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Author(s): Richard M. Cyert, Praveen Kumar and Jeffrey R. Williams

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INFORMATION, MARKET IMPERFECTIONS AND STRATEGY

RICHARD M. CYERT, PRAVEEN KUMAR, and JEFFREY R. WILLIAMS

Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, Pennsylvania, U.S.A.

In this paper we argue that the organization's search for market imperfections reflects the information dispersion in the economy. We describe, within a Bayesian framework, the relative importance of and the mechanisms by which externally- and internally-based informational rents arise endogenously. We argue that, rather than viewing the strategic planning process as one where the firm must pursue only one source of information, search should be viewed as evolving within a dynamically related system; progressing from externally-based to internally-based sources of rent as markets evolve.

INTRODUCTION

A firm's management is always on a search to find ways to make the firm unique. If the firm operated under the conditions specified for a perfectly competitive model, then there would be no use for strategy. In perfect competition, the product is a commodity since each firm has an identical product in every possible dimension. There is no strategy that will allow the firm to gain an advantage over its competitors. Even collusion as a strategy is ruled out since there is a large number of firms and each firm has a small impact on price. Thus, many economists have been led to undervalue the importance of strategy to the firm.

However, when we move to the real world, we see that firms always try to escape from competitive conditions and strategy becomes more important for the firm. If the product tends toward being a commodity, the firm will search for a comparative advantage through credit

terms, quickness of delivery, reliability of the supply, special services to tailor make products, and other similar factors.¹ The magnitude of the net profit figure; i.e., *rents* is then a direct function of the success the firm has in gaining a comparative advantage through these approaches.

Indeed, if the firm can produce a product that is the only one of its kind (i.e., achieve a local monopoly), then the constraints on pricing are loosened and the ability to make larger profits is increased. Thus, the search for market niches or other ways to escape from a competitive market has long been a major part of strategic planning. The length of the time that the firm can have a local monopoly from the niche depends on the sustainability² of that niche—in terms of the stability of consumer preferences, and the firm's ability to effectively blockade

Key words: Economics, strategic management, information, sustainability

¹ Broadly speaking, the firm will emphasize nonprice dimensions (Scitovsky, 1991) to enhance its market share and profits. This argument is developed in greater detail in Cyert, Kumar and Williams (1993).

² The issue of sustainability of comparative advantage (or sources of rents) has been directly examined by Williams (1992).

entry.³ For example, American Motors established a niche by deciding to sell jeeps. Unfortunately, they were not able to deter entry and the larger firms moved in as soon as the market was clearly profitable. An example of a different kind of 'mass market' niche is Coca-Cola. Coca-Cola has established a niche in a market that is world wide for its product. In a similar way, management information that is privately held can enable a firm to have a comparative advantage in lower costs through more efficient operations than its competitors.

But niches can be discovered and protected only in the presence of market *imperfections*. By market imperfections we will generally mean conditions that deviate from the assumptions of perfect competition. For example, discovering a niche implies locating a market that has been ignored by others. But in a capitalistic economy, firms will 'neglect' (truly) profitable opportunities only if, (i) there is a diversity of beliefs regarding the distribution of consumer preferences, and/or (ii) there are systematic differences amongst firms in the costs of delivering the product. If there is no uncertainty about the distribution of consumer preferences (or if there is uncertainty but unanimity amongst firms regarding the distribution of preferences), then all (potential) producers will have *symmetric* expectations regarding demand at various product locations. Thus, there must be an asymmetry, in either beliefs regarding consumer preferences or in the cost of production, for there to exist 'unexploited' niches. But these kinds of asymmetries are fundamentally inconsistent with a perfectly competitive market.

Similarly, 'protecting' a niche implies the existence of effective entry barriers. There are a number of types of entry barriers. Sometimes brand names are so strong in a product area that competitors are intimidated from entering.⁴ Sometimes proprietary knowledge is a factor. For example, a firm may have an advantage in being able to produce a product of a given quality

at lower cost because of superior manufacturing knowledge.⁵

Thus, strategy can be more deeply understood as a *search for market imperfections*. Moreover, we have identified two major types of market imperfections, one involving external markets and one internal to the firm, that allow the creation and sustainability of rents. In this paper, we advance the proposition that both these market imperfections are reflections of underlying *information dispersion* in the economy. Specifically, firms have realistic chances of searching for profitable new markets or product locations only if there is a diversity of beliefs regarding the distribution of consumer preferences among entrepreneurs. But such diversity of beliefs can be sustained over time, in an equilibrium sense, only if there is diversity of information regarding crucial behavioral attributes of consumers.⁶ Secondly, the presence of sustainable cost advantages will also largely stem from specialized production and/or organization related information that is privately held by firm management.⁷ In essence, we will argue that the types of market imperfections that are central for successful strategic planning are information based.

