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STRATEGIC IMPLICATIONS OF DARWINIAN ECONOMICS FOR SELLING EFFICIENCY AND CHOICE OF INTEGRATED OR INDEPENDENT SALES FORCES*

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Most managers, when confronted with a difficult strategic decision, would like to know what is the prevailing practice in their industry. Prevailing practice interests managers, in part, because it may indicate which decisions are good, even "best." The rationale is "Darwinian economics," which proposes that competitive markets operate to force at least an approximation of optimal behavior, because "wrong" decisions are extinguished by the market mechanism. If so, the bulk of survivors make good business decisions and their collective practice is worth knowing, meaning it should be difficult to improve upon. This paper tests whether prevailing practice represents "good" decisions. The context is the decision whether to fill a sales district with a company (integrated) sales force or with outside agents (independents). The outcome of the choice is the ratio of sales to the cost of running the sales force, i.e. selling efficiency. A model is described which summarizes industry decisions, and two propositions are developed. Proposition 1, a simple version, states that efficiency declines as firms depart from the industry rule as to when they should integrate. Proposition 2, a contingent version, states that efficiency declines as firms depart from the industry rule in unpredictable selling environments but that conforming to the rule has no impact in predictable environments. The rationale is that firms learn the environment well enough to know when to depart from the rule in predictable settings but not otherwise. The relationship between efficiency and conformity to prevailing practice is examined for 93 sales districts of 11 recognized electronic component manufacturers. The results support proposition 2: the most efficient sales forces conform to prevailing practice and the least efficient deviate, but only in uncertain environments. In more certain environments, conformity and efficiency are unrelated. Implications (such as when it pays to be different) and suggestions for future research are discussed.
(SALES FORCE MANAGEMENT; ORGANIZATION EFFECTIVENESS; ORGANIZATION DESIGN; ORGANIZATION ECONOMICS)

This paper concerns the proposition that descriptive research has normative implications. This is not a proposition but an article of faith among neoclassical economists, who assume that individuals (hence firms) operate in perfectly competitive markets and are completely rational and informed maximizers of utility and profit (Alchian 1950). By this reasoning, firm (hence industry) behavior is optimal.

This position has been frequently assaulted on grounds that (1) firm behavior is not merely the aggregate of individual (optimal) decisions, (2) individual decision makers are imperfectly rational, incompletely informed, and neither interested in nor capable of maximizing profit. Hence, it is argued, descriptive research does not offer a guide to normatively "correct" decisions.

In part in response to these critiques, a stream of research, which may be labeled "Darwinian economics," has arisen to defend the normative value of descriptive research. The basic argument (Hirschleiffer 1977, 1985) is that even if the behavioral assumptions are wrong, markets operate to force optimal behavior. Firms and industries operate "as if" they were guided by rational, informed maximizers because "wrong" decisions are extinguished by the market mechanism. Hence, the bulk of survivors exhibit optimal behavior, industries tend to operate efficiently, and research descriptive of survivors' patterns offers normative implications (Lilien 1979).

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That argument is the heart of this research. We examine one decision: whether a firm should serve a given market with an integrated sales force, composed of employees, or an independent sales force, composed of businesses with whom the firm writes a contract. The integrated option is called a "direct" sales force, while the independent option is called a "manufacturers' representative" or sales agency. An earlier study (Anderson 1985) built a descriptive statistical model (an "industry model" in Lilien's 1979 terms) of the usage of integrated versus independent sales forces in one highly competitive industry. In the current study, we explore whether sales districts that adhere to industry practice, as expressed by the descriptive model, exhibit greater selling efficiency than do districts which deviate from industry practice. If descriptive research has normative implications, à la Darwinian economic arguments, "deviant" sales forces should operate less efficiently than do "conformists." If, on the other hand, environments allow firms considerable leeway in their decisions, deviants should operate at least as efficiently as do conformists.

We begin by reviewing relevant literature from the "evolutionary economics" and "population ecology" streams. The review addresses three questions: (1) why should there be an estimable industry model, (2) why should such a model be a good (normatively correct) one, and (3) how good should the model be? From this we develop both a simple and a contingent version of our major proposition, that conformity is related to greater efficiency. Next, we present the descriptive model of when sales forces will be integrated rather than independent. This model is used to generate an "index of conformity" to industry practice (i.e. the degree to which the chosen sales force conforms to the recommendation of the descriptive industry model). We then develop measures and estimate in exploratory fashion the relationship between selling efficiency (sales/cost of sales force) and conformity to industry practice among 93 sales districts in the electronic components industry. We compare a simple model with a contingent model, wherein environmental uncertainty moderates the impact of conformity on efficiency, and find the contingent model preferable. We conclude with discussion and suggestions for future research.

Literature Review

Are firms "rewarded" by greater efficiency when they conform to the industry rule? By "industry rule" we mean the pattern of decision making in the industry, as evidenced by a descriptive, empirically estimated model relating an observed choice to independent variables that should influence the choice. For example, Lilien (1979) empirically models firms' observed decisions about integrating their distribution channels as a function of average order size, average order frequency, and so forth. "Conforming" to the rule or model means making the choice suggested by the model, while deviation means making a choice that is unexpected, based on the coefficients of the model and the values of the independent variables. Note that the pattern of decisions, as represented by the model, is *not* modal behavior and *not* imitative of certain firms. Hence, conforming to the model does not mean making the most popular (modal) decision or copying the decisions of leading firms.

To determine if conformity is rewarded and deviation penalized, we must address three sequential questions: why should practice be modelable, why should the model be normatively correct, and how correct should it be?

Why Should Practice be Modelable?

It can be argued that every firm's situation and pattern of responses are so unique that no generalization about the practice of a group of firms is possible (McKelvey and Aldrich 1983). Yet, commonalities in the decision processes should be expected, and these should create modelable patterns of behavior by groups of firms. Commonalities occur because, while no two situations are precisely alike, they do have elements in common. Further, a "good" decision is often subject to imitation (Alchian 1950, Freeman 1982, Conlisk 1980), introducing more regularities. Hence, we should not expect practice to be perfectly modelable, but neither should we expect such anarchy that no generalization is possible.

Why Should the Model Be Normatively Correct?

