STRUCTURAL INERTIA AND ORGANIZATIONAL CHANGE*

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Theory and research on organization-environment relations from a population ecology perspective have been based on the assumption that inertial pressures on structure are strong. This paper attempts to clarify the meaning of structural inertia and to derive propositions about structural inertia from an explicit evolutionary model. The proposed theory treats high levels of structural inertia as a consequence *of a selection process rather than as a precondition for selection. It also considers how the strength of inertial forces varies with age, size, and complexity.*

Most prominent organization theories explain variability in organizational characteristics, that is, diversity, through reference to the history of adaptations by individual organizations. Earlier (Hannan and Freeman, 1977), we challenged this view and argued that adaptation of organizational structures to environments occurs principally at the *population* level, with forms of organization replacing each other as conditions change. This initial statement of population ecology theory rested on a number of simplifying assumptions. A major one was the premise that individual organizations are subject to strong inertial forces, that is, that they seldom succeeded in making radical changes in strategy and structure in the face of environmental threats.

How strong are inertial forces on organizational structure? This question is substantively interesting in its own right. It is also strategically important, because the claim that adaptation theories of organizational change should be supplemented by population ecology theories depends partly on these inertial forces being strong.

Many popularized discussions of evolution suggest that selection processes invariably favor adaptable forms of life. In fact the theory of evolution makes no such claim, as we made clear earlier (Hannan and Freeman, 1977; Freeman and Hannan, 1983). This paper goes beyond our earlier theory in acknowledging that organizational changes of some kinds occur frequently and that organizations sometimes even manage to make radical changes in strategies and structures. Nevertheless, we argue that selection processes tend to favor organizations whose structures are difficult to change. That is, we claim that high levels of structural inertia in organizational populations can be explained as an outcome of an ecological-evolutionary process.

In addition to deriving structural inertia as a consequence of a selection process, this paper explores some of the details of inertial forces on organizational structure. It considers how inertial forces vary over the life cycle, with organizational size, and with complexity, and suggests some specific models for these dependencies.

BACKGROUND

Our earlier formulation of an ecological theory of organizational change pointed to a variety of constraints on structural change in organizations:

> . . . for wide classes of organizations there are very strong inertial pressures on structure arising from both internal arrangements (for example, internal politics) and from the environment (for example, public legitimation of organizational activity). To claim otherwise is to ignore the most obvious feature of organizational life. (Hannan and Freeman, 1977:957)

Some of the factors that generate structural inertia are internal to organizations: these include sunk costs in plant, equipment, and personnel, the dynamics of political coalitions, and the tendency for precedents to become normative standards. Others are external. There are legal and other barriers to entry and exit from realms of activity. Exchange relations with other organizations constitute an investment that is not written off lightly. Finally, attempting radical structural change often threatens legitimacy; the loss of institutional support may be devastating.

We continue to believe that inertial pressures on most features of organizational

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structure are quite strong—much stronger than most theorists acknowledge. Moreover, the assumption that organizations rarely make fundamental changes successfully has proven to be a useful strategic simplification. It has allowed a rich and evocative set of ecological theories and models to be applied to the problem of changes in organizational form over time (see, e.g., Brittain and Freeman, 1980; Carroll, 1983; Carroll and Delacroix, 1982; Freeman, 1982; Freeman and Hannan, 1983; Freeman et al., 1983).

However, the claim that organizational structures rarely change is the subject of dispute. March (1981:563) summarizes his review of research on organizational change by asserting:

> Organizations are continually changing, routinely, easily, and responsively, but change within organizations cannot be arbitrarily controlled . . . What most reports on implementation indicate . . . is not that organizations are rigid and inflexible, but that they are impressively imaginative.

The contemporary literature contains at least three broad points of view on organizational change. Population ecology theory holds that most of the variability in organizational structures comes about through the creation of new organizations and organizational forms and the replacement of old ones (Hannan and Freeman, 1977; Freeman and Hannan, 1983; McKelvey, 1982). A second view, which might be called rational adaptation theory, proposes that organizational variability reflects designed changes in strategy and structure of individual organizations in response to environmental changes, threats, and opportunities. There are numerous variants of this perspective which differ widely on other dimensions. Contingency theories emphasize structural changes that match organizational structures to technology-environment pairs (Thompson, 1967; Lawrence and Lorsch, 1967). Resource-dependence theories emphasize structural changes that neutralize sources of environmental uncertainty (Pfeffer and Salancik, 1978). An institutionally oriented version of this perspective holds that organizational structures are rationally adapted to prevailing, normatively endorsed modes of organizing (Meyer and Rowan, 1977; DiMaggio and Powell, 1983). Marxist theories of organization typically assert that organizational structures are rational solutions for capitalist owners to the problem of maintaining control over labor (Edwards, 1979; Burawoy, 1979). The third broad perspective, which might be called random transformation theory, claims that organizations change their structures mainly in response to endogenous processes, but that such changes are only loosely coupled with the desires of organizational leaders and with the demands and threats of environments (March and Olsen, 1976; March, 1982; Weick, 1976).

Progress in explaining organizational diversity and change requires understanding both the nature of organizational change and the degree to which it can be planned and controlled. Here we concentrate mainly on the first issue: does most of the observed variability in organizational features reflect changes in existing organizations, whether planned or not, or does it reflect changes in populations with relatively inert organizations replacing each other? In other words, does change in major features of organizations over time reflect mainly adaptation or selection and replacement?

The selection and adaptation perspectives are so different that it is hard to believe that they are talking about the same things. Scott (1981:204) claims that they are not:

> . . . the natural selection perspective seems to us to be particularly useful in focusing attention on the core features of organizations, explaining the life chances of smaller and more numerous organizations, and accounting for changes in organizational forms over the long run. By contrast the rational selection or resource dependency approach emphasizes the more peripheral features of organizations, is better applied to larger and more powerful organizations, and stresses changes occurring over shorter periods of time.

This contrast provides a useful point of departure for an attempt to clarify the conditions under which the two perspectives apply.

TRANSFORMATION AND REPLACEMENT

All accepted theories of biotic evolution share the assumption that innovation, the creation of new strategies and structures, is random with respect to adaptive value. Innovations are not produced because they are useful; they are just produced. If an innovation turns out to enhance life chances, it will be retained and spread through the population with high probability. In this sense, evolution is blind. How can this view be reconciled with the fact that human actors devote so much attention to predicting the future and to developing strategies for coping with expected events? Can social change, like biotic evolution, be blind?

Almost all evolutionary theories in social science claim that social evolution has foresight, that it is Lamarckian rather than

Darwinian in the sense that human actors learn by experience and incorporate learning into their behavioral repertoires (see, e.g., Nelson and Winter, 1982). To the extent that learning about the past helps future adaptation, social change is indeed Lamarckian—it transforms rather than selects. In other words, major change processes occur *within* behavioral units.