But an information based theory of market imperfections that lead to rents must specify the following:

1. What types of informational dispersion are important?
2. How do these dispersions arise and how are they sustained? Do different types of informational differences become less or more important over time?
3. How do these informational differences yield rents *in equilibrium*?
4. How does a typical firm search for these informational differences? i.e., is there a way

⁵ Strictly speaking, the cost advantage can not only be in terms of production in a manufacturing sense, but also marketing and delivering the product. In the sequel, our notion of production will encompass these aspects as well.

⁶ Lippman and Rumelt (1982) also show how an equilibrium can be obtained because of causal ambiguity; that is, where firms do not fully know their own, internal attributes.

⁷ Of course, some cost advantages are simply due to geographical proximity or proprietary ownership of resources etc. However, (i) not very interesting in terms of advice regarding strategy to firms, (ii) often 'geography' based cost advantages really stem from technological constraints, which is again covered in our notion of specialized production information.

³ The fact that consumers continue to assign value to the firm's niche product(s) implies the nonavailability of cheaper substitutes.

⁴ Note, the situation where the firm is perceived to offer a product of unmatched quality is a special case of this formulation.

of specifying a strategy planning process as an algorithm (heuristically speaking) that improves the firm's probability of finding the information based market imperfections?

To address these important questions, we describe the joint behavior of consumers and firms in a decision theoretic (i.e., Bayesian) framework. Our model builds nontrivially on the models of Hotelling (1929), and Cyert and DeGroot (1975). We extend the well known Hotelling framework to allow uncertainty regarding the consumer preference distribution, and dynamic (and endogenous) learning of the same by both firms and consumers. While Cyert and DeGroot (1975) also analyze a generic model where consumers learn about their preferences, our model embeds the consumer learning in a market framework where consumers learn by purchasing or 'experiencing' products that are endogenously chosen by firms.

This framework is arguably rich. For example, in recent years, learning in economic environments has been a central focus of study in the economic literature. And, some scholars have examined market outcomes when the seller uses market reaction to prices to learn about true consumer preferences. The model in this paper generalizes such studies in two important directions. First, it explicitly models consumer demand behavior and allows the possibility that consumers themselves may be learning (about their preferences or the attributes of the goods they purchase) over time. Second, our framework allows the possibility that firms learn by altering both prices and product lines. While the full potential of this framework still remains to be worked out, it has already yielded a number of insights regarding the questions posed above.

The major implications of our analysis are the following.

1. There are two sources of superior economic performance (i.e., rents) for firms. First, a firm may have systematically superior estimates of consumer demand for any given choice of products and prices.⁸ This superiority is an expression of the firm's more precise estimate of the parameters determining the true (or

objective) distribution of consumer preferences (over the product space). At the same time, since consumers are themselves learning about their true 'types', *their* beliefs are also important determinants of market demand. Hence, some firms may also have a superior estimate of the *consumers'* estimates of the preference distribution parameters. And, in Bayesian terms this asymmetry of estimates across firms arises either due to heterogeneous prior beliefs and/or heterogeneous models of consumer behavior (i.e., likelihood functions) among the firms.

Second, the firm may have lower costs of effectively delivering a given set of products relative to other firms. This superiority stems from either proprietary information about the effective organization of production, and/or the firm's proprietary access to raw materials.

2. The magnitude of the rents accruing to the firm from the sources outlined above depend (inversely) on the transferability of superior market related (external) or production related (internal) knowledge. If the knowledge is completely transferable, then either competition will eliminate the advantage of that knowledge or the input owners that embody such knowledge will extract the surplus from the firm.
3. In a given industry, with a stable distribution of consumer preferences, over time firms will have symmetric estimates of parameters determining the distribution of consumer preferences. Indeed, if the production technology is *symmetric* across firms, then the market outcomes will converge (over time) to the competitive outcome. This suggests that over time the importance of internal search (for earning supranormal profits) will increase relative to the importance of external search.
4. More generally, there is a dynamic interplay between the importance of external and internal knowledge, and the external and internal searches should therefore be viewed as a dynamically related system in the strategic planning process of the firm.

The structure of the paper is as follows. The next section formulates and analyzes the model. Then we derive the major implications, and relate these implications to the strategic planning process. Finally, we conclude the paper by

⁸ This contrasts with a literature that argues that only internal search capability is a viable source of rents.

suggesting future research directions suggested by our analysis.

DESCRIPTION OF THE MODEL

In this section we develop a dynamic model of firm and market behavior that begins to make precise the types of information—both external and internal to the firm—that are critical in guiding the firm to a superior strategy (in terms of creation and maintenance of rent sources). The identification of these critical types of information has immediate implications for the kinds of *search processes*—again, both external and internal to the firm—that the firm must conduct.