The question of whether the regularities that make up a rule represent good decisions has generated considerable controversy. Penrose (1952) has argued that an individual firm's model should be a good (reasonably normatively correct) one because managers tend to be skilled and capable. Bowman (1963) and Kunreuther (1969) have shown that experienced individual managers develop, through trial and error, a very good sense of what the best decision is, though they often cannot formalize their intuition.

However, a firm's major strategic decisions are seldom made by only one manager. Managers differ in their opinions, and the way that opinions become company decisions is not straightforward (Pfeffer 1982). Hence, even though managers have good judgment, firms are not obliged to make good decisions.

It may be argued that a model of many firms' strategic decisions is likely to be a very good general rule, more inclusive and perhaps even closer to optimality than are the separate rules of many of the underlying firms. A set of firms covers a much broader range of circumstances and reactions than does any one firm. Further, inconsistencies and other shortcomings in any one firm may be "washed out" in the model, thereby presenting a better picture than will a single firm's rule.

What if a firm's rule is not a good one? Alchian (1950) argued that such firms will be extinguished by the invisible hand of competition. This is the economist's analogue of Darwin's argument that only the fittest survive (Hirshleiffer 1977). Parallel reasoning can be found in the "population ecology" stream of organization theory. There it is argued that the environment "selects" organizations with the appropriate "form" (roughly, structure and strategy) for that environment, while "unfit" forms are extinguished (Hannan and Freeman 1977).

In contrast, many organization theorists argue that firms are motivated and able to insulate themselves from the adversities of their environments (Cyert and March 1963, Pfeffer 1982, Singh, Tucker, and House 1986). Further, firms that are not absolutely efficient in all domains may survive anyway due to imperfect competition (Penrose 1953, Liebenstein 1976, 1982). In particular, large firms may be insulated from environmental pressures (Betton and Dess 1984), in part because they can subsidize errors in one domain with successes in another.

Yet, even large firms should eventually feel the competitive environment's pressure to be efficient (Freeman 1982). The question most evolutionary theorists ask is not whether behavior is good but how good (how close to maximizing returns).

Is the Survivor's Behavior Optimal?

Enke (1951) argues that after some period of time, all behavior in a competitive industry is optimal, even if managers behave randomly, because the environment progressively winnows out the worst errors. After each round of elimination, the level of competition ratchets up. Eventually, the only firms that are left behave optimally.

Most evolutionary economists take exception, arguing that competition leads to better outcomes but not necessarily best outcomes. Nelson and Winter (1982) view firms as boundedly rational entities groping toward different goals. They demonstrate analytically that the equilibrium of competition among such firms need not be the neoclassical equilibrium, wherein all players behave optimally. A number of authors have suggested why. Alchian (1950) notes "The crucial element is one's aggregate position relative to actual competitors, not some hypothetically perfect competitors. As in a race, the award goes to the relatively fastest, even if all the competitors loaf" (p. 213). Winter (1964) points out that a generally good competitor may make an error and be eliminated in an early round, degrading the quality of competition in later rounds.

One thread of reasoning concerns the extent to which firms know what optimal behavior is and come to adopt it. Simon (1959) finds that decision makers tend to grope, to be ill informed, and to satisfice, content to stay with a reasonable solution unless forced by failure to search for something closer to optimal solutions. Similarly, Nelson and Winter (1982) posit firms which stick with "routines" (patterns of thought and action) until they fail. Such decision makers and firms are unlikely to experiment enough to find the optimal solution, vitiating Enke's (1951) ratchet effect.

The ability of firms to identify and imitate other firms' success is a major factor in evolutionary economics, for it is thought to speed up the optimizing process and safeguard against the early disappearance of good decisions. Yet Lippman and Rumelt (1982) argue that it is often unclear why success occurs. There are a host of competing explanations, and the relevant factors can be difficult to elucidate. Lippman and Rumelt's (1982) analytical model of competition under "uncertain imitability" suggests that optimal behavior will not occur because not enough firms will enter; they will hold back because it is not clear how to succeed.

The ultimate reason why practice might not be optimal is that, in uncertain environments, optima may not even exist (Alchian 1950, Penrose 1952, Hirshleiffer 1977). As Hirshleiffer (1977) puts it, "If, as applies in almost all interesting cases, the strategic choice is *among probability distributions*, what is the 'optimum'? According to what criterion does natural selection select when strategies have uncertain outcomes?" (Hirshleiffer 1977, p. 10).

We now turn to an empirical test of whether descriptive models have normative outcomes, as Darwinian economics suggests they should. We outline two propositions about the effect of conformity on the efficiency of a business unit and review empirical literature relating to the propositions. Next, we describe a test of the two propositions. This test is conducted in a particular context, namely, the decision whether to serve a sales district with an integrated ("direct") or independent ("rep") sales force.

Hypotheses About Business Unit Efficiency

Model A: A Simple Conceptualization

The simple form of the economic selection argument, which we label "model A," may be summarized as a proposition.

P1: A business unit's efficiency declines as it moves farther from the industry rule's recommendation.

Put differently, in competitive industries conformity (observance of the industry rule) pays. The proposition that deviation from a multi-firm rule hurts performance was tested by Pfeffer (1972). Using a multi-industry sample, Pfeffer modeled the composition of boards of directors by estimating a regression model of the ratio of inside (part of the management team) to outside board members. He operationalized deviance from the rule as the absolute value of the difference between the actual and predicted ratios. Pfeffer found that deviance was significantly and negatively correlated with each of two financial return measures (net income/sales and net income/stockholders' equity, each adjusted for the average level in the firm's industry). This result suggests that deviation in either direction hurts performance.

Bowman and Haire (1975) consider the issue of corporate social responsibility. They develop an index of a firm's degree of attention to social responsibility for 82 firms in one industry. Categorizing the firms into low, medium, and high degrees of attention, they take the medium level to be average behavior and ask whether deviation (either way) from the average hurts performance. Bowman and Haire find some evidence that the midrange firms show higher return on equity than either high or low firms. Although this test is crude, it is suggestive that deviation in either direction hurts performance.

Model B: A Contingent Conceptualization

Simple (parsimonious) models, such as Model A, have much to commend them and are preferable to more complex models, all else constant (Parsons and Schultz 1976). However, it is reasonable to expect that under some circumstances managers and firms can outperform industry models. A contingent framework, designated "Model B," is advanced to delineate those circumstances. The model estimation to follow compares the improvement that Model B offers (if any) over Model A.