Even when actors strive to cope with their environments, action may be random with respect to adaptation as long as the environments are highly uncertain or the connections between means and ends are not well understood. It is the *match* between action and environmental outcomes that must be random on the average for selection models to apply. In a world of high uncertainty, adaptive efforts by individuals may turn out to be essentially random with respect to future value.

The realism of Darwinian mechanisms in organizational populations also turns on the degree to which change in organizational structures can be controlled by those ostensibly in command. Suppose that individuals learn to anticipate the future and adapt strategies accordingly and that organizations simply mirror the intentions of rational leaders. Then organizational adaptations would be largely nonrandom with respect to future states of the environment. On the other hand, if March and others are right, organizational change is largely uncontrolled. Then organizations staffed by highly rational planners may behave essentially randomly with respect to adaptation. In other words, organizational outcomes may be decoupled from individual intentions; organizations may have lives of their own. In this case it is not enough to ask whether individual humans learn and plan rationally for an uncertain future. One must ask whether organizations as collective actors display the same capacities.

The applicability of Darwinian arguments to changes in organizational populations thus depends partly on the tightness of coupling between individual intentions and organizational outcomes. At least two well-known situations generate loose coupling: diversity of interest among members and uncertainty about means-ends connections. When members of an organization have diverse interests, organizational outcomes depend heavily on internal politics, on the balance of power among the constituencies. In such situations outcomes cannot easily be matched rationally to changing environments.

When the connections between means and ends are obscure or uncertain, carefully designed adaptations may have completely unexpected consequences. Moreover, short-run consequences may often differ greatly from long-run consequences. In such cases, it does not seem realistic to assume a high degree of congruence between designs and outcomes.

STRUCTURAL INERTIA

To this point we have adopted the frame of reference of the existing literature, which asks whether organizations learn and adapt to uncertain, changing environments; but we think this emphasis is misplaced. The most important issues about the applicability of evolutionary-ecological theories to organizations concern the *timing* of changes.

Learning and adjusting structure enhances the chance of survival only if the speed of response is commensurate with the temporal patterns of relevant environments. Indeed, the worst of all possible worlds is to change structure continually only to find each time upon reorganization that the environment has already shifted to some new configuration that demands yet a different structure. Learning and structural inertia must be considered in a dynamic context. Can organizations learn about their environments and change strategies and structures as quickly as their environments change? If the answer is negative, replacement or selection arguments are potentially applicable.

Three things must be known in order to answer questions about the applicability of selection theories to populations of organizations. The first issue is the *temporal pattern of changes in key environments*. Are typical changes small or large, regular or irregular, rapid or slow? The second issue is the *speed of learning mechanisms*. How long does it take to obtain, process, and evaluate information on key environments? The third issue is the *responsiveness of the structure to designed changes*. How quickly can an organization be reorganized?

To claim that organizational structures are subject to strong inertial forces is not the same as claiming that organizations never change. Rather, it means that organizations respond relatively slowly to the occurrence of threats and opportunities in their environments. Therefore, structural inertia must be defined in relative and dynamic terms. It refers to comparisons of the typical rates of change of the processes identified above. In particular, structures of organizations have high inertia when the speed of reorganization is much lower than the rate at which environmental conditions change. Thus the concept of inertia, like fitness, refers to a correspondence between the behavioral capabilities of a class of organizations and their environments.

Our definition of structural inertia implies that a particular class of organizations might have high inertia in the context of one environment but not in another. For example, the speed of technical change in the semiconductor industry has been very high over the past twenty years. Firms that would be considered remarkably flexible in other industries have not been able to reorganize quickly enough to keep up with changing technologies.

One of the most important kinds of threats to the success of extant organizations is the creation of new organizations designed specifically to take advantage of some new set of opportunities. When the costs of building a new organization are low and the expected time from initiation to full production is short, this kind of threat is intense (unless there are legal barriers to the entry of new organizations). If the existing organizations cannot change their strategies and structures more quickly than entrepreneurs can begin new organizations, new competitors will have a chance to establish footholds. Other things being equal, the faster the speed with which new organizations can be built, the greater is the (relative) inertia of a set of existing structures.

Even such a successful and well-managed firm as IBM moves ponderously to take advantage of new opportunities. Granted, IBM eventually moved into the market for minicomputers and microcomputers and appears poised to dominate them. Still, the protracted period of assessing these markets, waiting for technologies to stabilize, and reorganizing production and marketing operations created the opportunity for new firms to become established. As a consequence, the structure of the computer industry is almost certainly different than it would have been had IBM been willing and able to move quickly. The point is that IBM did change its strategy somewhat, but this change took long enough that new firms using different strategies and structures were able to flourish.

REPRODUCIBILITY, INERTIA, AND SELECTION

As we have emphasized elsewhere, organizations are special corporate actors. Like other corporate actors, they are structures for accomplishing collective action as well as repositories of corporate resources. Unlike other collective actors, organizations receive public legitimation and social support as agents for accomplishing specific and limited goals. Although individual members often manipulate organizations to serve private goals and organizations pursue other goals in addition to their public goals, the basis on which organizations mobilize resources initially and gain support from society is their *claim* to accomplish some specific set of ends (e.g., making a profit, treating the sick, producing basic scientific research).

Creating an organization means mobilizing several kinds of scarce resources. Organization builders must accumulate capital, commitment of potential members, entrepreneurial skills, and legitimacy (see Stinchcombe, 1965). Once such resources have been invested in building an organizational structure, they are difficult to recover. Although one can sell the physical assets of a disbanded organization and sometimes its name, most resources used to build it are lost when it is dissolved. Not only are the costs of starting an organization nontrivial, but organizations continually use substantial portions of their resources in maintaining and reproducing their structures rather than in performing collective action. Just as in the case of biotic creatures, there is a substantial metabolic overhead relative to the amount of work performed. Thus the creation of a permanent organization as a solution to a problem of collective action is costly compared to other alternatives.

Why do individuals and other social actors agree to commit scarce resources to such expensive solutions to problems of collective action? A number of answers to this question have been put forth (see Scott, 1981:135–63, for an insightful review). The new institutional economics argues that organizations arise to fill the gaps created by market failure (Arrow, 1974). Williamson's (1975) influential analysis proposes that organizations are more efficient than markets in situations in which economic transactions must be completed in the face of opportunism, uncertainty, and small-numbers bargaining. Although sociologists tend to deny that organizations arise mainly in response to market failures, they tend to agree that organizations have special efficiency properties, but emphasize their efficiency and effectiveness for coordinating complex tasks (Blau and Scott, 1962; Thompson, 1967).

