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Why Do Gas Prices Vary, or Towards Understanding the Micro-structure of Competition

Philip Bromiley*, Chris Papenhausen[1] and Patricia Borchert[2]

Department of Strategic Management, University of Minnesota, 321 19th Avenue South, Minneapolis, MN 55455, USA

Strategic management work on competition considers industry segments or industries for the most part. We argue that real competition occurs at much lower levels of aggregation in many industries: what we term the micro-structure of competition. Micro-structures arise from boundedly rational firms searching imperfectly for business opportunities and boundedly rational consumers searching in a behaviorally determined manner for products and services. This paper lays out the basics of the micro-structural approach to competitive analysis and presents initial propositions from that approach. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

This paper began from some curious observations. Gasoline, the ultimate consumer commodity, varies in price up to 20% or more within a metropolitan area. Why? Managers, including those in our executive MBA classes, see a world of opportunities. They often do not see the need to have specific and unusual capabilities or resources to enter a given business profitably. Surely, their experiences cannot be all wrong?

We attempt to answer these questions based on two changes from conventional analyses of competition. First, we take a behavioral rather than an optimizing approach to both customer and firm behavior (see Cyert and March, 1963). Thus, rather than assuming firms and consumers act in optimizing ways, we emphasize the patterns of behavior predicted by behavioral work on organizations and individuals. Such work emphasizes the limitations on knowledge and information processing. Second, we attempt to examine competition at a more disaggregated level than conventional analysis.

While the results of this analysis have various similarities to optimizing analyses of similar problems, this paper attempts to ground the analysis explicitly in a behavioral derivation. Just as traditional economists often develop optimizing models to fit patterns that others have explained already (Razin and Sadka (1995), or see, for example, the journal *Public Choice*), developing a given explanation consistently from a particular theoretical standpoint offers important insights. Even when two theories make some similar predictions in many cases, the differing theories often offer different explanations and understandings of the situation. We believe that a behavioral explanation is more realistic than the optimizing explanation, which disregards time, information, and cognitive constraints that managers actually face. It is the presence of these constraints and their interaction with the environment that largely differentiate behavioral and optimizing models.

*Correspondence to: Department of Strategic Management, University of Minnesota, 321 19th Avenue South, Minneapolis, MN 55455, USA. E-mail: pbromiley@csom.umn.edu
[1]cpapenhausen @csom.umn.edu
[2]pborchert@csom.umn.edu

Substantively, we suggest that the difference in perceptions between managers and scholars lies in a common issue concerning the level of analysis. Researchers normally study competition at an extremely high level of aggregation whereas actual competition takes place at a much lower level of aggregation. The high level of aggregation obscures the micro-structure of competition; yet this micro-structure of competition provides many of the opportunities executives seek.

Let us begin with the gasoline example: what would determine the price a gas station charges for gasoline? Since all competitors face similar variable costs (wholesale prices, labor prices, etc.), pricing must depend on local comparisons, fixed costs, local taxes, quality and profitability of other services, or the customer's ability to pay (Shepard, 1990).

We propose that price depends substantially on the amount of direct local competitive interaction. While gas stations a mile apart may charge different prices, gas stations on opposite corners of the same intersection seldom do. Rivalry can also come into play. Two gas stations on opposite corners may do fine if they keep their prices high but if one starts price-cutting they can drive gasoline prices down to marginal cost or even below. It may even depend on specifics such as location—is it a right or left turn into a given gas station from the most heavily traveled route (Ackoff, 1991)? The station with larger volume may charge a lower price since it spreads its fixed costs over more gallons. The quality of ancillary services can differ—whether the station has pumps allowing direct credit card charges, the newness of the station, whether the station sells food or does repairs, etc. (Plummer *et al.*, 1998). Alternatively, the station may try to break even on gasoline, but make money on ancillary services, However, all of these really matter relative to the local competitive interaction, not some metropolitan average.

How you define the level of the competitive market massively impacts the utility of a competitive analysis. In teaching executive MBA's to do industry analyses for their businesses, one finds they have difficulty selecting the level at which to define the industry. Aggregate industry definitions make industries appear highly competitive. By lumping in firms that compete in differing submarkets, they find more competitors than really compete with them. If they define the industry at too low a level of aggregation, they miss real competitors. If their level of analysis approaches the four-digit SIC code level, i.e., the level where strategy scholars work, most get useless results.

For example, a local advertising company competes in display advertising for shopping malls. It does not compete with TV advertising—that is a different business. It has some competition from other people who sell advertising directly to those specific customers who do mall advertising in that specific region. In other words, its sales may vary with respect to price or quality of those other products. However, the relevant level of competition is well below the industry level.

Both large and small businesses face these micro-structures within markets (which we call micro-markets). 3M, for example, competes in thousands of different micro-markets. Within the business that supplies the dental industry, the market for impression materials for building crowns differs radically from the market for highly sophisticated adhesives for attaching onlays. The number of competitors, the technology and the intellectual protection on those technologies, and the kinds of customers all differ. In short, the micro-structure of many markets is exceedingly product specific.

Airlines provide particularly visible micro-markets. Meaningful competition largely means competition on a particular route. Two or three airlines can easily extract monopoly profits while operating from the same airport if they fly to different destinations. Airline competition analyses have examined such specific routes as the unit of analysis (Peteraf and Reed, 1994).

Much of our strategic thinking ignores these micro-markets. We assume managers know the full range of the competition. Managers know the competition's location. Everyone makes sensible moves to compete. This results in a well-structured problem. Since people know the lay of the land, they move quickly to take advantages of opportunities. This logic leads to the kind of equilibrium or quasi-equilibrium arguments that underlie much of industrial organization economics and much of the resource-based view in strategy.