An advantage of developing a dynamic model, that makes explicit certain important dimensions of buyer and firm behavior, is that the interaction—and therefore, also, the relative importance—between external and internal searches arises endogenously. Indeed, we argue that rather than viewing the strategic planning process to be one where firms must ‘choose’ between searching for external and internal based rent sources, it is more useful to view these searches as a dynamically related system: as industries evolve, or as the economy moves over the business cycle, there will be a shift between the relative importance of the internal vs. external searches (in terms of yielding to the firm rent sources that are economically important and robust).

In our model, the typical firm over time makes *four* strategic decisions, namely

1. The specification of the product line that the firm offers to the market.⁹
2. The prices of this product line.
3. The (internal) organization to produce, market and deliver the product line.
4. The nature of information dissemination (for example, advertising) regarding the product line.

We reiterate that these four strategic decisions are not ‘once for all decisions’ but rather are made with varying degrees of frequency over

time. We also do not restrict the firm to market only one product at a time. In fact, the decision to offer a product line arises *endogenously* in the story that we tell. Notice furthermore, that consistent with our emphasis on dealing with imperfectly competitive environments, the pricing decision is only one of the strategic decisions for the firm.

The firm attempts to arrive at a dynamic strategy process so that these decisions are made over time with a view to maximize the long run expected economic profits (rents) of the firm. But to be able to say anything more precise regarding the choice of these variables, and their interaction with one another, we must specify (i) the behavior of the buyers, and (ii) the institutional and/or technological environment that determines the ease of entry into (and exit from) the industries that are relevant to the economic profits of the firm.

To this end, we start by specifying buyer behavior. The model for buyer behavior builds on earlier models by Hotelling (1929), and Cyert and DeGroot (1975). The central aspects of the model that we are advancing are as follows.

1. Products are interpreted as bundles of *attributes*.
2. Firms choose product specifications by ‘locating’ on the relevant attribute space.
3. Consumer utilities are defined over attributes. In a world of complete information (or no uncertainty), consumers can thus rank different products in terms of desirability. More specifically, each consumer has a ‘most preferred’ location in the attribute space.¹⁰
4. However, consumers are either uncertain of the utility they derive from various locations on the attribute space *or* are uncertain of the true attribute content of various products in the market. Both these types of uncertainties are observationally equivalent in our model.
5. Over time, consumers use information—either by direct consumption or ‘experience’ of the product, or other forms of indirect information—to update on their expected utility from various products in a Bayesian fashion. This is a *dynamic* process by means

⁹ See below for a more concise definition of product specification.

¹⁰ This is the analog, in our framework, of consumer location in the Hotelling (1929) model.

of which buyers' estimates of their expected utility become more precise over time.

6. Firms in our model are also Bayesian decisionmakers, and maximize the present value of their (expected) long-term profits. To this end, firms choose a vector of products (i.e., locations in the product space) and prices in each period. Clearly, the expected demand for their products is an important element in the firms' decision. But the demand for products depends on the *consumers'* estimates of the parameters determining their (i.e., the consumers') preference distribution (and the prices of the product lines). Thus, firms estimate both the true parameters (determining the preference distribution of the consumers), *and* the consumers' estimates of the same. Firms perform this estimation by observing the (history) of market reactions to the product lines offered to the consumers.

Before getting into the formal details, it is worthwhile to make some comments on the nature of the model, and provide a preview of the implications of the analysis.

The model differs from the Hotelling (1929) model in that consumers are uncertain of their ('most preferred') locations, and the firms here are also Bayesian learners. These aspects fundamentally alter the equilibrium behavior here with respect to the Hotelling model. For example, even with a fixed number of consumers and firms, our model is intrinsically dynamic (as the equilibrium changes over time in response to learning processes undertaken by both consumers and firms). Moreover, the optimal strategies of the firms are also greatly affected. More precisely, to the extent that firms are Bayesian learners, they will choose product location and pricing policy from that perspective. It is possible, for instance, that firms will offer *product lines* (i.e., a vector of products) since observing the market reaction to a number of products may be more efficient from a learning point of view.

The model builds on Cyert and DeGroot (1975) since the consumer learning process is embedded in a 'larger' learning game with both consumers and firms. In a dynamic sense, this implies that (unlike Cyert and DeGroot) learning in our model is *endogenous* since it depends on the (endogenously derived) aggressiveness of the firms regarding their product line and pricing policies.