Although these efficiency arguments are plausible, it is not obvious that they are correct. Many detailed accounts of organizational processes raise serious doubts that organizations minimize the costs of completing many kinds of transactions. Indeed, there appears to be a strong tendency for organizations to become ends in themselves and to accumulate personnel and an elaborate structure far beyond the technical demands of work. Moreover, many organizations perform very simple tasks that involve low levels of coordination. In contrast, collections of skilled work-

ers collaborating in ad hoc groups can often complete quite complex tasks. From the perspective of the performance of a *single*, complex collective action, it is not obvious that a permanent organization has any technical advantage.

We emphasize different kinds of competencies. The first of these is *reliability*. Organizations have unusual capacities to produce collective products of a given quality repeatedly. In a world of uncertainty, potential members, investors, and clients may value reliability of performance more than efficiency. That is, rational actors may be willing to pay a high price for the certainty that a given product or service of a certain minimum quality will be available when it is needed. Reliability depends on the *variance* of performance (including its timeliness) rather than its average level.

Organizations have higher levels of reliability than ad hoc collectives in two senses: one cross-sectional and the other temporal. Cross-sectional reliability means that an outcome chosen at random from a population of organizations will have a lower variance than one chosen at random from a population of other kinds of producers. Temporal reliability means the variability over time in the quality (including timing of delivery) of an outcome is lower for those produced by organizations than for those produced by ad hoc groups. Overall, we argue that the distinctive competence of organizations is the capacity to generate collective actions with relatively small variance in quality.

Organizations have a second property that gives them an advantage in the modern world: *accountability*. The spread of general norms of rationality in the modern world (Weber, 1968) and a variety of internal and external contingencies demand that organizations be able to account rationally for their actions. This means both that they must be able to document how resources have been used and to reconstruct the sequences of organizational decisions, rules, and actions that produced particular outcomes. It does not necessarily mean that organizations must tell the truth to their members and to the public about how resources were used or how some debacle came about. What matters is that organizations can make internally consistent arguments that appropriate rules and procedures existed to reproduce rational allocations of resources and appropriate organizational actions.

Norms of procedural rationality are pervasive in the modern world. Organizational legitimacy, in the sense of high probability that powerful collective actors will endorse an organization's actions (Stinchcombe, 1968), depends on ostensible conformity to these norms. Coleman (1974) has argued that corporate actors favor other corporate actors over individuals. We add that corporate actors especially favor other corporate actors that give signals of procedural rationality and accountability.

Testing for accountability is especially intense during organization building, the process of initial resource mobilization. Potential members want assurance that their investments of time and commitment will not be wasted. When membership involves an employment relation, potential members often want guarantees that careers within the organization are managed in some rational way. Potential investors (or supporters) also assess accountability. In fact, the profession of public accountancy arose in the United States in response to the desires of British investors in American railroads for assurances that their investments were being managed in appropriate ways (Chandler, 1977). Demands for accounting rationality in this narrow sense are both widespread and intense in modern societies. For example, the federal government will not allocate research grants and contracts to organizations that have not passed a federal audit, meaning that they have given evidence of possessing the appropriate rules and procedures for accounting for the use of federal funds.

Accountability testing is also severe when resources contract. Members and clients who would otherwise be willing to overlook waste typically change their views when budgets and services are being cut.

In our judgment, pressures for accountability are especially intense when (1) organizations produce symbolic or information-loaded products (e.g., education, branded products versus bulk goods)—see DiMaggio and Powell (1983); (2) when substantial risk exists (e.g., medical care); (3) when long-term relations between the organization and its employees or clients are typical; and (4) when the organization's purposes are highly political (Weber, 1968). Our arguments presumably apply with special force to organizations in these categories. Still, we think that pressures towards accountability are generally strong and getting stronger. The trend toward litigating disputes and pressures for formal equality in modern polities intensifies demands for accountability. All organizations seem to be subject to at least moderate levels of accountability testing.

We argue that the modern world favors collective actors that can demonstrate or at least reasonably claim a capacity for reliable performance and can account rationally for their actions. These forces favor organizations over other kinds of collectives and they favor cer-

tain kinds of organizations over others, since not all organizations have these properties in equal measure. Selection within organizational populations tends to eliminate organizations with low reliability and accountability. The selection processes work in several ways. Partly they reflect testing by key actors and environments in the organization-building stage. Potential members, investors, and other interested parties apply tests of reliability and accountability to proposed new ventures. Such testing continues after founding. Unreliability and failures of accountability at any stage in a subsequent lifetime threatens an organization's ability to maintain commitment of members and clients and its ability to acquire additional resources.

Assumption 1. *Selection in populations of organizations in modern societies favors forms with high reliability of performance and high levels of accountability.*

When does an organization have the capacity to produce collective outcomes of a certain minimum quality repeatedly? The most important prerequisite is so commonplace that we take it for granted. Reliable performance requires that an organization continually reproduce its structure—it must have very nearly the same structure today that it had yesterday. Among other things, this means that structures of roles, authority and communication must be reproducible from day to day.

Assumption 2. *Reliability and accountability require that organizational structures be highly reproducible.*

A structure can conceivably be reproduced repeatedly by negotiation and conscious decision making. The members of an organization with such practices might happen to decide each day to re-create the structure that existed the previous day. But this seems unlikely. Reproducibility is far more likely under different conditions. In general, organizations attain reproducibility of structure through processes of institutionalization and by creating highly standardized routines.

The first solution, institutionalization, is a two-edged sword. It greatly lowers the cost of collective action by giving an organization a taken-for-granted character such that members do not continually question organizational purposes, authority relations, etc. Reproduction of structure occurs without apparent effort in highly institutionalized structures. The other edge of the sword is inertia. The very factors that make a system reproducible make it resistant to change. In particular, to the extent that an organization comes to be valued for itself, changes in structural arrangements become moral and political rather than technical issues. Attempts at redesigning structures in organizations built on moral commitment are likely to spark bursts of collective opposition premised on moral claims in favor of the status quo. Even if such opposition does not prevail, it delays change considerably.

As a brake on structural change, institutionalization applies both to the organization as a whole and to its subunits. But what about the diversity among sets of differentiated activities within the organization? Some kinds of organizations perform diverse sets of activities, sometimes in parallel and sometimes sequentially. Military organizations provide a striking example; they maintain "peacetime" and "wartime" structures.[1] Similarly, labor unions gear up for organizing drives or for waves of strikes and then return to more placid bread-and-butter collective bargaining. Manufacturing firms sometimes concentrate on redesigning products and at other times concentrate on marketing an extant set of products. Each phase of organizational activity involves mobilizing different kinds of structures of communication and coordination. In a real sense these kinds of organizations can be said to use different structures in different phases.

