CHAPTER 1

Introduction

An increasing number of markets are something more than sites for direct transactions between buyers and sellers. These markets are mobilizers of production in networks of continuing flows. Firms continuously and jointly construct their market interface, which provides a measure of shelter from the uncertainties of business. These mobilizer markets induce and adapt flows in production and service, of various sizes and quality, through networks of relations that spread through a production economy.

Producers become individually established in a line of business as together they constitute a recognized industry or some analogous grouping of producers or processors. Having developed specialized facilities and organization, each member firm commits, period after period, to a definite flow of products for placement downstream.

In exactly what does this "production market" consist? Is this joint construction of a market by constituent firms a set of roles among positions? Is this market an integral actor, a chorus, or an agglomeration? Is it an ideal, a figure of speech, or a legal framework that acts as a guide to members? Is the market a by-product of signals that the actors read from each other's actions or from the actions of like markets?

There is also a larger view, in which each market is a by-product of dependencies of its own flows on actions around origin and destination markets. For more than a century, the social sciences have groped through a fog of custom that grew around and with this new institutional system centering on a new species of market.

Each such market coordinates its producer firms in commitments to pumping downstream product flows into which procurements from upstream have been incorporated. This sequence of transformation, controlled by producer commitments, fundamentally distinguishes the production market mechanism from earlier market genres of exchange well theorized by earlier economics. Resulting streams of differentiated goods or services from the market get split among diverse buyers as equally good options: The market discipline centers on product quality.

What is the mechanism by which production markets work, and, equally crucial, how do markets embed among dispersed and heterogeneous networks of relations? The following chapters propose and apply a family of mathematical models in answer. Many varieties of the mechanism are distinguished; therefore the modeling provides usable approximations to confused

and shifting realities that are affected by processes and institutions—technological, political, cultural, and social—that lie partly outside the modeling field.

The mechanism is adaptable to variety in upstream and downstream contexts (and a dual form oriented upstream is laid out in chapter 9). These contexts for individual firms and their embedding as a market must also reflect how this particular market as a whole fits in among other markets. In the overlapping evolutions of these markets and firms, common business usages and forms of discourse emerge and spread so that there are some common framings in terms of quality and monetary value, terms in which to express the mechanism and the context.

Each market reproduces itself as a social construction by virtue of some form of signaling within a shared frame of perception among its firms. This frame disciplines producers' strivings to maximize the gap between procurement costs and sales revenue, vis-à-vis buyers who hold out for equally good deals across producers with differentiated outputs. The models have roots in orthodox economic theory but insist on the realities of continuing profitability for firms and of local path dependence. They are models of interactive social constructions being carried out around us.

More concretely, what array of prices do firms maneuver each other into as such a market? The empirical focus for this question will be twentieth-century production markets in the United States. To get at price, one has to examine individual markets, each with particular firms as members, interacting to comprise a line of business reaching across cities and states. One can employ a host of intensive case studies of markets. These range from U.S. light aircraft and the dozen and more in Scottish knitwear (see chapter 4) through worldwide markets for oil tankers (Zannetos 1985), U.S. markets for accounting and advertising services (Han 1995; Baker, Faulkner, and Fisher 1998), markets for the latest products such as personal computers (Bothner 2000a)—and even investment banking (see chapter 12). Also relevant are studies of less glamorous markets—for example, cotton waste for cleaning machine rooms—and markets still traditionally local, such as for concrete blocks. One expects, and the case studies document, widely different levels and sensitivities of market outcomes in volume, quality, and price.

The aim of this book is to penetrate not one but all of these disparate examples, and to view them together across networks. Production markets are flexible and are able to persist because they are constructed in and from widely shared mores. A flexible mechanism can accommodate the intercalations of processes and perceptions in all of them. The model derives from and illustrates a more general theory of social construction, rooted in network, identity, and control and triggered by exposure to the uncertainties in ordinary business.

Network ensembles of such markets constitute ecologies with firm, mar-

ket, and sector levels. Implications for control properties are derived from and point toward devolutions into other forms, subject to additional institutions of finance and ownership. The array of models offers a basis for prognostications about the broader economy.

In this book, we trace some evolutions of identities in interaction with strategic moves, in order to explore degrees of freedom for entrepreneurial action. These market models presuppose human flexibility and scope in the actors, without which there would be no patterns of generalized exchange. So potentialities of maneuvering and disruption are inherent in the formulation.

A key source for the mechanism mathematics was work by the economist Michael Spence on signaling (see chapter 5). He interpreted each outcome, however, as a profile of control over a population of atomized individuals, whereas here the profile is of a joint interactive construction among a handful of players, which then is embedded in networks of other industries but also is subject to disruption and maneuvering.

This introductory chapter now turns to vignettes, accompanied by historical and theoretical framing, that point up key questions about production markets sketched in following sections. In later chapters, existing standard treatments, largely from economics, will be shown either to overlook these aspects or to merely accommodate them through ad hoc additions to their models. These models, such as pure competition, amount to suppression of markets (chap. 11). This introductory chapter ends with a road map of the rest of the book, following sections introducing motivational, contextual, and network aspects of the market mechanism.

From Localism to Generalized Exchange: American Vignettes

How do firms establish their outputs in each production market? Which firms are in which markets? How does one market relate to others?

Early on, production was more local and less systemic than in today's production markets. Let's begin with colorful just-so stories as a starting point for contrast with standard treatments. Pittsburgh has had several lives as a center of the production of heavy metals. Early in the twentieth century, fierce competition among rapidly growing iron and steel producers blanketed its steep river valleys with smoke. At the same time a trust blanketed much of the competitive action in the steel market. By midcentury, the smoke had thinned and turned apricot-hued as advanced steels came in, along with renewed, although cautious, competition. Across Pennsylvania, to the east in the Lehigh Valley, comparable early scenes out of Tolkien's Mordor were transformed in similar ways, as Bethlehem Steel became intimately connected in networks of business with Pittsburgh steel companies. Since then, Pittsburgh, more than Bethlehem, has spawned and regrown in markets around

newer technologies and the commercialization of specialized services hitherto done in-house if at all. The trust organization was loosened by these commercial and technological developments as well as by government antitrust actions.

