.509)
Industry volatility	-.008 (.010)	-.009 (.010)	36.939 (28.124)	31.107 (25.016)
Culture strength x Industry volatility	-.003 (.006)	-.004 (.007)	-54.975 (35.478)	-49.109 (33.846)
Culture strength x Log market constraint		.006** (.002)		8.530 (9.606)
<i>Log variance:</i>				
Corporate culture strength	-1.816** (.310)	-1.994** (.344)	-2.382** (.364)	-3.225** (.316)
Log market capitalization	-.005 (.066)	.021 (.066)	1.538** (.090)	1.532** (.090)
Industry volatility	.419 (.411)	.414 (.409)	-.841 (.464)	-1.134* (.465)
Culture strength x Industry volatility	1.428** (.307)	1.361** (.307)	1.951** (.342)	1.572** (.308)
Culture strength x Log market constraint		-.180 (.112)		-.846** (.105)
χ^2	1042	1052	3620	3677
D.f.	44	46	45	47
Firm-year spells	800	800	703	703

* $p < .05$; ** $p < .01$; two-sided tests.

* Models include industry dummies in the prediction equations for both the mean and log variance; thus all covariates are relative to the market averages. The model for operating cash flow includes a control for the operating cash flow level in 1978.

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ity models in table 5 and the analyses in table 4 of the error from the firm-specific regressions (models 4 and 8). These estimates suggest that as industry volatility increases, the reliability-enhancing benefits of strong corporate cultures attenuate. Moreover, this effect is robust to the inclusion of the interaction effect between culture strength and market competition.

Figure 1. Conditional effect of culture strength on cash-flow variance.

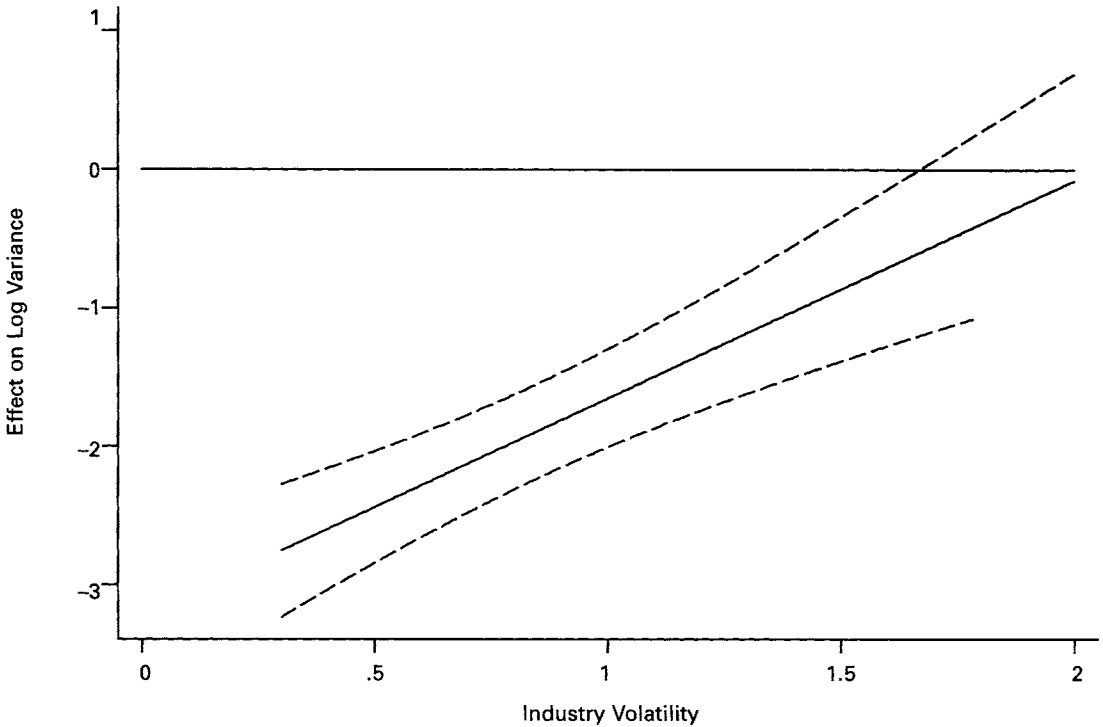


Figure 1 presents the interaction effect between culture strength and industry volatility graphically, using the estimates for cash-flow volatility from model 4 in table 5. Each point on the solid line in figure 1 represents the estimated reduction in the log cash flow variance due to a one-unit increase in culture strength at a particular level of industry volatility. The dashed lines are 95-percent confidence intervals about this effect, computed according to the formula in Friedrich (1982). The figure suggests that at most observed levels of industry volatility, the strength of corporate culture has a substantial influence on cash-flow volatility. At the same time, this effect diminishes markedly as volatility increases; when the volatility score equals approximately 1.5, the confidence interval includes zero, and culture strength has no reliability benefits. The interaction effect for the variance in ROI shows a similar pattern, although the confidence interval includes zero at a lower level of volatility (at a value of approximately 1.2).