However, many businesses compete in micro-markets. They seek the protection micro-markets afford where they can have a successful business without being exposed to the full wind of competition. These include small successful companies that just happened to find the right micro-

market, but also many larger companies with focused products.

Why do not other competitors simply come in? The answer comes from bounded rationality. In a world filled with highly competitive rational economic actors, we would expect even the micro-markets to fill quickly. On the other hand, in a world with many more micro-markets than actors, where search for these micro-markets takes time and sometimes fails, where no one knows a micro-market exists until someone discovers it, we can expect micro-markets to exist without intense competition. Furthermore, the actors who might enter these micro-markets may be doing fine elsewhere, and may not be looking for more micro-markets. Indeed, many of these micro-markets may lack the size to justify entrance by a large company. Additionally, very large companies often have difficulties implementing a multiple micro-market strategy.

In this initial effort to discuss micro-markets, we wish to address four issues:

1. The definition of competitive interaction.
2. How the definition of competitive interaction and consumer search patterns lead to a distribution of micro-markets within an industry.
3. How firm search patterns lead to entry into micro-markets.
4. How self-interest and social factors influence competition within a micro-market.

We distinguish between competition and competitive interaction. By *competitive interaction* we will mean the environmental situation such that the actions of one firm influence the performance of another. We wish to distinguish this from competition, which carries connotations of the specific strategy or approach of the firm. Thus, in a duopoly we could have a high level of competitive interaction but if the two competitors cooperate we might see them as creating a low competition or rivalry situation.

Our analysis of competitive interaction rests on a definition and a mechanism. We analyze competitive interaction based on customer behavior, not membership in a technologically defined group. The search mechanism underlies our analysis as customers may search for goods and firms search for competitive positions. Given these images, we now will attempt to present a more formal argument.

DEFINING COMPETITIVE INTERACTION

To discuss how firms compete, we need to define competitive interaction formally. For this, we turn to a traditional micro-economic approach.

Some micro-economists define an industry based on the price elasticity of different products. If demand for Firm A's product varies with respect to the price of Firm B's product (and they are not complements) then the two firms compete. Basing the definition of competitive interaction on elasticity implies firms with radically different technological products may compete.

We modify the price elasticity criterion slightly. Instead of a homogeneous and well-defined set of products, we assume a more realistic scenario, where products vary somewhat, and where boundedly rational consumers cannot perfectly compare product characteristics. For example, Bergen *et al.* (1996) describe how consumer electronics producers multiply their product offerings so that competing retailers can avoid carrying identical products. If products vary almost continuously in price and characteristics, competitive interaction should imply elasticity with respect to both price and product characteristics. Let us define the level of competitive interaction between Product A of Firm A and Product B of Firm B as the change in sales of Product A for a change in price or characteristics of Product B.

We define competitive interaction with a continuous measure at the dyadic product level for several reasons. First, firms may produce many differing products that compete quite differently. Even our gas station faces radically different competitors for repairs than for gasoline. Thus, competitive interaction occurs at the product level (although cross-product interactions may matter). Second, continuous measures generally fit our understanding of the way firms compete in most markets. Conventional definitions for bounding competitive interaction, for example industries and strategic groups, really constitute arbitrary cutoffs. In many industries, the closeness of products or customers, or other measures of underlying competitive interaction really vary continuously. We impose some arbitrary cutoff to give discrete groups or industries but such cutoffs often have tenuous ties to the real competitive interaction. Consider gasoline sales. Sales in one gas station may be extremely sensitive to the price of a competitor across the street, less sensitive to a

competitor two blocks away and less sensitive still to competitor a mile away or even two miles away. Nevertheless, if someone sells gasoline at 10 cents a gallon, many customers would drive a long way.

Thus, at least conceptually, we can define the level of competitive interaction between a focal firm and any other firm based on this elasticity. In some cases, we may end up with neat boundaries around competitive interaction, but this may be the exception rather than the rule. More likely, the extent to which two firms compete constitutes a continuous function. If we need to draw some lines around the competitive interaction, then we may need to impose arbitrary break points.

This may not provide the nice definitions of competitors scholars have become accustomed to see. However, many of these nice definitions suffer from the same problems. The difference between mechanical and electrical products has blurred as mechanical systems incorporate more and more electronics. The difference between retail and telecommunications has blurred with the Internet. The local hardware store and a large retailer such as Wal-Mart or Target differ but they certainly compete in selling many of the same products. As the many critics of the standard industrial code have made clear, much of the apparent clarity in the industry categories comes from being far enough away not to see the problems.

CONSUMER SEARCH AND MICRO-MARKETS

Our definition of competitive interaction leads directly to a continuous model of the competitive environment. Closely related firms compete more directly than less-related firms. In addition, the distribution of firms varies across the landscape. In some areas, many competitors cluster together while in others few competitors appear. This leads to a perception of a micro-competitive market where firms compete quite directly. Note that the definition here of competitive interaction refers to consumer switching, not to firm pricing or other competitive acts.

While many of the examples we employ use geography to define micro-markets, micro-markets can exist in numerous different ways. They can depend on the end use, on the technology, on the customer group, or any other factor that influences the elasticity of substitution on quality and price. We use geography for simplicity in our examples.

So far, we have argued that firms compete in micro-markets and that the degree to which a given product from two firms competes should reflect the cross-elasticity of those products. Understanding cross-elasticity requires an understanding of consumer behavior.