Chandler (1977) gives a broad overview of the history of industries in America, drawing on rich local, regional, and national materials. He describes interrelated massive changes in institutions of credit, information, and transport among cities that accompanied the emergence of large firms and the decline of localism. Inquiry into the mechanism of the accompanying production markets calls for further probes. This whole section could be preceded by still older developments in New England industry, which offer examples of markets constrained through the co-optation of state government by cabals of elite industrialists. The American economy soon grew too large, too fast for such easy derailment of incipient market mechanisms. Such interventions are not the focus of this book, but later chapters (especially chapter 12) sketch how they may affect predictions from the market mechanism.

Farther down the river from Pittsburgh lay Cincinnati, another city old by Midwestern standards, with a very different industrial history but a similar concentration of wealth and local power in magnates. Consumer goods, soft and sticky, generated huge receipts in Cincinnati, but receipts mostly direct from wholesalers and retailers. As in Pittsburgh, there was local concentration, but also measured competition developed between these locals, notably Procter and Gamble, and parallel consumer-goods giants elsewhere. Minneapolis was similar but larger and more diverse than Cincinnati, embracing packaged foods, lumber, office supplies, and more, again in a mixture of competition and elite control.

By the 1920s Pittsburgh Plate Glass (PPG) had emerged along with production market mechanisms for glass industries, with Owens Illinois (initially Owens Bottle) as one peer, located further west. During the genesis of PPG, several clusters of small local producers across Ohio and Pennsylvania were struggling with confusing, yet appealing, new circumstances in which one could ship to—and even buy from—remote localities and new sorts of industry downstream in production flows. From well before the 1920s, Corning Glass in upstate New York was developing more sophisticated products and methods in glass, protected by patents. And still other clusters across the nation became involved.

PPG came to see that Corning was selling more higher-end glass products to customers no longer committed by relative closeness to upstate New York, just as PPG and Owens Illinois were coming to sell huge amounts of average glass products for buildings in booming metropolises, even metropolises nearer to Corning's plants. It was under such pulls that congeries of small, traditional, local glass producers, not just in Ohio—and not just in glass—

either disappeared from major commerce or folded into one or another among the producers with size sufficient to seek niches as peers in a national market. The law of large numbers helped ensure that there was indeed demand for regularly repeated outputs from an industry differentiated enough to cater across an array of buyers.

Enter the transposable genus of production market that is central to this book. The focus is on one theme in these just-so stories: changes in structures of visibility, and thence influence, among actors in networks of business relations common across a production economy. The heart of the claim is that producers' attention was pulled away from habitual ties to local suppliers and distributors, whether in Pittsburgh or Minneapolis. Producers' horizon of opportunity opened up; they paid attention to a much larger and more diverse set of connections. In this enlarged world, producers became aware of a much greater range of contingencies and were exposed to more and more intricate influences that were harder to assess by habitual rules of thumb or by focus on a few predominant ties. This was especially true with respect to buyers. Even the largest buyer (perhaps some wholesaler or large building developer, in the case of glass) did not loom large on a national canvas. Markets in very different products came to be akin in mechanism, a mechanism transposable because adaptable to a great many diverse contexts—though by no means all, as we shall see in chapters 3 and 4.

The lure of market formation often was the prospect of gaining increasing returns to scale, which thus must be a main option in any believable modeling of the market mechanism, pace orthodox economics. The irony is that with such larger reach, the distinctive new signaling mechanism of this market was feasible only among a limited number of producers. So long as producers watched each other for cues and clues as each adapted its products for a niche, they could count on continuing in lines of business together as an industry.

Many other industries necessarily were getting together in the same period. A partition into markets imposed itself among networks of flows among firms. Tracing an industry within this interacting array of evolutions could permit us to estimate also the fungibility of products from different industries somewhat parallel in the underlying networks, such as, in the case of glass, translucent sheets or ceramic pots.

The long-term outcome was a production economy with networks of intermediate products and services. This supplanted more episodic economies among localities with self-contained producers and final consumers, mediated only by merchants of various sorts. But, like the system it supplanted, the production market could also routinely generate net profits for many or all producers. Chapter 15 develops this historical sketch further.

Figure 1.1 is a schematic rendering around one industry of flows and nodes in the new system. It is aptly characterized as generalized exchange

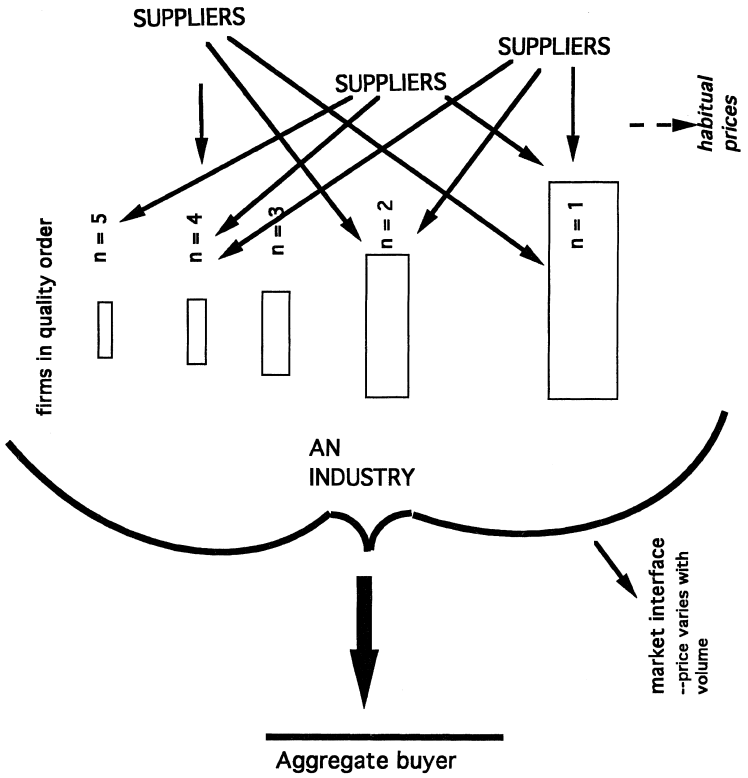

FIG. 1.1 Generalized exchange: configuration of flows across firms for one market in a production economy

because final uses usually require acquisitions originating from many sources through many steps of intermediate processing and service. Here, complementary flows of money and thus a complementary fiscal system are assumed, but anthropology and sociology offer many examples of generalized exchange, such as in kinship systems, that do not require money.

