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THE SIMPLICITY OF COMPETITIVE REPERTOIRES: AN EMPIRICAL ANALYSIS

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This research explores the notion of competitive simplicity: a tendency of some firms to concentrate intensely on just a few central activities. Our focus here is the simplicity inherent in the repertoire of concrete, market-oriented actions used by companies to compete: these actions include product introductions, pricing or advertising decisions, and changes in market scope. The simplicity of a competitive repertoire can be assessed by its range of actions and its degree of concentration on one or a few dominant types of actions. We argue that competitive simplicity is largely a function of organizational and environmental properties that attenuate managerial search or restrict knowledge of competitive alternatives. These properties include good performance, munificent, homogeneous or certain markets, a lack of breadth in competitive experiences, and the complacency that may accompany age and size. Paradoxically, although good past performance may contribute to simplicity, simplicity can hurt subsequent performance, especially during periods of uncertainty and growth. Many of these ideas were borne out in a study of the major carriers of the post-deregulation domestic airline industry.

Many studies suggest that organizations become more multifaceted and elaborate: in their structures, goals, administrative processes, and product-market domains (Blau and Schoenherr, 1971; Chandler, 1962, 1992; Starbuck, 1965; Thompson, 1967). This study takes a very different tack. It explores why some organizations become *simpler*—not in their structures or market scope—but in their set of competitive actions. It argues that past success, market munificence, and a lack of exposure to diverse modes of rivalry cause managers to concentrate on a narrow range of competitive activities. These conditions shape managerial cognitions; they reduce the incentive to search for different ways of doing things or contribute to an ignorance of competitive alternatives (Walsh, 1995). As a result, the set of actions used to compete becomes very skewed and limited (Miller, 1990, 1993; Pascale, 1990; Stacey, 1992).

Key words: Competitive strategy, competitive simplicity, competitive repertoires, organizational learning, managerial cognition

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RESEARCH OBJECTIVES

Miller (1993: 117) defines the general notion of simplicity as 'an overwhelming preoccupation with a single goal, strategic activity, department, or worldview—one that increasingly precludes consideration of any others.' This research focuses only on the concept of *competitive* simplicity—the tendency of firms to concentrate on fewer competitive activities than do their direct rivals.

The march towards simplicity is well illustrated in historical works such as those on microchip and automobile manufacturers (Miller, 1990; Wright, 1979), entrepreneurial firms (Lyon, 1984), and conglomerates (Sampson, 1974). Some managers became so obsessed with cost cutting that they neglected service and design; others became so absorbed with expansion that they forgot about renewing their products and processes.

Competitive simplicity can have profound consequences for an organization's ability to deal effectively with the challenges it faces (Miller, 1990, 1993; Pascale, 1990). It may, for example,

allow firms to develop distinctive core competences (Prahalad and Hamel, 1990) and economies of concentration (Chandler, 1992). But it may also cause Ashby's (1956) 'law of requisite variety' to be breached: the competitive arsenal gets too narrow to address the range of market challenges, a danger that is especially relevant in intensely competitive industries (Miller, 1993).

Despite the prevalence and potential implications of competitive simplicity, its causes and consequences have yet to be researched systematically in organizations. Our study is a first step in that direction.

FOCUS AND SCOPE OF THE STUDY

In order to derive a means of objectively characterizing and gauging the simplicity of an organization's competitive behavior, we view strategy as a repertoire of competitive actions (Miller and Chen, 1994). Competitive repertoires are the set of market actions used by an organization during a given year to attract, serve, and keep customers. These repertoires are composed of concrete market decisions such as price changes, product line or service alterations, and changes in the scope of operations (Chen, Smith, and Grimm, 1992; Chen and MacMillan, 1992; Chen and Miller, 1994; Miller and Chen, 1994). Competitive repertoires, we will argue, are very much shaped in the context of extensive and continuous contact among direct rivals in a market. The notion of 'repertoire' is an empirically grounded one that is based on the actions that competing organizations take in vying against one another. As such, it suggests a novel way of thinking about competitive strategy.

Competitive simplicity may be manifested in at least three related aspects of competitive repertoires: these we call range, concentration and dominance. *Range* is the total number of types of market-oriented actions taken by a firm. A simple repertoire has a small range of actions. *Concentration* is the degree to which repertoires tend to be focused on just a few key types of actions. Simple repertoires center mostly on just a few types of actions while de-emphasizing most others. Finally, *dominance* is the extent to which a firm relies on its single most common type of action, to the exclusion of all others. The range, concentration and dominance aspects of simplicity reflect restriction in the range of market-oriented actions or the tendency to focus on only a few kinds of actions.

Simplicity does not imply inertia. A repertoire that is simple may manifest a very active level of decision making, even though actions may be mostly of a single kind. Equally important, a firm's simplicity best can be assessed relative to that of its rivals with a similar competitive domain, or relative to its own past. This paper, while gauging simplicity among direct competitors with similar market scope, employs measures that may also be used to compare firms over time.[1]

Given the kinds of competitive actions that compose the repertoires in our sample, we are mostly concerned with short- to intermediate-term organizational decisions. Actions such as price and service adjustments or product improvements tend to be made rather quickly, especially in highly competitive contexts such as the post-deregulation U.S. airline industry of our study. Such actions, we found, could best be predicted by contemporaneous variables or by those lagged by only 1 year (Chen and MacMillan, 1992). This is not to argue, however, that the mental models that underlie core strategies change as quickly as the components of our repertoires (Barr, Stimpert, and Huff, 1992). But our research focuses not on such basic worldviews but on the thrust and parry of day-to-day competition where rapid responses and initiatives are the rule.

A FRAMEWORK FOR STUDYING THE SOURCES OF SIMPLICITY

We expect that competitive simplicity will be influenced by two essential factors underlying competitive behavior. First, it will be a function of *search incentives* that induce managers to look for and embrace additional ways of competing: these may take the form of poor performance and other sources of threat and uncertainty (Cyert and March, 1963; March, 1991). Second, competitive simplicity will be a function of managers' *knowledge* about the different ways of competing: this knowl-

[1] Repertoire simplicity should not be confused with market or business diversity. Diversified conglomerates can compete using simple repertoires while single-business firms may employ highly multifaceted ones. Moreover, repertoires are made up of individual actions, not stated or inferred strategies (Porter, 1980) or core competences (Prahalad and Hamel, 1990).

Table 1. Sources of competitive simplicity

	Source factors		
	Incentives to search for and try out action alternatives	Knowledge of action alternatives	Impact on simplicity
Internal sources			
Past performance	−		+
Breadth of experiences		+	−
Firm age	−		+
Firm size	−		+
External sources			
Market diversity		+	−
Market growth	−		+
Market uncertainty	+		−

edge will be enhanced by prior experience with various competitive methods and by exposure to a diversity of rivals and clients (Granovetter, 1985; Huber, 1991; Miller, 1993; Walsh, 1995).

Several factors inside the firm can influence managers' search incentives and knowledge of alternatives. *Good performance* can decrease the incentive to search by boosting managers' confidence in their favorite activities and thus narrowing their range of active concerns (Levitt and March, 1988; Miller, 1994). Conversely, a *breadth of competitive experience* provides managers with knowledge about many different forms of rivalry and thus may give rise to less simple repertoires (Miller and Chen, 1994). Finally, an organization's *age* and *size* may attenuate search by reducing perceived vulnerability (Milliken and Lant, 1991). Many large and mature firms have the confidence to concentrate on their favorite activities, no matter what their rivals are doing.