While the short run equilibrium in the model is complex and dependent on the parameterization (of the model), certain long-run trends that are quite robust are also apparent. Over the longer run, consumers' estimates of their 'true' expected utilities become precise with learning and must converge to some stable beliefs.¹¹

However, as consumers converge to stable beliefs, firms can earn rents only if: (i) they can incorporate product attributes that are either 'nonknowable' or 'nonreplicable' by the other firms, and/or (ii) they can deliver the crucial attributes (from the buyers' perspective) at a lower cost. In general this implies that over time the search of internal capabilities to deliver at a lower cost becomes more important to maintain rents. But we note that this implication is quite distinct from the claim (for example, Barney (1986)) that analysis of internal capabilities will be more useful (in terms of identifying potential rent sources) than the analysis of the firm's external environment, *per se*.¹² To the contrary, if the firm can continually search for product locations where there is great consumer uncertainty (in terms of diffuse priors), then rents can be potentially made even if the firm does not have a cost advantage, so long as its product cannot be *exactly* replicated.¹³ And, *exact* replication may not be trivial in multiattribute products, or products where there is an element of habit formation.¹⁴

¹¹ Note that since this model is built on a Bayesian learning process, the learning process must converge. Of course, since the learning here is endogenous it is not necessary that the updated beliefs converge to a degenerate distribution on the true parameters.

¹² Barney (1986) has argued that information-processing methods based on analysis of internal capabilities are more likely to yield rents than are methods based on analysis of the firm's external environment. The argument is that the methods of external analysis are generally available, as are external information sources; thus they will be sought out and used to conduct search, more or less by all members of the competitive community, thereby providing no real advantage for any firm. In contrast, internal analysis, it is argued, requires firm-specific knowledge that is not generally available.

¹³ The converse of this point is also important. In environments of low consumer uncertainty, a low cost of delivery of a given product location may not yield rents if consumers value the attribute structure of substitutes sufficiently high or are precisely aware of the attributes that generate utility, and these attributes can be delivered by a competitive industry. Examples include the experiences of Du Pont with synthetic fibres and the marketing of laundry detergents in Asia.

¹⁴ An example of a product where habit formation amongst consumers appears to play a role in the preservation of its

Furthermore, our framework suggests that all firms will not be equally efficient in the external search process *in equilibrium*. The source of heterogeneity in the efficacy of external analysis or search among firms is the *diverse experience* of firms (in a given industry). Based on this diversity, different firms will, in general, derive diverse inferences regarding the parameters determining the distribution of consumer beliefs from the same set of market data. In Bayesian terms, firms may differ in terms of the likelihood functions (i.e., consumer behavior models) that map prior distributions to posterior distributions given market data, and/or the prior distributions themselves. It is not surprising therefore that they will generally arrive at divergent posterior beliefs (given some market data).¹⁵ Moreover, as we argue, these different estimates (posterior beliefs) will arise through different information processing structures that are specific to the organization of the firm. Consequently, since these information processing structures are not easily transportable, or at least freely replicable, they should therefore be expected to be sources of rents for certain firms.

Formulation

We now proceed to specify the model more formally. We consider a market with infinitely lived consumers (buyers) and firms. There are N types of consumers. Each consumer type may be considered to be a 'representative stand-in' for a large number (more precisely, a continuum) of identical consumers. Thus, an individual consumer is 'economically small'. Consumers have preferences defined over a space of *attributes*. However, consumers are uncertain about these preferences. But consistent with the literatures on statistical decision theory, and the economics of information, we will represent this uncertainty through the unknown (to the consumers) realization of a random preference parameter.

More precisely, the relevant attribute space is

niche is Coca-Cola. In general, products whose crucial attributes to consumers cannot be precisely specified (in a technological sense) will resist exact replication.

¹⁵ As a practical example, it appears reasonable to argue that given a market survey in the (analog) film market, the inferences of Kodak, and a new entrant with limited experience with the product would be different.

some (partially ordered) metric space χ endowed with a metric. Consumers have preferences over (bundles of) attributes that are scaled by a preference parameter. Specifically, consumer type i 's preferences are represented by the means of a von-Neumann and Morgenstern (VNM) expected utility function $\mu_i: \chi \times \Theta_i \rightarrow R$, written $\mu_i(\chi, \theta_i)$. The preference parameter is $\theta_i \in \Theta_i$, where Θ_i is consumer type- i 's preference parameter space and could either be a finite set or a multidimensional Euclidean space. Furthermore, for each i , θ_i is a random variable.

At time 'zero', the preference parameter profile $\bar{\theta} = (\theta_1, \dots, \theta_N)$ is chosen according to a (cumulative) probability distribution $G(\bar{\theta})$ such that the preference parameter draws for each consumer type are independent; i.e., $G(\bar{\theta}) = \prod_{i=1}^N G_i(\theta_i)$. But the realizations of the preference parameters are not observed by the consumers. Consumers therefore can only estimate their (true) preference parameters. We assume that consumers are Bayesian decisionmakers whose (subjective) prior beliefs on their preference parameters are given by $Q_i(\theta_i), i = 1, \dots, N$.¹⁶ Consumers update on their preference parameters over time through consumption of products marketed by firms. We note that in our formulation consumers are both informationally and economically small; i.e., no consumer has an advantage in estimating *other* consumers' preference parameters (due to the independence assumption), and no consumer is large enough to impact market demand.

