COMMENTS

A NOTE ON THE DEFINITION AND MEASUREMENT OF COMPETITION IN REGULATED INDUSTRIES WITH SPECIAL REFERENCE TO TRANSPORT

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The purpose of this note is to clarify problems inherent in the determination of the existing competition in regulated industries. No attempt is made to develop statistical measurements; such measurements can be derived only after the problems have been defined and must take into account the particular structure of the industry in question. The problem of measurement of competitive conditions can only be approached after the general analytical difficulties are solved.

The determination of the degree of monopoly

The problem of an operationally meaningful definition of the degree of monopoly has received considerable attention in economic literature.[1] The fundamental problem of its measurement (or conversly of the measurement of the degree of competition) relates not only to the lack of available data, but also to the conceptual difficulty of relating the observable phenomena of the market structure to the behaviour of the firms. For a systematic analysis of the problem two alternative approaches may be distinguished, namely, the "morphological approach" (which implies the study of the number of competing firms and degree of concentration) and "behavioural approach" which studies the way the firms actually behave. "Monopolistic behaviour occurs if a seller

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1. See F. Machlup, *The Political Economy of Monopoly—Business, Labor and Government Policies*, Baltimore 1952 and Literature quoted by Machlup. On measures of industrial concentration, see M. A. Adelman, "The Measurement of Industrial Concentration", *Review of Economics and Statistics*, 1951, G. Rosenbluth "Measures of Concentration" in G.J. Stiegler (ed.) *Business Concentration and Price Policy*, Princeton, 1955. For a good textbook discussion summarizing recent methodology of measurement of industrial concentration and the relationship between measureable concentration and firms' behaviour, see D. Needham, *Economic Analysis and Industrial Structure*, New York, 1969.

in his economic plan reckons that his sales depend only on his own parameter of actions (for example, on his price) and on the behaviour of the buyers, but does not depend on the action-parameters of other sellers. As soon as a seller reckons that his sales also depend on the action-parameters of other sellers he is no longer behaving as a monopolist. He no longer feels himself alone on one side of the market . . . There can be no doubt that for the course of the economic process through time it is only the mode of behaviour of the economic subject that is relevant. The morphological structure of an economic area, or the number of sellers and buyers in it, plays no role . . . It can only be monopolist. He modes of behaviour are bound to particular forms of supply and demand. Such a relationship does not necessarily hold".[2]

Under conditions of regulation, the behaviour of the firms must necessarily be affected also by the expectations regarding possible actions of the regulating agencies.

The difficulty of relating observable market structures to the monopolistic behaviour does not imply that investigation of such market structures are of minor interest. They cannot be considered to be a substitute for the analysis of the output, pricing and investment policies of the firm, but they provide useful supplemental information on the structure of the industry and often suggest explanations for certain behavioural patterns. The following sections will deal with some of the more important difficulties in empirical studies of the market structure with special reference to regulated transport industries.

Definition of the Market

Since the existence and the degree of competition is always defined in terms of a "market", the definition of a market is basic to our further consideration. Market can be defined as the network or relationships between the potential buyers and sellers of a service or a commodity. Thus in order to define the market it is necesary to define the commodity or service in question.

In the case of transport, the definition of a service involves certain complications.[3] These complications relate to the *directional* characteristics of transport output, *specificity* of transport capacity (e.g. a

2. Erich Schneider, *Pricing and Equilibrium* (English version by E. Bennathan, London: 1962, pp. 57 and 58. In the case of "perfect competition" the actions of a great number of firms establish the "market price" which a competitive firm has to accept.

3. For a discussion of the complications involved in the definition of the output of transport industry see: G.W. Wilson, *Essays on Some Unsettled Questions in the Economics of Transportation*, Bloomington: 1962; G.W. Wilson, "On the Output in Transportation",

tank truck cannot be used for transport of automobiles!) and non-storability of the capacity produced. Transportation output is defined differently from the point of view of a transport enterprise (carrier) and from the point of view of the buyers of a transport service, consignees and/or consignors).[4] From the point of view of a transport enterprise, the output is defined as a capacity to carry certain types of goods, at a certain point of time between points of origin and destination. Thus the three characteristics defining the output are: (i) capacity (ii) time (iii) location of points between which the movement takes place and its direction. From the point of view of a buyer a transport enterprise (carrier) the "output bought" is simply the carriage of a certain quantity of goods (or persons) from a point of origin to destination at a particular time under certain conditions usually described as "service quality" (e.g. speed, probability of loss in transit, etc.). In addition, the buyer of a transport service is also interested in "service availability", output are: (i) capacity defined in terms of probability of being accomodated within a specific period of time.