Models based on observed practice are necessarily crude (Bowman 1963, Lilien 1979). Hence, managers and firms should be able to outperform models when they *correctly* sense when nonlinearities apply, when omitted variables matter, or when selected environmental cues are valid. These circumstances are most likely to occur in a stable environment, for such an environment can be relatively well understood. In stable environments, management can learn what works and develop good predictions. This fine-tuned sense of the environment tells managers when it pays to deviate from the rule.

In unstable environments, the reverse is true. Unstable environments create information overload, which impedes learning about the forces driving change (Lawrence and Dyer 1983). Further, because the environment changes so fast, managers will have difficulty mapping their environment (learning what works and why) (Fiol and Lyles 1985). As a result, managers will have a relatively poor sense of which selected cues to attend to in an unpredictable setting.

Hence, in unstable environments, conforming to a rule can avoid expensive errors. This is particularly likely for rare decisions, such as whether to vertically integrate a function, because firms cannot learn by experience from their own repeated decisions. In addition, firms have difficulty learning from each other's experience because circumstances are often difficult to observe. Firms may be able to observe their competitors' choices, allowing them to estimate the modal behavior. But modal choices do not take circumstances into account; this is the job of the industry rule. Because managers often do not have a good grasp of their competitors' circumstances, they cannot readily and precisely assess the pattern (rule) underlying observed choices. Further, firms cannot easily ascertain whether their competitors' decisions are good (increase efficiency). Hence, the survivors' apparent rule could be much better than a decision maker's implicit theories in an uncertain environment.

These ideas are summarized in the second proposition.

P2: Whether conformity improves the efficiency of a business unit is a function of the level of environmental uncertainty as follows:

—P2a: In predictable environments, conformity does not increase efficiency.

—P2b: In unpredictable environments, conformity increases efficiency.

The reasoning behind P2 is analogous to that of Frederickson (1984), who studies how the comprehensiveness of a firm's strategic planning process is related to its efficiency. Frederickson proposes that a comprehensive (exhaustive, rational, projective) planning process should make the firm more efficient, but only in stable environments, where the firm can ascertain the important variables and develop a good theory of how they are related. This is akin to saying that managers can develop a good rule of their own if the environment stands still long enough to become understood (P2a).

Frederickson also reviews counterarguments that comprehensiveness is impractical, even dysfunctional, and proposes that this is true in unstable environments. Exhaustive strategic planning in unstable environments is impractical due to bounded rationality (organizational actors are unable to figure out the shifting environment well) and dysfunctional because it drives management to overspend on information, ignore puzzling but important cues, and commit prematurely to response patterns. Instead, the firm is better off accepting its ignorance and making decisions incrementally and relatively loosely. This is akin to saying there is little point to developing one's own rule if the environment cannot be well understood (P2b). Frederickson (1984) and Frederickson and Mitchell (1984) provide empirical support for the proposition that the effect of comprehensiveness on performance is moderated by the level of environmental instability.

The Decision: Integrating the Selling Function

This study considers the apparent rule underlying the decision as to whether to integrate the selling function. The choice to be made is between a company (direct) sales force, which is the integrated choice, and a manufacturers' representative ("rep"), which is the independent choice. The manufacturers' representative is an agency which sells the products of multiple manufacturers (principals), bears all expenses, and is compensated by a commission on sales.[1]

Whether to go rep or direct in a given sales district is an issue which managers debate without achieving consensus (Shapiro 1977). The debate centers around what level of sales can be achieved by each system and at what cost. Direct sales forces are easier to control and can offer good sales results, but at high fixed cost and high total cost. Reps afford little control but can generate high sales at low total cost (and virtually zero fixed cost). Reps are used by a broad spectrum of firms for at least some sales districts (Research Institute of America 1975). Some of the firms that use reps are very large and can well afford the fixed cost of their own sales force. Yet, according to Shapiro (1979), "Some large companies believe . . . that they obtain better sales results, that is, more sales per dollar of sales expense, with independent representatives than with a company-owned sales force" (p. 252).

Sales managers and the sales force management literature tend to think of improving the performance of sales forces in terms of maximizing the sales/cost ratio, where "sales" means total revenue and "cost" means the expense of supporting a sales force (Shapiro 1979). This study casts the relative performance of rep and direct sales forces in terms of the efficiency (sales/cost) level each form attains under different selling situations.[2]

The business unit under consideration is a sales district, i.e. a group of customers served by a sales force (either rep or direct) reporting to a sales manager. It is common

[1] Rep agencies have much in common with distributors. However, reps do not take title to the goods they sell. Hence, reps do not set the price (as with direct salespeople, reps must clear prices with the manufacturer). Further, the manufacturer handles billing and shipping, meaning the manufacturer knows who bought the product. Therefore, manufacturers have much more control over manufacturers' representatives than over distributors. Nonetheless, they have much less control over reps than over their own direct (employee) sales force (Anderson 1985).

[2] Conceptually, a better measure is value added/cost, where value added is sales less cost of sales (i.e. gross margin). This measure, however, is seldom used to evaluate salespeople because many firms do not know their gross margins by item and have a shifting mix of sales, which makes the overall gross margin a variable. Although firms eventually estimate their margins for their income statement, many do not have a good current estimate (Goodman 1971). This problem is pronounced in some sectors of the electronic components industry, where the empirical test in this paper takes place, because production costs vary considerably from run to run. In addition, many sales managers focus on sales rather than contribution because they are evaluated on revenue. Revenue is also conceptually simpler and more readily available than margins. Hence, most studies of salesperson effectiveness use sales as their measure of performance (Weitz 1981).

for firms to use reps in some districts and direct in others ("hybrid" distribution). This mixed form is a function of the nature of the customer base, the strength of competition in the district, what part of the product line is being carried, and so forth (Research Institute of America 1974, Novick 1982). Depending on the characteristics of the district and whether rep or direct salespeople cover it, efficiency can differ markedly across districts within the same corporation.

The earlier discussion of Darwinian economics suggests that in the sales force context, Model A (the simple conceptualization) can be operationalized as the following hypothesis.

H1: A sales district's efficiency declines as it moves farther from the industry rule's recommendation concerning the choice of a rep or direct sales force.

Model B (the contingent conceptualization) leads to a rival hypothesis:

H2: Whether conformity improves efficiency is a function of the level of environmental uncertainty in a sales district as follows:

—H2a: In predictable environments, conformity does not increase the sales/cost ratio.