There are a finite number of firms in this market indexed by the set J . At the beginning of each time period $t = 1, 2, \dots$, the typical firm offers a set of products to the market (that are really choices of locations on the attribute space χ). This set of products essentially defines a product line for the firm. We will, realistically, assume that there are fixed costs of introducing a product at a location. This will imply that firms will offer only a finite set of products at any given time. More precisely, let ϕ_j^t represent the vector of products offered by firm j to the market at time period t (so that $\phi_j^t(k)$ represents the k th product in firm j 's product line at time t). And let P_j^t be the associated (ordered) vector of prices

¹⁶ In other words, we are not restricting consumers to use the 'objective' distributions.

(so that $P_j^i(k)$ is the price of the k th product offered by firm j at time t).

Firms are naturally interested in the preference parameter profile $\bar{\theta}$ (which they also obviously do not observe). In general, firms will have different production and marketing experiences, and furthermore they will have different information processing abilities internally. These differences are captured by allowing firms to have different subjective prior distributions on $\bar{\theta}$. Then let $F_j(\theta)$ denote firm j 's prior (distributions) at time 'zero'.

Consumers choose among the available product offerings in each period to maximize their contemporaneous expected utility.¹⁷ We will assume that the utility from product consumption and money are additive. Furthermore, to avoid excessive notation, we will also assume that the budget constraint considerations are such that in each period, every consumer chooses only one product offering from this market.¹⁸ Thus, if consumer type- i , $i = 1, \dots, N$, with the preference parameter θ_i chooses the k th product offered by firm j at time t , then its contemporaneous utility is given by:

$$u_i(\phi_j^i(k), \theta_i) - p_j^i(k) \quad (1)$$

Upon consumption of a product, the consumer receives a (noisy) signal on his true preference parameter. For example, consumption at time t will yield consumer type- i the signal

$$\eta_t^i = \theta_i + \zeta_t^i \quad (2)$$

Here ζ_t^i is drawn from the joint distribution $H^i(\theta_i, \zeta_t^i \mid \phi_j^i)$ that depends on the product chosen; i.e., learning about the preference parameter is specific to the consumer and depends on the (stream of) products chosen by the consumer over time.¹⁹ Thus, at any time t , the typical

consumer type's (relevant) information is the history $\gamma_t^i = (\eta_1^i, \dots, \eta_{t-1}^i)$, leading to the posterior beliefs $Q_i(\theta_i \mid \gamma_t^i)$.

Since consumers are Bayesian decision makers, the typical consumer type- i 's decision problem in this market at time t can be written as follows:

$$\max_{\phi_j^i(k) \in \phi_j^i, j \in J} \int_{\Theta_i} u_i(\phi_j^i(k), \theta_i) dQ_i(\theta_i \mid \gamma_t^i) - p_j^i(k) \quad (3)$$

In light of (2), market transactions in each period—the quantity demanded of each product offering in that period—will be *informative of the (posterior) beliefs of the consumers*. Firms will be interested in these consumer beliefs since firms wish to 'locate' products at points which will maximize the probability of their acceptance by the consumers (for a given price). Then let Ψ_τ denote the vector of product offerings, prices and market transactions at time τ . The observable history for all firms at time t is the profile of previous market description vectors; i.e. $\Psi^t = (\Psi_1, \dots, \Psi_{t-1})$.

A heuristic description of a typical firm's strategy problem at any point in time is as follows:

1. In each period firms choose a vector of products and (their) prices. The choice of products is simply a choice of product locations in the attribute space. At each period firms take as given a *cost function* that specifies the costs (in terms of quantity) of locating at various points in the attribute space.
2. The crucial input in the firm's choice problem is its *expectations* of the demand for its product at each location. A precise derivation of these complicated expectations is one of the most important outputs from our framework. Firms' expectations depend on (i) their (i.e., the firms') estimate of the beliefs of the consumer (at the given point in time), and (ii) their conjectures on the location strategy of rival firms.

We now express the components of the typical firm's choice problem in more precise terms. Let X^* denote the set of finite sequences in X . Thus, $\phi_j^i \in X^*$ for every firm j at any time t . Then each firm j is endowed with (a possibly time dependent) cost function $C_j^i: X^* \rightarrow R_+$ so that

¹⁷ This implies that consumers are myopic. But this does not affect the qualitative features of our model (which is our chief interest), and provides considerable notational convenience. Extension of the current framework to the case where consumers maximize their lifetime expected utility is straightforward.

¹⁸ This assumption is also without loss of generality since the notion of the market can be defined finely enough that a unit purchase is not a binding constraint. In any case, the extension to multiple simultaneous purchase is straightforward.

¹⁹ If there is no consumption at all at time t when $\eta_t^i = 0$.