Sources of simplicity may also be found outside the organization. These have long been the province of contingency theorists who argue that strategy will be shaped by the environment (Khandwalla, 1981; Miller and Friesen, 1984). External sources include market *diversity* that combats simplicity by increasing managers' knowledge about a wide range of competitive options. By contrast, environmental *growth* or munificence may lull managers into complacency and discourage search activity, inducing firms to focus on a few favored competitive tactics. Finally, environmental *uncertainty* may stimulate search and combat simplicity. Table 1 summarizes these sources of simplicity.

INTERNAL SOURCES OF SIMPLICITY

Simplicity and past performance

Good performance tends to attenuate search behavior (March, 1988; Miller, 1994). Success reduces the incentive to scan markets for challenges, opportunities and other sources of tactical variety (Lant, Milliken, and Batra, 1992; Starbuck and Milliken, 1988; Weick, 1987). For example, Starbuck and Milliken (1988) in their fascinating analysis of the *Challenger* tragedy argued that NASA's repeated successes resulted in managerial overconfidence and a consequent narrowing of attention. NASA's track record induced it to concentrate on a very limited range of concerns and allowed it to become negligent in its safety procedures. It took a disaster to make NASA enlarge its repertoire. Such failures promote search, which in turn broadens managerial perspectives and enlarges the competitive repertoire (Aguilar, 1967; Milliken and Lant, 1991; Walsh, 1995).

Levitt and March (1988) and March (1989) maintain that actions that administrators link to success will be repeated; others will vanish. According to Milliken and Lant (1991: 136), 'Success becomes causally linked with a strategy or routine in the minds of organizational decision makers . . . irrespective of whether such a causal link, in fact, exists.' Hence success induces simplicity by reinforcing existing perspectives and encouraging the pursuit of a few 'favorite' activities (Argyris and Schon, 1978; Barr *et al.*, 1992); it also discourages the search for and experimentation with other viewpoints and activities (Miller, 1990, 1994; Walsh, 1995).

Search and experimentation may in part be extinguished by what March (1988) has called 'superstitious learning'. Success makes some executives believe, perhaps erroneously, that they have discovered a special advantage *vis-à-vis* the competition. They then try to exploit to the maximum their perceived unique skill. Indeed, much of the popular normative literature on business strategy urges the importance of concentrating on a key ability (Hitt and Ireland, 1985; Prahalad and Hamel, 1990; Porter, 1980). Thus success, and the resultant *perceived* advantages of distinctive competence, may combine to motivate simplicity.

Hypothesis 1: Past performance will be positively associated with competitive simplicity.

Breadth of competitive experiences

Past competitive experience affects simplicity not by influencing search behavior but by enhancing managers' knowledge of alternative ways of competing. Firms that have competed using a broad arsenal of weapons will have learned much about a variety of competitive methods (Miller and Chen, 1994). Having employed many different methods, firms may develop the skills to compete in a more multifaceted way. Their managers could also have formed some political or economic commitments towards a larger set of competitive tools. By contrast, rivals who had concentrated on fewer modes of competition will be less aware of the potential of alternative methods and may lack the knowledge to implement them (Huber, 1991; Walsh, 1995).

Firms having employed more multifaceted repertoires may also attain familiarity with more aspects of their customers and competitors (Delacroix and Swaminathan, 1991). They will have received a wide range of market feedback in response to their varied actions. Such extensive contact with the environment can discourage simplicity (Aguilar, 1967; Amburgey, Kelly, and Barnett, 1993; Hambrick, Geletkanycz, and Fredrickson, 1993; Wilensky, 1971).

Hypothesis 2: A recent history of broad competitive experience will be inversely related to competitive simplicity.

Age and size of the organization

Through their impact on search incentives, the age and size of an organization also may have a bearing on competitive simplicity. Older organizations will have had the time to build confidence in favorite tactics, to develop the specialized skills and programs necessary to implement these tactics, and to establish a supportive infrastructure (Meyer and Zucker, 1989; Tushman and Romanelli, 1985). The incentive to search is small. Many younger firms, by contrast, are still groping to find their way and have not yet developed the formulae, routines and political commitments that discourage tactical variety (Aldrich and Auster, 1986). They thus may be willing to employ a large number of competitive methods. Also, because the managers of many young firms face the 'liabilities of newness'—the institutional and resource deprivations associated with youth—they are especially motivated to avoid the risks of competitive narrowness (Singh, Tucker, and House, 1986). Hence, age may have a positive relationship with competitive simplicity.[2]

Certainly, most large firms have in place the finances, people, and routines to implement more complex competitive repertoires than their tiniest rivals (Haveman, 1993). But beyond a minimum scale, size may well breed simplicity. Managers of large firms may feel that they are rich and powerful enough to ignore their weaker rivals (Halberstam, 1986; Pfeffer and Salancik, 1978: 52–54). This may prevent them from broadening their cognitive models and strategies in response to market developments (Wright, 1979). The vulnerability of small organizations, by contrast, may motivate them to be on the lookout for both threats and opportunities (Aldrich and Auster, 1986), and these challenges could dissuade managers from becoming too narrow or obsessive. Large size is also associated with programs and standard operating procedures designed to achieve reliability and economies of scale. These further encourage specialization and focus (Hannan and Freeman, 1984; Nystrom and Starbuck, 1984; Starbuck, 1965) and reduce the resilience of managerial cognitive models of the environment (Walsh, 1995).

Finally, the bureaucratic routines associated with both age and size tend to restrict organizational search because they encourage tunnel vision (Haveman, 1993; March, 1988; Miller *et al.*,

[2] The above arguments, however, may not apply to very young firms whose simple repertoires are a result of the lack of time, resources and programs needed to engage in any significant exploration of competitive methods (Aldrich and Auster, 1986; Blau and Schoenherr, 1971).

1996). They channel attention and interpretation, rigidify mental models, and extinguish behavior that is experimental and spontaneous (Walsh, 1995; Perrow, 1986). Consequently they may result in narrow repertoires.

Hypothesis 3a: The age of an organization will be positively related to competitive simplicity.

Hypothesis 3b: The size of an organization will be positively related to competitive simplicity.

EXTERNAL SOURCES OF SIMPLICITY

Contingency theorists have suggested that an organization's environment can have a profound impact on competitive strategy (Hofer and Schendel, 1978; Miller and Friesen, 1984). To parallel our model of internal sources of simplicity, we examine those aspects of the environment that impinge upon either search incentives or knowledge of competitive alternatives (Walsh, 1995). These, we believe, come mostly in the form of market diversity, munificence and uncertainty; perhaps the most prominent environmental qualities to have been examined by contingency theorists to date (see reviews by Aldrich, 1979: 63–73; Dess and Beard, 1984; Mintzberg, 1979: 267–287 and Sharfman and Dean, 1991). Market diversity may be reflected by a firm's breadth of markets, customers or competitors (Chandler, 1962; Thompson, 1967). Market munificence is often mirrored by the rate of growth of an industry (Castrogiovanni, 1991; Yasai-Ardekani, 1989). And market uncertainty, that is, change and unpredictability, relates to shifts in market composition and conduct (Mintzberg, 1979: 267–287; Porter, 1980, 1985).

