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Oligopoly Theory, Communication, and Information

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The stage is set for the development of a mathematical institutional economics which is simultaneously more abstract and more institutional than much of economic theory to date. The need for this development can be seen clearly by examining both the successes and failures of oligopoly theory.

Oligopoly theory has been the skeleton in every economic theorist's closet. Virtually every course in theory has a few hours spent in telling the students about the problems posed and showing them a few classical "solutions," after which the subject is dropped. The reason for this treatment is because we do not have a generally accepted adequate theory of oligopoly.

The reasons why we do not have a satisfactory theory are central to many economic problems. They exist for microeconomic models of competitive markets and they are hidden in the assumptions made in macroeconomic models. However, it is possible to gloss over the basic difficulties in these because, although they are still there, they do not appear to play as central a role as they do in oligopoly theory.

The key items are:

(1) the number and "size" of economic agents,
(2) the communication system,
(3) the state of information,
(4) the specifics of structure of both industrial and financial institutions, and
(5) the roles and goals of economic actors.

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These items primarily involve the description of the structure of a firm, industry, or market. Considerations of structure (especially in reference to information and communication) cannot easily be separated from considerations of behavior. Thus we may need to reconsider the nature of the decision making of the individual we choose to regard as the economic decision maker.

I. Different Approaches to Oligopoly Theory

There are four broad approaches to oligopoly theory which merit distinguishing. Not only are they complementary with each other, it is my belief that in the new theory that is emerging they will come together. The approaches are:

(1) mathematical models of oligopolistic competition,
(2) institutional studies and industrial organization,
(3) "neoclassical" oligopoly theory, and
(4) behavioral models of oligopoly, the "new industrial organization" and gaming experimentation.

Ever since Cournot, oligopoly theory has provided a rich source of models for the mathematically inclined. The works of A. A. Cournot, J. Bertrand, F. Y. Edgeworth, H. Hotelling, T. Bowley and others attest to this as do the more recent works using game theory including R. J. Aumann, R. Selten, Shubik, B. Shitovitz, L. Telser, and others.

Most of the mathematical models have

been static. They have divided more or less naturally into those stressing some variant of a noncooperative equilibrium as a solution and those considering cooperative solutions such as a contract curve or the core.

The research and teaching on industrial organization has scarcely intersected with the mathematical work, although this is now beginning to change. Nevertheless, until recently the painstaking detailed studies of individual industries and firms, such as those of A. F. Kahn and M. G. DeChazeau, J. Peck, F. M. Scherer, J. B. Dirlam, and others, have been rarely if ever read by those concerned with mathematical models. Being institutionally oriented, this work may be read by lawyers before other economists. (See, for example, H. Packer.)

Neoclassical oligopoly theory is scarcely well defined, but I would lump under this title E. H. Chamberlin, W. Fellner, H. Brems, F. Machlup, G. Stigler, H. von Stackelberg, P. Sylos-Labini, J. J. Bain, and several others. They are all less mathematical than the first group and less institutional than the second. Chamberlin's contribution, for example, was mathematically less rigorous than that of Cournot, but contained much more relevant economic modeling. Bain's contribution on the study of entry is closer to an institutional study than the others in this group.

The key characterizing features of what I have called "neoclassical oligopoly theory" are that the analysis is in an open or partial equilibrium context; much of the discussion is cast in dynamic or quasi-dynamic terms; information implicitly plays a role; money explicitly plays a role (trade is in goods for money and vice versa) and the solution sought is some sort of noncooperative or quasi-cooperative equilibrium.

In general, in this type of theorizing (with some exceptions, Bain and Brems, for instance) there is little in the way of micro detail on the differences in the communication and information patterns in different industries or on critical technological factors which limit the scope and timing of moves.

This type of oligopoly theorizing is sufficiently spiritually close to the style of Marshall's partial equilibrium analysis and comparative statics that it supplies the major source for the two or three lectures on oligopoly that are thrown into the microeconomics courses.

The fourth approach to oligopoly theory has come about through a basic dissatisfaction with the other three. The key characterizing feature of this approach is a central concern with the explicit description of process. It is explicitly concerned with dynamics and with disequilibrium. There are possibly three different modes of development which can be discerned. They are:

(1) behavioral models of the firm and simulations,
(2) experimental oligopoly investigations, and
(3) mathematical models of search and other economic activity under incomplete information.