$C_t^j(\phi_t^j)$ is the total cost to firm j of producing the product vector ϕ_t^j at time t . Next, let $(\bar{\phi}_t, \bar{P}_t) = (\phi_t^j, P_t^j)$, $j \in J$. Consider now the determinants of the demand for the k th product of firm j at time t . This demand will depend on the total number of products offered in the market (and their prices), and \bar{Q}_t the vector of consumer beliefs (for each consumer type $-i$) at time t . But \bar{C}_t is not known to the firms for two reasons. Firms do not know the initial priors of the consumers, and they also do not know the signals that the consumers have received from their consumption in the past (since these are privy to the consumers). And this uncertainty may be compounded by the fact that firms may not know the distribution that generates the signals for the consumers. Thus, a typical firm's (consumer related) unknown variables at time t may be specified as $s_t = (\bar{\theta}, \bar{C}_t)$.²⁰ We write firm j 's beliefs on s_t as (the probability distribution) $W_t^j(s_t | \Psi^t)$.²¹

From a dynamic programming perspective, the beliefs W_t^j of the firms are sufficient statistics on history (and may be interpreted as its state variable at time t). Thus, let for any time t , $\Pi_t^j(W_t^j)$ denote the present expected profits of firm j at time t when its beliefs are W_t^j . Then firm j 's decision problem at time t may be written as follows:

$$\max_{(\phi_t^j, P_t^j)} \left\{ \sum_{k \in \phi_t^j} (E_t^j(D_t^j(\phi_t^j(k)) | \Psi^t) - C_t^j(\phi_t^j)) + \delta E_t^j(\Pi_{t+1}^j | \Psi^t, \phi_t^j) \right\} \quad (4)$$

Here D_t^j represents the demand for the k th product of firm j at time t . And the expectations are taken in terms of the firms' beliefs W_t^j . Alternatively, the expected profits of the typical firm at any time t depend on its estimates of the parameters determining the distribution of consumer preferences and the consumer estimates of the same. Furthermore, as depicted in (4) the firm's optimal product line and pricing strategy should be *forward looking*, i.e., these decisions

should be made not only to maximize the current profits of the firm but be also based on strengthening the position of the firm in the future. For example, in the early time periods the firm may offer a product line that is broader than would be deemed optimal from the short-run point of view in order to increase the efficiency of its learning and improve its external estimates relative to its competitors.

Example

A useful specialization of the general framework set out above is the following. Consider the case where $N = 1$ (i.e., there is only one type of consumer), and the distribution of θ ; i.e., $G(\theta)$ is a multimodal distribution described by the parameter vector α . Thus, the 'learning' process described above is a search for a consistent (or unbiased) estimate of α by both the firms and consumers. In other words, we assume that the consumers and the firms know the distribution form but do not know the true parameter vector α . Then a plausible description of the optimal product introduction strategy of the firms will be as follows.

Starting with its initial estimate of the modal positions (of the distribution of consumer preferences), the typical firm will place a product at the estimated location of each of the modes. Consumers will accept or reject these products on the basis of *their* estimates of the distribution modes (and of course the prices of the products). But the consumption of the products gives consumers a more precise estimate of the true modal locations. Thus, by following the market reaction to its product locations in each period, the typical firm is able to refine its own estimate of the true modal location, and also gets a better idea of the *consumers' estimates of these locations*.

Moreover, if a firm initially has superior information regarding the true location of the modes relative to the consumers, then it can *direct consumer search* by strategic location of products, and also create first mover advantages since consumers will eventually learn the true locations in any case.

Model analysis

We now use the specified model to derive a basic result regarding the dynamic interrelationship

²⁰ s_t as written is really the (vector) of 'types' of the consumers as interpreted in the literature on the economics of information.

²¹ This distribution can be derived rigorously from the firm's priors on θ , its beliefs on the priors of the consumers, and its beliefs on the joint probability laws that generate the signals ζ_t (cf. (2)) for the consumers.

between the relative importance (to the firm) of external and internal information. We show that under relatively general conditions, the importance of internal search must increase over time.

More precisely, let M_t denote the market outcome in period t ; i.e., M_t summarizes the product lines, and prices and actual consumer demands for these products at time t . Furthermore, let M_t^* denote the market outcome under the perfect information conditions, i.e., the situation where both the consumers and the firms are perfectly knowledgeable about the 'true' consumer preferences (i.e., the realization of θ). Recall that we have assumed, realistically, that there are fixed costs of offering (incremental) products to the market. Under this assumption, the perfect information market outcome is *stationary* (i.e., invariant over time), with a finite number of products (i.e., product locations) being offered, and every firm offering a given product makes zero profits (rents).²²

Under our technical assumptions, any two market allocations X, Y can be compared through a *metric* or 'distance' function $D(X, Y)$. Furthermore, we will say that the market is *active* for consumer type- i at any time t , if there is a purchase (of a product) by consumer type- i at time t . Then we have,