Market diversity

A diverse environment can be a rich medium that discourages simple repertoires by giving managers knowledge about different ways of competing. Managers confronting many different clients and competitors often will be witness to a wide variety of strategic options and tactics, and will face a broader range of competitive challenges (Chen and MacMillan, 1992; Dess and Beard, 1984; Khandwalla, 1977). Indeed, firms operating in several markets can learn something from each of them, adding to the array of competitive tactics that managers are familiar with and willing to use (Chen and Miller, 1994; Miller and Chen, 1994).

In contrast, companies that deal with relatively few competitors and customers will have a narrower range of experience and possibly narrower mental models because they confront a more limited range of challenges (Barr *et al.*, 1992; Walsh, 1995). They are thus more apt to allow a single tactic or approach to dominate (Hedberg, 1981; Miller, 1993).

Hypothesis 4: The diversity of the market will be inversely related to competitive simplicity.

Market growth

Market growth is a prime indicator of market munificence (Castrogiovanni, 1991). And via its impact on search incentives it may be another important source of simplicity. Growing markets will present organizations and their competitors with a picture of munificence. According to Barr *et al.* (1992: 19) managerial mental models are more likely to resist change in munificent environments. In the absense of pressure from rivals and customers, managers will feel less driven to search for alternatives or to supplement their favorite competitive activities (Milliken and Lant, 1991; Walsh, 1995).

On the other hand, tough competition brought on by declining demand may create problems for a firm and its rivals. Such hardship in the marketplace encourages managers to try a wide variety of tactics in the effort to attract customers or to fend off hungry rivals (Aguilar, 1967; Khandwalla, 1981; Smith *et al.*, 1991). Furthermore, hostile settings are risky, and managers might try to reduce some of this risk by searching for a broader set of viable actions (Haveman, 1993; Miller, 1990).

Hypothesis 5: Market growth will be positively related to competitive simplicity.

Market uncertainty

If munificence can extinguish the incentive to search, then uncertainty may rouse complacent managers from their slumbers. When markets are altering in ways that are hard to understand or pre-

dict, managers may need to hedge their bets with a diverse set of competitive methods and employ more comprehensive business strategies (Hofer and Schendel, 1978: 90–93; Khandwalla, 1981).

New and frequent market entries and exits have been singled out by Porter (1980, 1985) as a key kind of uncertainty that can influence competitive behavior. The arrival of new actors and the departure of old ones signal that established patterns of rivalry are being upset. Such changes also herald the coming of more aggressive and multifaceted forms of competition as new actors bring to bear unorthodox techniques to establish a foothold in the market. Under such conditions managers will be especially motivated to search for and try out alternative methods of competition in order to reacquaint themselves with new market realities.

Hypothesis 6: Market uncertainty will be negatively related to competitive simplicity.

SIMPLICITY AND SUBSEQUENT PERFORMANCE

Some have argued that simplicity allows firms to develop the advantages of focus (Rogers, 1992; Treacy and Wiersema, 1995). By concentrating resources and attention on the most important activities, firms are able to allocate their efforts very effectively and become highly adept at performing the most pressing tasks. Companies that focus their competitive activities might also more easily develop core competences that attract customers and defy imitation by rivals (Lippman and Rumelt, 1982; Leonard-Barton, 1992; Prahalad and Hamel, 1990). Finally, firms with simple repertoires may more easily synchronize the efforts of their like-minded departments (Pascale, 1990).

These advantages of simplicity, however, are likely to accrue mostly in stable settings where it is possible for managers to know just which of their actions have the highest pay-offs. Elsewhere, in more competitive environments, concentration on a few kinds of actions carries a substantial risk that important market contingencies will be missed (D'Aveni, 1994; Miller, 1992). This danger is well captured by Ross Ashby's (1956) 'law of requisite variety,' which suggests that to be effective a competitive repertoire must be sufficiently comprehensive to address the relevant range of potential customer needs and competitor challenges. In environments where this range is large the disadvantages of simplicity can easily outweigh the advantages (Pascale, 1990).

These disadvantages may apply especially to industries undergoing major upheavals, such as the postderegulation S&L and airline sectors. In these settings, the requirements for competing effectively are hard to discern as they are ever evolving (Steffens, 1993). It is necessary therefore for companies to keep learning about their emerging markets by searching for and trying out a broad range of actions (D'Aveni, 1994). The market feedback that comes from implementing a broad competitive repertoire provides valuable information that helps to keep a firm's actions relevant and rewarding. Hence, in competitive industries such as the one we are studying:

Hypothesis 7: Competitive simplicity will have a negative relationship with subsequent *performance.*

The above arguments suggest that even within a given industry high levels of market uncertainty may moderate the relationship between competitive simplicity and performance. Uncertain settings pose many new contingencies that firms must deal with: for example, changing modes of competition, new and unpredictable rivals, and shifting customer tastes (Khandwalla, 1977). In these environments, simple repertoires are risky as they are apt to leave gaps that ignore a key contingency, challenge or opportunity (Stacey, 1992). And because change is constant, simple or narrow repertoires that are on target this year almost certainly will become outdated in the next. Firms that compete mostly on the basis of price, for example, may soon become irrelevant when new rivals attract customers with better service.

Hypothesis 8: Market uncertainty will moderate the relationship between competitive simplicity and performance: specifically, simplicity will be more damaging to performance during times of uncertainty than during more placid intervals.

Simplicity also may be doubly harmful to those firms within a given industry that face an especially diverse market: one exhibiting many different customer needs and competitive threats (Miller, 1993; Thompson, 1967). When a company caters to a

wide range of customers or confronts a great variety of challenges from dissimilar rivals, it will have to respond with a more comprehensive competitive repertoire. For example, a firm may be forced to compete on price in one market, and on service in another. Diverse markets also may make it hard for managers to determine the exact sources of success, and thus they discourage narrow repertoires. On the other hand, companies that cater to more specialized market segments may be able to rely on fewer kinds of competitive actions (Chen and Miller, 1994).

Hypothesis 9: Market diversity will moderate the relationship between competitive simplicity and performance: specifically, simplicity will be more damaging to performance in companies facing a diversity of customers and rivals than to those facing less such diversity.

Simplicity may have a less positive effect on performance during periods of market growth than during periods of market decline. Market growth creates new and unanticipated opportunities which may best be seized by firms cultivating a wide variety of appeals. Broad repertoires, then, are the most likely to contain actions that attract customers in emerging niches. Market decline, on the other hand, may require simple repertoires. A shrinking group of customers can erode resources and make rivals aggressive (Levine, 1987; Porter, 1980: 266–267). In responding, firms must be parsimonious and concentrate on actions that deflect the most detrimental onslaughts (Porter, 1980: 268–274).

Hypothesis 10: Market growth will moderate the relationship between competitive simplicity and performance: specifically, simplicity will be more damaging to performance during periods of market growth than during periods of market decline.