DISCUSSION

The results indicate that the strength of corporate culture affects the variability of firm performance and that this rela-

tionship is contingent on the level of industry volatility. In stable environments, firms perceived to have strong corporate cultures exhibit superior and more reliable performance. This suggests that in these environments, the consensus surrounding organizational goals and values characteristic of strong-culture firms enhances their ability to exploit established competencies. The benefits of a strong culture carry a cost with respect to adaptation in volatile environments, however, as the reliability benefits of strong cultures attenuate as industry volatility increases.

Hypothesis 2, that the positive effect of culture strength on mean performance should decrease in volatile environments, was not supported. It is not immediately apparent why this is the case. Substantively, it may be that firms with strong cultures can weather short periods of volatility without suffering a drop in performance. This would be the case, for example, if the improvements in internal efficiency due to strong cultures outweigh any difficulties strong-culture firms have in adapting to changed external demands. Similarly, the reliability benefits of a strong culture during periods of incremental change, such as the lowered likelihood of underinvestment (Minton and Schrand, 1999), may allow strong-culture firms to develop sufficient organizational slack to withstand periods of environmental change.

Methodologically, the lack of support for hypothesis 2 may reflect shortcomings in the volatility measure. It is difficult to construct a single volatility measure that applies across a wide range of industries, and it seems likely that the volatility measure used here, based on stock market returns, only imperfectly captured fundamental or discontinuous changes in the environment. If, as just argued, strong-culture firms are in a relatively good position to weather short-term volatility, it may only be when there are truly radical shifts in the underlying technologies and competitive conditions in an industry that the mean performance benefits of a strong culture disappear.

Several potential alternative interpretations should be examined more carefully in future research. First, unobserved factors may lead some firms to have high levels of performance with little variability; these firms may in turn be more likely to develop strong corporate cultures. For example, consistently high levels of performance may make it easier for members of the organization to arrive at a consensus about the firm's core values and norms. By contrast, individuals in firms with haphazard performance may be less likely to reach agreement about what the firm does and why it is successful. This alternative explanation cannot be ruled out conclusively using Kotter and Heskett's data, since a proper test would require collecting time-varying information on culture strength. Second, it is possible that a response effect caused by the instrument used to measure culture strength could result in a spurious association between culture strength and reliability. If respondents have difficulty assessing the culture strength of firms in their industry, they may turn to more easily observable firm attributes. Respondents may implicitly equate culture strength with consistent performance and therefore assign high culture scores to firms with reliable per-

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formance. But neither unobserved heterogeneity nor the response effect can explain satisfactorily the contingent nature of the relationship between culture strength and reliability. Reliable performance should be more noticeable in volatile environments, both to internal and external observers. If the culture scores simply reflect perceptions of reliable performance, one would expect the positive correlation between culture and reliability to be strongest in volatile environments, but this is not the case.

This study implicitly assumes that the strength of corporate culture can be represented adequately by a measurement taken at one point in time, a common assumption in studies of the effects of culture strength on performance (Denison, 1990; Kotter and Heskett, 1992; Gordon and DiTomaso, 1992). The validity of this assumption depends on the degree of inertia in cultural systems relative to the rate of change in environmental conditions. Harrison and Carroll's (1991) simulations suggested that cultural systems are relatively robust in the face of turnover and organizational growth and decline. More generally, organizational ecologists have argued that organizational structures are relatively inert (Hannan and Freeman, 1984). It may therefore be reasonable to assume that organizational cultures also have inertial tendencies (Schein, 1992). Future research should test the validity of this assumption and explore in greater detail the processes that drive change in the strength of corporate culture. An interesting question in this respect is whether cultural strength changes in response to unreliable performance.

Finally, both the theory and the evidence in this paper focus on the strength of corporate culture in terms of consensus but do not address the question of cultural content. An important issue for future research is how the bias against exploratory learning in strong cultures might be mediated by the content of the corporate culture. The statistical analyses in this paper address central tendencies: while strong-culture firms on average exhibit less reliable performance in volatile environments, some strong-culture firms handle the volatility better than others. Future research should investigate why this is the case. The answer may lie in other organizational characteristics of the firms in question—for example, differences in organizational structures, the delegation of authority, and incentive systems—in addition to the content of firm cultures.