Proposition: Suppose that for every $i = 1, \dots, N$, and every time τ there exists some τ_i with $\tau_i > \tau$ such that the market is active for consumer type- i at time τ_i . Then, for any $\epsilon > 0$ there exists some time T such that $D(M_t, M_t^) < \epsilon$ for every time period $t > T$.*

The proposition asserts that (with a stable set of consumer preferences), if consumers continue to purchase some product in this market (i.e., the market is always active), then over time the market allocation gets arbitrarily close to the complete information allocation. The proof of the proposition follows from the nature of the information structure (2): the martingale convergence theorem (Billingsley, 1979) assures us that the consumers' estimates (of the parameters determining the distribution of consumer

preferences) will eventually get precise. But since firms update *their* estimates of these parameters by observing consumers' response to product offerings (and prices), if the consumers have precise estimates then the firms will also eventually converge to precise estimates.²³ Notice that if firms have symmetric cost functions and there are no fixed costs of entry, then the proposition also asserts that eventually the market allocation will get arbitrarily close to the competitive allocation.²⁴ This implies that with a stable set of consumer preferences, over time a firm can earn rents only if it achieves a cost advantage through search internal to the firm.

IMPLICATIONS

The major implications, in terms of strategy formulation, of our framework are the following.

There are *two* sources of superior performance (i.e., rents) for firms. First, a firm may have a better estimate of consumer demand for each given product location (vector) and prices. In Bayesian terms, this superior estimation ability is an expression of the firm's relatively more precise estimate of the true preference location *and* consumers' beliefs regarding the same. The Bayesian framework also suggests that the heterogeneity in the firms' estimates may arise from (i) more precise priors on the crucial consumer related variables, and/or (ii) a better perception of the true behavior model being used by the consumers. In sum, heterogeneity along either (or both) of these two dimensions will imply that firms will interpret a *given set of market data* differently, and, moreover, this difference can be ordered in terms of superiority (or inferiority) in relation to profit performance. For example, a better demand estimate can translate into the firm offering products at locations which its rivals do not seriously consider. Furthermore, since a better estimate of consumer variables is important in *future* profit maximization, firms will offer products not only based

²² The fixed cost assumption is not strictly necessary. It only gives a realistic feature to the model (namely, finite product lines).

²³ This is guaranteed by our plausible assumption that since there are a large number of consumers, individual consumers are nonstrategic with respect to their behavior.

²⁴ And if there are fixed costs of entry, then the market allocation will converge to the situation where firms in the industry just make enough profits (after entry) to offset the cost of entry.

on their profit potential in the short run, but because market reaction to the products may improve learning efficiency. This latter aspect has some extremely interesting implications for the firm's product line strategy over time.

Second, the firm may have lower costs of effectively delivering a given set of products. This form of heterogeneity arises from the search for production efficiency internal to the firms. The 'internal' search based heterogeneity has been well analyzed in the literature. So we focus here on the ramifications of rents due to better demand estimation (i.e., heterogeneity due to differences in external search). The major question, of course, is whether the external search differences can be a viable source of rents? For example, are demand estimation differences sufficiently nonreplicable that their rent potential will not be dissipated either by intense competition or bargaining by input owners who may embody the superior external knowledge?

It appears plausible to argue that the answer to the question posed above is generally in the affirmative. Usually, the superior external knowledge will be dispersed in the various strategic divisions of the firm. For example, managers well versed in market experience will be dependent on managers of technical divisions and vice versa. In any case, the precise location of the superior knowledge will generally be sufficiently diffused or nontransparent so as to make it difficult to be replicated.

But consider, for the sake of argument, the situation where this superior knowledge is embodied *completely* in the (top) management. In that case there will emerge a bilateral monopoly situation between the owners of the firm and the management. Management will be able to bargain away all the rents from the firm only if they have a viable threat of transporting this knowledge and replicating the success elsewhere. But there will generally also be mobility barriers in the input and technology markets which may make such threats noncredible (for example, suppose the firm has proprietary ownership of some crucial raw materials). In essence the argument is that the knowledge to utilize information, the ability to seek out and the capability to exploit a market imperfection are critically dependent on the other, complementary assets which the firm holds. In any case, this framework suggests that rents due to superior

external knowledge may be more likely in certain industries (frictions in input markets, and diffuse location of superior knowledge) than others such as law firms and management consultancy firms where these factors are missing.

Finally, our framework also points to the importance of 'macro' events such as business cycles and secular changes in demographics to the strategy of the firm. The main point here is that such 'macro' events change the distribution of consumer preferences in a given market, so that the limiting behavior implied by our earlier proposition need not obtain. Put another way, such 'macro' events maintain the importance of external search capability for rent generation in a given market over time. On the other hand, in markets where the distribution of consumer preferences is invariant with respect to such (and other) 'macro' events, a firm that generally can not conduct superior internal search can make sustainable rents only by continually migrating to 'new' market situations where consumers (and other firms) are at the initial phase of learning.