Oddly, strategic management scholars do not give customers a position of central importance. While Porter's (1985) five forces include buyers, they constitute just one of five forces. Many other models give the customer even less emphasis. Coming down to the micro-level of analysis focuses us on businesses that we can understand more directly. This results in the need to discuss customers.

We assume boundedly rational consumers who search in a behaviorally determined fashion for products. Such a consumer often uses perceptual cues, which may substantially distort the consumer's search process from some optimal search. Following the kind of behavioral model discussed in March and Simon (1958), the consumer generally operates in a routine manner. The consumer does not continuously compare prices or qualities across all product lines but rather makes selections and follows those selections time and again until dissatisfied. If dissatisfied, the customer begins to search. This search remains subject to behavioral biases of all sorts, being influenced by advertising, minor convenience, original anchored point and so forth. In contrast to optimal search models for consumers (cf., Bettman *et al.*, 1998), we assume sequential search that generally involves aspiration-level decision rules (unless multiple alternatives present themselves at once or the decision has great importance). It is important to note that aspiration levels themselves are determined in a behavioral manner rather than by an optimizing process. Our model thus differs from optimization-under-constraints search models such as Stigler (1961), which predict search will stop once the marginal cost of additional search equals the marginal benefit of additional search. Using an aspirations approach, the customer has a target price and quality and quits search on finding a product that meets this target. The exception to this may occur where prices and qualities of several competitors appear simultaneously, for example when the consumer can see prices from several gas stations at once or

when an Internet reservation system simultaneously presents the customer with alternative suppliers, routes and prices for a given trip. Note that in the second case (presentation of alternative suppliers at once) airlines have sued to assure that a given competitor's products do not appear first in the list arbitrarily; the airline managements clearly believe that even in this easy search situation, customers will be influenced by the order in which the alternatives appear.

Using a behavioral approach instead of assuming perfectly informed consumers or optimal search has immediate implications for our understanding of competition. Whereas perfectly informed consumers know the best alternative and move quickly to it, behavioral search implies a lack of information that means customers do not automatically or rapidly switch to the best alternative.

Optimal search closely ties the amount of search to the expected returns to search and search costs. Customers search whenever it pays to do so because they have all the required cognitive capacity to calculate the appropriate search stopping point. A behavioral analysis, on the other hand, would expect many customers do not search even though searching might pay and the extent of search is driven by aspiration-level rules instead of careful calculations of expected returns to search.

In the behavioral model, consumers largely ignore or do not consider switching if their current experience meets their aspiration levels. Thus, we have substantial inertia in consumption patterns (for example, consider the reluctance of satisfied AT&T customers to switch to other long-distance carriers). Furthermore, if the consumer does begin to search, the aspiration level being met rather than some optimal trade-off will drive search. This could result for example in excessive search (relative to an optimizing model of search) for items of low importance and insufficient search for items of high importance. Searching until I meet my aspiration level implies that duration of search will depend on how my aspiration level is set relative to the frequency of satisfactory alternatives.

Buyers differ; they focus on different things. Some always buy gas from a given station based on a feeling of loyalty for that station. Others focus more on price and quality. We would expect a buyer who focuses on price for a given product, has relative price information readily available, and faces minimal switching costs would readily switch from one supplier to another depending on relative cost. For example, when two gas stations sit side-by-side, customers may readily switch from one to the other to get a lower price.

On the other hand, consumers often do not know relative prices and qualities, do not want to switch suppliers, or may not focus on price or apparent quality. Even with the reduced cost of search introduced by the Internet, information on quality and ease of comparison across competing sellers affects consumer price sensitivity (Lynch and Ariely, 2000). Let us mention two examples where extreme price differences exist. They both involve relatively large investments that should be subject to reasonably serious analysis by consumers.

As A.M. Best Company (1999) demonstrates, life insurance premiums for nearly identical term policies vary 300% across companies. For most individuals, life insurance constitutes an important investment. Search is relatively easy—insurance company telephone operators are standing by eager to provide a quote. The product does not differ much in intangible ways—for term life insurance you do not have the 'service' issues associated with determination of benefits found in home or auto-insurance or the prestige associated with shopping at Saks. Yet, we have these massive price differences.

The price differences appear to exist because customers seldom compare prices in this market. As life insurance sales agents say, 'people don't *buy* insurance, they are *sold* insurance'. In that selling process, the salesperson emphasizes the need to protect the beneficiaries; attention focuses on how much insurance to buy. In general, purchases reflect either standard rules of thumb (e.g., have the equivalent of 6 years of income in life insurance) or the amount the buyer can afford. Indeed, insurance agents admit to putting customers into higher risk classes (which increases agent commissions) if the agent believes the customer would not compare prices and can afford the higher premium. The buyer's attention simply does not get directed to comparisons of price and the buyer does not find purchasing life insurance a pleasant activity. Thus, many consumers do not compare prices.

Similar variance in prices can be found in mutual funds. Management fees for equivalent funds can vary by 300% based on Security and

Exchange Commission mutual fund comparisons. Perhaps simpler, the management fees on index funds (which by definition have a passive investment strategy) vary by the same 300%. Again, it appears that many consumers do not compare prices despite expert recommendations to do so (Malkiel, 1996).

We want to introduce two constructs that reflect the likelihood that a customer's search path will compare the products of two different firms. We refer to these as *product similarity* and *competitive proximity*.

Product similarity is the extent to which customers *perceive* alternative products as serving the same needs. We retain the 'perceptual' definition since customer behavior will be driven by customer perceptions whether those accord with reality or not.

Competitive proximity is the likelihood that an individual customer will observe the products (and prices) of Firms A and B. If firm A's customers do not consider buying from Firm B, then Firm B does not compete with A.