Does this mean that these organizations have somehow escaped inertial tendencies? We think not, at least from the perspective of attempts at building theories of organizational change. These organizations have multiple *routines;* they shift from one routine (or set of routines) to another in a fairly mechanical fashion. We think that organizations have high inertia both in the sets of routines employed and in the set of rules used to switch between routines.

According to Nelson and Winter (1982:96) routines are the "source of continuity in the behavioral patterns of organizations." They are patterns of activity that can be invoked repeatedly by members and subunits. One way of conceiving of routines is as organizational memory—an organization's repertoire of routines is the set of collective actions that it can do from memory. Nelson and Winter emphasize that organizations *remember by doing.* Like knowledge of elementary algebra or high school Latin, collective knowledge is the basis of organizational routines and decays rapidly with disuse. Even occasional use reveals some decay in recall and demonstrates the need to reinvest in learning to keep skills at their

[1] Janowitz (1960) discusses various conflicting demands of organizing military activities in peacetime and war. Etzioni (1975) discusses the shifts in control problems that arise in armies and labor unions as a result of such changes.

former levels. Organizations that have the capacity to use a broad repertoire of routines do so by virtue of large investments in keeping their routines sharp. For example, peacetime armies devote a great deal of their resources to simulating wartime situations and training. Armies that fail to make such an investment experience great difficulty in making the transition to battle readiness.

The fact that organizational routines decay with disuse implies that organizations face the classic specialism–generalism dilemma in deciding how many routines to maintain at any fixed level of resources. Generalists (those with many routines) are no less inert than specialists in the manner in which they adapt to environmental change in the sense that they still use a limited number of routines. As Nelson and Winter (1982:134) put it:

> . . . it is quite inappropriate to conceive of firm behavior in terms of deliberate choice from a broad menu of alternatives that some outside observor considers to be "available" to the organization. The menu is not broad, it is narrow and idiosyncratic . . . Efforts to understand the functioning of industries and larger systems should come to grips with the fact that highly flexible adaptation to change is not likely to characterize the behavior of individual firms.

We think that it is a reasonable first approximation to think of organizations as possessing relatively fixed repertoires of highly reproducible routines. Then the present argument can be applied either to the organization as a whole, where the issue is the diversity of the repertoire, or to the individual routine.

Thus we argue that the properties that give some organizations reproducibility also make them highly resistant to structural change, whether designed or not. As we noted above, this means that some aspects of structure can be changed only slowly and at considerable cost (many resources must be applied to produce structural change). Such structures have a dead-weight quality; there are large lags in response to environmental changes and to attempts by decision makers to implement change. Since lags in response can be longer than typical environmental fluctuations and longer than the attention spans of decision makers and outside authorities, inertia often blocks structural change completely.

The inertia of reproducible organizations is usually viewed as a pathology. A classic statement of this position is Merton's (1957) essay on the "dysfunctions of bureaucracy." High levels of inertia may produce serious mismatches between organizational outcomes and the intentions of members and clients in situations in changing environments. But, as we argued earlier (Freeman and Hannan, 1983), organizations that frequently try to reorganize may produce very little and have slight chances of survival. Here the issue is the cause of structural inertia rather than its consequences. Our argument is that resistance to structural change is a likely by-product of the ability to reproduce a structure with high fidelity:

Assumption 3. *High levels of reproducibility of structure generate strong inertial pressures.*

The three assumptions form the core of our first argument. Taken together they imply:

Theorem 1. *Selection within populations of organizations in modern societies favors organizations whose structures have high inertia.*

This theorem states that structural inertia can be a *consequence* of selection rather than a precondition. All that is required is that some organizations in an initial population have high levels of reproducibility (hence high levels of inertia) and that selection pressures be reasonably strong. Under such conditions, selection pressures in modern societies favor organizations whose structures are resistant to change, which makes selection arguments all the more applicable.

A HIERARCHY OF INERTIAL FORCES

So far we have considered organizations as unitary actors, either adapting to their environments or remaining inert. This is simplistic in that it ignores the obvious fact that some parts of organizations change more quickly than others and that adaptive changes are sometimes not difficult to discern or implement. Universities, for example, are constantly changing the textbooks used for instruction. They do so in an adaptive way, keeping up with the constantly evolving knowledge bases of their various fields. Persuading a university faculty to abandon liberal arts for the sake of vocational training is something else again.

Why would the university's curriculum be so difficult to change? A number of answers come quickly to mind. The curriculum embodies the university's identity with reference both to the broader society and to its participants (i.e., faculty, students, staff, administration, alumni). The kinds of courses offered and the frequency with which they are offered serve as a statement of purpose which is articulated with society's value system. The curriculum also represents one of the bases on which resources are distributed. A change toward a more vocationally oriented set of courses threatens entrenched interests. Professors of classics and other humanistic fields which

would have a lesser role in such an institution can be expected to resist such a change. The curriculum is difficult to change, then, because it represents the core of the university's organizational identity and underlies the distribution of resources across the organization. In these ways, it can be said to lie at the university's "core."

This view of organizations as having a core which is more difficult to modify than more peripheral parts of its structure is not new. As Parsons (1960:59–69) pointed out, organizational authority hierarchies are not continuous; qualitative breaks occur between the technical, managerial, and institutional levels. The technical system is that part of the organization that directly processes the "materials" used by the organization. The resources used by the technical system to do the organization's basic work are allocated by a broader organizational apparatus, the managerial or administrative system, which also relates those technical activities to the public served. While each depends on the other, the managerial level stands in a superordinate position. It both controls and services the technical level's operations, while the reverse is less often the case.

The third part, the institutional system, articulates the whole organization with the broader society. Parsons emphasized its role in legitimating the organization. Boards of trustees and directors are responsible for long-run policy and for the conduct of the organization with regard to its reputed goals. Because the institutional and managerial levels of the organization stand prior to the technical level in controlling the flow of resources, any important change in their operations leads to changes in the details of the operations of the technical system, while the reverse is less often true.

Thompson (1967) adopted these distinctions in arguing that organizations are built in such a way as to protect structural units carrying out the primary technology from uncertainties emanating from the environment. Thompson, however, drew core-periphery distinctions with reference to the organization's operating technology. Since we think that the importance of technology in determining structure varies greatly across kinds of organizations, we emphasize institutional characteristics more than technical ones. In this way our approach is closer to Parsons than to Thompson.

An argument similar to ours has been advanced by Downs (1967:167–68) in his use of the metaphor of organizational depth:

> . . . organizations have different structural depths. Our analysis recognizes four "organizational layers." The shallowest consists of the specific actions taken by the bureau, the second of the decision-making rules it uses, the third of the institutional structure it uses to make those rules, and the deepest of its general purposes.