These approaches cannot be easily compartmentalized as they overlap. The first is best characterized by the work of R. M. Cyert and J. G. March, R. Nelson, S. Winters, and several others. It is spiritually linked to the large business games, such as the Carnegie Tech game, as well as to operations research work in marketing, production scheduling, finance, and other special functions.

An important link among economic theory, operations research, and computer simulation of behavior comes in the attempts which have been made to build models of the behavior of specific firms or parts of firms (see A. M. Schrieber). Much of this work is done without academic

blessing; many studies done by and for private firms do not see the light of academic day and probably many do not deserve to be taken too seriously. Nevertheless, the efforts expended in attempting to construct detailed simulations are beginning to provide a connection between institutional and theoretical studies. The simulations are frequently rich in detail, yet at the same time spell out process.

Experimental oligopoly research is small relative to other scholarly activities, but since 1948 it has been growing and includes work by Chamberlin, T. Dolbear, L. Fouraker, J. Friedman, A. Hoggatt, Selten, Shubik, S. Siegel, V. Smith, and others.[1] There are several messages that this work has to deliver, the major one being that the specific details of communication, information, and the mechanisms of the market have considerable influence on the play when numbers are few.

Most of the experiments have employed students or individuals who are not senior businessmen; the time of play has been relatively brief and the stakes have been for the most part small or nonexistent. Thus what we are learning about is the behavior of students playing in business or economics games with low financial incentives and little if any institutional identification. Even so several useful observations can be made. Numbers play an important role. Without face-to-face communication the numbers in an experimental game appear to be 1, 2, 3–6, and "many." Information overload and computational limitations are also clear in the behavior of business game players. The coding and information processing step going from a matrix game to one with balance sheets is large. In all of the work the importance of sociopsychological variables is evident. These include "bargaining ability" in the work of Siegel and Fouraker, "trust" and "cooperativeness" in the work of Hoggart, T. C. Liu, and others. Furthermore, different approaches to cooperation and to decision making are evident in the work of Siegel and Fouraker, D. Stern, Shubik and G. Wolf, and others.

The third of the new approaches covers explicit models of search and behavior where information is scarce and costly. This includes work by P. Diamond, H. Leland, J. McCall, D. McFadden, M. Sobel, M. Spence, and others.[2]

II. A Reconciliation of General Equilibrium and Oligopoly Disequilibrium

General equilibrium theory and partial equilibrium offer us the concept of the efficient anonymous market price system. Oligopoly theories, in contrast, suggest the noncooperative equilibrium: quasi-cooperative solutions involving leaders and followers, "kinked oligopoly reaction functions," cooperative agreements, or a variety of behavioral mechanisms.

When general equilibrium theory is contrasted with work in oligopoly theory, it appears to be so pristine, general, mathematical, and noninstitutional that it makes the latter appear in utter disarray. This could be because oligopoly theorizing is not abstract enough or because there may be within the presentation of the general equilibrium system a false generality which conceals many gaps in basic modeling. I believe the latter is true.

There are at least eight desiderata for any robust economic model of markets which any student of oligopoly will recognize. A reasonable model should:

(a) depend explicitly on the number of participants;
(b) contain an explicit description of the functioning of the market mechanism;
(c) be able to handle nonsymmetric in-

[1] For a detailed bibliography, see M. Shubik.

[2] A recent article by M. Rothschild provides a survey.

formation conditions;

(d) be defined for all positions of disequilibrium as well as equilibrium;
(e) be able to handle markets with few traders and other markets with many traders together;
(f) have assets and capital structure play an important role;
(g) have money and finance play an important role; and
(h) be consistent with behavioral models of economic process.

The general equilibrium model as presented by K. J. Arrow, Gerard Debreu, and others fails to satisfy any of these criteria. The noncooperative behavioral model first suggested by Cournot as a solution to oligopolistic competition can be modified so that it satisfies all eight.[3] The work of Chamberlin, Stackelberg, Fellner, and many others and the recent work in game theory as applied to economics can be interpreted as variations on this theme.

The variety and difficulties manifested in oligopoly theory are a reflection of the maze of institutions and complex of processes which make up economic life. There is an underlying structure to these economic processes but in order to appreciate it we must be simultaneously more abstract and more concrete or institutional than most of current microeconomic theory. The theory of games, the new work on search and decision making under uncertainty are beginning to provide the basis for the former; process models, simulations, and direct empirical work are providing the latter.

[3] For a discussion of this somewhat cryptic remark, see Shubik.

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