METHOD

Sample

The scope of our initial data base and our final sample was determined by our notions of markets and competition. We view markets as social structures among specific cliques of firms whose repertoires are based in part on the mutual observation of concrete actions (see Burt, 1987; Granovetter, 1985; White, 1981). As suggested by Hypotheses 2 and 4, competitive repertoires are very much shaped by the regular and continual interaction among rivals. Thus our sample consisted of enterprises of comparable scope competing regularly against one another in the same market domain and over a significant interval.

The airline industry was chosen because of its competitiveness and its rich diversity of competitive tactics (Chen *et al.*, 1992). The industry also contains firms about whose decisions there is abundant pubic information. Moreover, because airlines receive very regular feedback about their market performance—their revenues per available seat mile flown—they are in a position to quickly adjust their competitive behavior in response to this information. These conditions provide a good opportunity for testing our hypotheses concerning the impact of market performance on simplicity. Finally, because our hypotheses pertain to the business rather than corporate level of decision making, it is also appropriate that all our airlines are single or dominant business firms according to the definition of Rumelt (1974).

It was necessary to include in our sample only firms with a comparable scope and domain of operation. The aims of the study demanded that we concentrate only on those carriers that competed against one another nationwide and that we exclude regionally based airlines whose distinctive markets might skew their competitive repertoires. Thus we chose the 18 largest carriers with annual operating revenues about $200 million and operations in at least eight different airports. This choice also allowed us to have complete data across an uninterrupted interval, a requirement of the time series–cross-section methods that we used to analyze the data.

The period of study chosen was the postderegulation but premerger era of 1979–1986, a time during which airlines would have to discover the most effective means of rivalry (Levine, 1987). Such an interval was expected to provide much impetus for competition and tactical adjustments, thereby producing much variation in most of the dependent and independent variables (Miller and Chen, 1994).

Identification of actions

Competitive repertoires, as we have noted, are made up of individual, externally oriented actions.

It was necessary, therefore, to select a relevant set of such actions for this research. Fortunately, Levine (1987) has conducted an authoritative study of the industry that identifies a comprehensive inventory of significant actions that domestic airlines use to compete with one another. We chose for study this entire set of actions. Our only omission from Levine's list was the use of computerized reservation systems—which was only sporadically reported in our data. These systems, moreover, are in part an aspect of internal operations which were beyond the scope of our hypotheses. The 21 types of actions chosen (Miller and Chen, 1994: 21) include changes in pricing, promotional activities, product line or service changes, distribution channel alterations, market expansions, vertical integration, intraindustry mergers and acquisitions, and strategic alliances. Actions include major and less momentous types of decisions as both are essential aspects of most competitive arsenals. There was much overlap between the actions we chose and those selected by researchers such as Hatten, Schendel, and Cooper (1978), Porter (1980, 1985), and Scherer (1980). Besides being outside the scope of our research, internal decisions concerning staffing, information systems, routines, reporting relationships and the like were too private or indistinct for us to study reliably.

This research recorded every appearance of any competitive action reported between 1979 and 1986 in *Aviation Daily*. Methods of 'structured content analysis' were used to identify and classify these moves (see Miller and Friesen, 1984; Jauch, Osborn, and Martin, 1980). *Aviation Daily* is widely known in the industry as the publication that provides by far the most comprehensive information on airline competition (Chen and MacMillan, 1992; Chen *et al.*, 1992; Miller and Chen, 1994). Of course, this source reports only public, market-oriented decisions—those significant, concrete actions that are observable to industry observers. Very small-scale actions such as unitary price adjustments were too unimportant and invisible to fall within the scope of this study. The comprehensiveness and reliability of the information reported in *Aviation Daily* is demonstrated by Chen and MacMillan (1992) and Miller and Chen (1994: 22–23).

The total sample of this study consisted of 891 actions. These were classified by one of the authors and by three Ph.D. students in the field of business strategy into 21 types of moves (Miller and Chen, 1994: 21). Accuracy of categorization was further established with a group of airline executives (Miller and Chen, 1994: 9–10).

Operationalization of variables

Competitive simplicity

Consistent with our threefold conceptualization of competitive simplicity, we used three related indexes to measure it: a range or '*R*' index, a concentration or '*C*' index, and a dominance or '*D*' index. Whereas the *R* index is simply the number of types of actions—an inverse index of simplicity—the *C* index assesses the numerical emphasis on those most commonly employed types of actions, and the *D* index assesses the numerical emphasis on the single most common type of action employed by a firm. The smaller the range of types of actions, the greater the concentration on a few types of actions, or the more dominant a single type of action, the simpler the competitive repertoire.

An organization's competitive repertoire can be described by the total number of decisions that it makes each year. Therefore all our indexes are based on the number of decisions in each of the j (= 1, . . . , 21) categories for each of the i (= 1, . . . , 18) airlines in year t (= 1979, . . . , 1986): $x_{i,j,t}$. Since the average number of decisions in each of the j categories differs dramatically (price changes, for example, are normally far more common than hub creation decisions), we wished to avoid overweighting the most common types. Thus our *C* and *D* indexes use $z_{i,j,t}$ scores standardized across all airlines/years for each of the j types of actions. These standardized scores have the effect of weighting rarer decisions like route entries more heavily than common decisions such as price cuts. For example, three price cuts per year might be unusually few—and thus would yield a standardized score of less than zero; three hub creations might be exceptionally many, and thus would yield a highly positive score.

The simplest range or *R* index merely counts the number of different *types* of actions, $A_{i,j,t}$, (out of the possible 21 types) used by an airline in a given year. Range, of course, is an *inverse* indicator of competitive simplicity.

$$R_{i,t} = \underset{j}{\text{count}}\,(A_{i,j,t})$$

The concentration or *C* index is based on the standard deviation, $S_{i,t}$, of the standard scores across

the 21 types of actions for an airline in a given year (this is *not* the standard deviation over time or across airlines of any single type of action). This standard deviation is divided by the total number of actions, $N_{i,t}$, for that airline for that year, in order to adjust for differences in the number of decisions made by large vs. small companies. The natural log of this quotient was taken to transform the index into one that would conform to the normality assumptions required for OLS regression analysis, such that:

$$C_{i,t} = \ln (S_{i,t}/N_{i,t})$$

Note that the C index, calculated for each airline for each year, is a positive measure of competitive simplicity. This index increases as discrepancies in the standardized scores grow between a given airline's most and least common types of actions for that year, that is, with increasing concentration on the most numerous actions.

The dominance or D index is based only on the number of actions (again, as measured by standardized scores) in an airline's most emphasized action category and as such is a narrower index of simplicity than the C index. The D index is simply the number of actions in the j category with the highest number of actions for an airline in a given year, $\max_j z_{i,j,t}$, divided by the total number of actions, $N_{i,t}$, for that airline in that year. Once more the natural log was taken to normalize the quotient for OLS analysis, to obtain:

$$D_{i,t} = \ln ((\max_j z_{i,j,t}) / N_{i,t})$$

Robustness of the indexes

The robustness of the indexes was established by varying their composition, that is, by altering the types of decisions included. Recall that we chose to study actions such as pricing and service changes, alterations in routes, and promotional activities, all actions that managers can implement soon after receiving performance feedback. Hence a lag of a few months to a year seemed appropriate for assessing the impact of past success on simplicity. Two of the 21 types of actions, however, may take some time to carry out: these are the creation of new traffic hubs and the making of intraindustry acquisitions. In order to establish the robustness of our findings we reran every analysis after having dropped these two decisions from all of our indexes. The results were almost completely identical to those we shall report—the only notable difference was that size and market growth had a slightly less significant impact on the C index. These analyses are available from the authors. To be consistent, we have included all 21 decision types that we started the research with in the findings to be presented.