In terms of cultural content, a shortcoming of Kotter and Heskett's data is that they may underrepresent firms with strong cultures of exploration, for two reasons. First, the measurement of culture strength relies on outsiders' perceptions of a firm having a recognizable way of doing things. If strong cultures of exploration lead to frequent changes in organizational routines, it seems unlikely that they will be identified with a particular way of doing things. Second, the composition of the sample may create a survivor bias against strong cultures of exploration. Most organizational environments are characterized by relatively long periods of incremental change, interspersed with periods of volatility. The returns to exploitation dominate the returns to exploration during incremental environmental change. Apart from the dif-

difficulties inherent in designing and maintaining a culture of exploration, firms with strong cultures of exploration should find themselves at a disadvantage during periods of stability relative to firms with strong cultures of exploitation that are well-matched to environmental conditions. Research designed to examine the mediating effect of cultural content must be sensitive to this issue.

CONCLUSION

Firms with strong cultures incur a tradeoff with respect to their adaptive ability in the face of environmental change. Strong corporate cultures facilitate reliable performance in relatively stable environments, but as volatility increases, these benefits are dramatically attenuated. This pattern is consistent with the fundamental tradeoff between exploration and exploitation noted by March (1991) and suggests that strong-culture firms excel at exploiting established competencies but have difficulty exploring and discovering new competencies that better suit changing environmental conditions.

While the tradeoff between exploration and exploitation has been acknowledged for some time, there has been little empirical research linking this tradeoff to organizational characteristics. Organizations make implicit and explicit choices about the allocation of resources to each type of learning. Some of the more explicit choices are encoded in formal structures. For example, the interdependencies created by vertical integration demand a commitment to a particular technology and, hence, a shift of resources toward exploitation. This affects adaptability in rapidly changing environments (Sorenson, 2001). In franchising organizations, the balance between exploration and exploitation depends on the mix of company-owned and franchised units (Sorenson and Sørensen, 2001). In hotel chains, Ingram and Baum (1997) found that the effects of operating experience depend on the structure of the chain and the nature of the operating experiences of chain members. The evidence in this paper suggests that a firm's informal structure, in the form of the strength of its corporate culture, also affects the balance between exploration and exploitation.

This research also helps us better understand the costs and benefits of strong corporate cultures. Corporate cultures consist of ideas about the firm's unique capabilities, frameworks for interpreting the state of the environment, and routinized means of responding to environmental changes (Weick, 1985; Levitt and March, 1988; Schein, 1992). Strong-culture firms have a high level of commitment to an established way of understanding the world, while weak-culture firms exhibit heterogeneity in participants' beliefs about the relationship between the organization and its environment. As long as the organization's perceptions of its environment are reasonably accurate, firms benefit from strong corporate cultures, both by achieving higher performance levels and by doing so more reliably. Strong-culture organizations do not bear the costs of disagreement surrounding organizational goals and the means to achieve them. When environments are volatile, however, exploration skills become more valuable. Success in volatile environments requires being able to learn from

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new and changing situations. In volatile environments, the assumptions forming the basis of the corporate culture become inaccurate at a faster rate. When the environment shifts, strong-culture organizations have no fall-back position, and the lack of internal diversity in perspectives makes it more difficult for the firm to adapt.

These findings might lead one to conclude that the optimal strategy for firms would be to develop strong cultures that explicitly encourage exploratory learning and innovation (Gordon and DiTomaso, 1992), but such a conclusion is unwarranted. The value of a strong culture of exploration still depends on the existence of environmental conditions that reward exploration. If the environment changes to reward efficiency and exploitation of organizational routines, firms that are strongly committed to exploration should have greater difficulty adapting than firms with weak cultures of exploration, because such an environment demands relative stability in organizational routines and the ability to make incremental improvements in efficiency. The difficulty encountered by the firm with a strong culture of exploration is, in this case, not an inability to discover new routines but greater difficulty in discovering a set of values and norms that are appropriate to the new environment.

Finally, the fact that there are tradeoffs associated with strong corporate cultures should not overshadow one of the central results of this paper, namely, that strong cultures in general lead to reductions in performance variability. As noted at the outset, firms benefit from reduced variability in performance. For example, the fact that strong-culture firms have less volatile cash flows suggests that they are less likely to underinvest. Strong cultures therefore create competitive advantage not only by increasing motivation and facilitating coordination and control, but also by leaving the strong-culture firm in a stronger position to respond to investment opportunities that might solidify its competitive advantage. While the results in this paper suggest that strong-culture firms encounter difficulties during periods of fundamental change, the advantages that accrue to them during periods of incremental change may make them better able to weather periods of upheaval.

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