Simple search routines tend to search by product similarity and/or competitive proximity. In looking for a place to eat lunch, I might search for a given kind of product (e.g., medium- to low-priced foreign restaurants) and within a given geographic region (walking distance).

Product similarity and competitive proximity are indications of consumer search, whereas competitive interaction is based on consumer behavior; as stated earlier, the change in sales of Product A for a change in price or characteristics of Product B. Product similarity and competitive proximity should interact in influencing the level of competitive interaction. First, we would expect positive influences of both: the more similar and closer the higher the level of competitive interaction. This leads to our first proposition:

Proposition 1:
Product similarity and competitive proximity positively influence the degree of competitive interaction between two firms on a given product.

However, the influences should depend on the interaction of these two factors. Gas stations next door to one another have high product similarity and competitive proximity implying high levels of competitive interaction. Distant gas stations or a retail store versus an Internet site selling the same software would rate high on product similarity but low on proximity. High on proximity, low on similarity could be an expensive Thai restaurant located next to a Burger King. A Thai restaurant located far from a pizza delivery service scores low on both.

Overall, we expect positive interactions between product similarity and competitive proximity. Where you have high levels of both, you approximate the single market. On the other hand, when you have very different products even if offered close together, you may have little or no competition.

The interaction depends on the consumer's cognitive categories, much in the same way as cognitive budgeting influences the allocation of funds (Hirst *et al.*, 1994). For example, some consumers in some situations may search by proximity first and then product similarity second. Thus, I may look for a restaurant in walking distance for lunch and then choose among the available variety of different kinds of food. Alternatively, I might decide to go out for Mexican food and then choose to some extent based on proximity. A given consumer may use these different patterns at different times and in different situations.

Thus, we cannot *a priori* argue for the dominance of proximity over similarity or vice versa. Indeed, with the inconsistent metrics between the two it is not clear how one could think about the dominance; one would have to normalize the measures of both and measures of distance or competitive proximity have no natural analog in product similarity.

However, the two factors should reinforce one another. The more similar two products are in characteristics, the more competitive proximity influences customer behavior. Likewise, the closer two products are in terms of customers observing both, the more likely differences in characteristics will influence customer behavior.

These arguments lead to two simple propositions. First, product similarity and competitive proximity should interact. Furthermore, the influence of these two on choice varies with the interaction of these two factors in a non-linear way. For example, with sufficient lack of product similarity firms will not compete even if located side by side.

Proposition 2:
Product similarity and competitive proximity as determined by consumer search behavior interact positively in influencing the degree of competitive interaction between two firms on a given product.

Overall, this implies a need to have a sophisticated understanding of buyers' search and switching behavior. The more customers differ in their search patterns, the more micro-markets can exist in an industry. If some diners search for alternatives in their immediate neighborhood while others search more widely to meet particular tastes, more kinds of restaurants can exist. This heterogeneity increases the likelihood of low-competitive interaction micro-markets existing.

Proposition 3:
Heterogeneity of behaviorally determined consumer search patterns positively influences the number of low-competitive interaction market positions within an industry.

For some products and customers, large highly competitive markets exist. For example, Internet services for industrial purchasing may create a very large, very competitive micro-market. Price-sensitive customers have almost costless and readily available information about alternative product suppliers. In the world of intelligent search agent software, successful competitors will need to carry unique or complementary products, or additionally reduce search costs by collecting and utilizing customer information to aid future purchases (Alba *et al.*, 1997). For many others, varying amounts and patterns of search can define numerous micro-markets. Furthermore, these patterns generally will lead to more micro-markets than would be the case under the assumption of optimal (or optimization under constraints) consumer search. Aggregating from the degree of competitive interaction within a micro-market to the number of micro-markets within an industry leads to the following proposition.

Proposition 4:
Difficulty and cost of behaviorally determined consumer search positively influence the number of low-competitive interaction market positions within an industry.

FIRM SEARCH AND MICRO-MARKET POPULATIONS

We assume firms operate with bounded rationality (Simon, 1947). Following Cyert and March (1963), firms seek profitability in general but face strong limitations on their ability to analyze. To learn about opportunities firms must search, but search takes time and money and often is not optimal in any sense. Most search involves incremental adaptation from current positions with feedback on the change in performance from such changes.

In a smooth competitive landscape, firms find it relatively easy to identify the most desirable points. Simple adaptation can readily lead you to the most profitable location. For example, if all firms sell a homogeneous product into a single large impersonal competitive market, then we can expect that firms will emphasize low-cost strategies. For firms competing in such industries, we would expect substantial homogeneity. Furthermore, we can expect firms to cluster around the most desirable point, and indeed, we may expect the highest performance firms in the middle of the cluster.

This smooth competitive landscape constitutes the underlying model of most strategy work. We would expect to see firms clustering around particular designs, industry standards, etc. While heterogeneity may exist on some unimportant market dimensions, we can expect a substantial amount of homogeneity. For example, wholesale gas comes in a relatively small number of types, and retail banks have substantial similarities in layout, products, and services.

On the other hand, in a rough or variegated competitive landscape, simple first-order learning may not lead to the most desirable positions. A rough landscape abounds with micro-market markets that are difficult for potential entrants to comprehend or analyze optimally. Tracking these minor differences in topography requires a high sensitivity to the environment that many firms lack. In a manner similar to consumers, firms will initiate search when dissatisfied and search sequentially in the neighborhood of the problem. Because few firms will identify these micro-markets through behaviorally determined search, few firms will enter these markets. Thus,

Proposition 5:
For market positions of above-average profitability, the discreteness and complexity of the factors characterizing competitive positions negatively influence the probability that new competitors will enter.