Production Commitments and Knightian Uncertainty

The basic distinction intrinsic to every market in a production economy is between upstream and downstream. This distinction is introduced often in economic theories and business analyses, but casually and without considering the necessary implications. Unlike familiar markets of haggle and exchange, actions in markets for production necessarily implicate not two but three roles for firms: supplier, producer, and purchaser. They are activated as a trio in sequences of interacting decisions that cross market interfaces.

Actions in these input-output networks of a production economy depend not only on sequence but also on timing. Occupancies of the supplier and purchaser roles with respect to that market will be multiple and subject to switching in and out. The producer role is the one entailing specific commitment to future flow, which presupposes investment in specific facilities and organization for that product. For simplicity we will continue to refer to producer firms as in an industry, but the analytic model is equally applicable to markets for services and other markets where the actors commit to process, not product flow. Nor is large size, in firm or market, necessary for applicability.

A producer has to commit its facilities in advance to obtain a level of production for a period, a level to which both its peers in the market and various possible occupants of the other roles adapt their choices. So commitment and uncertainty are the twin themes in production markets. From their interaction spins out the asymmetry among the three roles and all the other distinctive features of production markets.

What counts is that there be commitments visible as signals to induce and support market interfaces shaped by both upstream and downstream context. One can trace this social construction to uncertainty facing alert actors seeking secure footing as well as continuing profitability in networks of flows. Packaging as an industry offers producer firms long-term positions in niches, positions that help to mitigate the vital uncertainties that surround commitment and evaluation in a competitive environment. If we regard the firms as atoms, the market is a molecule.

Producers learn and are pressured to huddle together as an industry such that their key cues come from their fellow producers who face the same opaque diversity of buyers and who offer differentiated products filling distinct niches. Firms and industries thus interleave as actors, operating through this distinct genus of production market. Each of these markets is a social construction hammered out amid the flow of ongoing business life, as Marshall (1930), the first real theorist of industry, argued long ago. Appearances to the contrary, such social constructions all are cousins under their thick skins, since all derive from repeated relations in social networks under exposure to risk. This is what must be modeled.

Just What Are Producers Afraid Of?

The analysis in this book derives from three interwoven distinctions. The first is that between upstream and downstream. The second, also discussed in the previous section, is that between the role of making commitments and the roles of adapting. The third is that between perceptions and subsequent interpretation as signals. Producers' fear reflects the second and engenders the third distinction. All three distinctions fit together in the basic asymmetry in operation of production markets.

Producers' fear traces to the distinction between risk and assessable uncertainty, which was proposed eighty years ago by the economist Frank Knight. In Knight's words: "The problem of profit is one way of looking at the problem of the contrast between perfect competition and actual competition. . . . The key to the whole tangle will be found to lie in the notion of risk or uncertainty and the ambiguities concealed therein. . . . Our main concern will be with the contrast between Risk as a known chance and true Uncertainty. . . . At the bottom of the uncertainty problem in economics is the forward-looking character of the economic process itself. . . . The most fundamental feature of the economic system [is] *production for a market*" (Knight 1971, 19, 21, 237, 241).[1]

One implication to be derived (for it is not obvious) is so basic that if it is invalidated the argument of this book is contradicted: *Each market exhibits an orientation either upstream or downstream*. Producers are not just embedded in a market, as the sociologist Mark Granovetter (1985) would argue; they actually constitute the market's interface in, and as the set of, their perceptions and choices. They constitute the interface vis-à-vis the direction in which risk is perceived to originate.

This book will refine these three basic distinctions by introducing detailed stipulations and specifications of possible contexts for embedding markets. The forms of the mechanism interdigitating market and firms thereby can be arrayed in a space according to parameter values specifying embedding and thus substantive context (chaps. 3, 7). Shape and outputs from a market vary greatly with location in this market space. Orthodox theory of markets offers no such framework for discriminations. Why is this?

In fact, there is a space for each orientation of market molecule, according to the present model. Each of the two spaces splits into the same half-dozen regions defining major varieties of market. Market outcomes prove very different according to orientation, such that in some regions markets seem likely to have one orientation and in other regions the other orientation (chap. 9). But also the orientation of a given market may switch with external incident or internal provocation. Striking changes are predicted in market outcomes from switches. Standard views of markets make no such predictions and do not even distinguish orientation. Again, why is this?

Standard economics does offer various attempts at realistic modeling of a production market (as will be shown first in chapters 2 and 5). While economics has infiltrated common sense over a long period, economic theory itself starts from and borrows from commonsense views. So standard economics views, even though they ostensibly derive from models, often remain close to commonsense views.

But when it considers production markets in a realistic environment of flow networks, orthodox economic theory abandons any realistic or commonsense model and reverts to the fiction of markets with pure competition

(as will be elaborated in chapter 11). One great cost of this orthodoxy has been the unacknowledged infiltration of notions of pure competition into practical economists' research. This will be illustrated in a section of chapter 11 on the otherwise outstanding microeconometric work of Nerlove (1965). But it can also be seen in qualitative analysis: for example, in the work of Lazonick (1991), whose aim, ironically, is to challenge the "myth of markets"! Another great cost is the glibness with which economic theorists offer policy advice, such as in recent years for postsocialist economies.

Orthodox economic theory has yet to deal effectively with the three roles in upstream-downstream flows. This blinds it to the relevance of Knightian uncertainty and thereby also to polarization of market orientation and its possible switches. That is not so for the new evolutionary economics, sketched in chapter 14 and presaged by the Flaherty article discussed early in chapter 11, but even these do not take seriously the network spread and embeddings previewed in the preceding and in the next sections.