The layers supposedly differ in characteristic speeds of response.

We conceptualize organizational structure as composed of hierarchical layers of structural and strategic features that vary systematically in flexibility and responsiveness. Our theory emphasizes the claims used to mobilize resources for beginning an organization and the strategies and structures used to maintain flows of scarce resources. Thus we classify items of structure according to their bearing on resource mobilization. From the perspective of resource mobilization, the core aspects of organization are (1) its stated *goals*—the bases on which legitimacy and other resources are mobilized; (2) *forms of authority* within the organization and the basis of exchange between members and the organization; (3) *core technology*, especially as encoded in capital investment, infrastructure, and the skills of members; and (4) *marketing strategy* in a broad sense—the kinds of clients (or customers) to which the organization orients its production and the ways in which it attracts resources from the environment. The four characteristics stand in a rough hierarchy, with publicly stated goals subject to the strongest constraints and marketing strategy the weakest. Thus we expect the likelihood of change by transformation to decline as one proceeds up the hierarchy.

These four properties provide a possible basis on which to classify organizations into forms for ecological analysis. An organization's initial configuration on these four dimensions commits it to a certain form of environmental dependence and to a long-term strategy. Once an organization has made a public claim to mobilize resources, has induced individuals to cede some control in return for specific inducements, has invested in physical and human capital of specific types, and has designed a product or service to appeal to a certain audience, it has greatly limited its range of feasible transformations.

Although organizations sometimes manage to change positions on these dimensions, such changes are both rare and costly and seem to subject an organization to greatly increased risks of death. Thus these characteristics serve as a possible basis for selection and replacement within populations of organizations.

Although the four properties listed above encompass much of organizational strategy and structure, they do not come close to exhausting the dimensions of structure that

interest social scientists. In particular, the list does not include structure in the narrow sense of numbers and sizes of subunits, number of levels in authority structures, span of control, patterns of communication, and so forth. Nor does it contain what Scott (1981) calls peripheral structures, the detailed arrangements by which an organization makes links with its environment and tries to buffer its technical core (for example, interlocking directorates and joint ventures).

We think that properties of organization charts and patterns of specific exchanges with actors in the environment are more plastic than the core set. They tend to change as organizations grow and decline in size, as technologies change, and as competitive and institutional environments change. They can be transformed because attempts at changing them involve relatively little moral and political opposition within the organization and in the environment and do not raise fundamental questions about the nature of the organization. In short, inertial forces on these aspects of structure and on peripheral or buffering activities tend to be weaker than those on core features.

Most organization theories assume that peripheral structures are premised on and adapted to a core structure. Changes in core structures usually require adjustment in the peripheral structures. However, the reverse is not true.[2] If a core structure is subject to strong selection pressure, peripheral structures will also be subject to at least weak (indirect) selection. In such cases, ecological theory applies at least indirectly to changes in peripheral structures. The tighter the coupling between the core and peripheral structures, the more direct is the applicability of our theory.

Overall we are inclined to agree with Scott that evolutionary-ecological theories apply more appropriately to core properties than to others. But we think that is because the strength of inertial pressures differ rather than because selection pressures on core and peripheral structures differ.

In addition to varying by aspects of structure, the strength of inertial forces may also vary with life-cycle phase, size, and complexity. The remainder of the discussion considers these issues.

LIFE-CYCLE VARIATIONS IN INERTIA

Newly created organizations apparently have lower levels of reproducibility than older ones. As Stinchcombe (1965) pointed out, new organizations typically have to rely on the cooperation of strangers. Development of trust and smoothly working relationships take time. It also takes time to work out routines. Initially there is much learning by doing and comparing alternatives. Existing organizations have an advantage over new ones in that it is easier to continue existing routines than to create new ones or borrow old ones (see the discussion in Nelson and Winter, 1982:99–107). Such arguments underlie the commonly observed monotonically declining cost curve at the firm level—the so-called learning curve.

In addition, the reliability and accountability of organizational action depend on members having acquired a range of organization-specific skills (such as knowledge of specialized rules and tacit understandings). Because such skills have no value outside the organization, members may be reluctant to invest heavily in acquiring them until an organization has proven itself (see Becker, 1975). Once an organization survives the initial period of testing by the environment, it becomes less costly for members to make investments in organization-specific learning—early success breeds the conditions for later success. Thus collective action may become more reliable and accountable with age simply because of a temporal pattern of investments by members. Moreover, the collective returns to investments in organization-specific learning may take time to be realized, just like the case for other forms of human capital. For both of these reasons, the levels of reliability and accountability of organizational action should increase with age, at least initially.

Once members have made extensive investments in acquiring organization-specific skills, the costs of switching to other organizations rise. Consequently the stake of members in keeping the organization going tends to rise as it ages.

Finally, processes of institutionalization also take time. In particular, it takes time for an organization to acquire institutional reality to its members and to become valued in its own right.

Assumption 4. *Reproducibility of structure increases monotonically with age.*

Theorem 2. *Structural inertia increases monotonically with age.* (From Assumptions 2 and 4)

Theorem 3. *Organizational death rates decrease with age.* (From Assumption 4 and Theorem 1)

Theorem 3, often called the "liability of newness" hypothesis (Stinchcombe, 1965), has

[2] Hawley's (1968) principle of isomorphism makes a similar argument concerning the relationship between "key functions" and other organizational structures.

been well documented empirically (see Freeman et al., 1983). Death rates appear to decline approximately exponentially as organizations age. One explanation for this finding is that reproducibility rises roughly exponentially with age over the early years in an organization's life.

Processes of external legitimation also take time. Although an organization must have some minimal level of public legitimacy in order to mobilize sufficient resources to begin operations, new organizations (and especially new organizational forms) have rather weak claims on public and official support. Nothing legitimates both individual organizations and forms more than longevity. Old organizations tend to develop dense webs of exchange, to affiliate with centers of power, and to acquire an aura of inevitability. External actors may also wait for an initial period of testing to be passed before making investments in exchange relations with new organizations. Thus processes of institutionalization in the environment and exchange relationships with relevant sectors of the environment may account for the relationships stated in Theorems 2 and 3. The argument to this point cannot distinguish between the internal and external sources of the relationships.

SIZE AND INERTIA

We argued above that dampened response to environmental threats and opportunities is the price paid for reliable and accountable collective action. If this argument is correct, organizations respond more slowly than individuals on average to environmental changes. However, some organizations are little more than extensions of the wills of dominant coalitions or individuals; they have no lives of their own. Such organizations may change strategy and structure in response to environmental changes almost as quickly as the individuals who control them. Change in populations of such organizations may operate as much by transformation as selection.