Both search for new competitive positions and imitation should follow the standard rules of the behavioral model. Unless firms have explicit operating procedures for search, they avoid search while performing well. Firms with standard operating procedures for search may search continuously and effectively in those areas for which the procedures exist. In areas where they lack such standard operating procedures, firms do not search effectively. For example, consider IBM's response to the personal computer. First, IBM had high performance, so search lacked urgency. Furthermore, within the mainframe area, IBM had routines that watched competitive changes quite efficiently. However, in the personal computer business, IBM had no such routines. Thus, it did not react to the initial stages of the personal computer market; it came in after others had gained substantial positions demonstrating the market's feasibility.

Compare this to the systematic way large retail organizations select physical locations for their outlets, or the way personal computer manufacturers track features and performance of their competitors' products. In both these cases, and many others, the firms have procedures that search carefully. However, the search operates within a pre-defined set of dimensions—the personal computer manufacturer does not consider product changes that might involve offering sandwiches or transportation.

Proposition 6:
For market positions of above-average profitability, the existence of potential entrants with routines designed to search over the appropriate dimensions of market positions positively influences the probability new competitors will enter the market.

Micro-competitive analysis also suggests market size matters differently than it would at the industry level. Few industries in the US have economies of scale that imply one plant should serve the entire country. However, in micro-competitive environments you should more frequently see one plant or store being the appropriate scale to serve the entire environment. For example, many small towns can only support one insurance agent, bank, or hardware store. Furthermore, some micro-markets may lack the size to support two competitors, but exceed the necessary size for one competitor. This may give a single competitor the potential for above-average rents. This leads to:

Proposition 7:
Where supply decisions involve lumpy investments, micro-markets may exist that can support more than one but fewer than two suppliers. As the market capacity approaches two suppliers, a single supplier will earn increasing economic rents. Similar but smaller effects will appear at greater capacities (e.g., more than two but fewer than three, etc.)

Overall, we thus would expect market positions to differ radically in their populations. Good positions in well-behaved smooth market environments should be heavily populated. Firms can readily see where such good spots lie and attempt to move there in short order. In contrast, many market positions are hard to find. Lying in rugged territory, these regions offer multiple viable market positions, but the positions may not support large populations. Furthermore, firms can have difficulty evaluating the profitability or desirability of these positions *ex ante*. Firms can obtain performance data more easily at higher levels of aggregation, while performance data at the gas station or retail store level may be unavailable by legal means.

COMPETITION WITHIN A MICRO-MARKET

Just as traditional economics has difficulty analyzing imperfect competition (in the sense that multiple models have been suggested and many models have multiple potential outcomes), a behavioral analysis of competition does not necessarily lead to a simple answer. However, we may be able to say something about the process by which firms compete within micro-markets.

Even in markets with relatively large numbers of competitors, firms can earn relatively high returns

if all firms behave appropriately. For example, Plummer *et al.* (1998) show that a population of firms in which each tries to maximize returns rather than profits will earn a higher average profit than a population of firms that individually tries to maximize profits. Thus, we need to understand the process of cooperation.

Researchers often use the prisoner's dilemma in discussing cooperation. In this situation, an individual does better to not cooperate if the competitor cooperates, but if both do not cooperate they do particularly poorly and if both cooperate they do reasonably well. Simple game-theoretic analyses conclude that both will not cooperate resulting in both receiving the worst outcome. Within game theory, assuming the individuals will play repeatedly may change this result.

Scholars who study cooperation suggest that two very different processes influence cooperation (Tyler, 1999). First, cooperation may be driven by the rewards available for those who cooperate. This underlies game-theoretic analyses of cooperation where rational actors cooperate because it is in their interest to do so with interest defined as maximizing expected returns or some other clean criterion based on the tangible returns to the individual decision maker. In the organizations literature, this resembles social exchange theory where people cooperate in order to gain specific rewards (Thibault and Kelly, 1959). Second, cooperation can come from a variety of internal values of the individual. People may cooperate because they gain the respect of others, because they identify with the goals of the organization, because they want the organization to succeed, etc. Let us consider the social exchange or game-theoretic bases of cooperation first and the internal values issues second.

So basically we want to know how and under what conditions competitors avoid engaging in aggressive competitive behavior. Such avoidance of aggression could take many forms: increasing prices, reducing quality or service, shortening operating hours, and so forth.

Within a self-interest analysis, visibility of actions encourages the evolution of cooperation among competitors. On the other hand, if you cannot find out what the other firms are doing, you cannot know if others are cooperating. Under such a condition, generating cooperation is difficult, and being suspicious of others may be the most sensible approach, even though it guarantees lower performance than mutual cooperation. If you can observe competitor behavior, you can react to offensive moves thus reducing your risk. This leads to the following proposition:

Proposition 8:
Visibility of competitive behavior positively influences the likelihood of cooperative behavior among firms.

How does visibility vary within micro-markets? First, as the number of competitors within a micro-market increases, observing behavior often becomes more complex and difficult. The need to tie actions with their initiator and the interactions among interdependent competitors produces a combinatorial explosion in cognitive demands as the number of competitors increases. Potential for undetected predatory pricing, misinterpreted behaviors and outcomes, and increasing fear of being taken advantage of by competitors, all relate positively to the number of competitors. Thus, the reduced ability to see and know who does what as the number of competitors grows leads to the following proposition:

Proposition 9:
The number of competitors in a micro-market negatively influences cooperation.

