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PRICE-TAKING BEHAVIOR

BY LEIF JOHANSEN¹

A recent paper by D. J. Roberts and A. Postlewaite [1] shows a possible justification for the assumption that participants in a market behave as price-takers when the number of participants becomes large. The present note compares this justification with other approaches to the same question and argues that the various approaches are complementary rather than alternative since, in order to demonstrate the viability of a system with price-taking behavior, *all* types of feasible deviations from such behavior must be explored. The note introduces a taxonomy for such deviations which may be useful in comparing various approaches and contributions found in the literature.

THE CASE FOR THE ASSUMPTION of price-taking behavior has not been convincingly made in standard economic theory. This is now generally recognized, and several contributions from the last 10 to 15 years have tried to fill the gap by studying how incentives for price-taking behavior increase with the size of the economy, somehow defined in proportion to the transactions of the individual decision unit. D. J. Roberts' and A. Postlewaite's recent contribution [1] is an interesting and important addition to this literature. In this note I shall not take exception to the main part of their analysis. I would like, however, to comment on their concluding section where they evaluate their results and put them in perspective by comparing with other approaches.

Roberts and Postlewaite observe, in the introduction as well as in the concluding section, that their results "provide one justification of the competitive assumption." They compare this with the literature on the core of an economy and competitive equilibria, more specifically with the analyses which show that the core shrinks to the set of competitive equilibria when the size of the economy increases, and they observe that this branch of literature "points to another possible justification."

In my view these approaches should not be considered as alternative, but rather as *complementary* approaches. There is no need to take a stand as to which one is the more fruitful or realistic; both approaches are needed. The reason for this can be briefly sketched as follows.

Consider an economy for which a competitive equilibrium exists. We want to find out whether this is a stable situation, not from a dynamic point of view, but from the point of view of incentives for deviating from the price-taking behavior assumed in the definition of the competitive equilibrium. In order to reach a positive conclusion about such stability it is necessary to explore in principle *all* types of deviations from price-taking behavior which are open to the participants. The various possible actions which might be considered by the decision-makers can be classified according to the following criteria: In the first place, we may distinguish between actions which can be taken on an individual basis, and actions which require the coordinated decisions by more than one agent. In the second

¹ I am grateful to D. J. Roberts, A. Postlewaite and a referee for interesting communications.

place, we may distinguish between actions which are confined within the rules of prices and markets, and actions which are not so confined. According to this classification we have four possibilities out of which only three are relevant, as indicated in Table I. (Each class could of course be further subdivided according to other more detailed criteria.)

TABLE I

	Actions under the price and market regime	Actions not restricted by the price and market regime
Actions taken on the basis of individual decisions	(1) Studied by Roberts and Postlewaite	(2) (Irrelevant)
Actions taken by coordinated decisions by two or more agents	(3) Various forms of collusive market behavior	(4) The theory of the core of an economy

I shall comment briefly on the various cases represented in the table.

Case (1) represents actions taken on the basis of individual decisions, within the framework of the price and market regime. This is the case studied by Roberts and Postlewaite. They show how incentives for actions deviating from price-taking behavior within this class vanish as the size of the economy increases in some sense. In general one might question the way of posing the problem in this class. The problem refers to the possibility of taking individual actions. Models permitting the study of such possibilities somehow neglect the fact that there is a buyer involved in every sales action, and vice versa. Thus purely individual actions are not possible. A sort of impersonal market pool where all sellers dispose of commodities supplied, or a market administrator with no objective of his own, is introduced implicitly or explicitly to resolve this problem. However, this problem is not specific to Roberts' and Postlewaite's study (the fact is that most of standard micro-economic theory, which forms the basis for general equilibrium theory, considers only individual decisions), and we shall not dwell upon it here.²

Case (2) represents actions not restricted by the price regime which will be actions involving direct exchange of goods. A sort of cooperation or coordination between two or more agents is necessary; accordingly case (2) in the table is ruled out as irrelevant (disregarding gifts in kind).

Case (3) refers to actions taken by coordinated decisions by two or more agents within the framework of the price and market regime. This case is not treated by

² Recent work by L. S. Shapley and others on "non-cooperative general exchange" could also be referred to this class (1). It would, however, be beyond the purpose of this brief note to try to survey the literature.