Like orthodox economics, standard sociology has been reluctant to build up from analysis of particular markets to overall critiques and assessments of economic influences in social process. But then it has not been so charged in the academic division of labor. Because the market is a tangible social construction opaque to tools familiar to economists, and because sociologists by and large have not looked, the market has remained a mystification—much as field anthropology has usually asserted. Developments from these sociological and anthropological traditions will be melded with insights from economics, as is traced explicitly in chapters 10 and 14.

The task of this book is to develop an explicit yet flexible framework for modeling any market in a production economy. The modeling is as applicable to the heavy chemical as to machine tool and other sectors. It is as applicable for Britain or Germany, say, as for the United States (and indeed there may be smaller divergences between countries than between sectors within a country). In Britain and Germany, production markets emerged earlier and later, respectively, than in the American Midwest. But in both European countries, the middling firms, as contrasted with American behemoths, predominated.[2] The production market mechanism is applicable also to analogous processes on a still smaller scale. One can even model barbershops, say, but with the handicap that business journalists and analysts will not furnish much of the investigative material needed to estimate the model, at least until their attention comes to be drawn, for example, to "rationalization" into franchised organizations (Bradach 1998).

Molecular Markets in Their Network Setting

What properties enable a market interface to constitute a foil against Knightian risk for its members? Market transactions deal with repetitive rather than

one-shot production; so the size of flows committed becomes one possible form of signal among the producers as to coming commitments to the market. Each can orient to a niche by the size that is appropriate to the market's assessment of its quality compared to that of its fellows, who also are orienting to niches: the market as joint social construction.

The venerable term *quality* suggests judgments of products in themselves, judgments made even of each product separately. The production market mechanism, however, relies on standings that, in contrast, emerge from interactions among judgments by both producers and buyers. Thus, it is dual notions of differential quality, referent both to product and to producer, that become established as the core around which a set of market footings for producers can reproduce itself as footings in a joint market profile. The two sides, buyers and producers, exert contending pressures on the shape of this profile, pressures that correlate with their respective discriminations of quality.

In actual business life, quality meanings become jointly imputed to properties that have gotten bundled together as a "'product," even though these properties may seem to an observer various and somewhat arbitrary. This bundle is perceived with respect to the product market as a whole, the source to which everyone turns for that bundle. Particular producers seek and realize differentiation in appreciation—the quality index—for their particular versions of that market product. And indeed, there often will be a cluster of variants by size, color, and so forth of that firm's product shipments, so that there is bundling at the firm level also.

Choices interact to influence and calibrate the repeated commitments of flows in production and in payment. Think of these markets as molecules. Although the atoms are business organizations rather than individuals, they are making choices of commitment levels. The bonding is competitive rivalry, somewhat analogous to the bonding of atoms in molecules according to the proportions of time orbital electrons spend around one or another atomic nucleus.

This interaction of choices presupposes prior establishment of comparability. A linear order of precedence is perhaps the simplest way to achieve comparability; it is analogous to a linear array of atoms in space within a molecule. Hierarchic inequalities of rank and rewards are pervasive among humans, and indeed, dominance or pecking orders are common among vertebrates of all sorts (Wilson 1979).

Reputation in invidious array is the coin of discipline for production markets. It is hard to sustain the mutual discipline of a pecking order when there are more than a handful or a dozen participants because of limits on perception and cognition (Chase 1974, 2000). Such limits are especially constraining for firms building a market molecule through signaling.

The standard view in economics is starkly different. Any number of firms

can fit into a market; indeed, the more the better. The small number of members, the extensive engrossment of the market by its top members, the rarity of ties in precedence order—none of these come as entailments of standard models. And yet all are widely observed and can be found pasted like Band-Aids, by empirical investigators, onto orthodox economic models.

One can note already that the quality or precedence orderings in a market have less load of social ordering to support than do pecking orders in self-contained groups. It is as if the insides of the small world of a pecking order of wolves were opened out and some of the influences, constraints, and signalings transpired outside the small world in network connections that spread out more in time, with less direct feedback, and thus are more visible to observation—and hence to analysis. Such markets are in some senses simpler than closed small worlds, but as parts of a spread-out system of generalized exchange, they also face Knightian uncertainty of a different order.

Because each market is tripartite—suppliers, producers, and buyers—it has two distinct possibilities for a market interface. These are an upstream orientation toward suppliers and a downstream orientation toward consumers. Producer firms establish themselves in niches within their jointly constructed interface only if and as their identities are reshaped within an emerging order by quality, as seen up- or downstream as well as by fellow producers in their market. Chapters 4 and 5 explore the etiology of quality, and chapters 6 and 7 generalize it by parameterizing the substitutability between markets that parallel one another in the production streams of an economy.

The necessary involvement of other markets and firms upstream and down adds complications; it also can justify signaling other than by volume (chap. 4, last section), and modeling larger linear arrays (chap. 5, third section). Network context is how production markets can be distinguished from vertebrate flocks, which fit into some general ecology but not into a long-range pattern of flows among other markets and firms in generalized exchange (fig. 1.1). And at the other extreme, market networks are also not analogous to hydraulic pumping networks, whether biological (within cell, plant, or animal) or technological. The phenomenology is different: Choices are made and changed by actors.

These human actors are oriented to their local contexts, and yet also more indirectly and abstractly they coordinate through common forms held across larger scope. Culture and discourse are not antithetical; indeed Greg Urban argues, "Culture is localized in concrete, publicly accessible signs, the most important of which are actually occurring instances of discourse" (1991, 1; see also chapter 15 below). Culture and discourse support dual flows of money as the generalized medium of exchange (chaps. 12 and 15).

The use of stream as a metaphor misleads if it suggests definite successions

of markets along fixed branches of the stream. That was the vision of Leontief (1966). There is some analogy between market orientation upstream or down and polarization of a molecule by alignment of the spins of its electrons in an external magnetic field (chap. 9). But here, *upstream* and *downstream* are construed as purely relative terms that describe role relations with respect to a focal industry. An explicit theory of decoupling can be inferred from, and will also help to explain, the existence and nature of the two options of orientation for the market mechanism (chap. 10).