Also, we would expect cooperation to increase when competitors expect to face one another for a long time. Big gains to highly competitive behavior largely exist for the time period in which your competition has not reacted to the behavior. Thus, if I lower my prices while my competitors keep their prices high, I will gain sales until my competitors observe this and lower their prices. When we all have lowered our prices, assuming we are below the monopoly pricing point, we will lower the total profits of the industry.

While many theoretical experiments use short-term horizons, many real businesses expect to compete for the long term. Many game-theoretic analyses of cooperation run into difficulty because they argue that it is rational to not cooperate on the last play of the game if you know when that last play will occur. That is since the competition cannot respond to my action on the last play of the game, I should not cooperate on that play. However, if I do not cooperate on the last play

one can show that I also should not cooperate on the play before and thus cooperation unravels all the way back to the beginning of the game.

Most real businesses do not know when they will quit functioning. The exception may be those businesses that anticipate bankruptcy where they may be quite willing to engage in uncooperative behavior of all sorts. However, for the individual manager, such behavior can have long-term impacts. If I cheat someone now from a company that is going bankrupt, I may have to deal with those suppliers or people wherever I go next and the reputational effect may adhere to me, not just the organization.

Proposition 10:
Expected duration of competition positively influences cooperation.

While both behavioral and self-interest theories agree that the future should influence cooperation, behavioral theories also suggest that the past should influence cooperation. It takes time to learn to cooperate. For example, Axelrod (1984) describes the cooperation between the two sides in trench warfare in World War I. If left to their own devices, the soldiers in the trenches would largely quit fighting one another: such cooperation substantially increased their likelihood of surviving. When senior officers found this out, they prevented it by rapid rotation of the troops in the trenches. Such rotation did not allow the troops sufficient time to learn to cooperate.

In team sports, we have little doubt that it takes time to learn to cooperate. Teams practice together continually to improve their cooperation and coordination. Such learning may also help cooperation in micro-markets.

Cooperation requires substantial understanding. For example, in gasoline sales, prices rise and fall continuously and are substantially affected by gluts and shortages in supply. Cooperation requires some understanding of who will lead and who will follow in price rises and declines. In other areas, competitors sometimes develop implicit rules governing how they will and will not compete. For example, the California wine industry had implicit rules that they only did positive advertising because positive advertising increased not only your sales but also sales for the entire industry. When Coca-Cola entered this market, they did not have the history to understand such implicit rules and started competitive advertising. These arguments lead to the following proposition:

Proposition 11:
Duration of previous competition positively influences cooperation.

Knowing one another and communication can engender cooperation. Dawes *et al.* (1977) report an experiment where strangers played the prisoner's dilemma. Their 'treatment' was whether the individuals playing chatted beforehand (all players understood that their actual decisions would be kept private and confidential). Just having individuals chat beforehand resulted in more than an 80% cooperation rate, as opposed to $<30\%$ when they were not allowed to discuss beforehand.

Micro-markets may differ radically in the extent to which competitors know one another. In gas stations, some stations set their own prices while others have their prices set by management offices that handle the entire metropolitan area, or even multiple states. In some situations, the decision makers know one another and may even interact frequently while in others the decision makers are widely dispersed and may have absolutely no contact with the decision makers on the other side. This can vary both because different kinds of firms are competing a given market, and because differing firms design their organization structures differently. An organization structure that allows cooperative behavior to develop will tend to be one where decision-making lies with those most directly contacting the competitors.

Related to visibility, communication among competitors should increase cooperation. Most game-theory discussions do not allow communication among competitors because such communication enables cooperation. Under the more realistic scenario of micro-markets, however, close proximity leads directly to communication and cooperation (we assume that such cooperation is not in violation of anti-trust laws). A gas station manager, for example, may communicate with the manager across the street. Accidental meetings, non-firm business relations, social relations, and common third-party information sharing are all likely among competitors in close proximity.

Communication is not only a function of physical location, however. Social and business relations often span great distances. In some

markets, electronic communication links widely dispersed firms. Movements of employees, trade associations, social interaction, and many other mechanisms can influence communication.

Proposition 12:
Direct contact and communication between competing parties positively influence cooperation.

We now turn to organizational or value-based explanations for cooperation. These explanations do not rely on the self-interested behavior of firms, but instead rely on behaviors that do not include calculation of benefits and costs. Ring and Van de Ven (1994) argue that cooperation between organizations requires both 'efficiency' and 'equity'. By efficiency, they mean that the cooperation has positive economic value. In our case, market cooperation, the outcome may in fact be inefficient from an economic standpoint, but clearly can benefit the firms cooperating.

Equity also influences cooperation. As experimental economists have found (Camerer and Thaler, 1995) people will pass up a deal that clearly makes them better off if they perceive the deal to be unfair. Fairness does not mean equality but rather that the parties have equivalent balances of costs and benefits (Blau, 1964), or that the parties' rewards are proportional to their contributions. For example, a gas station might receive a net benefit from landscaping the border between itself and a rival station but decide not to proceed if the rival refuses to contribute anything at all to the project. This leads to the following proposition:

Proposition 13:
Perceived equity of the outcomes of inter-organizational cooperation positively influences cooperation.

Recent papers have also discussed the generation of cooperation based on social identity theory (Kramer, 1993; Tyler, 1999). This literature argues that people cooperate when a joint identity becomes salient. As Kramer (1993) notes, 'individuals are assumed to possess multiple, co-occurring identities, including personal group and organizational identities. When personal identities are salient, individuals are more likely to focus on their own outcomes and, accordingly, cooperation is less likely. When organizational identity is salient, individuals are more likely to take into consideration the collective consequences of their actions. Accordingly, they are more likely to adopt cooperative orientations during decision-making' (pp. 245–246).