Roberts and Postlewaite apart from some elements which are implicit in their Theorem 2.³ The main problem in class (3) would seem to be the classical problem of tendencies towards collusive behavior by resource owners and producers (if we broaden the view so as to consider not only exchange economies). This problem is of course well known in economic theory at least from Adam Smith's reference to conspiracies against the consumers. At this point there is hardly any doubt about the existence of incentives for deviating from price-taking behavior, and there is of course also ample evidence of the empirical relevance of the problem. The chances of successful deviation from price-taking behavior are best if one group of agents can coordinate their actions while other groups remain as individual price-takers within the framework of the market regime, i.e., other groups are not able to establish "countervailing power."

Under class (4) come the theory of the shrinking core and other cooperative game approaches using various solution concepts. In this case it is not assumed that the agents are restricted in their actions by any price and market regime. The only restrictions imposed are the ownership restrictions that nothing can be taken away from any agent without his consent, and the physical restrictions that no more can be allocated and distributed than what is available initially or produced. Within the limits set by these restrictions all sorts of coordinated actions are permitted. In the context of the present note the central result in this field can be interpreted as saying that no group can gain by breaking away from the rest of the agents and managing their own resources differently from that which is effected under the competitive market equilibrium; and, as the number of agents increases beyond any limit, the competitive equilibrium, with price-taking behavior all around, is the only solution which possesses this kind of robustness against formation of coalitions.

Referring back to case (3) an equilibrium with monopolistic behavior in some branches might appear to be a stable situation under a price and market regime. The result referred to concerning case (4) implies that such a situation would not be robust against the formation of coalitions of the type treated under case (4). This is evident for instance from the fact that a monopolistic equilibrium is not Pareto optimal with reference to all agents: in such a situation the coalition of all agents, including resource owners or producers and consumers, would be able to improve on the situation for all agents involved when they are restricted only by ownership and physical constraints, i.e., they would "block" the monopolistic equilibrium.

Summarizing the incentive test for the price-taking equilibrium, Roberts and Postlewaite cover up case (1)—or at least a quite wide range of cases which can be classified under (1), and the core theory covers up case (4), while there is no theory (and can hardly be any) which shows that the incentives for deviating from price-taking behavior by collusion under case (3) vanish when the number of agents increases. For case (3) it should however be added that there are, so to

³ See the closing remark by Roberts and Postlewaite referring to the possibility that "choices of responses may be coordinated."

speak, more dimensions to the incentives issue. If for instance a cartel is formed, then there will obviously be individual incentives for each member to break out and supply more than permitted by the cartel if he believes a sufficient number of the other members will remain in the cartel and contribute to keeping the price high. This points to an inherent stability problem: In a competitive equilibrium situation there are common incentives towards collusive behavior; in a market situation thus established there are again individual incentives to break out.

I think practical experiences bear out these conclusions quite well. In free markets with many sellers of homogeneous goods there is not much to be seen of significant deviations from price-taking behavior based on individual decisions, thus confirming the results for case (1). There is also not much to be seen in market economies of groups breaking away from the price and market regime, trying to manage on the basis of their own resources (at least as long as we disregard the effects of high tax rates, which is another problem than the one considered here). On the other hand, as already observed, there is ample evidence of attempts at deviating from price-taking behavior by collusions as under case (3) (as well as evidence of the inherent instability of this situation as pointed out above). Accordingly, both from the theoretical point of view and on empirical grounds the assumption of price-taking behavior seems to be most vulnerable on account of case (3) in the table.

In a more complete investigation of the likelihood of deviations from price-taking behavior the consideration of *incentives* is however only one side of the issue. The other side is the *practical possibility* of deviating behavior. If considerations of incentives fail to produce definitive results, one might add considerations referring to the practical possibilities to see if more definitive results can then be established. In case (1) above there is no problem about the practical possibilities since the actions explored are reasonably simple and based on individual actions so that there is no organizational problem. Furthermore, in this case no practical difficulties are "needed" since a definite result is obtained regarding the incentives.