Market performance

Given that our study focused only on market-oriented actions we selected a market-based performance measure, one that is likely to influence most directly (and to be influenced by) the actions in our repertoires—actions such as price changes, route entries and exits, new services and promotions. We gauged market performance by computing passenger operating revenues per available seat mile flown: *R*/ASM. This indicator has the advantage of reflecting not only the load factor of the airline, that is, the percentage of seats it fills, but also the revenue produced thereby given an airline's capacity (Miller and Chen, 1994; Schefczyk, 1993). The index is much used by managers in the industry wishing to gauge their airline's efficacy in competing for business (Bailey and Williams, 1988; Levine, 1987). *R*/ASM avoids counting as good performance growth or high load factors that come at the cost of inadequate revenues. It is also updated very frequently and thus can have a rapid impact on strategy. Measures such as return on assets or profit margins were deemed unsuitable as they are influenced by internal operating decisions that could *not* be measured in this study: such decisions concern financing, purchasing, operations management, staffing, and compensation. Profitability indexes would also have been inappropriate as they are much influenced by factors such as materials costs, interest rates, and accounting and depreciation policies that have no clear relationship to the market-oriented actions that we studied. Indeed, we were able to ascertain that operating margins and returns on assets bore no statistically significant relationships to any of our indexes of simplicity.

Breadth of experiences

Breadth of experiences was measured by the number of types of decisions reported in the preceding

year. This lagged 'range' variable was used in the regressions incorporating the *C* and *D* indexes of simplicity. However, the regressions of the *R* index employ as an historical experience surrogate the total *number* of decisions made in the previous year. This is because the lagged range variable would have been a lagged version of the dependent variable in models predicting range. It is poor econometric practice to employ as a regressor any such lagged dependent variables as these correlate with the residuals of the model, thereby biasing parameter estimates (Judge *et al.*, 1988: 17.4; Kmenta, 1986: 621).

Organization and environment

Firm age was measured in years since founding. The size of the organization was measured as the number of employees (Blau and Schoenherr, 1971; Miller and Droge, 1986). The natural logarithm was taken to normalize the variable which correlated at 0.86 with the log of sales revenues.

Market diversity was assessed by the number of segments and actors in an airline's market environment (Bourgeois, 1980: 35). These were measured by a composite index gauging (a) the number of different airports served by each airline, and (b) the number of competitors faced by each airline (inter-item correlation = 0.70). This index captures the breadth of markets addressed by an airline as well as the variety of competitors it confronts—both potential sources of knowledge of alternative modes of competing (Blau and Schwartz, 1984; Levine, 1987; Miller and Chen, 1994).

Market growth is an important indicator of environmental munificence (Castrogiovanni, 1991: 553; Yasai-Ardekani, 1989: 142). It was measured by the level of growth in total industry volume as reflected by annual change in total revenue passenger miles for the entire domestic airline passenger business.

Our measure of market uncertainty was intended to assess the dynamic nature of industry competition, which is in part reflected by changes in the actors comprising an industry or market. As the movement of competitors in and out of markets increases, modes of rivalry alter and become less predictable (Khandwalla, 1981; Porter, 1980, 1985). Our uncertainty index comprised three components: the annual number of route entries by new carriers, route exits, and bankruptcies (Cronbach alpha = 0.88). Each of these components was standardized before summation to ensure equal weighting.

Information for all of our environmental variables was obtained from the U.S. Department of Transportation's *Airport Activity Statistics of Certified Route Carriers.*

Analyses

As this study employs pooled cross-sectional observations, it was important to correct the data for any autocorrelation and heteroscedasticity (Sayrs, 1989). To do this we employed Kmenta's (1986: 618–622) autoregressive–heteroscedastic model for pooled time series cross-sectional data. The Kmenta model is:

$$Y_{it} = b_1X_{it,1} + b_2X_{it,2} + \ldots b_kX_{it,k} + e_{it}$$

where i equals 1, 2, ..., N, t equals 1, 2, ..., T, k equals 1, 2, ..., K. K equals the number of explanatory variables, N equals the number of cross-sectional units or firms (18), and T equals the number of time periods (7). Because the model requires an equal number of observations for each airline, we had to exclude from the sample any airlines with years of missing information. This left us with 126 observations—18 firms for which we had data for each of the 7 years (1 year was lost due to our lagging of some of the variables).

We applied the Kmenta model to data corrected for autocorrelation and heteroscedasticity. To correct for first-order autocorrelation the Prais-Winsten transformation was applied to each firm individually. In a second step, the data were corrected for heteroscedasticity by dividing dependent and independent variables by the firm-specific error variance obtained from the regressions on the autocorrelation-corrected data. Subsequent plots of residuals revealed an absence of autocorrelation and heteroscedasticity. The twice-transformed data could then be pooled and analyzed using OLS regression (see also Judge *et al.*, 1988, Section 11.5; and for applications Keck and Tushman, 1993; Haveman, 1993; Miller and Chen, 1994).

Predicting simplicity

In all models predicting simplicity, we had intended to use simplicity in period $t - 1$ as a control variable. But when we did so, the findings almost exactly replicated those of Table 3, which

omits this variable. Of course, the inclusion of any such lagged version of a dependent variable may bias estimators because of potential correlations with the disturbances of the equations (Kmenta, 1986: 621). To assess this bias we replaced the lagged simplicity variable with an instrument. The instrument was calculated by regressing simplicity on the current and lagged independent variables of the model. The lagged values of the predictions were then substituted into the reduced form of the model, which then yields consistent estimates of the errors (Greene, 1990: 440–450). These additions resulted in the same hypotheses being supported and the same ones being rejected as in Table 3 (the results are reported in Appendix 1). Also, there were nonsignificant improvements in the overall fit of the models. Hence lagged simplicity is omitted from Table 3. As the same hypotheses were supported whether or not our models included lagged versions of the dependent simplicity variable, *the predictors of simplicity and of annual change in simplicity were essentially the same.*

There was a potentially significant source of multicollinearity in the regression analyses. The size and market diversity variables had 67 percent of their variance in common. When we reran the analyses deleting the size measure, all of the major findings were preserved; indeed, most were strengthened. The effect of age on the simplicity indexes became significant in the expected direction as well. Given the stability of the findings and the specification error that would result from dropping airline size from the models, the most conservative course was to use the results for the full equations (Berry and Feldman, 1985: 37–50; Lewis-Beck, 1980: 58–63).

Predicting performance

Our structural models predicting performance (Tables 4–6) contain a lagged version of the dependent variable: performance in period $t - 1$. To test for estimation bias and ensure a consistent estimate of the autoregressive parameter we replaced the lagged exogeneous variables with an instrumental variable (Kmenta, 1986: 621). The instrument was obtained, as above, by regressing performance against the lagged exogeneous variables of the model (Greene, 1990: 440–450). Autoregressive heteroscedastic models were then run using the instrument for performance. The results, presented in Appendix 2, are very similar to those of Tables 4–6. The same hypotheses were supported, and the same ones disconfirmed.