Except in exceptional cases, only relatively small organizations fit this description. An organization can be a simple tool of a dominant leader only when the leader does not delegate authority and power down long chains of command. Failure to delegate usually causes problems in large organizations. Indeed, the failure of moderate-sized organizations is often explained as resulting from the unwillingness of a founder-leader to delegate responsibility as the organization grew.

One way to conceptualize the issues involved is to assume that there is a critical size, which may vary by form of organization (and also, perhaps, by age), at which failure to delegate power sharply limits viability. In such a threshold model, organizations may be quite responsive below the threshold level of size. Above the threshold, organizations tend to have higher inertia. Or the relationship between size and inertia may be roughly continuous. Downs (1967:60) argues that for the case of public bureaus: ". . . the increasing size of the bureau leads to a gradual ossification of its action . . . the spread and flexibility of its operation steadily diminish." Whether there is a threshold as we have suggested or a continuous relationship as Downs suggested, it seems clear to us that size does affect inertia.

Assumption 5. *The level of structural inertia increases with size for each class of organization.*

Assumption 5 seems to suggest that selection arguments are more appropriate for large organizations than for small ones, contrary to widespread opinion (Aldrich, 1979; Perrow, 1979; Scott, 1981; Astley and Van de Ven, 1983). However, the situation is more complex than this. The likelihood that an organization adjusts structure to changing environmental circumstances depends on two factors: the rate of undertaking structural change and the probability of succeeding in implementing change, given an attempt. Assumption 5 suggests that the first quantity, the rate of attempting change, is higher for small organizations. But what about the second quantity?

It is helpful in answering this question to complicate the model slightly. Fundamental change—change in core aspects of structure—rarely occurs over night. More commonly, an organization spends some period of time reorganizing, either by design or happenstance. Usually there is a period of time during which existing rules and structures are being dismantled (or successfully challenged) and new ones are being created to replace them. Similarly, existing links with the environment are cut and new links forged. During such periods, organizations have elements of both old and new structures. The presence of multiple rules and structures greatly complicates organizational action; so too does a shifting set of environmental relations. Such changes increase the likelihood of conflict within an organization as contending parties seek to shape rules to benefit their self-interests.

Fundamental reorganization may sometimes occur gradually and imperceptibly, but sometimes sharp breaks with the past can be discerned, and one can identify the approximate time of onset of the reorganization. One clear example is a declaration of bankruptcy in order to obtain relief from creditors during a period

of attempted reorganization. In many other circumstances, organizational leaders announce planned shifts in strategy and structure such as entries into new markets and internal restructuring. In such cases it may be helpful to introduce a new state into the model: the state of attempting fundamental reorganization. Figure 1 depicts the possible transitions in this expanded state space. The parameters associated with each transition, the r's, are instantaneous transition rates. In terms of this representation, Assumption 5 states that the rate of moving to the state of reorganization decreases with size. But it says nothing about the other rates.

The processes of dismantling one structure and building another make organizational action unstable. Consequently, the variance of quality and timeliness of collective action decline during reorganization.

Assumption 6. *The process of attempting reorganization lowers reliability of performance.*

Assumptions 1 and 6 together imply:

Theorem 4. *Attempts at reorganization increase death rates.*

Organizations undergoing structural transformation are highly vulnerable to environmental shocks. Large size presumably enhances the capacity to withstand such shocks. Small organizations have small margins for error because they cannot easily reduce the scope of their operations much in response to temporary setbacks. Indeed, the claim that death rates decrease with size is nothing more than a restatement of the idea advanced earlier (Hannan and Freeman, 1977) that longer time spans must be used to study replacement in populations of large organizations.

Assumption 7. *Organizational death rates decrease with size.*

We assume that size has qualitatively similar effects on all three death rates in Figure 1: r_d, r_e, and r_f. Thus small organizations are assumed to be more likely than large ones to enter the state of reorganization, but are also more likely to exit this state by death.

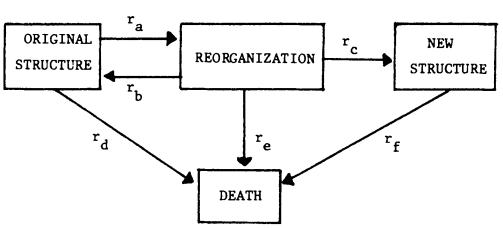

Figure 1. State Space for the Process of Fundamental Change in Organizational Structure (The r_j's are instantaneous transition rates)

Finally, there is the issue of success at implementing change (the rate of moving from "reorganization" to "new structure"). An organization undertaking reorganization can successfully make the transition to the new state or it can drift back to its original structure, assuming that it does not die. The model in Figure 1 contains two rates that pertain to these processes: r_c, the rate of moving to the new structure, and r_b, the rate of returning to the old one. The effect of size on these rates is unclear. On the one hand, the greater inertia of large organizations might lower the rate of successes at reorganization, On the other hand, successes at reorganization might depend on the magnitude of resources applied to the task. Since large organizations typically have more resources than small ones, this line of reasoning suggests that the rate of achieving structural change increases with size.

The relationship between size and the rate of structural change is indeterminate in our theory for two reasons. The first is ignorance about the effects of size on rates of completing structural reorganization, conditional on having attempted it. The second source of indeterminacy is the implication that small organizations are more likely to attempt structural change but are also more likely to die in the attempt. Although our analysis does not offer an answer to the main question about size and inertia, it does not support the widespread view that ecological arguments are particularly appropriate for the study of change in populations of *small* organizations.

The model in Figure 1 may be substantively interesting in its own right, assuming that approximate information on dates of leaving states of reorganization can be obtained. It provides a framework for addressing a variety of questions about inertia and change. It has the advantage of transforming what have been mainly rhetorical questions about the applicability of the ecological perspective into specific research questions.

Consider again the question of life-cycle variations discussed in the previous section. Recall that we assume that reproducibility increases with age (Assumption 4) because routines become worked out, role relations stabilize, and so forth. What effect, if any, does structural reorganization have on these processes? We think that reorganization is sometimes tantamount to creating a new organization (with a given level of resources). When reorganization is that fundamental, work groups are reshuffled, bringing strangers into contact, routines are revised, and lines of communication are reshaped. In this situation

reorganization robs an organization's history of survival value. That is, reorganization reduces the reliability of performance to that of a new organization. The stability of the previous structure does not contribute to reducing variability with new sets of procedures, role relations, etc.

If internal processes are solely responsible for the tendency of organizational death rates to decline with age (Theorem 3), the death rate for an organization that has just entered the state "new structure" should be no lower than the death rate of a completely new organization with that structure (and levels of resources). In this sense, reorganization sets the "liability of newness" clock back towards zero.