STRATEGY FORMULATION PROCESS

Strategy to some extent is the measure of managerial excellence. The strategy that the CEO can develop with a staff determines, assuming it is carried out effectively, the future of the firm. It is crucial that the chief executive officer play a major role in the development of strategy. Strategy development is not a process that can be turned over to a committee with a report to the CEO. It is a process that the CEO must mold and help formulate for the firm. The CEO must have a strategy to achieve the set of goals that has been established by the management in conjunction with the board of directors. These goals are usually financial—net profit per share, rate of return on assets, rate of return on equity and similar measures. Such goals suffice for short-term purposes. Long-run goals will include aspiration for the growth of the firm expressed in rates of growth for profits and sales. Both the short- and the long-run goals involve the board of directors because of their importance in determining compensation.

Goals are part of the vision of corporate management and this vision is an important ingredient in the development of the strategic

plan. The aspirations of the firm are embodied in the vision. The character of the firm—whether it is going to be large or small, whether it is going to be a full line producer or a specialty producer, whether it is going to emphasize marketing or manufacturing—is determined by the vision of the firm. The vision is analogous to a theory in science. From the vision goals and strategy can be deduced.

The goals of the organization become the means by which the organization is steered and become a stimulus for strategic thinking. The firm measures its progress by means of its monthly and annual financial statements and by nonfinancial information such as market share data, productivity statistics and competitors' results.

In a world of uncertainty many measures are needed to gauge the long run viability of the firm. The measures of performance are compared with the goals. On the basis of these comparisons the firm must decide whether action is necessary. If the performance is not achieving the goals, then there are a variety of short-term actions that the firm can take to attempt to achieve annual or other short-run goals—shutting plants, changing advertising expenditures, etc. Over time, as the management evaluates performance in relation to goals the significance of strategic planning becomes evident.

The need for a reassessment of strategy becomes imperative when performance continually underachieves goals. It is then necessary to examine the firm's strengths in order to determine where the firm has a comparative advantage. During this process of strategy formulation, it is also necessary to look externally for other opportunities and to examine the future in terms of technological change and demographic trends in the society and internationally. Some of these steps can be taken by the staff under the direction of the CEO, but the job of integrating the material and developing a strategic plan is the responsibility of the CEO in conjunction with the strategic planning committee. The latter should represent the management coalition.²⁵

Our framework strongly suggests that the

internal and external searches for comparative advantage should be treated as a system. The searches themselves have to be conducted separately but integrated before the strategic plan is formulated. In each of these searches, the firm's management must devise methods and analyses that are relevant for the firm. It is difficult to merely copy the approach of another firm because there are different strengths in different firms. Consultants can be helpful in both searches but ultimately the analyses must be done by the members of the organization. Established methods such as survey sampling can be used to try to find those modes in the distribution of consumer preferences but ultimately it is the knowledge of the marketing specialists (the persons in the organization who can start with the prior beliefs and develop consumer models that lead to the most efficient and unbiased external estimation) that can best guide the firm to the market niches it seeks (in the manner specified above). The same is true of the internal searches. It is the knowledge of the production specialist that can best guide the firm to lower production costs. In both searches, it is the leadership ability of the CEO that will determine the quality of the searches and the final strategic plan.

CONCLUSIONS AND FUTURE WORK

We have emphasized in this paper the role of information (knowledge) in determining market imperfections. It is the existence of knowledge of internal production techniques or external opportunities in the hands of a small number of firms that creates the market imperfections necessary to generate rents for the firm. Put another way, it is proprietary knowledge that creates a comparative advantage for the firm. Contrary to other work in the literature, we argue that internal and external market imperfections are a system and that neither has an advantage over the other in terms of profitability or sustainability.

Much work remains to be done on the basis of the arguments we have made and the framework we have developed. More analysis on the nature of internal and external knowledge is required: we need to know more about the

²⁵ For more details on this concept, see Cyert and March (1992): 32–37.

types or classes of knowledge that constitute market imperfections and how these types of information are formed and developed. In particular, we need to develop methodologies that implement the investigation of the distribution of consumer preferences: how does the firm interpret the market reaction to previous product offerings and refine its product line and pricing policy in a proactive way? How does the market experience of firms lead to the differences in priors and consumer behavior models? Finally, we need to examine in greater detail the relation of market imperfections to the long-run rate of growth of firms. For example, our analysis indicates that with a stable set of consumer preferences the rate of profit growth of the firm in a given market will eventually decline unless it can continually achieve reductions in the costs of production. Can the firm maintain the rate of growth by diversifying into new markets at strategic junctures? If so, how should the firm determine such junctures and what methods should it employ for such diversification?

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