Individual identities have far more complexity than this quote suggests. An individual may find important identification with their employer, their functional or training background (accounting, engineering, etc.), their community (their city, their suburb, etc.), their families, their country, and so forth.

In some cases, such identification may bring together competitors. Service station owners might see themselves as small town gas station owners trying to survive against corporate gas stations and the realities of the market. Engineers in differing companies may help one another seeing themselves as engineers trying to solve technical problems that management does not understand in either company. An entire national industry may see itself as a group competing against foreign competition.

Proposition 14:
Common identification among decision makers positively influences cooperation.

Finally, we would expect norms to matter. Groups define norms that can provide guidelines for all kinds of behavior. In the New York diamond trade, norms require certain forms of fair dealing: other may shun those traders who violate these norms. Norms also can tell groups how they treat outsiders.

However, the influence of norms on cooperation depends precisely on the kind of norms that have evolved. One can have norms that encourage cooperation but also norms that discourage cooperation. Historical rivalries, particularly bitter rivalries, can lead to organizational norms that strongly discourage cooperation. Thus, while we expect norms to have substantial influence, the precise sort of influence will depend entirely on the kind of norms that have evolved.

Overall, many of these behavioral factors act to encourage cooperation. Since we also acknowledge the self-interested foundations of cooperation, cooperation is far more likely in a behavioral model than in an optimizing model. Within an optimizing model, cooperation only comes from incentives being aligned so that the individual

self-interest equates to cooperation. In behavioral analyses, a number of other factors can encourage cooperation.

Game-theoretical analyses require a very curious sort of intelligence. Most such analyses assume exceedingly powerful computational and analytical capabilities on the part of the players, but not a lot of sense. For example, when they play the repeated prisoners dilemma they do not look at it after a short while and see that they are both better off cooperating. This kind of sense seems quite plausible for normal humans in normal situations.

In our simple gas station example, if one station raises prices and the other tends to follow, they can achieve higher profits (until they overprice) than if they compete strongly on price. If one station lowers price, it knows the other will follow quickly (a tit-for-tat) eliminating any volume benefits from lowering price while at the same time lowering margins for both stations. Very simple models and simple people can implement these strategies.

Prior Work on the Micro-structure of Competition

While we argue that explicit attention to the micro-structure of competition merits substantial investment, a variety of extremely interesting studies have been done at this level of analysis. Although these studies are not direct tests of our theory, they do provide good examples of empirical tests at the micro-market level. Let us examine some of these studies.

Airline industry researchers have examined competitive behavior after deregulation. This work generally takes one of two approaches. Many studies examine profitability or load factors by airline route. Peteraf and Reed (1994), for example, look at the profitability of routes as a function of competitors and potential competitors on specific routes. They find that, in monopoly airline markets, the number and concentration of potential entrants have weaker effects on pricing than they do in more competitive markets. They also find monopolist's fares vary with potential entrants' costs.

The second approach in the airline industry has examined specific competitive moves (Chen and MacMillan, 1992; Chen *et al.*, 1992; Smith *et al.*, 1992; Chen and Hambrick, 1995; Chen, 1996; Grimm and Smith, 1997). The moves include announcing new routes, announcing price changes, and so forth. They find interesting and important action–reaction patterns in the industry. This work is part of a larger stream of research referred to as the Maryland School. This stream of research focuses on competitive context, or the strategies and actions a firm undertakes relative to the strategies and actions of rivals, to explain firm performance (Smith *et al.*, 2000).

To understand direct competitive behavior—the cut and thrust of competitive competition about which we talk so much—you really need to get down to the product level. When we look at the overall firm level, much of the competition becomes hidden. Furthermore, we hide differences in performance across products. If we want to understand how capabilities or other competitive behaviors relate to profits, we may need to examine products, since many capabilities probably influence performance at the product level rather than a broader level. For example, American Airlines might have capabilities in both the reservation system and the operation of aircraft but these very different capabilities should impact performance in differing areas and not necessarily across activities.

An interesting series of studies on the Manhattan hotel industry also reflects the micro-structure issue (Baum and Mezias, 1992; Baum, 1995; Baum and Haveman, 1997). By getting down to the actual level of the hotel, we obtain a sophisticated understanding of competition. Some of the papers examine survival rates, finding for example that closeness of similar size competitors substantially reduces the probability of survival (Baum, 1995). Other studies find that closeness in organizational size, geographic location, and price all substantially influence failure rates (Baum and Mezias, 1992).

While the hotel studies often come out of a population ecology framework, and much of the population ecology work does emphasize the micro-level of competition, population ecology offers only a very partial understanding of micro-competition. By playing down the possibility of firms changing substantially, population ecology pays scant attention to adaptation of specific organizations and to ongoing competitive interaction. Furthermore, population ecology focuses on founding and death of organizations without considering other measures or kinds of performance. Both of these limitations imply that a

substantial amount of interesting work remains to be done at this level.

Overall View of the Micro-structure of Competition

This paper combines a behavioral perspective with the observation of micro-markets. While some of these topics have been addressed from an optimizing standpoint, in general these contributions have not centrally influenced strategic management. Across the wide span of economic research and theorizing, one can find almost any position supported from an optimizing model. However, when we get down to informing strategic thinking and the thinking of strategic management, scholars' conventional competitive market analyses move to the forefront. Both the micro-market approach and the behavioral perspective change much of our understanding about strategic competition. Let us consider some of the ways the behavioral and micro-structure approach may change our thinking.