It follows, from the above analysis, that a "transport market" must be defined in terms of the availability of a particular type of service of certain characteristics *from* a particular (origin) *to* a particular point (*destination*).[5] It is the number of independent firms providing service within such a defined market—not an overall number of firms in an industry—which is relevant from the point of view of assessment of the competitive conditions prevailing in a particular transport market. It also follows that little specific meaning can be attached to a general statement of the nature: "competition in the road, (air, rail, water, etc.) transport industry", except as a generalization of conditions existing in a great number of specific transport markets which a particular transport industry serves. In other words a statement that transport industry A is more competitive than transport industry B can only be interpreted to mean that transport markets served by industry A are more competitive than transport markets served by industry B, if a suitable index for this comparison can be developed. The number of firms in each industry do not—by themselves—define the degree of competition. This can be

4. The two main implications of this defintion are: (i) movement of carrying capacity *from* A *to* B, usually involves the generation of similar capacity *from* B *to* A; (ii) part of the capacity which is not utilized is lost—this leads to the problem of the load factor risk, i.e. who (the carrier or the buyer of transport service) pays for the costs of moving unused capacity.

5. In some cases it is more convenient, and more meaningful, to consider a number of related points (usually within the same area) as an origin or destination.

illustrated by the following example: assume industry A is composed of two carriers, and industry B is composed of ten carriers, each serving eight equal sized markets; carriers to industries A and B are assumed to be competitive in commonly served markets. The competitive conditions are illustrated by the following table:

	No. of Carriers Serving the Market		
Market	Industry A	Industry B	Total
I	2 (a 1, a 2)	4 (b 1, b 2, b 3, b 4)	5
II	2 (a 1, a 2)	4 (b 1, b 2, b 3, b 4)	5
III	2 (a 1, a 2)	3 (b 5, b 5, b 7)	5
IV	2 (a 1, a 2)	3 (b 5, b 5, b 7)	5
V	2 (a 1, a 2)	0	2
VI	2 (a 1, a 2)	0	2
VII	2 (a 1, a 2)	0	2
VIII	2 (a 1, a 2)	0	2
IX	0	2 (b 8, b 9)	2
X	0	1 (b 8, b 9)	2
XI	0	1 (b 10)	1
XII	0	1 (b 10)	1

The average number of competing carriers serving industry A's markets is 3.5; a similar average for industry B is 3; no market served by carriers of industry A has less than two competing firms; in one quarter of the markets served by industry B monopolistic conditions prevail. This example is admittedly an artificial one, but it serves to illustrate the dangers of counting the overall number of firms in a certain industrial classification to determine the degree of competition.

However the sizes of competing carriers serving markets are relevant as far as their ability to compete is concerned. In this way, a firm serving a number of transport markets may influence the rates and standard of service prevailing in each of the markets it serves to a degree larger than that indicated by the measurement of its share of traffic in a particular market.

Direct, potential and indirect competition

In addition to "direct" competition i.e. the firms actually competing in a particular market, the competitive behaviour of the firms is affected—often to an important degree—by the existence of "potential

competition", i.e. the existence or potential existence of firms which, given certain profit expectations, could enter the market.[6]

In a regulated industry, the existence of a licensing system restricts the freedom of entry. However the possibility of new licenses which can be issued, and the assumption that there are usually carriers interested in entering the market which is inherent in restricting the freedom of entry, (if they were not restrictive licensing would be meaningless) may—and usually does—affect the behaviour of carriers protected by licensing. Furthermore, the licensing does not completely block the freedom of entry; in many transport industries, notably in of firms which, given charter, the potential competition from "private carriage" often exists. This type of potential competition is particularly dangerous, since the threat is greatest where the revenues from a particular account are highest, and, secondly, once "private carriage" often exists. This type of potential competition is particularly dangerous, since the threat is greatest where the revenues from a particular account are highest, and, secondly, once "private carriage" organization is established by a customer he has a maximum incentive to use it in preference to the services of "public carriers".

In addition to potential competition one must often consider the existence of "indirect competition". Indirect competition is defined as a state where the output of a particular industry (say, transport) is an input of another industry which sells its products in a competitive market. In other words, indirect competition exists where the demand for the product of an industry is a derived demand of another competitive industry. If the services of an industry—such as transport—form a considerable part of the costs of the industry which purchases them, and if the "customer" sells under competitive conditions, then the effects of such a state of affairs on the carriers' pricing (rate setting) policies are likely to be quite profound. This helps to explain why even in the days of "railways' monopoly" certain "low value, high volume" commodities enjoyed very low rates: transport costs of such commodities formed a considerable part of their total costs at a point of final sale, and if the commodity in question was marketed under competitive conditions the "traffic could not bear" high transport costs.[7]

6. This is one of the important reasons why the existence of "free entry into an industry—free exit from the industry" is one of the necessary conditions for the existence of perfect competition.

7. Thus "low value" of the commodity which "could not bear" high transport costs existed because it was sold in competitive markets; "high volume" referred to in this context was relevant because it often was associated with a high proportion of transport cost total costs (at a point of final sale).

A special manifestation of indirect competition exists in cases where a particular movement (or movements) of traffic forms a part of a more involved pattern of commodity movement. Two examples should help to illustrate the typical cases:

> Example I: Product of an area X is destined for export to an overseas country Y. The exports could be routed either via port A or port B; in such a case carriers connecting X with A and carriers connecting X with B are in indirect—nevertheless real—competition with each other.
> Example II: Point P could be supplied either by traders located in Q or R. In this case routes QP and QR are indirectly competitive and form a part of the same transport market.