In examining the moderating effects of market uncertainty, diversity and growth on performance (Tables 4–6), the components of the interaction terms were standardized before multiplication to remove any multicollinearity with the main effects (Smith and Sasaki, 1979). Also, the significance levels of the interaction terms are those derived from the additional variance explained after all other variables had been added to the model. The goodness-of-fit measures for the overall models are Buse R-squares (Buse, 1973).

RESULTS

Table 2 presents the descriptive statistics and correlations for our variables. The multiple regression analyses of Table 3 employ as dependent variables the three indexes of simplicity. The dependent variable on Tables 4–6 is performance.

Causes of repertoire simplicity

Hypothesis 1: Past performance

Hypothesis 1 was supported. Table 3 shows that past performance relates positively to both the concentration (C) and range (R) indexes of simplicity. This is true for performance in both the preceding year ($t - 1$) and the most recent year (t). The dominance (D) index also bore a significant relationship to performance, but only in the most recent year. This is the narrowest of our measures of simplicity as it gauges a firm's concentration on a *single* most prevalent action.

Hypothesis 2: Breadth of experience

As predicted by Hypothesis 2, firms that had employed a wide range of actions in a previous year adopt less simple repertoires. This hypothesis was supported for all three indexes of simplicity. Varied experience, it seems, may keep managers alert to environmental complexities that provoke more comprehensive repertoires.

Hypothesis 3: Airline age and size

Hypothesis 3a was partly supported. It appears that larger airlines do become more focused in their

Table 2. Descriptive statistics and Pearson correlations[a]

	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9	10
Competitive simplicity														
1. Concentration (C) index	−1.83	0.43	−2.53	−0.52	1.00									
2. Dominance (D) index	−0.71	0.52	−1.64	0.84	0.89	1.00								
3. Range (R) index[b]	4.49	2.71	3.00	12.00	0.61	0.44	1.00							
Organization and environment														
4. Breadth of experiences	3.89	2.61	2.00	10.00	−0.34	−0.24	−0.41	1.00						
5. Firm size (natural log)	9.24	1.23	5.29	10.91	−0.30	−0.18	−0.47	0.46	1.00					
6. Firm age	28.00	17.00	2.00	45.00	−0.26	−0.21	−0.44	0.44	0.61	1.00				
7. Market diversity	21.30	8.24	2.00	35.00	−0.35	−0.25	−0.49	0.52	0.82	0.62	1.00			
8. Market growth	3.96	7.85	−5.90	17.40	0.13	0.17	−0.15	0.19	−0.03	0.01	0.23	1.00		
9. Market uncertainty	0.10	1.40	−1.44	2.97	−0.07	−0.03	−0.06	0.03	0.02	−0.01	0.14	0.27	1.00	
Market performance														
10. Revenue/ASM	0.08	0.02	0.04	0.14	0.21	0.14	0.33	−0.22	−0.34	−0.15	−0.27	0.13	0.00	1.00

[a]For the smallest sample size, all coefficients greater than 0.22 are significant at the 0.05 levels.
[b]Signs for the R index are reversed so that, like the C and D indexes, they reflect simplicity.

competitive activities, perhaps because of the complacency induced by their market power. This did not seem to be reflected, however, by the *R* measure, maybe because some big carriers could afford to do more kinds of activities. Hypothesis 3b received no support. Company age never related to simplicity as maybe it is too indirect a measure of bureaucratic rigidity. Or perhaps age effects are limited to very young firms still searching to find their skills.

Hypothesis 4: Market diversity

As expected, market diversity shows a very consistent negative association with simplicity, confirming Hypothesis 4. Diverse environments, it seems, elicit a broad array of competitive tactics and discourage too much emphasis on a few types of competitive activities.

Hypothesis 5: Market growth

The expected positive relationship between market growth and simplicity materialized for the *C* and *D* indexes of simplicity, but not for the *R* index. Market munificence does seem to lend itself to the concentration on fewer kinds of actions, but it does not notably restrict the range of actions taken.

Hypothesis 6: Market uncertainty

Uncertainty did not relate to any of our indexes of simplicity. While uncertainty may cause some managers to search for new ways to compete, it may cause others to become more defensive and to concentrate on the few actions that they feel safe with and expert at. Also, because uncertainty extended throughout the postderegulation period, it may have had a continual influence on most of our airlines' repertoires.

The above analyses present findings for each of the three individual measures of simplicity. We wished to establish whether the same results would be generated by an 'overall' or composite indicator of simplicity. This indicator was derived by performing a principal components analysis on the three indexes. The first component accounted for 77 percent of the variance (eigenvalue of 2.31), and correlated with the *C*, *D*, and *R* indexes at −0.96, −0.91, and 0.75 respectively. The results given in the last two columns of Table 3 were very consistent with the findings based on the individual indexes: specifically, Hypotheses 1, 2, 3a, 4 and 5 were all supported, and Hypotheses 3b and 6 were not.

Table 3. Regressions of simplicity indexes on performance, airline and industry characteristics (Hypotheses H1 to H6)[a]

	Concentration (*C*) index		Dominance (*D*) index		Range (*R*) index[b]		Simplicity principal component[b]	
Revenue/ASM at *t*	0.27***		0.19**		0.17*		0.23**	
Revenue/ASM at *t* − 1		0.15*		0.07		0.22***		0.17**
Breadth of experiences	−0.15**	−0.14*	−0.13*	−0.12*	−0.13*	−0.10^{+}	−0.23**	−0.20**
Firm size	0.31**	0.25**	0.37**	0.32**	−0.17*	−0.20*	0.26*	0.20*
Firm age	0.10	0.06	0.04	0.02	−0.13	−0.09	0.07	0.07
Market diversity	−0.59***	−0.58***	−0.49***	−0.47***	−0.26**	−0.29**	−0.55***	−0.54***
Market growth	0.41**	0.33**	0.35**	0.31**	0.03	−0.03	0.32**	0.24**
Market uncertainty	−0.07^{+}	−0.06	−0.08	−0.05	0.01	0.00	−0.04	−0.06
R^2	0.46	0.43	0.25	0.23	0.61	0.62	0.45	0.45
F ratio	14.32	12.76	5.71	5.11	26.37	27.76	13.54	13.66
p value	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00

d.f. for all equations: 7, 118

[a]The figures reported in the table are standardized beta coefficients.
[b]Signs of betas were reversed to be consistent with the *C* and *D* indexes because the *R* index as originally calculated was an inverse indicator of simplicity.
$^{+}$, *, **, ***, indicate that the partial *F* statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.

Simplicity and subsequent performance

Table 3 indicated that *past* performance relates broadly and significantly to subsequent simplicity. However, according to Hypothesis 7, in turbulent, uncertain contexts such as the postderegulation airline industry, simplicity might actually demonstrate a negative relationship with *subsequent* performance. The analyses of Table 4 test this association for all three indexes of simplicity. Control variables included past performance, organizational size and age, and market uncertainty, diversity, and growth. It is clear that for the *C* and *R* indexes simplicity was indeed followed by falling performance and by low levels of performance. Again, the findings for the narrower *D* index did not reach significance.