—H2b: In unpredictable environments, conformity increases the sales/cost ratio.

Controlling for Other Sources of Variation

The sales/cost ratio is influenced by factors other than conformity to industry practice. While it is impossible to specify and measure every influence on efficiency, several factors should have a large impact and are incorporated as covariates so as to avoid misattributing efficiency differences to conformity effects.

Size. Scherer (1980) argues that large firms perform better *per se* because they can achieve economies of scale and scope. In marketing, Scherer cites a large firm's ability to find, hold, and fully utilize management talent. Thus, a large firm "may be able to get more mileage out of its expenditures on a field sales force and other marketing instruments" (p. 84). If so, we would expect that the larger the firm, the greater the efficiency of any of its sales districts, all else constant.

Travel. An important characteristic of a sales district is the amount of travel required to cover it adequately. High travel requirements depress efficiency because salespeople are left with less selling time and because more travel means more travel expenses, hence higher costs (Novick 1982).

Technical Sophistication. As will be discussed below, the electronic components industry is the setting of this study. A feature of the industry is the distinction between "high tech" products and less sophisticated components. The more sophisticated products are growing quickly, while the less sophisticated products are declining (Electronic Industries Association 1981). Accordingly, we expect high tech components to generate sharply higher sales. Further, the sophisticated products tend to be more expensive, thereby generating higher revenue that unsophisticated products for the same unit sales. Hence, we expect that sales/cost ratios increase with the technical sophistication of the components carried by a district sales force.

Data Collection

Overview

Figure 1 is a schematic which summarizes the progression of data collection and analysis to test the relationship between the efficiency of a sales force and conformity to the industry rule. In essence, an industry decision rule (industry practice model) was estimated in a prior study. The output of that model is an estimate of the likelihood of integrating the selling function ("going direct"). A transformation (to be discussed) allows the estimation of an index of conformity, which measures the extent to which a

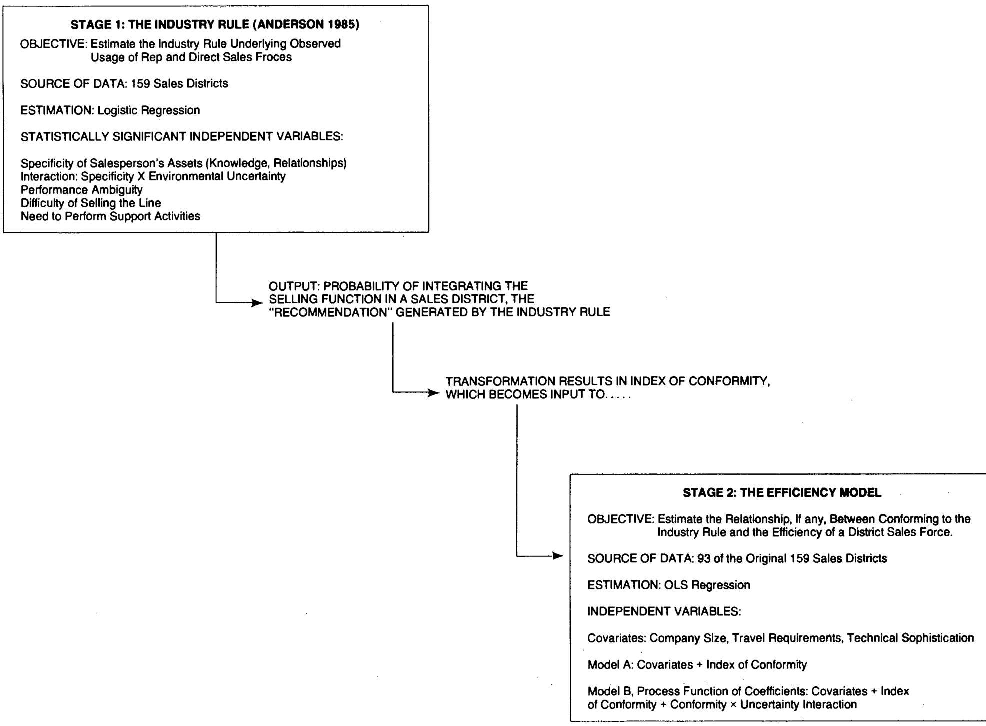

FIGURE 1. Building a Model of the Efficiency-Conformity Relationship.

sales district's choice deviates from the industry rule. This becomes the principal independent variable in a model (estimated on a subset of the original data) of the sales/cost ratio. The model of efficiency is used to test P1 (Model A) and P2 (Model B).

Data Collection

Data were collected from the electronic components industry in 1981. The single industry focus may limit generalization but avoids the noise arising from comparison problems across multiple industries. This point is especially important when comparing operating returns. The electronic components industry was chosen because it has multiple product classes, creating considerable variation within the industry.

Thirty electronic component manufacturers were asked to participate in a study designed to ascertain the industry's decision rule on the rep-direct choice. In return for cooperation, each firm was promised a report on how the firm's usage of rep and direct sales forces compared with industry trends (degree of conformity to the industry rule). These 30 manufacturers (principals) were selected because they were named by purchasing agents in an industry publication as being firms with superior products and established reputations. These firms may be considered experienced and successful in their industry.

Sixteen firms participated in the study of the industry rule concerning choice of rep and direct sales forces. These 16 firms yielded usable questionnaires from 159 sales districts. The 159 districts were used to estimate the industry rule and the degree of deviation from that rule.

To assess response bias at this step, the responding and nonresponding firms were compared, based on published information, on their size and on the sophistication of their product line, which are important general descriptors in this industry. This comparison, while rough, shows no large differences between participating and nonparticipating firms.

The participating firms instructed their district sales managers to fill out an extensively pretested questionnaire and return it directly to the researcher. Sales managers were informed that they were participating in an academic study on usage of rep and direct sales forces and that a report would be sent to top management summarizing their responses on that issue. Each respondent was assured that no information indicating his/her individual answers would be revealed to upper management.

Firms were also asked to supply 1980 cost and sales information for the corporate sales division and for each sales district. The information was in the researcher's format, which did not precisely correspond to most firm's accounting systems. Nonetheless, 11 firms comprising 93 districts supplied the sales and cost information. Five firms did not. One cited confidentially, while the rest passively resisted the researcher's requests.