Nine Known Phenomena to Be Explained Jointly

So much for introduction and rationale. Now let's turn to the goals of this modeling. New theory uncovers and predicts phenomena, but it can well begin with well-known phenomena that are not yet adequately explained as a set by any coherent scheme. The reader can check, as the book unfolds, that the model indeed embraces them all and goes on to others set at a larger scale.

1. *Small number*. Recognizable lines of business are constituted in and by some modest number of firms, typically fewer than twenty. The enduring legacy of transaction cost economics (Williamson 1975) is to have drawn attention to this.

2. *Identity*. This recognition comes as and through a long-continuing production market in the outputs of these firms, a market with an identity marked by a special register of discourse concerning its affairs: witness newspaper business pages or investor tip-sheets.

3. *Inequality*. A pecking order among the firms is marked by their unequal shares in gross output and profit of the market.

4. *Profit*. Businesses operate for and thus routinely incur profit, sometimes displaced by losses. They do not, as orthodox economic theory would have it, routinely operate with net returns of zero.

5. *Increasing returns*. When conditions in their continuing markets induce firms to increase production volumes, it is commonplace for them to expect unit costs to decrease.

6. *Perverse returns*. In many lines of business, accolades for higher quality in a firm's product accompany a cost structure lower than that of any peer judged of lesser quality.

7. *The rareness of monopoly*. Even in economies where monopolies are not subject to legal penalties, they are so rare as to be unnatural, despite frequent invocations of the peril of monopoly (especially by economists).

8. *Product industry life cycle*. Long-term observers (Lawrence and Dyer 1983) as well as the transactors in a given market typically expect to find, and formulate rules of thumb about, some secular trend in performance:

sometimes improvement, as with a learning curve improvement effect on costs, and other times degradation analogized to senescence.

And finally, a regularity at a more abstract level:

9. *Decoupling*. Rather than supply and demand, local variabilities and path determine market aggregates, which are historical, not accounting outcomes.

What is important about these nine phenomena is that all are explainable in terms of each other, brokered by a model that is operationalized around specific parameters.

Mechanism around Production Commitments

To "model" is to give explicit mathematical form to the phenomenology summarized in a mechanism. To a sociologist, "'mechanism' . . . gives knowledge about a component process . . . thereby increasing the suppleness, precision, complexity, elegance, or believability of the theory at the higher level . . . without doing too much violence to what we know are the main facts at the lower level. . . . The mechanisms must produce interesting hypotheses or explanations at the higher level *without* complex investigations at the lower level" (Stinchcombe 1988, 1).[3]

The production market mechanism must guide and yet also emerge from the choices of market actors who pay attention to an array of signals. It derives from the social construction of a quality order that producers as well as buyers recognize and regularly reinforce by their commitments. The fundamental idea is co-constitution of footings for firms through the interaction of their competitive strivings for acceptance in that line of business.

Our goal in this book is specification of a mechanism for the production market with a general yet detailed model using parameters that are explicit but widely applicable. Such a theory can with a single mechanism accommodate a variety of markets in their interactions. The formulas derived are to be interpreted richly, but they also must be kept sufficiently simple to permit the tracing of causal patterns.

The mechanism is necessarily a social construction, since there are no gods, no Walrasian imps, no Maxwell demons available to orchestrate patterns of choices in markets (putting aside, for now, the state and other political intrusions). Orchestration must emerge out of interactions. Yet the custodial discipline for markets, economics, has in general slid away from this issue of mechanism.

The present economy has grown up around production by firms that make commitments, period after period, within networks of continuing flows of goods and services. Markets evolved as mechanisms that spread the risks and uncertainties in placing these successive commitments with buyers. Firms shelter themselves within the rivalry of a production market.

Consider a mechanism for such a market. Guided and confirmed by the signals it reads from the operations of its peers, each producer firm can maneuver for position along a rivalry profile sustained out of the commitments of all the rival firms. These are repeated commitments rather than one-shot participation as by individuals at lawn sales. The increase in scale from persons to firms goes with a decline in the number of actors from individual to industry sort of market.

Some dozen or so firms are the players in a production market, the choosers who, period after period, commit to levels of output. Buyers come from a much larger pool across an economy, but most will be corporate firms, whether in manufacturing or other processing, including service. Competition by producers for interaction with buyers can sustain and reproduce a joint interactive profile in revenue for volume.

Call the total revenue received the *worth* of that volume of shipment: designate the volume as y and worth as $W(y)$.

Figure 1.2 is a graph of such pairs. Producers must interpolate through the particular set of observations to estimate a market profile. This is possible for figure 1.2, as is shown by drawing a line through the set of points. This is a smooth curve, easily estimated by the business analysts as a guide to a viable profile across them. Such a profile can discipline the commitments each producer makes to production volume in search of optimal results in revenue over cost.

Quality ordering becomes reflected in this profile of producers' revenues versus volumes, and it does so without requiring any explicit indexing of quality by market participants. Everyday attributions of market footings tend to become assimilated into a quality ordering that is transitive in the domain and network of that market's discourse. Existing network ties become folded into and supplanted by relations within a quality ordering, which comes to be perceived in terms of prestige that combines quality for consumption with competitive relations of rivalry.

The signaling mechanism can come to generate continuing commitments to production by all producers that can get reproduced as a set. Establishment of comparability among producers in each other's eyes is what induced and required establishment of a new relation among a market's producers as peers. Formally, comparability is most complete within a full linear order such as can be represented by a quality index. Substantively, comparability in such a pecking order becomes taken for granted and so all the more effective in framing perceptions.