Hypothesis 8 suggested that simplicity would be especially damaging during periods of the greatest uncertainty. This was tested by the interaction terms of Table 4. Support for the hypothesis was mixed. The post-deregulation era was uncertain at the best of times and, in general, annual fluctuations in uncertainty seemed to have little incremental effect on the hazards of concentration, as reflected by the *C* index. However, the remaining two indexes of simplicity diverged markedly on this one hypothesis: as expected, the significant interaction term for the range index suggests that the more uncertain the environment, the more must firms cover the bases in competing—that is, the more they must employ a wide range of competitive tactics to counter the challenges and unforeseen contingencies that arise. To our surprise, however, the findings also indicate that firms facing uncertainty benefit by focusing on their dominant competitive action—presumably the one that gives them an edge over their rivals and affords some competitive advantage.

According to Hypothesis 9, simplicity would most harm the performance of companies catering to a diverse clientele or facing many different competitors. This hypothesis was tested by the interaction terms of Table 5, but was not supported.

Hypothesis 10 argued that simplicity would be more harmful during intervals of market growth than during periods of decline or stagnation. This was confirmed by the interaction terms of Table 6—and even more strongly by the replications of Appendix 2. It appears that firms may benefit from broadening their repertoires when the market presents opportunities for garnering new business. But

Table 4. Moderated regressions of market performance on lagged competitive simplicity indexes and airline and industry characteristics (Hypotheses 7 and 8)

	Revenue/ASM		
Competitive simplicity at $t-1$:			
C index	−0.10**		
D index		−0.03	
R index[a]			−0.07**
Firm size	−0.04	0.01	−0.02
Firm age	−0.27**	−0.26**	−0.26**
Market diversity	−0.01	−0.05	−0.01
Market growth	0.16**	0.16**	0.19**
Market uncertainty	−0.01	−0.00	−0.01
Simplicity at $t-1$ × uncertainty[a]	0.01	0.10**	−0.06**
Performance at $t-1$	0.58***	0.59***	0.62***
R^2	0.64	0.69	0.68
F ratio	25.95	33.08	31.29
p value	0.00	0.00	0.00

d.f. for all equations: 8, 117

[a]The signs of the coefficients for the *R* index were reversed to be consistent with those of the *C* and *D* indexes.
+, *, **, ***, indicate that the partial *F* statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.

Table 5. Moderated regressions of market performance on lagged competitive simplicity indexes and airline and industry characteristics (Hypothesis 9)

	Revenue/ASM		
Competitive simplicity at $t-1$:			
C index	–0.09**		
D index		–0.04	
R index[a]			–0.08**
Firm size	–0.02	0.03	–0.00
Firm age	–0.27**	–0.25**	–0.26**
Market diversity	–0.04	–0.07	–0.07
Market growth	0.15**	0.15**	0.15**
Market uncertainty	–0.01	–0.01	–0.00
Simplicity at $t-1$ × diversity[a]	0.08	0.11	0.10
Performance at $t-1$	0.56***	0.59***	0.58***
R^2	0.64	0.64	0.66
F	27.64	28.08	31.32
p value	0.00	0.00	0.00

d.f. for all equations: 8, 117

[a]The signs of the coefficients for the *R* index were reversed to be consistent with those of the *C* and *D* indexes.
+, *, **, ***, indicate that the partial *F* statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.

Table 6. Moderated regressions of market performance on lagged competitive simplicity indexes and airline and industry characteristics (Hypothesis 10)

	Revenue/ASM		
Competitive simplicity at $t-1$:			
C index	–0.11**		
D index		–0.05	
R index[a]			–0.09**
Firm size	–0.05	0.00	–0.06
Firm age	–0.28**	–0.27**	–0.24**
Market diversity	0.03	–0.01	–0.02
Market growth	0.19**	0.17**	0.20**
Market uncertainty	–0.00	–0.00	–0.00
Simplicity at $t-1$ × growth[a]	–0.05*	–0.06*	–0.04*
Performance at $t-1$	0.59***	0.61***	0.63***
R^2	0.66	0.66	0.69
F	24.72	25.18	32.83
p value	0.00	0.00	0.00

d.f. for all equations: 8, 117

[a]The signs of the coefficients for the *R* index were reversed to be consistent with those of the *C* and *D* indexes.
+, *, **, ***, indicate that the partial *F* statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.

in periods of decline, tough competition may arise. Then, companies must concentrate on the essential: on those actions that best repel or discourage rivals' onslaughts.[3]

DISCUSSION

Search, knowledge and competitive simplicity

Our framework predicted that competitive simplicity would be a function of those organizational and environmental properties that shape managerial cognitions and motivations—either by informing managers of different modes of competing or motivating them to search for and adopt these modes (Walsh, 1995). Search incentives such as poor past performance, small size and market decline all seemed to push managers to employ less simple competitive repertoires. Factors contributing to managers' knowledge such as a rich history of broad competitive experiences and a diverse market had the same effect. One of the most encouraging aspects of these findings was the striking convergence in the findings for all of our indexes of simplicity.

Simplicity and performance

We have argued that sometimes simplicity can be a powerful competitive tool. It entails numerous economies and allows firms to concentrate on what they do best. However, in turbulent environments like the domestic airline industry, simplicity also seemed to cause problems. It may have contributed to overspecialization *vis-à-vis* the wide range of market contingencies. Simple repertoires appeared to be insufficiently comprehensive to cope with the many challenges posed by the post-deregulation upheaval. Paradoxically, because success induces managers to simplify their repertoires, it may very well provoke them into the narrowness that eliminates advantages instead of extending them (Miller, 1990; Pascale, 1990; Stacey, 1992). Repertoire simplicity seems then to be a key factor that warrants consideration in future studies examining the relationship between strategy and performance.

Implications

Our results suggest that organizational learning may indeed play some role in shaping competitive strategy. Success may drive managers to whittle down their repertoires—to zero in on what they believe is the path to success. But the simplicity of that path may be at least in part a product of 'extrarational' factors such as a munificent environment, the complacency born of size, and perhaps even the attribution of merit to practices of little consequence (Levitt and March, 1988; Miller and Chen, 1994; Milliken and Lant, 1991).

The field of business strategy has distanced itself from the more deterministic views of some organizational theorists. It maintains that managers, with the freedom to make intelligent strategic choices, can have a positive impact on the performance of their organizations (Porter, 1980, 1985). This research, although very much in the strategy domain, allows for the possibility that strategy may be shaped as much by the mental models, habits and random associations surrounding success, bigness, and munificence as by rational calculation.

In a more practical vein, successful executives must become especially critical of any tendency to focus too narrowly. They must strive to become more conscious of the learning processes that channel their competitive behavior and they should try to preserve a healthy skepticism about their strategic assumptions. They need also to remain eternally vigilant to the dangers of eliminating variety. And to make their task still more demanding, managers must at the same time avoid the opposite extremes of blandness and tactical indirection.

Previous studies using this data base

This is one of a series of papers based on an extensive and longitudinal study of domestic airline

[3] In order to test the robustness of the above findings we replicated the analyses of Tables 3–6 using an expanded sample of 146 observations from 32 national airlines (our 18 carriers plus 14 smaller niche carriers). Because OLS is not usually appropriate for cross-sectional time series data, we first performed diagnostics to detect any autocorrelation or heteroscedasticity. Residuals were plotted against estimates, against all independent variables, and against cross-sections and time using the procedures recommended by Sayrs (1989). The Cochrane–Orcutt iterative method was used selectively to transform the data wherever Durbin h statistics suggested autocorrelation. After performing these adjustments, we could detect no further systematic patterns in the residuals, nor any evidence of heteroscedasticity.