The 11 firms supplying data related to efficiency differ from the 5 who did not in one respect: they used direct sales forces less often. This may be because the requested information was more difficult to amass for direct sales forces (where there are many cost categories) than for reps.

The districts from the five omitted firms do not differ greatly in their degree of observance of the industry rule. The mean, standard deviation, and range of the index of conformity are virtually identical for the data base with and without the omitted districts. Hence, the included firms constitute a full range of observance (this measure is developed in detail below). Seventy-one rep districts and 22 direct districts supplied usable information.

Development of Measures

Efficiency

Efficiency, the sales/selling cost ratio, was measured as follows. Each firm was asked to indicate in dollars its corporate sales (*not* marketing) overhead in 1980 and what fraction of the corporate sales division's time was spent on each district. In addition, information was requested for each sales district. This information included dollar sales, plus

1. total salesperson salaries and benefits;
2. total incentive compensation (commissions, bonuses, etc.);
3. total variable selling expenses (transportation, lodging, meals, entertainment, samples, and so forth);
4. total sales overhead (administrative personnel, training costs, etc.) for the district sales office, *not* including corporate overhead.

The cost term of the sales/cost ratio was constructed by adding the above four categories of district-level cost, plus a fraction of corporate sales overhead. The fraction was determined by what percentage of corporate's time was spent on each district. Hence, districts requiring more corporate effort bear a heavier share of corporate overhead, as recommended by Horngren (1982). Within the 93 districts providing these data, sales ranged from approximately 1 times cost to 45 times cost.

Rep or Direct: Estimating the Industry Rule

The most critical construct in this study is the extent to which a district conforms to the apparent industry rule (industry practice). To assess this, a model of rep/direct usage was developed and estimated from the 159 districts comprising the full data set. A complete discription of the model of industry practice appears in Anderson (1985).

Once the industry rule, based on 159 districts, was estimated, the *degree of observance* of that model (rule) was estimated for each of the 93 districts that also supplied sales and cost figures. These 93 districts are the data set used to model efficiency (to be discussed in the results section).

Our principal interest is the relationship, if any, between conformity and efficiency. The industry practice model, while not the focus of this study, is crucial to the derivation of the index of conformity. Hence, we briefly sketch the model and how it was estimated.

Following Nunnally (1978), multiple item scales were constructed, as well as some single item measures, to represent independent variables hypothesized to be related to usage of rep or direct sales forces (industry practice). The scales were created by standardizing each question, then adding the standard scores. Coefficient alpha estimates (reliabilities) run from 0.42 to 0.88, with most estimates falling in the 0.5 to 0.7 range. Reliability estimates of this level are considered adequate but modest: the 0.7 to 0.9 range is preferable for basic research. The principal impact of imperfect reliability is the attenuation of correlations, which tends to skew results toward insignificance (Nunnally 1978).

Logistic regression was used to estimate a model of the probability of going direct in a district. Logistic regression, like discriminant analysis, estimates the relationship between a binary dependent variable (integrate or not) and a set of independent variables. The linear logistic model is: $E(y) = e^{\beta x}/(1 + e^{\beta x})$, where y is the observed choice (0 for rep or 1 for direct), $E(y)$ is the expected value of y (probability of going direct) and x is a set of independent variables. The parameters of the linear logistic function are estimated as the values that maximize the likelihood function:

$$L(\beta) = \prod \frac{e^{y\beta x}}{1 + e^{\beta x}}.$$

The model's predictions are estimates of the probability of taking on the value 1, i.e. the probability of going direct rather than rep in a sales district. Of course, a high probability of going direct implies a low probability of going rep and vice versa.

This estimated industry practice model is based on transaction cost analysis (Williamson 1981) and the sales force management literature. Estimated coefficients, where significant, are largely in accord with hypotheses. Appendix A summarizes the independent variables and their direction of effect. For our purposes, deviation from this model, which is an estimate of the industry rule, is of particular interest.

The model fits the data reasonably well, as indicated by a goodness of fit index. Nonetheless, it is clearly an incomplete representation of the industry's decision rule, as evidenced by the model's imperfect classification rate. Kunreuther (1969) points out four reasons why a model would not perfectly recapture decisions: (1) the rule is not completely specified, (2) the rule is nonlinear and the model is linear, (3) managers are experimenting to improve the rule and have not yet found a better pattern, and (4) there is an inherently random element in human behavior. It is likely that these explanations apply in some part to most settings, including the rep/direct choice rule estimated here.

The effect of an imperfect representation of industry practice should be to reduce whatever correlation exists between efficiency and conformity to the (incomplete) industry rule. Given this caveat, an index of observance of the industry rule for the 93 districts supplying efficiency data was developed in the following manner.

Estimating Conformity (Index of Observance)

The logistic regression model generates a *predicted probability* of going direct in district i (P_i) as a function of characteristics of the district (the industry rule). If the district *is* direct, its index of observance is P_i. If the district is rep, the index of observance is the probability of going rep, which is $1 - P_i$. Conceptually, this index represents the strength of the industry's "recommendation," based on its rule, that the district make its observed choice. The index, which is a predicted probability, runs from 0 to 100% in theory and from 7% to virtually 100% in the data set.

A low index of observance means the district is not observing industry practice (not conforming), while a high index means the opposite.[3] A midrange index of observance is neither conforming nor deviating from the rule, since a 50% probability covers a range of circumstances wherein the industry makes no recommendation (indifference between rep or direct).

Size of Company

This is measured by the dollar value of the firm's assets (the division's assets in the case where the firm is a subsidiary). In general, the assets measure has been shown to correlate well with other measures of size, such as the number of employees (Gupta 1980).

Travel Requirements

This five-item measure indicates how much traveling a salesperson does while covering a district. Indicators include average annual car mileage, average drive time between accounts, and annual number of nights away from home. Coefficient alpha is 0.55. The scale is shown as Table 1 of Appendix B.

Technical Sophistication

An eight-item scale (Table 2, Appendix B) measures the extent to which the product line carried in a district is "high tech." Coefficient alpha is 0.88.

Environmental Unpredictability: *Hypothesis* 2

Dess and Beard (1984) review prevailing characterizations of the environment by organizational theorists. They note that a principal feature in uncertainty, commonly conceptualized as a combination of instability and turbulence. Galbraith (1973) adds another dimension, the decision maker's ignorance (which is aggravated by instability/turbulence). Downey, Hellriegel and Slocum (1975) point out that it is very difficult to separate perceived and "objective" uncertainty and note that perceptual measures are the most commonly employed. Such measures mix ignorance and "objectively measurable" turbulence.