Assumption 8. *Structural reorganization produces a liability of newness.*

In order to make this argument concrete, we consider its implications for one kind of parametric model for liability of newness. A variation of the Makeham model fits data on age-variations in organizational death rates well (Freeman et al., 1983; Carroll and Delacroix, 1982). This model has the form

$$r_d(t \mid t_0) = \alpha + \beta e^{-\gamma(t-t_0)},$$

where t_0 is the time of founding and γ is positive. The liability of newness in this model is expressed by β, because the initial death rate is $\alpha + \beta$ and the asymptotic death rate is α. Imagine an organization created at time t_0 that successfully changes its structure at t_n, that is, it enters the state "new organization" at that time. The argument that the liability-of-newness clock is set back towards zero implies that its death rate at time t approximates that of a new organization with the same structure. In particular, suppose that the death rate of a new organization with structure like this one has the following age-dependence in death rates

$$r_d(t \mid t_0) = \alpha' + \beta' e^{-\gamma'(t-t_0)},$$

where $\gamma' \geq 0$. Then for the case of an organization born at t_0 that switches to this structure at $t_n > t_0$, the death rate is given by

$$r_d(t \mid t_n) = \alpha' + \beta' e^{-\gamma'(t-t_n)}.$$

That is, development over the period (t_0, t_n) has no impact on its death rate, other things being equal.

The argument in the preceding paragraphs can be viewed as one way to formalize some long-standing notions about organizational crises. Child and Kieser (1981:48) put the issue as follows: "To some extent, a crisis successfully overcome may represent a new birth, in the sense that changes initiated are sufficiently radical for a new identity to emerge." We suggest that such questions be viewed in terms of shifts in age-dependencies in organizational death rates.

External processes may also account for the tendency of death rates to decline with age. For example, we mentioned the tendency for organizations to acquire legitimacy simply by virtue of longevity as well as the fact that it takes time for organizations to develop enduring exchange relations with key actors in the environment. Some sorts of changes in strategy and structure strain external relations, especially when the changes imply a shift in ostensible goals. But, simple structural reorganization, without any apparent change of goals, does not rob an organization's history of its value for public legitimacy and does not necessarily upset exchange relations with the environment. Old organizations can presumably count on their existing exchange partners for support during and following such structural change.

If the liability of newness reflects internal processes, the death rate will jump with structural changes. In contrast, if the decline in the death rate with age reflects mainly the operation of external processes of legitimacy and exchange, the death rate will not jump when structural changes do not imply a change in basic goals. That is, arguments about internal and external processes lead to different predictions about the effect of structural reorganization on the death rate. Therefore the study of such effects may shed light on the relative importance of internal and external processes in accounting for age variation in the death rate in selected organizational populations.

Finally, there is no reason to suspect that the death rate declines with duration in the state "reorganization." Quite the contrary—as the length of time over which reorganization is attempted increases, the costs (especially the opportunity costs) of reorganization increase. As the fraction of organizational resources devoted to reorganization increases, the capacity of the organization to produce collective products declines along with its capacity to defend itself from internal and external challenges. Hence protracted periods of reorganization disrupt organizational continuity and increase the risk of death.

Assumption 9. *The death rate of organizations attempting structural change rises with the duration of the reorganization.*

A model consistent with this assumption is the classic Gompertz model:

$$r_e(t \mid t_r) = \theta e^{k(t-t_r)},$$

where t_r is the time of entering the state of reorganization and $k > 0$. This sort of model can perhaps elucidate another claim in the or-

ganizations literature. March (1981:567), referring to the work of Hermann (1963) and Mayhew (1979), states that

> . . . organizations facing bad times will follow riskier and riskier strategies, thus simultaneously increasing their chances of survival and reducing their life expectancy. Choices that seek to reverse a decline, for example, may not maximize expected value. As a consequence, for those that do not survive, efforts to survive will have speeded up the process of failure.

It is hard to imagine how an action can both increase a survival probability and increase the death rate in conventional models for the death rate (since life expectancy is a monotonically decreasing function of the death rate). However, the framework introduced above is consistent with this sort of pattern.

Consider the case in which the death rate of organizations in some environment rises precipitously at a certain moment t_1 (due perhaps to some discontinuous change in the environment). The death rate of organizations that retain their structures, r_d, will gradually decline to an asymptote that is considerably higher than the asymptotic rate in the old environment.

Suppose that some organizations in the population attempt structural change at t_1. Consider two kinds of trajectories of death rates by age. The dashed trajectory in Figure 2 depicts the death rate of an organization that successfully implements the new structure at t_3. The dotted trajectory pertains to an organization that reverts to the old structure at t_4. In a collection of histories like those in Figure 2, one would see that strategic action to promote survival exposes an organization to great risks (thereby "reducing its life expectancy"). But, because the death rate declines rapidly with duration in the new structure, a successful transformation eventually leads to a lower death rate (seeming to "increase chances of survival")—even lower than the death rates of organizations that retain the original structure. However, it is not clear that structural change necessarily increases unconditional life expectancy. This depends on the various rates. Still, introducing the competing risks of death and reorganization allows one to deal systematically with this complicated problem.

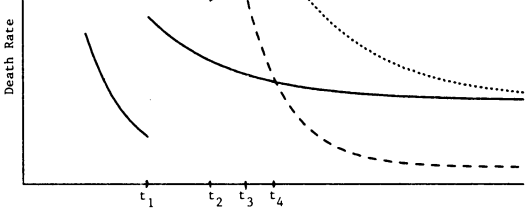

Figure 2. Hypothetical death-rate functions for a population of organizations exposed to a shift in selection pressures at t_1. The solid decreasing curves represent the death rates of organizations that retain their strategies and structures. The rising solid curve represents the death-rate function of organizations that undergo attempts at reorganization at t_2. The dashed curve represents the new (better adapted) strategy and structure at t_3. The dotted curve represents the death-rate function of organizations that revert to their old strategies at t_4.

ENVIRONMENTAL CHANGE, SIZE, AND INERTIA

Assumption 5 states that large organizations are less likely than small ones to initiate radical structural change. Does this mean that larger organizations have greater inertia, as Downs (1967) and others have claimed? If inertia is equated with low absolute rates of initiating structural change, it does. When inertia is viewed in comparative terms, as we argue it should be, the relationship of size to inertia is more complicated than the literature has indicated.

According to Assumption 7, the death rate declines with size. This statement is equivalent to the proposition that time-scales of selection processes stretch with size, as we noted earlier. One way to visualize such a relationship is to consider environmental variations as composed of a spectrum of frequencies of varying lengths—hourly, daily, weekly, annually, etc. Small organizations are more sensitive to high-frequency variations than large organizations. For example, short-term variations in the availability of credit may be catastrophic to small businesses but only a minor nuisance to giant firms. To the extent that large organizations can buffer themselves against the effects of high-frequency variations, their viability depends mainly on lower-frequency variations. The latter become the crucial adaptive problem for large organizations. In other words, the temporal dimensions of selection environments vary by size.