Firms' exertions as reflected in their cost structures tend to be reflected in differential valuations by buyers in aggregate; otherwise they would not be a set of producers that survived as a profile mechanism emerging within patterns in structural equivalence among production flow networks. This correlation provides the basis for an array by perceived quality, a coherent linear

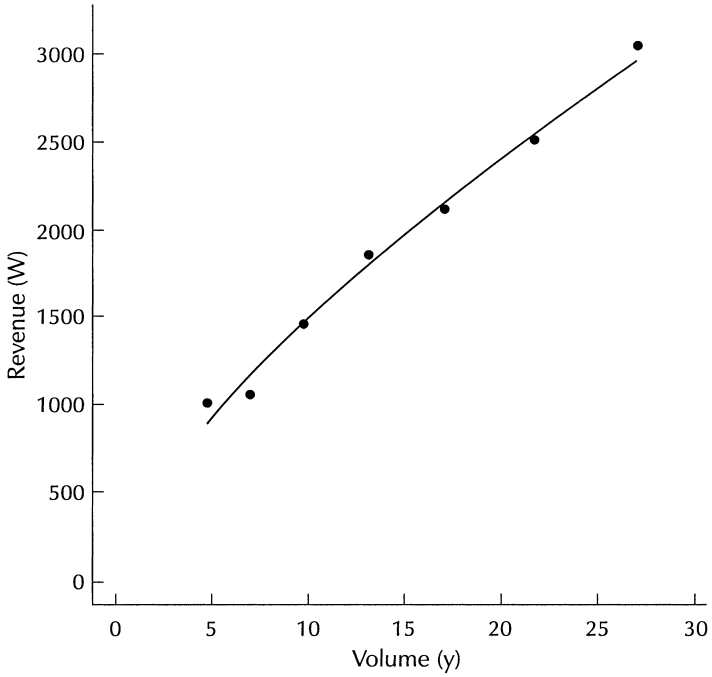

FIG. 1.2. A revenue-against-volume profile

array sufficient to support market profile. The quality index is just a specification by the observer of such an array.

Let's develop the notion of what *y* means to the buyer by turning from a focus on firms as buyers to individual persons, a scope that can also be accommodated by this market mechanism. Sometimes, a large *y* connotes higher quality, as in the soda pop industry, but at other times, lower quality, as in the wine industry. So the frequency with which buyers encounter a producer's output (the verb *encounter* is especially apropos for nondurable goods) can signal different things across different shapes of profile. As some goods monopolize shelf space, wealthier suburban mothers, like wealthy East Siders in Manhattan, shy away from them, since they are what the average person is buying. For other goods that receive high exposure in advertising, that's precisely what these shoppers buy. After all, the fact that everyone else is buying it confirms that it's the best.

Quality array comes out of particularities of historical process such that a producer's position on the quality index meshes its reputation as a firm with assessments of its product. Each of these two sides is affected by, and in, particular relations obtaining between the producer and other firms upstream and down. But the key to market formation is that these meshings be

ordered with respect to those of other like producers who are structurally equivalent as peers in the market established. The market profile succeeds in reproducing itself only if these various bundlings are such that products together with their producers are seen both inside and outside that market as falling into an array by quality, which often carries invidious overtones. Thereby, roles for firms in market networks are meshed with relative assessments of particular product flows.

Flows of information are central to the mechanism that steers and reproduces a production market. Terms of trade always have evolved through some form of exchange of information among the various parties to any market. Information desired by and useful to one party to the market need not, however, correspond with information as formulated by others. When it is possible for actors to make use of information read from the doings of others, let's call this information a *signal*. Fulfilled prior commitments are themselves the signals read off as profile by the producers.

Some See Markets, Some See Firms

From this same general mechanism derive many varieties of market. Constraints and opportunities for choices by the three roles—supplier, producer, and purchaser—differ among these market varieties, but all are calibrated by the sizes of flows being committed. Competing firms cluster to form a market through signals that then sustain dispersions in quality and cost, with respect to volume, as perceived either downstream or upstream.

Instead of one emanating from the other, quality and identity produce each other across the set of firms in interaction. Distinctive to the present model is its conception of the etiology of quality as a subtle social construction rather than an evident attribute. Just how this develops establishes the distinct identity of a market within its variety. Our model predicts a continuum of achievable identities for each variety in terms of parameters for context, with each variety of market embracing different ranges on these parameters.

Parameters capture and measure market context as sensitivities both to the volume of flows and to variabilities in quality for these flows. Parameter ratios then define a state space array, a plane that discriminates among varieties of markets and specific identities within varieties. Outcomes predicted by the model, in revenue and market share and the like, will be shown to correlate with and influence the outcomes of other markets that lie downstream, upstream, and parallel.

Recognize that distinct levels of identities are intrinsic to the mechanism. Markets are being constituted as a separate species of actor—molecular with respect to firms as actor atoms—through the reproduction of disciplines of competition for quality niches, yet also as shaped by larger context. The

array, the plane for contexts of a given market, is more analogous to the periodic table, which discriminates among the elements according to their atoms' electronic structures, than it is to an arbitrary index such as for books in a library. It is a map or topology across which to predict variation in performance.

This market plane already caught the attention of a group of French social scientists who had independently developed an economics of convention coordinated with substantial observation of several industries in European contexts. This group had identified four regimes of quality that seem to correspond to the most distinctive regions of contexts in the market plane predicted by the signaling mechanism. Their approach distinguishes business cultures.

Production markets evolved together with larger and more complex groupings of the initial entrepreneurial agents along networks of commerce. The historical background, noted earlier, is that networks of commercial connections sustained new, private sorts of bureaucracies called firms that induced and intermeshed with the new sorts of markets. These firms were by no means free-standing, by no means masters individually of their fates. Patterns of investment were crucial, and more than one format for systems of firms has appeared. Such evolution into firms came to include all sorts of coalitions and side arrangements. The most prominent avatar is the multidivisional firm (MDF) (Fligstein 1990), which builds exactly around the production market mechanism.

The boundaries are confusing. Business journalists usually report on individuals as acting from and within particular firms, but they report on prices acting within markets. The two framings direct attention differently. Each obscures some phenomena and brings others into focus. Those active in business switch in their discourse, unaware, between these idioms. A main goal of economic sociology is to integrate the two framings and thereby achieve a more complete realism.