A multiple-item scale was developed that covers two sources of uncertainty (Table 3, Appendix B). One is turbulence/instability (items 1–5), reflecting an environment which is complex, volatile, difficult to monitor, and difficult to forecast correctly. The other source of uncertainty is venturing into the unknown (new products and new markets, items 6–9), which means prediction is inherently difficult for the firm. This measure mixes perceptual and "objective" questions (past forecast error) to arrive at a composite reflection of uncertainty. Coefficient alpha is 0.65. The uncertainty scale was developed by adding standardized scores (Nunnally 1978), then applying the zeta squared transformation (Cooper and Nakanishi 1983) to make all scores nonnegative (a necessary condition for forming meaningful multiplicative interaction terms).

Uncertainty varies considerably within the electronic components industry. This is illustrated by Dess and Beard (1984), who use objective proxy measures to develop a factor analytic model of the uncertainty of an industry at the four-digit SIC code level. They include two types of electronic components: electronic computing machinery

[3] There is a wide range of reasons why districts may not conform. A prominent possibility is switching costs: the district may be locked into a poor choice because it is more expensive, at least in the short term, to tolerate the consequences than to right the error. Another explanation is that management may be pursuing goals other than maintaining an efficient sales force.

(which is the most uncertain of their 52 SIC codes), and electron tubes (at 48th place, almost the most certain component).

The four covariates included in the sales/cost model were measured in the same manner for the practice model and proved not to be statistically significant. These measures were dropped from the practice model and therefore do not enter into the index of conformity. Hence, there is no overlap between the practice and efficiency models.[4]

Model Estimation and Results

Hypothesis 1 (Model A) and Hypothesis 2 (Model B) were tested via ordinary least squares regression, with sales/cost as the dependent variable. Table 1 shows the correlation matrix, which indicates no signs of serious multicollinearity. The estimation results presented below proved stable as variables were added or deleted, which also indicates collinearity was not serious.

Model A

Model A (Hypothesis 1 plus the covariates) is a parsimonious representation. The dependent variable is the sales/cost ratio. Included as independent variables are the index of observance and three covariates: company size, travel requirements, and

TABLE 1
Descriptive Statistics and Correlation Matrix

	Mean	Standard Deviation	Lowest	Highest
A = Sales/Cost	13.85	9.08	1.31	45.87
B = Index of Observance	0.69	0.26	0.08	0.999
C = Company Size (disguised figures)	2.57	3.94	0.14	10.00
D = Travel Requirements*				
E = Technical Sophistication				
F = Observance × Environmental Unpredictability (Interaction)				

Correlation Matrix

	A	B	C	D	E	F
A	—					
B	−0.12	—				
C	0.53	−0.05	—			
D	−0.15	−0.05	0.23	—		
E	0.55	−0.04	0.52	−0.05	—	
F	0.45	−0.41	0.04	−0.19	0.19	—

* D, E, and F are standardized variables (mean 0, variance 1) or transformations of standardized variables.

[4] Uncertainty enters the practice equation in a complex, interactive way but fails to enter as a simple additive effect. Technical sophistication is related to transaction specificity of assets, which is part of the practice equation. However, sophistication and specificity are conceptually distinct and are measured differently. The covariates in the efficiency model are included in order to control for possible sources of bias in the estimation of the conformity-efficiency relationship. These variables represent factors which can influence efficiency regardless of the organization form—rep or direct—employed. Conceptually, the covariates could influence practice as well as efficiency. For this reason, most of the covariates in the efficiency model were originally included in the practice model. The variables were dropped from the practice model because they proved insignificant, although the signs were in the hypothesized directions.

TABLE 2

Results of Estimation of Model A Standardized Coefficients

Sales/Cost	=	−0.101	Index of Observance
		0.410**	Company Size
		−0.231**	Travel Requirements
		0.321*	Technical Sophistication
$F_{(4,88)} = 17.17$**			
$R^2 = 0.44$			

* $p < 0.05$.
** $p < 0.01$.

technical sophistication. Table 2 presents the standardized coefficients of the regression equation of model A.

The model fits the data reasonably well, as shown by an R^2 of 44%. However, the fit of the model comes entirely from the covariates: observing the industry rule has no statistically significant impact on selling efficiency. As expected in the electronic components industry, efficiency declines as more travel is required (−0.231) and rises with greater firm size (0.410) and more sophisticated product lines (0.321). However, the index of observance is far from significant ($p < 0.21$), indicating that conformity is not rewarded, nor is deviance penalized across sales environments. Hence, Model A is not supported.

Model B

Model B is the expression of Hypothesis 2. The underlying idea is that in relatively certain sales environments, managers can learn the environment well enough to know when to deviate from the (necessarily crude) industry rule. In a sense, the environment stands still long enough for managers to hone their own rules and deviate from the aggregate rule without penalty. In relatively uncertain environments, however, it is difficult, expensive, perhaps even infeasible to learn the environment well enough to know when to deviate. Hence, in uncertain environments, conformity to the (crude) industry rule should, on the whole, be rewarded (higher efficiency), while deviation should, on the whole, be penalized (lower efficiency). In short, the impact of conformity on efficiency is moderated by environmental uncertainty.

For purposes of estimation, this idea can be expressed as follows.

$$\text{Sales/Cost} = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4, \quad \text{where} \qquad (1)$$

$$B_4 = A_0 + A_1X_5, \qquad (2)$$

X_1 = Size,
X_2 = Travel requirements,
X_3 = Technical sophistication,
X_4 = Index of observance of the industry rule,
X_5 = Environmental uncertainty.

Substituting equation (2) into equation (1) gives a simple regression model with an interaction term as follows:

$$\text{Sales/Cost} = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + A_0X_4 + A_1X_5X_4. \qquad (3)$$

Thus, equation (3) summarizes the information in equations (1) and (2). Notably, the coefficient of observance is itself a function of the uncertainty (unpredictability) in the district's sales environment (equation (2)). According to Hypothesis 2b, conformity pays more as uncertainty increases. In terms of equation (2), A_1 should be positive. However, according to Hypothesis 2a, conformity does *not* influence efficiency when uncertainty is low. When uncertainty is low, the A_1X_5 term tends to zero. Therefore, A_0 dominates equation (2) and, according to Hypothesis 2b, should be zero or very small.