In both examples, the effectiveness of competition does not only depend on the actions of the carriers in question (defined here as "indirectly competitive") but also on factors such as relative efficiency of competing ports, traders in competing supply centres etc.

The interest of regulatory agencies in the existence of "competitive" conditions.

The interest of regulatory agencies in the existence and degree of competition is, in the final analysis, related to the existence of choice and the problems of pricing.

It is usually assumed that competition is "good" because its existence guarantees the greater choice for the customer. This may or may not be true in cases where the number of competitors is very limited (in an extreme case in the case of duopoly). Under such conditions "duopolistic", or even "oligopolistic competition" may lead to a smaller range of choice: this tendency is sometimes referred to as the "principle of minimum differentiation", which is well documented in Steiner's study of the effects of competition in broadcasting.[8] Steiner observed that broadcasting competition leads to the concentration of service in the majority market, with minority markets being less well served than under monopoly conditions. Similar examples are available in air transport, where duopolistic competition often leads to "bunching of

8. P.O. Steiner, "Monopoly and Competition in T.V. Some Policy Issues", *The Manchester School*, 1961 and "Program Patterns and Preferences and the Workability of Competition in Radio Broadcasting", *Quarterly Journal of Economics*, May 1952. A clear summary of the argument is available in R.G. Lipsey, *An Introduction to Positive Economics*, 2nd edition, London: 1966 pp. 386-390.

schedules"—i.e. both competing airlines aiming at obtaining the greatest share of the market tend to schedule their flights at the same times (peak times), whereas a monopoly carrier would spread the schedules more evenly. In such a case the passengers wishing to travel at times other than peak would find their choice actually diminished because of the competition.

It is also assumed that the existence of competitive conditions will lead to lower rates by elimination of "monopoly profits". In other words, the existence of competitive conditions brings about automatic price regulation through the workings of the price mechanism. This is quite correct, if (i) perfect competition exists, and (ii) the existence of competition does not result in the competing forms being less than of the optimum (most efficient) size. Under conditions of perfect competition all firms would operate at a level at which the full opportunity costs (including the opportunity costs of entrepreneurs or "normal profits") are covered but no monopolistic profits exist. Given free entry and exit into and out of the industry and mobility of factors of production, no reason exists why the firms could not eventually grow into the optimum size (although this may lead to the mass elimination of competing firms and thus the disappearance of perfect competition). However, given the normal conditions in transport markets "competitive" conditions, even if they exist are far from those of perfect competition; monopolistic or imperfect competition or oliogopoly is likely to mechanism. This is quite of production, especially entrepreneurial talent and finance, are not likely to be perfectly mobile; thus conditions of temporary excess capacity, long term existence of firms of less than optimum size, as well as temporary shortages of capacity and monopolistic profits are quite likely to be common.

Under these conditions the "lowest possible rates consistent with long term availability of service" may or may not be consistent with the maximum degree of competition. Low profits and high rates are not necessarily mutually exclusive, and once such conditions become established they may quite easily perpetuate themselves. The exploration of this problem is, however, outside the scope of the present note. It is assumed here that the regulatory agency or policy makers (including those who investigate the industry structure to establish facts on which policies could be based) are interested in the determination of the degree of competition. The previous analysis of the nature of transport markets and of the complexities introduced by the existence of "potential" and "indirect" competition indicated the difficulties which an empirical measurement scheme must resolve. Obviously, it is unlikely that sufficient

data would exist to allow direct quantification without further simplifications and approximations. The quantity and quality of data available varies tremendously from industry to industry; with the most sophisticated and relatively most adequate data existing for air transport (at least in Canada, the United States and major aviation countries); at least adequate data existing for high transport. The differences in the structures of the two industries do not fully explain this phenomenon, which is largely the result of the different development patterns and managerial characteristics.[9]

In addition to statistical measurement an extensive—although difficult to systematize—source of information is the material provided at regulatory agencies' hearings and special inquiries. The quality of such material varies tremendously. Shippers' evidence regarding the availability and quality of service, rate practices etc., is often highly coloured by the interests and feelings of individual shippers and their willingness to risk revealing information about their own activities. sophisticated and relatively carriers to present pertinent facts (and their willingness to do so) often depends on factors such as managerial attitude to regulatory procedures, ability to obtain relevant data and talent of the legal advisers retained. All that points to the importance of regulatory agencies assuming an active part in obtaining the relevant evidence, and is predicated on the adequate briefing of the agencies (and their examiners) by research staff and the availability of data. In short, the more the agency knows, the more it can learn through hearings and special inquiries—and this applies to the problem of the determination of the degree of competition with as much force as to the establishment of any other relevant set of facts.

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9. Technological complexity and relatively high capital costs of equipment in air transport made airline management much more conscious of the usefulness of data gathering and analysis and more willing to accept sophisticated methods of data processing and operations analysis. Growing within the same area industry may bring about similar attitudes to that industry.