Probably the biggest difference between behavioral and optimizing models of competition is that optimizing models generally lead one to imagine cooperation is a rare event, that total competition is the norm. The assumptions of optimization and competition underlie basic economics. For example, any analysis that argues for less than perfect competition and efficient market pricing in finance must deal with a strong ideological assumption of market perfection. If, after a potential market imperfection has been demonstrated, an optimizing model can be generated that rationalizes the behavior, then it is assumed that this is the correct solution rather than the simpler and more obvious imperfection explanation (Fama, 1997).

This underlying assumption of competition leads the entire field in certain directions. For example, resource-based analyses largely write off market competition as an explanation for inter-firm differences in performance within markets. Thus, the RBV emphasizes potential inefficiencies in factor markets and the role of luck to create advantage (Makadok, 2001). But, if businesses differ in the micro-markets they face, and co-operation develops differentially in various micro-markets, firms will have differing performance *based on competitive factors*, rather than resources.

Overall, we take an evolutionary view of the structure of competition. Firms compete in micro-markets. Firms adapt both long- and short-term within those markets. Boundedly rational firms and consumers employ sub-optimal search processes, which implies both unfulfilled needs and business opportunities. This differs somewhat from the model presented by Nelson and Winter (1982) because they assume a homogeneous product market with technological change being the primary source of uncertainty. In contrast, we see much greater product market complexity playing a central role in competitive dynamics.

This perception lets us begin to understand a variety of very important and troubling observations. First, it provides a framework for understanding the discovery of new products and services. Strategy scholars often emphasize technological innovation as key to the development of new products; they implicitly assume the product does not exist and cannot exist until the technological innovation has occurred. Yet we find organizational and product innovations that have been feasible for long periods of time. The Starbucks coffee chain, for example, uses decades-old technology, yet it constitutes a massive innovation. Likewise, inventors produce new gadgets of all sorts all the time without the help of high technology. Organizational innovations such as franchising barber shops instead of having small owner-operated facilities have always been feasible. Good managers just had not thought of or bothered to do it. Many of these innovations have transformed the competitive structure of industries (e.g., the men's hair cutting industry and coffee shops).

The micro-structure argument also explains why we have a variety of performance levels despite few apparent differences in ability. Some gas station owners happened on a good corner. A restaurant owner finds a product category (kosher health food for example) some consumers want. However, other potential competitors may have trouble getting to a particular micro-market or may not realize the profitability of the micro-market.

This analysis also has implications for another debate within strategic management. Work by Rumelt and others (Rumelt, 1991; James, 1996; Roquebert *et al.*, 1996; Brush and Bromiley, 1997; McGahan and Porter, 1997) finds that business units explain much more of the variance in business unit performance than either corporations or industries. Rumelt and others attempt to distinguish between features of the competitive

environment (characterized by industry) and management of the internal process (characterized by the business unit). However, business unit effects will capture any impacts of micro-competition.

Consider gas stations as an industry (retail gasoline sales). We might find an industry effect—gas stations on average differ from other industries in profitability. We might find a corporate effect; ownership of a gas station by a particular corporation matters. Nevertheless, if we look across the gas stations, their performance depends on location, the proximity of other competitors for each of the products the gas station sells, how much rivalry and price competition the gas station faces for each of the products it sells, etc. These competitive conditions vary radically across gas stations. Aggregating to the business unit level offers the potential for substantial variation across business units. Even if these competitive factors vary randomly, different business units will get different 'draws' on the random process. But, these factors certainly are not random; firms put substantial effort into 'location' decisions and probably differ in their decision rules. We suspect that this kind of effect will result in overestimation of the business unit effect. Estimates of business unit effects will include competitive effects from micro-structure of competition.

Our theory also offers an alternative to the nearly universal use of the structure–conduct–performance paradigm to predict relationships between market structure and competitive interactions (Smith *et al.*, 2000). Although some of our propositions resemble those found in the structure–conduct–performance work (Scherer and Ross, 1990), many do not. In either case, we assert that conduct is significantly determined by the market structure that arises from consumers and managers' cognitive limitations, the lack of information availability, and the behaviors that result from these factors. By taking into consideration how managers and consumers actually behave, our theory offers researchers a more realistic alternative to theories used in the study of competitive interaction such as the structure–conduct–performance paradigm that traditionally relies on the assumption of rational actors.

The micro-structure of competition suggests a partial explanation for the existence of so many different kinds of firms. Traditional economic analyses according to Rumelt and Teece tend to imply a relatively homogeneous population of firms. As Schendel (1991) points out 'why do firms differ' becomes a major issue. In addition, studies that find no dis-economies of scale imply we should have very few firms: without dis-economies of scale, there is no reason to have more than one firm. The micro-structure argument contradicts these possibilities. If we assume that firms differ in terms of initial conditions, have limited abilities to tailor their behaviors to micro-markets, and that a multiplicity of micro-markets exists, then we would expect to see a multiplicity of kinds of firms. Finally, firms probably differ in their ability to manage micro-competition. Many of them do not apply the strategic concepts that have been developed to the micro-level. Capabilities at micro-structural analysis may translate into higher performance.

While our analysis of the micro-structure of competition focuses on the markets for firm products, a very similar analysis may hold for the markets where a firm purchases inputs. For some inputs, all competing firms may face similar markets. However, for some inputs competing firms may differ radically in the markets they face. Perhaps the most obvious example is differences in labor cost and quality across regions. However, research on supplier networks and inter-organizational networks strongly implies firms face different effective markets for a variety of inputs. Thus, the micro-structure argument might productively be extended to input markets.

Overall, we see the micro-structure of competition as opening a new and interesting avenue for both strategic management research and practice. This paper attempts to present some of the groundwork for this study while clearly leaving much for future research.

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