In short, Hypothesis 2 can be tested by estimating equation (3). The hypothesis, in operational form, are:

H2a: $A_0 = 0$.

H2b: $A_1 > 0$.

Equation (3) can be estimated by ordinary least squares. The results appear in Table 3. The effect of the covariates is unchanged in direction and significance and is roughly of the same order of magnitude, which should be the case. Further, the interaction of observance and environmental unpredictability has the expected effect.

Table 3 shows the estimate of A_1 to be 0.378, significant at $p < 0.01$. This indicates that as uncertainty increases, conformity is associated with higher sales/cost ratios. This is in accord with Hypothesis 2b.

In accord with Hypothesis 2a, A_0 is insignificant (0.054, significant at $p < 0.50$). This result implies that observance of the industry rule by itself has no impact on selling efficiency (the same result obtained by estimating Model A). The impact of observance is moderated by the level of environmental unpredictability. Only in unpredictable environments is observance associated with higher levels of selling efficiency.

Model B offers a significant increase in explanatory power over the more parsimonious Model A: R^2 rises from 44% to 55% ($F_{1,87} = 16.87$, $p < 0.01$). This increase is achieved with the addition of only one more parameter. Hence, the data support Model B more strongly than Model A.

Analysis of Unusual Cases

Lewin and Minton (1986) suggest that when studying performance, more can be learned from unusual cases than from central tendencies. Here, unusual cases were examined in two ways.

First, the group of 10 districts that were more efficient (above the median sales/cost ratio) *and* less conforming (index of conformity less than 50%) was compared to all other observations via *t*-tests on a large number of variables. No statistically significant differences appeared, suggesting these unusual cases have no distinctive profile.

Second, the residuals for Models A and B were examined for heteroskedasticity and evidence of nonlinear relationships with all variables in the models. Residuals appeared homoskedastic and unrelated to other variables. Hence, the residuals do not appear to suggest what is distinctive about the unexplained variance in performance.

TABLE 3

Results of Estimation of Model B Standardized Coefficients

Sales/Cost	=	0.421**	Company Size
		−0.158*	Travel Requirements
		0.254**	Technical Sophistication
		0.054	Index of Observance
		0.378**	Observance * Unpredictability
$F_{(5,87)} = 21.03$**			
$R^2 = 0.55$			

* $p < 0.05$.
** $p < 0.01$.

Discussion

Implications

These results suggest that in uncertain environments, practice rules have normative properties. It is in these volatile, ill understood settings that managers find it most difficult to recognize valid cues, cues that tell them when and how to deviate from the survivors' apparent rule. In stable settings, firms may learn to incorporate factors that cannot be fit into an estimable model or turned into quantifiable data. In volatile settings, the data provided by survivors may not result in the best possible rule but is likely to be better than what firms can develop on their own, based largely on their own limited experience. An immediate implication is that where industries are competitive and environments are volatile, the survivors' pattern is not an accident or a preference but a prescription. Decision makers wishing to improve on that prescription face a difficult (though by no means impossible) task.

For both managers and researchers, the implication that practice can be prescriptive is an important one. Practice data (what firms do) are easier to obtain than performance data (the outcome of what they do), which is usually kept confidential. Further, practice data are less subject to the effects of accounting conventions and cross-industry differences.

Nonetheless, we do not argue that the survivors' rule is the best possible prescription, nor that the rule can never be beaten. This study models only the most successful survivors, the criterion of success being recognition by purchasing agents in the industry (this was the basis for selecting firms in the sample). The cream of the survivors (the most successful survivors) should offer an even better prescription than the "democratic" rule derived from all survivors, but there is no guarantee that a better rule cannot be discovered.

There are many reasons why the survivors' rule, albeit a good one, may not be the best possible rule. The adjustment process by which the fittest survive (to be modeled) takes time to occur (Nelson and Winter 1982). The not-so-fit have a variety of ways to postpone the day of reckoning, e.g. a parent with deep pockets and a desire to avoid "failing" (terminating an operation). Or the firm itself may be making enough right choices to compensate for some of its wrong choices if the "errors" are not egregious. Finally, a pattern that is an improvement on even a good current rule may simply not have been imagined or tried yet.

The more competitive the industry, the less likely it is that better solutions have not been tried or that firms can survive their mistakes. Nonetheless, perfectly competitive industries are hard to find. What these results suggest is that the rule prevailing in a competitive industry is a good baseline in uncertain environments, and that improvements on this baseline are difficult to create. However, in stable environments, managers should have more confidence in their own rules, for they have a better chance of learning the environment well enough to improve on the industry rule—or at least avoid a penalty for nonconformity.

Frederickson (1984) suggests one way in which uncertainty may come to moderate the relationship between efficiency and conformity. He discovers that managers in stable industries tend to take their strategic planning seriously, going to great effort to construct an accurate picture of the environment and fashion the firm's strategy accordingly. In contrast, managers in unstable environments appear almost to throw up their hands and call strategizing a futile effort. They do not devote much effort, relative to their stable-environment counterparts, to formulating a theory of the environment and then deducing an appropriate strategy. Instead, these managers are more likely to rely on heuristics and partial impressions. If so, it is hardly surprising that managers in stable environments know when to deviate from the industry rule, while managers in unstable environments are penalized for not conforming.

Much of standard economic theory assumes away the existence of significant degrees of uncertainty (Williamson 1981). These results suggest that uncertainty is an important variable. In particular, in the context of evolutionary economics, uncertainty appears to have a substantial impact on a manager's ability to parlay skill and knowledge into abnormal returns.

Limitations

Some of the measures (travel requirements, environmental unpredictability) exhibit relatively low reliabilities. Because this study was exploratory, extensive measure development and cross validation could not be undertaken. Further, the one-industry focus and the relatively small number of observations may limit generalization. These limitations may be overcome by future research in other settings and in other industries.

A potential limitation concerns the level of aggregation. Because firms can subsidize mistakes to some degree, some sales districts may survive in spite of utilizing poor practices. This vitiates the normative value of a practice rule built at the district level. Unfortunately, the subsidization problem is likely to affect any test of implications of Darwinian economics, even tests conducted on firm-level decisions.