We proposed above that inertia be defined in terms of speed of adjustment relative to the temporal pattern of key environmental changes. Although small organizations are less ponderous than large ones (and can therefore adjust structures more rapidly), the environmental variations to which they are sensitive tend to change with much higher fre-

quency. Therefore, whether the adjustment speeds of small organizations exceed those of large ones compared to the volatility of relevant environments is an open question. One can easily imagine cases in which the reverse is true, in which elephantine organizations face environments that change so slowly that they have relatively less inertia than the smallest organizations.

COMPLEXITY AND INERTIA

The complexity of organizational arrangements may also affect the strength of inertial forces. Although the term complexity is used frequently in the literature to refer to the numbers of subunits or to the relative sizes of subunits, we use the term to refer to patterns of links among subunits. Following Simon (1962), we identify a simple structure with a *hierarchical* set of links, which means that subunits can be clustered within units in the fashion of Chinese boxes (what mathematicians call a lattice).

Hierarchical systems have the property that flows (of information, commands, resources) are localized: an adjustment within one unit affects only units within the same branch of the hierarchy. Simon (1962) argued that hierarchical patterns appear frequently in nature ("nature loves hierarchy") because the probability that a complex assembly is completed in an environment subject to periodic random shocks is higher when stable subassemblies exist, as in a hierarchy. More complex structures do not have many stable subassemblies and thus are vulnerable to shocks during the whole developmental sequence.

Recent work on population ecology supports Simon's argument. For example, May (1974), Šiljak (1975), and Ladde and Šiljak (1976) show analytically and with simulation experiments that ecological networks are destabilized when links (of predation, competition, or symbiosis) are introduced. Both the number of links and the complexity of the pattern affect stability.

We think that similar arguments apply to structural change within organizations. When links among subunits of an organization are hierarchical, one unit can change its structure without requiring any adjustment by other units outside its branch. However, when the pattern of links is nonhierarchical, change in one subunit requires adjustment by many more subunits. Such adjustment processes can have cycles; change in one unit can set off reactions in other units, which in turn require adjustment by the unit that initiated the change. Long chains of adjustments may reduce the speed with which organizations can reorganize in response to environmental threats and opportunities.

Although slow response does not necessarily imply a lower rate of attempting structural change, it seems likely that this is the tendency. As we noted above, a slow speed of response increases the likelihood that the environment will have changed before an organization can complete a process of reorganization. Knowledge of this fact may dissuade organizational leaders from initiating change and may serve as a powerful objection to proposed change by parties who benefit from the status quo.

Complex systems have slow response times not because they are any slower than simpler systems in detecting environmental threats and opportunities but because the process of adjustment takes longer. In terms of the framework developed in earlier sections, this argument implies:

Assumption 10. *Complexity increases the expected duration of reorganization.*

That is, once a complex organization has begun structural change, it will tend to be exposed to a longer period of reorganization than a simpler organization attempting similar changes. Assumptions 9 and 10 imply:

Theorem 5. *Complexity increases the risk of death due to reorganization.*

A complete analysis requires consideration of the effects of complexity on rates of initiating change and of its effects on success in implementing change (as we discussed above in the analysis of the effects of size). We are not yet ready to make any claims about effects of complexity on these rates. Still, the result in Theorem 5 suggests that population-ecological analysis might be more appropriate for explaining change in populations of complex organizations than in populations of simple ones because complexity increases inertia by at least one mechanism. This result, like that on size, disagrees with the conventional wisdom.

CONCLUSIONS

We have attempted to clarify when it is reasonable to assume that organizational structures have inertia in the face of environmental turbulence. We have argued that selection pressures in modern societies favor organizations that can reliably produce collective action and can account rationally for their activities. A prerequisite for reliable and accountable performance is the capacity to reproduce a structure with high fidelity. The price paid for high-fidelity reproduction is structural inertia. Thus if selection favors reliable, accountable

organizations, it also favors organizations with high levels of inertia. In this sense, inertia can be considered to be a by-product of selection. Our argument on this point may be considered an instance of the more general evolutionary argument that selection tends to favor *stable* systems (see Simon, 1962).

Of course, the claim that selection favors organizations with high inertia is not a warrant for assuming that most organizations have high inertia. Selection pressures often may not be strong enough to screen exhaustively for the "most fit" organizations. Moreover, most organizational populations are replenished more or less continuously by an inflow of new members. Younger organizations tend to have less inertia than older ones, and new organizations are more likely to adopt structures that differ greatly from those that would dominate any steady-state of the process subject to selection and closed to new entries.

Organizational selection operates on many dimensions besides reproducibility of structure. If selection pressures on specific features of structure are sufficiently strong, organizations with the characteristics appropriate to the environment are favored even if they have relatively low levels of reproducibility.

By the same token, environments in which change is turbulent and uncertain may not constitute a systematic regime of selection. The traits that are favored may shift frequently enough that no clear trend emerges. Such settings may favor organizational forms that can take quick advantage of new opportunities and the appearance of new habitats. The capacity to respond quickly to new opportunities presumably competes with the capacity to perform reliably and accountably (Brittain and Freeman, 1980; Freeman, 1982). Such dynamics may dilute the importance of reliability and accountability in organizational selection. We will address these issues in subsequent papers.

For all of these reasons, it is not sufficient to assume that selection processes favor organizations with high inertia and to proceed as though observed populations contain only such organizations. These considerations lead naturally to consideration of systematic variation within populations in the strength of inertial pressures. Existing theory provides some insights into these matters. One line of reasoning, which we pursued, suggests that inertial pressures increase with age—that organizations tend to ossify as they grow older. We suggest that the more fundamental process is that reproducibility increases with age. It follows from our general perspective that the death rate declines with age.

The effects of size on inertia are problematic in our revised theory. It is widely agreed that larger organizations are more ponderous than small ones. We think that analysis of the effects of size on inertia must consider several kinds of transition rates. One is simply the rate (in an absolute time scale) of attempting fundamental structural change. Another transition concerns success in implementing change. There is also the effect of attempting change on the death rate. We argue that small organizations are not only more likely than large ones to attempt change, but are also more likely to die in the process. Without further information on the magnitudes of the rates, it is not clear whether small or large organizations have higher overall rates of successfully implementing change. Our analysis suggests that it is premature to conclude that ecological theory may be applied more readily to small than large organizations. Clearly this matter deserves more theoretical and empirical attention.

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