These analyses were merely used for confirmatory purposes, but they did support the results on Table 3 for Hypotheses 1, 2, 3, 4 and 6, but not entirely for 5. The analyses also confirmed Hypothesis 7, 8 and 10, the first more weakly than reported on Table 4. Finally, perhaps because of greater variability in the market diversity index in the full sample, Hypothesis 9 also was supported. These findings are available upon request.

competition. The data base, gathered in many stages and over many years, incorporates all market-oriented competitive moves made in the industry over an 8-year period. It was created in part through a detailed and systematic content analysis of the journal *Aviation Daily*. In its level of detail, mode of construction, and reliability, the data base is somewhat akin to that gathered by the Aston and PIMS researchers.

The data base was developed progressively to address some fundamental issues: how do firms compete, why do they compete in certain ways, and how do these methods of competition relate to market performance? These questions were investigated by examining concrete and tangible market-oriented actions. This is in contrast with previous research on competition which inferred strategy from aggregate and more abstract firm or process attributes or from the structural properties of an industry.

By focusing on the action/response dyad, three papers employing the data base explored attributes of the attack (Chen *et al.*, 1992) and of the attacker and defender (Chen and MacMillan, 1992) that might influence the likelihood and timing of competitive responses, as well as the performance implications of competitive exchanges (Chen and Miller, 1994). Two other papers examined the impact of organizational size (Chen and Hambrick, 1995) and information processing capacity (Smith *et al.*, 1991) on competitive behavior at the firm level. Firms were found, for example, to perform best when they conformed to the typical competitive behavior of their size group. Finally, in a companion study to this, Miller and Chen (1994) conceptualized competitive strategy as a repertoire of competitive actions in order to look into the causes and performance consequences of competitive inertia. Inertia in tactical actions was shown to have different antecedents from inertia in strategic actions, the former being more driven by past performance and market diversity, the latter by growth in markets. Benefits from inertia were shown to decrease with market diversity.

To meet the objectives of these studies, each with its own theoretical demands and its own variables, the original data base has been greatly expanded over time. The cumulative goal of these studies has been to move towards a predictive theory of competitive behavior which has hitherto been lacking in the field of strategy. We believe that by concentrating on the many facets of competition within a particular industry and set of competitors—by emphasizing detail and depth instead of breadth—it may be possible to gain a more profound understanding of the subtleties of competition.

Limitations

This study deals with only a single, rather volatile industry. Moreover, its sample consisted of major carriers competing at the national level. It did not include regional or niche carriers, nor did it contain many very young or small airlines. More research will be needed to determine whether our findings apply to different kinds of firms and more stable industries.

Another limitation of this study is that we could get only information on market-related actions, not internal decisions. Also, our hypotheses concerning size and age could have been better assessed had we had measures of organizational routinization and bureaucracy.

Directions for further research

The above limitations suggest opportunities for further research. It might, for example, be worthwhile to look at internal as well as external actions in assessing simplicity. This would afford a more encompassing representation of competitive repertoires, constructs that promote a more objective means of assessing strategy. Measures of *perceived* environmental munificence and diversity would also be useful. And the generality of our findings might be tested in other industries.

Another opportunity for further research might be to relate simplicity to its organizational context. Miller (1993, 1994) has discussed not only competitive simplicity, but simplicity in structure, information systems, corporate culture, and even the power distribution. It would be interesting to probe the links between these other aspects of organizational simplicity and the variety that we have studied here. Clearly, the topic is very new and there is much to be done.

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APPENDIX 1: REGRESSIONS OF SIMPLICITY INDEXES ON MARKET PERFORMANCE, AIRLINE AND INDUSTRY CHARACTERISTICS: CONTROLLING FOR LAGGED COMPETITIVE SIMPLICITY

	Concentration (C) index		Dominance (D) index		Range (R) index[a]	
Revenue/ASM at t	0.26***		0.18*		0.20**	
Revenue/ASM at t–1		0.13*		0.05		0.22***
C index at $t-1$	0.11	0.08				
D index at $t-1$			0.14^{+}	0.15^{+}		
R index at $t-1$					0.18^{+}	0.14^{+}
Breadth of experiences	–0.14*	–0.14*	–0.11^{+}	–0.10^{+}	–0.06	–0.06
Firm size	0.32**	0.27**	0.38**	0.33**	–0.16*	–0.16*
Firm age	0.04	0.00	0.02	0.03	0.04	0.03
Market diversity	–0.51***	–0.51***	–0.47***	–0.44***	–0.23**	–0.26**
Market growth	0.39**	0.32**	0.36**	0.32**	0.01	0.06
Market uncertainty	–0.06	–0.06	–0.07	–0.04	0.01	0.02
R^2	0.51	0.47	0.28	0.27	0.63	0.63
F ratio	15.46	13.09	5.67	5.12	25.23	25.11
p value	0.00	0.00	0.01	0.01	0.00	0.00

[a]Signs of betas were reversed to be consistent with those of the C and D indexes.
$^{+}$, *, **, ***, indicate that the partial F statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.

APPENDIX 2: MODERATED REGRESSIONS OF MARKET PERFORMANCE ON LAGGED COMPETITIVE SIMPLICITY INDEXES AND AIRLINE AND INDUSTRY CHARACTERISTICS: INSTRUMENT FOR PAST PERFORMANCE

	Revenue/ASM								
Simplicity at $t-1$:									
C index	−0.10**			−0.09**			−0.11**		
D index		−0.02			−0.03			−0.03	
R index[a]			−0.10**			−0.09**			−0.11**
Firm size	−0.03	−0.03	0.01	−0.01	0.00	−0.00	−0.04	−0.01	0.00
Firm age	−0.33**	−0.31**	−0.35**	−0.33**	−0.30**	−0.33**	−0.34**	−0.30**	−0.31**
Market diversity	−0.08	−0.06	−0.04	−0.09	−0.09	−0.11	−0.04	−0.08	−0.08
Market growth	0.16**	0.16**	0.16**	0.16**	0.16**	0.15**	0.20**	0.16**	0.18**
Market uncertainty	0.00	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.03
Simplicity at $t-1$ × Uncertainty[a]	−0.01	0.07*	−0.08**						
Simplicity at $t-1$ × Diversity[a]				0.06	0.09	0.07			
Simplicity at $t-1$ × Growth[a]							−0.06**	−0.08**	−0.09**
Performance at $t-1$	0.49***	0.48***	0.53***	0.49***	0.50***	0.47***	0.50***	0.53***	0.54***
R^2	0.58	0.62	0.63	0.59	0.60	0.62	0.60	0.62	0.64
F ratio	20.11	24.35	23.34	20.87	21.58	23.83	20.33	21.06	26.13
p value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[a]The signs of the coefficients for the *R* index were reversed to be consistent with those of the *C* and *D* indexes.
+, *, **, ***, indicate that the partial *F* statistics are significant at beyond the 0.10, 0.05, 0.01 and 0.001 levels respectively.