Darwinian economics implies that the survivors' rule is good, although it takes time for the market to signal who the survivors are. Established firms with superior products are unambiguously survivors; hence, their pattern is likely to have normative implications. Given resource limitations, this study has a range restriction: it is confined to firms with superior products and established reputations, thereby bypassing potentially transient firms. A larger scale study, one which included a broader range of firms, could offer a better test of Proposition 1 by determining whether less-established competitors are penalized efficiency-wise by deviating from the rule of the well-established firms.[5]

Future Research

Several issues merit future research. One is the dynamic process by which rules improve as industries change. When do rules change? How are the new rules diffused, and how quickly do they supplant the old rules? Developments in models of organizational evolution (Astley 1985) and organization learning (Fiol and Lyles 1985) suggest approaches to these issues.

Another issue concerns the level at which the rule should be estimated. Selecting the correct population is a critical and difficult issue which must be settled on a case-by-case basis (Freeman 1982). Lilien (1979) and Pfeffer (1972) pooled firms across industries, while Bowman and Haire (1975) and this study use one industry. Perhaps the rule would be more accurately and completely estimated at the relatively homogeneous level of a strategic group (Porter 1981). If so, the group rule should be more difficult to improve upon, even in stable environments.

The nature of the problem should also influence the rule's ability to outperform firms or managers. Where the same decision is made often (e.g. setting sales budgets), firms and managers have a chance to refine their models. This should make it harder to deviate in a way that outperforms a model. The vertical integration decision, which cannot be reconsidered often, gives firms little opportunity to learn and to refine their own models. If an industry is perfectly competitive and firms do not subsidize mistakes, the survivors' rule should still be a good one. However, it is not guaranteed to be the best possible rule (Kunreuther 1969). A better survivors' rule would be evidenced if firm rules were better, which is more likely with repetitive decisions than rare decisions. Decisions which are seldom changed, such as vertical integration, constitute a severe

[5] This idea was suggested by an anonymous reviewer.

test of Darwinian economics. This study's findings suggest the approach is useful even for such rarely occurring choices.[6]

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Appendix A. The Practice Model

The practice model (industry rule) was estimated via logistic regression from the full data set of 159 districts (90 rep, 69 direct) (Anderson 1985). Two tests were performed which indicated that it was acceptable to pool the district-level observations from different companies. The estimated model classifies the 159 observations well, as indicated by the proportion of observations correctly classified by the model (the "hit rate"). By chance, a 51% hit rate is expected in this sample: this is computed using the proportional chance criterion, which accounts for the *a priori* proportions of rep and direct sales forces in the sample. The model correctly classifies 79%.

To validate the logistic regression model, a discriminant analysis model was estimated, yielding very similar results. From this model, a jackknifed estimate (which corrects for the overstatement of the hit rate that occurs when classifying the same data used to build the model) can be readily estimated. This estimate, 69%, indicates the hit rate is not based merely on idiosyncracies of the data base. Further, the similarity of the discriminant model indicates the results are insensitive to the logistic specification and maximum likelihood estimation.

In the estimated practice model, the probability of going direct decreases as customer loyalty to the salesperson increases (reps are used where relationships are critical). The probability of going direct increases as:

—performance becomes more difficult to assess by sales measures alone,
—the product line carried in the district demands heavy nonsales support (e.g. service),
—the sales job entails learning confidential information,
—the product line carried in the district demands considerable training,
—the product line is attractive (high quality and low price relative to competition in the district).

In addition, direct salespeople are more likely to be used than reps when two conditions are present simultaneously: the sales environment is unpredictable and salespeople are in a position to acquire valuable transaction-specific assets. These assets (specialized knowledge and working relationships) make salespeople difficult to replace, which exacerbates the difficulty of coping with an uncertain environment.

Factors which were not statistically significantly related were:
—size of the firm,
—the degree of environmental uncertainty *per se*,
—company size,
—the district's travel requirements,
—specialized knowledge about company procedures and customer needs,
—the importance of large key accounts,
—the time needed to make a sale.

A full description of the model and data, development of hypotheses, and validation of the results can be found in Anderson (1985).

Appendix B: Measures

TABLE 1

Travel Requirements

1. How long does it take to drive between the two farthest accounts in this territory? ______ hours
2. In a typical call pattern in this territory, how long does it take to drive from one call to the next one? ______ hours
3. What percentage of your salesperson's time is spent flying or driving? ______ %
4. How many nights does your salesperson spend in a motel/hotel in a typical year? ______ nights
5. On the average, how many miles does a full-time salesperson in this territory drive during a year? ______ miles

In the questionnaire, "territory" was defined to respondents as their sales district.

Coefficient alpha: 0.55

TABLE 2

Technical Sophistication of Product Line Carried in District

On each scale below, please circle the most appropriate rating for your product line taken as a whole.

1. Technical ______ Nontechnical (1 to 7) (reversed)
2. Low engineering content ______ High engineering content (1 to 7)
3. Fast changing ______ Slowly changing (1 to 7) (reversed)
4. Unsophisticated ______ Sophisticated (1 to 7)
5. Commodity ______ Customized (1 to 7)
6. Unique ______ Common (1 to 7) (reversed)
7. Complex ______ Simple (1 to 7) (reversed)

Coefficient alpha: 0.88

TABLE 3

Uncertainty: Environmental Unpredictability

How would you describe the market for your product line?

1. Complex ______ Simple (1 to 7) (reversed)
2. Stable ______ Volatile (1 to 7)
3. Easy to monitor ______ Difficult to monitor (1 to 7)
4. Certain ______ Uncertain (1 to 7)
5. Consider the best forecast you feel could be made (by any means) of next year's sales in your territory. When the forecast is compared to actual sales, how close would you expect it to be?

   Within (plus or minus) ______ % of actual sales
6. What is the relative emphasis your firm places on growth in new product sales in your territory? (maximum 100 points allocated among 6 goals)
7. What is the relative emphasis your firm places on entering new markets in your territory? (maximum 100 points allocated among 6 goals)

   The following statements are labeled "disagree/agree" on a 1 to 7 scale. Please circle the number corresponding to how well each statement describes your situation in your territory.
8. New products are a minor part of our company sales effort. (reversed)
9. It is important to us that salespeople emphasize new products to the customer.

Coefficient alpha: 0.65

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