This is difficult. Indeed, theories of economists, who take markets as fundamental, still lack effective characterizations of the process and structure through which particular firms actually constitute a market. So they largely pass over particular *firms* by settling for a stylized story of pure competition. But, analogously, analysts of firms, examining history or strategy as well as structures, usually pass over particular *markets* and focus on various relations among and orientations by firms. The really big firms are seen as together constituting a social field (Fligstein 1990; Mintz and Schwartz 1985; Mizruchi and Schwartz 1987; Useem 1982), and smaller firms are most often pictured in networks, in trade associations, or in attribute categories (Scherer 1970; Scherer and Ross 1990; Uzzi and Gillespie 1999).

Neither the economists' approach nor the firm analysts' has been able to provide a plausible mechanism for the market, because neither explains how

markets and firms interdigitate as they evolve together. That is the task of this book. The market mechanism proposed is robust across different kinds of organization within the individual producer firm, including the large divisionalized firms (MDFs hereafter) predominant in the present economy as a hybrid between market and firm. My prediction is that even the newest forms of production organization that have been heralded for some years now (e.g., Powell 1990; Powell and DiMaggio 1991) can be modeled in ways consistent with this same market mechanism.

Roadmap, with Conundrums and Devices

Known phenomena will be accounted for, and new phenomena will be uncovered. The core of the basic model of a market is laid out in regular prose in the last section of chapter 3, following upon careful buildup and technical analysis in chapters 2 and 3 (the most technical sections in these and later chapters are marked by asterisks). Markets in networks are theorized in chapter 10, which wrestles with conundrums of theory for these models that combine determinism with room for agency. The distinct new level of actor produced by embeddings is accompanied by decoupling. Thus chapter 10 is a culmination of the first three parts and points to the exploration of wider realms in part 4.

Each successive part adds, layer by layer, to the preceding minimal version of the model. Additional parameters are introduced only as the scope is enlarged. Each successive cumulation of chapters, such as 2–3, or 2–5 and then 2–8, can stand on its own as a coherent account without reference to subsequent generalization. But of course each new parameter has been foreshadowed at its neutral value in earlier chapters, just as the interpretive themes and constructs new to a part have been assumed implicitly in earlier chapters.

Part 1 fleshes out the sketch of the market mechanism. Chapters 2 and 3 lay out and solve equations for market profiles. Predictions require descriptions for each member firm in its business setting both upstream and down, but chapter 2 reduces the complexity through a simplified specification of market context—that is, of the two valuation schedules—relying on an ordering of producers indexed by quality. This permits a plane map in chapter 3 to differentiate ranges of market operation. This plane applies, no matter the particular locations on a quality index or the number of firms in the market.

Chapter 4 goes on to probe phenomenology and agency. The nature of signaling is broadened in several reconstruals in chapter 5. This chapter draws comparisons with the seminal work of Spence on market signaling, which suggest an addition to the plane of market varieties. Chapter 5 ends

with an analysis of monopsony and subcontracting evoked in response to Spence's account.

Part 2 places a focal market in competition with parallel markets. Chapter 6 situates this market of differentiated producers within interactive substitution that involves markets in parallel positions within the system of generalized exchange.

The chapter 3 plane map is seen in chapter 7 to be but one of a sheaf of parallel maps that are laid out as a three-dimensional market space. These chapters establish the molecular nature of the market as an actor distinct in level from its differentiated set of constituent firms. Chapter 7 goes on to trace the close correspondence between present findings and those of the French economics of convention.

Formulas to guide fittings of index values and parameters from observed outcomes in particular markets are then developed in chapter 8 for all parameters; Chapter 8 also ventures to derive predictions for values of two key parameters in terms of network contexts.

Then part 3 theorizes and expands on just how $W(y)$ markets site themselves in networks and across sectors. Chapter 9 articulates and specifies an alternative polarization for the market molecule, facing upstream. It thus uncovers and explains the hitherto little-noted bipolarity in the siting of a production market molecule. Predictions are made concerning circumstances inducing one market polarization over the other. Chapter 10 examines closely the embeddings and decouplings involved, both along stream and at edges.

Chapter 11 turns again to putting-out practices discussed at the end of chapter 5, by which markets may, when they erode, reconstitute themselves in contractual forms. Some kinship is shown with the pure competition theorized by orthodox economists and modeled by econometricians. This pure competition is related to asymptotic limiting forms of the $W(y)$ mechanism, and thereby kinship is shown also with induction of internal hierarchy out of a market context.

Part 4 explores change over time in wider institutional realms and multiple levels of actors. Strategic action again becomes the focus in chapter 12, as it was in chapter 4, along with related maneuvers. But now these are seen as exogenously rooted in financial markets, rather than as endogenously rooted in the roles and mores of the production market. Firms can come to sprawl across distinct markets, but still be disciplined by their profiles. The correlative struggles for increase of investment engender a new level of competition, which may still be modeled by analogues to the $W(y)$ mechanism.

Chapter 13 offers sketches for modeling dynamics directly rather than from successive cross sections of comparative statics. In this chapter, interventions and mobilizations—which shade into one another—together are

the dynamics to be assessed from tracks and predicted from trajectories in market space. We could have justified allocating still more pages for chapters 12 and 13 because they are key to the pragmatics of using the models, but instead I refer the reader to applications to be published separately by Matthew Bothner.

Chapter 13 ends with a possible scenario for evolution of the American economy, compared with a scenario consistent with the new evolutionary economics theory. Then in chapter 14 the latter is discussed and compared with $W(y)$ along with a sheaf of other pragmatic approaches to business study.

"The" market, being always observed in some sort of network system, is marked, as anthropologists say, by its subcultures and linguistic registers. Practice and subculture together frame the commitments chosen in markets that in turn frame the identities of participants in a line of business. Chapter 15 explores this constitution of business culture in a feedback loop with business practice. Economics itself results from variants of this process.

Chapter 16, the conclusion, explains some melding of economics and sociology in the analysis, summarizes some findings, and points to challenges that remain.

These chapters all together frame markets in a multilevel role system. Shifts in idiom accompany this interpretive account. Whereas the initial chapters construe the market mechanism as interrelated mores, the idiom becomes network ecology in later chapters. Because markets embed into, but also decouple from, networks of economic relations, every chapter works with identities at two distinct levels: firm and market.