In case (4) the core theory disregards all practical difficulties regarding communication and formation of coalitions. Suppose (hypothetically) that the competitive equilibrium, based on price-taking behavior, did not possess the robustness property so that some coalition might block the competitive equilibrium solution. Then there would be a need for considerations regarding the practical possibilities of forming such coalitions. However, since the theorem says that no coalitions can make a gain for all their members by blocking the competitive equilibrium, there is no need for further considerations of practical difficulties of communication and formation of coalitions in order to "save" the competitive equilibrium on this score.

One might however raise an issue concerning the interaction between the considerations referring to case (4) and case (3). According to the theory referred to under (4) only Pareto-optimal solutions are viable (and this holds regardless of the number of agents). Nevertheless, we observe behavior deviating from price-taking, and accordingly violating Pareto optimality, as under case (3). It seems

therefore that, while the theory treating the problems under (4) shows convincingly that incentives for blocking the competitive equilibrium by actions permitted under class (4) are absent, we observe in practice that other solutions which should be blocked according to the same theory do survive. For the explanation of this fact considerations of incentives are not sufficient, i.e., considerations of practical possibilities of forming coalitions must also be invoked.

For case (3) we have, as already remarked, no theory which shows that the incentives for deviating behavior vanish even when the number of agents increases (although the relative strength of the common incentive in favor of collusion and the individual incentives towards breaking out may change). The competitive equilibrium can be protected against such behavior to the extent that there are other factors which prevent deviations from price-taking behavior. The obvious elements here are of course practical problems of forming groups so as to counteract the individual incentives towards breaking out, and there are well-known reasons to believe that these problems increase with the number of agents. Roughly we might imagine a theorem of convergence towards price-taking behavior under class (3) which stems not mainly from incentive considerations, but rather from difficulties and costs involved in organizing groups and controlling the behavior of the members of groups when the size of the economy increases.⁴ Anti-trust regulations and other types of interference against collusive behavior and exploitation of strong market positions are relevant in relation to case (3) exactly because the incentives for deviations from price-taking behavior do not disappear, and because the practical difficulties of organization are not always sufficiently strong to resist the incentives for collusion.

In this discussion we have referred to incentives on the one hand, and practical possibilities on the other hand. These "practical possibilities" or "practical difficulties" are not integrated in any analytical construct. This may be all right in an informal discussion. However, for a more rigorous exploration the possibilities or difficulties should not be introduced as something from the outside, but should rather be taken into account in the form of constraints, input requirements, etc., in the formal description of the set of possible actions and transformations describing the economy. Some recent trends in economic theory which have been concerned mainly with monetary aspects of general equilibrium, may have something to contribute in this sphere.

The brief discussion given above can be summarized as follows. In order to explore the viability of competitive equilibrium, including price-taking behavior, it is necessary to study its robustness against actions deviating from price-taking behavior by individual decisions as well as by coordinated actions by groups of agents, and against deviations within the confines of the price and market regime as well as against actions not so restricted. This gives rise to the taxonomy underlying the discussion above. Roberts and Postlewaite cover one of the possible avenues of deviating behavior. The cooperative game theory, or more

⁴ The necessity of control originates, of course, from individual incentives to break out of, e.g., a cartel if one believes that the remaining cartel will nevertheless continue and keep prices high; thus incentives in this sense play their part also in the "theorem" suggested.

especially the core theory, covers another avenue. Roberts and Postlewaite consider the latter to be an alternative to their own approach. It seems to be more correct and interesting to consider the two approaches as complements, since *all* avenues must be covered in order to demonstrate theoretically the viability of price-taking behavior. From this point of view case (3) in Table I seems to represent the most vulnerable point. In this case incentives for deviating behavior will not disappear even when the number of agents increases beyond any limit. When incentives fail to vanish, then practical problems of communication, organization, etc., may prevent deviating behavior. To what extent these factors work is an empirical matter, but it is evident that they are not sufficiently strong so as to wipe out the possibilities of deviating from price-taking behavior along avenue (3) in the classification above.

This note is not meant as a criticism of the main contribution of Roberts' and Postlewaite's paper, apart from the reservation I have adduced against the way in which they formulate some of their concluding observations. I have rather taken their paper as a welcome point of departure for a modest attempt at a sort of stock-taking to see where we are and how various trends in contemporary literature fit together in a somewhat broader perspective.

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