This interpretive voice is twinned with mathematics as a voice in most of these chapters. Mathematical modeling is essential to clarity and definiteness, but getting the basic phenomenology straight is the core. We draw on this tradition for mathematical modeling in sociology and allied social sciences, notably on Coleman 1964, Rapoport 1983, and Simon 1957; see, for early overviews, Fararo 1973 and Leik and Meeker 1975.

The succession of mathematical derivations is marked by intricacy, and many distinct aspects of modeling must be fitted together within a consistent computational framing. Yet the modeling also must be coordinated with the interpretive scheme. This calls both for simplicity of components in the mathematical model and for as much explicitness in constructs as possible in the interpretive track.

The modeling voice switches back and forth between mathematical form and numerical computations according to which best captures relevant interpretive themes. And the numerical examples can make the mathematics more transparent. We have taken pains to make the present account accessible even to readers with limited mathematical background. Asterisks at the beginnings of sections denote concentration on exact formal statement in

equations. Most of the essential points from the modeling are, however, sketched nearby in other sections of text.

The resulting models can index predictions of market equilibria to a range of historical paths, which do not derive just from geography or technology. The crux of the mathematical modeling, for us, is effective characterization by parameters of contexts for the market. This is a distinctive feature of this model as compared to alternatives. Parameters are on a level with theoretical constructs (White 2000b). Both are designed for stability and interpretability, to permit tracing complex webs of causation. Simulation of what can happen becomes as important as poking at particular data sets on what did happen.

Firms in particular markets often are targets for, or sources of, maneuvers in larger realms of business and of state intervention, but these larger realms, explored for example by Fligstein (1990; 2001) and in Campbell et al. 1991, are only touched on in the present book. The $W(y)$ parameters that site the market mechanism in context reflect degrees of responsiveness in relations among firms themselves. Help in estimation of these parameters can come from sociolinguistic studies of reflexive indexicality, as discussed in chapter 15, so discourse registers and styles that characterize interaction around particular markets should be a focus of research.

There is some scholarly duty to give an account of relations to other writings, in this case from several disciplines but most especially from sociology and economics. Such accounts are woven into the most relevant sections of the chapters to follow. By comparison with most approaches in economics, the present model is most distinctive in its derivation from Knightian uncertainty together with its focus on asymmetry. Conventional microeconomic theory remains mute on market polarization and has slid away from its earlier emphasis on discrimination of quality. And yet microeconomics does contribute crucial tools and perspective toward analyzing the social construction of the market mechanism around quality order and asymmetry in flow. Altogether six related strands in economics are sketched in chapters 2, 5, 11, and 14.

The references from anthropology are primarily in regard to linguistics, but the emphasis on social construction is rooted in that literature as well as in sociology. Although the overall focus is on the market mechanism, organization analysts will find relevant sections in almost every chapter. Issues of perception and its framings are central in the model, but the only primarily cognitivist chapter is the second, which comes most directly from economics.

To model a mechanism for markets requires, we argue, drawing on economics only as fused with both anthropological and sociological ideas and perspectives (e.g., Strathern 1971; Burt 1992; Granovetter 1985). Optimization and rational choice are indeed important, but they are disciplined within and subsidiary to a joint social construction, a market. The central

idea is the emergence of the market as an identity, which is also a source of action: embedding together with decoupling, as is elaborated in chapter 10. Tracking the undoubted turbulence and disarray of socioeconomic action seems by comparison a mere diversion for theory, though the new evolutionary economics argues differently (see chapter 14).

The reader can expect to wrestle with five conundrums:

1. *Action vis-à-vis role*. This conundrum of agency begins in chapter 2, with the play-off between path measure k and profile. It is developed around unraveling in chapter 4, reemerges in subsequent chapters, and is then again central to chapters 12, 13, and 14.
2. *Historicity*. This is the first conundrum seen in different light. Indeterminacies such as here of market profiles and networks lead the new evolutionary economics (see sections of chapters 5 and 14) to introduce explicitly stochastic features into their modeling.
3. *Network vis-à-vis molecule*. This conundrum is at the center of parts 3 and 4. It melds with the existence of distinct levels of actors with their niches and embeddings. But neither the network nor the molecule metaphor emerges unchanged in the $W(y)$ modeling, nor are any simple notions of boundary supportable.
4. *Self-similarity*. The same architectonics reappear again and again at different scopes, both in scale or extension (chap. 6) and in the two polarities (chap. 9). This ties to the previous conundrum.
5. *Mixed languages*. Optimization figures centrally, for example, but it is subordinated to imperatives of economic survival under Knightian uncertainty, which induce framings of market situations as joint social constructions that are costly—if also enticing—to evade: costly because enforced by taken-for-granted mores built into the accustomed discourse of a market sector (chap. 15).

The sixteen chapters meld several distinct arguments and address diverse constituencies, none of which will be entirely comfortable with the resulting synthesis of approaches. Historical view comes to the fore in dissecting quality (chap. 4). The language of state space is ubiquitous (chaps. 3, 7) and accommodates alternatives to $W(y)$ (chaps. 5, 11). But social network analysis pervades this book—readers unacquainted with it are referred to Degenne and Forsé (1999) as a comprehensive introduction for scientists.

Two devices in this book have proved central to obtaining explicit models. One is quality array (pecking order), dissected in chapters 2 and 4. The other device is the representative firm, which is central to the formulation in chapters 2 and 3. Only with chapters 6–8 (part 2) does there appear an explicit set of firms, such as are reported numerically in the appendix tables A.1–A.5 and descriptively in text accounts of particular industries such as light aircraft manufacturing (chap. 4).

The two devices presuppose and dovetail with each other. The quality array is a precursor to the search for optimality. The representative firm is an anticipation of the self-consistent field approach, which is spelled out in chapter 8 for estimation of parameters in market networks, and, a level below, for analysis of the set of firms in a market in terms of the quality index values of the member firms. This is a marvelous illustration of the self-similarity conundrum.